15 Impact Interactions

15.1 Introduction

15.1.1 The direct and indirect effects of the proposed development have been assessed within the relevant topic chapters of the EIAR (**Chapters 5 – 14**) and prepared by competent experts for the purposes of this EIA, as defined within the Town and Country Planning (EIA) (Scotland) Regulations 2017 as amended ('the EIA Regulations'). Environmental effects are assessed relative to the topic under consideration. This approach can lead to the interaction of effects being reported in separate chapters but combined effects on the same environmental receptor(s) not being considered. This chapter therefore considers the principal findings of each topic chapter of the EIAR to enable assessment of the potential for impact interactions. In doing so, the chapter also provides a summary of the likely significant environmental effects identified throughout the EIAR.

15.2 Methodology

15.2.1 The assessment methodology for combined effects involves the identification of impact interactions associated with both the construction and operational phases of the proposed development upon one or more environmental resources. This is undertaken using a qualitative appraisal process which has been used for numerous EIAs and draws upon best practice guidance, as detailed in **Section 3.7**.

15.2.2 The assessment of the significance of individual and cumulative effects has been based on the generic significance criteria provided in **Table 3-1**, although as detailed in Subsection 3 of each technical assessment EIAR chapter, topic-specific significance threshold criteria have been developed in accordance with relevant legislation, policy, technical guidance and standards. These significance criteria are also relevant when assessing likely interactions between individual predicted environmental effects.

15.3 Environmental Interactions and Combined Effects

15.3.1 Taking account of embedded and proposed mitigation and mitigation measures identified through the EIAR and in the Summary sections in **Chapter 3** and **Chapter 16**, including the development and implementation of a CEMP, a Landscape Management Plan, a Biodiversity Management Plan and a Travel Plan, no residual significant adverse environmental effects are predicted to arise from the proposed development.

15.3.2 The technical assessments presented in **Chapters 5-14** conclude that proposed construction activities and the subsequent operation of the proposed development could result in a number of adverse, albeit not significant, environmental effects (both individually from the proposed development and cumulatively with effects from cumulative developments). The interaction of these effects could generate overarching health and amenity effects, which are considered in turn below.

Health Risks and Effects

15.3.3 In the context of the proposed development, health risks and effects on human health have the potential to arise from:

- Direct effects relating to pollution and the quality of the environment (e.g. from noise and air quality emissions, including dust effects). These types of effects are primarily predicted to occur during the construction phase, although operational effects are also predicted from road traffic impacts; and,
- Indirect effects relating to the quality of the built environment and the provision, accessibility and green infrastructure.

15.3.4 The technical assessments conclude that no residual significant adverse environmental effects will occur from the proposed development with only localised effects occurring. In addition, predicted emissions (noise and air pollutants) will remain within legally accepted limits.

15.3.5 Taking account of proposed mitigation and enhancement measures, the proposed development will result in residual minor and not significant beneficial effects on health risks and effects.

Amenity and Visual Effects

15.3.6 It is considered that due to the site's location on the boundary of the LLTTNP and by being in an area already impacted by development, coupled with its lack of perceptibility, the proposed development would only cause Negligible long-term landscape and visual effects on the assessed Study Area and the LLTTNP, its Special Landscape Qualities and users.

15.3.7 The John Muir Way, The Three Lochs Way and Loch Lomond Shores have the potential to experience localised significant adverse effects. This is due to the proximity of these receptors to the proposed development and limited opportunities to mitigate the changes in view. It is unlikely that the presence of the proposed development will result in a change in visitor numbers to these receptors to such an extent that would result in an adverse effect in the long term.

15.3.8 the construction and operational phases of the proposed development are predicted to result in a number of effects on the physical environment. These have the potential to affect the same receptors (such as dwellings adjacent to the site) and, depending on the phasing of construction activities, could occur simultaneously. This has the potential to generate combined effects on quality of life and residential amenity.

15.3.9 However, a key role of the proposed CEMP will be to co-ordinate construction activities and mitigation measures to minimise all potential effects on both environmental and amenity receptors.

15.3.10 Taking account of proposed mitigation and enhancement measures, the proposed development will result in residual minor and not significant beneficial effects on amenity and visual effect.

16 Schedule Of Further Mitigation and Enhancement

16.1.1 **Table 16-1** below lists the further mitigation and enhancement measures which have been proposed in the technical assessment **Chapters 5 -14**.

Table 16-1: Schedule of Proposed Further Mitigation and Enhancement Measures

EIAR Chapter and Topic	Proposed Further Mitigation and Enhancement Measures
Chapters 5 & 6 – Ecology and Trees & Woodland	**Construction Phase**
	Good practice measures when working in or near to watercourses will be adhered to.
	Appointment of Ecological Clerk of Works (ECoW) team to monitor compliance, produce auditable records and provide onsite advice (different environmental constraints may require ECoWs of differing specialisms).
	Pre-construction and regular protected species surveys.
	Provision of information regarding ecological sensitivities as part of site induction. Toolbox talk for all operatives regarding habitat and species in area.
	Seasonal working checks and restrictions: where vegetation (including woodland, grassland, hedgerow, scrub and trees) clearance is to be undertaken in March to August inclusive, a pre-works nesting bird check would be carried out by a suitably qualified ecologist. If nesting birds are found an appropriate works exclusion area would be put in place to protect the nest until the young have fledged.
	Implementation of 10mph speed limit for all site traffic.
	Safeguarding of protected species: In the event that a protected species is discovered on site, the contractor will be expected to comply with relevant legislation and guidance. Where necessary all work in that area would stop immediately and the site ECoW contacted.
	Site compounds/material and plant storage areas to be located as far as possible from watercourses.
	If construction work is carried out during the hours of darkness, machinery and floodlights will be directed away from watercourses. Use of heavy machinery and pile drivers will be limited to avoid two hours before and after dawn and dusk within 30 m of watercourses or waterbodies.
	Commitment to site and design working areas and building footprints (at detailed design stage) with the objectives of minimizing habitat disturbance/loss and safeguarding important ecological features (IEF).
	Undertaking an early flowering plants survey prior to the detailed design of the proposed development.
	Any trenches or pits made during construction (for example that may be present to lay infrastructure) to be covered at the end of each working day or a wooden plank placed inside to allow any mammal species to escape, should it fall in. Any temporarily exposed open pipe system to be capped in such a way as to prevent wildlife gaining access.
	Use of geoweb to protect adjacent tree rooting systems from development within woodland.
	Porous gravel or similar for proposed parking.
	Turf translocation if required.
	Tree survey to be undertaken of focused areas of the development to provide information on individual trees in relation to design and construction. This would inform the production of method statements for particular construction activities within woodland habitats.

EIAR Chapter and Topic	Proposed Further Mitigation and Enhancement Measures
	New planting to compensate for any tree loss within the development footprint shall comprise native species trees reflecting the desired semi-natural oak woodland of Drumkinnon and Woodbank woodland features; and the alder dominated riparian woodland of the River Leven. New planting shall also include a mix of appropriate understory trees and shrub species particular to these woodland types such as birch, hazel, rowan, holly and willow species.
	Operational Phase
	Commitment for street lighting and other lighting associated with the development to be designed (at detailed design stage) in consideration with habitat use by nocturnal species. Where possible lighting to be positioned upon or around the completed development so it would not illuminate surrounding woodland and watercourses.
	An appropriate speed limit (10mph or less) to be applied to all traffic.
	Visitor management facilities/entrance area to incorporate suitably sized and located waste and recycling receptacles, to be combined with appropriate collection and transportation regimes.
	Management of the riparian and shoreline habitats, including the removal of invasive plant species and encouraging appropriately vegetated banks comprising native woodland species, to enhance the composition of vegetated connectivity between woodland and watercourses.
	An infusion of native, berry producing, shrub species to be planted within existing woodlands and along connective linear vegetated features to enhance the foraging and sheltering resource for a variety of mammal and bird species which may frequent the site in the future.
	Provision of information/ environmental education boards regarding woodland resource.
	Annual vegetation and protected species surveys.
Chapter 7 – Noise and Vibration	**Construction Phase**
	A Construction Environmental Management Plan (CEMP) will be prepared prior to construction. Further mitigation is not expected.
	Operational Phase
	The level of significance of noise impact within the current masterplan is minor. The design mitigation features incorporated into the final masterplan design is of one stretch of 2m high close boarded timber garden fencing at the garden /terrace boundary of NSR 11.
Chapter 8 – Air Quality	**Construction Phase**
	Taking account of proposed embedded mitigation measures, the assessment predicts that no significant effects on air quality are considered likely. No further mitigation, compensation or enhancement measures are therefore required or proposed.
	Operational Phase
	Not Required.
Chapter 9 – Ground Conditions and Geology	**Construction Phase**
	Additional intrusive investigation will require to be undertaken in specific localised areas to inform detailed design and delineate contamination. The results will be assessed in the context of the detailed master plan and, if required, a remediation strategy will be developed: ▪ If required, remediation is likely to comprise localised excavation of contaminated soils and / or capping with clean material to present a barrier between contamination and receptors.; ▪ In the case of proposed buildings or areas of hardstanding, the barrier will be integral to the design of the new development; and,

EIAR Chapter and Topic	Proposed Further Mitigation and Enhancement Measures
	▪ Further intrusive investigation may be required in within and around the derelict buildings in the Woodbank House area to determine the potential for contaminants of concern including asbestos and PAHs. It is understood that the existing relic buildings will be renovated to form apartment accommodation.
	Operational Phase
	None Required.
Chapter 10 – Water, Hydrology and Flood Risk	**Construction Phase**
	Further mitigation to be included in CEMP.
	As noted in Section 10.6, the commitment to develop and implement a CEMP for the construction phase of the proposed development is treated an embedded mitigation measure, as are the provision of certain standard information and environmental management measures within the CEMP (refer to Section 10.6). Over and above this, the assessment in this ES chapter has identified the need for the following further mitigation measures to also be detailed within and implemented through the CEMP.
	Any construction activities within a 5m strip along waterfronts will be subject to specific consideration within the CEMP to be agreed with the National Park Authority (NPA) prior to commencement.
	An Environmental Clerk of Works (ECoW) will ensure that the CEMP and associated mitigation measures are implemented effectively.
	A pollution prevention and response plan will be set out in the CEMP. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.
	Surface Water Management.
	Surface water drainage arrangements for the construction phase will be in line with SUDs principles, incorporating appropriate treatment and attenuation prior to discharge to the water environment in accordance with the required CAR authorisation and relevant GBR. It is proposed to replicate natural drainage around construction areas and to use source control to manage rainfall where, or adjacent to where, it lands.
	The implementation of a given SUDs measure will be dependent upon detailed site and hydrological investigations. Detailed surface water drainage proposals and methodology for the construction phase will be detailed within a Pollution Prevention Plan (PPP) which will be included within the CEMP as noted above. The SUDs features will be installed prior to the main construction activities (including removal of vegetation and any earthworks). Suitable measures will be in place at all times for treatment of runoff from construction areas, to prevent the release of pollutants including sediment to adjacent surface water features.
	Clean runoff from vegetated areas or offsite will be kept clean and diverted around works to prevent mixing with silt-laden water.
	Surface water management measures employed during the construction phase should be regularly inspected and maintained to check that they are working effectively and that there are no blockages or unexpected discharges.
	The risk of oil contamination will be minimised by good site working practice (further described below) but should a higher risk of oil contamination be identified then an oil separator will be considered.
	A minimum buffer zone of 5m will be maintained along the waterfronts. No construction activities will take place within this buffer zone, including movement of construction machinery, stockpiling and construction of SUDs features unless they have been specifically considered and allowed within the CEMP.

EIAR Chapter and Topic	Proposed Further Mitigation and Enhancement Measures
	Routing of construction discharges should ideally be through at least three levels of SUDs to ensure that water quality of high sensitivity receptors is not adversely affected.
	Earthworks
	Areas stripped of earth and vegetation will be kept to a minimum at any one time – this is in accordance with the GBR11 of CAR. Soil loss and erosion will be minimised through careful storage, reinstatement and re-vegetation. Stockpiles will be placed in areas of minimal risk of slippage or erosion from drainage and will not be located within 20m of any watercourses or ditches.
	Any runoff from earthworks and stockpiles will be passed through appropriate construction SUDs measures prior to discharge to the water environment.
	The time excavations are kept open for will be kept to a minimum to avoid ingress of water, minimise erosion and the need for dewatering. Drainage or pumping from excavations will be minimised through appropriate design. Temporary cut-off drains will be installed if required to prevent surface water runoff entering excavations.
	Any dewatering will comply with GBR2 and GBR5. If abstraction exceeds 10m3 per day a CAR registration or licence will be required, which will be obtained prior to the commencement of the abstraction. Any water pumped out of excavations will be treated by passing through a SUDs feature prior to discharge to the water environment.
	Construction Tracks
	Access tracks used during construction (i.e. not the final road layout) will incorporate appropriate drainage measures including ditches, camber to shed water to the edges, frequent cross drains and trackside grips/offlets to prevent the tracks acting as a preferential drainage route and to protect the water environment. Any trackside discharge will be passed through appropriate construction SUDs measures prior to discharge to the water environment. Water will not be allowed or encouraged to pond in the track where possible.
	Oils, Fuels, Site Vehicles and Welfare Facilities
	The mitigation measures to minimise risk of contaminant release will be in line with the updated Controlled Activities (Scotland) Regulations which came into force on 1st January 2018. These new General Binding Rules (GBRs) consolidate the provisions of the Water Environment (Oil Storage) (Scotland) Regulations 2006 into CAR and extend the application of those provisions. The relevant PPGs will also be used to guide the embedded mitigation. This includes the following: Storage of oil and fuels on site will be designed to be compliant with GBRs 26-28 and any bunds will provide storage of at least 110% of the largest tank's maximum capacity: ▪ The storage of oil in a portable container with a capacity of greater than 200 litres on site will not be permitted; ▪ Multiple spill kits will be kept on site; ▪ Drip trays will be used while refuelling; and, ▪ Regular inspection and maintenance of vehicles, tanks and bunds will be undertaken.
	Welfare facilities will include closed-system toilets, with disposal of foul drainage at a suitable off-site facility.
	Concrete and cement mixing should be sited on an impermeable designated area and at least 10m away from a watercourse or surface water drain, to reduce the risk of run-off entering a watercourse. Equipment will be washed out in a designated area, specifically designed to contain wet concrete and wash water. Wash waters should be discharged to the foul sewer with prior permission from Scottish Water or disposed off-site at an authorised facility.
	All chemicals and hazardous substances will be stored safely, away from watercourses and drains in line with current best practice. They should be disposed of in line with duty of care requirements.

EIAR Chapter and Topic	Proposed Further Mitigation and Enhancement Measures
	Operational Phase
	The proposed surface water and SUDs scheme (see Section 10.6) will require regular maintenance. This maintenance will include the regular debris clearing and cutting of grass of surface SUD features, and the inspection and repairs to underground features if necessary. The responsibility for the maintenance of the drainage network will lie with the organisation that adopts the network. Details of the proposed drainage strategy for the site are covered in **Appendix 10.3**.
	During the operational phase there should be no requirement for groundworks. However, should groundworks be required mitigation highlighted in the construction sections above will be adopted as appropriate.
Chapter 11 - LVIA	**Construction Phase**
	No further construction stage mitigation proposed.
	Operational Phase
	No additional operational stage mitigation proposed.
Chapter 12 – Traffic and Transport	**Construction Phase**
	Development and implementation of measures relating to: construction traffic routing, site access/deliveries, parking, contractor management, parking, fuels and materials storage, standard dust and noise suppression techniques and standard pollution presentation and control techniques. These measures will be set out within a Construction Environmental Management Plan (CEMP). Any construction activities within a 5m strip along waterfronts will be subject to specific consideration within a CEMP to be agreed with the LLTNPA prior to commencement.
	Adoption of standard construction industry working hours for noise generating activities.
	Operational Phase
	An Outline Travel Plan: Contained within the Transport Assessment an Outline Travel Plan incorporates actions and incentives and an ongoing programme of delivering sustainable travel options for the proposed development site. This includes several potential measures which could be implemented to support sustainable travel choices for future employees, through both induction processes and provision of a travel information pack for new starts. Users of the holiday accommodation will receive travel plan options on booking and arrival.
	Monorail: A monorail is incorporated in to the development proposals to provide better connectivity between Zone A (Station Square) and Zone C (Pierhead). This will provide better connectivity between Balloch Village and Loch Lomond Shores, through provision of a safe, direct and convenient means of transport. During the winter months/ dark nights the existing Pier Road and walking routes adjacent to the River Leven (Riverfront area) are not conducive to walking as function of reduced personal security, and the overall distance. As such, the monorail will help support an evening economy at the existing and with-development scenarios.
	Public Transport: The WDC plans for the Station Square enhancements on Balloch Road between the proposed new Station Square development (Zone A) and Balloch Railway Station, will help deliver enhanced access between the station and the proposed development site as well as the wider village of Balloch. It is also understood that revised parking arrangements are being considered for Balloch Rail Station as part of the wider “Balloch Village Parking Proposals” which are hoped to alleviate parking issues in the locality as well as encourage an uptake in rail usage; Discussions have been undertaken with ScotRail to seek to agree in principle the mutual benefits of promoting access to the development site by rail. Whilst any interventions are still in early developmental stages, these are presently anticipated to include:

EIAR Chapter and Topic	Proposed Further Mitigation and Enhancement Measures
	▪ Shared-ticketing: whereby rail and attraction-tickets can be purchased simultaneously, incorporating some form of discount for the passenger/ visitor; ▪ The opportunity to promote the new West Riverside development as a destination, where branding/ wrapping the trains can be used as a marketing/ promotional incentive; and, ▪ The potential for further studies into the need for enhanced rail services either by frequency and/ or selective station stopping to improve journey times.
	Lodge Parking: For accommodation land uses, except for the Woodbank House site, the arrivals and parking for this element can be managed from the point of booking, whereby visitors can be advised of the intended arrival and check-in arrangements. The intention is that accommodation-based-visitors and associated parking will be segregated from other land-uses and that parking will be provided remotely from the accommodation. Small buggies will be used to transport visitors and baggage to their holiday accommodation. This will reduce both unnecessary vehicular circulation at arrival and departure times but is also expected to reduce the use of cars for short-trips by guests throughout their stay: it will be more convenient to walk, cycle or use the mono-rail for shorter local and site-internal trips.
Chapter 13 – Archaeology & Cultural Heritage	**Construction Phase**
	Preferred mitigation option in to avoid or reduce impacts through design, or through precautionary measures such as fencing off heritage assets during construction works.
	A Conservation Management Plan will be produced by a suitably experienced historic buildings professional in consultation with HES.
	In terms of archaeology, an Archaeological Written Scheme of Investigation (WSI) will be produced and agreed with WoSAS.
	A programme of historic building recording (HBR) will be undertaken in connection with Woodbank House and its associated structures and estate grounds.
	The results of the HBR work will be used to inform the design of a flexible approach to the preservation of remaining facades of Woodbank House and restoration where viable of associated listed structures.
	Conservation work will pay particular attention to the east and south facades of Woodbank House, and their presentation as a landmark feature within the proposed development.
	Operational Phase
	The results of the EIA, HBR and conservation work will also be used to inform the production of interpretive materials for public dissemination. Such materials could take the form of information panels and/or a heritage trail around the grounds of Woodbank House describing and illustrating the history of the house and estate, whilst also providing information on the preservation and renovation process.
Chapter 14 - Socio-Economics, Tourism, Recreation and Public Access	**Construction Phase**
	None required.
	Operational Phase
	None Required.

17 Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
AAWT	Average Annual Weekday Traffic
ADMS	Air Dispersion Modelling System
ALC	Agricultural Land Classification
AMSC	Associated Matters Specified by Condition
AOD	Above Ordnance Data
APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BGS	British Geological Survey
BMV	Best and Most Versatile (agricultural land)
BRE	Building Research Establishment
BS	British Standards
BS	British Standard
BSI	British Standards Institute
CAMS	Catchment Abstraction Management Strategy
CDM	Construction Design and Management
CEMP	Construction Environmental Management Plan
CFMP	Catchment Flood Management Plan
CLEA	Contaminated Land Exposure Assessment
CLR	Contaminated Land Report
CMP	Construction Management Plan
CoPA	Control of Pollution Act
CRN	Calculation of Railway Noise
CROW	Countryside and Rights of Way
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
CTMP	Construction Traffic Management Plan
CTMS	Construction Traffic Management Scheme
CP	Compensatory Planting
dB	Decibel Level
dBA	A-Weighted Decibel Level
DCLG	Department for Communities and Local Government
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DIA	Drainage Impact Assessment
DMRB	Design Manual for Roads and Bridges
DOE	Department of Environment

Abbreviations	Meaning
EC	European Commission
EFT	Emission Factor Toolkit
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Act
EPUK	Environmental Protection UK
EU	European Union
FEH	Flood Estimation Handbook
FLS	Forestry and Land Scotland
FMP	Flood Modeller Pro Software
FRA	Flood Risk Assessment
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes. Includes Heavy Goods Vehicles and buses
HEP	Historic Environment Policy
HES	Historic Environment Scotland
HLA	Historic Land-Use Assessment
HMSO	Her Majesty's Stationary Office
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
ISO	International Standards Organisation
LAQM	Local Air Quality Management
LBC	Listed Building Consent
LDP	Local Development Plan
LFRMS	Local Flood Risk Management Strategy
LIDAR	Light Detection and Ranging
LLTNP	Loch Lomond & The Trossachs National Park
LLNTPA	Loch Lomond & The Trossachs National Park Authority
LGS	Local Geological Sites
LFA	Local Flood Authority
LOAEL	Lowest Observed Adverse Effect Level
LPA	Local Planning Authority
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NGD	Noise Generating Development
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NOEL	No Observed Effect Level
NO_x	Nitrogen oxides, generally considered to be nitric oxide and NO_2. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPF	National Planning Framework

Abbreviations	Meaning
NSD	Noise Sensitive Development
NSR	Noise Sensitive Receptor
OS	Ordnance Survey
PAC	Planning Application Consultation
PAN	Planning Advice Note
PAN	Proposal of Application Notice
PFRA	Preliminary Flood Risk Assessment
PG	Planning Guidance
$PM_{10}/PM_{2.5}$	Small airborne particles less than 10/2.5 μm in diameter
POM	Programme of Measures
PPiP	Planning Permission in Principle
PPV	Peak Particle Velocity
ProPG	Professional Practice Guidance on Planning and Noise
PSC	Potential source of contamination
RBMP	River Basin Management Plan
SEL	Single Event Level
SEPA	Scottish Environment Protection Agency
SFRA	Strategic Flood Risk Assessment
SG	Supplementary Guidance
SOAEL	Significant Observed Adverse Effect Level
SPP	Scottish Planning Policy
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SUDs	Sustainable Urban Drainage systems
UNECE	United Nations Economic Commission for Europe
VDV	Vibration Dose Value
VMS	Variable Message Signing
WDC	West Dunbartonshire Council
WFD	Water Framework Directive
WHO	World Health Organisation
WSAS	West of Scotland Archaeological Services
ZTV	Zone of Theoretical Visibility

Stantec

A: 5th Floor, Lomond House, 9 George Square, Glasgow, G2 1DY
T: +44(0)141 352 2360
E: info.glasgow@stantec.com