Grangemouth Flood Protection Scheme

Environmental Impact Assessment Report

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Acronyms

AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
ATC	Automatic Traffic Count
CEMP	Construction Environmental Management Plan
DMRB	Design Manual for Roads and Bridges
EB	Eastbound
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FC	Falkirk Council
HarTT	Helix Around Town Tour
HGV	Heavy Goods Vehicle
IEA	Institute of Environmental Assessment
IEMA	Institute of Environmental Management and Assessment
JTC	Junction Turning Count
LDP2	Local Development Plan 2
NB	Northbound
NCN	National Cycle Network
NESA	Network Evaluation from Surveys and Assignment
NPF4	National Planning Framework 4
OS	Ordnance Survey
RC	Roman Catholic
SB	Southbound
TAG	Transport Assessment Guidance
TTRO	Temporary Traffic Regulation Order
UAP	Urban All-Purpose Road
WA	Working Area
WB	Westbound

14. Traffic and Transportation

14.1 Introduction

14.1.1 Overview

This chapter provides an assessment of the traffic and access impacts of the Scheme, including those arising from construction traffic and temporary closures to the transport network, as well as identifying mitigation measures that seek to reduce the impacts on the road network and its associated infrastructure. The sensitive receptors along the proposed construction traffic routes are also identified, and the likely severance impacts to local active and public transport travel movements due to construction access arrangements and/ or traffic management measures are assessed.

14.1.2 Scope of Assessment

As stated in the Scoping Report (Appendix C3.1), on completion of construction, the anticipated traffic movements associated with the Scheme will be limited to routine inspection and maintenance of the flood protection measures. These traffic movements will be infrequent, are expected to be made by light vehicles and will not generate traffic impacts beyond anticipated day-to-day variations in traffic. As confirmed in the Guidelines on the Environmental Assessment of Road Traffic (Guidance Note 1) (IEA Guidelines) (Institute of Environmental Assessment, 1993) *"it should therefore be assumed that projected changes in traffic of less than 10% create no discernible environmental impact"*. Furthermore, the Scheme will provide beneficial traffic impacts through increased flood protection along routes currently affected by flooding. As such, operational traffic impacts are scoped out of this assessment.

The study area for the traffic and transport assessment, defined at the scoping stage as *"the local and strategic road network within and around Grangemouth that will be used by construction traffic"*, was determined as the maximum area likely to be affected during construction of the Scheme. This was taken to be the area covering the expected distribution of construction traffic, assuming all construction traffic would approach Falkirk and Grangemouth using the trunk (strategic) road network and would access the appropriate construction cell Working Area and compound via the nearest junction. Beyond the study area boundary, it is predicted that the construction and operational traffic would be fully integrated within the wider road network without any significant delay or impacts. Consequently, the traffic and transportation study area includes the sections of the road network as further defined in Section 14.4.1.1.

Subsequently, and as described further in Section 14.3.6, the IEA Guidelines were used as a screening framework to define the geographical boundaries of the assessment, based on predicted percentage increases in traffic flows.

A plan of the study area relative to the Scheme boundaries is illustrated in Figure B14.1 in Appendix B14.

14.2 Policy and Legislative Framework

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

NPF4 sets out the national spatial strategy of the Scottish Government. It sets out spatial principles, regional priorities, national developments and national planning policy.

NPF4 Policy 13 'Sustainable Transport' states that *"…development proposals will be supported where it can be demonstrated that the transport requirements generated have been considered in line with the sustainable travel and investment hierarchies and where appropriate they… are designed to incorporate safety measures including safe crossings for walking and wheeling and reducing the number and speed of vehicles"* and *"…Adequately mitigate any impact on local public access routes"*. One of the desired policy outcomes of Policy 13 is: *"More, better, safer and more inclusive active and sustainable travel opportunities"*. Policy 13 also advises that *"Where a development proposal will generate a significant increase in the number of person trips, a transport assessment will be required to be undertaken in accordance with the relevant guidance"*.

Considering the study area, NPF4 also has a focus on the role of Grangemouth in the national economy, and on the Central Scotland Green Network. Grangemouth is also specifically mentioned in reference to the Industrial Green Transition Zones and Grangemouth Investment Zone which acknowledges Grangemouth's importance as hosting strategic and critical infrastructure, high value employment and manufacturing, which it looks to support in the long-term while promoting decarbonisation. One development outlined within this framework as contributing towards this goal is the Grangemouth flood protection scheme.

LDP2 shares a vision for the Falkirk area to be *"a dynamic and distinctive area at the heart of Central Scotland, characterised by a network of thriving communities set within high quality greenspaces, and a growing economy which is of strategic importance in the national context, providing an attractive, inclusive and sustainable place in which to live, work, visit and invest."*

LDP2 reinforces the key objectives to promote sustainable means of travel in preference to travel by car and seeks to protect and keep open any route with access rights to encourage walking and cycling.

LDP2 Policy IR05 'Travel Hierarchy and Transport Assessment' requires that development proposals *"should support a hierarchy of travel which maximises the extent to which its travel demands are met first through walking, then cycling, then public transport and finally through use of private cars".*

LDP2 Policy IR06 'Active Travel' requires that the Council *"will safeguard, improve, and extend the network of active travel routes, with particular emphasis on the core path network… and should address the following requirements, as appropriate…safeguard and improve existing active travel routes affected by the development, including the provision of temporary alternative routes where routes are disrupted by construction."*

Local priorities for Falkirk are set out in The Falkirk Plan 2021-2030 (Falkirk Council, 2021) that capture the vision and commitment of the Falkirk Community Planning Partnership to reduce poverty, tackle inequality, and improve the quality of life for everyone in the Falkirk Council area. The plan gives recognition that local communities want to be more involved in the decision-making process and brought along throughout the planning process to reflect on the needs and aspirations of those who live there.

In addition to this local plan, The Economic Strategy for Falkirk 2015-2025 (Falkirk Council, 2015) focuses on the three key areas of:

- Growth – boosting business creation and growth, innovation, and ensuring a skilled workforce.
- Investment – enhancing infrastructure, attracting business, and unlocking the full economic potential of the area with the Grangemouth Investment Zone a key focus.
- Inclusion – providing access opportunities to local communities to contribute to the area's economy.

Falkirk council's core path information, obtained from The Falkirk Council Core Paths Plan (2010 Core Paths Plan) (Falkirk Council, 2010) and the Falkirk Council Revised Core Paths Plan (Draft) (2018 Core Paths Plan) (Falkirk Council, 2019), identifies a network of paths that gives people reasonable (non-motorised) access throughout the Falkirk Council area.

14.3 Methodology

14.3.1 Introduction

Falkirk Council's response to the EIA Scoping Report submitted to Falkirk Council in October 2018 (Appendix C3.1) agreed the baseline and the scope of the EIA, identified issues 'scoped in' and 'scoped out' of assessment and outlined the methodology proposed for undertaking the traffic and transportation assessment, including a requirement for the following inputs:

- a baseline summary of the transport infrastructure near the Scheme;
- a list of key issues and potential impacts arising during the construction phase including any temporary road or footpath closures;
- the required inputs and consultation to inform the assessment; and
- the proposed methodology for assessing the significance of effects.

14.3.2 Supporting Guidance

While NPF4 refers to the requirement for a Transport Assessment to be carried out *"Where a development proposal will generate a significant increase in the number of person trips"*, this would typically involve subsequent reference to the Scottish Government guidance, i.e. Transport Assessment Guidance (TAG) (Transport Scotland, 2012), which describes the transport assessment process, scope and purpose as well as the level of assessment required and consideration as to how Travel Plans can be implemented.

While TAG has some relevance to this assessment, the IEA Guidelines provide more specific guidance on the assessment of environmental road traffic impacts, and provide the basis for a systematic, consistent, and comprehensive coverage for the appraisal of environmental traffic impacts for a wide range of development project types. However, the IEA Guidelines are not intended to be exhaustive, nor do they provide reference for specific problems that may occur in assessing the environmental impact of traffic. As such, the Guidelines are intended to complement professional judgement and the experience of trained assessors, acknowledging that the significance of environmental impacts associated with certain traffic loads can vary depending on the location and characteristics of the proposed development.

Other guidelines referred to in this assessment include the Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Delivering Quality Development (IEMA Guide) (Institute of Environmental Management and Assessment, 2016), guidance presented in the Design Manual for Roads and Bridges (DMRB), Designing Streets: A Policy Statement for Scotland (The Scottish Government, 2010), Roads for All: Good Practice Guide for Roads (Transport Scotland, 2013), and Cycling by Design (Transport Scotland, 2021).

14.3.3 Overview

The following key tasks were undertaken to facilitate the assessment of key issues and potential impacts:

- a review of the relevant transport policies;
- consultation with relevant authorities;

- determining the baseline traffic and transport conditions via:
  - the collection of traffic data;
  - roads hierarchy review;
  - vehicle route review;
  - active travel review;
  - public transport review;
- the determination of construction traffic volumes[1] for use in the assessment;
- identification of sensitive receptors;
- establishing the need for a cumulative assessment with any nearby committed developments, and the determination of committed development traffic flows;
- an assessment of the potential magnitude of impacts and significance of effects on identified receptors in accordance with the methodology described in Section 3.5 of the IEA Guidelines
- a proposal of mitigation works where necessary; and
- an assessment of residual impacts.

14.3.4 Consultation

Consultation has been undertaken with Falkirk Council (Development Service Department) in relation to the transport, traffic, and access assessment, through attendance at an EIA Stakeholder Workshop in June 2019 and an EIA Pre-application Consultation Workshop in January 2020. More recently, Falkirk Council's response to the Screening / Scoping Report (Appendix C3.2), requested that the following be addressed, and these have been considered in this chapter:

- The assessment should highlight the duration of the construction and any temporary traffic management that will be required during the construction phase (Section 14.5.2.1 and Section 14.5.2.11).
- The assessment should include a traffic management plan for construction workers, including any proposals for an off-site park and ride facility if feasible (potential traffic management measures have been considered, to be developed further at detailed design) (Section 14.6.3).
- The assessment of the impact of construction traffic should consider the impacts of the Bo'ness Road closure. It should be noted that the proposed changes have not yet been implemented, though are likely to be in place before start of Scheme construction (Section 14.5.2).
- The assessment of the impact of construction traffic should consider a lower impact threshold (e.g., 10% significance) for routes that provide access to schools, care homes etc., and that these may be already congested at peak times (Section 14.5.2.2 and Section 14.5.2.3).

14.3.5 Baseline

The baseline review focused on the nature of the transport infrastructure surrounding the Scheme and was informed by desktop studies and consultation, and comprised the following:

- review of responses to the Scoping Report;
- review of responses to additional consultation undertaken by Jacobs specifically on traffic issues;
- review of Falkirk Council Local Development and Core Path Plans;

[1] Established in consultation with the wider Design Team.

- collection of existing traffic flow data;
- collection of existing public transport routes and service frequency;
- review of any roads hierarchy promoted in relevant Local Transport Strategies;
- identification of sensitive junction locations;
- identification of constraints to the roads network, with or without height/ width/ weight restrictions;
- identification of areas of road safety concerns;
- an active travel review from information received directly from Falkirk Council and available on the Falkirk Council website, providing details on the walking, cycling and equestrian routes near the Scheme;
- identification of other traffic sensitive receptors in the area e.g. routes, communities, buildings etc.; and
- review of Ordnance Survey (OS) plans to derive a local area roads network.

14.3.6 Impact Assessment

The IEA Guidelines are used to assess the environmental impact of road traffic associated with major new developments, excluding projects such as new trunk roads or railways which have separate and established procedures. The IEA Guidelines are intended to complement professional judgement and the experience of trained assessors, as the perception of changes in traffic is dependent upon a wide range of factors including volume, speed, function and composition, e.g., percentage of heavy goods vehicles.

The assessment of the environmental impacts of traffic involved a staged approach including:

- determining existing and forecast traffic levels and characteristics;
- determining the period suitable for assessment;
- determining the year of assessment, and
- identifying the geographical boundaries of assessment.

The following IEA Guidelines were used as a screening framework to define the roads identified within the study area that were considered further in the impact assessment:

- Rule 1 – include road links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%).
- Rule 2 – include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more (IEA Guidelines: Sensitive areas include 'accident blackspots, conservation areas, hospitals, and links with pedestrian flows').

Where existing traffic levels are exceptionally low, on some unclassified roads for example, any increase in traffic flow may result in a predicted increase in traffic levels which exceeds these thresholds. Where this situation is identified, it is important to consider any increase, both in terms of its relative increase in respect of existing traffic flows, as well as the overall total flow in respect of the available capacity of the section of road being considered.

For example, a 30% increase in traffic flow on a road which currently only carries 1000 vehicles annual average daily traffic (AADT) flow could potentially indicate a major significant impact if it was considered simply in terms of the IEA Guidelines rules. However, a 7.3 m wide single carriageway road can accommodate greater than 1,000 vehicles per hour (one-way), as indicated by the thresholds

contained in DMRB TA 79/99 Traffic Capacity of Urban Roads (DMRB TA 79/99) (Highways Agency, 1999), and as summarised in Table 14-1. Therefore, such an increase would be unlikely to have a significant impact, given the road's overall capacity. Table 14-1 also summarises the capacity (the maximum sustainable flow of traffic passing in 1 hour, under favourable road and traffic conditions) for a 6.1 m wide single carriageway road, which cannot accommodate the same level of traffic.

Note, an urban all-purpose (UAP) road is defined in DMRB TA 79/99 as a road within a built-up area, either a single carriageway with a speed limit of 40 mph or less or a dual carriageway with a speed limit of 60 mph or less.

Table 14-1: Road types, features / capacities (one-way hourly vehicle flows in each direction)

Feature	UAP1	UAP2	UAP3	UAP4
General description	High standard single / dual carriageway road carrying predominantly through traffic with limited access.	Good standard single / dual carriageway road with frontage access and more than two side roads per km.	Variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings.	Busy high street carrying predominantly local traffic with frontage activity including loading and unloading.
Speed limit	40-60 mph for dual, and generally 40 mph for single carriageway	Generally 40 mph	30-40 mph	30 mph
(Number of) Side roads	0-2 per km	More than 2 per km	More than 2 per km	More than 2 per km
Access to roadside development	Limited access	Access to residential properties	Frontage access	Unlimited access to houses, shops, and businesses
Parking and loading	Restricted	Restricted	Unrestricted	Unrestricted
Pedestrian crossings	Mostly grade-separated	Some at-grade	Some at-grade	Frequent at-grade
Bus stops	In lay-bys	At kerbside	At kerbside	At kerbside
Capacity (Road width 7.3m)	1590	1470	1300	1140
Capacity (Road width 6.1m)T	1020	1020	900	750

Therefore, an element of professional judgement is also applied regarding the carrying capacity of the roads being considered, which is an acceptable and well utilised approach for this type of assessment.

In addition, any potential environmental impacts, including severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation, and accidents and safety, are considered on a case-by-case basis using professional judgement and reasoned argument. The following sub-sections describe the impacts of potential importance outlined in the IEA Guidelines.

14.3.6.1 Severance

Severance is the perceived division that can occur within a community and access to the services and facilities therein e.g., when it becomes separated by impacts associated with construction and improvement projects resulting from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself.

Changes in journey times and amenity for pedestrians and cyclists may be such that they affect, adversely or beneficially, the degree to which a locality is subject to 'community severance'. In considering the impacts of the Scheme construction traffic, community severance is defined as the

separation of residents from facilities and services they use within their community caused by changes in traffic flows. However, the correlation between the degree of severance and the physical barrier of the road and its traffic is not straightforward.

Within DMRB LA 112 Population and human health (DMRB LA 112) (Highways England, 2020), the magnitude of impact (change) resulting from severance is described using the five-point scale summarised in Table 14-2. This has been adapted for the purposes of this assessment to include changes in traffic flows in built-up areas referenced in the IEA Guidelines which identify 'relief' from existing severance as changes in traffic flows in built-up areas of 30%, 60% and 90%.

Table 14-2: DMRB LA 112 Severance Magnitude of Impact

DMRB LA 112 Magnitude of Impact (change)	DMRB LA 112 Description	Change in Traffic Flow
Major	Introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision.	90%+
Moderate	Introduction (adverse) or removal (beneficial) of severe severance with limited/moderate accessibility provision.	60-90%
Minor	Introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision.	30-60%
Negligible	Very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision.	0-30%
No Change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.	0%

14.3.6.2 Driver Delay

Driver delay impacts are likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. To inform the assessment of driver delay, the theoretical capacity of the roads has been considered by referencing the capacity information presented in Table 14-1.

14.3.6.3 Pedestrian Delay

Pedestrian delay, as with driver delay, is likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. To inform the assessment of pedestrian delay, the theoretical capacity of the roads has been considered by referencing the capacity information presented in Table 14-1.

14.3.6.4 Pedestrian Amenity

The magnitude of the impact on pedestrian amenity is considered in terms of the 'threshold' described in the IEA Guidelines, which suggests that a meaningful change in amenity would be where traffic flow (or its lorry component) is halved or doubled.

14.3.6.5 Fear and Intimidation

The magnitude of the impact on fear and intimidation has been considered in reference to the IEA Guidelines, which state that any impact is *"dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths"* and conclude that there are no commonly agreed thresholds for estimating levels of danger, or fear and intimidation from known traffic and physical conditions.

However, the guidelines do present thresholds defining the degree of hazard to pedestrians by average traffic flow, composition and speed as presented in Table 14-3, which could be used as a first approximation of the likelihood of pedestrian fear and intimidation, although other factors are important e.g. proximity to traffic, footway widths etc. Whilst these factors can be quantified, and it is likely to be a combination of traffic volume and speed that would point to a certain degree of hazard (e.g., an average speed of 20+mph would not itself designate an extreme degree of hazard), professional judgement has been exercised in determining the degree of fear and intimidation. Due consideration is given to areas such as high-speed sections of road, locations of turning points and accesses, areas exposed to higher-than-average levels of school children, the elderly or other vulnerable groups.

Table 14-3: Degree of hazard thresholds

Degree of hazard	Average vehicles per hour	Total 18-hour HGV flows	Average speed (mph)
Extreme	1800+	3000+	20+
Great	1200 – 1800	2000 – 3000	15 – 20
Moderate	600 – 1200	1000 – 2000	10 – 15

14.3.6.6 Accidents and Safety

As there is no threshold assessment to determine the significance of the impacts of the construction related traffic on accidents and safety, consideration has been given to the temporary nature of the increase in traffic volumes associated with the Scheme, as well as mitigation measures employed during the period that the increased traffic will be appreciable. A qualitative assessment has therefore been undertaken informed by this consideration.

The increase in traffic volume associated with construction traffic is the main factor in the potential increase in risk regarding accidents and safety, as is the transfer of dirt and debris from the site and associated vehicles onto the surrounding road network. However, there is no threshold assessment to determine the significance of the impacts of the construction related traffic on accidents and safety.

14.3.7 Assessment of Impacts

The method for identifying the sensitivity or importance of receptors, the impact magnitude and the assessment of significant effects is set out in this subsection as follows.

14.3.7.1 Sensitivity / Importance of Receptors

The receptors that may be affected by traffic impacts arising from the construction of the Scheme are likely to exist adjacent to the construction traffic route(s). The sensitivity of these receptors is typically classified by size and function (in terms of settlements, the presence of school and community facilities, traffic calming or traffic management measures, vehicle speed limits and position on the roads hierarchy) using typical criteria such as those identified in DMRB LA 104 Environmental Assessment and Monitoring (DMRB LA 104) (Highways England, 2020) and DMRB LA 112, and summarised in Table 14-4. The classification is based upon subjective judgement and relative sensitivity to the potential traffic impacts of the Scheme.

Table 14-4: Receptor Sensitivity

Sensitivity	Description
High	- Receptors of high importance at the international or national scale and with limited potential for substitution. - Large settlements containing a high number of community and public services and facilities, areas with traffic control signals, waiting and loading restrictions, traffic calming measures and minor rural roads, not constructed to accommodate frequent use by HGVs. - National / regional walking, cycling and horse-riding (WCH) routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Surfaced and form part of the NCN. - WCH routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs. - Rights of way for WCH crossing roads at grade with >8,000 vehicles per day. - Bus routes with a service frequency of more than one bus every 30 minutes.
Medium	- Receptors with high or medium importance at the regional scale and with limited potential for substitution. - Intermediate sized settlements containing some community or public facilities and services, areas with some traffic calming or traffic management measures and local A or B class roads, capable of regular use by HGV traffic. - Public rights of way and other routes close to communities which are used for recreational purposes (e.g., dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys. Surfaced. - Rights of way for WCH crossing roads at grade with >4000-8000 vehicles per day. - Bus routes with a service frequency of one bus approximately every 30 minutes.
Low	- Receptors with low or medium importance and rarity on a local scale (on-site or neighbouring the site). - Small settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition. - Routes which have fallen into disuse through past severance, or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes. Unsurfaced or loose material. - Rights of way for WCH crossing roads at grade with <4000 vehicles per day. - Bus routes with a service frequency of fewer than one bus every 30 minutes.
Negligible	- Receptors with very low importance and rarity. - Roads with no adjacent settlements. - New strategic trunk roads or motorways that would be hardly affected by additional traffic and are suitable for abnormal loads.

14.3.7.2 Magnitude of Impact

The magnitude of impact is denoted using the terms outlined in Table 14-5, which are based on the rules set out in Section 14.3.6 and in consideration of IEA Guidelines, DMRB LA 112 and DMRB LA 104.

Table 14-5: Impact Magnitude

Magnitude	Definition
Major	Impact with substantial beneficial/adverse consequences and/or on a large area, and/or over a long-term period.
Moderate	Impact with consequences and/or over the medium term.
Minor	Discernible impact and/or on a small area, and/or for a short duration.
Negligible	No impact or no discernible impact.

Similarly, the rationale in determining the magnitude of the impact on active travel routes has been based on the length of time the adverse impact would last e.g., where a path is severed by the proposed flood defence structure, the magnitude of the impact is determined as being a major adverse impact.

14.3.7.3 Significance of Effects

The overall significance of effects is determined based on the combination of receptor sensitivity and impact magnitude using the matrix in Table 14-6. The matrix provides a guide subject to professional judgement. The significance of the effects ascribed within the matrix is defined as follows:

- Major – effect is easily detectable/noticeable; likely to be of a long-term or permanent duration; could have irreversible implications; influence exceeds the local area.
- Moderate – effect is easily detectable/noticeable; could have either a temporary or permanent duration; unlikely to exceed local influence.
- Minor – effect is slightly detectable/noticeable; likely to be of temporary duration; local influence.
- Negligible – effect is only very slightly detectable/noticeable or is undetectable and of no significance.

These effects can be either adverse or beneficial.

Table 14-6: Significance of effects matrix

Impact magnitude	Receptor sensitivity/importance			
	Negligible sensitivity	Low sensitivity	Medium sensitivity	High sensitivity
Major magnitude	Minor	Moderate	Major	Major
Moderate magnitude	Negligible	Minor	Moderate	Major
Minor magnitude	Negligible	Negligible	Minor	Moderate
Negligible magnitude	Negligible	Negligible	Negligible	Minor

14.3.8 Assumptions and Limitations

Until contractors have been appointed and materials sources have been identified, it is not possible to determine exactly how many vehicles would reach the respective Working Areas using the routes that have been identified in Table 14-17. The assessment has therefore assumed a reasonable worst-case scenario as described further in Section 14.5.2. Once contractors have been appointed and materials sourced, it is expected that generated construction traffic will arrive at each Working Area using the various assigned routes and would disperse prior to reaching some of the sensitive receptors. Consequently, the information presented in this assessment is necessarily indicative, and the proposed routes, vehicles and other arrangements provided are examples based on Jacobs' experience of construction and operation of similar schemes in Scotland, e.g., the Hawick Flood Protection Scheme.

It should be noted that there are minor limitations to the baseline traffic flows. Several of the traffic counters used to define the baseline traffic data (supplied by Falkirk Council) do not establish directional or vehicle classification data. However, this does not materially affect this assessment.

14.4 Baseline

14.4.1 Existing Baseline

The identification of appropriate baseline conditions for the traffic, transport and access assessment is defined by the approach adopted in Section 14.3.

14.4.1.1 Construction Traffic Routes Review

It was important to identify the likely routes that construction traffic will use to / from the site compounds during construction of the Scheme so that potential impacts and sensitive receptors could be defined. Based on a desktop review of the surrounding road network and professional judgement, the following roads, as illustrated in Figure B14.2 in Appendix B14, have been considered in the assessment:

- The A803, Glasgow Road connects the A803 and A883 from the Three Bridges Roundabout in the west to the A9 at Camelon Roundabout in the east. The road is single carriageway along its length and is subject to a 30mph speed limit. It is the main road leading to the A9 connecting Falkirk with surrounding settlements from the west.
- The A883 is the main route connecting Denny and the M876 J1 with Camelon and the A803, Glasgow Road at the Three Bridge Roundabout to the west of Falkirk. The road is single carriageway along its length and is subject to the national speed limit, except for within Denny where the speed limit is 30mph.
- The A904, Bo'ness Road runs from Grangemouth Town Centre in the west through the Grangemouth Refinery Complex to the River Avon bridge in the east (where it becomes A904, Grangemouth Road). The road is single carriageway across its length, except for between Powdrake Roundabout and Inchyra Roundabout where it is dualled. Bo'ness Road is subject to a 30mph speed limit through the residential area to the west of Powdrake Roundabout, increasing to a 40mph speed limit to the east of this as far as the River Avon crossing.
- The A904, Station Road is a continuation of the A904, Bo'ness Road from Grangemouth town centre to Timber Basin Roundabout. The road is single carriageway and is subject to a 30mph speed limit.
- The A904, Earls Road is a single carriageway road connecting Earl's Gate Roundabout at the M9 J6 and the A904 (Bo'ness Road) at Timber Basin Roundabout. The road is subject to a 30mph speed limit.
- The A904, Grangemouth Road is a continuation of the A904, Bo'ness Road from the River Avon bridge southwards to the Inveravon Roundabout, then continuing east towards Bo'ness. The road is single carriageway along its length and is subject to the national speed limit. It is the main road leading into Grangemouth from the east. Eastbound, the road leads to Bo'ness where it spurs off from the A993 and routes through the north of Bo'ness and re-joins the A993 to the east.
- The A904, Falkirk Road is a continuation of the A904, Earl's Road, connecting Earl's Gate Roundabout at the M9 J6 and Westfield Roundabout (junction with the A9). The road is generally single carriageway, with the northern/eastern section subject to a 30mph speed limit (with single lane dualling for right-turners), and the southern/western section between the bridge over the Helix Around Town Tour (HarTT) cycle route and Westfield Roundabout has a speed limit of 40mph.
- The A905/B9143, Inchyra Road is located between the A904, Bo'ness Road to the north and Cadgers Brae Roundabout (M9/A9/A905 junction) to the south. The northern B9143 section of Inchyra Road travels from the A904, Bo'ness Road at Inchyra Roundabout to the A905, Wholeflats Road at Wholeflats Roundabout to the south. It provides access to the Grangemouth Refinery

Complex and Kersiebank Avenue. The B9143, Inchyra Road is a wide single carriageway road with a speed limit of 40mph. Several access junctions have ghost-islands on the main carriageway for right-turning vehicles. In contrast, the southern A905 section of Inchyra Road is a dual carriageway, travelling from Wholeflats Roundabout to Cadgers Brae Roundabout and has a speed limit of 50mph.

- The A905, Wholeflats Road runs between Wholeflats Roundabout to the west and the Inveravon Roundabout to the east, linking Inchyra Road and the A904, Grangemouth Road. It is a single carriageway road subject to the national speed limit. There are several priority junctions along the road, namely to Grange Road on the south side and depot accesses on the north side of the carriageway.
- The A905, Beancross Road runs parallel to the M9 motorway and connects Earl's Gate Roundabout with Cadgers Brae Roundabout, to the south of Grangemouth. It is a single carriageway road subject to a 30mph speed limit for the most part although there is a national speed limit to south of East Gateway business park.
- The A905, Glensburgh Road is a continuation of the A905, Beancross Road between Earl's Gate Roundabout and the River Carron, crossed by the Kerse Bridge. It is a single carriageway for this entire stretch, subject to a 30mph speed limit.
- The A905 connects between the River Carron, to the northwest of Grangemouth, and the M876 (Junction 3), in the north of the study area. It is a single carriageway road for most part, except for dualling between South Bellsdyke Roundabout and the M876 and is subject to varying speed limits along its length. There is a 40mph speed limit between north of the River Carron and the village of Skinflats where the limit lowers to 30mph within its extents. Between the north of the village and the M876 the speed increases to the national speed limit. The A905 extends further north, eventually connecting to Craigs Roundabout in the centre of Stirling.
- The A9 connects Cadgers Brae Roundabout (south of Grangemouth) in the east and Rosebank Roundabout to the west of Falkirk, bypassing around the north of the town. The road is single carriageway along its length and is subject to varying speed limits. Between Bog Roundabout and Cadgers Brae Roundabout in the east it is subject to a national speed limit, from Bog Roundabout to Merchiston Roundabout it is 40mph while bypassing the town, with a shorter section to the west of Falkirk, between Rosebank Roundabout and Merchiston Roundabout, where the speed limits drop to 30mph.
- The A803/A9, Main Street – This is a short section of road, subject to a 30mph speed limit, that links the A9 and A803, Camelon Road in the east to the A9 Stirling Road and A803 Glasgow Road in the west. The eastern two thirds of the road is dualled, with one lane in the westbound direction a dedicated bus lane, while the western section is single carriageway.
- The A9, Stirling Road connects between A803/A9 Main Street and the M876 (Junction 2) to the north. It is single carriageway along its length and is subject to speed limits varying between 30mph and 40mph. Between the M876 and south of North Broomage Roundabout there is a speed limit of 40mph which then drops to 30mph until south of the River Carron. From south of the river to Falkirk Golf Club it is a 40mph stretch while the southern portion is subject to a 30mph speed limit. Stirling Road (A9) extends further north to Torwood, beyond the M876, where the A9 continues in various forms all the way to Scrabster on the north coast of Scotland.
- The A88, Bellsdyke Road links South Bellsdyke Roundabout in the east and North Broomage Roundabout in the west across the north of the study area. The road is a single carriageway across its full extent and is subject to a national speed limit to the east and 40mph to the west from Antonshill Roundabout.
- The B902, New Carron Road connects the A88, Bellsdyke Road in the north with the B902, Carron Road and the B906, Ronades Road in the south. It is a single carriageway road that is subject to a

40mph speed limit between Antonshill Roundabout and Carron Roundabout and a 30mph speed limit between Carron Roundabout and New Carron Road Roundabout, where it passes areas of housing.

- The B906, Ronades Road connects Merchiston Roundabout on the A9 with New Carron Road Roundabout to the north. It is a single carriageway road subject to a speed limit of 30mph across its entire length, passing through areas of housing.
- The B9132, Abbots Road runs through the centre of Grangemouth, connecting Bo'ness Road (A904) in the north with Newland Roads (B9132) in the centre. It is a single carriageway road subject to a speed limit of 30mph across its entire length, passing through areas of housing.
- The B9132, Newlands Road runs through the centre of Grangemouth, connecting Abbots Road (B9132) in the centre with Beancross Road (A905) in the south. It is a single carriageway road subject to a speed limit of 30mph across its entire length, passing through areas of housing.
- Avondale Road is a very narrow single carriageway rural road connecting the A905 (Wholeflats Road) and Smiddy Brae in the north with junction 4 of the M9 in the south. It is subject to the national speed limit across its entire length.
- Bothkennar Road connects the A905 to North Main Street at the northeast extent of flood cell 1 in the Carronshore area. It is a single carriageway road, that bridges over the M9, and is subject to a national speed limit to the east of Carronshore village, and 30mph within the village boundary.
- Carronshore Road connects the B902, New Carron Road at Carron Roundabout with Main Street in Carronshore. This single carriageway road is located to the north of Working Area 2-2 and Working Area 2-3 and is subject to a 30mph speed limit.
- Dalgrain Road is a narrow single carriageway road, through the industrial area to the west of Grangemouth, parallel to Forth-Clyde Way. Access will be gained from here to the Working Areas of Flood Cell 2.
- Dock Street is a single carriageway residential street running north to south from Main Street in Carronshore. This road provides access to North Bridge Street and Working Area 1-4 and is subject to a 30mph speed limit.
- Forth-Clyde Way is a single carriageway road that connects between the A905, Glensburgh Road in the south and South Bridge Street, west of Timber Basin Roundabout in Grangemouth to the north. This road runs along the edge of Flood Cell 2 and is subject to a 30mph speed limit.
- Grandsable Road runs between the A9 and A803 to the south of Grangemouth near junction 5 of the M9. It is a single carriageway road and is subject to a speed limit of 40mph.
- Grange Lane is a narrow single carriageway road, through the industrial area to the west of Grangemouth, accessed from South Bridge Street. Access will be gained from here to Working Area 2-2.
- Grange Road is a single carriageway road running from A905 Wholeflats Road in the north to Smiddy Brae in the south. It is subject to a national speed limit, apart from where it meets Old Polmontand, and will allow access to the Working Areas of Flood Cell 4.
- Grangeburn Road follows the south bank of Grange Burn, through a residential area in the north of Grangemouth. It is a single carriageway road, with one-way access from Bo'ness Road (A905), and is subject to a speed limit of 30mph.
- Millhall Gardens is a single carriageway residential street with access from Smiddy Brae to the southeast of Grangemouth. It is subject to a speed limit of 30mph and will be used to gain access to Millhall Burn within Working Area 4-4.

- Nicoles Way is a single carriageway road/track that runs parallel to the River Carron through an industrial area. Accessed from Stenhouse Road and subject to a speed limit of 15mph it provides access to Working Area 1-2.
- North Bridge Street is a single carriageway industrial access road connected to Dalgrain Road and provides access to the Working Areas of Flood Cell 2. This road is subject to a 30mph speed limit.
- North Shore Road is a single carriageway road from Timber Basin Roundabout through the Forth Ports land to the north of Grangemouth. This road is subject to a 30mph speed limit and leads to the Working Areas of Flood Cell 3.
- Park Road is a single carriageway residential street with access from Smiddy Brae to the southeast of Grangemouth. It is subject to a speed limit of 30mph and will be used to gain access to Millhall Burn within Working Area 4-4.
- Powdrake Road is within Flood Cell 4 and will also provide access to Flood Cell 3. The road is single carriageway along its length, connecting with South Shore Road to the north, and is subject to a 30mph speed limit. Several access junctions have ghost-islands on the main carriageway for right-turning vehicles coming from the south.
- Reddoch Road is a single carriageway farm / residential access road with access from Smiddy Brae to the southeast of Grangemouth. It is subject to a 30mph speed limit and will be used to gain access to Grange Burn and Millhall Burn within Working Area 4-4.
- Smiddy Brae is a single carriageway road running between Grange Road and Avondale Road to the south of the A905, Wholeflats Road to the southeast of Grangemouth. It is subject to a 30mph speed limit to the east of Reddoch Road and the national speed limit to the west.
- South Bridge Street is a short section of single carriageway road between Forth-Clyde Way at the junction with Dalgrain Road and Timber Basin Roundabout on the western side of Grangemouth. This road runs along the edge of Flood Cell 2 and is subject to a 30mph speed limit.
- South Shore Road is a single carriageway road that follows the north bank of Grange Burn, through the Forth Ports land to the north of Grangemouth. This road is subject to a 30mph speed limit and leads to the Working Areas of Flood Cells 3 and 4.
- Stenhouse Road is a single carriageway road with traffic calming, adjacent to New Carron Road (B902), to the south of Carron. Connecting between Park Road and Carron Roundabout it is subject to a 30mph speed limit and provides access to Nicoles Way.

14.4.1.2 Traffic Counts Data Review

The identification of baseline conditions included a desk-based review of traffic counts for key roads in the study area supplied by Falkirk Council and Transport Scotland. Traffic counts were processed into 24-hour Annual Average Daily Traffic (AADT) and Annual Average Weekday Traffic (AAWT) flows to represent the average flows throughout a given year. Where available, the average percentage of Heavy Goods Vehicles (HGV) has also been considered. The traffic flow data were obtained from the traffic counters listed in Table 14-7, and their locations are illustrated in Figure B14.3 in Appendix B14.

Table 14-7: Traffic counter locations

Ref.	Description	Year
1	JTC08236 – M876, Bonnybridge	2018
2	JTC00459 – M876, between Junction 1 and 2	2022
3	JTC00458 – M876 Between M9 and Jct 2 (A9)	2019
4	JTC00457 – M9, EB between Junction 7 and 8	2018
5	JTC00456 – M9, WB between Junction 7 and 8	2022

Ref.	Description	Year
6	JTC00023 – M876, between M9 Junction 7 and A905 junction	2022
7	JTC00369 – A876, east of Bowtrees junction	2022
8	JTC00133 – A905, Howkerse to A88	2016
9	JTC00024 – M9, south of Junction 7	2022
10	ATC00326 – A9, Merchiston to Munglend roundabouts	2022
11	JTC00460 – M9, Between Junction 5 and 6	2022
12	JTC00461 – M9, Between Junction 4 and 5	2022
13	A88, Bellsdyke Road west of South Bellsdyke Roundabout	2018
14	B902, New Carron Road at the Alloa Road underpass	2019
15	A9, Stirling Road at Falkirk Golf Course	2019
16	A9/A803, Main Street at the Coppertop	2017
17	A9, at St. Mungo's	2018
18	B906, Ronades Road, north of Merchiston Road	2016
19	A9, Falkirk Northern Distributor east of Abbots Road	2018
20	A904, Falkirk Road at Falkirk Stadium	2018
21	A904, Earls Road east of Earl's Gate Roundabout	2018
22	A904, Bo'ness Road at Grangemouth Town Hall	2018
23	A905, Beancross Road at Rannoch Park	2018
24	A9, WB at Klondyke Garden Centre	2018
25	A905, Wholeflats Road east of Wholeflats Roundabout	2016
26	B9143, Inchyra Road north of Kersiebank Avenue	2016
27	Powdrake Road	2018
28	A904, Bo'ness Road between Inchyra Roundabout and INEOS Access Gate 5	2016
29	A904, Bo'ness Road east of INEOS Access Gate 6	2016
30	A904, Bo'ness Road west of Inveravon Roundabout	2016
31	A904, Grangemouth Road east of Inveravon Roundabout	2016

The traffic flow characteristics for each counter location are summarised in Table 14-8 (AADT) and Table 14-9 (AAWT). Several traffic counters provide volumetric data only, and as such, it is not possible to establish vehicle classifications from these counters. Where data on HGV traffic flows are missing, the cells have been left blank. Note, the rows highlighted in Table 14-8 and Table 14-9 only summarise values for one direction at each location. Therefore, the impact assessment (which is undertaken based on two-way flows) will overestimate the impact at these locations.

Table 14-8: Baseline AADT flows

Ref.	Description	NB/EB	SB/WB	2-way	2-way	2-way
		All	All	All	HGV	% HGV
1	JTC08236 – M876, Bonnybridge	15,460	20,230	35,690	4,707	13.19
2	JTC00459 – M876, between Junction 1 and 2	20,603	20,223	40,825	4,736	11.60
3	JTC00458 M876 Between M9 and Jct 2 (A9)	21,177	21,359	42,536	4,977	11.70
4	JTC00457 – M9, EB between Junction 7 and 8	25,811	-	-	2,147	8.32
5	JTC00456 – M9, WB between Junction 7 and 8	-	30,098	-	2,378	7.90
6	JTC00023 – M876, between M9 Junction 7 and A905 junction	12,850	11,518	24,368	2,096	8.60
7	JTC00369 – A876, east of Bowtrees junction	15,264	14,834	30,098	2,378	7.90
8	JTC00133 – A905, Howkerse to A88	4,145	6,331	10,476	-	-
9	JTC00024 – M9, south of Junction 7	24,649	25,794	50,443	8,727	17.30
10	ATC00326 – A9, Merchiston to Munglend roundabouts	6,104	6,262	12,366	1,162	9.40
11	JTC00460 – M9, Between Junction 5 and 6	17,513	18,587	36,101	3,285	9.10
12	JTC00461 – M9, Between Junction 4 and 5	21,172	21,096	42,267	4,058	9.60
13	A88, Bellsdyke Road west of South Bellsdyke Roundabout	4,822	4,878	9,700	819	8.4
14	B902, New Carron Road at the Alloa Road underpass	5,964	5,881	11,845	343	2.9

Ref.	Description	NB/EB	SB/WB	2-way	2-way	2-way
		All	All	All	HGV	% HGV
15	A9, Stirling Road at Falkirk Golf Course	6,048	6,582	12,630	611	4.8
16	A9/A803, Main Street at the Coppertop	10,228	8,536	18,764	768	4.1
17	A9, at St. Mungo's	1,787	1,798	3,585	131	3.7
18	B906, Ronades Road, north of Merchiston Road	6,412	6,347	12,759	804	6.3
19	A9, Falkirk Northern Distributor east of Abbots Road	7,625	7,900	15,525	-	-
20	A904, Falkirk Road at Falkirk Stadium	-	-	25,688	3,600	14.0
21	A904, Earls Road east of Earl's Gate Roundabout	6,285	4,338	10,623	1,801	17.0
22	A904, Bo'ness Road at Grangemouth Town Hall	3,562	3,772	7,333	207	2.8
23	A905, Beancross Road at Rannoch Park	-	-	11,461	1,708	14.9
24	A9, WB at Klondyke Garden Centre	-	12,029	-	1,130	9.4
25	A905, Wholeflats Road east of Wholeflats Roundabout	6,313	6,945	13,258	1,226	9.2
26	B9143, Inchyra Road north of Kersiebank Avenue	4,773	5,000	9,773	1,840	18.8
27	Powdrake Road	1,980	2,500	4,480	1,035	23.1
28	A904, Bo'ness Road between Inchyra Roundabout and INEOS Access Gate 5	2,107	1,943	4,049	654	16.2
29	A904, Bo'ness Road east of INEOS Access Gate 6	2,032	1,982	4,014	693	17.3
30	A904, Bo'ness Road west of Inveravon Roundabout	1,740	1,680	3,420	499	14.6
31	A904, Grangemouth Road east of Inveravon Roundabout	6,059	6,107	12,166	-	-

Table 14-9: Baseline AAWT flows

Ref.	Description	NB/EB	SB/WB	2-way	2-way	2-way
		All	All	All	HGV	% HGV
1	JTC08236 – M876, Bonnybridge	17,421	22,487	39,908	5,853	14.67
2	JTC00459 – M876, between Junction 1 and 2	22,857	22,303	45,160	6,051	13.40
3	JTC00458 M876 Between M9 and Jct 2 (A9)	23,701	24,046	47,747	6,303	13.20
4	JTC00457 – M9, EB between Junction 7 and 8	26,611	-	-	2,593	9.74
5	JTC00456 – M9, WB between Junction 7 and 8	-	32,539	-	3,026	9.30
6	JTC00023 – M876, between M9 Junction 7 and A905 junction	13,893	12,453	26,346	2,661	10.10
7	JTC00369 – A876, east of Bowtrees junction	16,525	16,014	32,539	3,026	9.30
8	JTC00133 – A905, Howkerse to A88	4,542	6,755	11,297	-	-
9	JTC00024 – M9, south of Junction 7	27,072	28,316	55,389	10,912	19.70
10	ATC00326 – A9, Merchiston to Munglend roundabouts	6,671	6,822	13,493	1,457	10.80
11	JTC00460 – M9, Between Junction 5 and 6	19,125	20,298	39,424	4,179	10.60
12	JTC00461 – M9, Between Junction 4 and 5	24,951	23,136	48,087	5,112	10.63
13	A88, Bellsdyke Road west of South Bellsdyke Roundabout	5,298	5,365	10,663	-	-
14	B902, New Carron Road at the Alloa Road underpass	6,242	6,194	12,436	419	3.4
15	A9, Stirling Road at Falkirk Golf Course	6,609	7,222	13,831	720	5.2
16	A9/A803, Main Street at the Coppertop	10,706	8,907	19,613	916	4.7
17	A9, at St. Mungo's	2,089	2,123	4,212	171	4.1
18	B906, Ronades Road, north of Merchiston Road	6,815	6,762	13,577	972	7.2
19	A9, Falkirk Northern Distributor east of Abbots Road	8,444	8,789	17,233	-	-
20	A904, Falkirk Road at Falkirk Stadium	-	-	27,691	-	-
21	A904, Earls Road east of Earl's Gate Roundabout	7,339	4,993	12,332	-	-
22	A904, Bo'ness Road at Grangemouth Town Hall	4,038	4,234	8,272	242	2.9
23	A905, Beancross Road at Rannoch Park	-	-	12,865	1,918	14.9
24	A9, WB at Klondyke Garden Centre	-	12,925	-	-	-
25	A905, Wholeflats Road east of Wholeflats Roundabout	6,823	7,484	14,307	1,516	10.6
26	B9143, Inchyra Road north of Kersiebank Avenue	8,490	8,549	17,039	1,868	11.0

Ref.	Description	NB/EB	SB/WB	2-way	2-way	2-way
		All	All	All	HGV	% HGV
27	Powdrake Road	2,494	3,154	5,647	1,313	23.3
28	A904, Bo'ness Road between Inchyra Roundabout and INEOS Access Gate 5	2,374	2,214	4,588	799	17.4
29	A904, Bo'ness Road east of INEOS Access Gate 6	2,307	2,291	4,598	870	18.9
30	A904, Bo'ness Road west of Inveravon Roundabout	1,967	1,861	3,827	607	15.9
31	A904, Grangemouth Road east of Inveravon Roundabout	5,588	5,626	11,214	-	-

Due to plans to close Bo'ness Road through the Grangemouth Refinery Complex (refer to Section 14.3.4 for more details), localised traffic flows for this scenario, with Bo'ness Road closed, have also been estimated and are summarised in Table 14-10 and

Table 14-11.

Table 14-10: Baseline AADT flows with Bo'ness Road closed

Ref.	Description	NB/EB	SB/WB	2-way	2-way	2-way
		All	All	All	HGV	% HGV
25	A905, Wholeflats Road east of Wholeflats Roundabout	8,829	9,349	18,179	2,007	11.0
27	B9143, Inchyra Road north of Kersiebank Avenue	5,906	5,891	11,797	1,949	16.5
28	A904, Bo'ness Road between Inchyra Roundabout and INEOS Access Gate 5	Closed	Closed	Closed	Closed	Closed
29	A904, Bo'ness Road east of INEOS Access Gate 6	Closed	Closed	Closed	Closed	Closed
30	A904, Bo'ness Road west of Inveravon Roundabout	Closed	Closed	Closed	Closed	Closed
31	A904, Grangemouth Road east of Inveravon Roundabout	6,191	6,321	12,512	-	-

Table 14-11: Baseline AAWT flows with Bo'ness Road closed

Ref.	Description	NB/EB	SB/WB	2-way	2-way	2-way
		All	All	All	HGV	% HGV
25	A905, Wholeflats Road east of Wholeflats Roundabout	9,686	10,242	19,927	2,506	12.6
27	B9143, Inchyra Road north of Kersiebank Avenue	10,320	10,121	20,441	2,006	9.8
28	A904, Bo'ness Road between Inchyra Roundabout and INEOS Access Gate 5	Closed	Closed	Closed	Closed	Closed
29	A904, Bo'ness Road east of INEOS Access Gate 6	Closed	Closed	Closed	Closed	Closed
30	A904, Bo'ness Road west of Inveravon Roundabout	Closed	Closed	Closed	Closed	Closed
31	A904, Grangemouth Road east of Inveravon Roundabout	6,451	6,590	13,041	-	-

14.4.1.3 Sensitive Receptors

The potential sensitive receptors that have been identified, because of the traffic and transport impacts associated with the Scheme, are:

- the road network and the people using it, including those using public transport – potential delay, severance and disruption impacts;
- pedestrians and cyclists on surrounding footways and cycleways – potential delay, severance and disruption impacts;
- residents – potential disruption due to local intrusion, dust and dirt;

- local businesses and employees – potential disruption due to potential temporary road closures, local intrusion, dust and dirt;
- construction vehicle drivers – potential safety concerns; and
- Falkirk Council and other landowners – potential deterioration of local road surfaces.

14.4.1.4 Active Travel Review

A core paths dataset was obtained from Falkirk Council in 2023, and reference has also been given to the 2010 Core Paths Plan (Falkirk Council, 2010) and the 2018 Core Paths Plan (Falkirk Council 2019). The draft 2018 Core Paths Plan takes account of considerable investment in the path network and proposes 128 new core paths, nine realigned / alternative paths and the removal of one path. When comparing both core path plans with the dataset provided by Falkirk Council, some inconsistences were identified. Therefore, Table 14-12 summarises the core path references from the 2010 Core Paths Plan and the recent Falkirk Council dataset. These core paths, which include many that are also part of national and locally marketed recreational and tourist routes, form part of a wider network of walking and cycling routes in the Falkirk area, including many that are within or near the study area. The numerous walking and cycle routes, including those identified in Table 14-12Table 14-12: Core paths summary, are illustrated in Figure B14.4 in Appendix B14.

The National Cycle Network Route 76 (NCN76) – 'Round the Forth', between Berwick-upon-Tweed and Kirkcaldy, traverses a large part of Grangemouth, using a mixture of both the core path and road networks intersecting with several of the Flood Cell areas within the study area. The route is signed within the study area and generally keeps to minor roads and shared footpaths / footways, except for on the A904 Bo'ness Road through the town centre, which includes narrow advisory cycle lanes.

A local spur from the NCN76 links the national route to The Kelpies, an important local tourist attraction, and The Helix, a large recreational greenspace where 16 local communities are connected through the extensive path network. An extensive area of woodland to the north of Falkirk contains several walking and cycle routes and nature trails that make up part of The Helix network. These routes are presented as being suitable for family groups and inexperienced cyclists and are likely to be used for recreation and leisure purposes and will be considered important to the surrounding communities.

There are several other promoted walking and cycle routes throughout Falkirk and the wider area which the Scheme must be cognisant of. Among these, The Helix Around Town Tour (HarTT) cycle route and the Falkirk Wheel-Kelpies Canal path route are the most prominent, while the Helix-Bainsford Loop and The Helix-Larbert Link are also highlighted for local connectivity.

Reference is made to Chapter 9 (Landscape and Visual) which presents the potential impacts of the Scheme on the landscape and on views experienced by people on roads and routes used by pedestrians, cyclists, and equestrians.

Table 14-12: Core paths summary

WA	Location	2010 Path ref.	Core Path ref.	Surface	Gradient	Length (m)
1-1	River Carron path: Swing Bridge to Camelon Cemetery	001/28	001/013 (Proposed deletion)	Unsurfaced	Flat	486
1-1	River Carron Path: Swing Bridge to Camelon Cemetery	N/A	001/048 (Proposed addition)	-	-	615
1-1	Carronvale Road to Swing Bridge, River Carron	011/162	011/015	Farm Track	Steep	533

WA	Location	2010 Path ref.	Core Path ref.	Surface	Gradient	Length (m)
1-1	Dorrator Bridge to Cemetery Loop	N/A	001/050 (Proposed addition)	-	-	1276
1-2	Mungal Riverside (part of HarTT)	001/36	001/018	Tarmac	Flat	1046
1-2	Mungal Riverside (part of HarTT)	001/38	001/020	Tarmac	Flat	605
1-2	Mungal Riverside	001/39	001/021	Tarmac	Flat	409
1-2	River Carron to rear of Park Road (part of HarTT)	004/1244	004/017	Tarmac	Flat	312
1-2	Dawson Mission path (part of HarTT)	004/1196	004/003	Tarmac	Flat	155
1-2	Cobblebrae (part of Helix North)	004/1251	004/019	Compacted stone	Flat	43
1-2	Cobblebrae – River Carron Path (part of Helix North)	004/1247	004/018	Compacted stone	Flat	643
1-2	Cobblebrae (part of Helix North)	004/1191	004/001	Compacted stone	Flat	70
1-2	Cobblebrae to Carron Bridge (part of Helix North)	N/A	004/035 (Proposed addition)	Tarmac	Flat	71
1-2	Cobblebrae (part of Helix North)	004/1259	004/022	Tarmac	Flat	38
1-2	Cobblebrae (part of HarTT)	004/1261	004/023	Tarmac	Flat	630
1-2	Stenhouse Road to Mill Lade (part of Helix-Larbert Link)	011/144	011/008	Tarmac	Slight	719
1-3	Carronshore 2000 path	009/1674	009/001	Tarmac	Flat	297
1-3	Carronshore Road to Mill Road	009/1691	009/005	Tarmac	Flat	702
1-4	The Avenue to Glensburgh Road (River Carron path)	009/1702	009/009	Compacted stone	Flat	1930
1-4	Bothkennar Road to Waterslap Road	009/1701	009/007	Tarmac	Flat	2125
2-1	Rope Walk, Grangemouth Old Town	006/1339	006/008	Tarmac	Flat	482
4-1	Mumrills Road (part of HarTT)	015/522	015/012	Tarmac	Steep	894
4-1	Cassel Brae/Fairy Glen	016/580	016/015	Unsurfaced	Steep	592
4-2	Beancross Road	006/1366	006/016	Tarmac	Flat	359
4-2	Rannoch Park	006/1336	006/007	Tarmac	Flat	536
4-2	Rannoch Road	006/1368	006/018	Tarmac	Flat	571
4-2	Rannoch Road to Rannoch Park	006/1369	006/019	Tarmac	Steps and Bridge	65
4-2	Grange Burn	006/1343	006/009	Tarmac	Flat	530
4-2 / 4-3	Inchyra Road (part of NCN76)	006/1345	006/011	Tarmac	Flat	704
4-3 / 5-1	Inveravon to Wholeflats Roundabout (part of NCN76)	016/648	016/038	Tarmac	Steep	2190
4-3 / 4-4	Polmont Woods to Wholeflats Road	N/A	016/039 (Proposed addition)	Tarmac	Flat	991
4-4	Polmont Woods	016/616	016/024	Compacted stone	Steep	432
4-5	Zetland Park	006/1378	006/022	Tarmac	Flat	641
4-5	Zetland Park	006/1391	006/026	Tarmac	Flat	227
4-5	Zetland Park	006/1348	006/013	Tarmac	Flat	146
4-5	Wood Street to Zetland Park	N/A	006/043 (Proposed addition)	Tarmac	Flat with ramped bridge at park	1804

WA	Location	2010 Path ref.	Core Path ref.	Surface	Gradient	Length (m)
4-6	Dalratho Road to Bo'ness Road (adjacent to NCN76)	006/1400	006/028	Tarmac	Flat	272
4-6	Station Road (adjacent to NCN76)	006/1381	006/023	Tarmac	Flat	974
5-1	Jinkaboot Bridge	016/652	016/036	Tarmac	Flat	114
5-1	Inveravon to Wholeflats Roundabout (part of NCN76)	016/648	016/038	Tarmac	Steep	2190

14.4.1.5 Public Transport Review

According to the Falkirk Area Green Travel Map[2], the following roads within the study area are identified as being bus routes with a service frequency of one bus every 30 minutes or better (proximity to Working Areas has been included for reference):

- A9, Stirling Road (close to Working Area 1-1)
- B902, Carron Road (close to Working Area 1-2)
- Stenhouse Road (close to Working Area 1-2)
- Carronshore Road (close to Working Area 1-3)
- Main Street, Carronshore (close to Working Area 1-4)
- North Main Street, Carronshore (close to Working Area 1-4)
- Forth-Clyde Way (close to Working Area 2-1)
- South Bridge Street (close to Working Area 2-2 and Working Area 3-1)
- Rannoch Road (close to Working Area 4-2)
- A904, Bo'ness Road (close to Working Area 4-6 and Working Area 4-7)

The various bus routes are illustrated in Figure B14.5 of Appendix B14. The thirty-two bus services illustrated operate with an average frequency of just over one bus per hour, although some services have as many as five.

A pedestrian footbridge is provided over the A9, Stirling Road to Camelon Railway Station which is accessible via adjacent Stirling Road footways. Railway lines and railway stations are also illustrated in Figure B14.5 in Appendix B14, although unlikely to be impacted by the Scheme.

14.4.1.6 Trip Generators and Attractors

Key trip generators and attractors for people within the study area include links:

- between the residential areas of Grangemouth and the town centre (and the facilities therein e.g., shops, restaurants, medical centres, dental practices etc.);
- between the residential areas of Larbert, Stenhousemuir and the surrounding villages and their respective main streets and town centres (and the facilities therein e.g., shops, restaurants, medical centres, dental practices etc.);
- between the surrounding conurbation of Falkirk (the largest town in the region) and Falkirk town centre (and the facilities therein e.g., shops, restaurants, cinema, medical centres, dental practices etc.);
- between residential areas of Falkirk, Grangemouth, Larbert, Stenhousemuir etc. and schools;

[2] Available at: https://www.falkirk.gov.uk/maps-local/roads-parking-transport/green-travel-map.aspx (Accessed May 2023)

- between residential areas of Falkirk, Grangemouth, Larbert, Stenhousemuir etc. and the commercial land uses in the vicinity; and
- the walking and cycling and road network itself.

More specific trip generators and attractors, other than the main retail areas, include those summarised in Table 14-13 and illustrated in Figure B14.6 in Appendix B14.

Table 14-13: Trip generators and attractors

Ref.	Medical Centres	Schools/Colleges	Community/Leisure Facilities
1	Forth Valley Royal Hospital	Larbert Village Primary School	North Broomage Park
2	Stenhousemuir Health Centre	Ladeside Primary School	Falkirk Tryst Golf Club
3	Tryst Medical Centre	Easter Carmuirs Primary School	Chapelburn Park West
4	Camelon Health Clinic	Kinnaird Primary School	Chapelburn Park East
5	Carron Medical Centre	St Bernadette's RC Primary School	Stenhousemuir Active Health and Fitness
6	Falkirk Community Hospital	Stenhousemuir Primary School	Tryst Community Centre
7	Parkhill Medical Prcatice	Larbert High School	Larbert Library
8	Ark Medical Practice	Carmuirs Primary School	Crownest Park (The Lido)
9	Meeks Road Surgery	Falkirk High School	Stewartfield Park
10	The Graeme Medical Centre	Bantaskin Primary School / Windsor Park School	Falkirk Golf Club
11	The Wallace Medical Centre	Carron Primary School	Easter Carmuirs Park
12	Bo'ness Medical Practice	Carronshore Primary School	The Falkirk Wheel
13	Kersiebank Medical Practice	Langlees Primary School	The Mariner Centre
14	Westburn Medical Practice	Bainsford Primary School	Camelon Park
15	-	St Francis Xavier's RC Primary School	Nailer Park
16	-	St Mungo's High School	Camelon Community Centre
17	-	Comely Park Primary School	Dollar Park
18	-	Victoria Primary School	Bainsford Community Hall
19	-	Forth Valley College	Dawson Park
20	-	St Andrew's Primary School	Cobblebrae Park
21	-	Graeme High School	Burnside Park
22	-	Laurieston Primary School	Symington Park
23	-	Westquarter Primary School	Carronshore Community Centre
24	-	Beancross Primary School	Gairdoch Park
25	-	Moray Primary School	Abbotshaugh Community Woodland
26	-	Carrongrange High School	Dawson Community Centre
27	-	Sacred Heart RC Primary School	Thornhill Community Hall
28	-	Bowhouse Primary School	Victoria Park
29	-	Grangemouth High School	Cineworld Cinema
30	-	St Margarets Primary School	Falkirk Library
31	-	-	Erskine Community Halls
32	-	-	Callendar Park
33	-	-	Laurieston Community Hall
34	-	-	Westfield Park Community Centre
35	-	-	Falkirk Stadium
36	-	-	The Helix
37	-	-	The Kelpies
38	-	-	Dalgrain Park / Community Hall
39	-	-	Skinflats Park
40	-	-	Grangemouth Library
41	-	-	Zetland Park
42	-	-	Grangemouth Sports Complex

Ref.	Medical Centres	Schools/Colleges	Community/Leisure Facilities
43	-	-	Kersiebank Community Education Centre
44	-	-	Inchyra Park
45	-	-	Grangemouth Stadium
46	-	-	Bowhouse Community Association
47	-	-	Beancross and Newlands Community Hall
48	-	-	Rannoch Park
49	-	-	Galaxy Sports Little Kerse
50	-	-	Grangemouth Golf Course
51	-	-	Greenpark Community Centre
52	-	-	Gray Buchanan Park
53	-	-	Meadowbank Library
54	-	-	Polmont Sports Centre

In addition, it is important to note that the LDP2 identifies various sites for housing, infrastructure, business, and green network development / redevelopment within the study area and this is discussed further in Chapter 6 Population and Human Health.

14.4.2 Future Traffic Baseline

To present a robust assessment, baseline traffic flows have not been projected. By not applying traffic growth or additional traffic as a result of future development to the baseline traffic, the assessment can be deemed to be robust i.e., if the existing traffic flows were factored to future year levels, the calculated percentage increases would be less (e.g., an increase of 100 vehicles to a nominal existing flow of 5,000 vehicles means a percentage increase of 2.0%, whereas an increase of 100 vehicles to a nominal future year flow of, 6,000 vehicles means a percentage increase of 1.7%).

14.5 Impact Assessment

14.5.1 Introduction

In line with IEA guidelines and the agreed scope, the impact assessment has considered an assessment of road traffic during the construction phase of the Scheme. An assessment of the impacts on active travel routes follows in Section 14.5.3.

14.5.2 Road Traffic

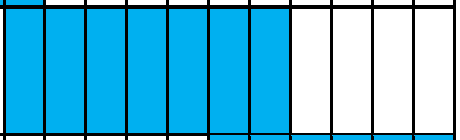
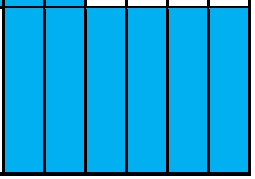
14.5.2.1 Construction Traffic Movements

The road traffic impact of the Scheme will be a result of temporary additional traffic volumes, associated with the construction activities (both staff and HGV movements), on the existing road network, and affecting users of that road network, including drivers, and those walking, wheeling, cycling, or travelling by public transport.

Table 14-14 illustrates the estimated works timetable for the main construction programme as provided in Appendix C4.1 (minus the initial (-1) year for pre-construction works). Although the exact construction phasing is currently unknown it is estimated that some works will occur in parallel, split into four phases, with each potentially involving more than once construction contract. The phases are colour coded in Table 14-14.

Table 14-14: Estimated works timetable

Cell	Working Area	Location	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Cell 1	1-1	Stirling Road Larbert									
	1-2	Carron Bridges									
	1-3	Chapel Burn									
	1-4	Dock Street									
Cell 2	2-1	Forth and Clyde Canal Lock									
	2-2	Jarvie Plant									
Cell 3	3-1	Mouth of the River Carron									
	3-2	West Coast of the Port									
	3-3	Lock Gates at the Port									
	3-4	West Gate to the Port									
	3-5	East Gate to the Port									
	3-6	Mouth of the Grange Burn									
Cell 4	4-1	Upstream of M9									
	4-2	Rannoch Park									
	4-3	Inchyra Road									
	4-4	Wholeflats Road									

	4-5	Zetland Park	
	4-6	Dalratho to Bo'ness Road	
	4-7	Grangeburn Road	
	4-8	Petroineos	
	4-9	Mouth of Grange Burn	
Cell 5	5-1	Smiddy Brae and Avondale Road	
	5-2	Flare Road and Road 33	
	5-3	Grangemouth Road	
	5-4	Mouth of the River Avon	
Cell 6	6-1	Beach Road & Petroineos Mouth of the River Avon	
	6-2	Chemical Works at River & Waste Water Treatment Works	

Colour coded by proposed phasing: Phase 1 (dark blue), Phase 2 (Red), Phase 3 (Green), Phase 4 (light blue)

The number of private car movements, as presented in Table 14-15, has been assessed on an estimate of the workforce and assuming 1.5 persons per car to reflect car sharing. This provides a robust assessment as it is anticipated that some staff may travel by crew buses.

Table 14-15: Average daily staff movements

Flood Cell	Workforce	1-way car journeys
1	60	40
2	40	27
3	90	60
4	130	87
5	100	67
6	80	54

The anticipated average HGV and staff movements are summarised in Table 14-16.

Table 14-16: Average daily construction traffic movements

Flood cell	Working Area	One-way HGV movements	One-way staff movements	Two-way HGV movements	Two-way staff movements	Working weeks
1	1-1	4	19	8	38	108
	1-2	5	15	10	30	81
	1-3	4	11	8	22	54
	1-4	4	6	8	12	41
2	2-1	5	5	10	9	41
	2-2	5	5	10	10	41
3	3-1	5	7	10	13	41
	3-2	5	6	10	12	41
	Lock Gates	5	30	10	60	68
	3-3	6	7	12	14	41
	3-4	5	7	10	13	41
	3-5	6	5	12	9	27
4	4-1	4	12	8	25	68
	4-2	4	6	8	12	41
	4-3	5	10	10	20	54
	4-4	5	29	10	59	122
	4-5	4	12	8	23	54
	4-6	4	13	8	25	54
	4-7	4	15	8	30	81
	4-8	5	12	10	23	54
	4-9	6	8	12	15	41

Flood cell	Working Area	One-way HGV movements	One-way staff movements	Two-way HGV movements	Two-way staff movements	Working weeks
5	5-1	5	17	10	34	81
	5-2	6	7	12	15	41
	5-3	7	11	14	22	54
	5-4	6	3	12	5	41
6	6-1 & 6-2	9	14	18	27	95
	6-3 & 6-4	8	9	16	18	81

Standard procurement practice means that a contractor and supply-chain for materials will not be selected prior to the Scheme being confirmed. Given that material sources are unknown at this time, it is anticipated that traffic may route via the roads as summarised in Table 14-17. It is assumed that all traffic will arrive via the trunk road network and exit via the nearest junction to the local road network for access to the relevant Flood Cell construction areas and compounds.

Table 14-17: Route options

Flood Cell	Route option description
1	M876 J1: A883; A803, Glasgow Road; A9 Stirling Road. M876 J2: A9, Stirling Road; A9, between Camelon Roundabout and Rosebank Roundabout; A9, between Rosebank Roundabout and B906, Ronades Road; A88 Bellsdyke Road; B902, New Carron Road; Stenhouse Road; Carronshore Road; Main Street; Dock Street; B906, Ronades Road. M876 J3: A905; Bothkennar Road; Main Street; A88, Bellsdyke Road; B902, New Carron Road; Stenhouse Road; Carronshore Road; Main Street; Dock Street; B906, Ronades Road; A9, Stirling Road; A9, between Camelon Roundabout and Rosebank Roundabout; A9, between Rosebank Roundabout and B906, Ronades Road.
2	M9 J5: A905, Beancross Road; A904, Earls Road; North Shore Road; A905, Glensburgh Road; Forth-Clyde Way; A904, Earls Road; South Bridge Street; Dalgrain Road; North Bridge Street; Grange Lane. M9 J6: A905, Glensburgh Road; Forth-Clyde Way; A904, Earls Road; South Bridge Street; Dalgrain Road; North Bridge Street; Grange Lane.
3	M9 J5: A905, Beancross Road; A904, Earls Road; North Shore Road; A905, Inchyra Road; B9143; Inchyra Road; A904, Bo'ness Road; A904, Station Road; North Shore Road; Powdrake Road. M9 J6: A905, Glensburgh Road; A904, Earls Road; North Shore Road; A904, Bo'ness Road; A904, Station Road; Powdrake Road.
4	M9 J5: A905, Beancross Road; A905, Inchyra Road; B9143, Inchyra Road; A904, Bo'ness Road; A904, Station Road; B9132, Newland Roads; B9132, Abbots Road; Park Road; South Shore Road; Grangeburn Road; Powdrake Road; South Shore Road; A905 Wholeflats Road; Grange Road; Smiddy Brae; Millhall Gardens; Reddoch Road; A9, between J5 and Grandsable Road; Grandsable Road. M9 J6: A905, Glensburgh Road; Earls Road; A905, Beancross Road; A905, Inchyra Road; B9143; Inchyra Road; A904, Bo'ness Road; A904, Station Road; B9132, Newlands Road; B9132, Abbots Road; Park Road; South Shore Road; Grangeburn Road; Powdrake Road; South Shore Road.
5	M9 J5: A905, Inchyra Road; A905, Wholeflats Road; A904, Grangemouth Road; Smiddy Brae; Avondale Road. M9 J6: A905, Glensburgh Road; A905, Beancross Road; A905, Inchyra Road; A905, Wholeflats Road; A904, Grangemouth Road; Smiddy Brae; Avondale Road.

Flood Cell	Route option description
6	M9 J5: A905, Inchyra Road; A905, Wholeflats Road; A904, Grangemouth Road; B9143; Inchyra Road; A904, Bo'ness Road; A904, Station Road; North Shore Road; Powdrake Road. M9 J6: A905, Glensburgh Road; A905, Beancross Road; A905, Inchyra Road; A905, Wholeflats Road; A904, Grangemouth Road; B9143; Inchyra Road; A904, Bo'ness Road; A904, Station Road; North Shore Road; Powdrake Road.

Given that precise vehicle movements are unknown, robust assumptions have been made regarding the proportion of construction vehicles using any proposed route, notably that 100% of construction traffic for each Flood Cell Working Area will pass all counter locations on the potential routes to that Working Area / site compound. It has also been assumed that works are only undertaken on weekdays (Monday to Friday) and that there are 50 working weeks per year.

14.5.2.2 Geographical Boundary of Assessment

When considering the temporary impact of construction related traffic on the roads network, it has been necessary to consider the relevant sites for which Automatic Traffic Count (ATC) data are available. The flows at these locations are summarised in Table 14-8 and Table 14-9 along with the predicted increase in construction related traffic at these locations. Additionally, Table 14-19 also considers the predicted impact of the prospective closure of Bo'ness Road, which is likely to see a redistribution of existing trips on the surrounding road network.

Table 14-18 and Table 14-19 compare the predicted daily average number of construction vehicle trips (distributed equally over the estimated construction period) against each ATC data site. This represents 100% of the estimated construction traffic for each flood cell passing all counter locations on the potential routes to that Flood Cell / compound. Once contractors have been appointed and materials sourced, it is expected that generated construction traffic would arrive at site using the assigned routes and would not pass each location. As a result, the assessments included in Table 14-18 and Table 14-19 are based on a worst-case scenario, and it is these impacts that are considered in the following assessment. Note, the rows highlighted in orange emphasise where counts only have values for one direction. Therefore, the predicted average daily percentage increases for these locations are exaggerated. The cells highlighted in red emphasise instances where the percentage increase exceeds the rules introduced in Section 14.3.6.

Table 14-18: Summary of predicted AAWT increases in traffic during construction

Ref.	Base			Predicted average daily increase			Predicted average daily percentage increase		Predicted temporary traffic		
	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way
	All	HGV	% HGV	HGV	Non-HGV	All	HGV	All	AAWT	HGV	% HGV
1	39,908	5,853	14.67%	54	176	230	0.92%	0.58%	40,138	5,907	14.72%
2	45,160	6,051	13.40%	54	176	230	0.89%	0.51%	45,390	6,105	13.45%
3	47,747	6,303	13.20%	54	176	230	0.86%	0.48%	47,977	6,357	13.25%
4	26,611	2,593	9.74%	54	176	230	2.08%	0.86%	26,841	2,647	9.86%
5	32,539	3,026	9.30%	54	176	230	1.78%	0.71%	32,769	3,080	9.40%
6	26,346	2,661	10.10%	54	176	230	2.03%	0.87%	26,576	2,715	10.22%
7	32,539	3,026	9.30%	54	176	230	1.78%	0.71%	32,769	3,080	9.40%
8	11,297	-	-	40	76	116	-	1.03%	11,413	-	-
9	55,389	10,912	19.70%	54	176	230	0.49%	0.42%	55,619	10,966	19.72%
10	13,493	1,457	10.80%	18	78	96	1.24%	0.71%	13,589	1,475	10.85%

Ref.	Base			Predicted average daily increase			Predicted average daily percentage increase		Predicted temporary traffic		
	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way
	All	HGV	% HGV	HGV	Non-HGV	All	HGV	All	AAWT	HGV	% HGV
11	39,424	4,179	10.60%	54	176	230	1.29%	0.58%	39,654	4,233	10.67%
12	46,043	5,111	11.10%	54	176	230	1.06%	0.50%	46,273	5,165	11.16%
13	10,663	-	-	26	76	102	-	0.96%	10,765	-	-
14	12,436	419	3.37%	26	76	102	6.21%	0.82%	12,538	445	3.55%
15	13,831	720	5.21%	8	44	52	1.11%	0.38%	13,883	728	5.24%
16	19,613	916	4.67%	18	78	96	1.97%	0.49%	19,709	934	4.74%
17	4,212	171	4.06%	18	78	96	10.53%	2.28%	4,308	189	4.39%
18	13,577	972	7.16%	10	34	44	1.03%	0.32%	13,621	982	7.21%
19	17,233	-	-	18	78	96	-	0.56%	17,329	-	-
20	27,691	-	-	18	78	96	-	0.35%	27,787	-	-
21	12,332	-	-	40	60	100	-	0.81%	12,432	-	-
22	8,272	242	2.93%	40	82	122	16.53%	1.47%	8,394	282	3.36%
23	12,865	1,918	14.91%	54	176	230	2.82%	1.79%	13,095	1,972	15.06%
24	12,925	-	-	18	78	96	-	0.74%	13,021	-	-
25	14,307	1,516	10.60%	46	148	194	3.03%	1.36%	14,501	1,562	10.77%
26	17,039	1,868	10.96%	40	50	90	2.14%	0.53%	17,129	1,908	11.14%
27	5,647	1,313	23.25%	28	44	72	2.13%	1.28%	5,719	1,341	23.45%
28	4,588	799	17.41%	26	40	66	3.25%	1.44%	4,654	825	17.73%
29	4,598	870	18.92%	26	40	66	2.99%	1.44%	4,664	896	19.21%
30	3,827	607	15.86%	26	40	66	4.28%	1.72%	3,893	633	16.26%
31	11,214	-	-	16	20	36	-	0.32%	11,250	-	-

Table 14-19: Summary of predicted AAWT increases in traffic during construction with Bo'ness Road closed

Ref.	Base			Predicted average daily increase			Predicted average daily percentage increase		Predicted temporary traffic		
	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way	2-way
	All	HGV	% HGV	HGV	Non-HGV	All	HGV	All	AAWT	HGV	% HGV
25	19,927	2,506	12.60%	46	148	194	1.84%	0.97%	20,121	2,552	12.68%
27	20,441	2,006	9.80%	30	44	66	1.50%	0.32%	20,507	2,036	9.93%
28	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
29	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
30	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
31	13,041	-	-	16	20	36	-	0.28%	13,077	-	-

The following points have been considered when assessing the potential impact of these increases:

- The predicted daily average increase in traffic has been based on 100% of the estimated construction traffic for each Flood Cell Working Area passing all counter locations on the potential routes to that Working Area / compound. This situation would not realistically occur.
- No traffic growth or additional traffic as a result of future development has been applied to the baseline traffic used in the assessment and, therefore, the assessment can be deemed to be robust i.e. if the existing traffic flows were factored to future year levels, the calculated percentage increases would be less (e.g. an increase of 100 vehicles to a nominal existing flow of 5,000 vehicles means a percentage increase of 2.0%, whereas an increase of 100 vehicles to a nominal future year flow of, say, 6,000 vehicles means a percentage increase of 1.7%).

- The increase in traffic during the construction phase is temporary.
- The predicted temporary percentage of HGVs is within normal parameters, and relatively consistent with existing HGV proportions at each location.
- The high percentage increases in HGV traffic highlighted in red are because of the low number of existing HGVs on the routes recorded at the count locations.
- The maximum estimated increase in HGVs is a total of 54, on average, per day, where some construction activities overlap. This is equivalent to approximately 5 HGV movements per hour (averaged over an assumed 10-hour delivery period).
- The maximum estimated increase in all traffic is a total of 230 vehicles, on average, per day. This is equivalent to approximately 23 vehicle movements per hour (averaged over an assumed 10-hour delivery period).
- As part of the proposal to close Bo'ness Road, the associated Transport Assessment proposes mitigation changes to the Wholeflats Road / Inchyra Road roundabout and Kersiebank Avenue / Inchyra Road junction, as stated below. Given these proposed changes (i.e. increased capacity, signalisation of Wholeflats Roundabout and rebalancing of green times, associated queue management and increased queueing space on this section) the construction traffic generation from the Scheme will have a negligible impact on the performance of these junctions:
  - Widening of Inchyra Road between Kersiebank Avenue and Wholeflats Roundabout to four lanes.
  - Upgrading to traffic signal control of the Wholeflats junction.
  - Improvement of the Wholeflats Road / Grange Road priority junction to incorporate a ghost-island right turn lane.

Considering the above points, the assessments shown in Table 14-18 and Table 14-19 highlight that the road links and any other specifically sensitive areas where traffic flows are predicted to increase by more than that suggested in the IEA Guidelines rules (refer to Section 14.3.6 for more details), and hence need to be considered further, are:

- 17: A9, at St Mungo's, between Rosebank Roundabout and B906, Ronades Road (based on greater than 10% increase in heavy goods vehicles in a 'sensitive' area i.e., residential area with nearby trip generators and attractors (see Figure B14.6. in Appendix B14)
- 22: A904, Bo'ness Road at Grangemouth Town Hall (based on greater than 10% increase in heavy goods vehicles in a 'sensitive' area i.e., residential area with nearby trip generators and attractors (see Figure B14.6. in Appendix B14)

14.5.2.3 Receptor Sensitivity

The roads identified from the geographical boundary assessment and summarised in Table 14-20 are part of the potential construction traffic delivery routes. Consideration has been given to their existing condition and ability to accommodate HGV traffic and characteristics as discussed in Table 14-1.

Table 14-20: Receptor Sensitivity

Ref.	Receptor Description	Receptor Sensitivity	Rationale
17	A9, at St. Mungo's (between Rosebank Road and B906, Ronades Road)	High	- This section of the A9 (a route that bypasses the north of the town) is a single carriageway road subject to a speed limit of 30mph. This is part of Falkirk's 'Northern Distributor Road' distributing traffic within Falkirk and linking the strategic road network with Falkirk's residential and industrial areas. - No traffic calming or traffic management measures and constructed to accommodate significant HGV movements. The predicted temporary percentage of HGVs is within normal parameters, and consistent with existing HGV proportions. - National / regional WCH routes nearby. - Schools and playing fields nearby. - At-grade crossings provided, although traffic flows below 8,000 threshold. - Regular bus service.
22	A904, Bo'ness Road at Grangemouth Town Hall	High	- This road provides for major traffic movements to the north of Grangemouth, giving access to residential areas and adjacent community and public facilities. This section of the A904 is a single carriageway road subject to a speed limit of 30mph, with no traffic calming or traffic management measures and constructed to accommodate significant HGV composition. The predicted temporary percentage of HGVs is within normal parameters, and consistent with existing HGV proportions.

14.5.2.4 Severance

The IEA Guidelines note that *"severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery"*. The assessed magnitude of the severance impact is presented in Table 14-21. This considers that a temporary increase of up to 40 HGV two-way movements and up to 82 non-HGV two-way movements i.e., equivalent to approximately 4 HGV movements and 8 non-HGV movements per hour, at these locations will have a minor adverse impact on severance.

Table 14-21: Magnitude of impact on severance at receptor locations

Ref.	Description	Magnitude of impact on severance
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Minor adverse
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Minor adverse

14.5.2.5 Driver Delay

Traffic delays caused by construction vehicles could occur along the chosen site access routes. The IEMA Guidelines note that "*these delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system*".

The road network surrounding the Scheme Flood Cell sites are operating comfortably within capacity, which is confirmed when comparing the baseline AAWT flows in Table 14-18 and Table 14-19 with the anticipated capacity outlined within

Table 14-1. For example, on the A904, at Grangemouth Town Hall, it is estimated that this is theoretically capable of accommodating 38,400 two-way vehicle movements per day. The estimated maximum increase in traffic movements associated with the proposed development at this location is 122 vehicles per day in addition to a two-way baseline flow of 8,272 per day. As such, the road is currently operating below its capacity and will continue to do so with the addition of construction traffic flows. The assessed magnitude of impact on driver delay at these locations is presented in Table 14-22.

Table 14-22: Magnitude of impact on driver delay at receptor locations

Ref.	Description	Magnitude of impact on driver delay
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Negligible
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Negligible

14.5.2.6 Pedestrian Delay

While there is the potential for an increase in traffic flow at all locations assessed, the level of change of up to approximately 4 HGV movements and 8 non-HGV movements per hour is such that the magnitude of impact on pedestrian delays is anticipated to be Negligible (reflecting the road capacity).

Consequently, and considering the temporary nature of any impact, there is a Negligible magnitude of impact on pedestrian delay for crossing the roads at the receptor locations shown in Table 14-23.

Table 14-23: Magnitude of impact on pedestrian delay at receptor locations

Ref.	Description	Magnitude of impact on pedestrian delay
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Negligible
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Negligible

14.5.2.7 Pedestrian Amenity

Amenity is defined as the relative pleasantness of a journey. The volume and composition of traffic are very important determinants of amenity, as are other factors e.g., footpath width and distance from traffic; any barriers between pedestrians and cyclists and vehicle traffic; the quality of any street furniture, route signing and planting, and presence of crossings.

For this assessment, based on the available information, the magnitude of the impact on pedestrian amenity has been considered in terms of the threshold described in paragraph 4.39 of the IEA Guidance, which suggests that *"a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its lorry component) is halved or doubled"*. Hence, based on the estimated two-way average daily percentage increase in construction traffic and the estimated two-way average daily percentage increase in HGV traffic summarised in Table 14-18, it is not anticipated that the Scheme construction traffic could see a more than two-fold increase in HGV or all traffic on the roads under consideration.

Given the temporary nature of the impact and the spare capacity on the roads at these receptor locations, professional judgement has been used to determine a Minor adverse magnitude of impact on pedestrian amenity, as shown in Table 14-24.

Table 14-24: Magnitude of impact on pedestrian amenity at receptor locations

Ref.	Description	Magnitude of impact on pedestrian amenity
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Minor adverse
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Minor adverse

14.5.2.8 Fear and Intimidation

Traffic volume, composition and speeds, pedestrian footways and crossings all contribute to the level of general pleasantness, fear, and intimidation experienced by pedestrians and other vulnerable road users.

The identified receptor locations can accommodate regular use by HGV traffic, and as such an additional 18-40 HGVs per day on roads that are operating comfortably within capacity, will not have a significant impact on pedestrians and other road users. Furthermore, given the spare capacity on the roads at these receptor locations, the thresholds outlined in Table 14-3, and the temporary nature of the impact, professional judgement has been used to determine a Negligible magnitude of impact on pedestrian fear and intimidation at these locations, as shown in Table 14-25.

Table 14-25: Magnitude of impact on fear and intimidation at receptor locations

Ref.	Description	Magnitude of impact on fear and intimidation
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Negligible
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Negligible

14.5.2.9 Accidents and Safety

There are no general thresholds for determining the magnitude of increased traffic on road safety. As such, professional judgement has been used to determine the impacts of the construction traffic associated with the Scheme.

Between 2015 and 2019, there has been a total of 244 accidents[3] on the identified construction vehicle routes and a total of 68 accidents on the surrounding motorway network comprising the study area. Table 14-26 details the breakdown of these accidents by severity, road type and vehicle. Four fatal accidents occurred during this five-year period; one on the M9 (Junction 7 EB off-slip), one on Bothkennar Road (east of Carronshore), one on the A883 (west of Carmuirs) and one on the A803 (west of Camelon Roundabout). From Table 14-26 it can be seen that 'Goods Vehicles' are only involved in a minor percentage of total accidents.

Table 14-26: Local accidents between 2015 – 2019

	Motorway (local area)		Construction vehicle routes	
Accident severity	All vehicle	Goods vehicles	All vehicle	Goods vehicles
Fatal	1	0	3	2
Serious	11	2	41	0
Slight	56	4	200	9

Most accidents occurred at the major junctions along the outlined construction vehicle routes. Assessment of collision clusters, with the definition of a cluster being a total of four collisions within a

[3] Available at: https://www.crashmap.co.uk/ (Accessed March 2023)

50-metre radius of any collision within five years, highlighted the following as the worst affected accident locations:

- M876 (junction 1 SB on-slip at the A8004 / Larbert Road junction);
- M876 (junction 2 NB off-slip / SB on-slip at North Broomage Roundabout);
- M9 Junction 5 (Cadgers Brae Roundabout);
- A88, Bellsdyke Road (Bellsdyke Roundabout);
- A9 (Grandsable Road junction);
- A9 (Stadium Drive junction);
- A9, Stirling Road (B905, Denny Road junction);
- A9 / A904 (Westfield Roundabout)
- A905, Wholeflats Road (Grange Road junction);
- A803, Glasgow Road (Redbrae Road junction);
- A803, Glasgow Road (Tesco junction);
- A883 (Lochlands Loan junction);
- A883 (bend in road at Bonny Water bridge); and
- B902, New Carron Road (Carron Roundabout).

Given that the increased traffic levels during construction are temporary, and the roads at the locations considered are capable of regular use by HGV traffic, there will not be a long-term impact on the risk of accidents. However, professional judgement has been used to determine that the magnitude of impact for accidents and safety during construction is minor at the receptor locations identified, as shown in Table 14-27. The worst-case scenario assumes up to 40 HGV movements per day and these are not considered to have a considerable impact on accidents and safety.

Table 14-27: Magnitude of impact on accidents and safety at receptor locations

Ref.	Description	Magnitude of impact on accidents and safety
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Minor adverse
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Minor adverse

14.5.2.10 Significance of Effects Assessment

The magnitude of the impacts of construction traffic on the identified sensitive receptors has been assessed based on traffic volumes and professional judgement and is summarised in Table 14-28.

Table 14-28: Summary of Magnitude of Impacts

Ref.	Description	Severance	Driver delay	Pedestrian delay	Pedestrian Amenity	Fear and intimidation	Accidents and safety
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Minor adverse	Negligible	Negligible	Minor adverse	Negligible	Minor adverse
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Minor adverse	Negligible	Negligible	Minor adverse	Negligible	Minor adverse

Based on the sensitivity of the receptors (Table 14-20) and the summary of magnitude of impacts (Table 14-28), the significance of effects of the additional construction related traffic movements during the construction phase are provided in Table 14-29, classified using the significance of effects matrix shown in Table 14-6.

Table 14-29: Significance of Effects

Ref.	Description	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Accidents and Safety
17	People using the A9, at St. Mungo's (north of Rosebank Roundabout)	Moderate	Minor	Minor	Moderate	Minor	Moderate
22	People using the A904, Bo'ness Road at Grangemouth Town Hall	Moderate	Minor	Minor	Moderate	Minor	Moderate

The additional traffic caused by construction activities for the Scheme would result in increases of traffic flows on the surrounding roads leading to the Flood Cell Working Areas. Overall, on the basis that the predicted traffic increases are particularly robust and the actual traffic volume increases are not deemed to be considerable (and with the predicted flows well within the practical operating capacity of these roads), it is assessed based on professional judgement that the estimated increases in traffic would have a **Moderate to Minor adverse** significant effect on the identified sensitive receptors.

14.5.2.11 Assessment of Temporary Road Closures

While it is anticipated that temporary road closures within the proposed Working Areas will be required, it has not been possible to fully determine these at this early stage. While partial closures and traffic management will reduce impacts as much as possible, there is likely to be a need to fully close certain roads on a temporary basis. As such, a specific assessment on the likely impacts of temporary road closures has been carried out.

A summary of the potentially affected roads and adjacent footways is given in Table 14-30. An assessment on driver delay has been undertaken. The rationale in determining the sensitivity of a road is that those with relatively frequent bus services, form part of NCN76 or which have frontage development have been categorised as medium sensitivity. Roads with little or no frontage development have been categorised as low sensitivity. Given the adverse impact of the anticipated partial road closures, it is noted that these will likely be over a small area and only temporary i.e., for a relatively short duration, and therefore the magnitude of this impact has been determined as being minor at all locations considered. The impact on pedestrians is considered further in Section 14.5.3.

Based on the sensitivity of the receptors and the magnitude of impacts, the significance of the effect of these temporary and partial road closures on driver delay during the construction phase are assessed as **Minor adverse** significance (for medium sensitivity receptors) and **Negligible** (for low sensitivity receptors), as summarised in Table 14-30.

Table 14-30: Assessment of Temporary Road Closures / Restrictions

WA	Description	Closure / Restrictions	Receptor Sensitivity	Magnitude of Impact	Significance of Effect
1-1	A9, Stirling Road	Partial, half road width and footway closed during works.	Medium	Minor	Minor

WA	Description	Closure / Restrictions	Receptor Sensitivity	Magnitude of Impact	Significance of Effect
1-2	B902, New Carron Road Bridge	Full, during bridge replacement. Not to be closed at same time as Stenhouse Road bridge.	Medium	Minor	Minor
1-2	Stenhouse Road Bridge	Full, likely to be closed to install flood gates. Access maintained to Nicoles Way.	Medium	Minor	Minor
1-2	Nicoles Way	Partial narrowing of road during works. To remain open to provide access to premises.	Low	Minor	Negligible
1-4	Dock Street	Parking Restrictions, likely to ensure sufficient space for construction vehicles to pass.	Medium	Minor	Minor
2-2	North Bridge Street	Parking Restrictions.	Low	Minor	Negligible
3-1; 3-2; 3-3	North Shore Road (in Port)	Partial, half road width closed during works.	Low	Minor	Negligible
3-4; 3-5; 4-7; 4-8; 4-9	South Shore Road	Partial, half road width / footway closed during works.	Low	Minor	Negligible
4-1	A9 near Beancross	Partial, lane closure required, and footway closed.	Medium	Minor	Minor
4-1	Grandsable Road	Partial, half road width/ footway closed during works.	Low	Minor	Negligible
4-2	Rannoch Road	Partial, half road width closed during works.	Medium	Minor	Minor
4-3; 4-4	Wholeflats Road	Partial, half road width / footway closed during works.	Low	Minor	Negligible
4-4	Reddoch Road	Partial restrictions in place. Some road width reduced. Access maintained to properties.	Low	Minor	Negligible
4-4	Millhall Gardens	Partial restrictions in place. Some road width reduced. Alternative pedestrian access provided. Access maintained to properties.	Low	Minor	Negligible
4-5; 4-6	Abbots Road	Partial, half road width / footway closed during works.	Medium	Minor	Minor
4-6	Dalratho Road	Full, during bridge replacement.	Low	Minor	Negligible
4-6	Park Road	Partial, half road width closed during works. Entry from Dalratho Road closed during bridge replacement. Alternative access via Ronaldshay Crescent.	Low	Minor	Negligible
4-7; 4-8	Grangeburn Road	Partial, half road width / footway closed during works.	Medium	Minor	Minor
5-3	A904 Bo'ness Road /Grangemouth Road	Partial, half road width / footway closed during works.	Medium	Minor	Minor

14.5.3 Active Travel Assessment

The potential impacts of the construction and operational phases of the Scheme on the existing active travel routes have been assessed. Impacts on existing active travel routes (illustrated in Figure B14.1 in Appendix B14) will be incurred where:

- a route is temporarily closed to accommodate construction works;
- a route is permanently closed as a result of the location of Scheme infrastructure.

The potential changes to active travel routes are summarised in Table 14-31.

Table 14-31: Active Travel Impacts Summary

WA	Location	2010 Core Path ref.	Core Path ref.	Construction Impact summary	Operational Impact summary
1-1	Dorrator Bridge to Cemetery Loop	N/A	001/050	During the construction phase, the footway and part of the A9, Stirling Road will be closed to pedestrians and traffic.	-
1-1	River Carron to Camelon Playing Fields	001/28	001/038	During the construction phase, the footway and part of the A9, Stirling Road will be closed to pedestrians and traffic.	The proposed flood defences are proposed to extend across the existing pedestrian (and vehicular) access from the A9. A pedestrian ramp will be incorporated near the junction of the path with the A9, Stirling Road to maintain access once the Scheme is operational. This is incorporated into the Scheme design as embedded mitigation.
1-1	River Carron Path: Swing Bridge to Camelon Cemetery to Camelon Playing Fields	N/A	001/048	The proposed construction compound is adjacent to the path.	-
1-2	Mungal Riverside (part of HarTT)	001/36	001/018	Impacted by proposed haul route from Cotland Drive.	Severed by proposed embankment flood protection structure. However, ground will be locally ramped up to embankment crest to maintain access once the Scheme is operational. This is incorporated into the Scheme design as embedded mitigation.
1-2	Mungal Riverside (part of HarTT)	001/38	001/020	Existing path to be temporarily closed during construction works at this location.	-
1-2	Mungal Riverside	001/39	001/021	Severed by proposed haul route from Cotland Drive.	-
1-2	River Carron to rear of Park Road (part of HarTT)	004/1244	004/017	During the construction phase, the path will be closed to users.	Proposed flood embankment will sever existing path. Existing bridge to be removed and Mungal Burn to be permanently culverted. A pedestrian ramp will be incorporated where the embankment intersects the existing path. This is incorporated into the Scheme design as embedded mitigation.

WA	Location	2010 Core Path ref.	Core Path ref.	Construction Impact summary	Operational Impact summary
1-2	Dawson Mission Path (part of HarTT)	004/1196	004/003	During the construction phase, the path will be closed to users.	Proposed flood wall will sever existing path to the east of Stenhouse Road. Existing grade-separated crossing (underpass) at New Carron Road to remain open. A pedestrian ramp will be incorporated where the wall intersects the existing path to the east of Stenhouse Road. This is incorporated into the Scheme design as embedded mitigation.
1-2	Stenhouse Road	N/A	N/A	During the construction phase, the adjacent Stenhouse Road footways will be closed to users.	Proposed flood walls extend across Stenhouse Road and adjacent footways. Flood gates will be installed across carriageways, including adjacent footways either side of road bridge. This is incorporated into the Scheme design as embedded mitigation.
1-2	Cobblebrae (part of HarTT)	004/1251	004/019	Located within the Scheme boundary and therefore to be temporarily closed during the construction phase at this location.	-
1-2	Cobblebrae	004/1191	004/001	Located within the Scheme boundary and therefore to be temporarily closed during the construction phase at this location.	Proposed flood wall severs path leading to / from Carronside Street. A pedestrian ramp will be incorporated where the wall intersects the existing path to / from Carronside Street. This is incorporated into the Scheme design as embedded mitigation.
1-2	Stenhouse Road to Mill Lade (part of The Helix-Larbert Link)	011/144	011/008	During the construction phase, the adjacent Stenhouse Road footways and local road route (on-road) will be closed to users.	Proposed flood protection structures sever Stenhouse Road and existing local road, an on-road section of the core path, at its junction with Stenhouse Road. A vehicle floodgate is to be provided on this on-road route. This is incorporated into the Scheme design as embedded mitigation. A new footpath is also proposed as part of the construction works.
1-3	Carronshore 2000 path	009/1674	009/001	During the construction phase, the path will be closed to users.	Proposed flood wall on wet side of path.

WA	Location	2010 Core Path ref.	Core Path ref.	Construction Impact summary	Operational Impact summary
2-1	Rope Walk, Grangemouth Old Town	006/1339	006/008	During the construction phase, the path will be closed to users.	Proposed flood protection wall follows route of existing path along much of its length. The path will be recreated on the wet side of the flood wall. A pedestrian ramp will be incorporated where the wall intersects the existing path. This is incorporated into the Scheme design as embedded mitigation.
4-1	Mumrills Road (part of HarTT)	015/522	015/012	During the construction phase, the path will be closed to users.	Existing path to be severed by proposed flood wall at two locations. Pedestrian ramps are to be provided to maintain access once the Scheme is operational. These are incorporated into the Scheme design as embedded mitigation. The existing grade-separated crossing (underpass) is to be blocked off.
4-1	Grandsable Road	N/A	N/A	Existing footway adjacent to proposed flood wall to west of Grandsable Road is within site boundary.	-
4-1	Cassel Brae/Fairy Glen	016/580	016/015	Existing path to be temporarily closed during construction works at this location.	-
4-2	Rannoch Park	006/1336	006/007	Existing path and links to Rannoch Park are within the site boundary and to be temporarily closed during construction works.	The proposed flood wall will sever the Rannoch Park links. Pedestrian ramps are to be provided to maintain access to Rannoch Park once the Scheme is complete. These are incorporated into the Scheme design as embedded mitigation.
4-2	Grange Burn	006/1343	006/009	Existing path and link to Rannoch Park are within the site boundary and to be temporarily closed during construction works.	The proposed flood wall will sever the path. A pedestrian ramp is to be provided to maintain access to Rannoch Park once the Scheme is complete. This is incorporated into the Scheme design as embedded mitigation.
4-2	Rannoch Road	006/1368	006/018	Existing route is on-road along Rannoch Road and partly within the site boundary. As summarised in Table 14-30, Rannoch Road will be partially closed during works.	The proposed flood wall will sever the link to Rannoch Park. A pedestrian ramp is to be provided at the eastern end of the route to maintain access to Rannoch Park once the Scheme is complete. This is incorporated into the Scheme design as embedded mitigation.

WA	Location	2010 Core Path ref.	Core Path ref.	Construction Impact summary	Operational Impact summary
4-3; 4-4; 5-1	Inveravon to Wholeflats Roundabout (part of NCN76)	016/648	016/038	Existing route is within site boundary and follows route of proposed flood embankment. This is part of NCN76.	The proposed flood wall will sever the route. Pedestrian ramps are to be provided to maintain access once the Scheme is completed. These are incorporated into the Scheme design as embedded mitigation.
5-1	Jinkaboot Bridge	016/652	016/036	During the construction phase, the route will be closed to users.	Proposed flood wall severs local links to/ from existing path (Avondale Road to NCN76). Floodgate to be provided to maintain access to/ from NCN76 from properties south of Grange Burn (Avondale Road). This is incorporated into the Scheme design as embedded mitigation.
4-5	Zetland Park	006/1378	006/022	Partly within the Scheme boundary and therefore to be temporarily closed during the construction phase at this location.	The proposed flood wall will sever the route. Pedestrian ramp to be provided to maintain access across flood defence once constructed. This is incorporated into the Scheme design as embedded mitigation.
4-5	Zetland Park	006/1391	006/026	During the construction phase, the route will be closed to users.	Existing path severed by proposed flood wall. Pedestrian ramp to be provided to maintain access across flood defence once constructed. This is incorporated into the Scheme design as embedded mitigation.
4-5	Zetland Park	006/1348	006/013	Existing path to be used as haul route from Henry Street.	-
4-5	Wood Street to Zetland Park	N/A	006/043	During the construction phase, the route will be closed to users.	Existing links severed by proposed flood defences, with links to zebra crossings of Abbots Road. Pedestrian ramps to be provided to maintain access one constructed. These are incorporated into the Scheme design as embedded mitigation.
4-6	Dalratho Road to Bo'ness Road (adjacent to NCN76)	006/1400	006/028	During the construction phase, Park Road will be partially closed during works, including to on-road cyclists (on-road section of NCN76).	-

While the potential pedestrian delay impacts in terms of time are not quantifiable, the active travel route sensitivity, the estimated magnitude of the impacts and significance of effects have been assessed and are provided in Table 14-32. During the construction phase, the magnitude of impact is assessed as minor adverse as it will happen for a short duration, i.e., temporarily during the construction period at that location. Any severance of a route once the Scheme has been completed has been assessed as a major adverse magnitude of impact. This assessment shows that the potential

significant effects the Scheme has on active travel routes range from **Negligible** to **Major adverse** significance.

Table 14-32: Active Travel Assessment

WA	Location	Core Path ref.	Receptor Sensitivity	Construction		Operational	
				Magnitude of Impact	Significance of Impact	Magnitude of Impact	Significance of Impact
1-1	Dorrator Bridge to Cemetery Loop	001/050	Medium	Minor	Minor	-	-
1-1	River Carron to Camelon Playing Fields	001/038	Medium	Minor	Minor	Negligible	Negligible
1-1	River Carron Path: Swing Bridge to Camelon Cemetery	001/048	Medium	Minor	Minor	-	-
1-2	Mungal Riverside (part of HarTT)	001/018	High	Minor	Moderate	Negligible	Negligible
1-2	Mungal Riverside (part of HarTT)	001/020	High	Minor	Moderate	-	-
1-2	Mungal Riverside	001/021	Medium	Minor	Minor	-	-
1-2	River Carron to rear of Park Road (part of HarTT)	004/017	High	Minor	Moderate	Negligible	Negligible
1-2	Dawson Mission Path (part of HarTT)	004/003	High	Minor	Moderate	Negligible	Negligible
1-2	Stenhouse Road	N/A	Medium	Minor	Minor	Negligible	Negligible
1-2	Cobblebrae (part of HarTT)	004/019	High	Minor	Moderate	-	-
1-2	Cobblebrae	004/001	Medium	Minor	Minor	Negligible	Negligible
1-2	Stenhouse Road to Mill Lade (part of The Helix-Larbert Link)	011/008	Medium	Minor	Minor	Negligible	Negligible
1-3	Carronshore 2000 path	009/001	Medium	Minor	Minor	Negligible	Negligible
2-1	Rope Walk, Grangemouth Old Town	006/008	Low	Minor	Negligible	Negligible	Negligible
4-1	Mumrills Road (part of HarTT)	015/012	High	Minor	Moderate	Major	Major
4-1	Grandsable Road	N/A	Low	Minor	Negligible	-	-
4-1	Cassel Brae/Fairy Glen	016/015	Low	Minor	Negligible	-	-
4-2	Rannoch Park	006/007	Low	Minor	Negligible	Negligible	Negligible
4-2	Grange Burn	006/009	Medium	Minor	Minor	Negligible	Negligible
4-2	Rannoch Road	006/018	Medium	Minor	Minor	Negligible	Negligible
4-3; 4-4; 5-1	Inveravon to Wholeflats Roundabout (part of NCN76)	016/038	High	Minor	Moderate	-	-
4-4	Jinkaboot Bridge	016/036	Low	Minor	Negligible	Negligible	Negligible
4-5	Zetland Park	006/022	Medium	Minor	Minor	Negligible	Negligible
4-5	Zetland Park	006/026	Medium	Minor	Minor	Negligible	Negligible
4-5	Zetland Park	006/013	Medium	Minor	Minor	-	-
4-5	Wood Street to Zetland Park	006/043	Medium	Minor	Minor	Negligible	Negligible

WA	Location	Core Path ref.	Receptor Sensitivity	Construction		Operational	
				Magnitude of Impact	Significance of Impact	Magnitude of Impact	Significance of Impact
4-6	Dalratho Road to Bo'ness Road (adjacent to NCN76)	006/028	High	Minor	Moderate	-	-

14.5.4 Cumulative Impacts

An assessment of potential cumulative impacts on traffic and active travel sensitive receptors has been undertaken and is discussed in Chapter 15: Cumulative Effects. The assessment concluded that there are no potential significant cumulative impacts when considered in combination with impacts identified for other environmental discipline assessments in this EIA Report ('Same Project' cumulative impacts).

With regards to 'Other Project' cumulative impacts, a study of foreseeable and committed projects and developments in the vicinity of the Scheme was carried out, and these included the sites that may potentially have a cumulative impact regarding traffic and transportation (refer to Chapter 15 for more detail). It has been concluded that there are unlikely to be any significant Other Project cumulative impacts from a traffic and transportation perspective. This has been determined taking into consideration the following factors relating to other projects: the proposed size of the development, the likely or unknown construction timing, the physical separation, and the distance of the development from the Scheme, and the lack of supporting information available from the planning application i.e. the magnitude of the impact of the proposed development has not been deemed necessary to undertake a separate traffic impact assessment.

14.6 Mitigation

14.6.1 Primary Mitigation

14.6.1.1 Active Travel Routes

Primary mitigation for active travel routes includes the provision of floodgates and ramps (to maintain access through and over the flood protection measures), routes which have been embedded into the Scheme design e.g., on embankments, and alternative routes, with the objective of minimising operational delay and optimising safety for users. This primary mitigation is shown under the operational phase in Table 14-31.

14.6.2 Secondary Mitigation

The following secondary mitigation measures will also be required to reduce the significance of effects identified.

Active Travel

The secondary mitigation measures identified in relation to active travel are shown in Table 14-33.

To minimise delay, optimise safety and mitigate amenity impacts for active travel route users, including disabled users, the level of provision of crossing 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.

The Construction Traffic Management Plan (CTMP) referred to in Table 14-33 is described in section 14.6.3 below and will include both secondary and tertiary mitigation measures. Where required, Transport Statements to be prepared by the contractor and in consultation with Falkirk Council are also specified.

Table 14-33: Active travel mitigation (Mitigation Item TT1)

WA	Location	2010 Core Path ref.	Core Path ref.	Construction		Operational	
				Impact summary	Mitigation summary	Impact summary	Mitigation summary
1-1	Dorrator Bridge to Cemetery Loop	N/A	001/050	During the construction phase, the footway and part of the A9, Stirling Road will be closed to pedestrians and traffic.	A temporary diversion route will be considered as part of the CTMP to maintain access from the A9, Stirling Road footway during construction. The existing footway along Stirling Road will be reinstated once construction works completed.	-	-
1-1	River Carron to Camelon Playing Fields	001/28	001/038	During the construction phase, the footway and part of the A9, Stirling Road will be closed to pedestrians and traffic.	A temporary diversion route will be considered as part of the CTMP to maintain access from the A9, Stirling Road footway during construction.	-	-
1-1	River Carron Path: Swing Bridge to Camelon Cemetery to Camelon Playing Fields	001/68	001/048	The proposed construction compound is adjacent to the path.	A temporary diversion route will be considered as part of the CTMP should the construction compound encroach on the path.	-	-
1-2	Mungal Riverside (part of HArTT)	001/36	001/018	Impacted by proposed haul route from Cotland Drive.	A temporary diversion route will be considered as part of the CTMP to mitigate the impact of the proposed haul route. Existing paths to be reinstated following construction.	-	-
1-2	Mungal Riverside (part of HArTT)	001/38	001/020	Existing path to be temporarily closed during construction	A temporary diversion route will be considered as	-	-

WA	Location	2010 Core Path ref.	Core Path ref.	Construction		Operational	
				Impact summary	Mitigation summary	Impact summary	Mitigation summary
				works at this location.	part of the CTMP to maintain access. The existing path will be retained, with the proposed embankment flood protection structure located contiguous to the path alignment.		
1-2	Mungal Riverside	001/39	001/021	Severed by proposed haul route from Cotland Drive.	A temporary diversion route will be considered as part of the CTMP to mitigate the impact of the proposed haul route. Existing path to be reinstated following construction.	-	-
1-2	River Carron to rear of Park Road (part of HArTT)	004/1244	004/017	During the construction phase, the path will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access. To be reinstated following construction.	-	-
1-2	Dawson Mission Path (part of HArTT)	004/1196	004/003	During the construction phase, the path will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access. To be reinstated following construction.	-	-
1-2	Stenhouse Road	N/A	N/A	During the construction phase, the adjacent Stenhouse Road footways will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access.	-	-
1-2	Cobblebrae (part of HArTT)	004/1251	004/019	Located within the Scheme boundary and therefore to be temporarily closed during the construction phase at this location.	A temporary diversion route will be considered as part of the CTMP to maintain access. To be reinstated following construction.	-	-
1-2	Cobblebrae	004/1191	004/001	Located within the Scheme	A temporary diversion route will	-	-

WA	Location	2010 Core Path ref.	Core Path ref.	Construction		Operational	
				Impact summary	Mitigation summary	Impact summary	Mitigation summary
				boundary and therefore to be temporarily closed during the construction phase at this location.	be considered as part of the CTMP to maintain access. Paths to be reinstated following construction.		
1-2	Stenhouse Road to Mill Lade (part of The Helix-Larbert Link)	011/144	011/008	During the construction phase, the adjacent Stenhouse Road footways and local road route (on-road) will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access.	-	-.
1-3	Carronshore 2000 path	009/1674	009/001	During the construction phase, the path will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access during construction.	-	-
2-1	Rope Walk, Grangemouth Old Town	006/1339	006/008	During the construction phase, the path will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access during construction.	-.	-
4-1	Mumrills Road (part of HArTT)	015/522	015/012	During the construction phase, the path will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access. To be reinstated following construction.	Existing grade-separated crossing (underpass) to be blocked off.	A suitable at-grade crossing will be provided to ensure connectivity between existing routes either side of the A9 at this location. This will be investigated further at the detailed design stage, in consultation with the road's authority.
4-1	Grandsable Road	N/A	N/A	Existing footway adjacent to proposed flood	A temporary diversion route will be considered as	-	-

WA	Location	2010 Core Path ref.	Core Path ref.	Construction		Operational	
				Impact summary	Mitigation summary	Impact summary	Mitigation summary
				wall to west of Grandsable Road is within site boundary.	part of the CTMP to maintain access should construction encroach on the existing footway.		
4-1	Cassel Brae/Fairy Glen	016/580	016/015	Existing path to be temporarily closed during construction works at this location.	A temporary diversion route will be considered as part of the CTMP to maintain access. The existing path will be reinstated, with the flood wall located contiguous with the alignment of adjacent boundary fence.	-	-
4-2	Rannoch Park	006/1336	006/007	Existing path and links to Rannoch Park are within the site boundary and to be temporarily closed during construction works.	A temporary diversion route will be considered as part of the CTMP to maintain access.	-	-
4-2	Grange Burn	006/1343	006/009	Existing path and link to Rannoch Park are within the site boundary and to be temporarily closed during construction works.	A temporary diversion route will be considered as part of the CTMP to maintain access. Existing footpath along Grange Burn to be maintained. Closure during construction works only.	-	-
4-2	Rannoch Road	006/1368	006/018	Existing route is on-road along Rannoch Road and partly within the site boundary. As summarised in Table 14-30, Rannoch Road will be partially closed during works.	Cycle users will be able to continue cycling on-road along Rannoch Road.	-	-
4-3; 4-4; 5-1	Inveravon to Wholeflats Roundabout (part of NCN76)	016/648	016/038	Existing route is within site boundary and follows route of proposed flood	A temporary diversion route will be considered as part of the CTMP to maintain access.	-	-

WA	Location	2010 Core Path ref.	Core Path ref.	Construction		Operational	
				Impact summary	Mitigation summary	Impact summary	Mitigation summary
				embankment. This is part of NCN76.			
5-1	Jinkaboot Bridge	016/652	016/036	During the construction phase, the route will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access.	-	-
4-5	Zetland Park	006/1378	006/022	Partly within the Scheme boundary and therefore to be temporarily closed during the construction phase at this location.	A temporary diversion route will be considered as part of the CTMP to maintain access. Existing path to be reinstated following construction.	-	-
4-5	Zetland Park	006/1391	006/026	During the construction phase, the route will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access.	-	-
4-5	Zetland Park	006/1348	006/013	Existing path to be used as haul route from Henry Street.	A temporary diversion route will be considered as part of the CTMP to maintain access. Existing path to be reinstated following construction.	-	-
4-5	Wood Street to Zetland Park	N/A	006/043	During the construction phase, the route will be closed to users.	A temporary diversion route will be considered as part of the CTMP to maintain access. Existing links between Zetland Park and Abbots Road reinstated following construction.	-	-
4-6	Dalratho Road to Bo'ness Road (part of NCN76)	006/1400	006/028	During the construction phase, Park Road will be partially closed during works, including to on-road cyclists (on-road section of NCN76).	To be reinstated following construction.	-	-

14.6.2.1 Route Selection (Mitigation Item TT2)

Consideration of the roads network 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 14.5.2). These preferred routes are summarised in Table 14-17.

The preferred routes consider the physical characteristics of the roads network and the number and location of potentially sensitive receptors along the various routes. 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. The route selection will play a significant role in reducing impacts.

14.6.3 Tertiary Mitigation

The following tertiary mitigation measures would be implemented as good practice and to comply with related legislative requirements:

Traffic Management Measures (Mitigation Item TT3)

In addition to the specification of preferred access routes and the anticipated phasing of construction traffic (see Table 14-14), additional tertiary mitigation measures and initiatives may be introduced to minimise the intrusive impacts of construction related traffic. Potential measures include the following:

- Regulated site working hours i.e., construction traffic will, where practicable, avoid heavy volumes of movement during peak periods, particularly in the morning and evening peak hours when general traffic levels will be higher than normal.
- Where appropriate, additional warning and speed control signs will be installed, temporarily or otherwise, with the agreement of Falkirk Council.
- A wheel wash facility (near each construction site access) and road sweeper (to maintain adjacent public roads) shall be provided to minimise any mud and debris on the surrounding public road network and prevent the introduction and spread of non-native or invasive plant material onto the site.
- A construction liaison committee shall be established 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. This committee would form a means of communicating and updating on forthcoming activities and dealing with any issues arising.
- The need for, and extent of, temporary parking restrictions will be discussed with Falkirk Council when construction vehicle access routes are confirmed. Consideration will be given to suitable alternative parking arrangements where on-street and off-street parking is restricted because of the Scheme.
- 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.

- At some locations the potential for conflict on the road could be easily mitigated by the stationing of a 'Stop-Go' banksman with appropriate communications between the two and the construction vehicle drivers.

To help reassure the local community, 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.
- 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, and will likely incorporate measures including:

- Submission and approval of Temporary Traffic Regulation Order (TTRO)
- Installation of advanced signage
- Associated road closure signage/barriers
- Route signage
- Deployment of Traffic Management personnel

In addition, careful consideration and liaison with bus operators and appropriate Falkirk Council officers will need to be undertaken by the contractor to address impacts on bus services and access to bus stops, while also considering appropriate alternative pedestrian routes between alternative bus stops. However, it is assumed temporary bus stances and/or traffic diversions will be put in place by Falkirk Council to address potential temporary disruption to the bus network.

14.7 Residual Effects

14.7.1 Road Traffic

Considering that the nature of construction traffic increases would be short term for each of the flood cells considered and combined with the mitigation measures outlined in Section 14.6, the residual effects are assessed as being **Negligible** or of **Minor adverse** significance, as summarised in Table 14-34.

Table 14-34: Residual Effects significance

Impacts	Receptor	Impacts Significance	Mitigation or enhancement	Residual Effects Significance
Severance	A9, at St. Mungo's (north of Rosebank Roundabout)	Moderate	See Section 14.6	Minor
	A904, Bo'ness Road at Grangemouth Town Hall	Moderate	See Section 14.6	Minor
Driver Delay	A9, at St. Mungo's (north of Rosebank Roundabout)	Minor	See Section 14.6	Negligible
	A904, Bo'ness Road at Grangemouth Town Hall	Minor	See Section 14.6	Negligible
Pedestrian Delay	A9, at St. Mungo's (north of Rosebank Roundabout)	Minor	See Section 14.6	Negligible
	A904, Bo'ness Road at Grangemouth Town Hall	Minor	See Section 14.6	Negligible
Pedestrian Amenity	A9, at St. Mungo's (north of Rosebank Roundabout)	Moderate	See Section 14.6	Minor
	A904, Bo'ness Road at Grangemouth Town Hall	Moderate	See Section 14.6	Minor
Fear and Intimidation	A9, at St. Mungo's (north of Rosebank Roundabout)	Minor	See Section 14.6	Negligible
	A904, Bo'ness Road at Grangemouth Town Hall	Minor	See Section 14.6	Negligible
Accidents and Safety	A9, at St. Mungo's (north of Rosebank Roundabout)	Moderate	See Section 14.6	Minor
	A904, Bo'ness Road at Grangemouth Town Hall	Moderate	See Section 14.6	Minor

14.7.2 Active Travel Routes

Incorporating the mitigation measures outlined in Section 14.6, the significance of the residual effects on active travel routes is provided in Table 14-35. This highlights that the residual significant effects of the Scheme on active travel routes during construction are **Negligible** except for those routes that form the HArTT and NCN which have a high receptor sensitivity, and which are assessed as having a residual effect of **Minor adverse** significance. The residual significant effects of the Scheme on active travel routes following construction (operational) are all **Negligible** given the incorporation of floodgates and ramps and the commitment to the secondary mitigation identified in Section 14.6.2 for Mumrills Road (part of HArTT).

Table 14-35: Active travel Residual Impact significance

WA	Location	Core Path ref.	Construction Impact Significance	Operational Impact Significance	Mitigation or enhancement	Construction Residual Impact Significance	Operational Residual Impact Significance
1-1	Dorrator Bridge to Cemetery Loop	001/050	Minor	-	See Section 14.6	Negligible	-
1-1	River Carron to Camelon Playing Fields	001/038	Minor	Negligible	See Section 14.6	Negligible	Negligible

WA	Location	Core Path ref.	Construction Impact Significance	Operational Impact Significance	Mitigation or enhancement	Construction Residual Impact Significance	Operational Residual Impact Significance
1-1	River Carron Path: Swing Bridge to Camelon Cemetery	001/048	Minor	-	See Section 14.6	Negligible	-
1-2	Mungal Riverside (part of HArTT)	001/018	Moderate	Negligible	See Section 14.6	Minor	Negligible
1-2	Mungal Riverside (part of HArTT)	001/020	Moderate	-	See Section 14.6	Minor	-
1-2	Mungal Riverside	001/021	Minor	-	See Section 14.6	Negligible	-
1-2	River Carron to rear of Park Road (part of HArTT)	004/017	Moderate	Negligible	See Section 14.6	Minor	Negligible
1-2	Dawson Mission Path (part of HArTT)	004/003	Moderate	Negligible	See Section 14.6	Minor	Negligible
1-2	Stenhouse Road	N/A	Minor	Negligible	See Section 14.6	Negligible	Negligible
1-2	Cobblebrae (part of HArTT)	004/019	Moderate	-	See Section 14.6	Minor	-
1-2	Cobblebrae	004/001	Minor	Negligible	See Section 14.6	Negligible	Negligible
1-2	Stenhouse Road to Mill Lade (part of The Helix-Larbert Link)	011/008	Minor	Negligible	See Section 14.6	Negligible	Negligible
1-3	Carronshore 2000 path	009/001	Minor	Negligible	See Section 14.6	Negligible	Negligible
2-1	Rope Walk, Grangemouth Old Town	006/008	Negligible	Negligible	See Section 14.6	Negligible	Negligible
4-1	Mumrills Road (part of HArTT)	015/012	Moderate	Major	See Section 14.6	Minor	Negligible
4-1	Grandsable Road	N/A	Negligible	-	See Section 14.6	Negligible	-
4-1	Cassel Brae/Fairy Glen	016/015	Negligible	-	See Section 14.6	Negligible	-
4-2	Rannoch Park	006/007	Negligible	Negligible	See Section 14.6	Negligible	Negligible
4-2	Grange Burn	006/009	Minor	Negligible	See Section 14.6	Negligible	Negligible
4-2	Rannoch Road	006/018	Minor	Negligible	See Section 14.6	Negligible	Negligible
4-3; 4-4; 5-1	Inveravon to Wholeflats Roundabout (part of NCN76)	016/038	Moderate	-	See Section 14.6	Minor	-
4-4	Jinkaboot Bridge	016/036	Negligible	Negligible	See Section 14.6	Negligible	Negligible
4-5	Zetland Park	006/022	Minor	Negligible	See Section 14.6	Negligible	Negligible
4-5	Zetland Park	006/026	Minor	Negligible	See Section 14.6	Negligible	Negligible

WA	Location	Core Path ref.	Construction Impact Significance	Operational Impact Significance	Mitigation or enhancement	Construction Residual Impact Significance	Operational Residual Impact Significance
4-5	Zetland Park	006/013	Minor	-	See Section 14.6	Negligible	-
4-5	Wood Street to Zetland Park	006/043	Minor	Negligible	See Section 14.6	Negligible	Negligible
4-6	Dalratho Road to Bo'ness Road (part of NCN76)	006/028	Moderate	-	See Section 14.6	Minor	-

14.7.3 Interaction with Other Environmental Disciplines

Indirect (secondary) impacts on traffic and active travel receptors may arise from construction disturbance, i.e. disruption to access, increased noise levels, change in amenity etc. This has been addressed and discussed in more detail in Chapter 6: Population and Human Health, which identifies that a Traffic and Access Management Plan and Construction Environmental Management Plan (CEMP) should be prepared to reduce impacts on pedestrians and park users, as similarly highlighted in Section 14.6.3.

The landscape and visual impact assessment undertaken in Chapter 9: Landscape and Visual, highlights the potentially significant adverse impact of construction activities on the landscape and views partly due to construction traffic, which also highlights the likely requirement for diversion routes for all cycle/footpath/road closures, as discussed in more detail in this chapter.

With regards to the potential operational visual impacts on people using core paths (active travel receptors), the mitigation proposed includes the proposal to widen pavements, where possible, to reduce the feeling of enclosure, and to incorporate high quality yet robust and durable surface finishes with paths needing to accord with active travel/ core path expansion aspirations as part of the proposed design approach.

14.7.4 Cumulative Impacts

No significant same project cumulative impacts on traffic and active travel receptors in the study area have been identified. Chapter 15: Cumulative Effects addresses impacts associated with other developments that may have been completed or coincide with the Scheme construction, however, there are no resulting significant cumulative effects identified.

14.8 Opportunities

Through consultation, the promoter of the Scheme (Falkirk Council) has stated that they are keen to pursue the installation of a footpath on Grangeburn Road, from Powdrake Road to Bo'ness Road, and on Park Road, between Bo'ness Road and Dalratho Road (an on-road section of NCN76). The footway width is proposed to be 1.5 m, although 1.7 m will be provided where possible. This provision will be investigated further at the detailed design stage.

14.9 Monitoring

As identified in Section 14.6.3, it is likely that wheel washing facilities will be required prior to construction traffic accessing the public road network. Any mud and debris generated by the construction traffic on the surrounding road network near the Scheme would be monitored by construction contractors and/ or Falkirk Council representatives.

Inspections of the transportation mitigation measures would be undertaken by construction contractors and/ or Falkirk Council representatives on a regular basis to confirm these measures prove effective at reducing impacts.

14.10 References

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