Environmental Impact Assessment Report

Chapter 16 Schedule of Environmental Commitments

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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16.1 Introduction

This chapter summarises the mitigation measures identified in Chapters 6-14 of this EIA Report that are considered necessary to avoid, reduce, or offset potential impacts. The purpose of the following Schedule of Environmental Commitments is to collate mitigation measures, both for ease of reference and for use by the appointed contractor(s).

The timing of mitigation is indicated. The timing varies and there may be a requirement to embed the mitigation in the detailed design, or be implemented prior to construction, during construction and/or during operation of the Scheme.

Table 16-1: Mitigation Measures Required for the Scheme

Mitigation Item	Timing of Measure	Description	Purpose/Objective
Chapter 6: Population and Human Health			
PHH1	Pre-construction	• Major Incident Control Committee (MICC) to be consulted at detailed design to discuss whether the Scheme construction or operation may affect emergency procedures and whether changes may be required. • Ensuring contractor is briefed on emergency procedures and risks. • Ensuring there are access routes to every section of the flood defences to facilitate inspection and repair following any disaster such as a significant flood event or an earthquake	To manage risks of accidents and disasters
PHH2	Construction	Ensuring the contractor provides temporary flood protection (e.g. temporary sheet piling / dumpy bags / sandbags / boards) to all areas potentially affected by increased flood risk during construction. Where there is not enough room to erect temporary flood defences or e.g. where surface water flooding occurs on the dry side of emerging defences before the secondary drainage is complete, bespoke temporary solutions are to be developed during the detailed design and/or preconstruction phases.	To address flood risks during construction.
PHH3	Pre-Construction	• Review health, safety and environmental risk at detailed design (e.g. to address risk response to flash flood events during/post construction). • Ensure the contractor includes appropriate measures to maintain worker, driver and pedestrian safety during construction (e.g. providing suitable access diversions to avoid areas of risk). • Ensure procurement documentation conditions adhere to best-practice and HSE guidelines relating to construction site planning and management. • Ensure a construction and access management and phasing plan are prepared to reduce the extent of any disruption such that health and safety risks are avoided or reduced	To manage safety during construction.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
PHH4	Construction	• Phase works that require the temporary closure or diversion of footpaths, cycle routes and areas available for recreation to limit the spatial extent of the impact on the whole network. • Ensure a robust traffic management plan is prepared and key facilities are informed of works periods and consulted on specific access needs or vulnerabilities. • Ensure 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 (and any other sensitive events within the vicinity of the Scheme Working Areas). • Plant (amenity) trees or shrubs in vacant areas and existing parks within proximity of the Scheme where possible to mitigate impacts on recreation, green spaces and vegetation loss (natural heritage). • Establish a community liaison officer for the Scheme and a construction liaison committee to ensure the smooth management of the project/public interface. It is proposed that representatives of Falkirk Council, the construction contractors, the local community, and, if appropriate, the Police form the committee. Develop a Communications Plan for targeted and regular updates to the public and key stakeholders. Display appropriate contact details. • Ensure contractor compliance with current regulations (Health and Safety Executive, n.d.) and measures described in Chapter 8: Noise and Vibration and Chapter 14: Traffic and Transportation. • Ensure contractors are required to submit a Construction Environmental Management Plan (CEMP) and Code of Practice or similar to be approved by environmental officers at Falkirk Council before construction can commence. Such documentation is expected to address not only noise, but other nuisance impacts such as the timing of works, dust, mud, visual impacts, contamination risk and traffic disruption amongst others.	To mitigate impacts on recreation and disturbance

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• Liaison with businesses to understand access needs and busy periods. • Implementing a traffic and access management plan. • Sign-post diversions and provide clear and accessible public information.	
PHH5	Procurement	Ensure contract provisions include reference to the Council's Sustainable Procurement Strategy (Falkirk Council, n.d.) (e.g. the contractor could have a target for sourcing services locally and, where feasible, providing training to local apprentices or unemployed individuals to enable them to apply for appropriately (un)skilled vacancies that arise).	To comply with Falkirk Council's Sustainable Procurement Strategy
PHH6	Procurement	Ensure potential for disruption to business activity is addressed in liaison with business owners and other potentially affected parties (i.e. consultation to understand concerns, and the measures to best mitigate those concerns will be included in the contractual requirements of the Contractor).	To avoid/reduce disruption to business activity.
PHH7	Operation	• Ensure a robust inspection and maintenance regime is implemented and maintained over the 100-year lifespan of the Scheme. • Ensure access routes to every section of the flood defences are maintained and cleared of obstructions and overgrowing vegetation to facilitate inspection and repair following any disaster such as a significant flood event or an earthquake. • Ensure emergency (evacuation) procedures and access / egress routes (outwith the refinery) are revised once the final Scheme design has been prepared and the flood warning system updated in consultation with SEPA and in accordance with the Civil Contingencies Act 2004 and Control of Major Accident Hazards (COMAH) Regulations. • Ensure emergency response protocols are updated to respond effectively to flood events greater than the Scheme standard of protection (i.e. > 1 in 200-year event), such as holding emergency response and evacuation drills to maintain civil preparedness. The FRM Strategy highlights the further actions the Council will take in future including awareness raising,	To mitigate effects not considered significant for these factors.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		self-help, flood warning, emergency plans/ response, etc. and all these will also help to mitigate the residual risk from these exceedance events. • Ensure means to continue the standard of protection to address climate change effects are implemented as required, driven by future Flood Risk Management strategies. • Explore options for e.g. property level protection with landowners at continued risk of flooding. • Undertake further investigation into surface water flood risk and apply measures accordingly. • Ensure appropriate signage and emergency egress options are provided at key locations.	
PHH8	Detailed design	Ensure a Landscape and Ecological Habitat Management Plan is produced at detailed design to maximise the biodiversity, amenity and landscape potential of areas requiring reinstatement post construction.	To maximise the biodiversity, amenity and landscape potential of areas requiring reinstatement post construction.
PHH9	Detailed design	Ensure amenity trees are replaced in situ with appropriately sized (heavy standard) examples, with woodland areas being replaced at a 3:1 ratio in suitable locations in the vicinity of the loss or elsewhere.	To reduce landscape and amenity impacts.
PHH10	Detailed design	Ensure the reinstatement of affected areas takes cognisance of future aspirations for Core Path and Active Travel Network improvements (possible partnering opportunities and funding may be sought with interested parties such as Sustrans).	To maintain and improve Core Paths and the Active Travel network.
Chapter 7: Biodiversity			
E1	Pre-construction phase	Prior to construction the contractor will develop, update, and maintain a Construction Environmental Management Plan (CEMP) which must, along with the final detailed design of the Scheme, be approved by Falkirk Council. The CEMP will include an Ecological Management Plan (EMP). The contractor	To ensure compliance with protected species licence conditions, legislation and commitments within the EIA

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		will develop the EMP in consultation with the relevant stakeholders, including NatureScot. The EMP will include Species Management Plans which, as a minimum, will include the following: • the scope of pre-construction surveys required prior to and during construction, in accordance with Mitigation Item E5, to verify and, where required, update the baseline ecological conditions set out in the EIA Report and associated HRA for the Scheme. • details of proposed mitigation measures and any required exclusion zones to avoid or reduce potential impacts and any unnecessary encroachment into adjoining areas of nature conservation. • restrictions on the timing of construction works to avoid or reduce impacts on protected species, for example vegetation clearance will avoid the nesting bird season and works within watercourses will avoid the sensitive period for fish, where possible. • appropriate watching briefs during construction as detailed in the role and expectation of the ECoW (see Mitigation Item E2). • details of proposed post-construction monitoring requirements to ensure mitigation measures are implemented and are functioning as expecting during the operational phase. The EMP will be informed by pre-construction surveys and updated as appropriate with additional mitigation measures where required (including protected species licence conditions where relevant). The EMP will also include a Biosecurity Plan, developed in line with SEPA guidance on INNS, to avoid the spread of INNS and manage their removal and disposal during construction, and a Landscape and Ecological Habitat Management Plan (LEHMP) (see Mitigation Item E21 for details of LEHMP).	Report and associated HRA for the Scheme.
E2	Pre-construction phase	Prior to construction a suitably qualified (or team of suitably qualified) Ecological Clerk of Works (ECoW) will be appointed and will be responsible for implementation of the Ecological Management Plan. The ECoW will:	To ensure compliance with protected species licence conditions, legislation and

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• provide ecological advice over the entire construction programme; • undertake or oversee pre-construction surveys for protected species in the areas affected by the Scheme; • ensure mitigation measures are implemented to avoid and reduce impacts on ecological features; and • monitor the implementation of the mitigation measures during the construction phase to ensure compliance with protected species licence conditions, legislation and commitments within the EIA Report and associated HRA for the Scheme. The ECoW will be a member of the CIEEM and will have previous experience in similar ECoW roles. The ECoW will be appointed in advance of the main construction programme commencing to ensure pre-construction surveys are undertaken and any advance mitigation measures required are implemented.	commitments within the EIA Report and associated HRA for the Scheme.
E3	Pre-construction phase/ Construction phase	A construction lighting plan and method statement will be developed and implemented by the contractor. The plan will detail specific mitigation requirements taking into account guidance on lighting (e.g. Bat Conservation Trust (2009); Institution of Lighting Professionals (2011) and The Royal Commission on Environmental Pollution (2009)). The construction lighting design will take into account the need to avoid illuminating sensitive habitats in locations such as sensitive bird or bat habitats, adjacent to watercourses, known commuting routes and where known protected species activity has been identified through pre- construction ecological surveys (refer to Mitigation Item E1). Where working in or near watercourses is required during the hours of darkness, the contractor will fit temporary lighting with a cowl to limit light spill, angle light away from the watercourses and keep light within the footprint of the construction works where possible to avoid disturbance to migratory fish and otter. Where this is not possible the contractor will agree any exceptions with the ECoW.	To minimise disturbance to sensitive species such as birds, bats, otter and migratory fish.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
E4	Construction phase	'Soft-start' techniques will be implemented for all activities predicted to be particularly noisy, to avoid sudden and unexpected disturbance of protected species. Noise levels will be gradually increased over a period of 30 minutes to allow protected species to relocate. Where construction methods and equipment that can reduce noise are available, these will be implemented where possible.	To minimise disturbance to protected species.
E5	Pre-construction phase	Pre-construction surveys will be undertaken to verify and, where required, update the baseline ecological conditions set out in the EIA Report. The scope of the pre-construction surveys will be confirmed with Falkirk Council (and NatureScot where required) prior to them being undertaken. The results of these surveys will be detailed within the Species Management Plans and will be used to inform protected species licences and any additional mitigation requirements.	To update the baseline and inform protected species licences and any additional mitigation requirements.
E6	Pre-Construction/ construction phase	Tree felling and vegetation clearance will be reduced as far as practicable and undertaken outside the core bird breeding season (01 March to 31 August) to avoid damage/destruction of active nests or disturbance/harm to breeding birds. If this cannot be achieved, works within the core bird breeding season will require an inspection of vegetation or suitable ground nesting habitat for nesting birds by a suitably qualified ecologist no more than 24 hours prior to any works being undertaken. If any active nests are identified during the survey, they will be left in situ for their entire nesting period until the young birds have fledged or the nests have failed due to natural reasons. Alternative approaches to the work will need to be proposed e.g., implementing an exclusion zone around the nest to avoid disturbance. All cleared vegetation will be rendered unsuitable for nesting birds, for example, by covering or chipping depending on the end purpose of the vegetation or will be removed from the works area.	To avoid damage or destruction of occupied nests or harm to breeding birds.
E7	Construction phase	Any tree felling and vegetation clearance will be carried out by experienced contractors to reduce potential direct impacts on protected species. Felling	To minimise impacts to protected species.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		will be carried out according to felling methods agreed between contractors and the ECoW.	
E8	Construction phase	Trenches, holes and pits will be kept covered at night or a means of escape will be provided (such as a ramp) for terrestrial vertebrates that may become entrapped.	To avoid direct mortality of protected species.
E9	Construction phase	Temporary mammal-resistant fencing and gates will be provided around construction compounds in the vicinity of habitat where badger and otter are known to be present. Fencing and gates will meet a specification based on current best practice and agreed through the EMP. Gates will be closed at night.	To minimise impacts to protected species.
E10	Construction phase	Should a new otter resting site, badger sett or great crested newt breeding pond be found within 100 m of piling works during pre-construction surveys, NatureScot will be consulted on licensing requirements and how to proceed.	To minimise to protected species.
E11	Construction phase	Where practicable, works will not be conducted on both banks on the same section of watercourse at the same time to ensure that at least one bank of a watercourse will be passable by otter at all times.	To maintain otter passage.
E12	Construction phase	Where direct impacts on protected species or their resting habitat cannot be avoided, and where such impacts would cause an offence under applicable conservation legislation, derogation licences will be obtained by the contractor from the relevant statutory body (e.g., NatureScot) in advance of the works proceeding. The contractor will comply with the requirements or conditions of any licences granted.	To minimise impacts to protected species.
E13	Construction phase	Placement of construction compounds, storage areas, temporary access tracks etc. will be at least 10 m from watercourse banks in line with SEPA PPGs.	To minimise risk of pollution incidents.
E14	Construction phase	Best practice construction methods (CIRIA 2015, SEPA 2009) and Guidance for Pollution Prevention for works and maintenance in or near water (GPP 5)	To minimise risk of pollution incidents.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		(Netregs 2018) will be followed to minimise impacts on aquatic habitats and species.	
E15	Construction phase	Where the contractor identifies areas within the Site Boundary not required for building the Scheme, temporary barriers will be provided to minimise damage to habitats and potential disturbance or mortality to protected species within these areas.	To minimise impacts to habitats and protected species.
E16	Construction phase	Fish will be removed by suitably qualified personnel prior to creation of in-water working platforms or dry works areas above the tidal limit. Qualified personnel will be on site during the creation of dry works areas in tidal reaches to remove any fish that become stranded.	To minimise impacts on fish.
E17	Construction phase	Unless there is agreement with SEPA and the Forth District Salmon Fisheries Board, no in-stream works will be undertaken between October and May inclusive above the tidal limit on the River Carron, River Avon, Grange Burn, Millhall Burn and Westquarter Burn, to avoid the sensitive fish migration, spawning and emergence periods in these watercourses. In-stream works include establishment and removal of working platforms or dry works areas. Once established, works can continue within dry areas/working platforms throughout the sensitive period although continuous periods of 'noisy' activities such as piling will be avoided unless timing/programme of piling works is agreed with SEPA/FDSFB. The contractor will comply with the conditions of CAR licences and best practice guidelines during works within or in proximity to watercourses.	To avoid the sensitive fish migration, spawning and emergence periods in these watercourses and minimise impacts on fish.
E18	Construction phase	Fish passage will be maintained throughout the works using temporary culverts or maintaining a partial open channel.	To maintain fish passage.
E19	Construction phase	If over-pumping is required, appropriately sized screens will be used to prevent fish from being drawn in.	To minimise risk of injury/mortality to fish.
E20	Pre-construction/	Visual and noise screening will be installed prior to construction along the temporary works areas adjacent to the estuary where possible, to screen the	To minimise disturbance impacts to birds.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
	Construction phase	movement of vehicles, plant and site personnel from birds. The screening will remain in place for the duration of the works. To minimise disturbance to qualifying species of the Firth of Forth SPA and Ramsar site, it has been stipulated in the HRA that construction works along the estuary within Flood Cells 3 and 6 will not be concurrent. During construction, a suitably qualified ecologist or ornithologist will undertake monitoring surveys following the methods for wetland bird Through the Tide Count surveys. These surveys will be used to determine if there is any significant disturbance to qualifying species of the SPA, Ramsar or SSSI, as well as other species of birds present in the survey area. Bird behaviour which constitutes a significant disturbance event, and additional mitigation required in response to this, will be agreed in advance with NatureScot and documented in the Bird Species Management Plan. Should disturbance be identified, works will stop immediately and further mitigation in line with those outlined in the Bird Species Management Plan will be implemented by the ECoW. Whilst significant disturbance to birds during works will be avoided where possible, it is acknowledged that disturbance could occur during construction; therefore, compensatory habitat has been provided.	
E21	Operation phase	Methods for mitigating habitats lost or damaged during construction will be detailed in the Landscape and Ecological Habitat Management Plan (LEHMP) developed as part of detailed design. An outline LEHMP (OLEHMP) and associated figures have been developed by Jacob's landscape architects and ecologists in agreement with Falkirk Council (see Appendix B9.9). This provides an overview of the habitat restoration requirements and indicative mitigation sites for woodland and wetland mitigation (significant impacts identified) within the Site Boundary. Additional woodland mitigation sites beyond the boundary will be identified at detailed design in consultation with Falkirk Council and detailed in the LEHMP.	To mitigate habitats lost or damaged during construction.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		Post-construction monitoring of habitats will be detailed in the LEHMP. Monitoring will be undertaken by a suitably qualified ecologist over a five year period to determine success of habitat restoration and inform whether further remedial action is required to ensure successful establishment. Monitoring will be undertaken at years one, three and five post construction. The results of the monitoring, including recommendations for remedial action where issues with establishment are identified, will be provided in a report following each year of monitoring.	
E22	Operation phase	Reprofile and landscape the banks of Grange Burn/ Westquarter to restore morphological diversity and improve suitability for protected species, including otter and kingfisher, along the sections outlined in mitigation item W27 and W31 of Chapter 10: Water and Environment. Where practicable, other watercourse banks will be reprofiled and landscaped to provide suitable habitat for protected species	To improve the suitability of watercourses for protected species.
E23	Operation phase	Where bat roosts are identified in buildings/structure/trees to be demolished during the baseline and pre-construction surveys, the loss of roosting habitat will be mitigated by the provision of bat boxes mounted on nearby buildings or trees in the area. Bat boxes should be installed prior to construction on suitable trees more than 30 m from the Site Boundary to avoid disturbance during works. Indicative locations for bat boxes include Zetland Park and local wildlife sites in proximity to the Scheme. Additional bat box locations beyond the Site Boundary will be identified at detailed design in consultation with Falkirk Council. Bat boxes should be constructed with durable materials such as concrete mixed with sawdust and polystyrene (e.g., Schwegler boxes). The dimensions and box design will be determined by the type of roost being mitigated. If a significant roost such as a maternity colony is found during pre-construction, then a dedicated bat mitigation structure, such as a bat house, may be required.	To mitigate the loss of bat roosting habitat.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		At years one, three and five post-construction, detailed monitoring will be undertaken by an appropriately experienced and licensed bat ecologist to determine if the mitigation has been installed correctly (year one only) and record any damage or use by nesting birds and document uptake by bats. At years 10, 15, 20, 25 and 30 post construction, simple checks will be undertaken to record and replace any bat boxes which have become damaged or destroyed as replacement planting will not provide suitable roosting habitat until trees have matured (30+ years). A report will be provided following each year of monitoring including recommendations for any issues identified (for example, replacing damaged boxes or cleaning out those used by nesting birds outwith the nesting bird season). Any issues identified will be resolved within six months of issues being reported.	
E24	Operation phase	Revetments along the River Carron will be constructed with loosely packed rock armour stone, which will provide shelter opportunities for otter.	To provide shelter opportunities for otter.
E25	Operation phase	To ensure habitat connectivity for badger along the estuary edge and ensure individuals do not get trapped between the petrochemical plant fence line and flood defences (applicable within Flood Cells 6 and 3), ramps or earth bunds will be installed from the flood defence access track which tie in with the rock armour revetment. Installation of the ramps or earth bunds will be supervised by a suitably qualified ecologist to ensure they are installed in the correct location and function as intended.	To ensure habitat connectivity for badger and that badger do not become trapped. To ensure ramps or earth bunds are installed and function correctly.
E26	Detailed design	A Positive Effects for Biodiversity Management Plan (PEBMP) will be developed at detailed design stage, which will be updated and maintained by the contractor. This will detail the enhancement measures to be implemented and managed in the long-term to ensure PEB are achieved and can be evidenced.	To secure positive effects for biodiversity.
Chapter 8: Noise and Vibration			

Mitigation Item	Timing of Measure	Description	Purpose/Objective
NV1	Construction phase	A noise and vibration monitoring plan will be drawn up, agreed with Falkirk Council and implemented during the construction phase. The monitoring plan will include the following locations as a minimum: • 1-1 Stirling Road: Residential receptors on Stirling Road. • 1-2 Carron Bridges: Residential receptors on Burder Park, Beaumont Drive, and Farm Street. • 1-3 Chapel Burn: Residential receptors on Waters End, Bryce Avenue, Duncan Avenue, Halket Crescent and Rae Court. • 1-4 Dock Street: Residential receptors on Dock Street, Wardlaw Place, Gilfillan Place, The Avenue (including Carron House Lodge). Noise levels must be monitored according to the methods set out in Annex G of BS 5228-1. All measurements must be made on a sound level meter complying Class 1 as defined within BS EN 61672-1:2013 (British Standards Institution, 2013). Vibration monitoring should be undertaken following the guidance contained in BS 6472-1:2008 on measurement of vibration for assessing human disturbance and for building damage in BS ISO 4866:2010.	To determine whether the noise and/or vibration levels arising from the works would exceed or are likely to exceed the agreed limits with the Falkirk Council.
NV2	Construction phase	Adopt Best Practicable Means (BPM) under Section 72 of the Control of Pollution Act 1974 and good practice under BS 5228 Part 1: Noise and Part 2: Vibration including: • Restriction of working hours to between 8:00 and 18:00 Monday to Friday, and no working on Saturday, Sunday or Public Holidays; • Programming the works to restrict impacts to the minimum possible time; • Keeping local residents and property owners fully informed about the nature and timing of the works, including traffic controls, via such means as newsletters or individual contact, where appropriate;	To reduce acoustic and vibrational disturbance as far as practicable.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• Having a representative available on site during working hours to answer queries or address any concerns expressed; • The quietest available plant or machinery should be used where practicable. For example, any compressors brought to site will be super-silenced or sound reduced models fitted with acoustic enclosures or any pneumatic tools fitted with silencers or mufflers, wherever practicable; • Ensure that all plant and equipment is properly maintained and operated in accordance with manufacturers' recommendations and in such a manner as to avoid causing excessive noise; • Start-up plant and equipment sequentially rather than all together; • Ensure that equipment is shut down when not in use for a period longer than 5 minutes; • Use of temporary construction noise screens / barriers around particularly noisy activities and stationary plant such as generators; • Setting for vibration compaction plant to a low amplitude mode or using smaller plant items when operating in close proximity to sensitive receptors to minimise the vibration levels; • Using rotary piling wherever possible to minimise the impact from vibratory piling; • No vehicles will wait or queue on public highways with engines running and care will be taken when unloading deliveries, and • The Contractor on site should carry out a risk assessment to determine the most appropriate mechanism of noise management for reversing alarms. The use of reversing alarms should not be considered as a default position in lieu of a proper risk assessment. The noise control for reversing alarms should consider; design traffic routing and vehicle selection to avoid / minimise the requirement for vehicle reversing, switch off alarms and introduce a banksman where feasible. Where vehicle reversing alarms are required, they should be designed to cause	

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		the lowest practical environmental impact; preferably these should be directional broadband noise emitters or automatically adjusted to ambient noise levels.	
Chapter 9: Landscape and Visual			
LV01	Detailed Design phase	Refine the extent of the required working areas and review the locations of construction compounds at detailed design to avoid features of biodiversity, landscape and amenity interest.	To avoid features of biodiversity, landscape and amenity interest.
LV02	Construction phase	Restore habitats lost or damaged to facilitate construction to the same or better condition as the original habitat.	To offset damage to habitats.
LV03	Construction phase	Use sensitive hoarding to reduce the visual impact of the construction works.	To reduce the visual impact of the construction works.
LV04	Construction phase	Provide advanced planting of offset vegetation, including the establishment of alternative amenity sites and planting of trees in open parkland to offset amenity greenspace and tree loss.	To offset amenity greenspace loss.
LV05	Construction phase	Provide opportunities for local communities to be consulted to help minimise disruption at key locations or during key events.	To encourage local communities to be involved in the Scheme and understand the wider benefits. To avoid/reduce disruption at key locations or during key events.
LV06	Construction phase	Appoint an Environmental Clerk of Works to ensure that all the contractors robustly implement all committed mitigation at the appropriate time and to the appropriate specification.	To ensure that all contractors robustly implement all committed mitigation at the appropriate time and to the appropriate specification.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
LV07	Construction phase	Meet requirements of BS 5837:2012 - Trees in relation to design, demolition and construction: To ensure the appointed (sub-) contractors take full care to avoid impacts on trees to be retained. Any tree felling and vegetation clearance to be carried out by experienced contractors and in accordance with the guidance	To ensure the appointed (sub) contractors take full care to avoid impacts on trees to be retained.
LV08	Construction phase	Meet requirements of BS 3882:2015 - Specification for topsoil: Any new planting to be installed in appropriate soil (import as required).	To ensure the soil is of the correct quality, so plants will thrive.
LV09	Construction phase	Meet requirements of BS 8601:2013 - Specification for subsoil and requirements for use:	To ensure all soils are lifted, transported, stored and spread carefully to avoid damage during handling.
LV10	Construction phase	Meet requirements of BS 4428:1969 - Code of practice for general landscape operations (excluding hard surfaces).	To ensure current appropriate techniques, equipment and materials for general landscape operations are adopted.
LV11	Construction phase	Meet requirements of Construction Design and Management (CDM) Regulations 2015. Site accesses, compounds and working areas must be kept clean and tidy to avoid any visual disruption and temporary lighting controlled to avoid light spill into adjacent landscape and visual receptors.	To avoid visual disruption and light spill into adjacent landscape and visual receptors.
LV12	Construction phase	Meet requirements of CDM Regulations, 2015 - Provision of any diversion routes which would be required for all cycle/footpath/road closures.	To maintain use of active travel routes.
LV13	Pre-construction phase	Review of the LVIA baseline at the pre-construction stage and an assessment made of how any changes to the local environment, which have occurred since this LVIA was undertaken, will affect the outcome of this LVIA.	To ensure no greater significance of effects in relation to the LVIA.
LV14	Operational phase	Replacement planting on riverbanks which have been cleared as part of the Scheme works where possible, which will also form a screening element to reduce the long-term effects of the walls/embankments. The riverbanks will	To reduce the long-term effects of the flood defence walls/embankments and

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		be vegetated by a mixture of natural regeneration of riverbank vegetation and careful planting of native species of wetland, grassland, low shrubs and scrub cover to support the biodiversity of the designated nature conservation sites. This will be established rapidly to maintain a wildlife corridor and minimise visual impact in the short term.	support the biodiversity of the designated nature conservation sites.
LV15	Construction phase	Replacements of trees (project policy, as agreed with the Local Authority): • 1 for 1 basis in sensitive areas using large replacement trees • 3 for 1 basis, either individual trees or measured in hectares for woodland, of replacement trees/woodland trees either within the site areas or in areas nearby. Offsite areas to address cumulative impacts on biodiversity, landscape, views, amenity, and greenspace provision.	To offset impacts of tree loss.
LV16	Construction phase	Review the side from which the walls will be constructed (i.e. from the river or the land), to reduce the effect on existing vegetation where possible, although the final decision on this may lie with the contractor (unless there is a particularly sensitive area which needs protecting).	To reduce the effect on existing vegetation where possible.
LV17	Construction phase	Addition of coir matting along the riverbanks, instead of a basic earth finish, as part of bank erosion protection and planting.	To encourage vegetation of the riverbanks.
LV18	Detailed design	Ensuring a softening of the river's edge in certain areas with additional planting, or wetland habitat creation to improve the riverside's visual appearance, improved habitat connectivity, and to support recreation and education benefits, subject to further design and consultation during detailed design stage.	To soften the river's edge in certain areas, improve the riverside's visual appearance, improve habitat connectivity, and to support recreation and education benefits.
LV19	Detailed design	Replacement trees will include a percentage of larger tree stock to augment smaller whip and feathered tree planting.	To ensure a degree of vegetative maturity at the earliest opportunity.
LV20	Detailed design	For embankment slopes, the gradient to be amended to be as shallow and varied as possible using the land available, thereby reducing the landscape	To reduce landscape and visual impacts of embankments.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		and visual impact of it within the space (this will be subject to further design and consultation during detailed design stage).	
LV21	Detailed design	Identification of appropriate wall materials and bridge finishes, as agreed with the Local Authority (and HES where appropriate), to integrate the walls and bridges into the local landscape and reduce the visual effect of the scheme, as well as protect the setting and qualities of designated landscapes – refer to Appendix B9.9 for a list of proposed wall and bridge finishes.	To integrate the flood defence walls into the local landscape and reduce the visual effect of the Scheme, as well as protect the setting and qualities of designated landscapes.
LV22	Detailed design	It is important that the finish of the walls is appropriate to its location and context. It is advised that a limited palette of materials and cope details be agreed as a design guide to ensure this is achieved – refer to Appendix B9.9 for a list of proposed wall finishes.	To ensure the finish of the flood defence walls is appropriate to their location and context.
LV23	Detailed design	Provision of higher boundary treatments in locations where residents require privacy and where the proposed flood wall boundaries are lower than 1.8m high (standard privacy fence height). This would likely be a fence next to the flood wall, to be agreed with Falkirk Council and affected residents.	To mitigate impacts on residents' privacy.
LV24	Detailed design	Use of art or artistic elements to help integrate the Scheme into the townscape/landscape to be considered and agreed with Falkirk Council.	To reduce potential landscape and visual impacts.
LV25	Detailed design	Widen pavements, where possible to reduce the feeling of enclosure.	To reduce the feeling of enclosure.
LV26	Pre-construction phase	The outline Landscape and Ecological Habitat Management Plan (LEHMP; Appendix B9.10 of the EIA Report) details the overall soft landscaping requirements for the Scheme as well as laying out the associated maintenance and management operations. The aim of the LEHMP is to mitigate/offset potentially significant (cumulative) adverse effects on amenity, trees, open/greenspace provision, recreation opportunities, views and landscape, woodland/scrub habitat, biodiversity, channel morphology, water quality, surface water flooding and	To mitigate/offset potentially significant adverse effects on amenity trees, open/greenspace provision, recreation opportunities, views and landscape, woodland/scrub habitat, biodiversity, channel morphology, water quality,

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		climate change and includes any relevant secondary mitigation, as noted in Chapter 9: Landscape and Visual of the EIA Report. The final LEHMP will cover a 10-year maintenance period following implementation. This will be prepared alongside the general arrangement drawings and associated soft landscape details and specification, as part of detail design. These will form the client's documentation on future maintenance of the Scheme.	surface water flooding and climate change.
LV27	Detailed design	To make sure there is continuity throughout the Scheme and to help reduce potential adverse landscape and visual effects, specific designed elements need to have connectivity and structure along the length of the Scheme. The key to the good design of these elements is appropriateness and robustness. The elements should be in harmony with their environment yet provide the service that they are designed for. The following designed elements will require to be considered at detailed design, as follows: 1) Flood Walls, Gates and Bridges - Types and Finishes: Key information on the finishes and types of flood protection walls and bridge finishes to be fully designed so that their appearance, finish and detailing is appropriate to the character of the adjacent landscape – refer to Appendix B9.9 of the EIA Report for a list of proposed wall finishes. 2) Embankments: slope gradients, seed types/vegetation, constraints on planting for operation/maintenance activities. 3) Footpaths and Hard Landscape: High quality yet robust and durable surface finishes are important to respond to or create the appropriate setting for the rivers and other watercourses. The paths will need to accord with active travel/Core Path expansion aspirations to avoid abortive design/construction work. Co-ordination with Falkirk Council will be key to achieving this. 4) Soft Landscape: New planting will be important for the integration of the Scheme into the adjoining landscape and will help to re-establish soft	To make sure there is continuity throughout the Scheme and to help reduce potential adverse landscape and visual effects.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		landscaped areas which have been affected by the construction of the Scheme. Replacement planting will comprise native species of local provenance where possible.	
Chapter 10: Water Environment			
W1	Pre-construction phase	Preparation of a Construction Environmental Management Plan (CEMP), which will incorporate all applicable individual mitigation measures set out in this Chapter 10 Water Environment of the EIA Report, prior to the commencement of works.	To address nuisance impacts including but not limited to the timing of works, dust, mud, visual impacts, noise, contamination risk and traffic disruption.
W2	Construction phase	Suitably qualified and experienced Environment Clerk of Works and Geomorphological Clerk of Works will be appointed to oversee the implementation of mitigation and monitoring of water environment during construction.	To ensure that all contractors robustly implement all committed mitigation at the appropriate time and to the appropriate specification.
W3	Construction phase	Any material added to the channel to aid construction (i.e., during the formation of temporary in water working areas) will be of a geological composition similar to that of the existing sediment (i.e. derived from local borrow pits). The material will be clean, and not contain high quantities of silt. Where possible, the added material will be removed at the end of the works. Post excavation, natural bed material will be physically separated from construction fill to stop mixing. Imported sediment to aid construction will be of a size that is unlikely to mobilise during a flood event or will be configured such that it cannot be mobilised. Natural bed material will be reinstated post construction.	To reduce the impacts on fluvial geomorphology.
W4	Construction phase	Implementation of measures to reduce the extent of fine sediment transportation, such as:	To reduce the impacts on fluvial geomorphology.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• minimising the extent of in-water working, and work from the bank side as far as practicable to reduce disturbance and damage to riverbeds and addition of excess sediment to the channel; • putting in place mitigation such as 'silt skirts' where construction must take place in or near areas of fine-grained sediments; and • disturbance of areas of fine-grained, easily transportable (by water) material would be avoided as far as practicable	
W5	Construction phase	Separating the working areas from the channel with working platforms which allow flow to bypass the works and minimise the width of the temporary working platforms within the channel, to allow single plant access with occasional passing places rather than a continuous 'two-lane' platform.	To reduce the impacts on fluvial geomorphology.
W6	Construction phase	Works will be undertaken (as far as practicable) during periods of low flow. All in-water works will be undertaken outwith fish spawning seasons.	To reduce the impacts on fluvial geomorphology.
W7	Construction phase	Limit the removal of vegetation from the riparian corridor and retain trees on banks and bank top as far as practicable during construction. Retain fallen trees and large wood on banks and in-water margins where practicable; retain root balls as a minimum during construction to aid the stability of the banks.	To reduce the impacts on fluvial geomorphology.
W8	Construction phase	Bank reinstatement following bank disturbance due to excavation of embankments, flood wall piling and shallow ground improvements.	To reduce the impacts on fluvial geomorphology. To reinstate the bank to a suitable condition and be in-keeping with the local landscape.
W9	Construction phase	Regular monitoring of any change to the channel bed and banks will be undertaken, particularly in the vicinity of the working platforms throughout the construction process. This will be undertaken using fixed point photography, with site surveys should any change be identified. If change does occur this will be reported to SEPA. If required, any mitigation will be agreed with SEPA.	To reduce the impacts on fluvial geomorphology.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
W10	Construction phase	A detailed methodology and accompanying construction method statement for the restoration of the channel bed to the previous levels, including existing forms, will be created. The methodology statement will include detailed reconnaissance and topographic survey undertaken before the works commence and the full methodology will be agreed with SEPA. Bed restoration will be implemented as soon as possible during or after the period of works.	To reduce the impacts on fluvial geomorphology.
W11	Construction phase	The Contractor(s)will implement the following mitigation measures during construction: • in-water working areas will be agreed with SEPA and Marine Scotland through the production of method statements, with the design, timing and location of works aiming to reduce the impact on flood risk, water flows and levels as far as practicable; • develop a flood response plan for all activities to be located within the functional floodplain (defined here as the 0.5% AEP (200-year) flood extent); • any temporary works within the functional floodplain will be made resistant or resilient to flood impacts; • if reasonably practicable, plant and material will be stored outside the 10% AEP (10-year) flood extent; and • In advance of extreme flood events (e.g., 0.5% AEP (200-year), in-water working areas will be evacuated and allowed to flood to prevent any increases in flood levels from constriction of flows.	To reduce potential impacts on flood risk.
W12	Construction phase	Water quality monitoring on affected watercourses will be undertaken one year prior to construction and during construction. The monitoring regime will include (but not be limited to) monthly laboratory analysis of determinants to be agreed in consultation with SEPA and visual inspections. Water quality criteria and standards to be achieved for all site discharges	To reduce potential impacts on surface water quality.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		during construction, and sampling locations, will be agreed in consultation with SEPA.	
W13	Construction phase	In relation to construction site runoff and sedimentation, the Contractor(s) will produce and adhere to Pollution Prevention Plans which will include, but may not be limited to: • avoid unnecessary stockpiling of materials and exposure of bare surfaces, limiting/phasing topsoil stripping wherever practicable; • use of silt fences, bunds, filter trenches, check dams, settlement lagoons, soakaways and other sediment trap structures as appropriate; • use an appropriate grade of material on temporary haul routes and in-water working areas that will be clean and will be durable under heavy trafficking; • monitor, maintain and regrade routes where necessary; • limit the amount of tracking adjacent to watercourses and avoid creation of new flow paths; • provision of wheel washes at appropriate locations (in terms of proposed construction activities) and >10 m from water features where practicable; • protocols will be developed for ceasing or reducing construction activities during periods of high rainfall to reduce the risks of erosion, sedimentation and pollution; • protection of soil stockpiles using bunds and silt fencing, locate stockpiles >10 m from water features where practicable; • concrete mixing and washing areas will be located > 10 m from water features (where practicable), have settlement and re-circulation systems for water reuse; and have a contained area for washing out and cleaning of concrete batching plant or ready-mix lorries;	To reduce potential impacts on surface water quality.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• chemical, fuel and oil storage will be undertaken within a site compound, which will be located on stable ground at a low risk of flooding and >10 m from any watercourse, where practicable; • quick setting products (cement, concrete, and grout) will be used for structures that are in or near to watercourses; and • equipment and materials will be removed wherever possible from the in-river working platforms. The Contractor(s) will provide sufficient security to minimise the risk of vandalism to equipment and materials which may release pollutants into the water environment. These Plans will form part of the CEMP and will be submitted to SEPA for approval prior to construction as part of the CAR Construction Site License authorisation or CAR License process.	
W14	Construction phase	During replacement of the lock gates, a dry working area will be established, where possible to minimise the risk of disturbance, resuspension, and migration of potentially contaminated bed material into the eastern channel or into the Middle Forth (which is a SSSI and SPA). Where practical, this bed material will be dredged/excavated and disposed of at an appropriately licensed facility. Should dredging be required prior to the establishment of a dry working area, this will be undertaken in calm conditions and avoid surge conditions. Booms or silt curtains will be deployed to prevent the migration of dredged material. This may include one or more booms and/or bubble screens and/or silt curtains at each entrance and exit of the locks. Consultation with Marine Scotland may be required, see Mitigation Item W15 below.	To reduce potential impacts on surface water quality.
W15	Construction and pre-construction phase	For works within areas identified as potentially containing contaminated land and sediment the Contractor(s) will reduce the risk of surface water pollution to an acceptably low level through:	To reduce potential impacts on surface water quality.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• further site investigation to determine the level of contamination prior to start of construction; • the installation of temporary treatment facilities to enable removal of pollutants from surface waters; and • further consultation with Marine Scotland and Forth Ports may be required subject to the results of any further site investigation in areas where sediment may be dredged and disposed of. This includes (but is not limited to) the area surrounding the lock gate replacement at the entrance to the Eastern Channel at Grangemouth Docks, where potentially contaminated bed sediments may be present. Assessment of any site investigation results (bed sediment samples) against Marine Scotland Action Levels (Marine Scotland, 2017) may be required.	
W16	Construction phase	In relation to service diversions and to avoid damage to existing services from excavations and ground penetration, including temporary severance of public and private water supplies through potential damage to infrastructure, the Contractor(s) will: • locate and map all private or public water supply assets and other service infrastructure prior to construction; • take measures to prevent damage to services and to avoid pollution during service diversions, excavations and ground works; and • liaise with Scottish Water to request suitable mitigation is implemented if services are disrupted or diverted by the works.	To reduce potential impacts on private water supplies and abstractions.
W17	Construction phase	Where artesian groundwater conditions have been identified, the design depth of sheet piles will terminate above bedrock, to avoid the release of artesian groundwater during construction. Based on the outcome of the detailed dewatering and groundwater flow assessments as well as findings associated with contamination outlined in the Chapter 11: Soils, Geology and Land Contamination of the EIA Report, additional mitigation measures may be required to treat groundwater. If a	To reduce potential impacts on groundwater.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		requirement for additional mitigation measures is identified, proposed measures will be discussed with SEPA prior to finalisation.	
W18	Construction phase	Detailed assessment of potential settlement effects on buildings at risk. Where further assessment establishes a potential subsidence risk to buildings, the Contractor(s) would carry out monitoring during construction and implement appropriate mitigation where necessary.	To reduce potential settlement effects on buildings at risk.
W19	Detailed design	Additional National Vegetation Classification (NVC) survey will be undertaken for GW22 and GW12 to improve the characterisation and confirm the presence of Groundwater Dependent Terrestrial Ecosystems (GWDTE). This will include the exact delineation of the GWDTE vegetation. Detailed design should avoid encroaching or keep to a minimum direct footprint onto GWDTE vegetation.	To reduce potential impacts on GWDTE.
W20	Construction phase	A risk assessment for the use of cementitious materials within 50 m of any excavations or highly permeable areas, which may lead to seepage into groundwater aquifers. To reduce the potential effect on groundwater quality, concrete will be batched off-site where practical.	To reduce the potential impacts on groundwater quality.
W21	Construction phase	Groundwater abstracted to facilitate excavations will be returned to watercourses immediately downstream of the works.	To reduce the potential impacts on groundwater quality.
W22	Construction phase	Adherence to appropriate guidance outlined in Chapter 10: Water Environment Table 10-27 of the EIA Report.	As part of good practice undertaken by the Contractor(s) to reduce impacts to the water environment during construction.
W23	Construction phase	Compliance with the conditions of the Marine Licence and any CAR Construction Site Licence authorisation.	As part of good practice undertaken by the Contractor(s) to reduce impacts to the water environment during construction.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
W24	Operation phase	A separate program of river restoration measures on Grange Burn/Westquarter Burn shall be committed to, which will identify and undertake measures to improve the morphological diversity of the channel banks and bed, encourage natural recovery and improve riparian habitat. Subject to further investigation, design and consultation with SEPA and other relevant stakeholders, potential measures may include (but not be limited to) removing or softening existing bank protection where present, reprofiling of the banks, creation of alternate berms and planting of riparian vegetation in highly modified reaches of the watercourse, such as the reach from approx. NGR NS 92685 80288 to NS 92827 81371.	To reduce potential impacts on fluvial geomorphology.
W25	Operation phase	Soften existing hard bank protection (e.g., willow spiling) and appropriate marginal planting on the Grange Burn/Westquarter Burn from Zetland Park to Bo'ness Rd, between NGR NS 92827 81371 to NS 92993 81990.	To encourage the natural recovery of the watercourse.
W26	Operation phase	Monitoring of the watercourses should be carried out to identify if there are any operational geomorphological issues associated with the Scheme, such as any impacts on watercourse stability (e.g., areas of excessive erosion or deposition) triggered by the Scheme. This will enable any such issues identified to be investigated and remediated as early in the operational phase as possible. Further details are provided in Appendix C10.1 – Fluvial Geomorphology.	To reduce potential impacts on fluvial geomorphology.
W27	Operation phase	Soften banks on the Grange Burn (3300-Grange Burn/Westquarter Burn) during reinstatement from Bo'ness Rd to the estuary, between NGR NS 92993 81990 and NS 94587 82541. Soft bank protection includes pre-planted coir matting or rolls which supports riparian vegetation to quickly re-establish.	To reduce potential impacts on fluvial geomorphology.
W28	Operation phase	Reprofile the banks on the Grange Burn / Westquarter Burn along Grange Burn Road between NGR NS 93036 82090 and NGR NS 94587 82541 to restore morphological diversity to the channel. Slope reprofiling extent will limit the impact on tree and shrub cover on the north bank.	To restore morphological diversity to the channel.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
W29	Operation phase	Further pluvial modelling will be undertaken at the detailed design stage to inform the impact of surface water flooding on receptors. Where necessary, additional surface water drainage will be implemented, for example additional storage, higher capacity drainage or pumping stations. Any detailed assessment will also consider the interaction of proposed flood defences with existing surface water drainage and the Scottish Water network.	To inform the impact of surface water flooding on receptors.
W30	Operation phase	Discussions have taken place with stakeholders which may be impacted due to increases in tidal and fluvial peak flood depths or extent during the 0.5% AEP (200-year) event during the development of the Scheme. Ongoing consultation will take place after publication of the Scheme and through further detailed design to assess appropriate mitigation.	To reduce the significance of impacts of increased flood risk during operation.
W31	Operation phase	A detailed hydrological – hydrogeological assessment of the terrestrial portion of the Firth of Forth SSSI, SPA and Ramsar will be carried out prior to construction. In particular, the detailed assessment will investigate the proportion of groundwater and run-off that contributes to sustaining this protected environment, with a view to adjust the design detailed of the proposed direct defence (with below ground structure) east of the existing treatment work. If required, a Water Compensation Strategy will be put in place to redirect lost water towards the impacted area. Subject to the outcomes of this assessment, monitoring may be required.	To reduce the potential for hydrological and hydrogeological impacts.
W32	Operation phase	A detailed hydrogeological assessment of baseflow groundwater contributions to the River Carron in Flood Cell 1 will be undertaken to support the re-direction of groundwater abstracted during temporary works to the River Carron and compensate baseflow losses. Based on the outcome of the detailed dewatering and groundwater flow assessments as well as findings associated with contamination outlined in the Chapter 11: Soils, Geology and Land Contamination chapter, additional mitigation measures may be required to treat groundwater. If a requirement for additional mitigation measures is identified, proposed measures will be discussed with SEPA prior to finalisation.	To reduce the potential for hydrological and hydrogeological impacts.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
W33	Operation phase	To mitigate against a potential increase in groundwater level reaching the ground surface, filter drains will be placed on the upgradient side of the defences to intercept rising groundwater, should it occur, with gravity outfalls to the nearest watercourse. The filter drains will be regularly maintained to ensure they are operational at all times. The filter drains will be sized to ensure they evacuate groundwater volumes sufficiently so that no new groundwater flooding events occur as a result of the Scheme. The detailed design stage will therefore need to be supported by a more detailed groundwater flow and level risk assessment. Based on the outcome of the detailed dewatering and groundwater flow assessments as well as findings associated with contamination outlined in the Chapter 11: Soils, Geology and Land Contaminationof the EIA Report, additional mitigation measures may be required to treat groundwater. If a requirement for additional mitigation measures is identified, proposed measures will be discussed with SEPA prior to finalisation.	To ensure additional mitigation measures are implemented as required to treat groundwater.
W34	Operation phase	An updated NVC survey and a hydrogeological survey will be carried out for potential GWDTE sites GW16, GW22 and GW24 to confirm the areas of GWDTE and support a detailed site characterisation.	To mitigate against a potential increase in groundwater level reaching the ground surface.
W35	Operation phase	Additional ground investigation and groundwater level monitoring will be carried out along the proposed sheet pile section to the southwest of GW24. This investigation will extend further west, outside the footprint of the proposed sheet piles, to enable a robust characterisation of the groundwater flow component feeding GW24.	To avoid or reduce impacts on GWDTE.
W36	Operation phase	Using information collected in W34 and W35, a detailed CSM complemented by a freshwater balance will be undertaken for GW24. A Water Compensation Strategy will be developed to ensure that freshwater groundwater flow losses are compensated by water being redirected towards GW24.	To enable a robust characterization of the groundwater flow component feeding GW24.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
W37	Operation phase	Sheet pile detailed design will be developed in cognisance of information gathered in W34, W35 and W36 to allow a sufficient proportion of groundwater to reach GW16, GW22 and GW24.	To ensure that freshwater groundwater flow losses are compensated by water being redirected towards GW24.
W38	Detailed design	Detailed design of any permanent culverts will ensure adherence to relevant design standards and good practice guidance, such as SEPA WAT-SG-25: Engineering in the Water Environment Good Practice Guide – River Crossings (SEPA, 2010), wherever practical	To reduce the significance of impacts of flood risk during operation.
W39	Detailed design	Watercourse crossing designs will take account, but not be limited to the following: • appropriate hydraulic design to mitigate flood risk impacts, as assessed against an appropriate flood event; • appropriate design of culvert structures and watercourse modifications (e.g., realignments) with respect to fluvial geomorphology, and riparian and aquatic ecology; • an experienced fluvial geomorphologist will input into the design of all watercourse crossings and associated engineering activities where appropriate; • the design of culverts and associated watercourse modifications will incorporate, wherever practical: • the channel cross section through culverts will be profiled to replicate the existing channel shape (and width) up to the predicted QMED water level where appropriate; • maintenance of the existing channel gradient to avoid erosion at the culvert inlet and outlet; • avoidance of reduction of watercourse length through shortening of watercourse planform;	As part of good practice to reduce impacts to the water environment.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• where possible, culvert lengths will be kept to a minimum and will align of with the existing watercourse; and • implementation of energy dissipation (e.g., stilling basins) and sediment retention measures where necessary; depressing the invert of culverts to allow for reinstatement of natural bed with embedment of the culvert invert to a depth of at least 300mm. • wherever practicable the re-planting of vegetation around culverts where required shall be undertaken. Vegetation will tie in with natural vegetation, where the trees are removed during construction, re-planting is of particular importance; and • post-scheme construction appraisal will be undertaken to identify if there are issues that can be addressed as early in the operation phase as possible.	
W40	Operation	Operation of the Scheme would include tertiary mitigation in the form of good practice undertaken by the maintenance workers to reduce impacts to the water environment. These should include adherence to the following appropriate guidance: • C786 Culvert, screen and outfall manual Culvert Design and Operation Guide (CIRIA, 2019); • C720 Culvert design and operation guide supplementary technical note on understanding blockage risks (CIRIA, 2013); • C763 River Weirs – Design, maintenance, modification and removal (CIRIA, 2016); and • WAT-SG-44 - Engineering in the Water Environment Good Practice Guide: Riparian Vegetation Management (SEPA, 2009c).	As part of good practice to reduce impacts to the water environment.
Chapter 11: Soils, Geology and Land Contamination			

Mitigation Item	Timing of Measure	Description	Purpose/Objective
G1	Pre-Construction phase	Prior to construction and where potential land contamination sources have been identified, further ground investigations and ground gas/ groundwater monitoring sufficient to determine the extent and type of contaminants present will be undertaken to inform detailed risk assessments, identification of appropriate construction methods and procedures, as well as any additional mitigation or remedial measures that may be required. This will include completion of the currently ongoing ground investigations, a detailed assessment of the findings and implementation of any additional investigation and monitoring work that may be deemed necessary in accordance with the regulatory guidance prevalent at the time of assessments.	To inform detailed risk assessments, identification of appropriate construction methods and procedures, as well as any additional mitigation or remedial measures that may be required.
G2	Construction phase	In the event that unexpected soil or water contamination is encountered, works would be stopped, and the working procedures (see Mitigation Item G9) re-assessed to confirm the working methods remain appropriate.	To manage risks to construction and maintenance staff working with/ near land potentially affected by contamination and neighbouring site users/ land users.
G3	Construction phase	Construction staff will be trained to identify asbestos containing material and any other hazardous contaminants potentially present, and appropriate training will be provided for personnel involved in all earthworks activities, to enable implementation of a watching brief to identify presence of unexpected soil or water contamination.	Mitigating the risk working with land potentially affected by contamination for construction and maintenance staff.
G4	Pre-Construction phase Construction phase Post-construction (if necessary)	Should ground gas or vapour issues be identified during further ground investigations or monitoring, appropriate working methods will be developed and adopted during below ground site construction works (including piling works and excavations) and should include as a minimum, monitoring undertaken prior to any entry into excavations, confined spaces or below ground structures and the use of personal protective equipment (PPE) as a last resort. If similar issues are identified during construction, further post-construction monitoring will be undertaken if necessary.	To manage ground gas or vapour risks associated with land potentially affected by contamination.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
G5	Construction phase	Storage of excavated soils and made ground will be minimised on site (spatially and in duration) to what is only practicably necessary and storage areas will be appropriately lined, with adequate drainage management in place and appropriate stand-offs from watercourses.	To manage risks to human health, water environment ecological and built environment/property receptors from uncontrolled storage of excavated soils and made ground.
G6	Construction phase	Standing water within excavations will be controlled where possible and pumped out if necessary. Any water encountered within excavation areas will be assessed for licensed removal or discharge. Containment facilities and discharge locations for abstracted water during construction will be defined taking water quality characteristics into account.	To manage risks to human health, water environment, ecological and built environment/property receptors from uncontrolled storage/discharge of standing water within excavations.
G7	Pre-Construction phase	Where buildings/structures are to be demolished the appointed demolition contractor will undertake asbestos surveys of the structures as appropriate prior to any demolition works commencing and identify appropriate management and disposal routes.	To reduce the risks to human health in relation to the potential release of asbestos containing materials during demolition works.
G8	Pre-Construction phase	Prior to construction and alongside Mitigation Item G1, consultation will be undertaken with Falkirk Council and SEPA (as necessary) regarding works in relation to land affected by contamination to support the obligations set out in 'Planning Advice Note 33: Development of Contaminated Land' (Scottish Government, 2017). Any remedial action undertaken in relation to land affected by contamination will be carried out under the appropriate remediation licencing.	To support the obligations set out in 'Planning Advice Note 33: Development of Contaminated Land' (Scottish Government, 2017).
G9	Pre-Construction phase	Prior to construction, appropriate health, safety and environment procedures for working with potentially contaminated soils and water will be established. This will include provision to manage risks to construction and maintenance staff working with/ near contaminated land and neighbouring site users/ land	To follow best practice in relation to soil management and re-use of site won materials to manage risks to human health,

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		users. Consideration will be given to the adoption of appropriate systems of work, including dust-suppression and air monitoring measures where necessary and the use of PPE. Reference should be made to the relevant Health and Safety Executive Approved Code of Practice and Guidance Notes including HSE Guidance Note MS31 (HSE, 2012). These procedures will be implemented as appropriate during construction.	water environment, ecological and built environment/property receptors.
G10	Pre-Construction phase	To prevent cross contamination and pollution from piling works undertaken in areas of land affected by contamination, Piling Risk Assessments will be undertaken to inform appropriate piling techniques and designs, which should adhere to appropriate guidance including the 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention, National Groundwater and Contaminated Land Centre Report NC/99/77' (Environment Agency, 2001).	To prevent cross contamination and pollution from piling works undertaken in areas of land potentially affected by contamination.
G11	Pre-Construction phase	The appointed Contractor will develop a Site Waste Management Plan (SWMP) in consultation with SEPA, to identify, prior to the start of construction, the types and likely quantities of waste that may be generated and set out, in an auditable manner, how waste will be prevented, re-used, recycled and otherwise recovered in accordance of the principles of the 'Waste Hierarchy' as set out Article 4 of the revised Waste Framework (Directive 2008/98/EC) (European Parliament, 2018).	To determine how waste will be prevented, re-used, recycled and otherwise recovered.
G12	Pre-Construction phase	To maximise the reuse of site-won materials on-site (and minimise the need for disposal of waste in line with the principles of the 'Waste Hierarchy') whilst ensuring that no risks are posed to human health, the water environment or other receptors, a soil re-use assessment will be undertaken prior to construction. The soil re-use assessment will identify any potential risks from potentially contaminated soils re-used throughout the Scheme. The soil re-use assessment will take cognisance of SEPA guidance document Land Remediation and Waste Management Guidelines (SEPA, undated).	To maximise the reuse of site-won materials on-site and minimise the need for disposal of waste whilst managing the risks to human health, water environment, ecological and built environment/property receptors.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
G13	Pre-Construction phase	Waste management procedures will take account of inter alia Waste Management Licence (Scotland) Regulations 2011 (as amended by the Waste Management Licensing (Scotland) Amendment Regulations 2016).	To manage the risks to human health, water environment, ecological and built environment/property receptors from incorrect disposal of waste materials associated with the project.
G14	Construction phase	If excavated soils are deemed unsuitable for re-use they will be assessed in line with the 'Waste Classification: Guidance on the Classification and Assessment of Waste' (Technical Guidance WM3) (Natural Resources Wales et al, May 2021) prior to disposal, to determine whether they are hazardous or non-hazardous. This will establish the most appropriate and cost effective waste stream for the waste materials. Any waste materials removed from the site must be disposed of in accordance with the Waste Management Licensing (Scotland) Regulations 2011 (as amended by the Waste Management Licensing (Scotland) Amendment Regulations 2016) (Scottish Statutory Instruments, 2016).	To manage risks to human health, water environment, ecological and built environment/property receptors from incorrect disposal of waste materials associated with the project and to establish the most appropriate and cost effective waste stream for the waste materials.
G15	Construction phase	Any recovered waste materials imported to site (such as imported soils) must be stored and used only in accordance with a waste management licence or exemption under the Waste Management Licensing (Scotland) Regulations 2011 (as amended by the Waste Management Licensing (Scotland) Amendment Regulations 2016) (Scottish Statutory Instruments, 2016).	To manage risks to human health, water environment, ecological and built environment/property receptors from use of imported soils.
G16	Detailed Design phase	Where concrete materials are proposed to be used, appropriate guidance such as 'Building Research Establishment (BRE) SD1:2005' (BRE Construction Division, 2017) and 'British Standard (BS) BS8500' (British Standards Institution, 2020) will be followed to ensure that ground conditions are appropriate for the use of concrete at each given location.	To ensure that ground conditions are appropriate for the use of concrete at each given location.
Chapter 12: Air Quality and Climate Change			

Mitigation Item	Timing of Measure	Description	Purpose/Objective
AQ01	Construction phase	Dust Management Plan (DMP) to include dust management and control measures, and to be approved by Falkirk Council prior to construction commencing. DMP to include measures as recommended by the IAQM guidance for the following dust emission categories/sources: • Demolition • Earthworks • Construction • Trackout • General dust management and communications – mitigation measures based on Medium risk (i.e. based on the highest risk from any of the specific dust emission sources above). (see Section 12.6.1.1 and Table 12-18 in Chapter 12: Air Quality and Climate of the EIA Report for further detail).	To manage the potential risk of dust on site.
CC01	Construction phase	Use of lower carbon concrete: Concrete to be used for construction of the Scheme is proposed to be low-carbon concrete where possible, e.g. changing the cement concrete in the flood walls from RC 32/40 MPa 15% cement replacement to RC 32/40 50% cement replacement. For this example, the use of the higher cement replacement content in the carbon calculations resulted in an overall 13% lower GHG emissions per tonne of material compared to concrete with lower cement replacement.	To reduce greenhouse gas (GHG) emissions
CC02	Construction phase	Use of lower carbon steel: It is proposed that the sheet piles which form the core of most of the flood defences would be specified in the carbon calculations as lower carbon steel where practicable.	To reduce greenhouse gas (GHG) emissions
CC03	Construction phase	Use of lower carbon aluminium: It is proposed that the flood barriers, gates and flow control could be constructed from recycled aluminium instead of virgin aluminium.	To reduce greenhouse gas (GHG) emissions

Mitigation Item	Timing of Measure	Description	Purpose/Objective
CC04	Construction phase	A Carbon Management Plan (CMP) is being developed by Falkirk Council to reduce the whole life carbon emissions for the Scheme. The Scheme-specific CMP assists in delivery of the wider carbon reduction objectives of Falkirk Council. The CMP for the Scheme aims to adhere to the principles of PAS 2080 (although not seeking official accreditation), the British industry standard for managing infrastructure carbon (British Standards Institute, 2023) and, in summary, will include the following steps: • Calculate the anticipated carbon footprint of the Scheme based on the current outline design information and use this information to assess the potential to reduce carbon across the design, construction and operational phases; • Identify the key carbon 'hotspots' of the Scheme (i.e. those elements of the Scheme which are likely to result in the greatest carbon impacts and therefore offer the greatest potential for reduction); • Set out carbon reduction targets against the carbon baseline; • Set out roles and responsibilities to successfully implement the Scheme-specific CMP and achieve carbon reduction targets; • Specify the steps needed to reduce carbon through the design, construction and operational stages; and • Identify the carbon actions and opportunities which will be considered moving forward and prior to construction completion.	To reduce greenhouse gas (GHG) emissions
CC05	Construction phase	Consideration of the use of construction materials with superior properties (such as increased tolerance to fluctuating temperatures, extreme temperatures and increased solar radiation) to be included within detailed design.	To increase the Scheme's resilience to climate change.
CC06	Construction phase	Implementation of an appropriate asset management strategy by the Scheme operator to proactively identify and, where necessary, rectify potential climate	To increase the Scheme's resilience to climate change.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		related impacts (e.g. additional visual inspections of the Scheme's assets after extreme weather events).	
Chapter 13: Cultural Heritage			
CH1	Pre-Construction phase	A photographic survey (Historic England 2016 Understanding Historic Buildings: a guide to good recording practice; ALGAO, Scotland 2019 Historic Building Recording Guidance for Curators, Consultants and Contractors) of the following assets 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). Refer to Chapter 13: Cultural Heritage of the EIA Report.	To mitigate impacts on the setting of the Cultural Heritage assets.
CH2	Pre-Construction phase	A Level 2 archaeological earthwork record (Historic England, 2017) of Zetland Park (Asset 59), will be undertaken prior to construction.	To mitigate the construction impact on Zetland Park.
CH3	Pre-Construction phase	A watching brief will be undertaken during the ground work excavations for the Scheme at the Westquarter Burn near the Antonine Wall World Heritage Site (Asset 1) and the details of this are to be agreed with Historic Environment Scotland. A watching brief will also be maintained during ground work 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	To identify and recording archaeological remains encountered during construction

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		Police Station (Asset 87). These shall be in accordance with 'CIfA's Standard and guidance for archaeological monitoring and recording' (CIfA 2023).	
CH4	Pre-Construction Construction phase	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.	To reduce vibrational impacts on assets.
CH5	Construction phase	A watching brief shall be undertaken on areas of archaeological potential within the Scheme, in order to identify and record archaeological remains. This shall be in accordance with 'CIfA's Standard and guidance for archaeological monitoring and recording' (CIfA 2023). The areas requiring a watching brief will be agreed with Historic Environment Scotland and Falkirk Council.	To mitigate the potential impact on previously unknown archaeological remains.
CH6	Pre-Construction Construction phase	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 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.	To mitigate potential impacts on the Scheduled Monument.
Chapter 14: Traffic and Transport			
TT1	Detailed design	The active travel measures identified in Chapter 14: Traffic And Transportation Table 14-33 of the EIA Report will be implemented, taking into account the following. To minimise delay, optimise safety and mitigate amenity impacts for active travel route users, including disabled users, the level of provision of crossing	To minimise disruption and maintain safety of users of active travel routes and crossings.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		facilities will require further assessment at the detailed design stage taking anticipated traffic volumes into account. Temporary paths will be created during construction where existing routes need to be closed to accommodate construction works. The routes of these temporary measures will be investigated further at the detailed design stage.	
TT2	Construction phase	Consideration of the roads network, its physical characteristics and location of potentially sensitive receptors along the various routes, has been undertaken to develop mitigation measures aimed at reducing the impacts of construction traffic, including preferred routes to and from the Scheme site compounds and routes to/ from the individual construction sites (see Section 14.5.1 in Chapter 14: Traffic and Transportation of the EIAR). These preferred routes are summarised in Table 14-17 in Chapter 14. It is imperative that construction traffic use the trunk road network to the nearest junction where it then must diverge to reach the destination construction compound. Where practical, construction traffic must use trunk or A-class roads, with little or no traffic calming or traffic management measures, which are designed to be able to accommodate significant HGV movements between the individual construction compounds and construction sites, only deviating where necessary e.g. to reach individual sites.	To reduce the impacts of construction traffic.
TT3	Construction phase	In addition to the specification of preferred access routes and the anticipated phasing of construction traffic (see Table 14-14) in Chapter 14: Traffic and Transportation of the EIAR), additional tertiary mitigation measures and initiatives may be introduced to minimise the intrusive impacts of construction related traffic. Potential measures include the following (in summary here, see Section 14.6.3 in Chapter 14: Traffic and Transportation of the EIA Report for detail): • regulated site working hours • where appropriate, additional warning and speed control signs	To reduce the impacts of construction related traffic.

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• a wheel wash facility and road sweeper • a construction liaison committee to communicate and update on forthcoming activities and deal with issues arising, likely to comprise representatives of Falkirk Council, the construction contractors, the local community, and, if appropriate, the Police. • potential temporary parking restrictions, and alternative parking arrangements, to be discussed with Falkirk Council when construction vehicle access routes are confirmed. • the temporary closure of public rights of way to facilitate construction activity will be discussed with Falkirk Council Access Officer(s) at an early stage during the detailed design of the Scheme and suitable diversions agreed. All rights of way will be reinstated to their original state, or better. Considering the potentially long-term nature of some closures, suitable consideration will be given to providing alternatives, which may necessitate due consideration of suitable crossing facilities, to extant standards, that minimise delay and optimise safety for all users. • the stationing of a 'Stop-Go' banksman with appropriate communications with construction vehicle drivers. A Construction Traffic Management Plan (CTMP) and Transport Statements will be developed and implemented by construction contractors, detailing ways to reduce the construction traffic impact, including: • Avoiding transit at school arrival and departure times. • A communications protocol to avoid delays with emergency vehicle traffic. • A diary of proposed delivery movements to liaise with the communities to avoid key dates such as festivals etc. • The publication of notices and provision of advice to the public and employers in the area where the likely increased driver delay may result.	

Mitigation Item	Timing of Measure	Description	Purpose/Objective
		• Working with local businesses to ensure that construction traffic does not interfere with deliveries or normal business traffic. A construction specific Travel Plan is also proposed (to be drafted and implemented by the contractor, following approval by Falkirk Council) to provide the mechanism to support and promote sustainable travel for staff, contractors and visitors travelling to the work sites. The Travel Plan would seek to eliminate the barriers preventing users of the site from accessing via sustainable travel modes, improving travel choices, and managing single occupancy car use. An appropriate traffic management strategy (to be drafted and implemented by the contractor, following approval by Falkirk Council) will also be necessary to accommodate proposed temporary partial road closures to accommodate the construction works. Careful consideration and liaison with bus operators and appropriate Falkirk Council officers will also need to be undertaken to address impacts on bus services and access to bus stops while also considering appropriate alternative pedestrian routes between alternative bus stops.	