West Riverside and Woodbank House

Environmental Statement: Volume 1 – Main Report

On behalf of Flamingo Land Ltd and Scottish Enterprise
This report has been prepared by Peter Brett Associates LLP (‘PBA’) on behalf of its client to whom this report is addressed (‘Client’) in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which PBA was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). PBA accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

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1 Introduction

1.1 Introduction

1.1.1 This Environmental Statement (ES) has been prepared by Peter Brett Associates LLP (PBA) to accompany an application for planning permission in principle (PPiP) for the erection and operation of a proposed tourism and leisure-led mixed use development (‘the proposed development’) on land at West Riverside and Woodbank House, Balloch (‘the site’). The PPiP application and this ES are submitted on behalf of Flamingo Land Ltd and Scottish Enterprise (‘the Applicants’) to the Loch Lomond and the Trossachs National Park Authority (LLTNPA) as the relevant local planning authority.

1.1.2 The ES has been co-ordinated by Peter Brett Associates LLP (‘PBA’) on behalf of the applicant, with input from technical assessment specialists as detailed in Section 1.7.

1.2 Purpose of this Environmental Statement

1.2.1 The purpose of this ES is to report the findings of an Environmental Impact Assessment (EIA) carried out for the proposed development. In doing so, this ES identifies the likely significant environmental effects of the proposed development during construction and operation. The ES has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 as amended (‘the EIA Regulations’) which are applicable to the determination of the PPiP application for the proposed development.

1.3 The Site

1.3.1 The site of the proposed development comprises approximately 35.5ha of land, situated to the north of Balloch at the southern tip of Loch Lomond. The site contains two distinct but contiguous areas, known for the purposes of this ES and the PPiP application as West Riverside and Woodbank House. The West Riverside area encompasses the south western bank of the River Leven at its confluence with Loch Lomond and extends eastwards across Drumkinnon Wood, whereas the Woodbank House area comprises the remains of the Grade A listed Woodbank House hotel, associated structures and attendant grounds.

1.3.2 A detailed description of the site and surrounding area is provided in Chapter 2 of this ES, with a Site Location Plan provided as Figure 2.1 in Appendix 2 of Volume 2 – Appendices.

1.4 The Proposed Development

1.4.1 The proposed development comprises the erection and operation of a tourism and leisure-led mixed use development, including:
- Refurbished tourist information building;
- 60-bedroom Apart-hotel;
- 32-bedspace budget accommodation;
- Up to 105 self-catering lodges;
- 20 houses;
- 900m² brewery;
- Leisure / pool / water park area up to approximately 2,500m²;
- Restaurants / Cafe & Retail areas up to 1,100m² in total;
- Visitor reception areas & hub building up to approximately 2,000m²;
- External activity areas including tree top walk, events/performance areas, children’s play areas, monorail, forest adventure rides, picnic / play areas;
- Staff and service area of up to approximately 900m²;
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- Associated parking (up to 320 additional spaces), landscaping and infrastructure development works; and
- Access to be taken from the surrounding road network including Ben Lomond Way and Pier Road.

1.4.2 The proposed development also includes the retention of the Grade A Woodbank House listed building façade. Of note, the conservation and redevelopment of other listed structures within the site will be subject to future applications for planning and listed building consent.

1.4.3 As the Applicants are seeking PPiP rather than full planning permission, at this stage the proposed development comprises a suite of key parameters, within which the detailed design of the proposed development will be confirmed later. This EIA has therefore adopted a Rochdale Envelope approach to assess likely significant effects on the environment from the key parameters of the proposed development. Providing that the final design remains within these key parameters, this approach ensures that the likely ‘worse case’ effects can be considered when determining the PPiP application for the proposed development.

1.4.4 A detailed description of the key parameters of the proposed development is provided in Chapter 3 of this ES. This is supported by a Parameters Plan, provided as Figure 3.1 in Volume 2 – Appendices, which is the key plan for which PPiP is being sought by the Applicants. All other plans submitted within this ES and the wider PPiP application are indicative and are provided for illustrative purposes only.

1.5 Terms and Definitions

1.5.1 For ease of reference, the following terms have been used in the ES:
- The site – the area within the PPiP application boundary which this ES relates to, as outlined in red on the Site Location Plan (Figure 2.1) within Volume 2 – Technical Appendices;
- West Riverside and Woodbank House – the two distinct areas of land which together comprise the site;
- The proposed development – the erection and operation of a tourism and leisure-led mixed use development as summarised in Section 1.4 above and detailed within Chapter 3 of this ES;
- The Applicants – Flamingo Land Ltd and Scottish Enterprise;
- The PPiP application - the application for planning permission in principle being submitted on behalf of the Applicants for the proposed development; and
- The EIA Regulations – the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 as amended.

1.6 The EIA, ES and Related Documents

1.6.1 This ES presents the findings of an EIA undertaken for the proposed development in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 as amended, referred to as ‘the EIA Regulations’. The transitional arrangements within the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, which came into force in May 2017, confirm that EIAs for development proposals which were the subject of an EIA scoping request prior to 16th May 2017 should proceed in accordance with the 2011 EIA Regulations. As a combined EIA screening and scoping request was submitted by PBA on behalf of the Applicants to the LLTNPA in April 2017, the 2011 EIA Regulations remain applicable to the EIA being undertaken for the proposed development.

1.6.2 Running concurrently with the design process (which remains ongoing), the EIA has sought to:
- Identify the likely environmental effects of the proposed development;
- Define appropriate design and construction measures and good practice to mitigate likely significant adverse environmental effects and maximise opportunities for environmental
enhancements resulting from the construction and operation of the proposed development; and
- Determine the significance of the likely residual environmental effects from the proposed development remaining identified mitigation and enhancement measures have been taken into account.

1.6.3 The ES comprises the following volumes:
- **Volume 1** – Main report;
- **Volume 2** – Appendices; and
- **Non-Technical Summary**.

1.6.4 The other principal documents submitted with the planning application include:
- Drawings (to be approved and illustrative);
- Design Statement;
- Pre-Application Consultation Report;
- Transport Assessment;
- Flood Risk Assessment;
- Enabling works report;
- Drainage Assessment;
- Planning Statement.

### 1.7 Stakeholder Consultation

1.7.1 A programme of consultation has been undertaken to inform the design of the proposed development and the EIA reported in this ES:
- Following a request submitted by PBA on behalf of the Applicants, a formal EIA scoping exercise was co-ordinated by LLTNPA in Spring 2018 seeking the views of consultees (statutory and non-statutory) regarding the required scope of the EIA for the proposed development. The resulting EIA Scoping Opinion, issued by the LLTNPA on 11th May 2017, has guided the preparation of this ES and is provided in full as Appendix 4.1 in **Volume 2 – Appendices**;
- Post scoping consultation has been undertaken with individual consultees to clarify points noted within LLTNPA’s EIA Scoping Opinion, inform the emerging design of the proposed development (e.g. with respect to parking provision) and agree the detailed scope of the assessment presented in this ES. Details of these consultations are provided where relevant in Subsection 3 – **Methodology** of each assessment presented in Chapters 6 – 16 of this ES; and
- A programme of public consultation has been undertaken, pursuant to the pre-application consultation requirements prescribed within Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 for all proposed ‘major’ developments, of which the proposed development is one. Full details of this pre-application consultation and how it has informed the design of the proposed development are provided within a separate **Pre-Application Consultation (PAC) Report** prepared by PBA on behalf of the Applicants. Relevant environmental issues raised through pre-application consultation activities are however addressed within the assessments presented in Chapters 6 – 16 of this ES.

### 1.8 Project Team

1.8.1 The organisations involved in the preparation of this ES are listed below:
- **Peter Brett Associates (PBA)** – EIA Co-ordination, Planning, Traffic & Transport, Ground Conditions & Geology, Socio Economics, Tourism, Recreation & Public Access;
1.8.2 The wider project team involved in the preparation of the PPIP application for the proposed development also includes:

- **Anderson Bell + Christie Architects** – Project Architect;
- **PBA** – Planning Agent, Civil Engineering, Site Investigation (SI) Co-ordination, Pre-Application Consultation;
- **Brown + Wallace** – Cost Consultant; and
- **Tourism Resources Limited** – Commercial Strategist.

1.8.3 The full project team is listed in **Appendix 1.1**.

### 1.9 Structure of the Environmental Statement

1.9.1 The remainder of this ES is structured as follows:

- **Volume 1** – Main Report:
  - **Chapter 2**: description of the site and the surrounding area;
  - **Chapter 3**: summarises the proposed development, including utilities and the consideration of alternatives;
  - **Chapter 4**: provides the methodology and assessment methods adopted to undertake the EIA;
  - **Chapter 5**: summarises the planning and policy context to the proposed development;
  - **Chapters 6 to 14**: comprise the technical assessment chapters which document the aspects of the environment likely to be significantly affected by the proposed development and describes the likely significant effects of the proposed development (Ecology and Woodland; Traffic and Transport; Noise and Vibration; Air Quality; Water, Hydrology and Flood Risk; Ground Conditions and Geology; Landscape and Visual;; Archaeology and Cultural Heritage; Socio-economics, Tourism, Recreation and Public Access);
  - **Chapter 15**: provides an assessment of impact interactions;
  - **Chapter 16**: provides a consolidated schedule of all identified mitigation measures and monitoring requirements; and
  - **Chapter 17**: provides a glossary of terms.

- **Volume 2** – Technical Appendices (1.1 to 14.3); and
- **Non-Technical Summary**.
2 Site and Surrounding Area

2.1 Overview

2.1.1 This chapter outlines the key environmental characteristics of the site and the surrounding area which have informed the EIA being undertaken for the proposed development. Details of the characteristics and sensitivities of the individual receptors which have been identified within relevant Study Areas and used to assess likely environmental effects from the proposed development are then provided in subsection 4 of Chapters 6 – 14.

2.2 The Site

Site Location and Context

2.2.1 The PPiP application site (‘the site’) is located to the north of Balloch and it contains two distinct areas, known respectively as West Riverside and Woodbank House. The site is therefore referred to in full as ‘West Riverside and Woodbank House’. This site comprises approximately 35.5ha of land north of Balloch, at the southern tip of Loch Lomond. A Site Location Plan, showing the PPiP application red line boundary delineated in red and other land under the control of the Applicants in blue, is provided as Figure 2.1 within Appendix 2.1.

Site Overview

2.2.2 A high level description of the West Riverside and Woodbank House areas of the site is provided below. Further details regarding individual potential receptors and sensitive areas within the site are identified within subsection 4 – Baseline of each technical assessment presented in Chapters 6 – 15.

West Riverside

2.2.3 The West Riverside site is bounded generally by the River Leven to the East, Loch Lomond Shores and Loch Lomond to the North, Old Luss Road and Ben Lomond Way to the west and Balloch Road and the houses in Clairinish to the South.

2.2.4 The West Riverside area is heavily influenced by Drumkinnon Woods and other pockets of landscaped woodland, amenity areas and car parks are in the north of the site and to the east of the Loch Lomond Shores complex.

2.2.5 An oil pipeline operated by Ineos runs east-west through the northern portion of the West Riverside area of the site, approximately parallel with Ben Lomond Way. The exact location is visible via pipeline markers and two fenced off areas in the north east near the junction of Ben Lomond Way and Pier Road – these are understood to be valve gear / headworks associated with the pipeline. The pipeline does not intrude into the Woodbank House area.

2.2.6 As the site is located close to the waterfront, it is considered to be constrained to the north and east by the River Leven and by Loch Lomond itself. There a number of existing minor roads running through the site including Pier Road and Ben Lomond Way. These connect to Balloch Road and a number of roundabouts linking motorists form the A811 Stirling Road and the A82 trunk road network.

2.2.7 The A82 provides the principal access route to the west of Loch Lomond, other parts of the Trossachs, Argyll & Bute and the North West Highlands.

2.2.8 The application site is a very short walking distance to Balloch Train Station – which currently provides a half hourly service to Glasgow and Lanarkshire on the North Clyde line. The station is limited in terms of size/scale and has a limited covered waiting area and passenger facilities, with only one platform.

2.2.9 The John Muir Way runs through the site. This established route will be secured and enhanced by the development. The site is also situated very close to National Cycle Route 7.
Woodbank House

2.2.10 The area known as Woodbank House comprises the remains of the Woodbank House hotel, outbuildings and gardens including estate walls. The area is situated immediately to the west of Old Luss Road and approximately 500m east of the A82.

2.2.11 At the centre of the Woodbank area of the site lies the remains of Woodbank House, a Grade-A listed property. The buildings which comprised this hotel are in a state of advanced disrepair as a result of a fire (at the main hotel building) and subsequent dereliction. The land surrounding the house are wooded and slope steeply upwards from the Old Luss Road towards the A82. To the front of the ruined Woodbank House building, between it and the Old Luss Road, is an area of open grassland that is currently used for grazing.

Access

2.2.12 Access into the site is influenced by the location of the River Leven to east, Loch Lomond to the north and the existing urban form of Balloch to the south.

2.2.13 There a number of existing minor roads running through the site including Pier Road and Ben Lomond Way. These connect to Balloch Road and a number of roundabouts linking motorists form the A811 Stirling Road and the A82 trunk road network.

2.2.14 The A82 provides the principal access route to the west of Loch Lomond, other parts of the Loch Lomond and the Trossachs National Park, Argyll & Bute and the North West Highlands. This trunk route is strategic in nature and is therefore maintained by Transport Scotland.

2.2.15 The site is a very short walking distance to Balloch Train Station, which at present provides a half hourly service to Glasgow and Lanarkshire on the North Clyde line. The station is limited in terms of size/scale and has a limited covered waiting area and passenger facilities, with only one platform.

2.2.16 The site is situated very close to National Cycle Network Route 7 and the John Muir Way. These established routes would be secured and enhanced by the development to ensure that the potential connections from these routes are utilised and enhanced.

Site History

West Riverside

2.2.17 Available historical maps from 1864 show that the West Riverside area of the site was primarily occupied by fields and woodland (labelled as Drumkinnon Wood). Balloch Rail Station was situated in the south east of the site and a railway line ran up the eastern site boundary connecting Balloch Pier to the wider rail network. Throughout the history of the site, various branches, sidings and associated infrastructure were present associated with the rail line. The north western most strip of land was shown to comprise mixed woodland, bounded by a track to the west. The south eastern portion (connecting the north western strip of land to the land in the east) was grassland (presumed to be agricultural).

2.2.18 Historic mapping indicates that an excavation labelled as a Sand Pit was present in the north western area of the site, within Drumkinnon Wood in 1899 and a curling pond was present in the north eastern corner. The excavation in the west appears to have been enlarged on the mapping from 1958.

2.2.19 In the 1960s, excavations labelled as Gravel Pits were present at the north western extent of the site. The excavations encroached onto the site, but were present more extensively offsite to the north west. The excavations continued to extend throughout the sequence of maps, until recent mapping which showed this area as part of Loch Lomond – indicating that the former excavations have been flooded – with a new shoreline created that is currently occupied by the Lomond Shores retail and leisure destination.

2.2.20 The Loch Lomond silk drying and finishing factory with associated tanks was constructed in the 1930s and was located immediately offsite to the south along with several associated outbuildings and a railway line. The factory (subsequently labelled as Works) was present on mapping until around 1992. The works and infrastructure have since been demolished and the housing estate on Clarinish Road has been constructed in its place.
2.2.21 Historical mapping shows the Woodbank House area to have remained largely unchanged since the first mapping (1864) when it comprised fields and woodland. The only significant infrastructure that appears to have been present on the site is associated with the (now derelict) hotel and outbuildings. The buildings were labelled on maps as Woodbank, and as a hotel from around 1958.

Environmental Characteristics

West Riverside

2.2.22 The West Riverside area of the site includes Drumkinnon Woods. This semi-natural woodland is located south east of the Loch Lomond Shores complex, across an undulating landform and is dissected by footpaths. The woodland is bounded to the west and north by roads accessing Loch Lomond Shores and the pier. Part of the woodland is designated as Ancient Woodland (long-established of plantation origin). Although subject to a level of disturbance, the woodland has the potential to support a range of wildlife.

2.2.23 SEPA’s Indicative Flood Maps indicate that the northern part of the site surrounding Balloch Pier and the western banks of the River Leven running through the site are located within the 1 in 200 year return period flooding envelope (medium likelihood of flooding). However, a flood study of the river undertaken by Jacobs\(^1\) which provides a more detailed outline of the modelled flood extents along the river highlights that the northern part of the site from the existing roundabout on Pier Road and above, would in fact be inundated in the 1 in 200 year return period event, and more substantially in the 1 in 500 year return period event. Only a small strip of land along the banks of the River Leven through the site would be affected by this flooding.

Woodbank House

2.2.24 The Woodbank House area of the site is not indicated as susceptible to river flooding on SEPA’s indicative flood maps, however there are areas shown as being at potential risk of surface water flooding that coincide with the two small watercourses running through this area from the hills to the west towards Loch Lomond.

Existing Land Uses and Activities

2.2.25 Table 2.1 below identifies all existing land uses and activities known to be present either within the site or along its boundaries. In accordance with the embedded mitigation set out in Section 3.4, continuity of access to these receptors will be maintained throughout the construction and operational phases of the proposed development.

<table>
<thead>
<tr>
<th>Receptor Type</th>
<th>Existing Uses and Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational routes</td>
<td>Loch Lomond Shores Walk, John Muir Way, Three Lochs Way, National Cycle Route 7, West Loch Lomond Cycle Path, Regional Cycle Route 40</td>
</tr>
<tr>
<td>Tourism, Recreation and Leisure</td>
<td>Maid of the Loch, Sweeney’s Cruises, Tourist Information Centre (Balloch VisitScotland iCentre), Tour Boats, Sealife Centre, Loch Lomond Bird of Prey Centre, Treezone aerial adventure course, Pier head users (swimming, fishing, canoeing, rowing, waterskiing, bike &amp; boat hire etc.)</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Receptor Type</th>
<th>Existing Uses and Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>Loch Lomond Shores including all operators currently within complex, National Park ranger's office at Pierhead</td>
</tr>
</tbody>
</table>

2.3 The Surrounding Area

2.3.1 As would be expected given the site's location within a National Park, it is proximate to various tourism and recreation resources/receptors, including: Loch Lomond, Ben Lomond, Luss, the River Leven and Balloch itself (with particular reference to visitor-related business activity and the accommodation sector). The closest visitor attractions to the site are:

- Loch Lomond Shores, a retail and leisure development situated immediately to the north west;
- The Loch Lomond Steamship, berthed at Balloch Pier within the northern extent of the development site;
- Loch Lomond Birds of Prey Centre, located within the Loch Lomond Shores complex;
- Balloch Castle and Country Park are situated east of the development site across the River Leven; and
- Other visitor attractions and tourism developments are located at greater distance within Balloch and along the shores of Loch Lomond.

2.3.2 Relevant environmental characteristics and sensitivities within the surrounding area are identified as potential receptors within the technical assessments presented in Chapters 6 – 15.

2.4 Cumulative Development

2.4.1 The EIA Regulations require likely significant cumulative effects from a development proposal in combination with other existing or proposed developments to be described within an ES. Details of relevant existing, approved and proposed developments which have been considered in this ES are provided below.

2.4.2 Consultation was undertaken with LLTNP in December 2017 to confirm the cumulative/committed developments which would be considered in this EIA. All of the selected cumulative developments are located within the immediate vicinity of the site, as shown on Figure 2.2 – Cumulative Developments Plan. These cumulative developments have been included within cumulative impact assessments provided in subsection 10 of each technical assessment presented in Chapters 6 – 14.

Existing Development

2.4.3 Existing development is considered as a receptor and/or impact source where relevant within each technical assessment through Chapter 6 – 14.

Approved Development

2.4.4 Table 2.2 below identifies the approved developments which have been considered in this EIA.

Table 2.2 Relevant Approved Developments

<table>
<thead>
<tr>
<th>Planning Application Reference</th>
<th>OS grid reference</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drumkinnon Bay Dredging 2017/0326/DET</td>
<td>NS 38531 82178</td>
<td>Dredging operation to extend existing dredged channel</td>
</tr>
</tbody>
</table>
### Other Proposed Development

2.4.5 Table 2.3 below identifies the approved developments which have been considered in this EIA.

**Table 2.3: Relevant Proposed Developments**

<table>
<thead>
<tr>
<th>Planning Application Reference</th>
<th>OS Grid Reference</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodbank Inn Extension 2017/0223/DET</td>
<td>NS 38938 81921</td>
<td>Demolition of kitchen extension. Erection of 3 storey extension comprising of 18 hotel rooms and kitchen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning Application Reference</th>
<th>OS Grid Reference</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweeney Cruises Replacement Infrastructure 2017/0373/DET</td>
<td>NS 38938 81921</td>
<td>Demolition of existing buildings and erection of: office building; slipway enclosure/workshop building; boathouse and installation of 2 pontoons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning Application Reference</th>
<th>OS Grid Reference</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balloch Street Design Project</td>
<td>NS 39299 80180</td>
<td>The Balloch Village Plans (Street Design) Project builds on the extensive engagement undertaken through the ‘Live in Balloch’ Charrette process that took place in February and March 2016.</td>
</tr>
</tbody>
</table>
3  The Proposed Development

3.1  Introduction

3.1.1 This chapter provides an overview of the key construction and operational characteristics of the proposed development.

3.2  Overview

3.2.1 The proposed development comprises the erection and operation of a tourism and leisure-led mixed use development at the site, including:

- Refurbished tourist information building;
- 60-bedroom Apart-hotel;
- 32-bedspace budget accommodation;
- Up to 105 self-catering lodges;
- 20 houses;
- 900m² brewery;
- Leisure / pool /water park area up to approximately 2,500m²;
- Restaurants/Cafe & Retail areas up to 1,100m² in total;
- Visitor reception areas & hub building up to approximately 2,000m²;
- External activity areas including tree top walk, events/ performance areas, children’s play areas, monorail, forest adventure rides, picnic / play areas;
- Staff and service area of up to approximately 900m²;
- Associated parking (up to 320 additional spaces), landscaping and infrastructure development works; and
- Access to be taken from the surrounding road network including Ben Lomond Way and Pier Road.

3.2.2 The proposed development also includes the remains of the Grade A listed Woodbank House and attendant structures. The conservation and redevelopment of the Woodbank House façade and other listed structures within the site will be subject to future applications for planning and listed building consent.

3.2.3 As the Applicants are seeking PPIP rather than full planning permission, at this stage the proposed development comprises a suite of key parameters, within which the detailed design of the proposed development will be confirmed at a later date. This EIA has therefore been undertaken using a ‘Rochdale Envelope’ approach, with each technical assessment assessing the likely worst case effects from the construction and operation of the proposed development according to the defined key parameters. These key parameters include land use blocks and maximum building dimensions, as shown on Figure 3.1 – Parameters Plan.

3.3  Key Physical Characteristics

Demolition

3.3.1 For the avoidance of doubt, no demolition is proposed as part of the current PPIP. Demolition has therefore not been assessed in this EIA.
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Tree-Felling

3.3.2 Targeted tree removal is proposed in order to create small development clusters within established woodland setting. No clear cut felling is proposed and the forestry EIA regulations are not considered to be engaged.

3.3.3 The approach to targeted tree removal and associated compensatory planting is assessed and detailed fully within the technical assessment presented in Chapter 6 – Ecology and Woodland.

Buildings

3.3.4 The Parameters Plan (Figure 3.1, contained in Appendix 3 within ES Volume 2) separates the site into five ‘Development Zones’ (Zones A, B, C, D and E) as well as overarching components. For each zone, a set of parameters for development has been defined within which there is flexibility in the final design and layout of buildings. The developments zones are broken down into details as below:

- **Zone A: Station Square**
  - Area 1: Mixed Use: Food & Drink, Entertainment and Budget Accommodation; and
  - Area 2: Tourist Information Services and Public Realm.

- **Zone B: Riverfront**
  - Area 3a: Woodland with Forest Lodges and Recreational Facilities; and
  - Area 4a: Managed Woodland with SUDs.

- **Zone C: Pierhead**
  - Area 5: Pierhead Visitor Destination;
  - Area 6: Future Iconic Visitor Attraction; and
  - Area 7: Multi-User Public Realm.

- **Zone D: Drumkinnon Wood & Bay**
  - Area 8: Woodland Visitor Attractions;
  - Area 3b: Woodland with Forest Lodges;
  - Area 9: Site Entrance Building(s);
  - Area 4b: Managed Woodland;
  - Area 10: Staff & Service Area;
  - Area 3c: Boathouse Accommodation; and
  - Area 11: Buffer Zone.

- **Zone E: Woodbank**
  - Area 12: Residential;
  - Area 13: Heritage Landscaping; and
  - Area 3d: Visitor Accommodation largely within woodland.

3.3.5 These zones and land use blocks, and their associated key parameters as defined on Figure 3.1 – Parameters Plan, represent the proposed development for the purposes of this PPiP and EIA. The siting and detailed design of individual development components within each zone and land use block will be subject to further consideration through the submission of applications for approval of matters specified in condition (AMC applications) after any PPiP is granted for the proposed development. As such, at this stage the EIA is not concerned with assessing likely effects arising from the detailed siting and design of individual development components within individual land use blocks.
Other Structures

3.3.6 In addition to each proposed zone and land use block, the following overarching components are also proposed across the site:

- Area 14: New car parking;
- Site Vehicular/Boat Access Points;
- Pedestrian/cycle linkages; and
- Monorail.

3.3.7 The key parameters of these components are detailed on Figure 3.1 – Parameters Plan.

Landscaping

3.3.8 A number of general landscape design principles have been developed as part of the landscape strategy that is described within the Design Statement accompanying the PPIP application. These principles seek to guide the implementation of a suitable landscape scheme for the proposed development.

3.3.9 As a result, the proposed development incorporates landscape buffers and planting to help set the development in its locality. Landscape buffers have been set at depths that respond to the adjacent current and proposed future land uses, with larger buffers close to sensitive receptors. For example, as shown on Figure 3.1 – Parameters Plan a 12m landscape buffer is proposed between the proposed development and the existing Drumkinnon Gate residential area to the south.

Ecology

3.3.10 A range of industry standard measures describing key working methods and timings to avoid/minimise ecological effects during construction will be delivered through a Construction Environmental Management Plan (CEMP) and protected species licences where required, overseen by an Ecological Clerk of Works. These licences would be obtained in advance of construction, and detailed mitigation measures would be agreed during the licensing process.

Existing Pipeline Infrastructure

3.3.11 The proposed development allows for the retention of existing INEOS pipeline infrastructure (2 main pipes and fenced valve areas) within the site. 3m stand-off zones each side of the infrastructure have been proposed to allow continuity of access for maintenance.

Access and Parking

Vehicular Access Points

3.3.12 The main access points to the site will be via Ben Lomond Way (the existing main access point to Loch Lomond Shores) and Pier Road, an existing, albeit secondary access point to Pierhead, Maid of the Loch and slipway activities. Woodbank House, as a standalone site, will be accessed via Old Luss Road and the reformation of an existing priority access junction.

3.3.13 Pier Road will be used for access to the newly proposed car park to the west of Pier Road, which is intended to cater for the land uses included within the Zone A Station Square proposals. Ben Lomond Way will be promoted as the main access point to the wider site to ensure strategic and site-bound traffic is removed from the local road network as soon as practicable.

3.3.14 A signage and wayfinding strategy will be developed for the wider site at the detailed design stage. It is expected that a combination of enhanced signage and Variable Message Signalling (VMS) will need to be installed at key approaches to the site, as well as internally within the site, to ensure effective vehicular movement for internal destinations and appropriate directions to the relevant car parking areas.
3.3.15 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. It is intended that parking for the visitor accommodation will be segregated from the parking for other land-uses and will be remote from the accommodation. Small buggies will be used to transport visitors and baggage to their holiday accommodation as to reduce unnecessary vehicular trips.

3.3.16 There are no new internal access roads to be provided as part of the proposed development.

3.3.17 It is intended that the proposed development will be fully accessible by sustainable modes of transport ETC

**Pedestrian and Cycle Path Networks**

3.3.18 The existing pedestrian and cycle network as it exists through the West Riverside site will be retained and enhanced as necessary to provide full connectivity to the wider network as well as all new internal elements of the site. Further to this, bike hire is proposed as part of the Station Square and enhanced Tourist Information Office offering, which will further support internal movements by bike.

3.3.19 Whilst the internal layout requires to be developed further as part of subsequent detailed design stages, it is intended that the existing cycle and walking routes will be widened to SUSTRANS standards for shared walking and cycling routes, where this is practicable to do so.

3.3.20 Throughout the Station Square, Riverfront and Drumkinnon areas, the existing path network including the John Muir Way will be retained and enhanced as appropriate. The existing north-south foot and cycle paths through the Riverfront Zone, will be enhanced with a series of east-west paths increasing access opportunities between Pier Road and the Riverfront area.

3.3.21 The existing foot and cycle way from Loch Lomond Shores to Old Luss Road will be extended to provide a shared foot and cycle way, compliant with technical standards, on the north (development) side of the road, providing a direct walking and cycling link between the two sites.

3.3.22 From the Woodbank House site, which is intended to be configured in accordance with Designing Streets Principles and will provide a continuous internal path network, a direct foot and cycle link will be provided to the Upper Stoneymollan Road/ John Muir Way.

**Rail**

3.3.23 The proposed development includes a mono-rail 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.

3.3.24 Proposed WDC plans for the Station Square enhancements on Balloch Village and Loch Lomond Shores, through provision of a safe, direct and convenient means of transport.

**Bus**

3.3.25 The existing bus service that operates through Loch Lomond Shores via Ben Lomond Way is presently intended to remain in operation with the proposed development, albeit discussions will be held with the operator once internal layout designs are progressed further.

**Car Parking**

3.3.26 As part of the PPiP application, parking arrangements have been outlined as described below. The development will seek to accord to the adopted parking standards at the time of reserved matters application(s).

3.3.27 The parking provision for the site is summarised below in Table 3.1.
### Table 3.1 Parking provision

<table>
<thead>
<tr>
<th>Development Zone</th>
<th>Land Use</th>
<th>Parking Provision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone A</td>
<td>Brewery incl. pub</td>
<td>30 spaces</td>
</tr>
<tr>
<td></td>
<td>Restaurant</td>
<td>30 spaces</td>
</tr>
<tr>
<td></td>
<td>Youth hostel</td>
<td>8 spaces</td>
</tr>
<tr>
<td></td>
<td><strong>Zone A Sub-Total</strong></td>
<td><strong>68 spaces</strong></td>
</tr>
<tr>
<td>Zone B</td>
<td>Woodland Lodges (Riverfront)</td>
<td>65 spaces</td>
</tr>
<tr>
<td></td>
<td><strong>Zone B Sub-Total</strong></td>
<td><strong>65 spaces</strong></td>
</tr>
<tr>
<td>Zone C</td>
<td>Apart Hotel &amp; Rest.</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Water Park</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Iconic Visitor Attraction</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Zone C Sub-Total</strong></td>
<td><strong>84 spaces</strong></td>
</tr>
<tr>
<td>Zone D</td>
<td>Woodland lodges (Drumkinnon)</td>
<td>48 spaces</td>
</tr>
<tr>
<td></td>
<td>Boathouse accommodation</td>
<td>1 space</td>
</tr>
<tr>
<td></td>
<td>Staff &amp; Service area</td>
<td>45 spaces</td>
</tr>
<tr>
<td></td>
<td><strong>Zone D Sub-Total</strong></td>
<td><strong>94 spaces</strong></td>
</tr>
<tr>
<td>Zone E</td>
<td>Residential Units</td>
<td>60 spaces</td>
</tr>
<tr>
<td></td>
<td>Woodland Lodges (Woodbank)</td>
<td>42 spaces</td>
</tr>
<tr>
<td></td>
<td><strong>Zone E Sub-Total</strong></td>
<td><strong>82 spaces</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total Incl. Woodbank Site</strong></td>
<td><strong>413 spaces</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total at West Riverside only</strong></td>
<td><strong>311 spaces</strong></td>
</tr>
</tbody>
</table>

3.3.28 For the purposes of the PPiP application, it has been assumed that the development proposals demonstrate self-sufficiency with respect to vehicle parking. That is, presently, no reliance is placed on the existing spare capacity at the Loch Lomond Shores (main or overspill car parks).

3.3.29 The parameters plan indicates total parking provision of 256 new parking spaces plus 74 relocated/reconfigured at Pierhead; this results in a total parking provision of 330 spaces across the site (excluding the Woodbank House site). This is disaggregated as follows:
- 109 spaces at the newly configured car park on Pier Road; and
- 221 new parking spaces at the Pierhead.

3.3.30 As the detail of the proposals progress, and dialogue with the other Loch Lomond Shores proprietors continues, it is anticipated that parking locations will be reconfigured to allow effective, efficient and sustainable vehicle and access operations across the shared-sites.
3.3.31 As a result of the Zone A Station Square proposals replacing the existing West Riverside Car Park, WDC has requested that as a result of displaced parking, 44 Park & Ride (for rail) spaces should be provided within the newly proposed car park on Pier Road. These should be sited at the southern extents of the new Pier Road car park to provide convenient proximity to the rail station, and reduce the need for on-street parking around the station and on Tullichewan Road. This level of provision is considered both achievable and compatible, given the nature of the proposed Station Square development uses (pub/ restaurant), which are largely expected to have a development/ parking demand peak outwith the commuting/ P&R demand period.

3.3.32 Consultation has been undertaken with WDC with respect to the Balloch Village Parking Proposals and, the streetscape improvements proposed as part of the Station Square Proposals for Balloch Road.

3.4 Key Operational Characteristics

3.4.1 Once constructed, the proposed development will operate as a tourism and leisure business centred around a range of on-site visitor accommodation facilities. As shown on Figure 3.1 – Parameters Plan, proposed food and drink, retail, leisure and entertainment uses will be clustered within Zone A – Station Square and Zone C – Pierhead, with visitor accommodation located across all zones. Additionally, a suite of management and entrance buildings are proposed to be located in Zone D – Drumkinnon Wood & Bay, adjacent to Loch Lomond Shores’ existing overspill carpark (which itself lies outwith the site and would not be subject to development through this PPiP application). Zone D will also include sensitively designed and sited forest adventure activities, as well as a dedicated area for site deliveries and operational staff parking.

3.4.2 With the exception of 20 low density houses which are proposed for permanent residents within the Woodbank area of the site, all proposed accommodation will be used for short term visitor/holiday purposes only. This visitor accommodation will therefore not give rise to any additional pressure on social or community infrastructure including education infrastructure.

3.5 Materials and Natural Resource Usage

3.5.1 The construction of the proposed development will utilise land and construction materials including bricks, roofing tiles, cement, concrete, timber, asphalt, piping, etc). Soil (reused from onsite resources wherever practicable) and seeded grass or turf will also be used for landscaping purposes. Once occupied the proposed development will use domestic energy and utilities infrastructure. Soil movement will be undertaken with reference to best practice guidelines available in the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009).

3.5.2 Where possible, excavated material will (depending on type) be used to backfill excavations and for site re-profiling purposes where appropriate. It is not expected that any material would be unsuitable for re-use in this way, though in the unlikely event that such material arises it will be disposed off-site in line with relevant waste disposal regulations.

3.6 Expected Residues, Emissions and Waste

3.6.1 Construction waste is expected to be restricted to normal non-hazardous materials such as off-cuts of timber, bricks, wire, fibreglass, cleaning cloths, paper, materials packaging and similar materials. These will be sorted and recycled if possible, or disposed of to an appropriately licensed landfill by the relevant contractor appointed (whether directly by the applicant or a subcontractor).

3.6.2 Once completed and operational, the proposed development will be serviced by a commercial waste management and recycling contractor which will be appointed by the Applicants. The proposed development has been designed to accommodate heavy goods vehicles in areas where access would be required for uplifting waste and delivering supplies. The quantity and type(s) of waste during the operational phase of the proposed development cannot be predicted at this stage, as this would depend on operational factors, visitor numbers and the implementation of waste management legislation unrelated to the proposed development.
3.7  Proposed Construction Works, Programme and Management Arrangements

Construction Works and Programme

3.7.1  At this pre-consent stage it is anticipated that construction will take approximately two years and that the key construction activities are likely to include:

- Vegetation clearance, earthworks and soil preparation to prepare areas of the site for construction activities;
- Construction of infrastructure including internal access routes, drainage pipes and SUDS attenuation basin(s);
- Formation of public open space, with associated landscaping;
- Targeted tree removal and installation of forest lodges and path networks;
- Construction of building foundations (where required), structure, cladding and glazing and internal walls and partitions;
- Installation of fixtures, fitting and building services;
- Utility diversions, upgrades and connections as required; and
- External landscaping, highway and drainage works.

3.7.2  A Construction Environmental Management Plan (CEMP) will be implemented to reduce the risk of any likely significant adverse effects on environmental receptors as a result of construction activities, and to minimise disturbance to the local residents.

3.7.3  Given that the applicant includes Scottish Enterprise, a designated Scottish public authority, relevant contracts may include applicable community benefit clauses in accordance with the Procurement Reform (Scotland) Act 2014 and associated guidance. Such clauses could include guaranteed employment opportunities for participants of construction related apprenticeship schemes and local education facilities. This is considered further within Chapter 14 - Socio-economics, Tourism, Recreation and Public Access.

3.8  Proposed Mitigation and Enhancement

Embedded Mitigation

3.8.1  In line with EIA best practice, the iterative EIA, planning and design processes for the proposed development have been undertaken in tandem, with close dialogue maintained between the Applicant, EIA project team, project architect and other advisers. This has allowed an overarching suite of mitigation measures and commitments to be incorporated into the proposed development from the outset, in order to both address potentially adverse effects and enhance its environmental performance. These are termed embedded mitigation measures.

3.8.2  The embedded mitigation measures incorporated within the proposed development are as follows:

Construction Phase

- CEMP:
  - 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 other measures to be included in the CEMP would be identified as ‘further mitigation’ (not embedded) through the EIA.
  - Any construction activities within a 5m strip along waterfronts will be subject to specific consideration within a CEMP to be agreed with the 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.

Adoption of standard construction industry working hours for noise generating activities

A contaminated hotspots plan and procedure for managing unexpected contamination.

Settlement tanks/beds should be utilised to prevent increased suspended solids entering Loch Lomond via surface water run-off during rainfall;

A 3 m exclusion zone will be adopted around either side of INEOS gas pipelines within the site;

Risk Assessments and Method Statements (RAMS) will be prepared. Construction/ground workers should take cognisance of the contamination reported and will be required to work in accordance with the RAMS. The provision of appropriate personal protective equipment (PPE) to be worn by site workers (as specified in RAMS);

Informing site workers of the contamination on the site (i.e. the conclusions of the site investigation) and the potential health effects from exposure through site induction and toolbox talks;

Dust suppression to minimise the effects on offsite users;

If piled foundations are required, a site specific risk assessment designed specifically to assess the risks posed by piling should be carried out. Ultimately, if piled foundations are required, the technique used will be selected on the basis of protecting groundwater from contamination. Safe piling techniques should be adopted to minimise the risks posed by piling activities.

All construction work will be undertaken in general accordance with SEPA’s Guidance for Pollution Prevention (GPPs).

### Landscape:

12m buffer (i.e. no construction) around the site boundary with Drumkinnon Gate;

Any construction activities within a 5m strip along waterfronts will be subject to specific consideration within a Construction Environmental Management Plan (CEMP) to be agreed with LLTNPA prior to commencement;

Adherence to relevant (Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) and Historic Environment Scotland (HES) regulatory and good practice guidance in construction methods;

Adoption of standard construction industry working hours for noise generating activities;

Safeguarding of identified important trees from disturbance or loss;

Work with existing topography to minimise ground level regrading where possible;

Proposed utilities to be located underneath existing path network to minimise disturbance to existing tree roots;

Access to all key nodes and routes through the site are to be maintained during the construction phase. Localised diversions to facilitate construction may occur on land within the applicant’s control. Any impacts on walking/cycle routes during the construction phase will be short term and localised diversions will be put in place;

Continued provision of access through the site to existing receptors and land uses as identified in Chapter 2 Site and Surrounding Area.

### Heritage:

Commitment to undertake a programme of archaeological works, as requested by WoSAS, prior to the construction of the proposed development;
Adherence to relevant HES regulatory and good practice guidance in construction methods;
Retention of Woodbank House listed building façade as a landmark feature; and,
Conversion of other listed buildings within the Woodbank area of the site where practicable and viable.

**Socio-economics, Tourism, Recreation and Access:**
Access to all key nodes and routes through the site are to be maintained during the construction phase. Localised diversions to facilitate construction may occur on land within the applicant’s control. Any impacts on walking/cycle routes during the construction phase will be short term and localised diversions will be put in place; and
Continued provision of access through the site to existing receptors and land uses as identified in Table 2.1 in Chapter 2 (Site & Surrounding Area).
Access to tourist information facility will be maintained whilst building refurbishment takes place.

**Pipeline:**
No ground development within 3m stand-off zone each side of INEOS pipelines, unless agreed with INEOS;
Minimisation of any piling (if required) within 25m zone each side of INEOS pipelines, with construction techniques to be agreed through consultation with INEOS if required; and
On-site supervision by/on behalf of INEOS of construction work within 25m zone each side of INEOS pipelines.

**Ground Conditions**
Additional intrusive investigation to delineate contamination and for a remediation strategy;
Further intrusive investigation will be undertaken as required prior to construction within and around the derelict buildings in the Woodbank House site to determine the potential for contaminants of concern including asbestos and PAHs. If elevated concentration is identified, remediation will be undertaken to remove the contaminated material or lower the concentration of contaminants to a suitable level (i.e. below GAC).
Remediation strategy which may include localised excavation of contaminated material and replacement with clean fill/capping material or hardstanding.
Gas protection measures (if required) will be incorporated into the design of the proposed development to protect the building structures and human health (future end users).
Risk Assessments and Method Statements (RAMS) will be prepared. Construction/ground workers should take cognisance of the contamination reported and will be required to work in accordance with the RAMS.

**Noise**
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 19.

**Ecology:**
Safeguarding of identified important trees, including their root systems, from disturbance or loss.
Erection of forest lodges on elevated support structures where required to minimise the need for the development of building foundations within woodland areas;
Siting and design of forest lodges to be informed by detailed tree surveys of the site, to be undertaken in accordance with relevant British Standards. This siting and design process should:
- Maintain the integrity of the existing forest habitat network;
- Target existing open areas where possible by using the completed survey to locate existing glades;
- Ensure the retention of desirable, native species trees is achieved by maximising the use of glades for lodge positions and by targeting specific survey of trees which surround the chosen areas (to be identified through aforementioned surveys);
- Use baseline habitat and future targeted tree survey to mitigate any predicted tree loss and disturbance impacts; and,
- Target opportunities to remove invasive species through construction activities;
  o Commitment to the provision of appropriate compensatory planting to offset the loss of trees in building footprint and working areas within existing woodland (the details of which are considered below and treated as further mitigation and enhancement).
  o Manage extents of invasive species such as rosebay willowherb, Japanese knotweed and bamboo in particular on the Woodbank site.
  o Development of path and minor route networks using low impact technology to protect tree roots, soils and surrounding vegetation.
  o Manage existing woodland to improve its age profile, encourage continued biodiversity and preserve its presence in the landscape;
  o Boost ecology and ground flora within woodland by thinning out trees, consequently allowing more sunlight to reach the woodland floor. Management of none native species;
  o A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequency of potential collisions
  o Boundary features and fences would be designed to allow roe deer and badgers to move freely where appropriate;

- **Hydrology:**
  o No buildings within the functional floodplain and finished floor levels of buildings adjacent to the water bodies to be above the 1 in 200yr + climate change peak flood level;
  o Avoid crossings of existing watercourse to prevent pollution;
  o Development within a 5m strip along waterfronts will be subject to specific consideration with a CEMP;
  o The surface water drainage scheme for the proposed development will be designed in accordance with Sustainable Drainage Systems (SuDS) principles and such that the maximum discharge rate will be equivalent to the greenfield (i.e. pre-development) runoff rate.

**Operational Phase**

- **Landscape:**
  o 12m buffer (i.e. no operational activities) around the site boundary with Drumkinnon Gate;
  o Screening increased around the boundary between woodland and residential area where existing screening is limited, using evergreen native shrubs which are in-keeping with the surroundings, ensuring a decrease impact for the residents;
  o Lower density of lodges to be located within the ‘Plantation origin’ of Drumkinnon woodland;
  o Existing fenced substations and unsightly utilities to be screened and incorporated within the woodland setting;
o Proposed car parking to be sensitively incorporated into the woodland. Surface materials to be in keeping with the location and context. Additional mitigation measures such as buffer planting to provide natural screening to new car parking;

o Retain and upgrade existing pathways, enhance with new porous surfacing. Widen and locally regrade to allow for buggies, cycles and emergency access;

o New woodland planting to be created on the Woodbank plot, immersing proposed residential plots in order to reduce and mitigate any visual impact. Whilst acknowledging the need to retain the open views towards the facade of Woodbank House;

o Retention of Woodbank House listed building facade as a landmark feature;

o Continued public access to Drumkinnon Bay waterfront;

o Continued provision of access through the site to existing receptors and land uses as identified in Chapter 2: Site and Surrounding Area;

o Safeguarding of identified important trees within existing woodland areas, as identified on the Figure 3.1 - Parameters Plan in Appendix 3.1;

o No structures or buildings within woodland areas to exceed the height of the tree canopy;

o Integration of Station Square zone with Balloch Street Design Project proposals and Sweeney Cruises;

o Elevated sections of monorail to have sufficient clearance above roads and paths to allow for passage underneath; and

o Access to all key nodes and routes will be maintained during operation with the quality of some routes enhanced. Some permanent localised diversions may be required: however, this will be limited to using other land within the applicants control in order to avoid lengthy or circuitous alterations.

- **Heritage:**
  - Retention of Woodbank House listed building facade as landmark feature.

- **Monorail:**
  - Elevated sections of monorail to have sufficient clearance above roads and paths to allow for passage underneath.

- **Socio-economics, Tourism, Recreation and Access:**
  - Employment of locally resident workers and delivery of training (e.g. apprenticeships) where possible.
  - Access to all key nodes and routes will be maintained during operation with the quality of some routes enhanced. Some permanent localised diversion may be required however this will again be limited to using other land within the applicant control in order to avoid lengthy or circuitous alterations;

  - Continued public access to Drumkinnon Bay waterfront and public beach areas at Balloch Pierhead;

  - Development and implementation of Travel Plan (to encourage sustainable travel to/from site by visitors and workers); and

  - Continued provision of access through the site to existing receptors and land uses as identified in Table 2.1 in Chapter 2 (Site & Surrounding Area).

  - Elevated sections of monorail to have sufficient clearance above roads and paths to allow for passage underneath.

- **Pipeline:**
  - No ground development within 3m stand-off zone each side of INEOS pipelines, unless agreed with INEOS.
Ecology

- Commitment to implement a woodland management plan to enhance the quality and composition of existing woodland within the site, particularly of the ancient woodland and those presenting semi-natural characteristics. The details of this plan will be informed by the EIA and relevant design considerations.
- Ongoing management of existing and newly created woodland to improve its age profile, encourage continued biodiversity and preserve its presence in the landscape;
- Ongoing management and survey of invasive species such as Rosebay Willow herb, Japanese Knotweed and Bamboo in particular on the Woodbank site;

Hydrology:

- The proposed surface water and SuDS scheme (see Section 11.6) will require regular maintenance during its operational life. This maintenance will include the regular debris clearing and cutting of grass of surface SuDS 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

Traffic & Transport

- It is intended that the proposed development will be fully accessible by sustainable modes of transport. The existing pedestrian and cycle network as it exists through the West Riverside site will be retained and enhanced as necessary to provide full connectivity to the wider network as well as all new internal elements of the site. The site will benefit from increased uptake of sustainable modes over the use of the private car, and it is anticipated that walking and cycling will be the go-to-mode of choice for those visitors using the woodland lodges and overnight accommodation: by leaving their cars remote from the lodges, it is hoped this will reduce any unnecessary internal car trips;
- Bike hire is proposed as part of the Station Square and enhanced Tourist Information Office offering, which will further support internal movements by bike;
- Whilst the internal layout requires to be developed further as part of subsequent detailed design stages, it is intended that the existing cycle and walking routes will be widened to SUSTRANS standards for shared walking and cycling routes, where this is practicable to do so;
- Throughout the Station Square, Riverfront and Drumkinnon areas, the existing path network including the John Muir Way will be retained and enhanced as appropriate, albeit some relocating of certain sections may be required. It is expected that discussions will be held with SUSTRANS when the detail of these routes is considered. The existing north-south foot and cycle paths through the Riverfront Zone, will be enhanced with a series of east-west paths increasing access opportunities between Pier Road and the Riverfront area;
- The existing foot and cycle way from Loch Lomond Shores to Old Luss Road will be extended to provide a shared foot and cycle way, compliant with technical standards, on the north (development) side of the road, providing a direct walking and cycling link between the two sites;
- From the Woodbank House site, which is intended to be configured in accordance with Designing Streets Principles and will provide a continuous internal path network, a direct foot and cycle link will be provided to the Upper Stoneymollan Road/ John Muir Way; and
- A signage and wayfinding strategy will be developed for the wider site, once clarification on the preferred parking locations for site-based activities and land uses are confirmed. It is expected that a combination of enhanced signage and Variable Message Signing (VMS) will need to be installed at key approaches to the site from both the strategic and local road network, as well as internally within the site, to ensure effective vehicular movement for internal destinations and appropriate directions to the relevant car parking areas.

Cumulative Development:
Integration of the proposed development, in particular the proposed Station Square zone, with Balloch Street Design Project proposals (this is identified as a cumulative development per Section 2.4).

3.8.3 The embedded mitigation measures of relevance to each technical assessment are listed in Subsection 6 – Embedded Mitigation and have been taken account of within the assessments presented in subsection 7 – Potential Effects of chapters 6 - 15.

Further Mitigation and Enhancement

3.8.4 Further specific mitigation has also been identified where necessary through the EIA process to prevent, avoid, minimise or offset significant adverse effects and to further enhance the environmental performance or wider benefits of the proposed development. This ‘further mitigation and enhancement’ is identified in Subsection 8 – Further Mitigation and Enhancement of Chapters 6 – 14.

3.8.5 Embedded mitigation described above and the further mitigation measures proposed in connection with the proposed development summarised in Chapter 14 – Schedule of Mitigation and Monitoring. This will enable LLTNP to easily secure this mitigation in any PPiP granted for the proposed development.

3.9 Consideration of Alternatives

3.9.1 Paragraph 4 of Part II of Schedule 4 of the EIA Regulations requires an ES to include an outline of the main alternatives considered by the applicant, indicating the main reasons for the choice made, taking into account the environmental effects.

3.9.2 Although the EIA Regulations do not expressly require the applicant to study alternatives, the nature of certain developments and their location may make the consideration of alternative sites a material consideration. In such cases, the ES must record this consideration of alternative sites. More generally, consideration of alternatives (including alternative sites, choice of process, and the phasing of construction) is widely regarded as good practice, and resulting in a more robust application for planning permission. Ideally, EIA should start at the stage of site and process selection, so that the environmental merits of practicable alternatives can be properly considered. Where this is undertaken, the main alternatives considered must be outlined in the ES.

3.9.3 For the purposes of this EIA, the only alternatives considered in relation to the proposed development were:

- Different possible formulations of proposed land use zones across the site. The proposed configuration of land use zones has been arrived at following detailed analysis of multiple on-site constraints, including the need to safeguard INEOS pipeline infrastructure and to minimise disturbance to woodland. As reported in Chapter 6 – Ecology and Woodland a glade survey has been undertaken to determine the feasibility of installing lodges within pockets of Drumkinnon Woodland without resulting in significant disturbance to or the substantial loss of trees. The proposed configuration of land use zones is considered to be optimal in terms of safeguarding environmental and infrastructure constraints whilst enabling the development of a commercially viable tourism and leisure development; and

- The potential inclusion of a 100m viewing tower. This was dropped from the proposed development in order to take account of feedback received from local communities through statutory pre-application consultation (PAC) activities, as detailed within the West Riverside and Woodbank House PAC Report.
4 Assessment Methods

4.1 Introduction

4.1.1 This chapter describes the process by which the EIA was carried out. It includes a discussion of the relevant EIA Regulations, the EIA process, consultations, and the assessment method adopted.

4.2 Overview of EIA

4.2.1 EIA is a systematic procedure that must be followed when determining applications seeking consent for certain categories of project (see Section 4.3). It aims to identify a project’s likely significant environmental effects, identify mitigation measures to reduce the level of or avoid those effects, and assess the residual significance of predicted environmental effects taking account of all proposed mitigation and enhancement measures. This process helps to ensure that predicted significance effects, and the scope for reducing them, are properly understood by the public and the relevant authority (Loch Lomond & The Trossachs National Park Authority) before determining an application for a development proposal.


4.2.3 An important tenet of EIA is that it is a process culminating in the submission and examination of an ES, rather than merely a single output in the form of the ES. EIA therefore has a number of key characteristics; it is:

- **Systematic**, comprising a sequence of tasks defined both by regulation and best practice;
- **Analytical**, requiring the application of specialist knowledge and skills from environmental sciences and policy;
- **Impartial**, its objectives being to inform decision making and improve the environmental performance of projects rather than being to promote them;
- **Consultative**, with provision being made for obtaining information and feedback from interested stakeholders and relevant consultees; and
- **Iterative**, allowing opportunities for environmental concerns to be addressed during the planning and design of a project.

4.2.4 Typically, an iterative design process occurs in response to environmental constraints (identified during the EIA process) and other design objectives, taking account of project viability considerations and feedback from relevant consultees. This often results in a development proposal incorporating mitigation measures or design features to avoid, reduce or compensate for potential adverse effects, referred to as embedded mitigation. Additional mitigation is then identified where necessary to reduce or avoid residual significant environmental effects.

4.3 Statutory Provisions

4.3.1 The planning application submitted for the proposed development stands to be determined under the provisions of the Town and Country Planning (Scotland) Act 1997 as amended. Statutory EIA requirements for certain planning applications are set out within the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 as amended, which remain applicable in cases where an EIA scoping request was submitted in respect of a development proposal prior to 16th May 2017. This is the case for this PPiP application for the proposed development, meaning that the Town and Country Planning (Scotland) Environmental Impact Assessment (Scotland) Regulations 2011 as amended (hereafter ‘the EIA Regulations’) are applicable to this EIA.
4.4 EIA Screening and Scoping

4.4.1 The site extends to some 33.5ha, and therefore exceeds the thresholds identified for EIA screening under Classes 10 or 12 of Schedule 2 of the EIA Regulations. Furthermore, the site is located within the boundaries of Loch Lomond and the Trossachs National Park (LLTNPA). Within the meaning assigned to it by the EIA Regulations, it is a ‘Sensitive Area’:

“sensitive area” means any of the following: —

(g) an area designated as a National Park by a designation order made by the Scottish Ministers under section 6(1) of the National Parks (Scotland) Act 2000(f).

4.4.2 In recognition of the environmental sensitivities affecting the site and surrounding area, the Applicant considered from the outset that a formal EIA would be likely to be required to support any planning application submitted for the proposed development. To confirm this and to obtain clarity on the required scope of the EIA, a formal EIA screening and scoping report (PBA, March 2017) was submitted to the Loch Lomond and the Trossachs National Park Authority (LLTNPA) in their role as the relevant local planning authority.

4.4.3 Subsequently, LLTNPA provided a positive EIA Screening Opinion in April 2017 which confirmed that a formal EIA would be required on account of likely significant effects from the proposed development. After consulting relevant stakeholders an EIA Scoping Opinion was then issued by LLTNPA on 11th May 2017 to define the required scope of this EIA; this is provided in full within Appendix 4.1.

4.5 Information Requirements and Guidance

Information Requirements

4.5.1 Schedule 4 of the EIA Regulations prescribe the information which must be included within an ES. The information requirements specified in Part 2 of Schedule 4 must be addressed in all ES, whilst the requirements specified in Part 1 must also be addressed to the extent “reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile”.

4.5.2 Schedule 4 of the EIA Regulations therefore require this ES to include descriptions of:

- Relevant environmental baseline characteristics. Each of the technical assessments presented in chapters 6 – 14 include Baseline sections to meet this requirement;
- Physical characteristics of the whole development, which in this case means identifying the key characteristics of the construction and operational phases of the proposed development (refer to Chapter 3 – The Proposed Development);
- Consideration of the reasonable alternatives studied by the developer (refer to Chapter 3 – The Proposed Development);
- The main characteristics of the production or operational phase, including natural resource usage (refer to Chapter 3 – The Proposed Development);
- An estimate of expected residues and emissions (refer to Chapter 3 – The Proposed Development);
- The assessment methodologies deployed in undertaking this EIA (refer to the technical assessment methodologies provided in Subsection 3 within chapters 6 – 14);
- Likely significant effects from the proposed development (refer to the assessments presented in Subsection 7 – Potential Effects, Subsection 9 – Residual Effects and Subsection 10 – Cumulative Assessment within the technical assessments presented in chapters 6 – 14);
- Mitigation measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment (refer to Section 3.8 – Proposed Mitigation and Enhancement, Subsection 6 – Embedded Mitigation and Subsection 8 – Further
Mitigation and Enhancement within the technical assessments presented in chapters 6 – 14, and Chapter 16 – Schedule of Mitigation and Monitoring):

- Any proposed monitoring arrangements in relation to any predicted significant adverse effects (refer to Chapter 16 – Schedule of Mitigation and Monitoring);
- A non-technical summary of all of the above elements (refer to the standalone West Riverside and Woodbank House Environmental Statement Non-Technical Summary); and
- A reference list detailing the sources used in the assessments (refer to the reference lists provided at the end of each technical assessment presented in chapters 6 – 14).

EIA Guidance

4.5.3 A range of reference material and guidance has been drawn upon in developing the EIA methodology adopted for the proposed development. Over and above the EIA Regulations, this guidance includes:

- Morris, P and Therivel, R. (2009) Methods of Environmental Impact Assessment; and

4.5.4 Topic specific guidance used in the preparation of the individual technical assessments presented in this ES is noted where relevant in Subsection 2 of chapters 6 – 14.

4.6 The EIA Process

4.6.1 The EIA Regulations emphasise that EIA is a process rather than output and involves the following stages:

- **Assessment work** culminating in the preparation of an ES in accordance with information requirements prescribed by the EIA Regulations;
- **Public consultation on the application for planning permission, the ES and any other relevant information.** Consultation may be iterative rather than only occurring once in the EIA process;
- **Examination** by the relevant authority of the information presented in the ES and other relevant information including that received through the consultation; and
- The authority coming to a reasoned conclusion on the residual significant effects of the proposed development on the environment, prior to the determination of any related consenting application.

4.6.2 The EIA process therefore encompasses all stages of considering environmental issues associated with projects, from initial identification of relevant issues through to assessing the residual significance of predicted environmental effects and securing required mitigation. This ensures that all required mitigation is subsequently carried out in the implementation of projects. EIA therefore directly influences the design, construction, operation and, where relevant, decommissioning, of proposed projects, as well as providing information to decision makers.
4.7 EIA Methodology

Overview

4.7.1 Following the identification of the scope of the EIA in accordance with Appendix 4.1 – West Riverside and Woodbank House EIA Scoping Opinion, each environmental topic has been subject to investigation and assessment to identify and evaluate likely significant environmental effects. The survey and assessment methodologies deployed were based on recognised best practice and guidance relevant to each topic area, details of which are provided within relevant technical assessment ES chapters (Chapters 6 – 14). In general terms, the technical assessments undertaken for each topic area and ES chapter include:

- Collation of existing baseline information regarding relevant aspects of the environment, together with surveys and fieldwork, as required, to fill any knowledge gaps or update historical information;
- Use of the collated baseline to identify relevant trends, describe the baseline scenario and predict the evolution of this baseline scenario in the absence of the proposed development;
- Consultation with relevant consultees in relation to the EIA scope and emerging findings;
- Consideration of the potential effects of the proposed development on the baseline scenario (and its predicted evolution), followed by the identification of design changes, mitigation measures to avoid or reduce predicted significant adverse effects, and possible enhancement measures to improve environmental outcomes;
- Assessment of the significance of predicted residual effects from the proposed development and consideration of any monitoring required in relation to predicted residual significant adverse effects;
- Production of ES chapter; and
- Input into a consolidated schedule of required mitigation measures and proposed monitoring arrangements for the proposed development.

4.7.2 The detailed methodology adopted to undertake each individual technical assessment is presented in Subsection 3 – Methodology within chapters 6 – 14.

Key Methodological Assumptions

4.7.3 The following key assumptions have been used to ensure that the EIA reported in this ES has undertaken a proportionate assessment of the level and significance of likely effects from the proposed development:

- The EIA including the preparation of this ES has been undertaken in full accordance with the EIA Regulations;
- The proposed development will be built out in accordance with Figure 3.1 – Parameters Plan. All other drawings submitted as part of this ES or the wider PPiP are for illustrative purposes only, as the detailed siting and design of the proposed development required to be confirmed after PPiP is granted;
- Construction will be completed by 2020, with visitor accommodation and attractions scheduled to open in that year;
- Baseline conditions are generally considered to be current conditions at the site and surrounding area, unless materially affected by the approved developments noted in Section 2.4. The potential for cumulative effects as a result of the construction and operation of the approved developments has been considered;
- In accordance with the EIA Regulations, an assessment of likely effects (including cumulative effects) from the proposed development has been carried out in order to identify, describe and assess any significant effects. As such, the assessment only considers possible effects which have some potential to be significant within the context of the EIA Regulations. Other possible effects which have no potential to be significant in EIA terms have necessarily been scoped out of this EIA;
The assessment of likely significant cumulative effects has assumed that the cumulative developments identified in Section 2.4 will be built out as set out in the planning applications, planning permissions and associated documents available in the public domain for these developments; and

- Suitable planning conditions and planning obligations will be attached to any planning permission granted for the proposed development to secure relevant mitigation measures proposed in this ES (refer to Chapter 16 – Schedule of Mitigation and Monitoring).

Consultation

4.7.4 In addition to formally requesting LLTNPA to adopt an EIA Scoping Opinion in respect of the proposed development, additional consultation has been undertaken to provide information, discuss assessment methods and findings, and to agree mitigation measures and design responses. Consultation has been undertaken with stakeholders including (NB this is not an exhaustive list):

- LLTNPA Access Officer;
- West Dunbartonshire Council Roads Department;
- Transport Scotland;
- Abellio Scotrail;
- Historic Environment Scotland;
- Scottish Water; and
- Scottish Environment Protection Agency.

4.7.5 A programme of community engagement has also been undertaken, as detailed within the statutory Pre-Application Consultation Report which is submitted in support of the PPiP application for the proposed development.

Establishing Baseline Conditions

4.7.6 A range of site surveys and data collection exercises have been used to identify environmental conditions at the site and the surrounding area. The surveys undertaken are reported in each of the topic chapters. Data has also been collated regarding relevant approved cumulative developments which need to be considered in this EIA (see Section 2.4).

4.7.7 The EIA has been based on technical surveys and assessments, the reporting of which is frequently too detailed and lengthy for incorporation into Volume 1 of this ES (e.g. ecology surveys). In such instances the technical survey and assessment reports are provided in full as an appendix to this ES (Volume 2), with a relevant summary and the reference for the full survey or assessment provided in the ES. The geographical scope of these appended surveys and assessments has been based on the likelihood for significant effects in accordance with the EIA scope summarised above.

Types of Effect

4.7.8 Schedule 4 to the EIA Regulations requires consideration of a variety of types of effect, namely direct / indirect, secondary, cumulative, positive / negative, short / medium / long-term, and permanent / temporary. All identified effects need to be considered in terms of how they are predicted to arise, whether they are positive (beneficial) or negative (adverse), their temporal occurrence (i.e. when they are predicted to occur) and their duration once the effect does occur. This includes consideration of effects during both the construction and operational phases of the proposed development.

4.7.9 The ES must also consider the potential for effects identified through one topic specific technical assessment to generate secondary or otherwise related effects of relevance to other environmental topics. At the outset of this EIA it was recognised that predicted traffic movements (from the proposed development, existing development and approved cumulative developments) would need to be taken account of in the Noise and Air Quality technical
assessments as well as the Transport ES Chapter. Traffic data calculated to inform the West Riverside and Woodbank House Transport Assessment submitted separately in support of the PPIp application for the proposed development has therefore been used to inform the transport and access, noise and air quality assessments presented in relevant chapters of this ES.

4.7.10 The spatial scope for the identification of likely significant environmental effects varies between environmental topic areas and a relevant Study Area is therefore defined within each technical assessment ES chapter (chapters 6 – 14). In general terms, this spatial scope depends on the location of relevant receptors and the existence of known pathways for effects from the proposed development to the identified receptors. Where it was considered necessary, a Study Area map is included within the Appendix to the relevant technical assessment chapter.

Uncertainty

4.7.11 The prediction of future effects inevitably involves a degree of uncertainty. Where necessary, the technical assessments presented in chapters 6 - 14 describe the principal factors giving rise to uncertainty in the prediction of effects and the degree of the uncertainty.

4.7.12 Confidence in the assessments presented in this ES can be derived from the application of robust topic specific assessment methodologies, which have been developed and implemented in accordance with relevant technical guidance and standards (e.g. those detailed within Design Manual for Roads and Bridges, the Guidelines for Ecological Impact Assessment in the UK and British Standard Institute publications). Where the success of a mitigation measure is uncertain, the extent of the uncertainty has been identified in the ES and a suitable response identified.

Mitigation and Enhancement Measures

4.7.13 The technical assessments presented in chapters 6 – 14 of this ES firstly identify predicted effects from the proposed development taking into account embedded mitigation measures, before identifying any required further mitigation and then reporting predicted residual effects.

4.7.14 The EIA Regulations require ES to include a description of “measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment”. Subsection 8 within each technical assessment presented in chapters 6 - 14 therefore consider the need for additional mitigation measures (beyond embedded mitigation features) to avoid significant adverse effects which are otherwise predicted to occur. Consideration is also given to potential measures in order to reduce predicted ‘not significant’ adverse effects and to enhance predicted beneficial effects from the proposed development where appropriate.

4.7.15 A schedule of all proposed mitigation measures is provided in Chapter 16 – Schedule of Mitigation and Monitoring. This schedule is provided to assist the planning authority in securing all required mitigation measures and any proposed monitoring within the decision notice of any PPIp granted for the proposed development.

The Significance of Likely Residual Effects

4.7.16 Residual effects are the environmental effects that will remain after the incorporation of both embedded and additional mitigation measures. It is these residual effects which should be considered when assessing the significance of the proposed development, rather than the unmitigated effects as unmitigated effects will not occur. For example, whilst the proposed development may affect protected species, appropriate mitigation has been identified to ensure that significant effects on such species do not occur.

4.7.17 To provide an objective assessment of residual effects, their significance has been determined and is identified in the ES, as detailed below. This allows for comparison of effects between topics, strengthens the assessment of impact interactions and allows decision makers to more easily examine and make a reasoned conclusion on the significant environmental effects of a project.

4.7.18 The two principal criteria for determining significance of an environmental effect are the magnitude of change and the sensitivity of an identified receptor to this change. The likelihood
of the change occurring is also considered, as a constituent factor affecting the predicted magnitude of change.

4.7.19 The approach to assigning significance to predicted environmental effects is not itself detailed within the EIA Regulations, meaning that it is necessary to develop effect significance thresholds to underpin the assessments reported in this ES. These thresholds are defined on a topic specific basis within chapters 6 – 14, taking account of relevant regulations, guidance, standards, the advice and views of consultees, and expert judgement. Subsection 3 – Methodology within each of these chapters explains the topic specific methodology adopted to identify the level and associated significance of predicted effects with reference to relevant thresholds. Where relevant, this is based on the factors identified above and the generic criteria set out in Table 4.1 below.

Table 4.1 Generic Significance Criteria

<table>
<thead>
<tr>
<th>Level of Effect</th>
<th>Criteria</th>
</tr>
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<tbody>
<tr>
<td>Substantial</td>
<td>These effects are assigned this level of significance as they represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites and features of national or regional importance. A change at a district scale site or feature may also enter this category.</td>
</tr>
<tr>
<td>Major</td>
<td>These effects are likely to be important considerations at a local or district scale and may become key factors in the decision-making process.</td>
</tr>
<tr>
<td>Moderate</td>
<td>These effects, while important at a local scale, are not anticipated to be key decision-making issues.</td>
</tr>
<tr>
<td>Minor</td>
<td>These effects may be raised as local issues but are unlikely to be of importance in the decision-making process.</td>
</tr>
<tr>
<td>Negligible or No Effect</td>
<td>Either no effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error. Such effects should not be considered by the decision-maker.</td>
</tr>
</tbody>
</table>

4.7.20 Effects that are described as ‘substantial’, ‘major’ or ‘moderate’ are determined to be significant, whereas effects that are described as ‘minor’ or ‘negligible’ are determined to be not significant.

4.8 Impact Interactions

4.8.1 Chapter 15 – Impact Interactions provides the assessment of impact interactions, i.e. receptors being affected by more than one environmental effect and therefore potentially being subject to a more significant combined effect than reported within the individual technical, assessment ES chapters (i.e. chapters 6 – 14). Details of the approach to identifying and assessing impact interactions is provided within Chapter 15.

4.9 Approach to Cumulative Impact Assessment

4.9.1 The EIA Regulations require likely significant cumulative effects from a development proposal in combination with existing and approved development to be described within an ES.

4.9.2 Existing developments are considered as part of the baseline scenario within the technical assessments provided in chapters 6 – 14 of this ES, whilst approved developments are considered separately within the cumulative impact assessment section of each technical assessment ES chapter. Approved developments of relevance to this ES are listed in Section 2, 4 and shown on Figure 2.2 - Cumulative Development Location Plan provided in Appendix 2.1.
5 Legislative and Planning Policy Context

5.1 Introduction

5.1.1 This chapter sets out the key planning legislation, policies and other material considerations applicable to the proposed development which have informed the siting, design and environmental assessment processes. Consideration is given to the following matters in turn:

- Relevant Statutory Provisions;
- The statutory Development Plan applicable to the site; and
- Other material considerations, including the National Park Plan, local planning guidance and relevant national policies, advice and guidance.

5.1.2 The purpose of this chapter is to identify all legislative and policy requirements and considerations relevant to the technical assessments provided in Chapters 6 – 15 of this ES. Appropriate cross-references are provided within Subsection 2 of each technical assessment chapter to confirm which legislation and policies are applicable to the assessment.

5.1.3 This chapter is factual in nature and does not assess the proposed development’s accordance with relevant planning policies. A separate Planning Statement explains the rationale for the proposed development and assess in detail how it accords with relevant Development Plan policies and other material considerations.

5.2 Relevant Statutory Provisions

5.2.1 The key planning legislation of relevance to this ES and the overall EIA process is:

- The Town and Country Planning (Scotland) Act 1997 as amended (‘the Principal Act’);
- The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 as amended;
- The National Parks (Scotland) Act 2000 as amended;
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 as amended (‘the EIA Regulations’);
- The Climate Change (Scotland) Act 2009; and

5.2.2 Under section 25 of the Principal Act, the determination of all planning applications must be made in accordance with the statutory Development Plan applicable to the site of a proposed development, unless material considerations indicate otherwise. Section 264A of the Principal Act also requires special attention to be paid to the applicable National Park Plan. Section 59 of the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 as amended requires planning authorities to have “special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses”.

5.2.3 Section 1 of the National Parks (Scotland) Act 2000 as amended identifies the four aims of Scotland’s National Parks including Loch Lomond and the Trossachs National Park (LLTNP), namely:

- “(a) to conserve and enhance the natural and cultural heritage of the area;
- (b) to promote sustainable use of the natural resources of the area;
- (c) to promote understanding and enjoyment (including enjoyment in the form of recreation) of the special qualities of the area by the public; and
- (d) to promote sustainable economic and social development of the area’s communities”.

5.2.4 These National Park aims are material planning considerations. Section 9 of the same Act states that the aims should be achieved collectively. However, if in relation to any matter it appears to the National Park Authority that there is a conflict between the first aim, and the other National
Park aims, greater weight must be given to the conservation and enhancement of the natural and cultural heritage of the area.

5.2.5 Section 44 of the Climate Change (Scotland) Act 2009 requires all Scottish public bodies to “act in the way best calculated to” contribute to the delivery of Scotland’s greenhouse gas (GHG) emissions reduction targets and climate change adaptation programmes, as well as “in a way that it considers most sustainable”. These public body duties are relevant insofar as the Applicant (which includes Scottish Enterprise), a major landowner within the site (Scottish Enterprise) and Planning Authority (LLTNP) are Scottish public authorities.

5.2.6 The relevance and implications of the EIA Regulations for this ES are detailed separately in Chapter 3 – Assessment Methods.

5.2.7 It should be noted that the technical assessments presented in chapters 6 – 14 have also been prepared in accordance with a wide range of topic specific legislation, non-planning policies, technical guidance and standards, as detailed within a dedicated section of each chapter (Subsection 2).

5.3 Development Plan

Overview

5.3.1 The current statutory Development Plan applicable to the site of the proposed development comprises the Loch Lomond and the Trossachs Local Development Plan 2017 – 2021 (‘the LDP’), which was adopted by LLTNPA in December 2016, and associated adopted Supplementary Guidance.

Loch Lomond and the Trossachs Local Development Plan 2017 – 2021

5.3.2 The LDP is split into four distinct sections (and appendices), of which Sections 2 – Vision, Section 3 – Place and Section 4 - Policies are of relevance.

Section 2 – Vision

5.3.3 The LDP’s vision is focused around conservation, visitor experience and rural development. Of relevance to the proposed development, it calls for "a high quality, authentic experience for visitors, with many opportunities to appreciate and enjoy the natural and cultural heritage within an internationally renowned landscape that compares to the best on offer around the world". The LDP’s Development Strategy Map (page 17) identifies Balloch as one of eight locations for "Strategic Tourism Opportunities", reflecting its role as a visitor destination and gateway to the National Park.

Section 3 – Place

5.3.4 This section sets out a spatial strategy for the LLTNPA area, including land use allocations for each defined settlement. The following land use allocations in Balloch are of relevance:

- Balloch VE1: West Riverside – allocated for visitor experience related uses (as defined in approved Visitor Experience Planning Guidance – see Section 5.4 below). This allocation covers the eastern part of the site;
- Balloch VE4: Woodbank House – allocated for visitor experience related uses. This allocation covers Woodbank House and attendant grounds within the site; and
- Balloch MU1: The Old Station – allocated for mixed use (visitor experience and transport) uses. This allocation is located immediately south east of the site.

5.3.5 No details are provided in Section 3 regarding development requirements or design principles for these LDP site allocations.

Section 4 - Policies

5.3.6 This section of the LDP sets out three overarching policies which apply to all development proposals, followed by a suite of subject specific policies. The LDP policy of most relevance is Visitor Experience Policy 1, which at criterion (a) provides support for proposals forming a
strategic tourism opportunity within Balloch. The other criterion within this policy relate to small-scale proposals and are not relevant to the proposed development.

5.3.7 Other policies within the adopted LDP of relevance to the proposed development are outlined in Table 5.1. Particular attention is given to Overarching Policies 1 – Strategic Principles and 2 – Development Requirements as these set the framework within which all environmental and wider planning issues will be assessed through individual subject policies.
Table 5.1 Other Relevant Policies within the Loch Lomond and the Trossachs LDP (2016)

<table>
<thead>
<tr>
<th>LDP Policy Title</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overarching Policy 1 - Strategic Principles</td>
<td>Sets out principles linking the LDP with the Scottish Planning Policy (SPP, 2014 – see Section 5.4 below). All proposals should demonstrate their accordance with relevant principles, including:</td>
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<td></td>
<td>• Collective achievement of the four statutory National Park aims (see Section 5.2 above) and implementation of the National Park Partnership Plan;</td>
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<td></td>
<td>• Contributing to sustainable development and climate change mitigation, including through sustainable design;</td>
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<td></td>
<td>• Prioritising the reuse of brownfield and vacant land;</td>
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<td>• Prioritising place making, including in street design;</td>
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<td>• Increasing connectivity, especially to public transport and key destinations, and providing safe access;</td>
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<td>• Open space provision that is “high quality, appropriate to the needs of the local community, integrated to the development and provide links to the wider green network”;</td>
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<td></td>
<td>• “Minimising adverse impacts on water, air and soil quality”;</td>
</tr>
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<td></td>
<td>• “Addressing climate change impacts”;</td>
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<td></td>
<td>• “Avoiding significant flood risk”;}</td>
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<td></td>
<td>• “Relating well to the landscape context and setting”, including in terms of cultural heritage and local built form”; and</td>
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<td></td>
<td>• “Incorporating appropriate soft and hard landscaping, a planting scheme, and measures to protect existing trees and other landscape features”.</td>
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<tr>
<td>Overarching Policy 2 - Development Requirements</td>
<td>Provides high level design and environmental assessment criteria to assess all proposals, including the following of relevance to the PPIP application for the proposed development:</td>
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<td></td>
<td>• “Safeguard visual amenity and important views, protect and/or enhance rich landscape character, and features and areas specifically designated for their landscape values at any level;</td>
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<td></td>
<td>• avoid any significant adverse impacts of: flooding, noise/vibration, air emissions/odour/fumes/dust, light pollution, loss of privacy/sunlight/daylight;</td>
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<tr>
<td>LDP Policy Title</td>
<td>Summary</td>
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<tr>
<td>• protect and/or enhance the character, appearance and setting of the historic</td>
<td>• protect and/or enhance the biodiversity, geodiversity, water environment, sites and species designated at any level…including ancient and semi-natural woodland, green infrastructure and habitat networks;</td>
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<tr>
<td>environment;</td>
<td>• support Active Travel choices where possible…and transport infrastructure;</td>
</tr>
<tr>
<td>• protect and/or enhance the biodiversity, geodiversity, water environment,</td>
<td>• provide safe road access and appropriate parking provision;</td>
</tr>
<tr>
<td>sites and species designated at any level…including ancient and semi-natural</td>
<td>• promote understanding and enjoyment (including recreation) of the special qualities of the area by the public including safeguarding access rights;</td>
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<tr>
<td>woodland, green infrastructure and habitat networks;</td>
<td>• achieve a high quality design and layout, provide a positive sense of place, and compliment local distinctiveness; and</td>
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<tr>
<td>• support Active Travel choices where possible…and transport infrastructure;</td>
<td>• adaptable for the changing needs of future users, designing for extreme weather, fulfil disabled requirements, support new businesses, training/jobs for local people and a mix of uses/tenures…”.</td>
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<tr>
<td>• provide safe road access and appropriate parking provision;</td>
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<td>• promote understanding and enjoyment (including recreation) of the special</td>
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<td>qualities of the area by the public including safeguarding access rights;</td>
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<tr>
<td>• achieve a high quality design and layout, provide a positive sense of place,</td>
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<td>and compliment local distinctiveness; and</td>
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<td>• adaptable for the changing needs of future users, designing for extreme</td>
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<td>weather, fulfil disabled requirements, support new businesses, training/jobs for</td>
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<td>local people and a mix of uses/tenures…”.</td>
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<tr>
<td>Overarching Policy 3 - Developer Contributions</td>
<td>Sets out the circumstances in which development contributions will be sought in respect of proposals, including for infrastructure upgrades required to make the proposal acceptable in planning terms.</td>
</tr>
<tr>
<td>Visitor Experience Policy 2 - Delivering a World Class Visitor Experience</td>
<td>Requires tourism development proposals to enhance the visitor experience of the National Park.</td>
</tr>
<tr>
<td>Transport Policy 2 - Promoting Sustainable Travel and Improved Active Travel</td>
<td>Sets out criteria requiring proposals to contribute positively to “encouraging safe, sustainable travel and improving active travel options” throughout the National Park.</td>
</tr>
<tr>
<td>Options</td>
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</tr>
<tr>
<td>Transport Policy 3 - Impact Assessment and Design Standards of New Development</td>
<td>Requires large-scale proposals to be supported by a Transport Statement and Travel Plan, and to implement any identified appropriate mitigation, in order to minimise adverse traffic effects. The policy also sets out design related assessment criteria to ensure that proposals satisfy relevant technical standards and contribute to place making in the National Park.</td>
</tr>
<tr>
<td>LDP Policy Title</td>
<td>Summary</td>
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</tr>
<tr>
<td>Natural Environment Policy 1 - National Park Landscapes, seascape and Visual Impact</td>
<td>Requires proposals to protect the defined Special Qualities (SQ) of the LLTNP. In this regard proposals must “be sympathetic to their setting and minimise visual impact”.</td>
</tr>
<tr>
<td>Natural Environment Policy 2 - European Sites - Special Areas of Conservation (SAC) and Special Protection Areas (SPA)</td>
<td>In line with European legislative requirements, this policy sets out criteria to protect SPAs and SACs from significant adverse effects relating to the integrity and conservation objectives of each designated site.</td>
</tr>
<tr>
<td>Natural Environment Policy 3 - Sites of Special Scientific Interest, National Nature Reserves and RAMSAR Sites</td>
<td>Requires development affecting these nationally designated sites to either result in an overall “enhancement” to the designation, not have an adverse effect on its conservation objectives or integrity, or otherwise demonstrate that “adverse effects on the qualities for which the area has been designated are clearly outweighed by social or economic benefits of national importance”.</td>
</tr>
<tr>
<td>Natural Environment Policy 4 - Legally Protected Species</td>
<td>Affords protection to all legally protected species from adverse effects, unless criteria protecting the conservation status of the species, the absence of alternatives and the demonstration of “public health, public safety or other imperative reasons of overriding public interest, including those of a social or economic nature” are satisfied.</td>
</tr>
<tr>
<td>Natural Environment Policy 5 - Species and Habitats</td>
<td>Sets out criteria to protect habitats and species identified in the National Park Biodiversity Action Plan from unacceptable adverse impacts. Also requires consideration of effects on ecological functions and the continuity and integrity of species and habitats. Compensatory and management measures are required where adverse effects are predicted.</td>
</tr>
<tr>
<td>Natural Environment Policy 6 - Enhancing Biodiversity</td>
<td>Requires proposals to enhance biodiversity by protecting, managing and enhancing natural landscape, wildlife, wildlife habitat, habitat networks and green corridors. The policy also encourages the planting of native species.</td>
</tr>
<tr>
<td>Natural Environment Policy 8 - Development Impacts on Trees and Woodlands</td>
<td>Sets out criteria to protect against the loss or deterioration of loss of ancient or long-established plantation or semi-natural woodland. Development proposals resulting in the loss of woodland which contributes to local amenity, character and/or are of nature conservation value or historic significance will not be</td>
</tr>
<tr>
<td>LDP Policy Title</td>
<td>Summary</td>
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<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Natural Environment Policy 9 - Woodlands on or Adjacent to Development Sites</td>
<td>Requires proposals which may affect trees or woodland to comply with British Standard 5837:2012.</td>
</tr>
<tr>
<td>Natural Environment Policy 11 - Protecting the Water Environment</td>
<td>Requires proposals not to have a significant adverse effect on the water environment.</td>
</tr>
<tr>
<td>Natural Environment Policy 12 - Surface Water and Waste Water Management</td>
<td>Requires proposals to connect to public sewers where available.</td>
</tr>
<tr>
<td>Natural Environment Policy 16 - Land Contamination</td>
<td>Requires proposals on or close to known or suspected contamination to be supported by an appropriate risk assessment.</td>
</tr>
<tr>
<td>Historic Environment Policy 1 - Listed Buildings</td>
<td>Criterion (b) restricts the demolition of listed buildings. Criterion (c) seeks to limit enabling development to the minimum level required and ensure it is sensitively designed.</td>
</tr>
<tr>
<td>Historic Environment Policy 3 - Wider Built Environment and Cultural Heritage</td>
<td>Sets out criteria to protect buildings or feature of architectural and/or historical merit or of cultural significance.</td>
</tr>
<tr>
<td>Historic Environment Policy 4 - Gardens and Designed Landscapes (GDL)</td>
<td>Requires proposals not to adversely impact on GDL character, important views or wider landscape setting.</td>
</tr>
<tr>
<td>LDP Policy Title</td>
<td>Summary</td>
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<td>------------------</td>
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</tr>
</tbody>
</table>
| Historic Environment Policy 5 – Conversion and Re-Use of Redundant Buildings | Requires proposals for the conversion and reuse of “buildings of vernacular quality and local historic and/or architectural interest” to demonstrate the building is structurally sound and that conversion would not involve significant “rebuilding or new building elements”.
| Historic Environment Policy 6 - Scheduled Monuments and Other Nationally Important Archaeological Sites | Sets out criteria to protect these national heritage assets and their setting. |
| Historic Environment Policy 7 – Other Archaeological Resources | Requires development proposals to retain, protect and preserve in-situ and in an appropriate setting any archaeological resources affected by the proposal. |
| Historic Environment Policy 8 – Sites with Unknown Archaeological Potential | Requires development proposals on sites considered to have significant archaeological potential to be supported by an archaeological evaluation of the site, with appropriate archaeological mitigation then implemented. |
| Open Space Policy 2 - Protecting Other Important Open Space | Sets out criteria to protect formal and informal open spaces in public or private ownership. Proposals need to demonstrate that any affected open space “is not of community value and has no other multifunctional purposes such as cultural, historical, biodiversity or local amenity value”. Where open space is affected, alternative provision and alignment with nature conservation management objectives is also required. |
| Waste Management Policy 1 - Waste Management Requirement for new Developments | Requires suitable waste management provision to be incorporated into proposals. |
Adopted Supplementary Guidance

5.3.8 A number of draft Supplementary Guidance and Planning Guidance documents were published by LLTNPA in 2015 for consultation alongside the LLTP LDP Proposed Plan (2015). None of the Supplementary Guidance documents which have to date been adopted (as at January 2018) are of relevance to the proposed development.

5.4 Other Material Considerations

Overview

5.4.1 Other material considerations of relevance to the proposed development are:
- LDP Supplementary Guidance;
- LDP Planning Guidance;
- Draft LLTP Partnership Plan (2018 – 2023);
- National Planning Policies; and,
- Other National Policies, Advice and Guidance.

5.4.2 Each of these material considerations is outlined in turn below.

LDP Supplementary Guidance

5.4.3 The only Supplementary Guidance relevant to the proposed development is the Design and Place making Supplementary Guidance. This document providing siting and design guidance to ensure that all development proposals, including specifically “holiday park developments” are of high quality. In doing so the document identifies a range of detailed urban and environmental considerations for proposals in the National Park.

LDP Planning Guidance

5.4.4 In addition to statutory Supplementary Guidance, the adopted LDP is also supported by a suite of non-statutory Planning Guidance documents. The following approved Planning Guidance documents are relevant to the proposed development:
- Listed Buildings and Conservation Areas Planning Guidance - sets out assessment criteria for proposals in the grounds of listed buildings, including the protection of key views and landscape setting; and
- Visitor Experience Planning Guidance - defines different types of tourism accommodation and infrastructure. This Planning Guidance does not set out criteria to assess tourism development proposals beyond repeating those within relevant LDP policies.

5.4.5 In addition, the Draft Development Contributions Planning Guidance identifies where developer contributions are likely to be sought by the LLTNPA in respect of proposals, depending on their scale, location, predicted impacted and particular circumstances.

National Park Partnership Plan

5.4.6 All planning decisions within the LLTNPA area require to be guided by the policies of the National Park Partnership Plan where relevant to ensure that decisions are consistent with the National Park’s statutory aims (identified in Section 5.2 above).

5.4.7 The National Park Partnership Plan 2018-2023 is an important material consideration in the determination of this application. It is framed around three thematic vision statements, 13 outcomes and numerous related priorities for the LLTNPA. All three identified themes, Conservation and Land Management, Visitor Experience and Rural Development, are relevant to the proposed development. Many of the identified outcomes are also relevant, specifically:
Outcomes 1, 2 and 3 seek to conserve and enhance the National Park’s natural resources, special qualities and sense of place, whilst better mitigating and adapting to climate change;

Outcomes 5 – 9 seek to enhance recreational opportunities of all kinds and enjoyment within the National Park, deliver a thriving visitor economy, and protect and enhance environmental quality, community life, health and wellbeing; and

Outcomes 10 – 12 seek to enhance the National Park’s towns and villages through investment, strengthen and diversify the rural economy, realise sustainable business growth, and retain a larger skilled young and working age population.

5.4.8 To monitor its implementation, the National Park Partnership Plan (2018-2023) lists 14 targets for the LLTNP area over the period to 2023, of which the following are relevant to the proposed development:

- Increase the value of the visitor economy from 2016 STEAM baseline of £340m;
- Increase the proportion of people reporting a good quality experience of the National Park’s settlements and landscapes;
- Reduce the proportions of people arriving in or exploring within the National Park by car and increase the proportion exploring by foot, water and bike, all from 2015/16 Visitor Survey baseline levels; and
- Increase from 2016 baseline of 44% to 59% of water bodies achieving at least good ecological condition.

National Planning Policies

5.4.9 National planning policy is contained within both the National Planning Framework 3 (NPF3) and the SPP, both of which were published in June 2014. Given that the statutory Development Plan applicable to the site post-dates this and has undergone a formal Examination through which its soundness has been tested, and since section 25 of the Principal Act requires planning applications to be determined in accordance with the Development Plan unless material considerations indicate otherwise, national planning policy is considered to play a secondary role in this EIA for the proposed development. Correspondingly, this section only briefly identifies relevant national planning policy provisions.

National Planning Framework

5.4.10 The NPF3 provides a statutory framework around which to orientate Scotland’s long-term spatial development. The Framework highlights the spatial planning implications of multiple national policy documents and commitments. In overall terms the NPF3 emphasises the Scottish Government’s commitment to increasing sustainable economic growth across all areas of Scotland and orientates the efforts of Scotland’s planning system towards this purpose.

5.4.11 The introduction to the NPF3 notes the importance of maintaining economically active and vibrant rural areas whilst “safeguarding our natural and cultural assets and making innovative and sustainable use of our resources”. Related to this, the document identifies tourism as a key economic growth sector and includes a strategy for Scotland’s two National Parks. This notes that the National Parks are “sustainable, successful places” where the Scottish Government wishes to see “planning and innovation continue to strengthen communities, encourage investment, support tourism, deliver affordable rural housing, and encourage high quality place making and visitor experiences”. At the same time the NPF3 expects Development Plans to safeguard their “exceptional environmental quality”.

5.4.12 The national spatial strategy of the NPF3 is structured around four key themes, namely: a successful, sustainable place; a low carbon place; a natural, resilient place; and a connected place. These themes are presented as ‘planning outcomes’ within the SPP (2014).

5.4.13 With respect to the Glasgow and Clyde Valley City Region (which includes West Dunbartonshire and therefore in local authority terms, Balloch), the NPF3 focuses on efforts to regenerate post-industrial areas and provides support for proposals which increase employment and economic development. It also identifies the Central Scotland Green Network (CSGN) as a National
Development, encourages the remediation of derelict land, promotes active and sustainable travel and supports the protection and enhancement of green infrastructure.

Scottish Planning Policy

5.4.14 The SPP (2014) is a material consideration that carries significant weight. It sets out the Scottish Government’s expectations regarding the treatment of specific planning issues within development planning and development management. The document aims to contribute to the achievement of the Scottish Government’s overarching purpose of achieving sustainable economic growth.

5.4.15 The SPP’s Principal Policy on Sustainability (paragraphs 24-35) includes a presumption in favour of development that contributes to sustainable development, which relates to the identification of the need for and acceptability of the development. To implement this policy presumption, the SPP (paragraph 29) identifies 13 sustainable development principles which should guide planning policies and decisions, of which 12 are relevant to the proposed development:

- "giving due weight to net economic benefit;"
- responding to economic issues, challenges and opportunities, as outlined in local economic strategies;
- supporting good design and the six qualities of successful places;
- making efficient use of existing capacities of land, buildings and infrastructure including supporting town centre and regeneration priorities;
- supporting delivery of accessible housing, business, retailing and leisure development;
- supporting climate change mitigation and adaptation including taking account of flood risk;
- improving health and well-being by offering opportunities for social interaction and physical activity, including sport and recreation;
- having regard to the principles for sustainable land use set out in the Land Use Strategy;
- protecting, enhancing and promoting access to cultural heritage, including the historic environment;
- protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment;
- avoiding over-development, protecting the amenity of new and existing development and
- considering the implications of development for water, air and soil quality”.

5.4.16 The SPP’s other Principal Policy, on Place making (paragraphs 36-57), seeks to direct new development to the right location and to encourage a design-led approach to development in order to create high quality places. The SPP (under paragraph 40) states that high quality development which demonstrates the following six qualities of successful places should be supported: “Distinctive, Safe and Pleasant, Welcoming, Adaptable, Resource efficient, and Easy to move around and beyond”. As noted in Section 5.3 above, these six qualities are referenced in Overarching Policy 1 – Strategic Principles within the adopted Loch Lomond and the Trossachs LDP (2016).

5.4.17 Subject specific provisions within the SPP of relevance to the proposed development are outlined in Table 5.2 below.
<table>
<thead>
<tr>
<th>Subject Policy</th>
<th>Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promoting Rural Development (Paragraphs 74 – 91)</td>
<td>This section identifies planning principles related to sustainable rural development including “…encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality…” The section includes a sub-section regarding planning within Scotland’s National Parks (paragraphs 84 – 86), which lists the statutory aims of National Parks (see Section 5.2 above) and notes the need for LDP’s covering National Parks to be consistent with National Park Partnership Plans (see below).</td>
</tr>
<tr>
<td>Supporting Business and Employment (Paragraphs 92 – 108)</td>
<td>This section highlights the need to “give due weight to net economic benefit of Proposed Development” (paragraph 93). The SPP identifies tourism as one of several key growth sectors which should be appropriately supported through development plans.</td>
</tr>
<tr>
<td>Valuing the Historic Environment (Paragraphs 135 – 151)</td>
<td>This section states that planning should promote the care and protection of the designated and non-designated historic environment and should take account of all aspects of the historic environment. Detailed policy provisions are set out in order to protect and enhance different types of historical assets.</td>
</tr>
<tr>
<td>Listed Buildings (Paragraph 141)</td>
<td>This paragraph states that “where planning permission and listed building consent are sought for development to, or affecting, a listed building, special regard must be given to the importance of preserving and enhancing the building, its setting and any features of special architectural or historic interest…”</td>
</tr>
<tr>
<td>Gardens and Designed Landscapes (Paragraph 148)</td>
<td>This paragraph states that planning authorities should protect and, where appropriate, seek to enhance gardens and designed landscapes included in the Inventory of Gardens and Designed Landscapes and designed landscapes of regional and local importance”.</td>
</tr>
<tr>
<td>Archaeology (Paragraph 150)</td>
<td>This paragraph states that “planning authorities should protect archaeological sites and monuments as an important, finite and non-renewable resource and preserve them in situ wherever possible”. In-situ preservation is encouraged, but in cases where this is not possible conditions or legal obligations should be used to ensure archaeological assets are recorded and analysed before development proceeds.</td>
</tr>
<tr>
<td>Valuing the Natural Environment (Paragraphs 193 - 233)</td>
<td>This section identifies a number of planning principles related to natural heritage protection and ecological resilience. Principles (paragraph 194) of relevance to the Proposed Development include that planning should: “facilitate positive change while maintaining and enhancing distinctive landscape character; conserve and enhance protected sites and species... promote protection and improvement of the water environment...in a sustainable and co-ordinated way; protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with high nature conservation or landscape value;</td>
</tr>
<tr>
<td>Subject Policy</td>
<td>Relevance</td>
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<tr>
<td>----------------</td>
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</tr>
<tr>
<td><strong>Seek benefits for biodiversity from new development where possible...</strong></td>
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</tr>
<tr>
<td>Protecting Designated Sites (Paragraph 196)</td>
<td>This paragraph requires designated areas and sites to be identified and appropriately protected through development plans, without the use of buffer zones. It also states that &quot;the level of protection given to local designations should not be as high as that given to international or national designations&quot;.</td>
</tr>
<tr>
<td>Development Management Decisions (Paragraphs 202 - 203)</td>
<td>This section states that planning decisions “should take account of potential effects on landscapes and the natural and water environment, including cumulative effects” (paragraph 202). It further states that “planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment” (paragraph 203). The same paragraph notes that whilst effects on statutorily protected sites will be an important consideration, this “does not impose an automatic prohibition on development”.</td>
</tr>
<tr>
<td>Non-Native Species (Paragraph 210)</td>
<td>This paragraph states that “where non-native species are present on site, or where planting is planned as part of a development, developers should take into account the provisions of the Wildlife and Countryside Act 1981 relating to non-native species”.</td>
</tr>
<tr>
<td>National Designations and Protected Species (Paragraphs 212 - 214)</td>
<td>Reflecting legislative requirements, these paragraphs identify criteria to safeguard nationally designated sites (including National Parks) and protected species from adverse effects. In relation to the protection of designated sites and protected species, these criteria have effectively been transposed into Natural Environment Policies 2-4 of the adopted Loch Lomond and the Trossachs LDP (2016).</td>
</tr>
<tr>
<td>Woodland (Paragraph 218)</td>
<td>This paragraph refers to and aligns directly with provisions set out in the Scottish Government’s Control of Woodland Removal Policy 2009 (see below).</td>
</tr>
<tr>
<td>Maximising the Benefits of Green Infrastructure (Paragraphs 219 - 233)</td>
<td>This section identifies a number of planning principles related to the protection, enhancement and promotion of green infrastructure including core paths and other important routes.</td>
</tr>
<tr>
<td>Managing Flood Risk &amp; Drainage (Paragraphs 254-268)</td>
<td>This section promotes a precautionary approach to flood risk management. Where relevant, flood risk assessments and the deployment of SUDs are required (paragraph 255).</td>
</tr>
<tr>
<td>Subject Policy</td>
<td>Relevance</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Promoting Sustainable Transport and Active Travel (Paragraphs 269-291)</td>
<td>This section includes a requirement for development proposals to consider traffic impacts including cumulative effects (paragraph 286).</td>
</tr>
</tbody>
</table>
Other National Policies, Advice and Guidance

Scottish Historic Environment Policy Statement

5.4.18 This document takes account of the Historic Environment (Scotland) Act 2014 and explains how provisions within the SPP (2014) relating to the management of the historic environment should be interpreted. The document does not set out any new or different planning policies or development management assessment criteria, however it does retain the “presumption in favour of preservation of individual historic assets and also the pattern of the wider historic environment” previously set out in the now superseded Scottish Historic Environment Policy (2011).

Government Economic Strategy 2015

5.4.19 The overall purpose of the Scottish Government's Economic Strategy is to deliver increased sustainable growth. In order to deliver this, one of the key priorities is securing sustainable investment. This includes investment in business and infrastructure. The Strategy highlights that it is important to foster an environment that supports business growth. Investment in sectors in which Scotland has an advantage, including tourism, is encouraged. In addition, the Strategy calls for businesses to be resource efficient and low carbon in order to improve efficiency and productivity.


5.4.20 The SPP (2014) requires Development Plans to be informed by the Tourism Development Framework for Scotland, which is also identified as a key document for planning decisions more widely. The Framework was first published in 2013 and refreshed in 2016 to align with a mid-term review of the national tourism strategy, Tourism Scotland 2020.

5.4.21 The Framework sets out actions to assist and promote growth in Scotland’s visitor economy to 2020. It supports the implementation of Tourism Scotland 2020 and the achievement of its central target to secure annual visitor spend of between £5.5bn and £6.5bn to 2020 for overnight visitors. The Framework does this by providing guidance to development planning authorities to help secure growth in the visitor economy.

5.4.22 The Framework identifies the importance of the tourism economy within the LLTNP and states that “further opportunities remain around the south of the Loch at the gateway to the National Park” for hotel and other accommodation (paragraph 2.48). At paragraphs 2.54 – 2.58 the Framework defines ‘resort development’ as “destinations where a collection of activities, such as eating, sleeping and recreation, can be undertaken in one defined location” and confirms that such development can be situated in urban or rural locations, including within National Parks as existing key visitor destinations. The “significant economic opportunities” provided by resort development in terms of onsite rural employment, off-site supply chain benefits and the type of visitors they attract is noted within paragraph 2.55 of the Framework.

Scottish Government Control of Woodland Removal Policy (2009)

5.4.23 This policy provides a national position to inform decisions on all woodland removal across Scotland. The policy includes a presumption in favour of protecting woodland, stating that removal should only be permitted where it would achieve significant and clearly defined additional public benefits. The concept of additionality is therefore central to the application of the Policy.

5.4.24 The Policy identifies situations where:

- There is a strong presumption against removal of woodland;
- Woodland removal is acceptable without compensatory planting (CP); and
- Woodland removal is acceptable with CP.

5.4.25 The Policy requires consideration of any need for CP as part of a judgement regarding the acceptability of woodland removal, rather than as a separate issue or automatic presumption. Consequently, if significant net additional public benefit can be demonstrated from a development proposal involving woodland removal without compensatory planting, there is no
5.4.26 Annex C of the Policy specifies acceptability criteria for demonstrating significant net additional public benefit either in the absence of, or with, CP. The criteria regarding acceptability in the absence of CP include benefits derived from land use change (whether or not the intended direct result of a development proposal) as well as other environmental and public safety factors.

5.4.27 The policy is supported by implementation guidance (March 2015) for Forestry Commission Scotland staff. This document notes that the need for any compensatory planting should be minimised and that compensatory planting “should be seen as the final option once all other solutions have been exhausted”.

Creating Places - A policy statement on architecture and place for Scotland (2013)

5.4.28 This document sets out the Scottish Government’s overall policy statement on architecture and place. The document defines ‘good design’ as “an innovative and creative process that delivers value” and provides a detailed explanation of the six qualities of successful places which are now embedded within the SPP (2014).

National Planning Advice and Circulars

5.4.29 National planning policy is supported by numerous Scottish Government Planning Circulars, Planning Advice Notes (PANs), Advice Sheets, Ministerial/Chief Planner Letters to Planning Authorities, as well as guidance documents prepared by Key Agencies of the Scottish Government. Annexe A to Scottish Government Planning Circular 3/2013: Development Management Procedures (Revision 1.0) confirms that amongst other considerations, the types of documents listed above are all potential material considerations in the determination of a planning application depending on the individual context of the case.

5.4.30 The following guidance and advice documents are considered to be of relevance to the proposed development and have been considered where appropriate in undertaking this EIA:

- SEPA’s Development Management Guidance: Flood Risk (July 2017);
- Online Planning Advice regarding Flood Risk (June 2015);
- PAN 1/2013: Environmental Impact Assessment (August 2013);
- PAN 2/2011 Planning and Archaeology (July 2011);
- PAN 1/2011 Planning and Noise (March 2011);
- PAN 60 Planning for Natural Heritage (2000, revised January 2008);
- PAN 81 Community Engagement (March 2007);
- PAN 51 Planning, Environmental Protection and Regulation (Revised October 2006);
- PAN 79 Water and Drainage (September 2006);
- PAN 75 Planning for Transport (August 2005);
- PAN 68 Design Statements (August 2003);
- PAN 61 Planning and Sustainable Urban Drainage Systems (July 2001); and
- PAN 33 Development of Contaminated Land.
5.5 References


6 Ecology and Woodland

6.1 Introduction

6.1.1 This chapter provides an assessment of the likely significant effects on ecology and woodland. It details the ecological studies undertaken and presents the results of an Ecological Impact Assessment (EcIA) undertaken for the proposed development in accordance with the latest guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2016). The assessment is based on the characteristics of the site and the surrounding area detailed in Chapter 2 – Site and Surrounding Area, and the key parameters of the proposed development detailed in Chapter 3 – The Proposed Development.

6.1.2 The aims of this chapter are to:
- Outline the methodology used in the assessment;
- Establish a robust and accurate ecological baseline for the site;
- Identify and evaluate the nature conservation/biodiversity interest present;
- Identify any likely impacts arising from the proposed development (construction and operational stages);
- Establish the magnitude of identified impacts;
- Identify further mitigation and enhancement measures where required to address identified impacts;
- Assess residual predicted impacts; and,
- Assess cumulative impacts from the proposed development in combination with other relevant cumulative developments.

6.1.3 This chapter is supported by the EcIA provided in Technical Appendix 6.5 - EcIA.

6.2 Scoping

6.2.1 An EIA Scoping Report was produced by PBA in April 2017. Consultation responses in reference to the initial development description as described in the Scoping Report were received in mid-May 2017 and these were reviewed in order to finalise and agree the scope of the EcIA. Based on the Ecological Constraints and Opportunities Plan (ECOP) undertaken to inform the Scoping Report and the preliminary consultation responses, the scope of the ecology survey work is summarised below:
- Vegetation, comprising a Phase 1 Habitat Survey, including potential Groundwater Dependent Terrestrial Ecosystems (GWTDE’s) and Invasive Non-native Species (INNS);
- Trees and woodland;
- Otter (Lutra lutra);
- Water vole (Arvicola amphibius);
- Badger (Meles meles);
- Red squirrel (Sciurus vulgaris);
- Pine marten (Martes martes);
- Roe deer (Capreolus capreolus); and
- Bats (all species) (automated and activity).

6.2.2 Following the ECOP findings and the preliminary consultation responses the following elements were scoped out of the EcIA:
- The direct impacts to designated sites ecologically linked to the proposed development site have been scoped out as it is considered that no direct impacts as a result of the proposed development are likely. Aside from Loch Lomond, indirect impacts to ecologically connected...
sites have also been scoped out as they are not considered to be tourist destinations and therefore impacts such as increased public pressure are not anticipated.

- Breeding and wintering bird surveys were scoped out due to the habitats on and directly adjacent to the site being considered suitable to support bird populations of only local importance. It was considered that any impacts on these local populations could be mitigated by enacting good practice mitigation during and post construction.

6.2.3 The scoping exercise narrowed down the Important Ecological Features (IEFs) within the study area and the Zone of Influence (ZoI) was set for each one according to the CIEEM guidance.

6.3 Methodology

6.3.1 In order to anticipate the potential ecological sensitivities at the site and inform the impact assessment a desk study was conducted in advance of the survey work. Where field surveys were not undertaken, desk study information was used to carry out the impact assessment. The IEFs were assigned a level of geographical importance based on the CIEEM guidance.

6.3.2 The assessment of impacts describes how the baseline conditions would change as a result of the project and its associated activities and from other developments. The term ‘impact’ is defined as a change experienced by a receptor (this can be positive, neutral or negative). The term ‘effect’ is defined as the consequences for the receptor of an impact after embedded and further mitigation and enhancement measures have been taken into account, as per the CIEEM guidance. The EIA Regulations specifically require all likely significant effects to be considered, therefore, impacts and effects are described separately and the effects on the IEFs are assessed as being either significant at a relevant geographic scale or not significant.

6.3.3 A cumulative impact assessment is included as cumulative effects in the construction and/or operational phase are likely. The cumulative impact assessment considers if the combined actions of adjacent developments is likely to have a negative impact on the IEFs.

6.4 Baseline Conditions

The Site

6.4.1 The site can be considered in two separate areas: the land at West Riverside and the area associated with Woodbank House. The area surrounding West Riverside includes Drunkinnon Woods. This semi-natural woodland is located south east of the Loch Lomond Shores complex, across an undulating landform and is dissected by footpaths. The woodland is bounded to the west and north by roads accessing Loch Lomond Shores and the pier. Part of the woodland is designated as ancient woodland. Although subject to a level of disturbance, the woodland has the potential to support a range of wildlife. A corridor of woodland is also present alongside the River Leven on the eastern boundary of the site, whilst pockets of landscaped woodland, amenity areas and car parks are present in the north of the site and to the east of the existing Loch Lomond Shores complex.

6.4.2 The area associated with Woodbank House is situated to the west of Old Luss Road and approximately 500m east of the A82. At the centre of the site are the remains of Woodbank House, a Grade-A listed property, which is now largely derelict. The remains of the house are accessed from Old Luss Road by a driveway through an area of paddock, used for grazing horses and surrounded by the remains of the former gardens. Ancient woodland surrounds the site of the building with mature specimens of broadleaved species such as oak and yew. The woodland and small watercourses present to the north and south of the site boundary at Woodbank House have the potential to support a range of faunal species.

Designated Sites and Ancient Woodland Sites

6.4.3 The site is situated within the Loch Lomond and the Trossachs National Park (LLTNP) near the southern park boundary. Twenty-four statutory designated sites are present within 10km of the site. Five of these sites are considered to be hydrologically and/or ecologically connected to the site. Six Local Nature Conservation Sites (LNCS) are present within 2km of the site. Only the River Leven LNCS has direct hydrological and ecological connectivity to the site.
6.4.4 Long-established woodland of plantation origin (LEPO) is present in the north and west of the site. The woodland present in the north and west offers connectivity to similar habitat in the wider area.

**Evaluation of Important Ecological Features**

6.4.5 The evaluations have been applied only to those habitats and species that have been scoped in to the assessment and those where there is the potential for impacts that could result in significant adverse ecological effects as a result of the proposed development.

**6.5 Baseline Evolution**

6.5.1 In the absence of the proposed development, increased public pressure and climate change are likely to contribute to the evolution of the baseline. Further details are provided in Technical Appendix 6.5 - EcIA.

**6.6 Embedded Mitigation**

6.6.1 The proposed development seeks to construct small woodland lodges on elevated support structures (if required) to avoid the creation of foundations within the woodland areas. These woodland areas form part of the Forest Habitat Network. The proposed development intends to maintain and enhance this network during construction and post development.

6.6.2 The embedded mitigation measures incorporated within the proposed development that are relevant to this chapter and that are considered in the impact assessment are as follows:

- A Construction Environmental Management Plan (CEMP);
- Siting and design of forest lodges to be informed by detailed tree surveys of the site, to be undertaken in accordance with the relevant British Standards;
- Safeguarding of identified important trees, including their root systems, from disturbance or loss;
- Commitment to the provision of appropriate compensatory planting to offset the loss of trees to the building footprints and working areas within the existing woodland;
- Manage extents of invasive species such as rosebay willowherb, Japanese knotweed and bamboo, in particular on the Woodbank site;
- Development of path and minor route networks using low impact technology to protect tree roots, soils and surrounding vegetation;
- Existing woodland managed to improve age range and biodiversity;
- Boost ecology and diversify species mix further by replanting lost species with native hardwood trees such as beech and oak;
- Boost ecology and ground flora within woodland by thinning out trees, consequently allowing more sunlight to reach the woodland floor. Management of non-native species;
- A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequency of potential faunal collisions;
- Boundary features and fences would be designed to allow roe deer and badgers to move freely where appropriate.

**6.7 Further Mitigation and Enhancement**

6.7.1 As set out in Appendix 6.5, further mitigation and enhancement is proposed. The measures include the following:

- Appointment of an Environmental/Ecological Clerk of Works (ECoW) team to monitor compliance, produce auditable records and provide onsite advice;
- Pre-construction and regular protected species surveys;
- Provision of information regarding ecological sensitivities as part of site induction;
- Seasonal working checks and restrictions;
- Safeguarding of protected faunal species;
- Commitment to site and design working areas and building footprints (at detailed design stage) with the objectives of minimising habitat disturbance/loss and safeguarding IEFs;
- Undertaking an early flowering plants survey prior to detailed design;
- Use of geoweb to protect adjacent tree rooting systems from development within woodland;
- Porous gravel or similar for proposed parking;
- Turf translocation if required; and
- Tree survey to be undertaken of focused areas of the development to provide information on individual trees in relation to design and construction.

### 6.8 Residual Effects

#### 6.8.1 Taking account of the proposed mitigation and enhancement measures, the significant residual effects from the construction and operation of the proposed development are identified in Table 6.1 below.

#### Table 6.1 Significant Residual Effects

<table>
<thead>
<tr>
<th>IEF</th>
<th>Importance of IEF</th>
<th>Nature of Impact</th>
<th>Duration of Impact</th>
<th>Magnitude of Impact</th>
<th>Significance of Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ancient woodland (LEPO)</td>
<td>County</td>
<td>Partial loss of habitat and damage.</td>
<td>Permanent and temporary</td>
<td>Moderate</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Broadleaved semi-natural woodland</td>
<td>National (UK)</td>
<td>Partial loss of habitat and damage.</td>
<td>Permanent and temporary</td>
<td>Moderate</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Standing water</td>
<td>International</td>
<td>Pollution</td>
<td>Temporary</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Running water</td>
<td>National (UK)</td>
<td>Pollution</td>
<td>Temporary</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Intact hedgerow</td>
<td>National (UK)</td>
<td>Partial loss of habitat</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Red Squirrel</td>
<td>National (UK)</td>
<td>Habitat loss, disturbance, displacement, injury and fatality.</td>
<td>Permanent and temporary</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td><strong>Operation Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ancient woodland (LEPO)</td>
<td>County</td>
<td>Recreational use</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>IEF</td>
<td>Importance of IEF</td>
<td>Nature of Impact</td>
<td>Duration of Impact</td>
<td>Magnitude of Impact</td>
<td>Significance of Effect</td>
</tr>
<tr>
<td>------------------------------------------</td>
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<td>------------------------</td>
</tr>
<tr>
<td>Broadleaved semi-natural woodland</td>
<td>National (UK)</td>
<td>Recreational use</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Inundation vegetation</td>
<td>Local</td>
<td>Pollution and recreational activities</td>
<td>Permanent</td>
<td>Moderate</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Otter</td>
<td>International</td>
<td>Injury and fatality, disturbance and displacement</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Red squirrel</td>
<td>National (UK)</td>
<td>Injury and fatality, disturbance and displacement</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Ancient woodland (LEPO)</td>
<td>County</td>
<td>Compensatory planting and future management</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Broadleaved semi-natural woodland</td>
<td>National (UK)</td>
<td>Compensatory planting and future management</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Intact hedgerow</td>
<td>National (UK)</td>
<td>Compensatory planting and future management</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Standing water</td>
<td>International</td>
<td>Shoreline habitat management</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Running water</td>
<td>National (UK)</td>
<td>Riparian habitat management</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Otter</td>
<td>International</td>
<td>Shoreline and riparian habitat management</td>
<td>Permanent</td>
<td>Minor</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Red squirrel</td>
<td>National (UK)</td>
<td>Purpose built resting and feeding provisions</td>
<td>Permanent</td>
<td>Moderate</td>
<td>Significant at a local level</td>
</tr>
<tr>
<td>Pine marten</td>
<td>National (UK)</td>
<td>Purpose built resting and feeding provisions</td>
<td>Permanent</td>
<td>Moderate</td>
<td>Significant at a local level</td>
</tr>
</tbody>
</table>
### Assessment of Cumulative Effects

6.9.1 Cumulative impacts could occur if pollutants or sediments are released into the River Leven and/or Loch Lomond during the construction phase of the proposed development if simultaneous with the construction of the replacement building and infrastructure for Sweeney’s Cruises. Without mitigation, the impacts may increase in magnitude and significance at a local level. If construction occurs consecutively impacts could increase in duration and significance at a local level. There may also be cumulative impacts once both developments are in operation, if increased visitor numbers lead to an increased frequency and/or duration of boat tours. If not properly managed this could lead to increased disturbance of species within the Loch Lomond Woods SAC and Loch Lomond SPA.

6.9.2 Once the Woodbank Inn Hotel Extension is operational, cumulative impacts could occur with the proposed development and the Sweeney’s Cruises development in terms of increases in visitor numbers as above.

### Summary

6.10.1 The ecology and woodland assessment has considered the likely effects of the proposed development on the Important Ecological Features (IEFs) within the Zone of Influence (ZoI). A suite of embedded and further mitigation measures is proposed to avoid, prevent and minimise the likely negative significant effects on ecology and woodland IEFs.

6.10.2 Taking account of the proposed mitigation and enhancement measures, the significant residual effects from the construction and operation of the proposed development are limited to:

- Negative impacts of partial loss of habitat and damage to ancient woodland (LEPO), broadleaved semi-natural woodland and intact hedgerow, resulting in significant effects at a local level;
- Negative impacts of pollution to standing water and running water, resulting in significant effects at a local level;
- Negative impacts of habitat loss, disturbance, displacement, injury and fatality to red squirrel, resulting in significant effects at a local level;
- Negative impacts of recreational use and pollution to ancient woodland (LEPO), broadleaved semi-natural woodland and inundation vegetation, resulting in significant effects at a local level;
- Negative impacts of injury and fatality, disturbance and displacement to otter and red squirrel, resulting in significant effects at a local level;
- Positive impacts of compensatory planting and future management to ancient woodland (LEPO), broadleaved semi-natural woodland and intact hedgerow, resulting in significant effects at a local level;
- Positive impacts of shoreline and riparian habitat management to standing water and running water and otter, resulting in significant effects at a local level;
- Positive impacts of purpose built resting and feeding provisions to red squirrel and pine marten, resulting in significant effects at a local level; and
- Positive impacts of increased roosting and foraging resources to bats, resulting in significant effects at a local level.
6.10.3 With reference to the Generic Significance Criteria the negative and positive effects on all the IEFs apart from ancient woodland (LEPO) and inundation vegetation are categorised as substantial, as they affect IEFs of national and international importance. The positive and negative effects on ancient woodland (LEPO) are categorised as major, as they affect an IEF of county importance. The negative effects on inundation vegetation are categorised as moderate, as they affect an IEF of local importance.

6.10.4 Cumulative impacts could occur during the construction phase if it is simultaneous with the construction of the replacement building and infrastructure for Sweeney’s Cruises. There may also be cumulative impacts once both developments, and the Woodbank Inn Hotel Extension, are in operation. If not properly managed this could lead to increased disturbance of species within the Loch Lomond Woods SAC and Loch Lomond SPA.
7 Traffic and Transport

7.1 Introduction

7.1.1 This ES chapter provides an assessment of the likely significant effects on the traffic, transport and access, arising from the West Riverside & Woodbank House Planning Permission in Principle (PPiP) development proposals. It incorporates the findings of the Transport Assessment (TA) and the Outline Travel Plan.

7.1.2 The aims of this chapter are to:
- Identify the relevant context in which the TA has been undertaken;
- Describe the methods used to undertake the assessment;
- Outline the relevant baseline conditions currently existing at the site and surroundings;
- Identify the potential direct and indirect traffic and transport effects of the proposed development;
- Identify mitigation and enhancement measures where required to address identified effects;
- Assess residual predicted effects; and
- Assess cumulative effects on the local and trunk road network from the proposed development in combination with other relevant cumulative developments.

7.2 Legislative and Policy Context

Legislation

7.2.1 The overarching legislative framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context.

Policy

7.2.2 The planning policy framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context. Planning policy considerations of specific relevance to this assessment are:
- Scottish Planning Policy (SPP);
- A Catalyst for Change - The Regional Transport Strategy for the West of Scotland 2008-2021, Strathclyde Partnership for Transport (SPT);
- Loch Lomond & the Trossachs National Park (LLTNP) – Local Development Plan, 2017-2021; and

7.2.3 Other policy considerations of relevance to this assessment are:
- Designing Streets, Scottish Government, 2010; and

Guidance and Relevant Technical Standards

7.2.4 The following guidance and technical standards have informed this assessment:
- Transport Assessment Guidance 2012 – produced by Transport Scotland to guide the preparation of Transport Assessments for development proposal in Scotland, for which the planning and transport policy are contained within Scottish Planning Policy (SPP). The guidance provides an outline of the framework for delivering integration of transport and land use planning, including the requirements for a Transport Assessment, of development involved significant travel generating uses; and
The principal aspects considered within this assessment include:
- Changes in vehicle flows and usage patterns within the road network;
- Associated amenity and environmental effects, including:
  - Severance;
  - Driver delay;
  - Pedestrian and Cyclist Delay;
  - Pedestrian and Cyclist Amenity;
  - Fear and intimidation;
  - Driver delay; and
  - Accidents and safety.

Overall Approach

In undertaking the assessment presented in this ES Chapter, the following activities have been carried out:
- EIA screening and scoping (see below);
- Scoping discussions and correspondence with West Dunbartonshire Council (WDC Roads Officers and Transport Scotland (TS));
- Desk-based review of available information including previous studies;
- A site-visit, walkover and cycle of the site and surrounding pedestrian, cycle and local road network;
- Traffic data collection;
- Evaluation of the baseline and baseline + development scenario traffic conditions;
- Production of a Transport Assessment (TA) for the proposed development; and
- Identification and assessment of likely significant effects, taking into account proposed mitigation and enhancement measures and including consideration of likely cumulative effects.

The assessment has been informed by an EIA Screening and Scoping Report (PBA, April 2017) and subsequent EIA Screening and Scoping Opinion issued by LLTNPA (11th May 2017) in respect of the EIA for the proposed development.

The EIA Scoping Opinion indicated that WDC had requested that “Parking for the development should conform to the appropriate standards set out in WDC Parking Standards”. Later scoping discussions in October 2017 requested a revision to this to accord with SCOTS National Roads Development Guideline (NRDG) parking standards. These guidelines suggest that maximum standards should be used with respect to providing car parking in new developments and have been used to identify an initial level of parking provision commensurate with the development proposals.
7.3.6 Consultation was undertaken with ScotRail Abellio 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, options for shared-ticketing, marketing and the need for future studies is being explored further.

7.3.7 Consultation was undertaken with respect to the Balloch Village Parking Proposals and, more specifically, the streetscape improvements proposed as part of the Station Square Proposals for Balloch Road. WDC has indicated that any future refinement of the streetscape proposals will be informed through collaborative working with the proposed developer, to develop a scheme which will meet the needs of WDC and the design requirements of the Zone A Station Square area of the development proposals. It is expected that this scheme will progress collaboratively between WDC, SUSTRAINS and the developer.

Study Area

7.3.8 The study area in the TA is consistent with that set out in ‘the EIA Screening and Scoping Report’ and ‘the EIA Scoping Opinion’, with key junctions between the Drymen Road/ A811 Stirling Road Priority junction to the east and the A82/ A11 Stoneymollan Roundabout to the west, being identified and agreed for assessment with WDC and TS. These junctions, as listed below under “Extent of Assessment”, are those junctions expected to experience an uplift in through traffic volumes as a result of the development.

Information Sources

Desk Top Study

7.3.9 The following sources were used within the Transport Assessment:

- Scottish Planning Policy (SPP);
- A Catalyst for Change - The Regional Transport Strategy for the West of Scotland 2008-2021, Strathclyde Partnership for Transport (SPT);
- Loch Lomond & the Trossachs National Park (LLTNP) – Local Development Plan, 2017-2021;
- Designing Streets, Scottish Government, 2010;
- Cycling by Design, Transport Scotland, 2010;
- Transport Assessment Guidance 2012;
- SCOTS National Roads Development Guide 2014 – produced by the Society for Chief Officers of Transport in Scotland, supported by Transport Scotland and Scottish Government Planning and Architecture Division. This document supports Designing Streets and expands on its principles to clarify the circumstances in which it can be used;
- www.crashmap.co.uk;
- TRICS V7.4.4 trip generation database;
- ARCADY Roundabout junction analysis software;
- PICADY Priority junction analysis software; and
- STEP Scottish Trip End User Programme software application.

7.3.10 A desk top study was undertaken to inform the policy review of the TA, as well as gathering supporting information on existing public transport services and timetables for bus and rail services adjacent to the development site.

Fieldwork

7.3.11 Fieldwork was undertaken in the form of site visits by walking, cycling and private vehicles of the development site and surrounding local area. Traffic data was also collected to inform baseline traffic flows.
7.3.12 To determine the existing traffic conditions on the study network a series of Junction Turning Counts (JTCs) were undertaken over Thursday 6 September 2017 and Saturday 9 September 2017 at all junctions noted above. Traffic surveys were undertaken in accordance with an agreed survey specification.

7.3.13 To inform the TA and the noise and air quality assessment to support the Environmental Assessment, a seven-day Automatic Traffic Count (ATC) survey was undertaken from Thursday 6 September 2017 to Wednesday 12 September 2017, inclusive to record existing traffic link flows, vehicle composition and traffic speeds.

**Approach to Assessment**

**Identification of Relevant Receptors**

7.3.14 Scoping was undertaken with West Dunbartonshire Council (WDC) Road Officers and Transport Scotland (TS). Preliminary scoping was undertaken with WDC and TS during the preparatory stages of the Planning Application Notice (PAN), submitted in October 2017. As the development proposals have evolved to reflect land use constraints, more detailed Scoping was undertaken with both TS and WDC to confirm the assessment parameters of the TA.

7.3.15 The TA was prepared in accordance with the Scoping agreed with WDC Road Officers in October 2017 and TS in March 2018. As such, the following assessment parameters were established:

**Extent of Assessment**

7.3.16 The extent of the TA is defined by the following junctions:

- Ben Lomond Way/ Loch Lomond Shores Roundabout (internal);
- Ben Lomond Way, Old Luss Road, Balloch Road Roundabout;
- A811, Ben Lomond Way Roundabout;
- A82/ A811 Stoneymollan Roundabout;
- A811/ Carrochan Cres Roundabout;
- Pier Road/ Balloch Road Priority;
- Balloch Road/ Drymen Road/ Carrochan Road Priority; and
- Drymen Road/ A811 Stirling Road Priority.

**Year of Assessment**

7.3.17 A year of opening assessment of 2020 was based on all development being operational in accordance with Transport Assessment Guidance 2012. Given the short lead in time between the surveyed flows to the baseline and year of assessment, it was agreed that growth would not need to be applied to the surveyed flows.

**Assessment Period**

7.3.18 The assessment periods for the proposed development are:

- Weekday AM Network Peak (08:00-09:00);
- Weekday PM Network Peak (16:30-17:30); and
- Weekend/ Saturday Network Peak (15:15-16:15).

**Trip Generation**

7.3.19 Trip generation has been based on the use of the TRICS V7.4.4 database for all proposed development land uses, with exception of the Iconic Visitor Attraction (IVA) and Woodland
Visitor Attractions, for which a bespoke trip arrivals and departures profile was produced for both the weekday and weekend.

**Trip Distribution**

7.3.20 Development trips have been assigned to the network on the basis of the existing turning proportions of vehicles on the network. This was considered to be the most robust approach given the nature of trips associated with the existing activities at: Old Luss Road; Loch Lomond Shores; Pierhead; and the West Riverside car park (to become Zone A Station Square) and adjacent to WDC/ SUSTRANS planned Station Square Proposals.

**Junction Analysis**

7.3.21 Junction capacity assessments have been undertaken using industry standard software PICADY, for priority junctions and ARCADY, for roundabouts junctions.

7.3.22 Each junction included in the extent of assessment has been assessed during the Weekday AM and PM peak and Weekend (Saturday) peak under the following conditions: 2020 Baseline Traffic Flows; and 2020 Baseline + West Riverside & Woodbank House Development Traffic Flows.

7.3.23 The ARCADY and PICADY computer models can split the peak period under consideration into a series of 15-minute time segments in order to simulate the likely arrival pattern of traffic more effectively. Research indicates that the peak Ratio to Flow Capacity (RFC) values returned in any individual peak (i.e. the peak capacity and corresponding queue results) are likely to be observed over the central 15-30 minute period for the hour.

7.3.24 RFC values between 0.00 and 0.85 are generally accepted as representing stable operating conditions, values between 0.85 and unity represent variable operation (i.e. possible queues building up at the junction during the period under consideration and increases in vehicle delay moving through the junction). RFC values in excess of unity represent possible congested conditions.
7.4 Assessment Methodology

Guidance

7.4.1 The assessment of the likely significant transport effects has been undertaken using established methodologies and has concentrated on examining the capacity of relevant local transport infrastructure to accommodate the proposed development. It has been undertaken in accordance with the guidance set out within the Institute of Environmental Assessment (IEA) document ‘Guidelines on the Environmental Assessment of Road Traffic (Guidance Note 1)’, 1993.

7.4.2 In line with IEA guidelines, further assessment will be undertaken on:

- Road links where traffic flows will increase by more than 30% (or the number of HGVs will increase by more than 30%);
- Any specifically sensitive areas where the traffic flows have increased by 10% or more; and

7.4.3 Any non-road based transport infrastructure (e.g. national cycle roads) where likely effects from the proposed development have the potential to be significant.

Effect on Pedestrians

Severance

7.4.4 Severance is defined as the perceived division that can occur within a community when it becomes separated by a major traffic artery and describes a complex series of factors that separate people from places and other people. Such division may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself.

Pedestrian & Cyclist Delay

7.4.5 The IEMA guideline note that changes in the volume, composition and or speed of traffic may affect the ability of pedestrians and cyclists to cross the roads. Typically, this increase in traffic levels result in increased pedestrian and/ or cyclist delay, although increased pedestrian and cycle activity also contributes. The guidelines do not set any thresholds, recommending instead that assessors use their judgement to determine the significance of effect.

Pedestrian & Cyclist Amenity

7.4.6 Pedestrian and cyclist amenity is defined as the relative pleasantness of a journey which, as with pedestrian and cyclist delay, is affected by traffic volumes and composition along with foot and cycle way width and pedestrian and cyclist activity. The guidelines suggest tentative thresholds of significance would be where the traffic flows are doubled or halved.

Fear and Intimidation

7.4.7 The IEMA guidelines note that a further effect of traffic may have on pedestrians is fear and intimidation, the impact of which is dependent on volumes of heavy vehicular traffic, its proximity to people or a lack of protection caused by such factors as narrow pavements.

Effect on Road Users

Driver Delay

7.4.8 The IEMA guidelines note that driver delay to non-development traffic can occur at several points on the network, although the effects are only likely to be significant when the traffic on the road network is predicted to be at or close to the capacity of the system: typically during commuter periods. Values for delay are determined through ARCADY, PICADY and LINSIG junction modelling software to obtain detailed output on a range of traffic parameters including flows and average delay.
Accidents and Safety

7.4.9 IEMA guidelines do not include any definition in relation to accidents and safety, suggesting that professional judgement would be needed to assess the implications of local circumstances, or factors which may increase or decrease the risk of accidents.

Assumptions and Limitations

7.4.10 The limitations of the TA methodology are:

- Trip generation rates have been taken for proposed development land uses operating as individual entities, and do not account for shared trips either between the existing and proposed land uses or the newly proposed land uses. Trip-sharing will occur and so the TA is robust in traffic impact terms, but may overestimate the effects on receptors;

- The full extent of development traffic trips has been assessed in a 2020 scenario and, as such, represents a worst-case assessment scenario. A future operational year of assessment could be anticipated to have higher baseline flows, against which the % impact of development traffic trips would be lessened. As above, this adds to the robustness of the TA in traffic impact terms, but may overestimate on receptors; and

- The TA assumes a routing strategy for all development traffic trips which is based on the principles of making best use of the road hierarchy and seeking to minimise through-traffic trips in the village of Balloch. Whilst the external network routing is likely to be applicable in the future, the internal network and routing strategy may change in the future to account for refinement of the proposed parking locations and an associated internal access strategy. As such, this assessment may over or under-estimate the effects on receptors on internal/access routes to the site.

Establishment of Effect Significance

7.4.11 Potential and residual effects will be defined in accordance with Table 7.1.

<table>
<thead>
<tr>
<th>Nature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficial</td>
<td>Meaning that they are expected to produce environmental benefits in transportation terms, i.e. where overall traffic flows or percentage HGV movements decrease, or there are improved facilities for pedestrians, cyclists or public transport users;</td>
</tr>
<tr>
<td>Negligible</td>
<td>Meaning that expected changes are too small to meaningfully measure, i.e. where changes in flows are typically less than 10%; and</td>
</tr>
<tr>
<td>Adverse</td>
<td>Meaning that they are expected to produce environmental disbenefits in transportation terms, e.g. where overall traffic flows or percentage HGV movements increase, or there are reductions in facilities for pedestrians, cyclists or public transport users.</td>
</tr>
</tbody>
</table>

7.4.12 Beneficial and adverse effects will be further characterised in accordance with Table 7.2

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>Slight very short or highly localised changes of no significance and/or where changes in traffic flows/patterns are between 10% and 30%;</td>
</tr>
<tr>
<td>Moderate</td>
<td>Limited change by extent, duration or magnitude which may be considered significant and/or where changes in traffic flows/patterns are between 30% and 60%; and</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Major</td>
<td>Considerable change by extent, duration or magnitude of more than local significance or in breach of recognised acceptability, legislation, policy or standards, and/or where changes in traffic flows/patterns are greater than 60%.</td>
</tr>
</tbody>
</table>

7.4.13 Where predicted increases in traffic flows are lower than the percentage based thresholds, the IEMA guidelines suggest that the significance of effects can be stated to be low or insignificant and further detailed assessments are not required.

**Approach to Cumulative Impact Assessment**

7.4.14 A separate cumulative assessment is not being provided for traffic, transport and access due to agreement with WDC Road Officers that committed development flows were not required for the TA.
7.5 Baseline Conditions

Pedestrian Facilities

7.5.1 The proposed development site is accessible by foot along the existing main vehicular access routes to the site, as well as the NCN 7 towpath along the western side of the River Leven and west bank of the site, dedicated pedestrian routes through Lomond Shores and the footways and links to the John Muir Way. This section considers the following routes:

- Pier Road;
- Ben Lomond Way;
- Lomond Shores Internal Routes;
- Old Luss Road; and
- John Muir Way.

Pier Road

7.5.2 Pier Road is an un-adopted private road providing primarily vehicle access to the Pierhead area (northern extents) of the proposed development site, where there is an operational slipway into Loch Lomond. As such, this route provides for functional access to the slipway and associated activities and, whilst a relatively direct route from Balloch into the site, the lack of footways on the route combined with dense brush and tree cover, is such that it has limited function as a walking route due to perceived safety and security issues. There is no lighting provided on this route, with the exception of the southerly extents adjacent to a handful of residential properties and the interface with Balloch Road.

Ben Lomond Way

7.5.3 Ben Lomond Way is the main vehicular access route into the Lomond Shores site from the western extents of the West Riverside component of the site. It provides an “Avenue-esque” connection from Balloch Road into Lomond Shores, as a function of strong landscaping defined by Beech hedges and a tree-lined, remote pedestrian route into Drumkinnon Woods and further north into the immediate Lomond Shores site. This is a well-lit, circa 2m wide pedestrian route and is favoured by many local people accessing the site and/or the network of informal woodland trails through Drumkinnon Woods. This route links continuously with footways on Balloch Road and, whilst there are no controlled pedestrian crossing points, there is a dedicated, dropped-kerb with tactile paving to the east of Ben Lomond Roundabout. Further, there is a dedicated crossing location on Ben Lomond Way itself, just north of Ben Lomond Roundabout, providing continuous pedestrian access to Old Luss Road (north and south).

Loch Lomond Shores Internal Routes

7.5.4 Much of the Lomond Shores site is pedestrianised and facilitates movements on foot for all nature of users through large areas of the site. The main pedestrianised areas, remote from vehicular routes, include: around the “bay” and beached area to the west of the Pierhead area; to the rear and frontage of the commercial units; the route which skirts the north-western boundary of the car park and connects to Old Luss Road to the west; and a network of raised boardwalk paths through woodland to the north of the Lomond Shores main area.

7.5.5 Notwithstanding the boardwalk paths, the main pedestrianised areas are generally wide and well surfaced and capable of accommodating a reasonable volume of two-way pedestrian flow. These are also well lit. At a minimum, for example to the rear of the retail units, the footway is circa 2m wide.

7.5.6 The boardwalk paths through the woodlands to the north of the site are raised walkway of circa 2m wide and textured to avoid slipping hazards. Some of the routing is tight and angular, but provide reasonable opportunity for passing.

7.5.7 Ben Lomond Way – internal to the Lomond Shores area – provides a continuous 2m footway along the southern side of the road, connecting the Ben Lomond Way/ Lomond Shores access roundabout with the Pierhead area of the site, and Pier Road. The route is lit on the northern side, where there is no continuous footway, albeit sections of the route are paved on the north side to facilitate access into the main pedestrianised area from a coach drop off area and a
layby for disabled-users drop-off. CCTV security cameras are located on the route and orientated on the link into the main pedestrianised area of Lomond Shores and the service access area.

7.5.8 A dedicated, pedestrian crossing with barriers on the approach to the carriageway, is located to the south west of the commercial units, to allow onward connection to Drumkinnon Woods and the main entrance footway in to the site, on Ben Lomond Way.

**Old Luss Road**

7.5.9 Old Luss Road is located to the east of the Woodbank House site and to the south of the Lomond Shores area. Access from Lomond Shores to Old Luss Road is provided by the internal remote pedestrian footway to the north of the Lomond Shores car park: wooden bollards prevent vehicle access from Old Luss Road. Old Luss Road provides for onward pedestrian connections to the west towards the more rural Upper Stoneymollan and John Muir Way and, to the east, the suggested cycling section for the John Muir way.

7.5.10 The low volumes of traffic on the route, as a result of a “no-through-route” to vehicles to the north, gives rise to the route being used as a pedestrian link between Balloch and Cameron House and Duck Bay Marina to the north. A continuous footway is provided on the eastern side of the road, albeit foliage growth and lack of maintenance, is such that this largely overgrown and rough underfoot. This is not noted to be a deterrent to pedestrians who continue to make use of the relatively wide and reasonably surfaced carriageway, for walking (and cycling). There is no street lighting along the section of route between the Lomond Shores site and where the carriageway terminates to the north.

7.5.11 The southern extents of Old Luss Road provide reasonable quality, circa 2m wide and lit footways connecting to Ben Lomond Road Roundabout and Ben Lomond Way on the east. Lighting is more extensive on the east side of Old Luss Road, but with some lighting provision on the west side at the more southerly extents of the road.

**John Muir Way**

7.5.12 The John Muir Way is a coast to coast predominantly rural route for walkers (and cyclists) which stretches 134 miles between Helensburgh in the west, through to Dunbar on the east coast of Scotland. The route is divided into 10 sections, with the Helensburgh to Balloch and Balloch to Strathblane sections, being of relevance to the proposed development site.

7.5.13 The John Muir Way comes into the proposed development site’s area of influence, via Upper Stoneymollan, over the A82 footbridge and linking to a single-track access road which skirts the southern boundary of the Woodbank House site. At the interface of this route with Old Luss Road, walkers are signed north towards the pedestrian link from Old Luss Road in to the Lomond Shores site. Thereafter, the route follows the internal pedestrian routes of Lomond Shores towards the west bank of the River Leven and follows this route south to Balloch Bridge. From here the route enters Balloch Castle Country Park on the east bank of the River Leven and meanders north and eastwards through Boturich, intercepts the A811 Stirling Road, and on towards Auchencarroch Road (providing connections to Gartocharn, Croftamie and Drymen).

**Cycling Facilities**

**NCN Route 7**

7.5.14 National Cycle Network (NCN) Route 7 links Sunderland in England to Inverness in the north. The 601 mile route in its entirety forms part of the wider Lochs & Glens (north) cycle route which passes through two national parks - Loch Lomond & The Trossachs and Cairngorms. The route leaves Glasgow by following the River Clyde to Dumbarton and then heads to Inverness via Aberfoyle, Callander, Killin, Pitlochry, Kingussie, Aviemore and Carrbridge.

7.5.15 In relation to the proposed development side, NCN Route 7 follows the west bank of the River Leven and approaches the proposed development site from the south, via Sweeney’s Cruises adjacent to Balloch Bridge. There is a main dedicated path – shared with walkers – but an alternative meandering unsurfaced route, which takes cyclists adjacent to the west river bank, through trees and scrub. This links directly to the Pierhead area and onwards to Loch Lomond Shores main.
West Loch Lomond Cycle Way

7.5.16 The West Loch Lomond Cycle Way starts at the Visit Scotland Visitor Centre in Balloch, adjacent to Balloch Bridge and Sweeney’s Loch Cruises. It’s an “easy” waymarked route suitable for most abilities of cyclist and follows part of the John Muir Way, along the west river bank of the proposed development site area. From the Pierhead area, cyclists are directed through the off-road shared pedestrian routes through Lomond Shores and west wards to Old Luss Road via the wide remote foot and cycleway to the north of the car park. From Old Luss Road, cyclists are directed along a route which skirts Loch Lomond side and, from Arden roundabout can continue adjacent to the A82 (off-road) or through an alternative route through the Carrick Golf Course. A short on-road section through the former Luss access road, takes cyclists through to Luss, thereafter, the route remains off-road as far north as Tarbet.

General Cycle Network

7.5.17 There are no other dedicated off-road cycle routes within the local urban area. Given the nature of the location and relatively low number of pedestrians, most routes highlighted above for the pedestrian environment will be used by both walkers and cyclists, with mutual acceptance of users on both parts. On-road cycle routes are limited, noting that the approach to the pedestrian crossing facility on Ben Lomond Way, appears to dedicate both lanes of the carriageway, to cycle priority. This is not noted elsewhere in the area and is therefore assumed to have been provided on the basis of this section of route being provided primarily for service vehicle access (and, potentially, relatively lower levels of vehicles). There is no continuum of this route noted elsewhere on the local network.

7.5.18 In the wider locality, including John Muir Way to the west and off-road routes through Whinny Hill Woods and Boturich to the east, routes are generally used by both walkers and cyclists – particularly, local mountain bikers and leisure cyclists.

7.5.19 Cyclists are able to use the recommended walking route for the John Muir Way as described above, however, an alternative cycling section is suggested on the Section 1 route maps which follows the NCN Route 7 trail. This remains an off-road section and directs cyclists towards the Cross Keys roundabout on the B832, and then east to Arden Roundabout (A82). Here the route links with a shared foot and cycle way, which skirts the A82, the west bank of Loch Lomond and continues south to link with Old Luss Road. From here, cyclists and walkers, can tie back into the dedicated route at Lomond Shores and continue west and south.

Public Transport

Balloch Railway Station

7.5.20 Balloch railway station is located approximately 100 metres to the south of the proposed development on Tullichewan Road. The station can be accessed via the established footpaths in the surrounding area. Sheltered cycle storage is available with 22 bicycle parking spaces. On-street parking is available from Tullichewan Road.

7.5.21 Train services run half hourly on Monday to Saturday from Balloch to Airdrie via Glasgow Queen Street and Singer. Sunday services run via Yoker and Glasgow Central and then alternately to Motherwell via Whifflet and to Larkhall on an hourly basis.

7.5.22 Table 7.3 provides a summary of existing train services at Balloch Rail Station.

Table 7.3 Train Services Summary

<table>
<thead>
<tr>
<th>Service</th>
<th>Destination</th>
<th>Journey Time (minutes)</th>
<th>Frequency (Services per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday to Saturday</td>
<td>Glasgow Queen Street</td>
<td>47</td>
<td>2</td>
</tr>
<tr>
<td>Monday to Saturday</td>
<td>Airdrie via Glasgow Queen Street</td>
<td>74</td>
<td>2</td>
</tr>
<tr>
<td>Sunday</td>
<td>Glasgow Central</td>
<td>48</td>
<td>2</td>
</tr>
<tr>
<td>Service</td>
<td>Operator</td>
<td>Route</td>
<td>Nearest Bus Stop</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>1 (The One)</td>
<td>First Greater Glasgow</td>
<td>Balloch Glasgow Centre – City</td>
<td>Balloch Bus Terminus</td>
</tr>
<tr>
<td>206</td>
<td>First Glasgow</td>
<td>Balloch - Westcliff</td>
<td>Balloch Bus Terminus</td>
</tr>
<tr>
<td>207</td>
<td>McColl’s</td>
<td>Balloch - Bonhill</td>
<td>Loch Lomond Shores</td>
</tr>
<tr>
<td>305</td>
<td>Garelochhead Minibuses and Coaches</td>
<td>Alexandria - Luss</td>
<td>Loch Lomond Shores</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luss - Alexandria</td>
<td>Loch Lomond Shores</td>
</tr>
<tr>
<td>309</td>
<td>McGill’s</td>
<td>Old Bonhill - Balmaha</td>
<td>Balloch</td>
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<tr>
<td></td>
<td></td>
<td>Balmaha - Bonhill</td>
<td>Loch Lomond Shores</td>
</tr>
<tr>
<td>316A*</td>
<td>Garelochhead Coaches</td>
<td>Coulport Alexandria</td>
<td>Loch Lomond Shores</td>
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<tr>
<td>Service</td>
<td>Operator</td>
<td>Route</td>
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<tr>
<td>---------</td>
<td>----------</td>
<td>-------</td>
<td>------------------</td>
</tr>
<tr>
<td>863**</td>
<td>First Greater Glasgow</td>
<td>Balloch Dumbarton</td>
<td>Haldane, Balloch</td>
</tr>
<tr>
<td>874***</td>
<td>First Greater Glasgow</td>
<td>Balloch Dumbarton</td>
<td>Balloch Bus Terminus</td>
</tr>
</tbody>
</table>

* Service from Coulport – Loch Lomond Shores (LLS) arrives at 0755 Monday – Friday and service from Garelochhead – Loch Lomond Shores arrives at 0855 on Saturday.

** Four morning services from Dumbarton – Balloch (Monday – Friday) and four evening services from Balloch – Dumbarton (Monday – Friday).

***Morning services only run from Dumbarton – Balloch (Monday – Sunday) whilst evening services only run from Balloch – Dumbarton (Monday – Saturday).

**Vehicular Access**

7.5.24 This section outlines the strategic and local vehicular access routes to the site. They include:

**A82 Trunk Road**

7.5.25 The A82 runs north – south and is one of two trunk roads through the National Park which is managed by Transport Scotland and therefore is one of the main access routes to the site. It provides access from the centre of Glasgow to Inverness via Fort William. For the most part, this route has a 60 mph speed limit. In addition, there are proposals in place to upgrade the section between Tarbet and Inverarnan which aims to reduce congestion and improve traffic flows. The National Park states that travel from central Glasgow would take approximately 40 minutes using the A82.

**A811 Stirling Road**

7.5.26 In addition to the A82, this trunk road provides key access through the National Park. It links Stirling in the east to the A82 in the west at Balloch, via Drymen. As a result, it provides a connection north to Perth, Dundee and Aberdeen. Generally, the speed limit is 60 mph. The National Park notes that car journeys from Stirling are approximately 50 minutes using this route.

**B857 (Renton Road / Bank Street / North Main Street / Luss Road)**

7.5.27 The B857 connects the A82 in the south to the A811 Stirling Road in the north, running through Renton, Alexandria and Balloch parallel to the A82 and A813. As a result of its built-up surroundings, the B857 has a speed limit of 30 mph with 20mph speed limits in place adjacent to main school routes.

**Carrochan Road (A813)**

7.5.28 The A813 links the A82, north of Dumbarton at Bellsmyre, to Drymen Road in Balloch crossing the A811. It runs north – south on the east side of the River Leven, parallel to the A82 and B857. The speed limit on this route is predominantly 40 mph speed limit, with sections of 30 mph in built-up areas.

**Balloch Road / Drymen Road**

7.5.29 This road runs east – west, parallel to the A811 Stirling Road, through Balloch from A811 Stirling Road in the east to the roundabout with Old Luss Road / Ben Lomond Way in the west, crossing River Leven. It has a speed limit of 30 mph.
Ben Lomond Way

7.5.30 This route provides access to the Loch Lomond Shores site from the northern arm of the roundabout with Old Luss Road / Ben Lomond Way and has a speed limit of 30 mph. It runs north west from the roundabout to an internal roundabout at Loch Lomond Shores which provides access to the main car parks, before running north east towards Balloch Pier.

Pier Road

7.5.31 This is a private adopted road which runs northwards from Balloch Road to Ben Lomond Way. Signage at the Balloch Road junction states that, due to its private status, “Vehicles using this road do so at their own risk”.

Existing Traffic Flows

7.5.32 Table 7.5 below provides a summary of the observed 2017 and estimated 2020 Base Flows for the local and strategic road network. The flows are the same across both scenarios as background traffic growth was not applied, nor committed development flows given the negligible flows associated with any minor local developmental changes.

Table 7.5 2017/2020 AADT Base Flows

<table>
<thead>
<tr>
<th>Location</th>
<th>Two-Way Flows (All Vehicles)</th>
<th>HGV’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>A811 (East of Stoneymollan Roundabout)</td>
<td>16,542</td>
<td>9%</td>
</tr>
<tr>
<td>Old Luss Road (South)</td>
<td>9,375</td>
<td>7%</td>
</tr>
<tr>
<td>Ben Lomond Way</td>
<td>2,661</td>
<td>10%</td>
</tr>
<tr>
<td>Balloch Road (South)</td>
<td>4,958</td>
<td>8%</td>
</tr>
<tr>
<td>Pier Road</td>
<td>292</td>
<td>10%</td>
</tr>
<tr>
<td>Balloch Road (Balloch Bridge)</td>
<td>4,070</td>
<td>23%</td>
</tr>
<tr>
<td>Stirling Road (A811)</td>
<td>6,009</td>
<td>19%</td>
</tr>
<tr>
<td>A813 Carrochan Road (South)</td>
<td>8,079</td>
<td>7%</td>
</tr>
<tr>
<td>A811 (Lomond Bridge)</td>
<td>12,777</td>
<td>9%</td>
</tr>
<tr>
<td>Luss Road</td>
<td>12,427</td>
<td>9%</td>
</tr>
<tr>
<td>A82 (North of Stoneymollan Roundabout)</td>
<td>20,090</td>
<td>12%</td>
</tr>
<tr>
<td>Old Luss Road (North)</td>
<td>242</td>
<td>13%</td>
</tr>
</tbody>
</table>

7.5.33 The development site and its proposed access routes are integral to the existing commercial, retail and leisure development at Loch Lomond Shores, as well as access to the Loch Lomond (Pierhead) slipway and Maid of the Loch.
Existing Accident Data

7.5.34 Crashmap data was interrogated to provide a 5 year summary of the accident history on the local and strategic road network, within the scope of the proposed development site.

Figure 7.1 Crashmap Data

7.5.35 Figure 7.1 above, indicates that five year accident data demonstrates a spread of slight accidents on the local road network, which can be disaggregated to the following receptors as:

- Old Luss Road (South) – one reported slight incident on the approach to the A811/ Lomond Road roundabout (Lomond Roundabout);
- Ben Lomond Way – no reported incidents;
- Balloch Road (South) – no reported incidents;
- Pier Road – no reported incidents;
- Balloch Road (Balloch Bridge) – three slight incidents are within close-proximity of the pedestrian crossing, railway station and tourist information on Balloch Road (South) and this area is heavily conflicted as a result of competing pedestrian and vehicular demands, as well as a nearby taxi rank, local leisure and retail amenities;
- Stirling Road (A811) – two slight incidents including one on approach to the Lomond Road Roundabout;
- A813 Carrochan Road (South) – two slight incidents are within close proximity to existing residential access points and the A813 Carrochan Road/ A811 Stirling Road;
- A811 (Lomond Bridge) - three slight accidents are dispersed over this link, which suggest driver behaviour/ error as opposed to locational characteristics and constraints are an issue;
- Luss Road - three slight incidents are clustered around an area of Old Luss Road (South) where there are a number of conflict points adjacent to a pedestrian crossing, bus laybys in proximity and two large residential estates;
- A82 (North of Stoneymollan) – three serious incidents reported on the approach from the north to the Stoneymollan Roundabout, albeit more remotely. This section of route is notorious for queuing and delay as a result of exceptionally heavy traffic volumes, which may have contributed to the incidents and propensity for occurrence in this location; and
- Old Luss Road (North) – no reported incidents.

7.5.36 Notwithstanding the noted incidents for the links above, the A82 Stoneymollan Roundabout – all approaches and circulatory, and Lomond Road Roundabout (A811/ Old Luss Road (South)) particularly on the A811 and Old Luss Road (South) approaches/ exits, all have a higher
incidence of slight accidents. These are likely attributed to higher circulatory speeds, driver error and the higher volume of traffic on these links and junctions generally. The area is also expected to experience a higher prevalence of visitors to the area, who are less familiar with the network and routing/destination points which may be a contributory factor.

**Water-Based Transport**

7.5.37 The Waterbus service operates on Loch Lomond and Loch Katrine, offering ten services which are used by cyclists and walkers. The Park offers this as a sustainable alternative to the car which can enhance the visitor experience. There is potential to develop upon the success of the Waterbus with the opportunity to enhance integration as part of a wider tourism and/or access strategy.

7.5.38 Loch Lomond services offer alternative connections between Balloch, Luss, Balmaha and Tarbet amongst others. Generally, these run between April and October, although seasonality varies between services.

**Summary of Receptor Sensitivity**

7.5.39 The sensitivity of receptors has been defined as follows:

- **Low** – receptors which are lightly used (by all users or particularly by vulnerable road users) relative to other receptors within the study area;
- **Medium** – receptors which are used (by all users or particularly by vulnerable road users) to a roughly average level relative to other receptors within the study area; and
- **High** – receptors which are heavily used (by all users or particularly by vulnerable road users) relative to other receptors within the study area.

7.5.40 Significance criteria are determined through referencing magnitude of change with sensitivity of receptors. The significance of traffic change varies depending upon the environmental impact criteria being considered.

7.5.41 The receptors considered in this assessment include those people making journeys within the relevant study area (or links) for each mode, and include those travelling by that mode, or travelling by other modes affected by the mode in question, on the following links:

- Old Luss Road (South) – medium sensitivity for all users;
- Ben Lomond Way – low sensitivity for all users;
- Balloch Road (South) – low sensitivity for all users;
- Pier Road – low sensitivity for all users;
- Balloch Road (Balloch Bridge) – low sensitivity for all users;
- Stirling Road (A811) – low sensitivity for all users;
- A813 Carrochan Road (South) – low sensitivity for all users;
- A811 (Lomond Bridge) – low sensitivity for all users;
- Luss Road – medium sensitivity for all users;
- A82 (North of Stoneymollan) – low sensitivity for all users; and
- Old Luss Road (North) – low sensitivity for all users.

**7.6 Baseline Evolution**

7.6.1 Baseline traffic, transport and access conditions at the development site are expected to remain as per the existing situation, without the development proposals. The development site is integral to a wider existing commercial, retail and leisure development, which is anticipated to operate as per the status quo, without development intervention.
7.7 Embedded Mitigation

7.7.1 As detailed in Chapter 3 – The Proposed Development, a number of design features and embedded mitigation measures have been incorporated into the design and construction of the proposed development to avoid, prevent or minimise significant adverse environmental effects and to enhance beneficial effects. Embedded mitigation measures of relevance to this assessment are:

Construction Phase

7.7.2 The embedded mitigation measures incorporated within the proposed development are as follows:

Construction Environmental Management Plan (CEMP):
- 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 other measures to be included in the CEMP would be identified as ‘further mitigation’ (not embedded) through the EIA;
- Any construction activities within a 5m strip along waterfronts will be subject to specific consideration within a CEMP to be agreed with the NPA prior to commencement; and
- Adoption of standard construction industry working hours for noise generating activities.

Operational Phase

7.7.3 The embedded mitigation measures incorporated within the proposed development are as follows:

Design & Form-Based Mitigation
- It is intended that the proposed development will be fully accessible by sustainable modes of transport. The existing pedestrian and cycle network as it exists through the West Riverside site will be retained and enhanced as necessary to provide full connectivity to the wider network as well as all new internal elements of the site. The site will benefit from increased uptake of sustainable modes over the use of the private car, and it is anticipated that walking and cycling will be the go-to-mode of choice for those visitors using the woodland lodges and overnight accommodation: by leaving their cars remote from the lodges, it is hoped this will reduce any unnecessary internal car trips;
- Bike hire is proposed as part of the Station Square and enhanced Tourist Information Office offering, which will further support internal movements by bike;
- Whilst the internal layout requires to be developed further as part of subsequent detailed design stages, it is intended that the existing cycle and walking routes will be widened to SUSTRANS standards for shared walking and cycling routes, where this is practicable to do so;
- Throughout the Station Square, Riverfront and Drumkinnon areas, the existing path network including the John Muir Way will be retained and enhanced as appropriate, albeit some relocating of certain sections may be required. It is expected that discussions will be held with SUSTRANS when the detail of these routes is considered. The existing north-south foot and cycle paths through the Riverfront Zone, will be enhanced with a series of east-west paths increasing access opportunities between Pier Road and the Riverfront area;
- The existing foot and cycle way from Loch Lomond Shores to Old Luss Road will be extended to provide a shared foot and cycle way, compliant with technical standards, on the north (development) side of the road, providing a direct walking and cycling link between the two sites;
From the Woodbank House site, which is intended to be configured in accordance with Designing Streets Principles and will provide a continuous internal path network, a direct foot and cycle link will be provided to the Upper Stoneymollan Road/ John Muir Way; and

A signage and wayfinding strategy will be developed for the wider site, once clarification on the preferred parking locations for site-based activities and land uses are confirmed. It is expected that a combination of enhanced signage and Variable Message Signing (VMS) will need to be installed at key approaches to the site from both the strategic and local road network, as well as internally within the site, to ensure effective vehicular movement for internal destinations and appropriate directions to the relevant car parking areas.

7.8 Potential Effects

7.8.1 This section describes the potential effects associated with the development proposals in relation to construction and operational traffic.

Construction Phase

7.8.2 The transport, traffic and access impacts arising as a result of the proposed development are considered to be negligible as a result of incorporating the CEMP embedded mitigation. Moreover, the development will be built-out in discrete phases such that individual sections of the site will be subject to the effects of construction traffic at any one time. The scale of the effect of the development is minor negligible.

Operational Phase

7.8.3 Table 7.6 below includes a summary of the potential number of vehicular trips associated with the completed development proposals based on the trip rates described in detail in the Transport Assessment.

7.8.4 The flows represent the number of external trips generated by the site and do not include any reductions for internal trips i.e. trips shared between different land uses and working and living within the site.

Table 7.6 Estimated Number of Two-Way External Development Daily Trips

<table>
<thead>
<tr>
<th>Development</th>
<th>Two-Way Daily Vehicular Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weekday</td>
</tr>
<tr>
<td>West Riverside &amp; Woodbank House</td>
<td>12,954</td>
</tr>
</tbody>
</table>

7.8.5 Table 7.7 below provides a summary of the potential changes in traffic on the local road network once the proposed development is fully operational.

Table 7.7 2020 AADT With Development Flows

<table>
<thead>
<tr>
<th>Location</th>
<th>Two-Way Flows (All Vehicles)</th>
<th>HGVs</th>
<th>% Over Base</th>
<th>Change 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>A811 (East of Stoneymollan Roundabout)</td>
<td>18,072</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Old Luss Road (South)</td>
<td>11,679</td>
<td>7%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Ben Lomond Way</td>
<td>4,783</td>
<td>10%</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Balloch Road (South)</td>
<td>7,128</td>
<td>8%</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>Pier Road</td>
<td>2,403</td>
<td>10%</td>
<td>723%</td>
<td></td>
</tr>
</tbody>
</table>
7.8.6 Noting the % change in traffic from the baseline 2020 to the baseline with development flows and in accordance with the IEA guidelines, the following links will not be subject to further assessment:

- A811 (East of Stoneymollan Roundabout);
- Balloch Road (Balloch Bridge);
- Stirling Road (A811);
- A813 Carrochan Road (South);
- A811 (Lomond Bridge);
- Luss Road; and
- A82 (North of Stoneymollan Roundabout).

7.8.7 The impacts on the roads listed above are less than 10% and, as such, traffic flow impacts are considered negligible. The scale of the effect of the development on the above links is minor negligible.

7.8.8 Old Luss Road (South) will experience an uplift in AADT flows by 25% as a result of the development traffic, but this remains less than the IEA guidelines requirement of a 30% increase in traffic warranting further assessment. As such, this route will not be considered further. The scale of the effect of the development is minor adverse.

7.8.9 Noting the % change in traffic from the baseline 2020 to the baseline with development flows and in accordance with the IEA guidelines, the following links will be subject to further assessment:

- Ben Lomond Way;
- Balloch Road (South);
- Pier Road; and
- Old Luss Road (North).

**Effect on Pedestrians and Cyclists**

7.8.10 With the exception of Balloch Road (South) which experiences a 44% uplift in traffic flow as a result of the development, Ben Lomond Way, Pier Road and Old Luss Road (North) constitute the three main access routes into the site.

7.8.11 Balloch Road (South) is a link between the Pier Road and Ben Lomond Way access points, within which there is anticipated to be a 44% increase in the traffic flow as a result of the development proposals. The uplift should be tempered against the negligible uplift of 7% increase in traffic flow over Balloch Road (Balloch Bridge) which is sited just east of Balloch.
Road (South), and demonstrates that the proposed access arrangements and routing strategy are “achieving” what was originally intended: that traffic would be directed onto the appropriate road hierarchy as far as reasonably practicable and avoid additional traffic through the main Balloch Village. In effect, the traffic impacts have been “directed” to Balloch Road (South) to optimise ease of access to the trunk road network, and reduce impacts across the wider Balloch village. This is considered to be a moderate adverse effect with respect to traffic volume, although given WDC’s longer term ambitions to reconfigure this area of road, and noting that other “exit” links from the development site exist in the form of Tullichewan Road, the actual and perceived issues for pedestrians and cyclists are not considered to be notably impacted upon by the increase in flows. The scale of the effect of the development is minor adverse.

7.8.12 Old Luss Road (North) experiences a 51% uplift in traffic flow as a result of the development, but the existing nature of the road as a quiet, predominantly residential/rural no-through-route, is such that the increase in flows are noted as a moderate adverse effect. The % impact is considered moderate, despite the modest levels of development that will be accessed from Old Luss Road. At present, whilst the section of Old Luss Road (north beyond the existing Loch Lomond Shores pedestrian access) is used for walking to Cameron House, Duck Bay and beyond, the area fronting the development site is not particularly conducive to walking and cycling as a result of poor lighting and lack of appropriate footways on either side of the carriageway. The development includes for provision of enhanced lighting, a connection will be provided between Loch Lomond Shores to Old Luss Road to provide a shared foot and cycle way, compliant with technical standards, on the north (development) side of the road, providing a direct walking and cycling link between the two sites and onwards to Balloch. Further, a connection will be provided within the Woodbank House site to the Upper Stoneymollan Road/John Muir Way, thereby enhancing the environment overall for pedestrians and cyclists. Increased ambient surveillance in the area as a result of additional residential properties, lends itself to improving actual and perceived personal security for walkers and cyclists. The scale of the effect of the development is moderate beneficial.

7.8.13 Pier Road experiences a 723% uplift in traffic flow as a result of the development proposals, however, this constitutes a new access road into the site and the very minimal existing AADT flows of 292 represent the very limited uses and operational function on the road at present. The road also has private status (is not adopted by the local authority) and as such, does not provide lighting and/or a dedicated footway. Pier Road is not presently conducive to walking and cycling and an overgrown and dense foliage environment and associated dark and damp conditions, do not contribute to personal safety and security nor encourage travel by sustainable modes. As such, general improvements to Pier Road combined with alternative and enhanced walking and cycling routes through the site and the new monorail, are such that even with the anticipated increases in traffic, there will not be a notable adverse effect on severance, pedestrian and cyclist delay or amenity. More so, the development proposals will enhance Pier Road in terms of access for vehicles, and pedestrians and cyclists will be able to make use of alternative optimal routes. On this basis, the potential effects can be considered as moderate beneficial in environmental, placemaking and movement terms. The scale of the effect of the development is moderate beneficial.

7.8.14 Ben Lomond Way is the existing main access to the existing Loch Lomond Shores and provides the most appropriate direct access route into the proposed development site, both in terms of its proximity and ready access to the wider local and strategic road network, as well as its current form with a remote pedestrian and cycle path to the east. Ben Lomond Way experiences an 80% uplift in traffic flow as a result of the development proposals which will see the AADT traffic flow rise from 2,661 to 4,783 on the road. This is considered to pose a major adverse effect in terms of traffic flow, albeit this is a preferential position to potentially higher vehicle flows on Balloch Road (South) which has frontage residential properties and is a gateway route into Balloch main village from the west.

7.8.15 The existing pedestrian environment immediately adjacent to Ben Lomond Way is considered to be of a reasonable standard and, in terms of pedestrian amenity, the existing foot and cycle way is remote from the carriageway with a tree-lined avenue-type environment. As such, other road users are largely removed from the immediate road network and the environment is likely to remain relatively pleasant for walkers and cyclists. In addition, there are a number of pedestrian crossing routes approaching Ben Lomond Way, for which a number of access options or routing variations is possible. Given the limited need to cross Ben Lomond Way, largely as a function of no attractors on the west side of the carriageway, the existing pedestrian...
environment is expected to prevail with limited effects on severance, fear and intimidation and pedestrian amenity. A crossing point exists on the southern end of Ben Lomond Way and the Queen of the Loch pub/restaurant, for which it is expected some severance and fear and intimidation impacts could be felt. Vehicle speeds are generally low in this area and will remain the case, if not lessened, by increased traffic volumes. It is suggested that pedestrian movements will require to be monitored incrementally as the development builds out in phases, to ascertain the trigger point for enhanced pedestrian crossing infrastructure. The scale of the effect of the development is minor adverse.

**Effect on Road Users**

7.8.16 Delay to drivers can be predicted through capacity assessments at key points on the local road network. The TA (Appendix E) includes detailed junction capacity assessment results for the access routes and network junctions within the scope of the TA and influence of the proposed development site. The detailed junction capacity assessments suggest that remedial junction measures are not required on the local or strategic road network as a result of the development proposals.

7.8.17 As discrete phases of development come forward for detailed development in conjunction with refinement of the parking management, access and routing strategy, then monitoring should be implemented to gauge the quantum of "actual" development traffic levels (over the assessments 'theoretical' basis) on key routes. This will allow any locational and route-specific interventions and mitigation to be more accurately tailored. The scale of the effect of the development is minor negligible.

**7.9 Further Mitigation and Enhancement**

**Construction Phase**

7.9.1 The further mitigation and enhancement measures incorporated within the proposed development are as follows:

**Construction Environmental Management Plan (CEMP):**

- 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 other measures to be included in the CEMP would be identified as 'further mitigation' (not embedded) through the EIA;
- Any construction activities within a 5m strip along waterfronts will be subject to specific consideration within a CEMP to be agreed with the NPA prior to commencement; and
- Adoption of standard construction industry working hours for noise generating activities.

**Operational Phase**

7.9.2 The mitigation measures incorporated within the proposed development are as follows:

**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. This would also include the provision of a Residential Travel Information Pack for the residential component of the site, which will be issued at point of occupation.

**Monorail**

- A monorail is incorporated into 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 proposed 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 Abellio 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:
  - 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.

Remote Lodge Accommodation 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.

7.10 Residual Effects

7.10.1 The residual effects arising from the development proposals following the implementation of the mitigation measures are described below:

Construction Effects

7.10.2 Appointed contractors would be required to implement strategies and work plans to minimise the potential effects of construction works on pedestrians, cyclists and drivers. Notwithstanding this, there would be negligible to short-term slight adverse residual effects (not significant) on pedestrians and drivers in terms of severance, amenity and delay due to construction activity.

Operational Effects

7.10.3 The embedded design and operational mitigation measures proposed would ensure that the potential traffic impact associated with the development proposals can be satisfactorily accommodated. Junction capacity assessments suggest that there would some slight delay and congestion on some junctions within proximity to the site, due to development traffic, albeit not so much as to warrant remedial action to the junctions to increase capacity. The ongoing management of the eventual operational Travel Plan for the site, as well as the careful monitoring of usage of walking, cycling and vehicular access routes, will help ensure that any ongoing interventions for access and parking management are evaluated. Where measures are gauged to less effective, then ongoing targets for improvement will help ensure appropriate
initiatives and interventions are undertaken. The scale of the effect of the development is concluded to be moderate beneficial (significant).

7.10.4 The increases in the AADT traffic flow as a result of the development proposals are initially considered to be moderate adverse at Balloch Road (South) and Old Luss Road (North), albeit the operational mitigation, in conjunction with WDC streetscape improvements schemes (Balloch Road) will assist in an enhanced walking and cycling environment generally and are therefore considered beneficial within the wider context of the development proposals. The scale of the effect of the development is concluded to be moderate beneficial (significant).

7.10.5 The increases in the AADT traffic flow as a result of the development proposals are initially perceived to be substantial adverse at both Pier Road and Ben Lomond Way, the two main access points into the main West Riverside site. Given the existing status of Pier Road as private, the uplift in traffic flows are initially perceived as being substantial, however, in the wider context of improvements to the existing function of Pier Road and the wider “movement” environment, the development proposals are considered to deliver a moderate benefit to the locality overall. The traffic impacts at Ben Lomond Way in terms of pedestrians and cyclists amenity are focused in an area of less sensitivity (limited residential area) as opposed to wider dispersal of more significant impacts on more sensitive residential and village centre areas. Further, monitoring of pedestrian and cycle movements on the key access routes will help identify trigger points for mitigation and/or intervention as detailed stages of the development are progressed. The scale of the effect of the development is concluded to be moderate beneficial (significant) at Pier Road, and minor beneficial (not significant) at Ben Lomond Way.

7.11 Monitoring of Residual Effects

7.11.1 Ongoing monitoring of traffic flows, and walking and cycling on the key access routes into the development should be undertaken during build-out and completion stages to ascertain the appropriate trigger level for additional interventions. These are likely to include provision of designated pedestrian and cycle crossings, albeit their requirement and preferred location, would be based on actual operational data as opposed to the current theoretical data. It is expected that internal parking and routing operations will evolve as the application progresses to the detailed stage, and as such it would currently be abortive to include additional and, potentially surplus, infrastructure at the present time.

7.12 Summary

7.12.1 As a result of the proposed development and design measures, the effects of the development on the surrounding local and strategic road network, are not anticipated to result in substantial adverse effects. The embedded and operational mitigation is anticipated to greatly expand and enhance the walking, cycling and public transport environment within the immediate site and within the wider Balloch village. This is anticipated to materially change the local “road focussed culture in the area, in conjunction with the WDC Balloch Village, Station Square and Road/streetscape proposals, which will see an uptake in the use of sustainable modes of travel within the local area more generally.

7.12.2 All construction traffic to and from the site will be controlled by a routing agreement which will ensure the correct road hierarchy is used and will prevent the use of residential roads by such vehicles, therefore resulting in a temporary slight adverse impact on road users, pedestrians and cyclists during this phase.

7.12.3 There would be increases in traffic flows within the Loch Lomond Shores/development site as a result of the development proposals, more noticeably on roads Old Luss Road (North), Ben Lomond Way, Balloch Road (South) and Pier Road, which constitute the main access roads and links into the site. The % increase in AADT flows as a result of development require to be put in context to the existing status quo, which lessens the overall impact to moderate on Balloch Road (South), Old Luss Road (North) and Pier Road. Ben Lomond Way requires to be subject to monitoring during the construction and operational phases, to determine any future requirement for associated intervention or mitigation to reduce pedestrian and cyclist delay and fear and intimidation. Increases elsewhere will be less noticeable and generally confined to peak periods.
7.12.4 Junction capacity impact assessments undertaken in the TA indicate that remediation and mitigation are not required to improve the capacity at local or strategic road junctions. Moreover, increasing capacity is understood to lead to an eventual increase in vehicles, which should be avoided wherever practicable.

7.12.5 The provision of the improved public transport, pedestrian and cycle routes through the site and to the surrounding areas of Balloch will, in conjunction with site-specific initiatives as well as the implementation of a Travel Plan and other ongoing Parking and Access Management strategies, potentially lead to an overall increase in the uptake and propensity of use for sustainable modes to the moderate benefit of all road users.

7.13 References

- Insight Warehouse (no date). [Viewed on 16/04/18] Available from http://crashmap.co.uk
8 Noise and Vibration

8.1 Introduction

8.1.1 This ES chapter provides an assessment of the likely significant effects on sensitive receptors as a result of road traffic noise.

8.1.2 The aims of this chapter are to:

- Identify the relevant context in which the noise assessment has been undertaken;
- Describe the methods used to undertake the assessment;
- Outline the relevant baseline conditions currently existing at the site and surroundings;
- Identify the potential direct and indirect noise effects of the proposed development;
- Identify mitigation and enhancement measures where required to address identified effects;
- Assess residual predicted effects; and
- Assess cumulative effects on sensitive receptors as a result of road traffic noise from the proposed development in combination with other relevant cumulative developments.

8.2 Technical Context

8.2.1 The purpose of the assessment is to identify and describe any likely significant effects arising from the proposed development. This chapter details the noise monitoring, modelling and the results of the impact assessment, which has been carried out for the proposed development.

8.2.2 This ES chapter is supported by the information provided in Appendices 5.1 (Drawings) and 5.2 (Technical Report).

8.3 Legislative and Policy Context

Legislation

8.3.1 Chapter 5 Planning Policy Context states the planning policy relevant to this EIA with regards to the proposed development. Full details of legislation and guidance relevant to the noise impact assessment is detailed in Technical Appendix 8.2: Noise Assessment. A summary of the relevant legislation, guidance and noise definitions used in this report is provided in this section.

Guidance and Relevant Technical Standards

8.3.2 The following definitions relating to noise are used in this report:

- $L_{Aeq}$,$T$: Equivalent continuous A-weighted sound pressure level. This is the single number that represents the average sound energy over that time period. It is the sound level of a notionally steady sound that has the same energy as a sound that fluctuates over a specified measurement period;
- $L_{A10}$,$T$: The noise level exceeded for 10% of the measurement period;
- Free-field: As sound propagates from the source it may do so freely, or it may be obstructed in some way by a wall, a fence, building, earth bund, etc. The former is known as free-field propagation;
- Façade Effect: When sound is reflected back towards its source, off a surface, such a wall, the reflected and incident sound waves interfere constructively, causing what is known as façade effect, or pressure doubling. This increases the noise, compared to that which exists in free-field, by approximately 3dB(A) for other sources;
- Octave: A range of frequencies whose upper frequency limit is twice that of its lower frequency limit; and
- **Octave Band**: Sound pressure level is often measured in octave bands, the centre frequencies of the bands are defined by ISO 266:1975, the audio spectrum is divided into 10 equal parts; 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz, 16kHz. The sound pressure level of sound that has been passed through an octave band pass filter is termed the octave band sound pressure level.

8.3.3 **PAN 1/2011 Planning and Noise**
- Advice on the role of the planning system in helping to prevent and limit the adverse effects of noise is provided in Planning Advice Note (PAN) 1/2011 'Planning and Noise' (The Scottish Government, 2011a). The associated Technical Advice Note (TAN) 1/2011 'Assessment of Noise' (The Scottish Government, 2011b) provides guidance on Noise Impact Assessment methods; and
- The methodology provided in Technical Advice Note (TAN) 1/2011 'Assessment of Noise' (The Scottish Government, 2011b) is used to assess the suitability of the local noise environment for a residential development.

8.3.4 **Calculation of Road Traffic Noise (CRTN)**
- CRTN is the standard UK procedure which defines measurement and calculation methods for assessing road traffic noise;
- The standard contains a shortened measurement procedure by which daytime \( L_{A10,(18\text{hour})} \) noise levels can be calculated from the arithmetic average of three consecutive hourly \( L_{A10,(1\text{hour})} \) measurements. Daytime \( L_{Aeq,(16\text{hour})} \) are then calculated by subtracting a further 2dB(A) from the \( L_{A10,(18\text{hour})} \) value; and
- Night-time \( L_{Aeq,(8\text{hour})} \) values can be extrapolated from daytime \( L_{Aeq,(16\text{hour})} \) levels following guidance provided in the Highway Agencies publication, Design Manual for Roads and Bridges.

8.3.5 **World Health Organisation (WHO) Guidelines for Community Noise 1999**
- In Guidelines for Community Noise, (World Health Organisation, 1999), 55dB(A) was indicated as a criteria threshold below which few people are seriously annoyed (for an outdoor living area), during daytime and evening and other circumstances. To avoid sleep disturbance night time noise events exceeding 45dB (A) at the outside facades of living spaces should be avoided. In addition the guidance identifies that negative sleep impacts are avoided at 30dB for continuous noise sources. It also provides guidance on the attenuation provided to internal living areas when windows are partially opened i.e. up to 15dB reduction in external noise levels.

8.3.6 **BS EN 12758:2011 'Glass in Building, Glazing and Sound Insulation; Product Descriptions and Determination of Properties'**

8.4 **Methodology**

**Scope of Assessment**

8.4.1 This ES chapter presents an assessment of likely significant effects on sensitive receptors as a result of road traffic noise from the proposed development (West Riverside and Woodbank House). The assessment presented in this ES chapter has been prepared in accordance with the 2011 EIA Regulations.

8.4.2 The noise assessment was undertaken to establish the existing and predicted future noise climate and to determine the suitability of the site for development.

8.4.3 As this is a Planning Permission in Principle (PPiP) application, detailed design is unknown at this stage and it is not possible to assess, for example, commercial/entertainment etc. noise. This will be undertaken for the detailed planning application.

8.4.4 Vibration was scoped out of the assessment because it is considered not to be an issue.
Overall Approach

8.4.5 In undertaking the assessment presented in this ES Chapter, the following activities have been carried out:

- An EIA Screening and Scoping Report was submitted to West Dunbartonshire Council in April 2017 with a formal Scoping Opinion received in May 2017;
- Consultation with West Dunbartonshire Council’s Environmental Health Department to agree the noise assessment methodology and criteria;
- Measurement of daytime and evening existing baseline noise levels for a period of 1 hour at each location, repeated at varying times over two separate dates. Baseline data to be used at the detailed planning stage to carry out any potential commercial/entertainment noise assessment as required;
- Measurement of existing road traffic noise at one position (close to the A82); in accordance with the shortened measurement procedure of The Calculation of Road Traffic Noise (CRTN). The results of the measurements were used to calibrate the CadnaA road traffic noise model;
- 3D computer noise modelling of the proposed development site and surrounding area using CadnaA software. The noise model takes into account site topography, proposed development layouts, and current/predicted future traffic data in the form of annual weekly traffic flows (AAWT) to produce noise contours showing the impact in the surrounding areas. The following scenarios have been modelled:
  - 2017; Baseline road traffic, for noise model validation purposes against measured road traffic data;
  - 2020; Baseline + future committed developments;
  - 2020; Baseline + future committed developments + proposed development generated traffic;
- Validation of CadnaA noise model outputs for the 2017 scenario against measured noise monitoring data;
- Calculation of increase in road traffic noise at existing sensitive receptors with and without development for the future year of opening scenario (2020); the significance of the impact has been assessed in accordance with guidance provided in TAN 1/2011 (refer to Section 5.4.10 – 5.4.21 for TAN 1/2011 assessment methodology). Existing noise sensitive receptors used within the assessment are shown in Figure 168659 - 042 within Appendix 8.1 of this ES. The noise sensitive receptors are considered as representative of the most exposed properties within the study areas considered;
- TAN 1/2011 assessment of day and night-time noise levels at location of new proposed sensitive receptors within the development; assessed against WHO Guidelines for Community Noise external noise criteria of 55dB(A) during the day (in gardens/terraces), and 45dB(A) at night (refer to Section 5.4.10 – 5.4.21 for TAN 1/2011 assessment methodology). The noise sensitive receptors are considered as representative of the most exposed properties within the study areas considered;
- If the TAN 1/2011 magnitude of impact at night exceeds 'slight', undertake calculations of internal noise levels and compare to guidance provided in WHO Guidelines for Community Noise of 30dB(A) within bedrooms at night (assuming closed windows). Similarly, if daytime exceedance exceeds 'slight', calculate external garden noise levels (refer to Section 5.4.10 – 5.4.21 for TAN 1/2011 assessment methodology). A daytime TAN 1/2011 exceedance of ‘moderate’ or above within gardens is considered as significant; and
- Advise on potential mitigation measures necessary to reduce the noise to within assessment Study Area.

EIA Screening and Scoping

8.4.6 This assessment has been informed by an EIA Screening and Scoping Report (PBA, April 2017) and subsequent EIA Screening and Scoping Opinions issued by LLTNPA (11th May 2017) in respect of the EIA for the proposed development.
8.4.7 The EIA Scoping Opinion, which is provided in full in Appendix 4.1, included a list of standard requirements for noise assessments in respect of development proposals.

Post Scoping Consultation

8.4.8 Consultation was carried out in June 2017 with West Dunbartonshire council in order to confirm assessment methodology, noise monitoring locations and noise criteria to be applied to the site. The approach within section 5.4.3 was agreed upon.

Study Area

8.4.9 The study area for the assessment of potential noise impacts focusses on existing sensitive receptors located adjacent to the local road network within the vicinity of the development most likely to be subjected to traffic increases as a result of the development. Future sensitive receptors were also assessed within the proposed development boundary.

Information Sources

Desk Top Study

8.4.10 The following data sources were used within this assessment:

- Aerial photography of the site;
- Traffic flow data for the roads surrounding the site;
- Weather data from Glasgow Bishopton weather station; and
- CadnaA noise modelling.

Fieldwork

Fieldwork included noise monitoring at locations agreed with the West Dunbartonshire Council Environmental Health Officer.

Approach to Assessment

Identification of Relevant Receptors

8.4.11 The noise assessment considered the most exposed residential resort accommodation within the development site to road noise as shown in Drawing Nos. 168659-043, in Appendix A. In addition, a sample of eleven existing noise sensitive receptors within the surrounding areas (refer to Drawing No. 168659-042, refer to Appendix 8.1 for locations) were also considered in the noise assessment. All existing noise sensitive receptors were agreed with West Dunbartonshire Council Environmental Health Department through consultation.

Impact Assessment Methodology

8.4.12 The methodology provided in Technical Advice Note (TAN) 1/2011 ‘Assessment of Noise’ (The Scottish Government, 2011b) is used to assess the suitability of the local noise environment for a residential development. This is a five stage process as follows:

Stage 1: Initial Process

8.4.13 The development is categorised according to whether it has the potential to generate noise i.e. a Noise Generating Development (NGD) or be affected by the existing noise i.e. a Noise Sensitive Development (NSD).

8.4.14 All Noise Sensitive Receptors (NSRs) that have the potential to be impacted by the proposed development are identified and prioritised according to their level of sensitivity. The residential receptors assessed within this ES chapter are categorised as having a high sensitivity to noise.

Stage 2: Quantitative Assessment

8.4.15 The quantitative assessment method depends on the type of development proposed i.e. Noise Sensitive Development (NSD) or Noise Generating Development (NGD) as follows:

- NSD – a quantitative assessment will be based on comparing an absolute noise level with an appropriate noise target, e.g. WHO guidelines etc.; and
NGD – a quantitative assessment will be based on the change in noise climate before and after the new noise is introduced. This requires predictive calculations to be used to define post development noise.

8.4.16 In relation to the proposed development at West Riverside and Woodbank House, this is considered to be both a noise sensitive and noise generating development as proposed sensitive receptors are susceptible to noise from the existing road network, whilst existing residential receptors are susceptible to any increase in noise level that may be result from the increase in traffic flows generated by the development.

Noise Sensitive Development

8.4.17 The magnitude of the impact is defined by assessing the amount the road traffic noise level exceeds the assessment criteria for either day or night time periods. The magnitude of impact classifications used in this assessment and shown in Table 8.1 are based on the consultation response from West Dunbartonshire Council and classifications provided in the Technical Advice Note of PAN 01/2011 (The Scottish Government, 2011a).

Table 8.1 Classification of Magnitude of Noise Impacts; Noise Sensitive Development

<table>
<thead>
<tr>
<th>Night Noise Level(^1), (x = (\text{Existing} - 45) \text{ L}_{\text{Aeq,8h}})</th>
<th>Day Noise Level(^1), (X = (\text{Existing} - 55) \text{ L}_{\text{Aeq,16h}})</th>
<th>Magnitude of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x &gt; 15)</td>
<td>(X &gt; 10)</td>
<td>Major</td>
</tr>
<tr>
<td>(10 \leq x \leq 15)</td>
<td>(5 \leq x \leq 10)</td>
<td>Moderate</td>
</tr>
<tr>
<td>(5 \leq x \leq 10)</td>
<td>(3 \leq x \leq 5)</td>
<td>Minor</td>
</tr>
<tr>
<td>(0 \leq x \leq 5)</td>
<td>(0 \leq x \leq 3)</td>
<td>Negligible</td>
</tr>
<tr>
<td>(x &lt; 0)</td>
<td>(x &lt; 0)</td>
<td>No change</td>
</tr>
</tbody>
</table>

\(^{(1)}\) Corresponding façade levels are 2.5 dB\((A)\) higher

Stage 3: Qualitative Assessment

8.4.18 The qualitative assessment allows the magnitude of the impact established in Stage 2 to be adjusted accordingly to take into account additional factors. It is based on perception and how noticeable the noise impact is in affecting the amenity value of the NSR. As noise becomes more noticeable, the level of disruption increases leading to significant changes in behaviour with a subsequent loss in the amenities associated with the NSR as follows:-

- Where a new noise source is planned, the assessment will be based on the effect the new noise climate may have on the amenity value of the existing NSR; and
- Where a new NSD is planned the assessment will be based on the effect the existing noise climate may have on the amenity value of the proposed property.

Establishment of Effect Significance

Stage 4: Level of Significance

8.4.19 The level of significance of the noise impact at the NSR is obtained through the relationship of the receptor's sensitivity to noise and the magnitude of the noise impact. Table 8.2 provides a framework for determining the level of significance in relation to the magnitude of the impact and the sensitivity of the receptor.

Table 8.2 Significance of Effects

<table>
<thead>
<tr>
<th>Magnitude of Impact</th>
<th>Level of Significance Relative to Sensitivity of Receptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>Slight / Moderate</td>
</tr>
<tr>
<td></td>
<td>Moderate / Large</td>
</tr>
<tr>
<td></td>
<td>Large / Very Large</td>
</tr>
</tbody>
</table>
8.4.20 A daytime TAN 1/2011 exceedance of ‘moderate’ or above within gardens is considered as significant.

8.4.21 The definitions of the levels of significance are described as below:

- **Slight**: These effects may be raised but are unlikely to be of importance in the decision making process;
- **Moderate**: These effects, if adverse, while important, are not likely to be key decision making issues;
- **Large**: These effects are likely to be important considerations but where mitigation may be effectively employed such that resultant adverse effects are likely to have a Moderate or Slight significance; and
- **Very large**: These effects represent key factors in the decision making process. They are generally, but not exclusively associated with impacts where mitigation is not practical or would be ineffective.

**Stage 5: The Decision Process**

8.4.22 Stages 2 to 4 are repeated for all identified NSRs and a Summary Table of Significance is completed which provides an overview of the level of significance of the noise impact on all NSRs.

**Noise Generating Development**

8.4.23 The magnitude of impact is defined by assessing the change in road traffic noise with vs without development during the day and night-time periods at existing noise sensitive receptors. The classification of the magnitude of impacts used in this assessment is shown in Table 8.3.

<table>
<thead>
<tr>
<th>Change in Noise Level, $L_{A_{eq,T}}$ dB</th>
<th>Magnitude of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x \geq 5$</td>
<td>Major adverse</td>
</tr>
<tr>
<td>$3 \leq x &lt; 5$</td>
<td>Moderate adverse</td>
</tr>
<tr>
<td>$1 \leq x &lt; 3$</td>
<td>Minor adverse</td>
</tr>
<tr>
<td>$0 &lt; x &lt; 1$</td>
<td>Negligible adverse</td>
</tr>
<tr>
<td>$x = 0$</td>
<td>No change</td>
</tr>
<tr>
<td>$-1 &lt; x &lt; 0$</td>
<td>Negligible beneficial</td>
</tr>
<tr>
<td>$-3 &lt; x \leq -1$</td>
<td>Minor beneficial</td>
</tr>
<tr>
<td>$-5 &lt; x \leq -3$</td>
<td>Moderate beneficial</td>
</tr>
<tr>
<td>$x \leq -5$</td>
<td>Major beneficial</td>
</tr>
</tbody>
</table>
8.4.24 Cumulative effects can occur when other proposed developments would also add to the noise environment that are relevant to the setting of a proposed development. There are no other proposed developments to which these criteria apply, and therefore cumulative effects have been scoped out of this assessment.

8.5 Baseline Conditions

The Site

8.5.1 The site is located immediately to the north of Balloch, West Dunbartonshire on the southern shores of Loch Lomond at OS grid reference 238500 682000.

The Surrounding Area

8.5.2 Notes of significant noise sources affecting the monitoring location were recorded and are summarised below in order of dominance (greatest first) (Refer to Technical Appendix 8.2):

- Road traffic on A82;
- Light wind in trees; and
- Birdsong.

Summary of Receptor Sensitivity

8.5.3 The receptor sensitivity as defined in TAN/2011 is High i.e. residential receptors.

8.6 Baseline Evolution

8.6.1 In the absence of the proposed development, future baseline conditions would likely remain consistent with existing conditions on site.

Baseline Noise Monitoring

8.6.2 Several noise surveys were carried out within and around the site of the proposed development at Riverside West during the daytime and evening of the 1st, 2nd, 20th, 21st February and 13th March 2018. The purpose of the survey was to determine the existing baseline noise environment in the area. The monitoring was carried out at each measurement location at varying times over two separate dates (Refer to Technical Appendix 8.2).

Noise Monitoring Locations and Periods

8.6.3 Seven measurement locations were chosen to represent the residual background noise levels within and surrounding the proposed development site. The monitoring locations, periods and durations were agreed through consultation with West Dunbartonshire Council. The location of the noise monitoring locations, and periods monitored for each is summarised in and shown in Drawing No 168659-048 (Refer to Appendix 8.1)
### Table 8.4 Noise Monitoring Locations

<table>
<thead>
<tr>
<th>NML ID</th>
<th>Description</th>
<th>Period Monitored</th>
<th>Grid Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>Off Lower Stoneymollan Rd</td>
<td>Daytime</td>
<td>E: 238167 N: 681643</td>
</tr>
<tr>
<td>03</td>
<td>Off Old Russ Road-Behind two Residential Properties</td>
<td>Evening</td>
<td>E: 238303 N: 681833</td>
</tr>
<tr>
<td>04</td>
<td>Land between Ben Lomond Shores Car Park and Clairinsh</td>
<td>Daytime</td>
<td>E: 238616 N: 681920</td>
</tr>
<tr>
<td>05</td>
<td>Off Ben Lomond Way, adjacent to Loch Lomond Shores</td>
<td>Daytime &amp; Evening</td>
<td>E: 238587 N: 682190</td>
</tr>
<tr>
<td>06</td>
<td>On land between Pier Road and River Leven</td>
<td>Daytime &amp; Evening</td>
<td>E: 238787 N: 682295</td>
</tr>
<tr>
<td>07</td>
<td>Land behind Anchorage Guest House and adjacent to Pier Road</td>
<td>Daytime &amp; Evening</td>
<td>E: 238940 N: 681960</td>
</tr>
<tr>
<td>08</td>
<td>Off Old Luss Road</td>
<td>Evening</td>
<td>E: 238082 N: 682085</td>
</tr>
</tbody>
</table>

#### 8.6.4

The weather conditions during the monitoring events were recorded and are summarised in Table 8.5

### Table 8.5 Monitoring Periods and Weather Conditions

<table>
<thead>
<tr>
<th>Monitoring Period/ Event</th>
<th>Weather Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/02/2018; Afternoon</td>
<td>Partially cloudy, between 4 and 7°C, wind speed between 0.0 m/s and 4.5 m/s</td>
</tr>
<tr>
<td>01/02/2018; Evening</td>
<td>Partially cloudy, between 3 and 4°C, wind speed between 2 m/s and 3.0 m/s</td>
</tr>
<tr>
<td>02/02/2018: Morning &amp; Afternoon</td>
<td>Partially cloudy, between 4 and 10°C, wind speed between 0.0 m/s and 1.0 m/s.</td>
</tr>
<tr>
<td>20/02/2018: Daytime</td>
<td>Partially cloudy, between 8 and 13°C, wind speed &lt; 1.0 m/s.</td>
</tr>
<tr>
<td>20/02/2018: Evening</td>
<td>Partially cloudy, between 1 and 3°C, wind speed &lt; 1.0 m/s.</td>
</tr>
<tr>
<td>21/02/2018: Evening</td>
<td>Partially cloudy, between 4 and 8°C, wind speed &lt; 1.0 m/s.</td>
</tr>
<tr>
<td>13/03/2018: Evening</td>
<td>Overcast, between 4 and 7°C, wind speed &lt; 1.0 m/s.</td>
</tr>
</tbody>
</table>

#### 8.6.5

During the monitoring periods, notes of the general noise climate at each of the monitoring locations were recorded. It was noted that background noises were observed at each location as follows:
### Table 8.6 Observations

<table>
<thead>
<tr>
<th>Period</th>
<th>Monitoring Location</th>
<th>ID</th>
<th>Date</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday - Daytime</td>
<td>Off Lower Stoneymollan Rd</td>
<td>02</td>
<td>01/02/2018</td>
<td>• Road traffic on A82</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Dogs barking at local kennels</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Birds chirping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Trees rustling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>02/02/2018</td>
<td>• Road traffic on A82</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Distant music within Loch Lomond Shores</td>
</tr>
<tr>
<td></td>
<td>Land between Ben Lomond Shores Car Park and Clairinsh</td>
<td>04</td>
<td>01/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Leaves rustling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Birds chirping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>02/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Leaves rustling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Birds chirping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Intermittent distant sawing activity</td>
</tr>
<tr>
<td>Week Day – Night-Time</td>
<td>Off Ben Lomond Way, adjacent to Loch Lomond Shores</td>
<td>05</td>
<td>01/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Kids playing in playground</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Mechanical services noise from Loch Lomond Shores</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Infrequent dog barks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Kids playing in playground</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Mechanical services noise from Loch Lomond Shores</td>
</tr>
<tr>
<td></td>
<td>Land between Pier Road and River Leven</td>
<td>06</td>
<td>01/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Birds chirping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Infrequent shouting in distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>02/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Boating activity on River Leven</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Paddle Steamer starting up</td>
</tr>
<tr>
<td></td>
<td>Land behind Anchorage Guest House and adjacent to Pier Road</td>
<td>07</td>
<td>02/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Boating activity on River Leven</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Overhead light aircraft</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20/02/2018</td>
<td>• Traffic on local road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Infrequent distant indistinct industrial/commercial noise</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Birds chirping</td>
</tr>
<tr>
<td></td>
<td>Off Old Russ Road-Behind two Residential Properties</td>
<td>03</td>
<td>01/02/2018</td>
<td>• Road traffic on A82</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Water in stream nearby</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Very Infrequent passing cars on Old Luss Road</td>
</tr>
<tr>
<td>Period</td>
<td>Monitoring Location</td>
<td>ID</td>
<td>Date</td>
<td>Observations</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------</td>
<td>----</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
|        | Off Ben Lomond Way, adjacent to Loch Lomond Shores | 05 | 01/02/2018 | • Traffic on local road network  
• Leaves and trees rustling  
• Mechanical services noise from Loch Lomond Shores |
|        |                     |    | 21/02/2018 | • Traffic on local road network  
• Mechanical services noise from Loch Lomond Shores  
• Van in Loch Lomond Shores delivery area idling for less than 10 mins |
|        | Land between Pier Road and River Leven | 06 | 20/02/2018 | • Traffic on local road network  
• Distant intermittent dog bark  
• Lorry pulling up on Pier Road and idling for less than 10 mins  
• Low to mid frequency drone suspected to be from mechanical services at Drumkinnon Tower |
|        |                     |    | 21/02/2018 | • Traffic on local road network  
• Low to mid frequency drone suspected to be from mechanical services at Drumkinnon Tower  
• Single HGV passing on Pier Road |
|        | Land behind Anchorage Guest House and adjacent to Pier Road | 07 | 20/02/2018 | • Traffic on local road network  
• Music from property on Pier Road  
• Diesel car idling in adjacent car park |
|        |                     |    | 13/03/2018 | • Traffic on local road network  
• Music from property on Pier Road  
• Infrequent lorry movements and doors closing in adjacent car park |
|        | Off Old Luss Road   | 08 | 20/02/2018 | • Road traffic on A82 and local road network  
• Water in nearby stream  
• Infrequent, distant cars revving engines |
8.6.6 A summary of the baseline noise monitoring results can be found below in Table 8.7.

Table 8.7 Noise Monitoring Results

<table>
<thead>
<tr>
<th>Period</th>
<th>Date</th>
<th>Monitoring Location</th>
<th>Start Time – End Time (hrs:mins)</th>
<th>Noise Levels (dB(A))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L_{Aeq}</td>
</tr>
<tr>
<td>Position 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daytime</td>
<td>01/02/2018</td>
<td>02</td>
<td>14:50 – 15:50</td>
<td>52.6</td>
</tr>
<tr>
<td>Daytime</td>
<td>02/02/2018</td>
<td>02</td>
<td>14:28 – 15:28</td>
<td>51.5</td>
</tr>
<tr>
<td>Position 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening</td>
<td>01/02/2018</td>
<td>03</td>
<td>20:49 – 21:49</td>
<td>45.7</td>
</tr>
<tr>
<td>Evening</td>
<td>01/02/2018</td>
<td>03</td>
<td>20:47 – 21:47</td>
<td>47.7</td>
</tr>
<tr>
<td>Position 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daytime</td>
<td>01/02/2018</td>
<td>04</td>
<td>13:27 – 14:27</td>
<td>49.1</td>
</tr>
<tr>
<td>Daytime</td>
<td>02/02/2018</td>
<td>04</td>
<td>09:48 – 10:48</td>
<td>49.3</td>
</tr>
<tr>
<td>Position 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daytime</td>
<td>01/02/2018</td>
<td>05</td>
<td>16:03 – 17:03</td>
<td>59.0</td>
</tr>
<tr>
<td>Daytime</td>
<td>20/02/2018</td>
<td>05</td>
<td>15:23 – 16:23</td>
<td>57.0</td>
</tr>
<tr>
<td>Evening</td>
<td>01/02/2018</td>
<td>05</td>
<td>19:39 – 20:39</td>
<td>53.3</td>
</tr>
<tr>
<td>Evening</td>
<td>21/02/2018</td>
<td>05</td>
<td>20:41 – 21:41</td>
<td>53.2</td>
</tr>
<tr>
<td>Position 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daytime</td>
<td>01/02/2018</td>
<td>06</td>
<td>17:13 – 18:13</td>
<td>45.2</td>
</tr>
<tr>
<td>Daytime</td>
<td>02/02/2018</td>
<td>06</td>
<td>12:28 – 13:28</td>
<td>44.0</td>
</tr>
<tr>
<td>Evening</td>
<td>20/02/2018</td>
<td>06</td>
<td>19:00 – 20:00</td>
<td>42.7</td>
</tr>
<tr>
<td>Evening</td>
<td>21/02/2018</td>
<td>06</td>
<td>19:33 - 20:33</td>
<td>42.0</td>
</tr>
<tr>
<td>Position 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daytime</td>
<td>02/02/2018</td>
<td>07</td>
<td>11:06 – 12:06</td>
<td>46.6</td>
</tr>
<tr>
<td>Daytime</td>
<td>20/02/2018</td>
<td>07</td>
<td>16:31 – 17:31</td>
<td>47.3</td>
</tr>
<tr>
<td>Evening</td>
<td>20/02/2018</td>
<td>07</td>
<td>20:11 – 21:11</td>
<td>44.4</td>
</tr>
<tr>
<td>Evening</td>
<td>13/03/2018</td>
<td>07</td>
<td>19:30 – 20:30</td>
<td>45.0</td>
</tr>
<tr>
<td>Position 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Road Traffic Noise

8.6.7 A noise survey was carried out at the site of the proposed development at West Riverside between 10:23hrs and 13:23hrs on Friday 22nd June 2017. The purpose of the survey was to establish the noise from road traffic on the A82 without development traffic, the results of which are used to validate outputs from the CadnaA noise modelling exercise. The monitoring was carried out in accordance with the shortened measurement procedure of The Calculation of Road Traffic Noise (CRTN).

8.6.8 Details of the CRTN noise monitoring location is provided in Table 8.8 and shown in Drawing No 168659-048 (refer to Appendix 8.1).

Table 8.8 Noise Monitoring Location

<table>
<thead>
<tr>
<th>NML ID</th>
<th>Grid Reference</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>NS 237950 681930</td>
<td>Adjacent to A82, 6m back from carriageway edge.</td>
</tr>
</tbody>
</table>

8.6.9 The weather conditions during the monitoring events were recorded and are summarised in Table 8.9

Table 8.9 Monitoring Periods and Weather Conditions

<table>
<thead>
<tr>
<th>Monitoring Period/Event</th>
<th>Weather Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/06/2017; 12:00</td>
<td>Partially cloudy, 16°C, wind speed between 0.0 m/s and 3.6 m/s in a westerly direction.</td>
</tr>
</tbody>
</table>

8.6.10 A summary of the results can be found in Table 8.10.

Table 8.10 Noise Monitoring Results

<table>
<thead>
<tr>
<th>Measurement Position</th>
<th>Start Time/ Duration (hrs:mins:secs)</th>
<th>L_{Aeq} (dB)</th>
<th>L_{A10} (dB)</th>
<th>L_{AFMax} (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>10:23/ 01:00:00</td>
<td>71.5</td>
<td>74.9</td>
<td>83.9</td>
</tr>
<tr>
<td></td>
<td>11:24/ 01:00:00</td>
<td>71.8</td>
<td>74.9</td>
<td>90.4</td>
</tr>
<tr>
<td></td>
<td>12:24/ 01:00:00</td>
<td>71.5</td>
<td>74.8</td>
<td>86.8</td>
</tr>
</tbody>
</table>

8.6.11 Following guidance provided in the Calculation of Road Traffic Noise (CRTN), 1dB(A) is subtracted from the average of the three hour LA10 levels at each position to provide the LA10 (18 hour), as shown in Table 8.11.

Table 8.11: L_{A10} Noise Monitoring Levels

<table>
<thead>
<tr>
<th>Measurement Position</th>
<th>L_{A10, 1hr} (dB)</th>
<th>L_{A10, 3hr}</th>
<th>L_{A10 18hr}</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>74.9</td>
<td>74.8</td>
<td>74.9</td>
</tr>
</tbody>
</table>
8.7 Embedded Mitigation

8.7.1 As detailed in Chapter 3 – The Proposed Development, a number of design features and embedded mitigation measures have been incorporated into the design and construction of the proposed development to avoid, prevent or minimise significant adverse environmental effects and to enhance beneficial effects. Embedded mitigation measures of relevance to this assessment are:

- Development, approval and implementation of noise suppression techniques as part of a Construction Environmental Management Plan (CEMP); and
- 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 19.

8.8 Potential Effects

Construction Phase

8.8.1 At the time of writing, the development is at the Planning Permission in Principle (PPiP) stage and detailed design and construction methods have not yet been determined, as such, noise assessment is not possible at this stage.

8.8.2 Noise suppression techniques will be developed, approved and implemented as part of a Construction Environmental Management Plan (CEMP).

Operational Phase

8.8.3 There is the potential for commercial/entertainment noise from the proposed development to impact on future residents within resort accommodation, and on existing residents in the area surrounding the development. At the time of writing the development is at the PPiP/ masterplan stage, therefore detailed design information on proposed commercial/entertainment noise sources is not available. If required, an assessment of commercial/entertainment noise sources can be carried out at a later date when sufficient design information is available.

Impact Assessment

Noise Input Parameters

8.8.4 A 3D computer noise modelling exercise using CadnaA software has been carried out in order to predict future levels of road traffic noise across the proposed development site and surrounding areas.

8.8.5 CadnaA uses the principle methodologies as set out in the Calculation of Road Traffic Noise 1988 (CRTN), for determining the $L_{A10}$ basic road noise level. In order to consider the noise data in a comparable form to PAN 01/2011, the output from CadnaA is converted into a $L_{Aeq,T}$ within the program.

Noise Sources

8.8.6 The dominant sources of noise affecting the proposed development site have been identified as being the A82, A811, Old Luss Road and Balloch Road.

8.8.7 Eighteen hour Annual Average Weekly Traffic (AAWT) flows for the above roads have been provided by Peter Brett Associates LLP and input to the CadnaA noise model.

Noise Sensitive Receptors

8.8.8 The noise assessment considered the proposed residential resort properties most exposed to road noise as shown in Drawing Nos. 168659-043. In addition a sample of eleven existing noise sensitive receptors within the surrounding areas (refer to Drawing No. 168659-042 for locations) were also considered in the noise assessment. All existing noise sensitive receptors were agreed with West Dunbartonshire Council Environmental Health Department through consultation.

8.8.9 Three different scenarios have been considered within the CadnaA model, as shown in Table 8.12.
Table 8.12: Modelled Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2017</td>
<td>Baseline road traffic, for noise model validation purposes against measured road traffic data.</td>
</tr>
<tr>
<td>2</td>
<td>2020</td>
<td>Baseline + future committed developments</td>
</tr>
<tr>
<td>3</td>
<td>2020</td>
<td>Baseline + future committed developments + proposed development generated traffic.</td>
</tr>
</tbody>
</table>

Other Input Parameters

8.8.10 A number of assumptions have been established during the CadnaA modelling exercise, as detailed below:

- The noise model includes the effect of site design mitigation features (i.e. a 2m high close boarded timber fence along part of the boundary of the garden/terrace of NSR19);
- The 2017 and 2020 models use a combination of existing site topography, sourced from Lidar 1m resolution terrain height data and site topography supplied by the client;
- One storey buildings have been taken to be 6m high, two storey as 8m high;
- Receptor heights at garden and ground floor level have been taken as being 1.5m above ground level;
- Receptors at first floor level i.e. bedrooms have been taken to be 4m above ground level;
- Ground absorption has been set to 1 for soft ground for the 2017 and 2020 models, which comprises the majority of land, apart from areas:
  - Drumkinnon Gate housing – Modelled as 0.5 (mixed hard and soft ground);
  - Loch Lomond and River Leven – Modelled as 0 (reflective surface);
  - Ben Lomond car and coach park – Modelled as 0 (reflective surface);
  - Car park west of Drumkinnon Gate housing and adjacent to Ben Lomond Way – Modelled as 0 (reflective surface);
  - Housing between Balloch Road and the A811 – Modelled as 0.5 (mixed hard and soft ground);
  - Housing south of the A811 – Modelled as 0.5 (mixed hard and soft ground); and
  - Lomond Woods Holiday Park – Modelled as 0.5 (mixed hard and soft ground).

Calibration and Validation of CadnaA Noise Model

8.8.11 A CadnaA noise model was run for 2017 at a receptor height of 1.5m, with the results being compared to the noise monitoring results recorded at the site for validation purposes, as summarised in Table 8.13.

<table>
<thead>
<tr>
<th>Monitoring position ID</th>
<th>Modelled period</th>
<th>L\text{A}_{10,18hrs} Noise Level (dBA) in accordance with CRTN</th>
<th>CadnaA results</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Daytime</td>
<td>73.9</td>
<td>74.9</td>
<td>1.0</td>
</tr>
</tbody>
</table>

8.8.12 The analysis of the CadnaA validation results (as shown in Drawing No 168659-044) shows a good agreement between modelled results and monitoring data. The model is therefore considered to reflect the current situation at the site.
Environmental Statement, Volume 1 – Main Report
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Impact Assessment: Existing Residential Receptors

8.8.13 The proposed residential development is predicted to increase traffic flows on the local road network surrounding the site. In order to assess how the noise levels will increase in these areas, noise models with and without development generated traffic have been compared.

8.8.14 The relevant heights for each of the existing noise sensitive receptors, have been based on daytime garden free fields of 1.5 metres and 4 metres for façade level night-time receptors.

Existing Noise Sensitive Receptor Heights

8.8.15 The receptor heights for the existing noise sensitive receptors have been set to 1.5m during the daytime (i.e. gardens), and 4m at night (i.e. 1st floor bedrooms).

Comparison of Daytime Predicted Noise Levels

8.8.16 Daytime noise levels in the gardens of the noise sensitive receptors with vs without development generated traffic are compared in Table 8.14.

Table 8.14 Comparison of Daytime Noise Levels With vs Without Development; 1.5m Receptor Height

<table>
<thead>
<tr>
<th>Noise Sensitive Receptor ID</th>
<th>2017 Without Development L_{Aeq,T} dB(A)</th>
<th>2020 With Development L_{Aeq,T} dB(A)</th>
<th>Differences dB(A)</th>
<th>TAN 2011 Magnitude of Impact</th>
<th>TAN 2011 Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>53.7</td>
<td>53.9</td>
<td>0.2</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>02</td>
<td>49.1</td>
<td>49.6</td>
<td>0.5</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>03</td>
<td>52.2</td>
<td>53.6</td>
<td>1.4</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>04</td>
<td>59.2</td>
<td>59.5</td>
<td>0.3</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>05</td>
<td>57.2</td>
<td>59.2</td>
<td>2.0</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>06</td>
<td>49.2</td>
<td>50.6</td>
<td>1.4</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>07</td>
<td>41.3</td>
<td>42.2</td>
<td>0.9</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>08</td>
<td>42.8</td>
<td>43.4</td>
<td>0.6</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>09</td>
<td>66.8</td>
<td>67.1</td>
<td>0.3</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>10</td>
<td>55.5</td>
<td>56.6</td>
<td>1.1</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>11</td>
<td>66.6</td>
<td>66.7</td>
<td>0.1</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
</tbody>
</table>

8.8.17 The results show that the increase in daytime noise levels when comparing between the with vs without development scenarios for the year of development completion (2020) varies between 0.1dB(A) and 2.0dB(A), the TAN 2011 significance of which is slight. The existing properties at which the greatest increase in noise levels are predicted are located on, or close to Old Luss Road, Ben Lomond Way and Balloch Road (NSR 03, 05 & 06, refer to Drawing No. 168659-042, (refer to Appendix 8.1). This is due to the current traffic flows increasing due to development generated traffic. An increase in noise levels of around 2dB(A) shall be barely perceptible to the listener, and is therefore considered as insignificant.

Comparison of Night-time Predicted Noise Levels

8.8.18 Night time noise levels have been calculated to be 10dB(A) lower than daytime levels following guidance provided in the Design Manual for Roads and Bridges.

8.8.19 Night time noise levels at the facades of the noise sensitive receptors with vs without development generated traffic are compared in Table 8.15.
### Table 8.15 Comparison of Night-time Noise Levels With vs Without Development; 4m Receptor Height

<table>
<thead>
<tr>
<th>Noise Sensitive Receptor ID</th>
<th>2017 Without Development $L_{Aeq, T}$ dB(A)</th>
<th>2020 With Development $L_{Aeq, T}$ dB(A)</th>
<th>Differences dB(A)</th>
<th>TAN 2011 Magnitude of Impact</th>
<th>TAN 2011 Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>55.7</td>
<td>55.8</td>
<td>0.1</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>02</td>
<td>40.3</td>
<td>41.4</td>
<td>1.1</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>03</td>
<td>42.3</td>
<td>43.7</td>
<td>1.4</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>04</td>
<td>53.9</td>
<td>54.3</td>
<td>0.4</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>05</td>
<td>49.1</td>
<td>51.3</td>
<td>2.2</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>06</td>
<td>54.7</td>
<td>56.2</td>
<td>1.5</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>07</td>
<td>49.7</td>
<td>51.1</td>
<td>1.4</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>08</td>
<td>53.7</td>
<td>55.3</td>
<td>1.6</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>09</td>
<td>55.9</td>
<td>56.2</td>
<td>0.3</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>10</td>
<td>52.1</td>
<td>52.2</td>
<td>0.1</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>11</td>
<td>56.8</td>
<td>56.9</td>
<td>0.1</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
</tbody>
</table>

8.8.20 The results show that the increase in night-time noise levels when comparing between the with vs without development scenarios for the year of development completion (2020) varies between 0.1dB(A) and 2.2dB(A), the TAN 2011 significance of which is slight. The existing properties at which the greatest increase in noise levels are predicted are located on, or close to Old Luss Road, Ben Lomond Way and Balloch Road (NSR 03, 05, 06, 07 & 08, refer to Drawing No. 168659-042 within Appendix 8.1. This is due to the current traffic flows increasing due to development generated traffic. An increase in noise levels of around 2dB(A) shall be barely perceptible to the listener, and is therefore considered as insignificant.

### Proposed Resort Accommodation

#### Year of Development Completion Predicted Noise Levels

8.8.21 In order to assess the impact of road traffic noise on proposed sensitive receptors within the development, the CadnaA noise model considering the 2020 base + committed + development scenario has been used for assessment purposes. Site design mitigation features as outlined in Section 5.9.2 have been incorporated into the noise model.

#### Daytime Predicted Noise Levels

8.8.22 The noise model results for the 1.5m receptor height are summarised in Table 8.16, the free-field noise contours are shown in Drawing No. 168659-046 (refer to Appendix 8.1).

### Table 8.16 CadnaA daytime model results. Receptor height: 1.5 metres; Gardens/Terraces

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>53.9</td>
<td>YES</td>
<td>-1.1</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>13</td>
<td>54.1</td>
<td>YES</td>
<td>-0.9</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>14</td>
<td>54.2</td>
<td>YES</td>
<td>-0.8</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>15</td>
<td>53.5</td>
<td>YES</td>
<td>-1.5</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
</tbody>
</table>
### Table 1: Noise Sensitive Receptors

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>53.9</td>
<td>YES</td>
<td>-1.1</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>17</td>
<td>52.8</td>
<td>YES</td>
<td>-2.2</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>18</td>
<td>56.0</td>
<td>NO</td>
<td>1.0</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>19</td>
<td>57.2</td>
<td>NO</td>
<td>2.2</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>20</td>
<td>57.7</td>
<td>NO</td>
<td>2.7</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>21</td>
<td>55.0</td>
<td>NO</td>
<td>0.0</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>22</td>
<td>55.5</td>
<td>NO</td>
<td>0.5</td>
<td>Negligible</td>
<td>Slight</td>
</tr>
<tr>
<td>23</td>
<td>53.4</td>
<td>YES</td>
<td>-1.6</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>24</td>
<td>52.6</td>
<td>YES</td>
<td>-2.4</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>25</td>
<td>52.3</td>
<td>YES</td>
<td>-2.7</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>26</td>
<td>53.2</td>
<td>YES</td>
<td>-1.8</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>27</td>
<td>50.4</td>
<td>YES</td>
<td>-4.6</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>28</td>
<td>56.3</td>
<td>NO</td>
<td>1.3</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>29</td>
<td>57.9</td>
<td>NO</td>
<td>2.9</td>
<td>Minor</td>
<td>Slight</td>
</tr>
<tr>
<td>30</td>
<td>52.1</td>
<td>YES</td>
<td>-2.9</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>31</td>
<td>50.6</td>
<td>YES</td>
<td>-4.4</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>32</td>
<td>51.8</td>
<td>YES</td>
<td>-3.2</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>33</td>
<td>54.3</td>
<td>YES</td>
<td>-0.7</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>34</td>
<td>54.2</td>
<td>YES</td>
<td>-0.8</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>35</td>
<td>54.0</td>
<td>YES</td>
<td>-1</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>36</td>
<td>53.3</td>
<td>YES</td>
<td>-1.7</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
<tr>
<td>37</td>
<td>54.3</td>
<td>YES</td>
<td>-0.7</td>
<td>No Change</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

8.8.23 The above noise receptors were chosen as they are considered to be the most exposed to noise from road traffic on the A82 and the local road network. The results show that the external noise levels at the majority of these properties, are predicted to be within the target external noise criteria of 55dB(A). Noise levels at the most exposed properties exceed the noise target between 0.0dB(A) at NSR 21 to 2.9dB(A) at NSR 29. An exceedance of less that 3dB(A) is considered as barely perceptible to a listener. When assessed to TAN 2011, the significance of the daytime noise varies between Neutral and Slight, which are defined as;

**Neutral:** No effect, not significant, noise need to be considered as a determining factor in the decision making process.

**Slight:** These effects may be raised but are unlikely to be of importance in the decision making process.
8.8.24 As the greatest TAN 2011 level of significance at the most exposed properties is *Slight*, the noise is considered as acceptable in line with the consultation response received from West Dunbartonshire Council.

8.8.25 As the noise is acceptable at these, the most exposed properties; it shall also be at other, less exposed parts of the development. The external daytime noise is therefore considered acceptable at the proposed development site and does not need to be reduced further.

**Night Time Predicted Noise Levels**

8.8.26 Night time noise levels have been calculated to be 10dB(A) lower than daytime levels following guidance provided in the Design Manual for Roads and Bridges.

8.8.27 As part of the consultation carried out with West Dunbartonshire Council (refer to Section 1.6) it was agreed that if the TAN 2011 significance of the external night-time noise within some parts of the development exceeds *Slight*, internal noise calculations shall be carried out to confirm that the target internal noise criteria of 30dB(A) shall be met within bedrooms with closed windows.

8.8.28 External free-field noise levels at one of the most exposed properties of the development (NSR19) is predicted to exceed 49.9dB(A), (as shown in Table 8.17, and Drawing No. 168659-047, in Appendix A), the TAN 2011 significance of which is slight/moderate. In order to confirm if noise levels shall be met at the most exposed properties throughout the development, levels within ground floor bedrooms with windows facing towards the roads have been predicted using closed windows. At the time of writing the glazing configuration has not been specified, therefore the minimum standard of double glazing required for thermal insulation by the Building Standards (Scotland) Regulations of 6/16/6mm glazing, with a sound reduction index of 31dB, as described in Section 8.8.30, has been used. A façade correction of +2.5dB(A) in accordance with CRTN has been used for the calculation of internal noise levels.

8.8.29 A summary of the CadnaA night-time noise model results, TAN 2011 assessment and predicted internal noise levels are shown in Table 8.17. Night-time free-field noise contours for the 4m receptor height are shown in Drawing No. 168659-047 (refer to Appendix 8.1).

<table>
<thead>
<tr>
<th>Noise Sensitive Receptor ID</th>
<th>Modelled Free-field External $L_{Aeq,T}$ dB(A)</th>
<th>Meet External Noise Criteria?</th>
<th>Excess $L_{Aeq,T}$ dB(A)</th>
<th>TAN 2011 Magnitude of Impact</th>
<th>TAN 2011 Level of Significance</th>
<th>Predicted Internal Bedrooms $L_{Aeq,T}$ dB</th>
<th>Meet noise criteria? Internal 30dB(A) night time</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>41.7</td>
<td>YES</td>
<td>-3.3</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>13.2</td>
<td>YES</td>
</tr>
<tr>
<td>13</td>
<td>41.8</td>
<td>YES</td>
<td>-3.2</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>13.3</td>
<td>YES</td>
</tr>
<tr>
<td>14</td>
<td>42.2</td>
<td>YES</td>
<td>-2.8</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>13.7</td>
<td>YES</td>
</tr>
<tr>
<td>15</td>
<td>42.0</td>
<td>YES</td>
<td>-3.0</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>13.5</td>
<td>YES</td>
</tr>
<tr>
<td>16</td>
<td>43.1</td>
<td>YES</td>
<td>-1.9</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>14.6</td>
<td>YES</td>
</tr>
<tr>
<td>17</td>
<td>42.4</td>
<td>YES</td>
<td>-2.6</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>13.9</td>
<td>YES</td>
</tr>
<tr>
<td>18</td>
<td>45.4</td>
<td>NO</td>
<td>0.4</td>
<td><em>Negligible</em></td>
<td>Slight</td>
<td>16.9</td>
<td>YES</td>
</tr>
<tr>
<td>19</td>
<td>50.0</td>
<td>NO</td>
<td>5.0</td>
<td><em>Minor</em></td>
<td>Slight/Moderate</td>
<td>21.5</td>
<td>YES</td>
</tr>
<tr>
<td>20</td>
<td>47.0</td>
<td>NO</td>
<td>2.0</td>
<td><em>Negligible</em></td>
<td>Slight</td>
<td>18.5</td>
<td>YES</td>
</tr>
<tr>
<td>21</td>
<td>47.4</td>
<td>NO</td>
<td>2.4</td>
<td><em>Negligible</em></td>
<td>Slight</td>
<td>18.9</td>
<td>YES</td>
</tr>
<tr>
<td>22</td>
<td>45.0</td>
<td>NO</td>
<td>0.0</td>
<td><em>Negligible</em></td>
<td>Slight</td>
<td>16.5</td>
<td>YES</td>
</tr>
<tr>
<td>23</td>
<td>41.1</td>
<td>YES</td>
<td>-3.9</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>12.6</td>
<td>YES</td>
</tr>
<tr>
<td>24</td>
<td>41.2</td>
<td>YES</td>
<td>-3.8</td>
<td><em>No change</em></td>
<td>Neutral</td>
<td>12.7</td>
<td>YES</td>
</tr>
</tbody>
</table>
### Table 1: Noise Sensitivity and Criteria Assessment

<table>
<thead>
<tr>
<th>Noise Sensitive Receptor ID</th>
<th>Modelled Free-field External $L_{Aeq,T}$ dB(A)</th>
<th>Meet External Noise Criteria?</th>
<th>Excess dB(A)</th>
<th>TAN 2011 Magnitude of Impact</th>
<th>TAN 2011 Level of Significance</th>
<th>Predicted Internal Bedrooms $L_{Aeq,T}$ dB</th>
<th>Meet noise criteria?</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>39.6</td>
<td>YES</td>
<td>-5.4</td>
<td>No change</td>
<td>Neutral</td>
<td>11.1</td>
<td>YES</td>
</tr>
<tr>
<td>26</td>
<td>40.9</td>
<td>YES</td>
<td>-4.1</td>
<td>No change</td>
<td>Neutral</td>
<td>12.4</td>
<td>YES</td>
</tr>
<tr>
<td>27</td>
<td>41.0</td>
<td>YES</td>
<td>-4.0</td>
<td>No change</td>
<td>Neutral</td>
<td>12.5</td>
<td>YES</td>
</tr>
<tr>
<td>28</td>
<td>45.2</td>
<td>NO</td>
<td>0.2</td>
<td>Negligible</td>
<td>Slight</td>
<td>16.7</td>
<td>YES</td>
</tr>
<tr>
<td>29</td>
<td>45.5</td>
<td>NO</td>
<td>0.5</td>
<td>Negligible</td>
<td>Slight</td>
<td>17.0</td>
<td>YES</td>
</tr>
<tr>
<td>30</td>
<td>44.6</td>
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<td>-0.4</td>
<td>No change</td>
<td>Neutral</td>
<td>16.1</td>
<td>YES</td>
</tr>
<tr>
<td>31</td>
<td>46.0</td>
<td>NO</td>
<td>1.0</td>
<td>Negligible</td>
<td>Slight</td>
<td>17.5</td>
<td>YES</td>
</tr>
<tr>
<td>32</td>
<td>43.7</td>
<td>YES</td>
<td>-1.3</td>
<td>No change</td>
<td>Neutral</td>
<td>15.2</td>
<td>YES</td>
</tr>
<tr>
<td>33</td>
<td>44.5</td>
<td>YES</td>
<td>-0.5</td>
<td>No change</td>
<td>Neutral</td>
<td>16.0</td>
<td>YES</td>
</tr>
<tr>
<td>34</td>
<td>44.8</td>
<td>YES</td>
<td>-0.2</td>
<td>No change</td>
<td>Neutral</td>
<td>16.3</td>
<td>YES</td>
</tr>
<tr>
<td>35</td>
<td>45.6</td>
<td>NO</td>
<td>0.6</td>
<td>Negligible</td>
<td>Slight</td>
<td>17.1</td>
<td>YES</td>
</tr>
<tr>
<td>36</td>
<td>41.7</td>
<td>YES</td>
<td>-3.3</td>
<td>No change</td>
<td>Neutral</td>
<td>13.2</td>
<td>YES</td>
</tr>
<tr>
<td>37</td>
<td>44.8</td>
<td>YES</td>
<td>-0.2</td>
<td>No change</td>
<td>Neutral</td>
<td>16.3</td>
<td>YES</td>
</tr>
</tbody>
</table>

8.8.30 According to these results, night time internal noise levels at the properties around the periphery of proposed development; those most exposed to the main noise sources (i.e. A82, Old Luss Road, Ben Lomond Way, Pier Road and Balloch Road) are predicted to meet the agreed noise criteria of 30dB(A) within bedrooms during the night-time periods with closed windows. The minimum standard of double glazing required in the Building Standards (Scotland) Regulations for thermal insulation, of 2 panes of 6mm thick glass separated by a 16mm wide cavity shall provide the sound reduction required.

### 8.9 Further Mitigation and Enhancement

#### Construction Phase

8.9.1 As stated in Paragraph 8.8.1 construction phase impacts have been scoped out of this assessment.

#### Design Mitigation

8.9.2 As part of the masterplan design process EnviroCentre used CadnaA noise modelling software to inform the design of any mitigation measures if necessary for the year of development opening scenario (2020). The results were assessed in accordance with TAN 2011. Exceedances of the Council’s noise criteria were identified in one of the garden/terraces of the most exposed properties.

8.9.3 The level of significance of any TAN 2011 exceedance within the current masterplan is now slight. 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 19.

#### Operational Phase

8.9.4 Daytime external noise levels are predicted to meet West Dunbartonshire Council’s noise target of 55dB(A) in the majority of properties. Noise exceeds the target noise criteria in some locations by up to 2.9dB(A). The TAN 2011 level of significance of the exceedances is slight. In line with consultation carried out with West Dunbartonshire Council, the daytime external noise, when
incorporating the site design mitigation features, has been found to be within acceptable limits and does not need to be reduced further.

### 8.10 Residual Effects

**Construction Phase**

8.10.1 As stated in Paragraph 8.8.1 construction phase impacts have been scoped out of this assessment.

**Operational Phase**

8.10.2 Taking account of proposed mitigation and enhancement measures, the residual potential effects from the construction and operation of the proposed development are identified in Table 8.18.

Table 8.18: Residual Effects

<table>
<thead>
<tr>
<th>Noise Sensitive Receptor</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Residual Effect</th>
<th>Significance (EIA Terms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Moderate (Daytime)</td>
<td>2m high close boarded timber fencing at the garden/terrace boundary</td>
<td>Slight</td>
<td>Not significant/Minor</td>
</tr>
</tbody>
</table>

### 8.11 Monitoring of Residual Effects

8.11.1 No monitoring of residual effects is proposed.

### 8.12 Assessment of Cumulative Effects

8.12.1 Cumulative effects can occur when other proposed developments would also be relevant to the setting of a sensitive receptors. There are no other proposed developments to which these criteria apply, and therefore cumulative effects have been scoped out of this assessment.

### 8.13 Summary

8.13.1 A noise assessment has been carried out to assess the impact of the increase in traffic noise as a result of a proposed development at Riverside West in Balloch. The impact of road traffic noise on both existing and proposed residential receptors has been assessed against noise criteria agreed with West Dunbartonshire council.

8.13.2 3D computer noise modelling using CadnaA software has been carried out and validated against measured on-site road traffic noise data. The modelling considered current year (2017), and year of development completion (2020) scenarios.

8.13.3 Vibration was scoped out of the assessment because it is considered not to be an issue.

**Existing Noise Sensitive Receptors**

8.13.4 A TAN 2011 assessment of the day and night-time noise impact from future (2020) development generated road traffic at existing noise sensitive receptors within the surrounding areas has been carried out, through comparison between with vs without development scenarios.

8.13.5 The amount by which day and night-time road traffic noise levels are predicted to increase varies between 0.1dB(A) and 2.2dB(A), the TAN 2011 level of significance of which is Slight. The greatest increase in road traffic noise is predicted to occur at properties located at Old Luss Road, Ben Lomond Way and Balloch Road. This is due to the largest percentage increase in road traffic as a result of the proposed development occurring around these areas.
Proposed Noise Sensitive Receptors

8.13.6 A TAN 2011 assessment of the day and night-time noise impact from road traffic at proposed future noise sensitive receptors, for the year of development completion scenario (2020) has been carried out. The assessment includes the use of design mitigation.

8.13.7 Daytime external noise levels are predicted to meet the agreed noise target of 55dB(A) at all but seven properties. Noise exceeds the target noise criteria at these properties by up to 2.9dB(A). The TAN 2011 level of significance of the exceedances is Slight. The daytime external garden/terrace noise, when incorporating the site design mitigation features, has been found to be within acceptable limits and does not need to be reduced further.

8.13.8 Similarly, A TAN 2011 assessment of night-time external noise at proposed future noise sensitive receptors has been carried out, for the year of development completion scenario. At one of the most exposed properties, the TAN 2011 level of significance of the night-time noise is predicted to exceed Slight, therefore internal noise levels have been calculated. At all locations throughout the proposed development internal noise levels are predicted to meet the target noise criteria of 30dB(A) with closed windows. The minimum standard of double glazing required in the Building Standards (Scotland) Regulations for thermal insulation, of 2 panes of 6mm thick glass separated by a 16mm wide cavity shall provide the sound reduction required.

8.13.9 The Noise Assessment has determined that the significance of the proposed development is not significant/ minor i.e. the effects may be raised as local issues but are unlikely to be of importance in the decision-making process.

8.14 References

9 Air Quality

9.1 Introduction

9.1.1 This ES chapter considers the suitability of the site in terms of local air quality for the proposed development and the potential for the proposed development to adversely affect local air quality. The assessment is based on the characteristics of the site and surrounding area and the key parameters of the proposed development detailed in Chapter 2 – Site and Surrounding Area and Chapter 3 – The Proposed Development respectively. This chapter has been prepared by EnviroCentre Ltd.

9.1.2 The aims of this chapter are to:

- Identify the relevant context in which the air quality assessment has been undertaken;
- Describe the methods used to undertake the assessment;
- Outline the relevant baseline conditions currently existing at the site and surroundings;
- Identify the potential direct and indirect air quality impacts of the proposed development; and,
- Identify mitigation and enhancement measures where required to address identified effects;

9.1.3 This ES chapter is supported by the following technical reports provided in Appendices 9.1 (Drawings) and 9.2 (Technical Report).

9.2 Legislative and Policy Context

Legislation

9.2.1 The overarching legislative framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context. Subject specific legislation of relevance to this assessment is outlined below.

9.2.2 Air Quality is protected by national and regional legislation. In the UK, Part IV of the Environment Act 1995 places a statutory duty on local authorities to periodically review and assess the air quality within their area. This involves consideration of present and likely future air quality against air quality standards and objectives. Under section 83(1) of this Act, local authorities have a duty to designate any relevant areas where the air quality objectives are not (or are unlikely to be) being met as Air Quality Management Areas (AQMAs). West Dunbartonshire Council have not currently declared any AQMA’s within their administrative area, which includes the site of the proposed development.

9.2.3 Associated with Part IV of the Environment Act 1996, guidelines of the “Review and Assessment” process of local air quality were published in the 1997 National Air Quality Strategy (NAQS) and associated guidance and technical guidance. In 2000, the government reviewed the 1997 Strategy and produced a revised Air Quality Strategy for England, Scotland, Wales and Northern Ireland, which resulted in the production of air quality standards and objectives. The most current revision of the strategy available is dated March 2011 (DEFRA, 2011).

9.2.4 The objectives adopted in Scotland are contained within the Air Quality (Scotland) Regulations 2000 and Air Quality (Scotland) Amendment Regulations 2002 for the purpose of Local Air Quality Management and consolidate the provisions of the previous Air Quality Regulations. The Air Quality Standards (Scotland) Amendment Regulations 2010 introduce objectives for Particles (PM<sub>10</sub>), Polycyclic Aromatic Hydrocarbons and Lead with the Air Quality (Scotland) Amendment Regulations 2016 amending the Air Quality (Scotland) Regulations 2000 to bring into statute an objective for PM<sub>2.5</sub>. 
Policy

9.2.5 The planning policy framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context. Planning policy considerations (including policies and guidance) of specific relevance to this assessment are:

- Adopted Loch Lomond and the Trossachs National Park (LLTNP) Local Development Plan (LDP) (2016) including relevant policies outlined in Table 5.1, in particular:
  - Overarching Policy 1 – Strategic Principles;
  - Overarching Policy 2 - Development Requirements; and
  - Transport Policy 2 - Promoting Sustainable Travel and Improved Active Travel Options.
- Draft LLTP Partnership Plan 2018 – 2023, in particular outcomes 1-3 and 5-9;
- National Planning Framework 3 (NPF3) (2014);
- Scottish Planning Policy (SPP) (2014) including relevant provisions outlined in Table 9.2, in particular:
  - Principal Policy on Sustainability (paragraphs 24-35); and
  - Valuing the Natural Environment Subject Policy (Paragraphs 193 - 233).
- PAN 51 Planning Environmental Protection and Regulation (Revised October 2006).

9.2.6 Other policy considerations of relevance to this assessment are:

- Policy Guidance Local Air Quality Management. Policy Guidance (LAQM. PG(S) 16 was released by the Scottish Government in March 2016 as means of providing a source of guidance for local authorities to comply with their local air quality management duties as set out in Part IV of the Environment Act 1995 (see above).

Guidance and Relevant Technical Standards

Air Quality Definitions

9.2.7 Standards for air pollution are concentrations over a given time period that are considered to be acceptable in light of what is known about the effects of each pollutant on health and on the environment. They can also be used as a benchmark to see if air pollution is getting better or worse.

9.2.8 Objectives for pollutants have been derived from these standards and represent a compromise between what is desirable in terms of human health impacts and what is deemed to be achievable in terms of practicality and cost.

National Air Quality Objectives

9.2.9 Table 9.1 provides a summary of the air quality objectives from the Air Quality (Scotland) Regulations 2010, as amended 2016. An objective is the target date on which exceedances of a standard must not exceed a specified number. The results of air quality modelling will be compared against these objectives.
## Table 9.1 Summary of Objectives of the UK Air Quality Strategy

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Objective</th>
<th>Measured as</th>
<th>To be Achieved by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (All Authorities)</td>
<td>16.25 µg/m³</td>
<td>Running Annual Mean</td>
<td>31 December 2003</td>
</tr>
<tr>
<td>Benzene (Scotland and Northern Ireland Only)</td>
<td>3.25 µg/m³</td>
<td>Running Annual Mean</td>
<td>31 December 2010</td>
</tr>
<tr>
<td>1,3 Butadiene</td>
<td>2.25 µg/m³</td>
<td>Running Annual Mean</td>
<td>31 December 2003</td>
</tr>
<tr>
<td>Carbon Monoxide (Authorities in Scotland Only)</td>
<td>10.0 µg/m³</td>
<td>Running 8-Hour Mean</td>
<td>31 December 2003</td>
</tr>
<tr>
<td>Lead</td>
<td>0.5 µg/m³</td>
<td>Annual Mean</td>
<td>31 December 2004</td>
</tr>
<tr>
<td></td>
<td>0.25 µg/m³</td>
<td>Annual Mean</td>
<td>31 December 2008</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>200 µg/m³</td>
<td>Not to be exceeded more than 18 times per year</td>
<td>1 Hour Mean</td>
</tr>
<tr>
<td></td>
<td>40 µg/m³</td>
<td>Annual Mean</td>
<td>31 December 2005</td>
</tr>
<tr>
<td>Particles (PM₁₀) (gravimetric)</td>
<td>50 µg/m³</td>
<td>Not to be exceeded more than 35 times per year</td>
<td>24 Hour Mean</td>
</tr>
<tr>
<td>All authorities</td>
<td>40 µg/m³</td>
<td>Annual Mean</td>
<td>31 December 2004</td>
</tr>
<tr>
<td>Particles (PM₁₀) (gravimetric)</td>
<td>50 µg/m³</td>
<td>Not to be exceeded more than 7 times per year</td>
<td>24 Hour Mean</td>
</tr>
<tr>
<td>Scotland Only</td>
<td>18 µg/m³</td>
<td>Annual Mean</td>
<td>31 December 2010</td>
</tr>
<tr>
<td>Particles (PM₂.₅) (gravimetric)† (target)</td>
<td>25 µg/m³ (target)</td>
<td>Annual Mean</td>
<td>2020</td>
</tr>
<tr>
<td>All authorities</td>
<td>15% cut in urban background exposure</td>
<td>Annual Mean</td>
<td>2010 – 2020</td>
</tr>
<tr>
<td>Particles (PM₂.₅) (gravimetric)† (Limit)</td>
<td>10 µg/m³ (Limit)</td>
<td>Annual Mean</td>
<td>2020</td>
</tr>
<tr>
<td>Scotland Only</td>
<td>350 µg/m³ not to be exceeded more than 24 times a year</td>
<td>1-Hour Mean</td>
<td>31 December 2004</td>
</tr>
<tr>
<td>Pollutant</td>
<td>Objective</td>
<td>Measured as</td>
<td>To be Achieved by</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td></td>
<td>125 µg/m³ not to be exceeded more than 3 times a year</td>
<td>24 Hour Mean</td>
<td>31 December 2004</td>
</tr>
<tr>
<td></td>
<td>266 µg/m³ not to be exceeded more than 35 times a year</td>
<td>15-Minute Mean</td>
<td>31 December 2005</td>
</tr>
<tr>
<td>PAH *</td>
<td>0.25 ng/m³</td>
<td>Annual Mean</td>
<td>31 December 2010</td>
</tr>
<tr>
<td>Ozone *</td>
<td>100 µg/m³</td>
<td>8 hourly running or hourly mean *</td>
<td>31 December 2005</td>
</tr>
</tbody>
</table>

* not currently assessed by Scottish Local Authorities

### Air Quality Guidance

9.2.10 Technical guidance Local Air Quality Management. Technical Guidance (LAQM.TG) 09 was issued on behalf of the Department of Environment, Food and Rural Affairs (DEFRA) in February 2009 (DEFRA, 2009a). A Policy Guidance (LAQM.PG09) was also issued at the same time (DEFRA, 2009a_b). This guidance is designed to guide local authorities through the Review & Assessment process and will also be adhered to for the purposes of the air quality assessment.

9.2.11 DEFRA and the Scottish Government updated LAQM Technical Guidance in 2016 Local Air Quality Management. Technical Guidance (LAQM.TG) 16 (The Scottish Government, 2016). The main change is in the approach with a greater emphasis on action planning to bring forward improvements in air quality and to include local measures as part of the EU reporting requirements. The reporting requirements for Local Authorities also changed with the adoption of an Annual Progress Report. Local Authorities continue to appraise pollutant concentrations of Nitrogen Dioxide (NO₂), Particulate Matter (PM₁₀) and Sulphur Dioxide (SO₂). Local authorities are also required to work towards reducing levels of PM₂.₅.

9.2.12 The document “Land-Use Planning & Development Control: Planning for Air Quality” produced by Environmental Protection UK and the Institute of Air Quality Management (EPUK & IAQM, 2017) provides guidance on dealing with air quality issues within the development control process. The guidance provides an assessment approach to defining whether the impact on air quality associated with the proposed development should be of material concern. This methodology uses a predicted change in pollutant concentrations, taking into account the relevant air quality objectives, to assess the impacts of development proposals on air quality. It further states that the effects on the residents of a proposed development need to be assessed as significant if the air quality objectives at the façade are not met. Assessed effects can be reduced if provision is made to reduce the exposure to the pollutant being considered.

### Methodology

#### Scope of Assessment

9.3.1 This ES chapter presents an assessment of likely significant effects on air quality from the proposed development (West Riverside and Woodbank House). The assessment presented in this ES chapter has been prepared in accordance with the 2011 EIA Regulations.

9.3.2 The primary long-term concern in relation to air quality is the emissions generated by traffic and the subsequent impact on the local ambient air quality at residential areas located within the vicinity of the main road network. The main pollutant concentrations of concern from this source are Nitrogen Dioxide (NO₂) and Particulate Matter (PM₁₀ and PM₂.₅).
### Overall Approach

9.3.3 In undertaking the assessment presented in this ES chapter, the following activities have been carried out:
- EIA screening and scoping (see below);
- Desktop review of current and predicted future baseline environmental conditions at the site and surrounding area (Section 9.4);
- Assessment of potential changes in air quality using dispersion modelling, as detailed in Appendix 9.2 – Air Quality Assessment; and
- Identification and assessment of likely significant effects, taking into account proposed mitigation and enhancement measures and including consideration of likely cumulative effects (Sections 9.6 – 9.10).

9.3.4 The assessment has been informed by an EIA Screening and Scoping Report (PBA, April 2017) and subsequent EIA Screening and Scoping Opinions issued by LLTNPA (11th May 2017) in respect of the EIA for the proposed development. The EIA Scoping Opinion is provided in full in Appendix 4.1.

### Study Area

9.3.5 The Study Area adopted for the assessment of potential air quality impacts focuses on the roads within the vicinity of the site that are most likely to be subjected to traffic increases as a result of the proposed development. Minor roads have been excluded from consideration due to the relatively low pollutant concentrations that they generally produce.

### Information Sources

#### Desk Top Study

**Data Sources**

9.3.6 The following data sources were used within this assessment;
- 2017 Air Quality Annual Progress Report (APR) for West Dunbartonshire Council;
- DEFRA background mapping data for local authorities;
- Aerial photography of the site;
- Traffic flow data for the roads surrounding the site; and
- Weather data from Glasgow Bishopton weather station for the year 2016.

**ADMS Dispersion Modelling**

9.3.7 An ADMS-Roads dispersion model was built to underpin this assessment. This model is approved for use in detailed assessment dispersion modelling studies through technical guidance LAQM.TG16 (DEFRA, 2016). The model has been subject to extensive validation and inter-model comparison studies. The ADMS-Roads model provides a means of predicting pollutant emissions attributed to road traffic and can be used to assess the impact of road traffic increases and resultant pollution as a consequence of a development.

9.3.8 The location of sensitive receptors, as identified in Section 9.4 – Baseline, and details of the local road network system were inputted to the ADMS model using the GIS software ArcMap 10.5 on a digital OS tile of the surrounding area.

9.3.9 For local impact assessments, all roads which are expected to make a significant contribution to pollution at identified sensitive receptor locations should be included within the ADMS model. These road links are identified in Section 9.4 – Baseline. Traffic flow data for these road links was provided by Peter Brett Associates LLP (PBA) for input to the ADMS model, whilst PBA also undertook wider modelling and analysis to underpin the West Riverside and Woodbank House Transport Assessment and Chapter 7 – Traffic and Transport of this ES. For full details of the traffic data utilised in the model refer to Appendix 9.2 - Air Quality Assessment.
As no industrial sources are located within the Study Area, none were included within the ADMS model.

9.3.10 Additional input data to the ADMS model was confirmed through a validation process designed to result in a model which most closely represented conditions at the existing monitoring locations and therefore gave a conservative prediction of pollutant concentrations the assessed receptors would be exposed to. The following additional input data were therefore utilised in the model.

9.3.11 The chemical reaction scheme option within the ADMS model was utilised in the assessment so that the model took into account the photochemical reactions between NO, NO$_2$ and O$_3$.

9.3.12 As no background concentration for West Dunbartonshire could be obtained the model was run using the 2016 annual average O$_3$ concentration for Glasgow Waulkmillglen Reservoir (classed as rural). The respective value is 49µg/m$^3$. A surface roughness length is used in the dispersion modelling study to characterise the land use of the surrounding area in terms of frictional effect that will occur due to the interaction of wind with the surface; this is a key component in the generation of atmospheric turbulence, which influences dispersion. A surface roughness length of 0.5 was used to characterise the proposed development site which is representative of Parkland, open suburbia. A surface roughness of 0.3 was used to characterise the meteorological site. This is representative of agricultural areas (max).

9.3.13 A minimum Monin-Obukhov length is used in the dispersion model to represent the effects of buoyancy on turbulent flows as a result of the surface temperature and mechanical mixing in the lower atmosphere. The minimum Monin-Obukhov length used for both the proposed development and dispersion sites was 10m which is considered representative of small towns <50,000 residents.

9.3.14 No improvement in emission factors was assumed for the ‘future year’ scenarios in order to provide a ‘worst case’ assessment scenario.

9.3.15 Both gridded and specified points output were selected in the model so that emissions could be displayed as both contour plots and as values at particular sensitive receptors in the surrounding area.

9.3.16 The annual average concentrations of NO$_2$, PM$_{10}$ and PM$_{2.5}$ were modelled in this assessment.

Fieldwork

9.3.17 No fieldwork was undertaken as part of this assessment.

Approach to Assessment

Identification of Relevant Receptors

9.3.18 Receptors considered in this assessment comprise human receptors, that is locations where a person or property may experience adverse impacts of airborne dust or exposure to ambient pollution (i.e. residential, leisure use, amenity and sensitive commercial use) and ecological receptors where this refers to any sensitive habitat that may be affected by dust soiling or increased ambient pollution (e.g. locations with an international, national or local designation and sensitive habitat features).

9.3.19 The proposed development is likely to alter traffic movements on the road network in the vicinity of the site. Therefore, the sensitive receptor locations examined in this assessment were selected due to their proximity to the roads most likely to be subject to traffic increases as a result of the development. The roads included in the assessment are those expected to make a significant contribution to pollution at identified receptor locations. In practise, roads more than 200m away from any sensitive receptor can be excluded. Minor roads can also be excluded even when they are closer than 200m to sensitive receptors due to their relatively small pollutant contributions. As no industrial sources are present within the Study Area, no such sources were modelled.

Construction Phase Assessment Methodology

9.3.20 At the outset it was recognised that certain construction activities have potential to generate dust emissions, which could adversely affect amenity and the environment. This will be managed through the preparation of a dust management plan as part of a Construction
Environmental Management Plan (CEMP) which will be developed prior to the commencement of construction and thereafter implemented. The CEMP, including a dust management plan, will be submitted to and approved by Loch Lomond and the Trossachs National Park under a condition attached to any PPiP granted for the proposed development. The inclusion of a dust management plan detailing relevant dust suppression techniques within the CEMP is therefore treated as an embedded mitigation measure within this ES.

9.3.21 Construction impacts are considered to be temporary, with any dust emissions being managed through embedded mitigation and dust levels returning to baseline post construction. Impacts from the construction phase of the proposed development are therefore not considered further in this assessment.

Operational Phase Assessment Methodology

9.3.22 The ADMS modelling exercise outlined above considered the impact of the operational phase of the proposed development on existing and future residents in areas where traffic movements are predicted to alter. Therefore, the sensitive receptors considered in the ADMS model were selected due to their proximity to the roads most likely to be subject to traffic increases as a result of the proposed development.

9.3.23 The following scenarios were considered:
- 2016 Baseline;
- 2019 Baseline; and
- 2019 Baseline + Proposed Development.

9.3.24 In accordance with the impact assessment methodology advised within Land-Use Planning & Development Control: Planning for Air Quality (EPUK & IAQM, 2017), the magnitude of likely operational impacts on air quality under the above scenarios was determined by assessing the predicted change in a pollutant concentration at a sensitive receptor between a ‘without development’ scenario against the ‘with development’ scenario. The criteria shown in Table 9.2 will be used for assessment purposes.

<table>
<thead>
<tr>
<th>Long term average Concentration at receptor in assessment year</th>
<th>% Change in concentration relative to Air Quality Assessment Level (AQAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 75% of AQAL</td>
<td>Negligible Negligible Slight Moderate</td>
</tr>
<tr>
<td>76 – 94% of AQAL</td>
<td>Negligible Slight Moderate Moderate</td>
</tr>
<tr>
<td>95 – 102% of AQAL</td>
<td>Slight Moderate Moderate Substantial</td>
</tr>
<tr>
<td>102 – 109% of AQAL</td>
<td>Moderate Moderate Substantial Substantial</td>
</tr>
<tr>
<td>≥ 110% of AQAL</td>
<td>Moderate Substantial Substantial Substantial</td>
</tr>
</tbody>
</table>

Explanation

AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency ‘Environmental Assessment Level (EAL)’.

The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as Negligible.

The Table is only designed to be used with annual mean concentrations.

Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a ‘moderate’ adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
When defining the concentration as a percentage of the AQAL, use the 'without scheme’ concentration where there is a decrease in pollutant concentration and the ‘with scheme’ concentration for an increase.

The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

Assumptions and Limitations

9.3.25 This assessment is based on modelled air quality figures, validated against monitored data. It is considered to be a good representation of the likely impact of the development on air quality.

Establishment of Effect Significance

9.3.26 In line with the approach and criteria set out in Chapter 4 – Assessment Methods for establishing the significance of likely effects, likely impacts on air quality at Moderate or higher levels (as per Table 9.2) are deemed to be significant in the context of the EIA Regulations. Any likely impacts at Slight or Negligible levels are deemed to be not significant.

Approach to Cumulative Impact Assessment

9.3.27 The traffic data provided by PBA assumed no interim growth in traffic flows between the 2016 and 2019 scenarios, as agreed with Transport Scotland and West Dunbartonshire Council. Furthermore, the traffic data future year scenarios provided by PBA also include no flows attributed to identified cumulative developments. As these cumulative developments are not predicted to affect traffic flows, no consideration of associated cumulative impacts on air quality is considered to be required as there is no potential for likely significant cumulative effects to occur. Cumulative air quality effects have therefore been scoped out of this assessment.

9.4 Baseline Conditions

Sensitive Receptors

9.4.1 The sensitive receptors considered in this assessment and included in the ADMS model are listed in Table 9.3.

Table 9.3 Air Quality Sensitive Receptors

<table>
<thead>
<tr>
<th>Sensitive Receptor ID</th>
<th>Sensitive Receptor Description</th>
<th>Rationale for Inclusion in Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Site of proposed boutique hotel within the proposed development</td>
<td>Proposed visitor accommodation</td>
</tr>
<tr>
<td>2.</td>
<td>Site of proposed budget accommodation within the proposed development</td>
<td>Proposed visitor accommodation</td>
</tr>
<tr>
<td>3.</td>
<td>South Eastern corner of the Woodbank area of the proposed development</td>
<td>Proposed visitor accommodation</td>
</tr>
<tr>
<td>4.</td>
<td>Anchorage B&amp;B</td>
<td>Existing residential in close proximity to road network</td>
</tr>
</tbody>
</table>
9.4.2 The location of each sensitive receptor relative to the site is shown in Figure 9.1 (Drawing No. 168655-007) provided in Appendix 9.1. These locations, along with details of the local road network system, were inputted to the air dispersion model using the GIS software ArcMap 10.5 on a digital OS tile of the surrounding area.

9.4.3 These sensitive receptors were selected for inclusion within the ADMS model due to their proximity to the roads most likely to be subject to traffic increases as a result of the proposed development. These road links are:

- A811;
- Old Luss Road;
- Ben Lomond Way;
- Balloch Road;
- Pier Road;
- A813 Carrochan Road;
- B857; and
- A82.

### Background Air Quality

9.4.4 For NOX, PM10 and PM2.5 these background pollutant concentrations are split into contributions from various sectors and therefore background levels can be obtained and the risk of “double counting” concentrations can be avoided. Only minor roads were removed during the adjustment process. In order to assume a worst-case assessment scenario no improvement in background concentrations was assumed for the ‘future year’ scenarios.

9.4.5 The proposed development is located in OS 1 kilometre grid square 238500 681500. The background pollutant concentrations for this square are outlined in Table 9.4 below:

<table>
<thead>
<tr>
<th>Sensitive Receptor I.D</th>
<th>Sensitive Receptor Description</th>
<th>Rationale for Inclusion in Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>2 Clairinsh</td>
<td>Existing residential in close proximity to road network</td>
</tr>
<tr>
<td>6.</td>
<td>8 Drumkinnon Road</td>
<td>Existing residential in close proximity to road network</td>
</tr>
<tr>
<td>7.</td>
<td>Arbor Travel Lodge</td>
<td>Existing residential in close proximity to road network</td>
</tr>
<tr>
<td>8.</td>
<td>27 Laudervale Gardens</td>
<td>Existing residential in close proximity to road network</td>
</tr>
<tr>
<td>9.</td>
<td>28 Lomond Road</td>
<td>Existing residential in close proximity to road network</td>
</tr>
<tr>
<td>10.</td>
<td>Cameron Drive</td>
<td>Existing residential in close proximity to road network</td>
</tr>
<tr>
<td>11.</td>
<td>North Western corner of the Woodbank area of the proposed development</td>
<td>Proposed visitor accommodation</td>
</tr>
</tbody>
</table>
Table 9.4 Site Background Air Quality Concentrations

<table>
<thead>
<tr>
<th>Year</th>
<th>NO₂</th>
<th>NOₓ</th>
<th>PM₁₀</th>
<th>PM₂.₅</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Adjusted</td>
<td>Total</td>
<td>Adjusted</td>
</tr>
<tr>
<td>2016</td>
<td>7.23</td>
<td>5.30</td>
<td>9.36</td>
<td>6.82</td>
</tr>
</tbody>
</table>

Monitored Pollutant Concentrations

9.4.6 The ADMS-Roads model is verified for the year 2016 against the diffusion tube detailed in Table 9.5 below.

Table 9.5 Air Quality Monitoring Location

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Site Type</th>
<th>OS Grid Reference</th>
<th>Orientation to Site</th>
<th>NO₂ 2016 Annual Mean Concentration (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT21 (Balloch 1)</td>
<td>Urban Traffic</td>
<td>238584 681562</td>
<td>South West</td>
<td>19.6</td>
</tr>
</tbody>
</table>

9.4.7 The annual average NO₂ concentration recorded at this location for 2016 was well within the objective level of 40µg/m³ for this parameter.

Weather Conditions

9.4.8 Meteorology data purchased from ADM Ltd specifically for use in ADMS-Roads was utilised in this assessment. The data was for the year 2016 and was obtained from the nearest meteorological weather station to the site recording a full suite of meteorological parameters, which is located at Glasgow Bishopton.

9.4.9 This weather station has an altitude of 59m and is located in a rural area approximately 11km south-east of the proposed development site. The data provided by the meteorological station was fully ratified and validated for the year 2016 and included all the meteorological parameters required by the model comprising hourly sequential recordings of:

- Surface Temperature;
- Precipitation;
- Wind speed;
- Wind direction;
- Relative humidity; and
- Cloud cover.

9.4.10 The corresponding wind rose for this year is provided in Diagram 9.2. It indicates 3 prominent wind directions: 200-220°, 250-270°, and 300-310°. It also indicates the greatest percentage wind speed lies between 10-16 knots.
Summary of Receptor Sensitivity

9.4.11 The receptors included within the assessment are representative of current or future residential and therefore are considered to have high sensitivity to potential air quality impacts.

9.5 Baseline Evolution

9.5.1 In the absence of the proposed development the baseline conditions would likely be consistent with existing conditions.

9.6 Embedded Mitigation

9.6.1 As detailed in Chapter 3 – The Proposed Development, a number of design features and embedded mitigation measures have been incorporated into the design and construction of the proposed development to avoid, prevent or minimise significant adverse environmental effects and to enhance beneficial effects. Embedded mitigation measures of relevance to this assessment are:

Construction Phase
- Development, approval and implementation of a dust management plan as part of a Construction Environmental Management Plan.

Operational Phase
- Development, approval and implementation of a Travel Plan.
9.7 Potential Effects

Construction Phase

9.7.1 Construction phase dust effects will be managed through a dust management plan to be approved as part of a CEMP for the proposed development. This would prevent likely significant construction dust effects from arising. No further assessment of construction phase effects is therefore required.

Operational Phase

9.7.2 The proposed development is likely to alter traffic movements on the road network in the surrounding area. The primary long-term concern in relation to air quality is the emissions generated by traffic and the subsequent impact on the local ambient air quality at residential areas located within the vicinity of the main road network. The main pollutant concentrations of concern from this source are Nitrogen Dioxide (NO\textsubscript{2}) and Particulate Matter (PM\textsubscript{10} and PM\textsubscript{2.5}).

Impact Assessment

9.7.3 The predicted pollutant concentrations of the 2019 scenarios were assessed against the criteria provided in Table 9.2 of this document. Full model output results can be found in the Appendix 9.2 - AQA Technical Report.

NO\textsubscript{2} Assessment

9.7.4 The percentage of the objective level and the impact descriptors for the predicted NO\textsubscript{2} concentrations as a result of the proposed development for each sensitive receptor are provided in Table 9.6 below. The resulting level of impact at each sensitive receptor has been calculated using the methodology detailed in Table 9.2.

<table>
<thead>
<tr>
<th>ID</th>
<th>Receptor Description</th>
<th>2019 Baseline (% of objective)</th>
<th>2019 Baseline + Development (% of objective)</th>
<th>Difference (% of objective)</th>
<th>Impact Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR1</td>
<td>Site of proposed boutique hotel</td>
<td>15</td>
<td>15</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR2</td>
<td>Site of proposed budget accommodation</td>
<td>18</td>
<td>19</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR3</td>
<td>South Eastern corner of Woodbank site</td>
<td>17</td>
<td>18</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR4</td>
<td>Anchorage B&amp;B</td>
<td>26</td>
<td>27</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR5</td>
<td>2 Clairinsh</td>
<td>22</td>
<td>23</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR6</td>
<td>8 Drumkinnon Road</td>
<td>27</td>
<td>29</td>
<td>2</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR7</td>
<td>Arbor Travel Lodge</td>
<td>24</td>
<td>26</td>
<td>2</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR8</td>
<td>27 Laudervale Gardens</td>
<td>40</td>
<td>41</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR9</td>
<td>28 Lomond Road</td>
<td>26</td>
<td>27</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR10</td>
<td>Cameron Drive</td>
<td>30</td>
<td>31</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR11</td>
<td>North Western corner of Woodbank site</td>
<td>25</td>
<td>25</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>DT21</td>
<td>Diffusion Tube – Balloch 1</td>
<td>53</td>
<td>55</td>
<td>2</td>
<td>Negligible</td>
</tr>
</tbody>
</table>
9.7.5 The assessment concludes that in relation to NO\textsubscript{2} the impact of the development is considered to be Negligible for all of the assessed sensitive receptors.

**PM\textsubscript{10} Assessment**

9.7.6 The percentage of the objective level and the impact descriptors for the predicted PM\textsubscript{10} concentrations as a result of the development for each sensitive receptor are provided in Table 9.7 below.

Table 9.7 PM\textsubscript{10} Percentage Objective Level & Impact Magnitude

<table>
<thead>
<tr>
<th>ID</th>
<th>Receptor Description</th>
<th>2019 Baseline (% of objective)</th>
<th>2019 Baseline +Development (% of objective)</th>
<th>Difference (% of objective)</th>
<th>Impact Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR1</td>
<td>Site of proposed boutique hotel</td>
<td>42</td>
<td>42</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR2</td>
<td>Site of proposed budget accommodation</td>
<td>44</td>
<td>44</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR3</td>
<td>South Eastern corner of Woodbank site</td>
<td>43</td>
<td>43</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR4</td>
<td>Anchorage B&amp;B</td>
<td>46</td>
<td>46</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR5</td>
<td>2 Clairinsh</td>
<td>45</td>
<td>45</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR6</td>
<td>8 Drumkinnon Road</td>
<td>47</td>
<td>47</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR7</td>
<td>Arbor Travel Lodge</td>
<td>46</td>
<td>46</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR8</td>
<td>27 Laudervale Gardens</td>
<td>51</td>
<td>52</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR9</td>
<td>28 Lomond Road</td>
<td>46</td>
<td>47</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR10</td>
<td>Cameron Drive</td>
<td>48</td>
<td>48</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR11</td>
<td>North Western corner of Woodbank site</td>
<td>46</td>
<td>47</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>DT21</td>
<td>Diffusion Tube – Balloch 1</td>
<td>56</td>
<td>58</td>
<td>2</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

9.7.7 The assessment concludes that in relation to PM\textsubscript{10} the impact of the proposed development is considered to be Negligible for all of the assessed sensitive receptors.

**PM\textsubscript{2.5} Assessment**

9.7.8 The percentage of the objective level and the impact descriptors for the predicted PM\textsubscript{2.5} concentrations as a result of the development for each sensitive receptor are provided in Table 9.8 below. The resulting level of impact at each sensitive receptor has been calculated using the methodology detailed in Table 9.2.
### Table 9.8 PM$_{2.5}$ Percentage of Objective Level & Impact Magnitude

<table>
<thead>
<tr>
<th>ID</th>
<th>Receptor Description</th>
<th>2019 Baseline (% of Objective)</th>
<th>2019 Baseline + Development (% of Objective)</th>
<th>Difference (% of Objective)</th>
<th>Impact Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR1</td>
<td>Site of proposed boutique hotel</td>
<td>49</td>
<td>49</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR2</td>
<td>Site of proposed budget accommodation</td>
<td>50</td>
<td>51</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR3</td>
<td>South Eastern corner of Woodbank site</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR4</td>
<td>Anchorage B&amp;B</td>
<td>53</td>
<td>53</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR5</td>
<td>2 Clairinsh</td>
<td>52</td>
<td>52</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR6</td>
<td>8 Drumkinnon Road</td>
<td>54</td>
<td>54</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR7</td>
<td>Arbor Travel Lodge</td>
<td>53</td>
<td>53</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR8</td>
<td>27 Laudervale Gardens</td>
<td>59</td>
<td>59</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR9</td>
<td>28 Lomond Road</td>
<td>53</td>
<td>54</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR10</td>
<td>Cameron Drive</td>
<td>55</td>
<td>55</td>
<td>0</td>
<td>Negligible</td>
</tr>
<tr>
<td>SR11</td>
<td>North Western corner of Woodbank site</td>
<td>53</td>
<td>54</td>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>DT21</td>
<td>Diffusion Tube – Balloch 1</td>
<td>64</td>
<td>65</td>
<td>1</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

9.7.9 The assessment concludes that in relation to PM$_{2.5}$, the impact of the proposed development is considered to be **Negligible** for all of the assessed sensitive receptors.

9.8 **Further Mitigation and Enhancement**

9.8.1 Taking account of proposed embedded mitigation measures, the assessment provided in Section 9.7 predicts that no significant effects on air quality are considered likely. No further mitigation, compensation or enhancement measures are therefore required or proposed.

9.9 **Residual Effects**

9.9.1 The assessment provided in this chapter has concluded that:

- Significant construction phase dust effects are not likely owing to the proposed development, approval and implementation of a dust management plan within a CEMP for the proposed development; and

- No significant changes in NO$_2$, PM$_{10}$ or PM$_{2.5}$ levels at all assessed sensitive receptors are likely, with the impact magnitude for all sensitive receptors categorised as Negligible.

9.9.2 The overall impact of the proposed development on air quality in the study area can therefore be concluded as not significant.
9.10 Monitoring of Residual Effects

9.10.1 As no residual significant adverse effects on air quality are predicted, no monitoring of residual effects is proposed or considered to be required.

9.11 Summary

9.11.1 An air quality assessment was undertaken using an ADMS-Roads air quality model to investigate if there was potential for traffic emissions to impact future residents on site as well as existing residents in the vicinity of the site.

9.11.2 The model predicts no significant change in NO\textsubscript{2}, PM\textsubscript{10} or PM\textsubscript{2.5} at all receptors on comparison of the 'with and without' development scenarios, with the impact magnitude for all sensitive receptors categorised as Negligible.

9.11.3 The overall impact of the proposed development on air quality in the study area can therefore be concluded as not significant.

9.11.4 With reference to the Generic Significance Criteria the level of effect of the proposed development in terms of air quality can therefore be categorised as ‘Negligible or No Effect’.

9.12 References

- West Dunbartonshire Council (2017) 2017 Air Quality Progress Report (APR) for West Dunbartonshire Council. West Dunbartonshire Council (June 2017).
10 Water, Hydrology and Flood Risk

10.1 Introduction

10.1.1 This ES chapter provides an assessment of the likely significant effects on water, hydrology and flood risk. This assessment covers a range of components including, surface water and fluvial hydrology, water quality, drainage, groundwater, water supplies and wetlands. The assessment is based on the characteristics of the site and surrounding area and the key parameters of the proposed development detailed in Chapter 2 – Site and Surrounding Area and Chapter 3 – The Proposed Development respectively. This chapter has been prepared by EnviroCentre Ltd.

10.1.2 The aims of this chapter are to:

- Identify the relevant context in which the hydrological and flood risk assessment has been undertaken;
- Describe the methods used to undertake the assessment;
- Outline the relevant baseline conditions currently existing at the site and surroundings;
- Identify the potential direct and indirect effects of the proposed development on the water environment;
- Identify mitigation and enhancement measures where required to address identified effects;
- Assess residual predicted effects; and
- Assess cumulative effects on the water environment from the proposed development in combination with other relevant cumulative developments.

10.1.3 This ES chapter is supported by the following technical reports provided in Appendices 10.1 - 10.3:

- Appendix 10.1 – Figures;
- Appendix 10.2 – Flood Risk Assessment; and
- Appendix 10.3 – Drainage Strategy.

10.2 Legislative and Policy Context

Legislation

10.2.1 The overarching legislative framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context. Subject specific legislation of relevance to this assessment is:

- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act);
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR);
- Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013;
- Flood Risk Management (Scotland) Act 2009;
- Water Environment (Oil Storage) (Scotland) Regulations 2006;
- Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009; and
- The Private Water Supplies (Scotland) Regulations 2006.

10.2.2 All activities with potential to impact on the water environment require to be authorised under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The level of authorisation required is dependent on the anticipated environmental risk posed by the activity to be carried out. Liaison with SEPA operations team will be undertaken at an early stage to
further confirm this. These activities could include construction drainage, dewatering, storage of oil and the three watercourse crossings.

10.2.3 Revised levels of authorisation, including amendments to the General Binding Rules (GBR), came into effect on January 1st 2018. These include the need for CAR authorisation for drainage of construction sites over four hectares in size, as well as a change to the size of development that will require authorisation for the permanent surface water drainage. The below summarises the requirements of these regulations.

10.2.4 For the construction SuDS associated with a site of this size, a complex CAR licence will be required, as detailed in the CAR Practical Guide (SEPA, 2018).

Policy

10.2.5 The planning policy framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context. Planning policy considerations (including policies and guidance) of specific relevance to this assessment are:

- **Adopted Loch Lomond and the Trossachs National Park (LLTNP) Local Development Plan (LDP) (2016)** including relevant policies outlined in Table 5.1, in particular:
  - Overarching Policy 1 – Strategic Principles;
  - Overarching Policy 2 - Development Requirements;
  - Natural Environment Policy 11 – Protecting the Water Environment; and
- **National Planning Framework 3 (NPF3) (2014)**;
- **Scottish Planning Policy (SPP) (2014)** including relevant provisions outlined in Table 5.2, in particular:
  - Principal Policy on Sustainability (paragraphs 24-35);
  - Valuing the Natural Environment Subject Policy (Paragraphs 193 - 233); and
  - Managing Flood Risk & Drainage Subject Policy (Paragraphs 254-268).
- **SEPA’s Development Management Guidance: Flood Risk (2017);**
- **Scottish Government Online Planning Advice regarding Flood Risk (2015);**
- **PAN 61 Planning and Sustainable Urban Drainage Systems (July 2001); and**
- **PAN 79 Water and Drainage (September 2006).**

10.2.6 Other policy considerations of relevance to this assessment are:


Guidance and Relevant Technical Standards

10.2.7 The following subject specific guidance and technical standards have informed this assessment:

- **The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended): A Practical Guide (SEPA);**
- **SEPA (2006) Guidelines for Water Pollution Prevention from Civil Engineering Contracts;**
- **SEPA (Various). Guidance for Pollution Prevention including PPG 1, 3, and 6 and GPP2, 5 and 21;**
10.3 Methodology

Scope of Assessment

10.3.1 This ES chapter presents an assessment of likely significant effects on the water environment from the proposed development. The assessment presented in this ES chapter has been prepared in accordance with the 2011 EIA Regulations.

10.3.2 The principal aspects considered within this assessment include flood risk, surface water drainage, pollution prevention and environmental management, engineering activities in the water environment, existing groundwater abstractions, water abstractions and disruption to wetlands.

Overall Approach

10.3.3 In undertaking the assessment presented in this ES Chapter, the following activities have been carried out:

- EIA screening and scoping (see below);
- Desk based review of available information, including previous studies, topographic, flood and geological maps, identification of local water receptors, surface water drainage and wetlands including potential groundwater dependent terrestrial ecosystems (GWDTEs);
- A walkover survey of the site;
- Evaluation of baseline water environment conditions (Section 10.4);
- Development of a drainage strategy for the proposed development, which is presented as Appendix 10.3; and
- Identification and assessment of likely significant effects, taking into account proposed mitigation and enhancement measures and including consideration of likely cumulative effects (Sections 10.6 – 10.10).

10.3.4 The assessment has been informed by an EIA Screening and Scoping Report (PBA, April 2017) and subsequent EIA Screening and Scoping Opinions issued by LLTNPA (11th May 2017) in respect of the EIA for the proposed development. The EIA Scoping Opinion is provided in full in Appendix 4.1. Subsequent meetings and discussions with SEPA and West Dunbartonshire Council have taken place to inform the design of the proposed development and the scope of this assessment. Table 10.1 below provides a summary of relevant consultee responses from the EIA Scoping Opinion and other discussions.
<table>
<thead>
<tr>
<th>Consultee</th>
<th>Comment</th>
<th>How and where addressed</th>
</tr>
</thead>
</table>
| SEPA                          | SEPA stated within the formal Scoping Opinion that the assessment should cover the following:  
  - Flood risk;  
  - Waste water drainage;  
  - Surface water drainage;  
  - Pollution prevention and environmental management;  
  - Engineering activities in the water environment;  
  - Existing groundwater abstractions;  
  - Water abstractions; and  
  - Disruption to wetlands.                                                                 | These are addressed within of this chapter. Further detail is provided within Appendix 10.2: Flood Risk Assessment and surface and waste water drainage covered under Appendix 10.3: Drainage Assessment.                                                                 |
| SEPA                          | SEPA advised that they have no record of CAR authorisations for any abstractions within the site, and no records of private water supplies were held.                                                                 | Noted under Section 10.4 - Baseline Conditions.                                                                                                                                                                           |
| SEPA                          | Between July 2017 and January 2018 a number of meetings have been held with SEPA, along with email correspondence, with respect to the potential flood risk on site. SEPA hydrometry experts had flagged concerns with the flow data used within the flood study and Flood Risk Assessment due to poor recording at the gauging station on the River Leven. This raised questions as to the accuracy of the peak flood levels identified in the Flood Risk Assessment. | In order to provide more confidence in the flow data used within the study, and the subsequent design flood levels, additional hydrological analysis was undertaken. This additional work calculated flow rates using a number of methods to verify the existing available data and indicated that the outputs from the Flood Risk Assessments would be representative of the extreme flooding scenarios. This was issued to SEPA for review and initial consultation indicated that this was acceptable to them. The additional hydrological analysis and subsequent correspondence is appended to Appendix 10.2: Flood Risk Assessment. |
| West Dunbartonshire Council   | Environmental health department advised that they have no private water supplies within the development site.                                                                                                     | Noted under Section 10.4 - Baseline Conditions.                                                                                                                                                                           |
Study Area

10.3.5 The study area for the assessment of potential effects on the water environment is generally consistent with the site boundary, as shown in Figure 2.1 – Site Location Plan. The wider catchment area have also been considered where appropriate, for example the potential effect of the proposed development on downstream flood risk has been assessed.

10.3.6 The wider hydrological catchments include the upstream catchment of the River Leven, which encompasses Loch Lomond, as well as downstream along the River Leven through Balloch and Alexandria.

Information Sources

Desk Top Study

10.3.7 The following data sources were used within the assessment:

- Ordnance Survey (OS) 1:10,000 & 1:25,000 digital mapping;
- Topographical survey of the Proposed Development site;
- British Geological Survey (BGS) 1:50,000 digital map data;
- Digital soil maps published by the Scottish Government and James Hutton Institute;
- Aerial photography of the site;
- Catchment extents and characteristics from the Flood Estimation Handbook (FEH) website (CEH, 2017);
- The online SEPA River Basin Management Plan Interactive Map and Flood Map;
- River Leven Flood Study undertaken by Jacobs in 2001, along with the updates to the study in 2003 and 2009; and
- Annual Maximum (AMax) flow data from SEPA for the Linnbrane gauging station on the River Leven, covering the period 1963-2015.

Fieldwork

10.3.8 A site walkover for the flood risk assessment was undertaken on 3rd March 2017. The weather on the day was sunny and fine, and there had been little precipitation in the days prior to the site visit. A photographic record of this site walkover is presented in Appendix 10.2: Flood Risk Assessment.

10.3.9 This walkover covered the whole of the development site, and included inspection of existing watercourses and water features on site, detailing their condition and any likely flood mechanisms.

Approach to Assessment

Identification of Relevant Receptors

10.3.10 Based on the information sources outlined above, the current baseline characteristics of the water environment at site and the surrounding area was characterised. This led to the identification of relevant sensitive receptors to consider within the assessment. Receptor sensitivity is defined based on the capacity of the receptor to accommodate change without fundamentally altering its character. The definitions provided in Table 10.2 take into account the quality of the receptor, its purpose and the potential for substitution or replacement.

Impact Assessment Methodology

10.3.11 Table 10.3 sets out the criteria for assessing the likely magnitude of the change due to the proposed development upon identified sensitive receptors.
<table>
<thead>
<tr>
<th>Receptor Sensitivity</th>
<th>Description</th>
</tr>
</thead>
</table>
| Low                 | Receptors with a high capacity to accommodate change, low value or poor condition and no significant uses, for example:  
  - Receptor is not an internationally, nationally or locally designated site;  
  - Not classified as a surface water body for the River Basin Management Plan;  
  - No sensitive flood risk receptors downstream;  
  - Surface water body not significant in terms of fish spawning and no other sensitive aquatic ecological receptors e.g. freshwater pearl mussels;  
  - Surface water body not used for abstraction;  
  - Surface water body not used for recreation directly related to water quality e.g. angling, swimming, and watersports;  
  - Aquifer with no identified abstractions; and  
  - GWDTEs with low to moderate dependency on groundwater (as defined by the site-specific conceptual model). |
| Medium              | Receptors with a moderate capacity to accommodate change, medium value or condition and limited use, for example:  
  - Receptor is not an internationally or nationally designated site. May be a locally designated site;  
  - Salmonid species may be present and surface water body may be locally important for spawning. No other sensitive aquatic ecological receptors e.g. freshwater pearl mussels;  
  - Surface water body used for private water supply or medium scale industrial/ agricultural abstractions;  
  - Surface water body used for occasional or local recreation e.g. local angling clubs;  
  - Groundwater body supports identified private water supplies or medium scale industrial/ agricultural abstractions;  
  - GWDTEs with moderate to high dependency on groundwater (as defined by the site-specific conceptual model); and  
  - Carbon-rich soils which have been affected by historic or current land management practices. |
| High                | Receptors with a low capacity to accommodate change, high value or condition and significant use, for example:  
  - Receptor is an internationally or nationally designated site.  
  - Surface water body supports sensitive aquatic ecological receptors e.g. freshwater pearl mussels;  
  - Surface water body used for public water supply or large scale industrial/ agricultural abstractions;  
  - Surface water body important for recreation directly related to water quality e.g. swimming, watersports, angling;  
  - Groundwater body supports public water supply or large scale industrial/ agricultural abstractions;  
  - GWDTEs which form a qualifying feature, or part thereof, for an internationally or nationally designated site; and  
  - Carbon-rich soils which form part of intact, active blanket bog in good condition. |
Table 10.3 Criteria for Assessing Magnitude of Change

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>Very light changes from baseline (pre-development) conditions. Change barely distinguishable, approximating to the “no change” situation.</td>
</tr>
<tr>
<td>Low</td>
<td>Minor shift away from baseline (pre-development) conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of the baseline condition will be similar to pre-development circumstances/patterns.</td>
</tr>
<tr>
<td>Medium</td>
<td>Loss or alteration to one or more key elements/features of the Baseline (pre-development) conditions such that post-development character/composition/attributes of baseline will be partially changed.</td>
</tr>
<tr>
<td>High</td>
<td>Total loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post-development character/composition/attributes will be fundamentally changed.</td>
</tr>
</tbody>
</table>

Establishment of Effect Level and Significance

10.3.12 The criteria set out in Table 10.2 and Table 10.3 have been used to develop a simple table to assess the significance of likely effects of the proposed development on the water environment, as shown in Table 10.4 below.

10.3.13 This methodology is derived from the SNH Environmental Assessment Handbook (SNH, 2013). The assessment of likely effects also takes into consideration the probability of the effect occurring (certain, likely, possible or unlikely) and the duration of the effect (short (less than 2 years), medium (2 – 5 years) or long term) (more than 5 years). Residual effects (direct and indirect) at levels of Moderate to Major as identified in Table 10.4 are considered to be significant in terms of the EIA Regulations.

Table 10.4 Criteria for Assessing Significance of Effects

<table>
<thead>
<tr>
<th>Sensitivity of Receptor</th>
<th>Magnitude of Change</th>
<th>Predicted Significance of Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
<td>Major</td>
</tr>
<tr>
<td>High</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>High</td>
<td>Major</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Medium</td>
<td></td>
</tr>
</tbody>
</table>
Sensitivity of Receptor | Magnitude of Change | Predicted Significance of Effect
---|---|---
Low | Low | Negligible
High, Medium or Low | Negligible | Negligible

Approach to Cumulative Impact Assessment

10.3.14 Cumulative effects on the water environment could occur where more than one development is proposed within a catchment, and Chapter 3 – The Proposed Development identified the relevant cumulative developments within the area. This included:

- Replacement building and infrastructure for Sweeney’s Cruises;
- Drumkinnon Bay dredging;
- Woodbank Inn Hotel Extension; and
- Balloch Street Design Project.

10.3.15 A cumulative impact assessment for effects impacting the water environment has been undertaken and is included in Section 10.10.

10.3.16 This assesses whether any of the above developments will have an impact upon the proposed development in terms of the water environment, both independently and cumulatively.

10.4 Baseline Conditions

The Site

10.4.1 The site comprises two distinct but contiguous areas of land at West Riverside, adjacent to the River Leven, and Woodbank House, located between Old Luss Road and the A82.

10.4.2 The West Riverside area of the site is bounded to the north by the Loch Lomond Shores complex and Loch Lomond itself, to the west by a minor unnamed road and a landowner boundary, to the east by the River Leven and to the south by Balloch Road, the Balloch Road housing estate and Old Luss Road. The site is an irregular shape and effectively surrounds the Balloch Road housing estate on three sides. The site mainly comprises wooded areas (including Drumkinnon Wood) with recreational parkland and footpaths. Pier Road runs from south to north through the site. A beach area (Loch Lomond shore) is present in the north-west. The shoreline is used for mooring boats and pontoons are present in the water for this purpose.

10.4.3 The Woodbank House area of the site currently comprises two relatively flat grassy fields in its eastern area which are bisected by an access track running from east to west. The track leads to an area of mixed woodland in the western area which has a more varied topography with levels generally rising to the west and becoming particularly steep in the north-west. Within the woodland are the remnants of Woodbank House, outbuildings and a walled garden. The buildings are in a state of advanced disrepair as a result of a fire (at the main hotel building) and subsequent dereliction.

Topography and Land Use

10.4.4 The general topography of the site falls from the west down to the east towards Loch Lomond and the River Leven. In the west of the site surrounding Woodbank House and adjacent to the A82, the ground is at a maximum elevation of approximately 45m AOD. From here the ground slopes down relatively steeply towards Old Luss Road, beyond which the ground levels off and undulates at 15-19m AOD. Adjacent to the shores of the Loch, the ground level is approximately 7.5m AOD.

10.4.5 Within Drumkinnon Wood the ground levels undulate significantly, but in general slope from the west to the east towards Pier Road, from a level of approximately 16 mAOD down to approximately 12 mAOD.
10.4.6 The site currently consists of a range of different uses including leisure and recreation (water sports) along the shores of the loch, several areas of car parking which serve the public slipways as well as the neighbouring Loch Lomond Shores development, areas of woodland through Drumkinnon Woods and open parkland along the banks of the River Leven.

10.4.7 A tourist information and visitor centre is located at the south eastern point of the site, opposite Balloch train station and Sweeney’s Cruises.

**Surface Water Hydrology**

10.4.8 There are four watercourses which have been identified as flowing through the site. The major watercourse is the River Leven which flows to the east of the site. To the west of the site there are two smaller unnamed watercourses which are described in more detail below. A fourth smaller watercourse is marked upon the Ordnance Survey mapping within the wooded area at Woodbank House. A plan showing the location of these watercourses is presented as Figure 10.1 in Appendix 10.1 – Figures. Additional details including photographs from the site walkover are included in Appendix 10.2 - Flood Risk Assessment.

**River Leven**

10.4.9 The River Leven flows to the east of the site in a southerly direction. It rises at the outflow from Loch Lomond to the north of the development site, and routes south through the towns of Balloch and Alexandria to outfall into the River Clyde at Dumbarton. The river is approximately 11.5km long and has tidal influence for approximately 5km upstream from its confluence with the River Clyde.

10.4.10 Adjacent to the site, the river is approximately 85-90m wide and contains a number of floating pontoons for mooring boats. Approximately 550m downstream of the Balloch Station area of the site, the River Leven Barrage is located. This is operated by Scottish Water and controls the outflow from the loch limiting the discharge and maintains water levels within Loch Lomond between 7 and 7.6m Above Ordnance Datum (AOD). However, it is not formally operated as a flood prevention structure.

10.4.11 Scotland’s River Basin Management Plan (RBMP)(Scottish Government, 2014) classified the River Leven in 2016 as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact from an increased risk of subsidence or flooding. As such this has been classified as having Moderate ecological potential.

**Loch Lomond**

10.4.12 Loch Lomond is located to the north of the site and has a surface area of approximately 71 km². Areas within and adjacent to the water body are designated Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Ramsar Sites and National Nature Reserves. The loch is located wholly within the Loch Lomond and The Trossachs National Park and is used extensively for recreational use.

10.4.13 The RBMP classified Loch Lomond (south, ID:100257) as having a Moderate overall status in 2016.

**Unnamed Watercourse 1**

10.4.14 The Unnamed Watercourse 1 rises in the hills to the west of the A82. The burn flows in an easterly direction along the north-western boundary and passes beneath Old Luss Road before routing north of the existing car park and Loch Lomond Shores development. It outfalls into Loch Lomond at the end of a small headland in the bay north of the site.

**Unnamed Watercourse 2**

10.4.15 Unnamed Watercourse 2 also rises in the hills to the west of the site and the A82, and routes in an easterly direction towards Drumkinnon Farm. The burn flows through a small caravan park to the south of the site and below Lower Stoneymollan Road before routing along the boundary of the Woodbank House area of the site. The burn then passes below Old Luss Road and routes north towards the car park of the Loch Lomond Shores complex. The burn routes through a number of culverts as it passes beneath access roads and flows through an open channel through the car park area.

10.4.16 Downstream of the car park the burn routes to the east and flows parallel with unnamed watercourse 1 towards Loch Lomond where it outfalls adjacent to the aerial adventure course.
10.4.17 Within the Woodbank House area of the site a small watercourse is shown on plan routing in an easterly direction before it sinks, with no downstream route marked on the maps. During the site walkover there was water present within the channel however there was very little flow. The channel appeared to route into a culvert structure, but it is not known where this routes to or if it discharges into the unnamed watercourse 1. There were no visible signs of a culvert downstream across this area of the site. During the site walkover for ecological surveys, as noted in Chapter 6 - Ecology, it was noted that there were no flows within this channel, indicating that flows within this channel may be intermittent and dependent upon runoff.

**Geology & Hydrogeology**

**Bedrock Geology**

10.4.18 The British Geological Survey's (BGS) geological data (BGS, n.d.-a) (1:50,000 scale) indicates that the site is underlain by Teith Sandstone Formation. No fault lines are present within the site.

**Drift Deposits**

10.4.19 The BGS (BGS, n.d.-b) data indicates that the superficial deposits are predominantly formed of Glaciofluval Deposits - Gravel, Sand and Silt, which cover the southern and western parts of the site. To the north and surrounding the shore of Loch Lomond the superficial deposits consist of Raised Marine Deposits of Holocene Age - Clay, Silt, Sand and Gravel.

**Soils**

10.4.20 Soil survey of Scotland 1:25,000 scale mapping (Soil Survey of Scotland Staff, n.d.) shows the site to be underlain by brown soils which have been stated to have parent materials of fluvioglacial sands and gravels derived from acid schists and Lower Old Red Sandstone sediments and lavas.

**Hydrogeology**

10.4.21 The Hydrogeological Map of Scotland (BGS, n.d.-c) shows that the site is underlain by the Strathmore Group, a moderate to highly productive aquifer with intergranular/fracture flow.

10.4.22 The Hydrogeological Maps highlight that superficial deposits classified as glaciofluvial are associated with high productivity intergranular flow, and raised marine deposits would be classified under low to moderate productivity with intergranular flow in the region of 0.1-10 l/s.

10.4.23 The aquifer vulnerability is classed as 4a in the Groundwater Vulnerability dataset (Ó Dochartaigh, Doce, Rutter & MacDonald, 2011). Class 4a is groundwater which is described as being ‘vulnerable to those pollutants not readily absorbed or transformed, and may have low permeability soil and less likely to have clay present in superficial deposits.’

10.4.24 Under the RBMP the development site is located within the Loch Lomond and Leven Sand and Gravel (ID:150766) and Balloch (ID:150651) groundwater bodies, both of which have overall classifications of Good.

**Flood Risk**

10.4.25 In line with the SPP (2014) at paragraphs 254-268 and the recommendations of SEPA and West Dunbartonshire Council in relation to the proposed development, a comprehensive site-specific flood risk assessment (FRA) was undertaken to assess the risks associated with all potential flood sources. The FRA is included as Appendix 10.2 and the key findings in relation to flood risk under existing site conditions are described here.

10.4.26 A flood study of the River Leven was first undertaken in 2001 and then updated in 2003. This assessed the flood risk along the length of the River Leven, from Loch Lomond through to Dumbarton in the south. In 2009 the hydraulic model was updated to include more recent hydrological analysis as well as calibration of the model using the December 2006 flood event. The FRA undertaken for this proposed development included additional hydrological analyses to verify the flow rates and flood levels output from the original flood study, and to provide a level of confidence in the results. This is presented in Appendix 10.2 - Flood Risk Assessment.
10.4.27 The FRA concluded that the areas in the northeast of the site adjacent to the head of the River Leven and Loch Lomond would be at risk of fluvial flooding during the 0.5% Annual Exceedance Probability (AEP) event, and the area surrounding the existing tourist information centre is located immediately adjacent to the 0.5% AEP flood extents. The flood extents plans showing the maximum flood levels for the 0.5% AEP + climate change and the 0.2% AEP events is presented in Figure 10.2.

**Water Supplies**

10.4.28 Information supplied by SEPA and West Dunbartonshire Council confirmed that there are no private water supplies or CAR licensed abstractions within the site.

10.4.29 SEPA confirmed that there are no abstractions from the River Leven, and no groundwater abstractions within 1km.

**Wetlands**

10.4.30 Wetlands which are potential GWDTEs have been identified based on the ecological surveys covered in Chapter 6 - Ecology.

10.4.31 A small area of marshy grassland in the south of the Woodbank House area of the site has been listed as a wetland type classed under the Functional Wetland Typology for Scotland as 2A Marshy Grassland. This habitat is also a potential GWDTE and is identified as likely to be NVC type MG10 - *Holcus lanatus*–*Juncus effusus* rush pasture. This is listed under SEPA guidance (SEPA, 2014) as moderately groundwater dependent depending on the hydrogeological setting. Whilst a National Vegetation Classification (NVC) survey has yet to be undertaken for the site, for the purposes of this assessment it is assumed that this area of marshy grassland is a GWDTE habitat.

10.4.32 This area is located at the top of a slope and it is not located at a low spot or depression within the ground where ponding or standing water may occur. Based upon the topographic setting and hydrogeological information presented in paragraph 10.4.18, it is considered that this area would have Moderate dependency on groundwater.

**Summary of Receptor Sensitivity**

10.4.33 The sensitivity of identified water environment receptors to be considered in this assessment is detailed in Table 10.5 below.

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Sensitivity</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loch Lomond</td>
<td>High</td>
<td>International and national designations within and adjacent to the Loch. Used extensively for recreation.</td>
</tr>
<tr>
<td>Watercourses: River Leven and three unnamed watercourses</td>
<td>Medium</td>
<td>River Leven used for boating recreation and classified as Moderate Ecological Potential. Smaller watercourses not identified on RBMP.</td>
</tr>
<tr>
<td>Groundwater - Bedrock</td>
<td>Low</td>
<td>Bedrock: Moderate productivity aquifer with no identified abstractions within 1km proximity to site. Drift: Low productivity and very localised nature of present glaciofluvial deposits.</td>
</tr>
<tr>
<td>GWDTEs: Marshy grassland</td>
<td>Medium</td>
<td>Small area of MG10 GWDTE habitat located within the site, within 250m of proposed development, and considered to have moderate groundwater dependency.</td>
</tr>
</tbody>
</table>
10.5 Baseline Evolution

10.5.1 In the absence of the proposed development, future baseline conditions would likely remain consistent with existing conditions on site.

10.5.2 Increasing climate change may however affect the hydrological cycles within the catchments surrounding the site, resulting in marginally higher flows and more extreme intense rainfall events, which may result in higher water levels with Loch Lomond and the River Leven, as described above. This however is a change which would be relatively consistent across Scotland and would not be limited to this site.

10.6 Embedded Mitigation

10.6.1 As detailed in Chapter 3 – The Proposed Development, a number of design features and embedded mitigation measures have been incorporated into the design and construction of the proposed development to avoid, prevent or minimise significant adverse environmental effects and to enhance beneficial effects. Embedded mitigation measures of relevance to this assessment are:

- No buildings within the functional floodplain and finished floor levels of buildings adjacent to the water bodies to be above the 1 in 200yr + climate change peak flood level;
- Avoid crossings of existing watercourse to prevent pollution; and
- Development within a 5m strip along waterfronts will be subject to specific consideration within a CEMP to be agreed with the NPA prior to commencement.

10.6.2 The surface water drainage scheme for the proposed development will be designed in accordance with Sustainable Drainage Systems (SuDS) principles and such that the maximum discharge rate will be equivalent to the greenfield (i.e. pre-development) runoff rate.

10.6.3 Additional mitigation measures identified through the EIA process are detailed in Section 10.8 below before likely residual effects from the proposed development are then stated in Section 10.9.

10.7 Potential Effects

10.7.1 Potential effects on the water environment that could arise during the construction and post-completion phases of the proposed development are summarised in Table 10.6 and are discussed further in the following sections.

Overview

10.7.2 The construction phase is the most important in terms of potential impacts on the water environment, with key activities including:

- Earthworks, including alteration of site ground levels;
- Excavation for foundations of properties and site infrastructure;
- Stockpiling of excavated materials;
- Creation of impermeable surfaces;
- Construction of new stormwater drainage system; and
- Use and storage of oils and fuels.

10.7.3 During the operational phase, the most important potential impact is the potential change in surface water quality and volume of runoff, arising from increased impermeable surfaces, and associated downstream flood risk.

10.7.4 Watercourse crossings have the potential to impact upon the water environment in terms of flows within channels and sediment release during construction. There are however no watercourse crossings identified on the proposed masterplan, and so this has not been considered further.
Table 10.6 Summary of Potential Effects

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Potential Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loch Lomond and watercourses</td>
<td>Flow alterations (increased runoff/ alteration of flow paths, and associated flood risk)</td>
</tr>
<tr>
<td></td>
<td>Increased pollution from sediments – within watercourses and locally within Loch Lomond.</td>
</tr>
<tr>
<td>Groundwater/ GWDTEs</td>
<td>Flow and level alterations (groundwater drawn-down/ alteration of flow paths)</td>
</tr>
<tr>
<td></td>
<td>Pollution from chemicals</td>
</tr>
</tbody>
</table>

**Construction Phase**

**Surface Water Flow Alterations and Flood Risk**

10.7.5 During construction, existing drainage patterns and flow pathways would be altered by the introduction of impermeable surfaces, change in site ground levels and presence of stockpiles or foundation voids. Impermeable surfaces arising from the compaction of soils and construction of infrastructure would reduce infiltration and may lead to an increase in surface water runoff. The potential environmental impacts of this include increase in flow rates within the on-site or adjacent watercourses, potentially leading to increases in channel erosion, sediment transport and both on-site and downstream flood risk.

10.7.6 Potential surface water flow alterations are assessed as having a possible, short-term, medium magnitude adverse impact on the identified watercourses and Loch Lomond (medium and high sensitivity receptors respectively).

**Pollution from Sediments**

10.7.7 There is the potential for increased release of fine sediment into watercourses and Loch Lomond arising from sediment-laden runoff from areas of soil stripping, earthworks and stockpiles.

10.7.8 Increased sediment loading to watercourses can degrade water quality and change substrate characteristics, which may affect the quality of the aquatic habitat. Sedimentation of watercourses can also have a detrimental effect on flow conveyance of the channel and downstream culverts, affecting flood risk.

10.7.9 Potential increased pollution from sediments would be short to medium term in duration and are assessed as having a likely, medium magnitude adverse impact on Loch Lomond and the identified watercourses (high and medium sensitivity receptors respectively).

**Pollution from Chemicals**

10.7.10 During construction there is a risk of accidental pollution incidences affecting the water environment (watercourses, loch, groundwater and GWDTEs) from the following sources:

- Spillage or leakage of oils and fuels:
  - Stored on site;
  - From construction machinery or site vehicles; and
  - From refuelling machinery on site.
- Spillage or leakage from on-site toilet facilities;
- Cement, concrete or grout getting polluting surface water or groundwater; and
- Spillage or leakage from use or storage of other chemicals and hazardous substances.

10.7.11 Oil spillages to the water environment would be detrimental to water quality and could affect fauna and flora. Oils and fuels are hazardous (List 1) substances under the Groundwater and Priority Substances (Scotland) Regulations 2009 and their ingress to groundwater must be prevented. Groundwater vulnerability to pollutants may increase in areas where drift deposits...
are excavated, for example for foundations or alteration of site ground levels. Potential contaminants could leak through fractures and cavities in the bedrock and affect groundwater quality.

10.7.12 Cement, concrete and grouts used for construction are highly alkaline and corrosive and can cause serious pollution to the ground and water environment. Water wildlife, such as invertebrates and fish, are very sensitive to changes in pH (acid/alkaline) levels.

10.7.13 Other chemicals and hazardous substances used and stored on site (e.g. cleaning products, solvents, and pesticides) could cause pollution if they enter surface waters or groundwater.

10.7.14 The potential impact of contaminant discharges on the identified receptors is likely to be short-term in nature. Potential contaminant discharges are assessed as having a possible, medium magnitude adverse impact on Loch Lomond and identified watercourses (high and medium sensitivity receptors respectively), and GWDTEs and groundwater (medium and low sensitivity receptors respectively).

**Groundwater Flow and Level Alterations**

10.7.15 Groundwater is expected to be at shallow depth in areas of lower ground. Excavations below groundwater level, for example for foundation construction, could lead to localised groundwater drawdown. Open excavations that cannot be drained by gravity may require dewatering. Groundwater pathways could also be altered by construction of foundations and road infrastructure.

10.7.16 The potential effect would be localised in extent and short-term in nature (duration of open excavation or dewatering). Groundwater flow and level alterations are assessed as having a likely, low magnitude adverse impact on the underlying moderate productivity aquifers (low sensitivity receptor).

10.7.17 Changes in groundwater flow and levels can also affect GWDTE. A small area of MG10 GWDTE habitat was identified in the southeast of the site within the Woodbank House area. Development is proposed to be undertaken within 250m of this location and so a site-specific risk assessment is provided in Table 10.7 below in accordance with SEPA’s LUPS-GU31 guidance (SEPA, 2014), with reference to the baseline conceptual site model (CSM) presented in Section 10.4.32. The risk on GWDTE would be low. The proposed development is therefore assessed as having a possible, long term, low magnitude adverse impact on GWDTEs (medium sensitivity receptor).

<table>
<thead>
<tr>
<th>GWDTE</th>
<th>Location</th>
<th>Risk Assessment</th>
<th>Risk Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG10</td>
<td>South-east of site, in the southern boundary of Woodbank House area.</td>
<td>Marshy grassland presenting moderate groundwater dependency located at the top of the slope within Woodbank House area of the site. Contributing catchment to this area would be to the west, upslope of the site. Woodland lodges proposed to be located adjacent to this, however no roads or linear features proposed which may have intercepted contributing groundwater flows. Main proposed development in the area which may have deeper excavations will be located downgradient of the GWDTE, approximately 60m to the east and at an elevation approximately 4-5m lower. The typology is common throughout Scotland and is not of high botanical interest. The size of the marshy grassland has been measured as only 0.007ha (70m²).</td>
<td>Low</td>
</tr>
</tbody>
</table>
Operational Phase

Surface Water Flow Alterations and Flood Risk

10.7.18 Once the proposed development is completed and operational, in the absence of further mitigation, surface water runoff volumes would be increased due to the increase in impermeable area across the site, and surface water flow pathways would be altered by the drainage scheme. However as identified in Section 10.6 - Embedded Mitigation, the drainage scheme for the proposed development has been designed to attenuate runoff from impermeable areas within the development site to Greenfield (i.e. pre-development) rates. The discharge of flows from the site into the River Leven will be restricted so that is no increase in flood risk downstream.

10.7.19 Potential surface water flow alterations post-completion are assessed as having a likely, positive, long-term, negligible magnitude impact on Loch Lomond and the identified watercourses (high and medium sensitivity receptors respectively) and a negligible impact upon downstream flood risk.

Pollution from Sediment

10.7.20 Pollution from sediment may be reduced compared to baseline conditions due to the site SuDS scheme attenuating the sediment content in runoff from the development. Potential increased pollution from sediments are assessed as having an unlikely, long term, low magnitude adverse impact on Loch Lomond (high sensitivity receptor) and identified watercourses and GWDTE (medium sensitivity receptors).

Pollution from Chemicals

10.7.21 During the operational phase of the proposed development, oils and fuels within surface runoff from roads will be the main potential source of contaminant discharges. The SuDS scheme for the proposed development will include treatment of runoff in accordance with published standards and guidance. Increased contaminant discharges are therefore assessed as having an unlikely, short-term, low magnitude impact on Loch Lomond (high sensitivity), watercourses and GWDTE (medium sensitivity receptors) and groundwater (low sensitivity).

Groundwater Flow and Level Alterations

10.7.22 During the operational phase, the on-going impact of the proposed development on groundwater flow and levels would be negligible due to the nature of the development and no anticipated disturbance of the ground.

10.7.23 The potential effect on the hydrological supporting conditions for the GWDTE post-completion is as per Table 10.7 above, with the proposed development having a possible, long term, negligible magnitude impact on groundwater levels and GWDTEs (low and medium sensitivity receptors respectively).

10.8 Further Mitigation and Enhancement

10.8.1 The assessment of potential effects from the proposed development in Section 10.7 indicates that in the absence of further mitigation, a number of significant adverse effects on the water environment would be likely. To address this and minimise the likelihood of significant adverse effects arising, as well as to maximise environmental opportunities from the proposed development, further mitigation and enhancement measures are proposed below. These are then taken into account in the assessment of residual effects provided in Section 10.9.

10.8.2 The proposed further mitigation and enhancement is grouped into the following areas:

Construction Phase

Further Mitigation to be included within CEMP

10.8.3 As noted in Section 11.6, 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 11.6). Over and above this, the assessment in this ES chapter
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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; and
- 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

10.8.4 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 deal with rainwater in proximity to where it hits the ground.

10.8.5 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 and GWDTEs.

10.8.6 Clean runoff from vegetated areas or offsite will be kept clean and diverted around works to prevent mixing with silt-laden water.

10.8.7 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.

10.8.8 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.

10.8.9 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.

10.8.10 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

10.8.11 Areas stripped of earth and vegetation will be kept to a minimum at any one time. 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.

10.8.12 Any runoff from earthworks and stockpiles will be passed through appropriate construction SuDS measures prior to discharge to the water environment.

10.8.13 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.

10.8.14 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

10.8.15 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

10.8.16 The mitigation measures to minimise risk of contaminant release will be in line with the updated Controlled Activities (Scotland) Regulations which will 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. Mitigation measures will follow these GBRs. 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.

10.8.17 Welfare facilities will include closed-system toilets, with disposal of foul drainage at a suitable off-site facility.

10.8.18 Concrete and cement mixing will 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 will be discharged to the foul sewer with prior permission from Scottish Water or disposed off-site at an authorised facility.

10.8.19 All chemicals and hazardous substances will be stored safely, away from watercourses and drains in line with current best practice. They will be disposed of in line with duty of care requirements.

Operational Phase

10.8.20 The proposed surface water and SuDS scheme (see Section 10.6) will require regular maintenance during its operational life. This maintenance will include the regular debris clearing and cutting of grass of surface SuDS 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.

10.8.21 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.

10.9 Residual Effects

As shown in Table 10.8, the influence of the further mitigation identified in Section 10.8 means that with one exception (effects on groundwater flow) the level of predicted effects would reduce such that the residual effect would become Negligible and not significant in the context of the EIA Regulations. The rationale for the predicted level (and thus significance) of effects on groundwater flow is provided in Section 10.7.
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Receptor, Sensitivity</th>
<th>Source of Impact</th>
<th>Type of Effect</th>
<th>Duration</th>
<th>Probability of Effect Occurring on Receptor</th>
<th>Pre-Mitigation Magnitude of Change</th>
<th>Pre-Mitigation Level of Effect</th>
<th>Post Mitigation Magnitude of Impact</th>
<th>Residual Significance of Effect</th>
<th>Residual Effect Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface water flow alterations and flood risk</td>
<td>Loch Lomond, High</td>
<td>Impermeable surfaces, change in site levels, stockpiles, voids</td>
<td>Negative</td>
<td>Short</td>
<td>Possible</td>
<td>Medium</td>
<td>Major</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>Watercourses, Medium</td>
<td></td>
<td>Negative</td>
<td>Short</td>
<td>Possible</td>
<td>Medium</td>
<td>Moderate</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Pollution from sediments</td>
<td>Loch Lomond, High</td>
<td>Soil stripping, earthworks, stockpiles</td>
<td>Negative</td>
<td>Short – medium</td>
<td>Likely</td>
<td>Medium</td>
<td>Major</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>Watercourses, Medium</td>
<td></td>
<td>Negative</td>
<td>Short – medium</td>
<td>Likely</td>
<td>Medium</td>
<td>Moderate</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Pollution from chemicals</td>
<td>Loch Lomond, High</td>
<td></td>
<td>Negative</td>
<td>Short</td>
<td>Possible</td>
<td>Medium</td>
<td>Major</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>Watercourses, Medium</td>
<td>Oils, fuels, machinery, welfare facilities</td>
<td>Negative</td>
<td>Short</td>
<td>Possible</td>
<td>Medium</td>
<td>Moderate</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>Groundwater, Low</td>
<td></td>
<td>Negative</td>
<td>Short</td>
<td>Possible</td>
<td>Medium</td>
<td>Minor</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>GWDTEs, Medium</td>
<td></td>
<td>Negative</td>
<td>Short</td>
<td>Unlikely</td>
<td>Medium</td>
<td>Moderate</td>
<td>Negligible</td>
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<td>Not Significant</td>
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<tr>
<td>Groundwater flow and level alterations</td>
<td>Groundwater, Low</td>
<td>Excavations and dewatering</td>
<td>Negative</td>
<td>Short</td>
<td>Likely</td>
<td>Low</td>
<td>Minor</td>
<td>Low</td>
<td>Minor</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>GWDTEs, Medium</td>
<td></td>
<td>Negative</td>
<td>Long</td>
<td>Possible</td>
<td>Low</td>
<td>Minor</td>
<td>Minor</td>
<td>Minor</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Receptor, Sensitivity</td>
<td>Source of Impact</td>
<td>Type of Effect</td>
<td>Duration</td>
<td>Probability of Effect Occurring on Receptor</td>
<td>Pre-Mitigation Magnitude of Change</td>
<td>Pre-Mitigation Level of Effect</td>
<td>Post Mitigation Magnitude of Impact</td>
<td>Residual Significance of Effect</td>
<td>Residual Effect Significance</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------</td>
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<td>-------------------------------</td>
</tr>
<tr>
<td>Operational Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downstream &amp; on-site flood risk</td>
<td>Loch Lomond, Medium</td>
<td>Impermeable surfaces, drainage system</td>
<td>Positive</td>
<td>Long</td>
<td>Likely</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Watercourses, Medium</td>
<td>Positive</td>
<td>Long</td>
<td>Likely</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
<td></td>
</tr>
<tr>
<td>Pollution from sediments</td>
<td>Loch Lomond, High</td>
<td>Increased runoff from impermeable surfaces, roads</td>
<td>Negative</td>
<td>Long</td>
<td>Unlikely</td>
<td>Low</td>
<td>Moderate</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Watercourses, Medium</td>
<td>Negative</td>
<td>Long</td>
<td>Unlikely</td>
<td>Low</td>
<td>Minor</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
<td></td>
</tr>
<tr>
<td>Pollution from chemicals</td>
<td>Loch Lomond, High</td>
<td>Vehicle use</td>
<td>Negative</td>
<td>Short</td>
<td>Unlikely</td>
<td>Low</td>
<td>Moderate</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Watercourses, Medium</td>
<td>Negative</td>
<td>Short</td>
<td>Unlikely</td>
<td>Low</td>
<td>Minor</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
<td></td>
</tr>
<tr>
<td>Groundwater, Low</td>
<td>Negative</td>
<td>Short</td>
<td>Unlikely</td>
<td>Low</td>
<td>Minor</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
<td></td>
</tr>
<tr>
<td>GWDTEs, Medium</td>
<td>Negative</td>
<td>Short</td>
<td>Unlikely</td>
<td>Low</td>
<td>Minor</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
<td></td>
</tr>
<tr>
<td>Groundwater flow and level alterations</td>
<td>Groundwater, Low</td>
<td>Built infrastructure</td>
<td>Negative</td>
<td>Long</td>
<td>Possible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
<td></td>
</tr>
<tr>
<td>GWDTEs, Medium</td>
<td>Negative</td>
<td>Long</td>
<td>Possible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Not Significant</td>
<td></td>
</tr>
</tbody>
</table>
10.10 Assessment of Cumulative Effects

10.10.1 Cumulative effects on the water environment could occur where more than one development is proposed within a catchment, and Chapter 3 – The Proposed Development identified the relevant cumulative developments within the area.

10.10.2 The relevant cumulative developments are:

- Replacement building and infrastructure for Sweeney’s Cruises;
- Drumkinnon Bay dredging;
- Woodbank Inn Hotel Extension; and
- Balloch Street Design Project.

10.10.3 With reference to impact upon the water environment, the only cumulative development which may have an impact would be the dredging of Drunkinnon Bay to the north of the site.

10.10.4 The proposed dredging is to take place to the west of the Pierhead area of the site, and it is to be undertaken to provide a greater area for open water swimming for the Glasgow 2018 European Championships. Approximately 1000 m³ of material is to be excavated to provide a minimum depth of 1.4m within the bay.

10.10.5 The dredging activities are estimated to be undertaken with 3 weeks, with another 3 weeks drying and disposal time for the material. This will all have to be undertaken prior to the swimming events which will be held in August 2018.

10.10.6 The dredging activities will have a short term negative impact upon the water quality and may introduce sediment pollution to the Loch shore, which as noted is a highly sensitive receptor. However due to the duration of the activity and the fact that it will be undertaken early in 2018, it is not considered that it will coincide with any construction activities relating to the proposed development.

10.10.7 As such there would be negligible/no cumulative effects on the water environment.

10.11 Summary

10.11.1 This chapter of the ES has assessed the impact of the proposed development upon the water environment which includes surface water and fluvial hydrology (including flooding), water quality, drainage, groundwater, water supplies and wetlands.

10.11.2 A suite of embedded and further mitigation has been proposed to avoid, prevent and minimise likely significant effects on the water environment. This includes:

- A buffer for construction activities within a 5m strip along waterfronts;
- Adherence to relevant national guidance, legislation and good practice in construction methods;
- Development and adhering to a Construction Environmental Management Plan (CEMP) containing a Pollution Prevention Plan (PPP), which will include monitoring of the site activities to ensure compliance;
- The use of construction phase Sustainable Drainage Systems (SuDS);
- An Environmental Clerk of Works (ECoW) will supervise the construction works to ensure compliance with the above;
- Permanent surface water drainage network incorporating SuDS to ensure sufficient levels of treatment and attenuation of surface water discharges from site;
- All proposed development is to be located outwith the functional floodplain as identified in the Flood Risk Assessment, and the minimum finished floor levels of buildings on site are to be above the maximum flood level estimated for the 1 in 200 year + climate change event; and
Routing of construction discharges through at least three levels of SuDS to ensure that water quality of high sensitivity receptors is not adversely affected.

10.11.3 With the above mitigation measures in place, the assessment has concluded that the proposed development would not generate any significant effects upon the water environment.

10.12 References

11 Ground Conditions and Geology

11.1 Introduction

11.1.1 This chapter identifies the likely environmental effects from the construction and operation of the proposed development in relation to the ground conditions, including land stability and geological hazards. The assessment is based on the characteristics of the site and surrounding area and the key parameters of the proposed development detailed in Chapter 2 – Site and Surrounding Area and Chapter 3 – The Proposed Development respectively. This chapter has been prepared by Peter Brett Associates LLP (PBA).

11.1.2 This ES chapter is supported by the following technical reports provided in Appendices 11.1 - 11.2:

- Appendix 11.1 – Figures;
- Appendix 11.2 – Preliminary Phase 2 Ground Conditions Assessment, PBA, 2017

11.2 Legislative and Policy Context

Legislation

11.2.1 The overarching legislative framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context. Subject specific legislation of relevance to this assessment is:

- Environmental Protection Act 1990 (Part 2A) (as amended 2012);
- The Environment Act 1995 (Section 57);
- The Contaminated Land (Scotland) Regulations 2002 (as amended 2005);
- The Private and Public Water Supplies (Miscellaneous Amendments) (Scotland) Regulations 2015;
- Water Framework Directive 2000/60/EC; and
- Private Water Supplies (Scotland) Regulations 2006 (as amended 2015).

Policy

11.2.2 The planning policy framework applicable to this EIA for the proposed development is outlined in Chapter 5 – Legislative and Policy Context. Planning policy considerations (including policies and guidance) of specific relevance to this assessment are:

- Adopted Loch Lomond and the Trossachs National Park (LLTNP) Local Development Plan (LDP) (2016) including relevant policies outlined in Table 5.1, in particular:
  - Overarching Policy 1 – Strategic Principles;
  - Overarching Policy 2 - Development Requirements;
  - Natural Environment Policy 11 – Protecting the Water Environment; and
  - Natural Environment Policy 16 - Land Contamination.
- Draft LLTP Partnership Plan 2018 – 2023, in particular outcomes 1-3 and 5-9;
- National Planning Framework 3 (NPF3) (2014);
- Scottish Planning Policy (SPP) (2014) including relevant provisions outlined in Table 5.2, in particular the Principal Policy on Sustainability (paragraphs 24-35); and
- PAN 33 Development of Contaminated Land.
Guidance

11.2.3 The following subject specific guidance and technical standards have informed this assessment:

- Model Procedures for the Management of Contaminated Land (CLR11), Environment Agency, 2004; and
- CLR11 is the UK industry technical framework used for applying a risk management process when dealing with land impacted by contamination. This sets out a procedure for carrying out an environmental risk assessment based on a source-pathway-receptor relationship, referred to as a pollutant linkage. This allows an assessment of potential environmental risk to be determined, based on the nature of the contaminant, the degree of exposure of a receptor to a contaminant and the sensitivity of the receptor.

11.3 Methodology and Significance Criteria

Scope of Assessment

11.3.1 This ES chapter presents an assessment of likely significant effects on ground conditions and geology from the proposed development. The assessment presented in this ES chapter has been prepared in accordance with the 2011 EIA Regulations.

11.3.2 The principal aspects considered within this assessment are:

- The likely effects of the proposed development on the environment, human health and the proposed structures in relation to ground conditions, contamination and stability; and
- The likely effects of the environment on the proposed development itself.

11.3.3 Likely environmental effects are considered during construction and operational phases and before and after mitigation measures have been applied.

Overall Approach

Contamination

11.3.4 The assessment of the ground conditions at the site has been undertaken by following a tiered approach as recommended within the industry guidance (namely the Model Procedures for the Management of Contaminated Land, CLR11):

- Tier 1 – a qualitative assessment of historical and published information, together with a site reconnaissance, undertaken in order to develop a preliminary conceptual site model and inform a preliminary risk assessment;
- Tier 2 – an assessment of ground condition data using published GAC (generic assessment criteria) to screen the site and establish whether there are actual, or potential, unacceptable risks; and
- Tier 3 - detailed - a quantitative assessment involving the generation of site specific assessment criteria (SSAC).

11.3.5 In the event that unacceptable risks are identified following a Tier 3 assessment, a remediation strategy may be required to mitigate the risks.

11.3.6 In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences, a source-pathway-receptor methodology is adopted, with the underlying principle the identification of pollutant linkages. A pollutant linkage consists of the following three elements:

- A source/hazard (a substance or situation that has the potential to cause harm or pollution);
- A pathway (a means by which the hazard moves along / generates exposure); and
- A receptor/target (an entity that is vulnerable to the potential adverse effects of the hazard).
11.3.7 Without a pollutant linkage the contamination may be a hazard but does not constitute a risk unless all three elements are present. Therefore, in assessing the potential for contamination to cause a significant effect, the extent and nature of the potential source or sources of contamination must be assessed, pathways identified, and sensitive receptors or resources identified and appraised, to determine their value and sensitivity to contamination related impacts.

11.3.8 The methodology adopted in this chapter is qualitative with a progression from factual information (stated with reasonable certainty) regarding the baseline conditions, to appraisal informed by professional judgement and expression of opinions on the relative significance.

**Ground Stability**

11.3.9 An assessment of potential ground stability issues was undertaken by PBA as part of the preliminary site investigation. Available published geological information was obtained and reviewed, together with data acquired from public databases. This report presents a review of the acquired information and gives comments with respect to potential constraints on foundation and general site infrastructure design and construction. Ground stability assessment utilises the guidance given in NHBC Standards Chapter 4.1 Land Quality – Managing Ground Conditions (NHBC, 2014).

**Study Area**

11.3.10 The Study Area adopted in this assessment comprises the site of the proposed development (“onsite”), as shown in Figure 2.1, together with the surrounding area up to a maximum radius of 1000m from the site boundary (“offsite”).

**Information Sources**

**Desk Top Study**

11.3.11 The following sources of information have been reviewed and used to inform the geology and ground conditions assessment:

- Riverside & Woodbank Estate, Balloch, Preliminary Phase 2 Ground Conditions Assessment, Peter Brett Associates, 2017 or the “preliminary ground investigation”;
- Engineering Review, West Riverside, Balloch, AECOM, 2015 or “2015 Engineering Review”;
- West Riverside, Loch Lomond Shores, Phase 1 Geoenvironmental Desk Study, AECOM 2015 or “2015 Phase 1 Desk Study”; and
- Lomond Shores, Stage 2 Site Investigation Report, URS Report Fer 44762681/GLRP0533 Issue 2 or “URS Report”.

**Fieldwork**

11.3.12 A preliminary site investigation has been undertaken, comprising a programme of shallow boreholes across the site. All locations were logged and soil samples recovered for geotechnical and geoenvironmental analysis. Boreholes were installed at representative locations. Groundwater and gas monitoring was undertaken on six occasions. The results of this fieldwork are summarised in the Baseline Section 11.4 below.

**Approach to Assessment**

**Identification of Relevant Receptors**

11.3.13 Receptors considered in this assessment are users or locations where a person, property or the environment may experience adverse impacts due to ground condition effects as a result of the proposed development. The sensitivity of a receptor is based upon the relative importance of the receptor. The approach towards determining the sensitivity is specified in Table 11.1 below.
Table 11.1 Criteria used in geology and ground conditions for classifying receptor sensitivity

<table>
<thead>
<tr>
<th>Classification</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Groundwater: Source Protection Zone</td>
</tr>
<tr>
<td></td>
<td>Surface water: Scottish Environment Protection Agency (SEPA) overall status of High</td>
</tr>
<tr>
<td></td>
<td>Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR)</td>
</tr>
<tr>
<td></td>
<td>Buildings: World Heritage Site or Conservation Area</td>
</tr>
<tr>
<td></td>
<td>Human health: Residential and uses where children are present</td>
</tr>
<tr>
<td>Moderate</td>
<td>Groundwater: Principal aquifer &amp; Secondary A aquifer</td>
</tr>
<tr>
<td></td>
<td>Surface water: SEPA overall status of Good or Moderate</td>
</tr>
<tr>
<td></td>
<td>Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) County Wildlife Sites (CWS)</td>
</tr>
<tr>
<td></td>
<td>Buildings: Area of Historic Character</td>
</tr>
<tr>
<td></td>
<td>Human health: Employment</td>
</tr>
<tr>
<td>Low</td>
<td>Groundwater: Secondary B aquifer or Unproductive</td>
</tr>
<tr>
<td></td>
<td>Surface water: SEPA overall status of Poor or Bad</td>
</tr>
<tr>
<td></td>
<td>Ecology: local habitat resources or no designation</td>
</tr>
<tr>
<td></td>
<td>Buildings: Replaceable/Local value</td>
</tr>
<tr>
<td></td>
<td>Human health: Transient or Limited Access. Unoccupied/Industrial land use and construction workers**</td>
</tr>
</tbody>
</table>

**assuming that construction workers will adopt appropriate health and safety and personal protective equipment procedures (PPE)**
Impact Assessment Methodology

11.3.14 The level of likely ground condition effects from the construction and operation of the proposed development is determined by assessing the likely magnitude of impacts, using the criteria set out in Table 11.2.

Table 11.2 Magnitude of Impact on Ground Conditions

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>Adverse</td>
</tr>
<tr>
<td></td>
<td>Beneficial</td>
</tr>
<tr>
<td>Moderate</td>
<td>Adverse</td>
</tr>
<tr>
<td></td>
<td>Beneficial</td>
</tr>
<tr>
<td>Minor</td>
<td>Adverse</td>
</tr>
<tr>
<td></td>
<td>Beneficial</td>
</tr>
<tr>
<td>Negligible</td>
<td>Adverse</td>
</tr>
<tr>
<td></td>
<td>Beneficial</td>
</tr>
<tr>
<td>No Change</td>
<td></td>
</tr>
</tbody>
</table>

Assumptions and Limitations

11.3.15 The preliminary site investigation obtained site wide coverage, however, it was undertaken without a definitive proposed layout. As such, it is acknowledged that there may be a requirement for more detailed investigations in specific areas of the site once the layout has been finalised.

11.3.16 No intrusive investigation was undertaken within the footprint of the ruined buildings within the Woodbank House site and therefore the ground conditions within this area are unknown and have not been assessed.

11.3.17 The eastern area of the site is known to have had extensive rail lines running north/south. The extent to which these rail lines have been removed or simply buried is not known.

11.3.18 A belowground void was encountered during the preliminary ground investigation. It was later suggested that this void relates to a redundant 18” culvert at approximately 2m depth. This culvert may require further investigation.
Establishment of Effect Significance

11.3.19 The significance of an environmental effect is determined with reference to the sensitivity of identified receptors (Table 11.1) and the predicted magnitude of the impact (Table 11.2). To determine the significance of an effect, reference should be drawn to the impact significance matrix as set out in Table 11.3 below.

11.3.20 In line with the general approach set out in Chapter 4 – Assessment Methods, effects at Moderate or above levels are considered significant in EIA terms.

Table 11.3 Significance of Effects for Assessing Ground Conditions

<table>
<thead>
<tr>
<th>Sensitivity/Value of Receptor</th>
<th>Magnitude of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Major</td>
</tr>
<tr>
<td>High</td>
<td>Major</td>
</tr>
<tr>
<td>Medium</td>
<td>Major</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Approach to Cumulative Impact Assessment

11.3.21 In accordance with the EIA Regulations, the cumulative assessment needs to consider all approved developments which have the potential to result in cumulative significant environmental effects alongside the proposed development. As outlined in Section 2.4, for the purposes of this assessment, the four developments in the table below have been identified:

- Sweeney Cruises Replacement Infrastructure - Demolition of existing buildings and erection of office building; slipway enclosure/workshop building; boathouse and installation of 2 pontoons;
- Drumkinnon Bay Dredging - Dredging operation to extend existing dredged channel;
- Woodbank Inn Extension - Demolition of kitchen extension. Erection of 3 storey extension comprising of 18 hotel rooms and kitchen; and
- Balloch Street Design Project - The Balloch Village Plans (Street Design) Project builds on the extensive engagement undertaken through the ‘Live in Balloch’ Charrette process that took place in February and March 2016.

11.3.22 Based on information available at this time, it is anticipated that the planning applications for the above developments will not have an impact on geology and hydrogeology such that a cumulative impact would occur alongside the proposed development impacts.

11.3.23 However, cumulative impacts may occur if pollutants or sediments are released into the River Leven and/or Loch Lomond concurrently during the construction phase of the proposed development and this proposal. If construction occurs simultaneously and without mitigation, the impacts may increase in magnitude and significance at a local level. If construction occurs consecutively impacts could increase in duration and significance at a local level.

11.4 Baseline Conditions and Receptors

11.4.1 Baseline conditions for the proposed development have been identified using the recent 2017 preliminary ground investigation, together with the historical desk-based studies by AECOM and URS.

The Site

11.4.2 The site is located at the northern extent of the town of Balloch, at the southern end of Loch Lomond approximately centred at Ordnance Survey Grid Reference 238666, 682128. The boundary of the site is shown on Figure 2.1 – Site Location Plan (Appendix 2.1). The site
measures approximately 35.5 hectares and can be split into two distinct areas known as West Riverside in the east and Woodbank House in the west.

11.4.3 A detailed description of the site and surrounding area is provided in Chapter 2 – Site and Surrounding Area.

Current Land Use

11.4.4 The larger eastern area of the site (West Riverside) is an irregular shape and is bounded to the north by the Lomond Shores centre and the bank of the Loch itself. To the east is the River Leven (the Maid of the Loch Slipway, including pontoons) and to the south is primarily housing. The majority of the West Riverside area is occupied by woodland and walking paths. Two INEOS oil pipelines run through the site from west to east and two fenced valve compounds are present.

11.4.5 The smaller western area (Woodbank House) is accessed via a track from Old Luss Road. The majority of the site area comprises two relatively flat lying open fields, however, in the west is an area dominated by woodland and the ruins of an old hotel and outbuildings.

11.4.6 The site in general is relatively flat lying. However, in the eastern area, ground levels fall away towards the River Leven. The INEOS oil pipelines run from west to east through the northern part of the site and for the most part are situated within a cutting. Woodland areas are hummocky, with level variations in the region of 2 – 3m. Other mounds and hollows at the site may be related to the superficial quarrying of sands and gravels. The western part of the Woodbank House site includes some steeply sloping ground which is thought to be a natural feature, possibly due to the effects of glacial movement. The above features (with the exception of the Woodbank House site) are shown on a topographical survey undertaken in 2017 (see Figure 11.2).

Historical Land Use

11.4.7 This summary is based on information from historical Ordnance Survey (OS) maps, which were included within the 2015 Phase 1 Desk Study.

11.4.8 The West Riverside area of the site has a varied history. There is no record of heavy industrial land uses within the West Riverside site, however, multiple small quarries were active, particularly in the northern and western areas. The eastern area (beside the slipway) was dominated by railway infrastructure from Balloch Station in the south to Balloch Pier in the north. A dye works was located immediately offsite to the south, however, this area is currently occupied by housing.

11.4.9 The majority of the Woodbank House area of the site remained undeveloped from 1864 until present. The exception to this being the hotel and outbuildings present within the sloping woodland area in the west of the Woodbank house area. On later mapping the hotel was labelled as Hamilton House. The hotel building was destroyed in a fire in 1995. The majority of the building was ruined, however, the façade remains standing. The various outbuildings are in a state of severe disrepair.
Summary of Receptor Sensitivity

Published Superficial Geology

11.4.10 The 1:50 000 scale geological map of the area, Sheet 30W and part of 29E (Scotland) - Drift “Greenock” (British Geological Survey, 1989) indicates the presence of some superficial deposits overlaying the solid geology within the site. The superficial deposits comprise three main types:

- **Raised Marine Deposits** – Clay, silt, sand and gravel. Formed in shallow seas with mainly siliciclastic sediments. This is indicated to be present adjacent to and following the southern shoreline of the loch;
- **Glaciofluvial Sand and Gravel** – gravel, sand and silt formed in cold periods with Ice Age glaciers scouring the landscape and depositing moraines of till with outwash sand and gravel deposits. These deposits are indicated to be present across the greater part of the Woodbank House and West Riverside areas; and
- **Till (Diamicton)** – these deposits were formed in cold periods with Ice Age glaciers scouring the landscape and depositing moraines of till with outwash sand and gravel deposits. These deposits are indicated to be potentially present along the western part of the Woodbank House site.

11.4.11 In addition, the British Geological Survey (BGS) mapping also shows areas of man-made deposits (Made Ground) being present and these are annotated by the BGS as being “deposited on original ground surface”. These occur in two locations, being; in a narrow strip along the banks of the River Leven (Slipway) to the east of Pier Road (along the alignment of the former railway line); and in an area of ground to the North of Balloch Road and extending beneath Clairnish. Furthermore, infilled ground (annotated as being manmade deposits - filling former opencast excavation) is marked as a parcel of land to the east of Old Luss Road and northwest of Ben Lomond Way, however this is believed to be outside of the site boundary.

11.4.12 The Geology of Britain viewer on the BGS website indicates that there are also deposits of Alluvium present at the site, described as clay, silt, sand and gravel, and shown as a ribbon extending from the shore of Loch Lomond, adjacent to the River Leven and along the alignment of the former railway line, predominantly to the east of Piers Road. These deposits may be present beneath any made ground.

Published Solid Geology

11.4.13 The 1:50 000 scale geological map of the area, Sheet 30W and part of 29E (Scotland) - Solid “Greenock” (BGS, 1990) indicates that the site is entirely underlain by the Teith Sandstone Formation of the Devonian Period.

BGS Boreholes and Historical Investigations

11.4.14 There are a number of BGS Borehole records available within the boundary of the West Riverside site, and the deepest of these undertaken in 1998 for Balloch Footbridge (adjacent to the northern boundary of the site) indicates that depth to bedrock is in excess of 35m at that location.

11.4.15 The 2015 Phase 1 Desk Study summarises the ground conditions indicated by previous ground investigations carried out at the West Riverside site and identifies the presence of Made Ground and ‘Organic Soils’ overlaying ‘Fluvio/Upper Glacial Deposits’, ‘Glacial Till’ with Bedrock (sandstone) encountered at depths of between 51m below ground level (m bgl) and 69m bgl. It is considered that the descriptor ‘Organic Soils’ could represent Alluvium.

11.4.16 There are no BGS borehole records from within the Woodbank House site area. The closest BGS records relate to a string of shallow (generally <5m) boreholes drilled along the A82, to the west of the Woodbank House boundary. The boreholes typically reached depths of around 4.0mbgl and described ‘Soft, friable or dense clayey SAND with cobbles’ to around 1.5mbgl followed by ‘Hard or Stiff sandy clay with boulders’
11.4.17 Two of the boreholes to the north / west of Woodbank House (close to Stoneymollan Road / Roundabout) encountered sandstone bedrock at 5m – 6.5mbgl.

11.4.18 The historical boreholes indicate that the depth to bedrock may be highly variable within the area of the West Riverside / Woodbank House sites. Sandstone was encountered at a depth of 52.65m at Balloch Station (southern end of West Riverside), whilst in close proximity to the roundabout at the southern tip of Woodbank House site sandstone was recorded at 5.0m.

Findings of the Preliminary Ground Investigation

11.4.19 The 2017 ground investigation comprised 57 window sample boreholes to depths of up to 5m below ground level (mbgl). However, as a result of frequent obstructions which prevented drilling progress, several attempts were made at achieving depth at many of the boreholes and as a result, the total number of boreholes attempted was 73. Borehole locations are shown in Figure 1 of Appendix 11.2. The following section summarises the ground conditions encountered in the boreholes.

Geology

Made Ground

11.4.20 Made Ground was encountered in forty-six out of seventy-three window sample boreholes, either from the ground surface or below a relatively thin layer of topsoil, to depths of between 0.15m bgl and 3.5m bgl. With the exception of WS07 on the Woodbank House site, Made Ground thicknesses in excess of 1m were encountered predominantly to the east of Pier Road (as shown on Figures 2, 3 and 4 of Appendix 11.2), where a former railway line used to cross the site on embankment (as shown on the historical maps presented in the 2015 Phase 1 Desk Study). The borehole descriptions of the Made Ground indicate that it varies in composition from being a predominantly cohesive deposit comprising very soft gravelly sandy clay, to more typically a granular deposit, being a very loose to loose sand and gravel or organic silty gravelly sand. Each deposit contains varying quantities of cobbles, ash, glass fragments, pottery and brick fragments.

11.4.21 A programme of geochemical laboratory testing was carried out on selected soil and groundwater samples to determine the concentrations of a range of commonly occurring potential contaminants as part of the investigation. In addition, monitoring wells installed in selected boreholes were monitored on a single occasion to provide a preliminary determination of concentrations of potentially hazardous ground gases.

Alluvium

11.4.22 Material considered to represent Alluvium was encountered in fourteen of the seventy-three window sample boreholes, at depths between 0.2m bgl and 5.0m bgl. The Alluvium was only encountered in the eastern part of the site, between Pier Road and the River Leven. The Alluvium was typically described as very soft and soft peaty sandy Clay, but it is noted that beds (full thickness not proven but up to at least 2.85m) of very soft and soft sandy clayey Peat were encountered, as shown on Figures 2 and 3 of Appendix 11.2 within the middle part of the site area east of Pier Road. The Alluvium is also occasionally encountered as a very loose and loose silty Sand. An additional window sample borehole containing 2.5m thickness of peaty Sand overlying sandy Peat was encountered at WS16 located offsite between West Riverside and Woodbank House.

Till (Diamicton)

11.4.23 Material considered to represent Till was encountered in five of the seventy-three window sample boreholes, all located in the western part of the Woodbank House site (see Figure 3 of Appendix 11.2). The Till was encountered at depths of between 0.1m bgl and 1.7m bgl, and was typically described as a firm to stiff gravelly sandy Clay. The gravel was recorded as being flat to elongated subangular to rounded igneous rock and other lithologies. Some high value SPTs were recorded in the deposit which are considered to represent larger gravel /boulder elements present.

Glaciofluvial Deposits
Material considered to represent Glaciofluvial deposits was encountered in fifty-one out of seventy-three window sample boreholes, at depths from existing ground surface to 4.8m bgl. These deposits were typically encountered in the western part of the West Riverside site and the eastern part of the Woodbank House site (as shown on Figure 3 of Appendix 11.2). These deposits were typically described as medium dense Sand and Gravel, silty gravelly Sand and silty Sand, but also occasionally as gravelly sandy Clay. The gravel inclusions are described generally as elongated, sub angular to sub rounded, fine to coarse of quartz, sandstone, igneous rock and other lithologies.

Hydrogeological Setting

The 2015 Phase 1 Desk Study indicated that earlier ground investigations at the site identified groundwater strikes in the ‘majority of exploratory locations’ and that ‘groundwater at the site was in general hydraulic continuity with the River Leven at the level between 7.54m Above Ordnance Datum (AOD) and 8.89m AOD.

During 2017 phase of investigation, groundwater was only encountered during drilling in fourteen of the seventy-three window sample boreholes, at variable depths of between 0.8mbgl and 3.7mbgl, predominantly located in the Made Ground, Alluvium and glaciofluvial deposits in the east of the site. It is noted that the surface datum level of each of the boreholes was not recorded and as such the relative level of groundwater during this phase of investigation cannot be determined. In subsequent monitoring visits, around 13 of the 36 installed boreholes remained dry.

The groundwater encountered is considered to be perched water, existing in pockets of more permeable strata (such as sands and gravels), restricted by lower permeability deposits (such as clays), rather than a continuous shallow groundwater body.

The 2015 Phase 1 Desk Study states that groundwater in superficial deposits beneath the site is likely to be of moderate to high potential productivity. Furthermore, the Lower Devonian (Strathmore) bedrock aquifer is of High Productivity and has an overall classification of ‘Good’.

The 2015 Phase 1 Desk Study states that there are no known abstraction boreholes within 1km of the site.

Hydrological Setting

The nearest surface water features to the site are Loch Lomond which is situated immediately to the north and the River Leven which is situated immediately to the east and enters the Loch adjacent to the north eastern point of the site.

The Phase 1 Desk Study states that the River Leven has a SEPA status of Poor for ecology and Pass for chemistry. The pressures on the river resulting in these classifications include morphological modifications (water collection, dams, weir etc.) and point source pollutants.

Likewise, the Phase 1 Desk Study states that Loch Lomond has a SEPA status of Poor for ecology and Pass for chemistry. The status is a result of both diffuse and point sources of pollution, morphological alterations and recreational activities.

Information on discharge consents is summarised in the Phase 1 Desk Study which includes a Landmark Envirocheck report.

A flood risk assessment has been undertaken and is reported in this ES under a separate chapter (see Chapter 10).

Other Potential Geological Hazards

Radon is a naturally occurring radioactive gas and emanates from geological formations to varying degrees, depending on the type, porosity and permeability. An assessment of potential for radon gas to be present is given in the 2015 Phase 1 Desk Study and indicates that the site is in the lowest category for potential radon risk.

Mining based on the conclusions of the 2015 Phase 1 Desk Study and the Coal Authority website, the site is not considered to be in an area where coal mining has occurred.

Geoenvironmental Conditions – Soil
11.4.37 The majority of the site has remained undeveloped. The main exceptions to this are the area of railway land in the east, the small superficial quarries (potentially backfilled with material of unknown origin) and the buildings associated with the hotel at the Woodbank House site. These areas are considered the main potential sources of onsite contamination.

11.4.38 Table 11.4 below summarises the potential sources of contamination.

<table>
<thead>
<tr>
<th>Source</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onsite</strong></td>
<td></td>
</tr>
<tr>
<td>Railway land</td>
<td>Railway land is often a source of contamination from the material used as ballast (including clinker and ashy material) as well as operational leaks and spills.</td>
</tr>
<tr>
<td>Made Ground</td>
<td>Made Ground or fill material of unknown origin can be a source of a range of contaminants including organic and inorganic compounds. Asbestos may be present within demolition rubble. If organic material is present, microbial decay can generate ground gases.</td>
</tr>
<tr>
<td>Peat / Organic Soils</td>
<td>Microbial decay can generate ground gases</td>
</tr>
<tr>
<td><strong>Offsite</strong></td>
<td></td>
</tr>
<tr>
<td>Dye-works</td>
<td>Potential for waste material from the adjacent historical dye works being deposited onsite. The dye works may have affected groundwater, subsequently migrating below the site.</td>
</tr>
</tbody>
</table>

*Woodbank House Area*

11.4.39 Despite the presence of Made Ground near the existing / ruined buildings, no potentially significant contamination has been encountered in soil samples recovered from the Woodbank site.

11.4.40 It should be noted that no investigations have been undertaken from within the building footprints.

11.4.41 Given that the main hotel building was destroyed by fire, the potential exists for limited contamination to exist in soils within the building footprint. In particular, polycyclic aromatic hydrocarbons (PAHs) are often associated with combustion. If asbestos containing materials were present in any of the structures onsite, the potential exists for asbestos to be present in structures or rubble that currently remain onsite.

11.4.42 At the time of writing, it is unknown whether an attempt will be made to retain some or all of the existing buildings / remnants of buildings for inclusion within the proposed development. Depending on the outcome of these proposals, additional ground investigation locations are likely to be required within the existing / ruined building footprints.

*West Riverside Area*

11.4.43 No significant contamination was encountered within soil samples recovered from the natural soils to the west of Pier Road or South of Ben Lomond Way.

11.4.44 Elevated concentrations of heavy metals (lead and less frequently, arsenic and hexavalent chromium) were encountered within Made Ground soils to the east of Pier Road and North of Ben Lomond Way. These are likely to be associated with the former railway land and activities and potentially linked to the offsite dye works.

11.4.45 Concentrations of lead ranged from a maximum of 5,100mg/kg (in WS47) to a minimum of 5.1mg/kg. The average concentration of lead was 268mg/kg. The most conservative
assessment criteria for lead is 200mg/kg which is the Category 4 Screening Value (C4SL) for soils in a residential garden scenario. Fourteen soil samples contained concentrations of lead above the C4SL of 200mg/kg. The 14 locations, together with the lead concentrations are included on Figure 4 of Appendix 11.2.

11.4.46 With the exception of WS46 (which is in close proximity to Pier Road), all of the potentially elevated concentrations of lead were located in Made Ground to the East of Pier Road and north of Ben Lomond Way.

11.4.47 A single soil sample contained a concentration of arsenic that was above the threshold for residential garden soil (65mg/kg arsenic in WS38). This location is indicated on Figure 4 of Appendix 11.2. A single soil sample contained a concentration of hexavalent chromium that was above the threshold for C4SL for soils in a residential garden scenario (8mg/kg hexavalent chromium in WS49). This location is indicated on Figure 4 of Appendix 11.2. The elevated chromium concentrations correspond approximately with an area that driller noted some green colouration in soils during the site investigation.

11.4.48 No asbestos was encountered in any of the 63 samples analysed from the site.

**Geoenvironmental Conditions – Groundwater**

11.4.49 Samples from 15 boreholes across the site recorded concentrations of heavy metals that were, in some cases, elevated by comparison to the most conservative assessment criteria typically Annual Average (AA) EQS. However, with the exception of zinc and copper (which do not have a Maximum Allowable Concentration EQS), none of the samples were elevated by comparison to the less conservative Maximum Allowable Concentration (MAC) EQS.

11.4.50 The EQS for both copper and zinc are based on bioavailable concentrations, whereas the laboratory results are for the dissolved metals regardless of bioavailability. The actual bioavailable proportion would inevitably be lower than the total amount measured.

11.4.51 EQS thresholds are designed to be protective of the freshwater environment and are therefore intended to be applied at a compliance point within the surface water, after dilution has occurred, or to direct discharges. Therefore, it is highly conservative to compare these thresholds to samples of ground water recovered from boreholes within made ground or natural soils.

11.4.52 Both the River Leven and Loch Lomond are categorised as ‘Poor’ for ecology and ‘Pass’ for quality by SEPA due to physical modification and heavy recreational use. As such, despite their proximity, these receptors are considered to be of only moderate sensitivity.

11.4.53 It is considered highly unlikely that groundwater from the site is causing significant pollution of Loch Lomond or the River Leven as a result of the marginal concentrations of contamination encountered here. Contaminants have been recorded at relatively low concentrations and are likely to exhibit relatively low mobility through soil pores. The rate of flux of shallow perched groundwater from below the site into Loch Lomond is likely to be low. Furthermore, if contaminated groundwater from the site did reach the river or loch, the effect of dilution from such a large body of water would be highly effective.

**Geoenvironmental Conditions – Ground Gas**

11.4.54 Ground gasses were measured in 36 boreholes across the site on six occasions. The results are included in Appendix 11.2.

11.4.55 Using the approach recommended in CLAIRE (2012) and endorsed in BS 8485 (2015), the Woodbank Site and the area of the West Riverside site to the west of Pier Road and south of Ben Lomond Way may be classified as Characteristic Situation 1 as defined in BS 8485 (2015). This situation is representative of ground with a very low potential for gas generation. For Characteristic Situation 1, BS 8485 (2015) advises that no special gas protection measures are required.

11.4.56 Within the areas to the east of Pier Road and the north of Ben Lomond Way the site is classified as ‘category situation 2’ (CS2) for gas. This is due to the carbon dioxide (CO₂) and methane (CH₄) being recorded at concentrations above the trigger values of 5% and 1% respectively during the monitoring even though flow rates remained low.
11.4.57 As expected, the elevated concentrations of ground gases correspond with Made Ground and Peaty soils.

11.4.58 Depending on the nature of the structures proposed for this area, there may be a requirement to incorporate gas protection measures. The appropriate gas protection measures are dependent on the proposed building design and end use, however, typically gas protection measures comprise a combination of barrier (e.g. concrete slab, gas resistant membrane) and a ventilation layer (e.g. a void space).

Ground Stability Hazards

11.4.59 Construction on areas where peat has been identified can however suffer from significant settlement and any structures proposed that cross areas underlain by peat may need to consider either excavation of the peat and replacement with engineered fill or the formation of a piled load transfer blanket with the road construction layers formed on top of the load transfer blanket. Where peat is present consideration will need to be given to all buried services that are sensitive to settlement and movement such as surface water drains or foul sewers.

11.4.60 It is unlikely that traditional shallow spread foundations will be suitable in the areas of the site where deeper Made Ground (>1.5m – 2.0m thick) and Alluvium are present due to their variability, typically very low strength, and loose relative density resulting in unacceptably high magnitudes of total and differential settlements. Where the Made Ground and Alluvium deposits are typically less than about 1.5m to 2.0m thick, and very lightly loaded structures that are relatively insensitive to settlement are proposed, deep strip or trench fill foundations could be taken through these deposits to found on more competent strata below (assuming competent strata is present). Alternatively, the Made Ground or Alluvium deposits could be excavated and replaced with engineered fill and a ground bearing raft used.

11.4.61 Where the Made Ground or Alluvium is greater than 1.5m to 2.0m thick, it may be uneconomical to adopt a traditional pad or deep strip foundation solution, and therefore consideration should be given to Vibrated Concrete Columns (VCC’s) or a piled foundation solution.

11.4.62 Across the majority of the site, where Till deposits and Glaciofluvial deposits are present, it may be possible to adopt shallow spread foundations for relatively lightly loaded structures where the underlying material is proved to be at least medium dense or medium strength, otherwise ground improvement may be required (e.g. piled foundations or VCCs).

11.4.63 Careful consideration will need to be given to potential differential settlement developing between parts of the same building founded on different types of soil such as cohesive Till, peat or granular Glaciofluvial deposits.

Piled Foundations

11.4.64 Piled foundations are likely to be required where strip or pad foundation depth becomes excessively deep, where the size of the foundation becomes excessively large, or where the magnitude of predicted settlements for pad or strip footings is unacceptable. It is therefore anticipated that medium and heavily loaded structures or structures that are sensitive to total and/or differential settlements such as the pool and leisure facility, budget accommodation and hotel will require piled foundations. Lighter structures including the forest lodges are unlikely to require piling.

Belowground Structures

11.4.65 Utilities including the INEOS High Pressure Oil Pipeline and other gas apparatus are known to be present below the surface of the site. Known utilities (and where available, standoff zones) are included on Figures 1 – 4 of Appendix 11.2.

11.4.66 A belowground void was encountered during hand digging at borehole WS 40. It was later suggested that this void relates to a redundant 18” culvert at approximately 2m depth. The direction and extent of this feature is not known and may require further investigation with an excavator. This feature is not included on service plans which have been reviewed (and are included on Figures 1 to 4, Appendix 11.2) which suggests that it is not Scottish Water plant.
11.4.67 The eastern area of the site is known to have had extensive rail lines running north / south. The extent to which these rail lines have been removed or simply buried is not known.

**Summary of Identified Sensitive Receptors**

11.4.68 Sensitive receptors will include development and maintenance workers, future users, surface and groundwater and proposed buildings and structures, as shown in Table 11.5 below.

Table 11.5 Summary of Sensitivity of Potential Receptors

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Sensitivity</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site Workers</strong></td>
<td>High</td>
<td>Ground workers and construction workers are likely to come into direct contact with soils, albeit for a short period of time. As the potential risk is to human health, the sensitivity is considered to be high.</td>
</tr>
<tr>
<td><strong>Future Site Users</strong></td>
<td>High</td>
<td>Future users include employees, day visitors and residential tourists who will have variable exposure scenarios to the potential contaminants. However, since the potential risks are to human health, the sensitivity is considered to be high.</td>
</tr>
<tr>
<td><strong>Offsite Users</strong></td>
<td>High</td>
<td>Off-site workers, visitors and residents including potential groundwater users.</td>
</tr>
<tr>
<td><strong>Groundwater Resources</strong></td>
<td>Moderate</td>
<td>Groundwater is currently considered to be of poor quality, albeit with a target of continuous improvement.</td>
</tr>
<tr>
<td><strong>Surface Water Resources</strong></td>
<td>Moderate</td>
<td>The site is immediately adjacent to the River Leven and Loch Lomond. The River Leven is considered to be of poor quality, albeit with a target of continuous improvement.</td>
</tr>
<tr>
<td><strong>Built Environment</strong></td>
<td>Moderate</td>
<td>Proposed buildings are potentially at risk from aggressive ground conditions caused by low pH or high sulphate and from the build-up of gases in confined spaces.</td>
</tr>
</tbody>
</table>

11.4.69 Table 11.6 below summarises the classification of potential receptors assuming no mitigation measures are in place.

Table 11.6 Receptor Sensitivity

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Risk Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Health - Future Users</td>
<td>High</td>
</tr>
<tr>
<td>Human Health - Construction and Ground Workers</td>
<td>High</td>
</tr>
<tr>
<td>Human Health - Offsite</td>
<td>High</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Moderate</td>
</tr>
<tr>
<td>Surface Water</td>
<td>Moderate</td>
</tr>
<tr>
<td>Buildings</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
11.5 Baseline Evolution

11.5.1 In the absence of the proposed development, the future baseline conditions would likely remain consistent with the existing conditions onsite.

11.5.2 However, as described in Chapter 10, climate change may cause higher water flows and more frequent and intense rainfall events which would likely result in higher water levels in the adjacent Loch Lomond and River Leven. Higher groundwater levels could form a pathway (linkage) through the mobilisation of ground contamination present onsite which could have an adverse effect on the nearby waterbodies.

11.6 Embedded Mitigation

11.6.1 As detailed in Chapter 3 – The Proposed Development, a number of design features and embedded mitigation measures have been incorporated into the design and construction of the proposed development to avoid, prevent, or minimise significant adverse environmental effects and to enhance the beneficial effects.

11.6.2 The embedded mitigation measures of relevance to this assessment are set out below.

Construction Phase

Construction Environmental Management Plan

11.6.3 A Construction Environmental Management Plan (CEMP) will be prepared and implemented during the construction phase of the proposed development. The purpose of the CEMP is to mitigate any adverse environmental effects and will specifically include the following:

- Surface water and groundwater protection measures, including an emergency spillage response procedure;
- Procedures for the storage of fuel and chemicals;
- A contaminated hotspots plan and procedure for managing unexpected contamination. Specifically, a watching brief for the visual and olfactory assessment of the soil and groundwater (if encountered) will be maintained with sampling and testing for verification and assessment purposes where necessary;
- Settlement tanks/beds should be utilised to prevent increased suspended solids entering Loch Lomond via surface water run-off during rainfall;
- A 3 m exclusion zone will be adopted around either side of INEOS gas pipelines within the site and no groundworks will take place within this zone unless agreed with INEOS;
- Risk Assessments and Method Statements (RAMS) will be prepared. Construction/ground workers should take cognisance of the contamination reported and will be required to work in accordance with the RAMS. The provision of appropriate personal protective equipment (PPE) to be worn by site workers (as specified in RAMS);
- Informing site workers of the contamination on the site (i.e. the conclusions of the site investigation) and the potential health effects from exposure through site induction and toolbox talks;
- Dust suppression to minimise the effects on offsite users;
- If piled foundations are required, a site specific risk assessment designed specifically to assess the risks posed by piling should be carried out. Ultimately, if piled foundations are required, the technique used will be selected on the basis of protecting groundwater from contamination. Safe piling techniques should be adopted to minimise the risks posed by piling activities; and
- All construction work will be undertaken in general accordance with SEPA’s Guidance for Pollution Prevention (GPPs).
Further Ground Investigation

11.6.4 Additional intrusive investigation will be required to delineate contamination and to inform the remediation strategy. Further intrusive investigation will be undertaken as required prior to construction within and around the derelict buildings in the Woodbank House site to determine contaminants of potential concern including asbestos and PAHs. If elevated concentration is identified, remediation will be undertaken to remove the contaminated material or lower the concentration of contaminants to a suitable level.

Remediation

11.6.5 Remediation measures will be established in a Remediation Strategy document and will depend on the risk associated with any potential contaminants specific to the proposed uses planned.

11.6.6 The remediation measures will be designed to reduce the impact of any contaminants on human health or environmental receptors to low or negligible levels.

11.6.7 Depending on the nature of the structures proposed for the West Riverside area, there may be a requirement to incorporate gas protection measures. The appropriate gas protection measures are dependent on the proposed building design and end use, however, typically gas protection measures comprise a combination of barrier (e.g. concrete slab, gas resistant membrane) and a ventilation layer (e.g. a void space).

11.6.8 The potential for ground instability has been identified within the proposed development associated with localised Made Ground deposits and naturally occurring weaker soils and peat. This hazard is considered to be Moderate and the risk associated with it will be quantified further through additional site specific intrusive ground investigation, the findings of which will inform the mitigation measures to be implemented. Once the risks have been quantified, suitable mitigation will be designed which may include ground improvement measures, non-standard foundations (piling etc.) and the treatment of weaker soils or removal of peat. Planning conditions can be attached to any PPIP granted for the proposed development in order to secure the implementation of this mitigation.

Operational Phase

11.6.9 In relation to geology and ground conditions, it is not anticipated that specific embedded mitigation will be required at the operational phase of the proposed development.

11.7 Potential Effects

Construction Phase

11.7.1 A summary of the potentially sensitive receptors is provided in Table 11.5 above.

Human Health (Construction/Ground Workers)

11.7.2 Based on ground investigations to date, it has been established that there are some contaminants in soils at the site associated with the former neighbouring works, infilled made ground and naturally occurring peat which can produce ground gasses. However, the likelihood of severe and mobile contaminations is considered low.

11.7.3 Without prior knowledge of the site or appropriate planning and mitigation measures, construction worker’s health could be adversely affected by contamination. The Woodbank House area of the site, whilst free of contaminants in the areas investigated, may have issues associated within the footprint of the former Hotel which was destroyed by fire and in some areas has therefore not been fully investigated at this stage.

11.7.4 Localised, elevated contaminants were identified during the preliminary ground investigation, including hotspots of heavy metals (lead and less frequently, arsenic and hexavalent chromium) in the Made Ground.

11.7.5 Embedded mitigation includes proposed further intrusive investigation to determine the potential for contaminants of concern (including asbestos and PAHs) within and around the derelict buildings in the Woodbank House site.
11.7.6 Taking account of this and the implementation of any remediation action which may subsequently be required, the construction phase of the proposed development is likely to have a localised, **Minor Adverse** effect on construction and ground workers.

**Human Health (Future End Users)**

11.7.7 The future end users are operational phase receptors, therefore are not considered in assessing construction effects.

**Water Environment (Groundwater and Surface Resources)**

11.7.8 It is considered highly unlikely that groundwater from the site is presently causing significant pollution of Loch Lomond or the River Leven as a result of the marginal concentrations of contamination encountered. Contaminants have been recorded at relatively low concentrations and are likely to exhibit relatively low mobility through soil pores. The rate of flux of shallow perched groundwater from below the site into Loch Lomond is likely to be low. Furthermore, if contaminated groundwater from the site did reach the river or loch, the effect of dilution from such a large body of water would be highly effective.

11.7.9 Without prior knowledge of the site or appropriate planning and mitigation measures, it is possible that construction techniques (notably piling, deep excavations and ground improvement) could mobilise contaminants and/or introduce pathways via which contaminants could migrate to the groundwater. Safe piling techniques will be utilised and controlled through specific risk assessments and methods statements, to prevent the mobilisation of any contamination during these construction activities.

11.7.10 In the absence of good construction site management there is potential for the accidental release of stored fuels and chemicals directly affecting localised areas of the surface water and groundwater quality during the construction of the proposed development. These pollution incidents could occur due to incorrect storage/transport/use of materials such as fuels, oils and chemicals. With containment in place, any accidents may result in the containment system being affected and a greater risk of measures being defeated. The presence of hardstanding/buildings and surface planting should reduce the infiltration (and therefore migration) of contamination into groundwater and surface resources. The construction phase will be undertaken in general accordance with SEPA’s Guidance for Pollution Prevention (GPPs).

11.7.11 During the construction phase, there is potential for increased run-off of suspended soils entering Loch Lomond and other nearby water bodies. To reduce the impact, settlement tanks/beds can be utilised.

11.7.12 Embedded mitigation includes the development, approval and implementation of a CEMP, which will include procedures for the storage of fuel and chemicals and for managing unexpected contamination.

11.7.13 Taking account of this, potential release of contaminants or pollutants is likely to have a **Minor Adverse** effect on the water environment.

**Built Environment**

11.7.14 The built environment onsite is an operational phase receptor and therefore is not considered in assessing construction impacts.

**Ecological Designations**

11.7.15 Ecological receptors are not likely to be affected by ground contamination and instability. Ecology is considered in **Chapter 6 – Ecology and Woodland**.

**Operational Phase**

**Human Health (Construction/Ground Workers)**

11.7.16 Construction and ground workers are construction phase receptors and therefore are not considered in assessing operational effects.
Human Health (Future End Users)

11.7.17 There are no potential human health pollutant linkages anticipated to remain during the operational phase (completed development) or during maintenance as it is assumed that the design of the proposed development will embed suitable mitigation for the protection of human health.

11.7.18 Overall, once the embedded mitigation has been implemented, the operational phase of the proposed development is likely to have a Negligible Beneficial effect on the future end users.

Water Environment (Groundwater and Surface Resources)

11.7.19 There are no potential water environment pollutant linkages anticipated to remain during the operational phase (completed development) or during maintenance as it is assumed that the design of the proposed development will embed suitable mitigation for the protection of groundwater and surface water resources.

11.7.20 Overall, once the embedded mitigation has been implemented, the operational phase of the proposed development is likely to have a localised, Negligible Beneficial effect on the water environment.

Built Environment

11.7.21 Methane and carbon dioxide were detected at concentrations slightly above the trigger concentrations (refer to Section 11.4) to the east of Pier Road and north of Ben Lomond Way, which will be designated as CS2. Depending on the nature of structures and / or buildings proposed in these areas, it will be necessary to consider the need to incorporate ground gas protection measures.

11.7.22 Overall, once the embedded mitigation has been implemented, the operational phase of the proposed development is likely to have a Negligible Adverse effect on the building environment.

Ecological Designations

11.7.23 The likely disturbance effects on ecological receptors are considered within Chapter 6 – Ecology and Woodland.

11.8 Further Mitigation and Enhancement

11.8.1 As a general rule, further mitigation measures are proposed where a significant effect is predicted to occur. As no significant effects are predicated, no additional mitigation is expected. Embedded mitigation measures, which have been incorporated within the design of the proposed development or are standard practice measures, are summarised in Section 11.6 above, and in Chapter 3 – The Proposed Development.

11.9 Residual Effects

11.9.1 Taking account of all proposed mitigation and enhancement measures, the likely residual effects from the construction and operation of the proposed development on ground conditions are identified in Table 11.7 and Table 11.8 below.
### Table 11.7 Summary of likely residual effects related to ground conditions (Construction Phase)

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Residual Effect Significance</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Health (site workers)</td>
<td>Minor Adverse</td>
<td>The risks to human health will become more quantifiable following further advancement of the site layout and designed uses, plus additional phases of investigation and assessment. The Contractor will take cognisance of the investigation works undertaken and prepare Risk Assessment Method Statements (RAMS) as appropriate. The CEMP will document the procedures to minimise and manage spillages from chemical storage, dust generation, dewatering discharges and run-off. The possibility exists for unexpected conditions to be encountered during groundworks, therefore a watching brief should be maintained. Work should be halted in the event of unexpected, potentially detrimental conditions pending further assessment.</td>
</tr>
<tr>
<td>Human Health (future site users, workers, guests, customers and maintenance workers)</td>
<td>Not Applicable</td>
<td>Not a construction phase receptor.</td>
</tr>
<tr>
<td>Water Environment</td>
<td>Minor Adverse</td>
<td>Construction phase will occur following some further site investigation and, if necessary, site remediation. As such, contaminants in the subsurface will have been quantified and deemed to pose an acceptably low risk or remediated. Piling and/or other ground improvements/deep excavations will only take place following a specific risk assessment and method statement. Techniques to minimise the creation of pathways/mobilisation of contaminants will be employed. The CEMP will document the procedures to minimise and manage spillages from chemical storage, dust generation, dewatering discharges and run-off.</td>
</tr>
<tr>
<td>Built Environment</td>
<td>Not Applicable</td>
<td>Not a construction phase receptor.</td>
</tr>
<tr>
<td>Ecological Systems</td>
<td>Not Applicable</td>
<td>No designated ecological sites have been identified in the vicinity, mitigation measures for the site Ecology are addressed in other Chapters of this EIA.</td>
</tr>
</tbody>
</table>
Table 11.8 Summary of likely residual effects related to ground conditions (Operational Phase)

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Residual Effect Significance</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Health (site workers)</td>
<td>Not Applicable</td>
<td>Not an operational phase receptor.</td>
</tr>
<tr>
<td>Human Health (future site users, workers, guests, customers and maintenance workers)</td>
<td>Negligible Beneficial</td>
<td>The risks to human health have quantified and are considered moderate to low. However, through avoiding developing some of these areas and following further phases of investigation and assessment, the site will be remediated. This should aim to render it suitable for the proposed end use without entailing unacceptable risks to human health of future users. The remedial measures will be validated prior to construction. Based on the above, the risks to future site users will have been reduced.</td>
</tr>
<tr>
<td>Water Environment</td>
<td>Negligible Beneficial</td>
<td>The risks to controlled water have been quantified by detailed site investigation and are considered to be very low. The development will incorporate hard standing across the majority of the site, with run off and precipitation managed. As such, the potential for migration of mobile contamination through the subsurface will be reduced.</td>
</tr>
<tr>
<td>Built Environment</td>
<td>Negligible Adverse</td>
<td>Buildings and infrastructure will be constructed following further site investigation and, if necessary, remediation. Buildings will be constructed with mitigation measures to reduce the potential impact of adverse ground conditions (for example appropriate ground treatment / foundation design, gas protection measures, sulphate resistant cement etc.).</td>
</tr>
</tbody>
</table>
11.10 Summary

11.10.1 The proposed development comprises two separate areas known as Woodbank House and West Riverside. In terms of baseline conditions, Woodbank House is currently occupied by fields used for grazing, vegetated with woodland and various ruined buildings formerly associated with a hotel and West Riverside is occupied by woodland and walking paths and two INEOS oil pipelines run through the site from west to east.

11.10.2 A recent preliminary ground investigation has identified ground conditions across the undeveloped areas site which comprise natural drift deposits with alluvium (soft, sandy, clayey peat) primarily to the east of Pier Road, glaciofluvial deposits (sands and gravels with silt and clay) and till (gravelly sandy clay), and Made ground of > 1m thick, almost entirely restricted to the eastern part of the site where former railway lines ran. Soils containing elevated contaminants were primarily restricted to the area to the east of Pier Road and to the North of Ben Lomond Way. The primary contaminant of concern was lead, however, elevated arsenic and hexavalent chromium were also encountered.

11.10.3 More detailed assessment of the potential risks posed by contaminants will be undertaken after any PPiP is granted for the proposed development, in order to inform its detailed design. In particular, additional area specific site investigation will be designed and undertaken to quantify the potential sources of contamination and to inform the design of specific mitigation measures to be adopted. This investigation will also be required to target areas of potential instability associated with former Made Ground deposits and in areas of Peat.

11.10.4 Specific mitigation measures will then be devised, secured through the approval of matters specified in conditions (AMC) applications to the local planning authority and thereafter implemented. In particular, it is likely that some remediation measures will be required in the West Riverbank area. Ground gas monitoring indicates that the area east of Pier Road and north of Ben Lomond Way will be classified as CS2 as a result of concentrations of carbon dioxide and methane in exceedance of trigger values. The design of buildings in these areas may therefore require the inclusion of gas protection measures. The results for the remainder of the site indicate that it would be classified as CS1 and no gas protection measures will be required. The results of the analysis of groundwater samples have confirmed the presence of slightly elevated concentrations of heavy metals in some of the boreholes. The concentrations encountered are considered unlikely to have significant negative impact on the sensitive receptors (Loch Lomond and River Leven), however, a further round of borehole sampling and the collection of surface water samples with testing is recommended to strengthen this conclusion.

11.10.5 The conclusions of this assessment are that the construction and operation of the proposed development would result in a likely significant effects in respect of site workers (human health) during the construction phase of the development. However, this effect is localised, and will be mitigated through site specific Risk Assessment and Method Statements together with a ‘procedure and watching brief’ for any unexpected conditions that should be encountered during groundworks. In this case, work should be halted in the event of unexpected, potentially detrimental conditions pending further assessment.

11.10.6 Taking account of all proposed embedded and further mitigation measures, no likely significant residual effects are predicted on ground conditions from the proposed development.
11.11 Glossary and reference

### References

- British Geological Survey (2018) Geology of Britain viewer, available at: [www.bgs.ac.uk/data/boreholescans/home.html](http://www.bgs.ac.uk/data/boreholescans/home.html) [last accessed 04/04/18].

### Glossary

11.11.1 A summary of terms and abbreviations used in this ES chapter is provided below.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquifer</td>
<td>Underground body of permeable rock which can contain or transmit groundwater.</td>
</tr>
<tr>
<td>Asbestos containing materials</td>
<td>Materials which have the potential to contain asbestos.</td>
</tr>
<tr>
<td>Phase I Ground Condition Assessment Report</td>
<td>Report assessing ground conditions based on publicly available information, current and historical mapping, previously undertaken reports and a site visit. Includes an assessment of potential contamination sources, a Conceptual Site Model which sets out the relationships between Sources, Pathways and Receptors and a preliminary risk assessment.</td>
</tr>
<tr>
<td>Phase II Ground Investigation Report</td>
<td>Report which provides factual records from ground investigations and includes the ground conditions encountered during ground investigation works.</td>
</tr>
<tr>
<td>Contamination</td>
<td>Anthropogenic or naturally occurring chemicals in soils or water that have the potential to cause harm to sensitive receptors.</td>
</tr>
<tr>
<td>Construction Environmental Management Plan</td>
<td>Outlines how a construction project will avoid, minimise or mitigate effects on the environment of the construction activities and operations.</td>
</tr>
<tr>
<td>Land instability</td>
<td>Ground conditions that could cause damage to proposed buildings and infrastructure due to compressibility, cavity collapse or slope instability.</td>
</tr>
<tr>
<td>Conceptual model</td>
<td>Representation of a site and the surrounding area. Typically comprises a mixture of pictures, diagrams and text and it is used to provide a vision of the site. It is important that your conceptual model is updated regularly during your site investigation.</td>
</tr>
<tr>
<td>Contaminated land</td>
<td>Environmental Protection Act Part IIA: Any land which appears to the local authority in whose area it is situated to be in such condition, by reason of substances in, on or under land that: (i) Significant harm is being caused or there is significant possibility of such harm being caused; or (ii) Pollution of controlled waters is being, or is likely to be, caused.</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Water held underground in the soil or in pores and crevices in rock.</td>
</tr>
<tr>
<td>Groundwater abstraction</td>
<td>The process of taking groundwater from any source, either temporarily or permanently and using it for industrial or domestic.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hazard/source</td>
<td>Substance or situation that has the potential to cause harm or pollution.</td>
</tr>
<tr>
<td>High Sulphate (or Sulfate)</td>
<td>High concentrations of sulphate can react with concrete and adversely affect its form (expansion, extensive cracking, loss of bond between cement paste and aggregate).</td>
</tr>
<tr>
<td>Hydrology</td>
<td>Study and practical implications of the movement, distribution and quality of freshwater in the environment.</td>
</tr>
<tr>
<td>Hydrogeology</td>
<td>Branch of geology concerned with water occurring underground or on the surface of the earth.</td>
</tr>
<tr>
<td>Made Ground</td>
<td>Land or ground created by filling in a low area with waste or other fill material.</td>
</tr>
<tr>
<td>Pathway</td>
<td>A means by which the hazard moves along / generates exposure.</td>
</tr>
<tr>
<td>Potential sources of contamination</td>
<td>Sources which have the potential to cause ground and/or water contamination.</td>
</tr>
<tr>
<td>Potential geological hazards</td>
<td>Geological features related to ground stability (i.e. unstable slopes, ground compression and cavities (natural and anthropogenic) which have the potential to become a hazard.</td>
</tr>
<tr>
<td>Remediation</td>
<td>Action taken to reverse or stop environmental damage.</td>
</tr>
<tr>
<td>Receptor</td>
<td>An entity that is vulnerable to the potential adverse effects of the hazard.</td>
</tr>
<tr>
<td>Risk assessment</td>
<td>A systematic process of evaluating the potential risks that may be involved in a projected activity or undertaking.</td>
</tr>
<tr>
<td>River Basin Management Plan</td>
<td>Establish the current status of waters within the catchments across Scotland.</td>
</tr>
<tr>
<td>Source Protection Zones</td>
<td>Are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.</td>
</tr>
<tr>
<td>Surface water</td>
<td>Water that collects on the surface of the ground (e.g. rivers or lakes).</td>
</tr>
<tr>
<td>Water Framework Directive</td>
<td>European legislation in place to protect groundwater.</td>
</tr>
</tbody>
</table>
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Containing Materials</td>
<td>ACMs</td>
</tr>
<tr>
<td>British Geological Survey</td>
<td>BGS</td>
</tr>
<tr>
<td>Construction Environmental Management Plan</td>
<td>CEMP</td>
</tr>
<tr>
<td>Contaminated Land Report</td>
<td>CLR</td>
</tr>
<tr>
<td>Contaminants of Concern</td>
<td>CoC</td>
</tr>
<tr>
<td>Department for Environment, Food and Rural Affairs</td>
<td>Defra</td>
</tr>
<tr>
<td>Environment Agency</td>
<td>EA</td>
</tr>
<tr>
<td>Multi-Agency Geographic Information for the Countryside</td>
<td>MAGIC</td>
</tr>
<tr>
<td>National Planning Policy Framework</td>
<td>NPPF</td>
</tr>
<tr>
<td>Peter Brett Associates LLP</td>
<td>PBA</td>
</tr>
<tr>
<td>Potential Geological Hazard</td>
<td>PGHs</td>
</tr>
<tr>
<td>Potential Sources of Contamination</td>
<td>PSC</td>
</tr>
<tr>
<td>Risk Assessments and Method Statements</td>
<td>RAMS</td>
</tr>
<tr>
<td>River Basin Management Plan</td>
<td>RBMP</td>
</tr>
<tr>
<td>Site Specific Assessment Criteria</td>
<td>SSAC</td>
</tr>
<tr>
<td>Site of Special Scientific Interest</td>
<td>SSSI</td>
</tr>
<tr>
<td>Scottish Environment Protection Agency</td>
<td>SEPA</td>
</tr>
<tr>
<td>Source Protection Zones</td>
<td>SPZs</td>
</tr>
<tr>
<td>Water Framework Directive</td>
<td>WFD</td>
</tr>
</tbody>
</table>