

## 21 Summary of Mitigation, Monitoring and Residual Effects

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### 21.1 Introduction

This chapter provides a summary of the proposed mitigation and monitoring measures as well as an overview of the residual likely significant effects associated with the proposed scheme (as identified in **Chapters 7 – 20**).

### 21.2 Summary of Mitigation and Monitoring Measures

A number of safeguards and management measures have been identified in order to mitigate negative environmental effects during construction and operation as described in detail in **Chapters 7 – 20**.

It should be noted that chapter this generally excludes any inherent measures and elements that have been incorporated in the design as these design measures have been documented as part of **Chapter 4, Description of the Proposed Scheme**. Further, any environmental management measures during construction that have been identified and are associated with specific construction activities and methodologies are documented in **Chapter 5 Construction Strategy** and in the *Construction Environmental Management Plan* which is available in **Appendix 5.1**. Therefore, the design approach, design measures and construction methodologies as described in **Chapters 4 and 5** and in **Appendix 5.1** shall be implemented as part of the overall mitigation and monitoring strategy.

Monitoring has been identified to occur after consent is granted in order to provide assurance that aspects of the proposed scheme are functioning as intended (and thus not generating significant effects) as described in detail in **Chapters 7 – 20**. Where appropriate, remedial actions have also been identified.

The mitigation and monitoring measures that have been established to minimise any likely significant negative effects arising from the proposed scheme on the surrounding environment are summarised below in **Sections 21.2.1- 21.2.13**.

#### 21.2.1 Traffic and Transport

##### Construction

A Construction Traffic Management Plan (CTMP), covering all stages of construction, shall be prepared by the Contractor and included in the Construction Environmental Management Plan. The construction traffic management information detailed below shall be included in the CTMP and have been transposed into the CEMP presented in **Appendix 5.1** of the EIAR.

The appointed contractor(s) for the proposed scheme will develop individual CTMPs, based on the overall CTMP in the CEMP, for its/their contract packages and construction methodologies. These individual CTMPs will also take into account other potential construction works in the area as well including the proposed Arklow Wastewater Treatment Plant construction project. The individual CTMPs will contain detailed plans to ensure pedestrians, cyclists and motorised vehicles can pass through the working areas safely and that measures are in place which ensure traffic operates in as an efficient manner possible.

The individual CTMPs will include a detailed consultation strategy to deal with third-party queries from both residents and retail/commercial operators. This strategy will assign ownership of communications (names, companies etc), methods of communication (e.g. website, twitter accounts etc), manage contact details for communications etc). This strategy will form part of the overall Communications Management Plan which is presented in the CEMP in **Appendix 5.1**. The individual CTMPs will require agreement with both Wicklow County Council and An Garda Síochána. Should a contractor be appointed for the Wastewater Treatment Plant (WwTP), its traffic management plans will need to be coordinated between the parties.

The individual CTMPs will be prepared for all Work Packages specifying the designated access routes, to the various site compounds and works areas as described in **Chapter 7** of the EIAR and shall include measures to ensure safe passage of pedestrians, any required laydown areas, temporary diversion routes including location of signage, etc.

As part of the CTMP, the contractor(s) is required to implement the following measures in relation to traffic management throughout the course of the construction works:

- The site compounds (SC) and river access (RA) points will be located as described in **Chapter 5 Construction Strategy** of the EIAR;
- The contractor will designate specific access routes to be used to access the working areas (WA), site compounds and river access points as described in **Chapters 5 and 7** of the EIAR;
- Night-time works will be carried out for some elements of the construction works as described in **Chapters 5 and 7** of the EIAR;
- Haul Roads in the river channel will be used for WP2, rather than from street level, as described in **Chapter 5** of the EIAR;
- The contractor will coordinate with the WwTP project with regards construction programme and subsequent traffic movements;
- All trucks entering and exiting the site will be covered with a tarpaulin;
- Adequate parking will be provided to avoid queuing at the site entrances and prevent disruption to neighbouring businesses. Construction vehicles will not be allowed to park on the public road either outside a working area or site compound or on any of the approach roads leading to it;

- All trucks entering a working area or site compound will be restricted to suitable speed limits and will be directed to the relevant waiting areas by the Site Manager;
- Trucks required to wait in a working area or site compound will switch off engines to avoid unnecessary fuel usage and noise;
- All trucks exiting a working area or site compound will be required to pass through a wheel wash. A lance will be provided to clean down the bodies and sides of the truck prior to leaving a working area or site compound;
- Roads outside a working area or site compound will be visually inspected on a daily basis and power swept and washed as and when required;
- All site staff including truck drivers will be required to abide by the normal rules of the road;
- Construction safety signs and signals will be installed at identified locations in accordance with the CTMP to coordinate the direction and flow of traffic at working areas. The contractor will be responsible for the maintenance of all construction safety signs and signals.
- Traffic routes affected by the works will be communicated to Arklow residents by the Contractor in advance of commencement of works as per Communications Management Plan described in the CEMP.
- As part of the individual CTMPs, a Mobility Management Plan (Workplace Travel Plans) will be prepared by each contractor to ensure construction workforce access to the working areas and site compounds by sustainable travel modes is encouraged. The Mobility Management Plan (Workplace Travel Plans) shall follow the guidance set out by the National Transport Authority (<https://www.nationaltransport.ie/wp-content/uploads/2013/04/Workplace-Travel-Plans-A-Guide-for-Implementers.pdf>)

For each construction stage the individual CTMPs will be continually monitored to ensure the impact on traffic capacity and operations on the surrounding street network are minimised and additional mitigation measures will be introduced as required to assist traffic safety or the flow of traffic. The monitoring regime will include all road users including pedestrians, cyclists, and public transport users, as well as car parking provision.

### 21.2.1.1 Communications Management Plan

The individual CTMPs will be included in the Communications Management Plan and will be used to deal with third-party queries from both residents and retail/commercial operators. The individual CTMPs will require agreement with both Wicklow County Council and An Garda Síochána. Should a contractor be appointed for the Wastewater Treatment Plant, its traffic management plans will need to be coordinated between the parties.

The contractor(s) will appoint a single point of contact to facilitate the communication of the various traffic management plans.

### 21.2.1.2 Mobility Management Plan

As part of the individual CTMPs, a Mobility Management Plan will be prepared by each contractor to ensure construction workforce access to the working areas and site compounds by sustainable travel modes is encouraged. The following measures will be included within the Mobility Management Plan:

- Arrangements for the provision of showers/ changing rooms for construction staff;
- Arrangements for the provision of cycle parking for staff; and
- The promotion of car sharing among staff, including van pooling to travel between the different working areas.

### 21.2.1.3 Individual Traffic Management Plans

The individual CTMPs will be prepared for all Work Packages specifying the designated hauls, as described above, to the various site compounds and works areas, measures to ensure safe passage of pedestrians, any required laydown areas, temporary diversion routes including location of signage, etc.

The individual CTMPs will be prepared in consultation with the contractor for the Wastewater Treatment Plant. Construction traffic associated with the Flood Relief project will have to follow any required diversion route needed to deliver the Wastewater Treatment Plant, with particular consideration of possible restrictions on the following streets:

- Arklow Bridge (night-time closures)
- South Quay (diversion of traffic onto Harbour Road and South Green)
- North Quay (particularly the proposed diversion of traffic via Seaview Avenue)
- Marina (diversion of traffic onto Mill Road)

For any works to Arklow Bridge that require lane closures the following measures are suggested:

- No scheduled lane closures should commence before 21:00 and all lane closures should be lifted by 07:00 in the morning.
- The length of lane closure and the required working area needs to be kept as small as possible to reduce the length of the shuttle system.

### Operation

No further mitigation measures have been proposed with respect to effects from the operation of the proposed scheme as the insignificant projected increase in traffic will have no impact on prevailing traffic conditions. The mitigation measures which are intrinsic to the construction approach, as discussed above and which are relevant for the maintenance activities will be implemented.

No monitoring has been proposed with respect to effects arising from the operation of the proposed scheme as the projected increase in traffic will have no impact on prevailing traffic conditions.

## 21.2.2 Air Quality and Odour

### Construction

The following measures will be implemented to reduce dust impacts during the construction phase. All of the measures set out below have been incorporated into the Construction and Environmental Management Plan (CEMP) in **Appendix 5.1** of the EIAR for dust management.

#### *Mitigation for all sites*

- A Communications Management Plan that includes community engagement will be developed and implemented before work commences on site.
- The name and contact details of person(s) accountable for air quality and dust issues will be displayed on the site boundary. This may be the environment manager/engineer or the site manager.
- The contact information of the contractor's head or regional office will be displayed on the site boundary.

#### *Site Management*

- All dust and air quality incidents and complaints will be recorded, the causes identified, appropriate measures will be taken to reduce emissions in a timely manner, and the measures taken will be recorded.
- Regular liaison meetings will be held with the contractors on other significant construction sites within 500 m of the site boundary (i.e. potentially Arklow WwTP), to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. Off-site transport/ deliveries, which might be using the same strategic road network routes, will be co-ordinated.

#### *Monitoring*

- Daily on-site and off-site inspection will be undertaken where receptors (including roads) are nearby to monitor dust. Inspection findings will be recorded, and the log will be available to Wicklow County Council when asked. The frequency of inspections will be increased during site activities with a high potential to produce dust are being carried out.
- Dust deposition monitoring locations will be chosen in consultation with the Wicklow County Council.

#### *Preparing and maintaining the site*

- The site layout will be planned so that machinery and dust causing activities are located away from receptors, as far as is possible.
- A c. 2.4m hoarding of density of at least 7kg/m<sup>2</sup> will be provided around construction works and site compounds.

- Runoff of water or mud from site will be prevented.
- Site fencing, barriers and scaffolding will be kept clean using wet methods.
- Materials that have a potential to produce dust will be removed from site as soon as possible, unless being re-used on site. If they are being re-used on-site they will be covered as described below.
- Stockpiles will be covered, seeded or fenced to prevent wind whipping.

#### *Operating vehicle/machinery*

- All vehicles will switch off engines when stationary - no vehicles will idle on site.
- Mains electricity or battery powered equipment will be used where practicable and the use of petrol or diesel powered generators will be avoided where practicable.
- A maximum-speed-limit of 25 km/hr on surfaced and 15 km/hr on unsurfaced haul roads and work areas will be imposed and signposted.

#### *Operations*

- Only cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems, will be used.
- An adequate water supply will be provided on the site for effective dust/particulate matter suppression/mitigation.
- Enclosed chutes and conveyors and covered skips will be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment will be minimised and fine water sprays will be used on such equipment wherever appropriate.
- Equipment will be readily available on site to clean any dry spillages, and spillages will be cleaned up as soon as reasonably practicable after the event using wet cleaning methods.
- Hessian, mulches or trackifiers will be used where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- The cover will be removed in small areas during work and all areas will not be uncovered at once
- Sand and other aggregates will be stored in banded areas and will not be allowed to dry out, unless this is required for a particular process, in which case appropriate additional control measures will be put in place.
- Water-assisted dust sweeper(s) will be used on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Vehicles entering and leaving sites will be covered to prevent escape of materials during transport.

- On-site haul routes will be inspected for integrity and any necessary repairs to the surface will be undertaken as soon as reasonably practicable.
- A wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable) will be provided.
- An adequate area of hard surfaced road will be provided between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates will be located at least 10 m from receptors where possible.

Monthly dust monitoring using dust deposition gauges will be undertaken at the construction site/compound boundaries and nearest sensitive receptors to the works during the construction phase of the proposed development. The TA Luft dust deposition limit values of 350 mg/m<sup>2</sup>/day will be applied as a 30-day average.

The following mitigation measures to reduce odour impacts are proposed during the dredging and storage of material.

- Vehicles leaving sites will be covered to prevent escape of materials and odour during transport.
- Onsite odour monitoring will be undertaken as follows:
  - Two odour specialists will be present onsite to monitor odour during the excavation of estuarine material from the river (also referred to as dredge material in some sections of the EIAR) during work packages (WP) 1-3, upstream and downstream, and across the channel profile.
  - The odour assessors will alternate so that not one assessor will be continually onsite so that odour fatigue is avoided.

During WP1 and WP3, the following procedures will be observed:

- Estuarine excavated material that is too odorous for archaeological examination at SC1 will be transported directly offsite, as SC5 and SC6 may not be operational during the initial stages of these work packages.

During WP2 the following procedures will be observed:

- Hazardous and non-hazardous contaminated material that is deemed too odorous (odour rating of 3 or more, see **Table 8.23** in **Chapter 8** of the EIAR) for stockpiling at SC2 will be transported directly offsite.
- Inert material that is too odorous for SC1 will be transported to SC6.
- Material with a slightly elevated chloride concentration that is too odorous for SC1 will be transported to SC5.

The assessment of odour will follow the guidance as set out in the EPA's Odour Emissions Guidance Note AG9, as outlined in Table 8.22 and Table 8.23 in Chapter 8 of the EIAR.

## Operation

As discussed in Section 8.5.3 of the EIAR, the impact on nearby receptors is likely to be slight, negative and temporary during debris trap clearing and maintenance dredging. During maintenance work, vehicles leaving sites will be covered to prevent escape of materials and odour during transport.

As no significant adverse effects are predicted to occur during the operation of the proposed development, no monitoring measures are required.

### 21.2.3 Noise and Vibration

#### Construction

##### *Management Plans and Method Statements*

The information provided in the following sections will form part of the Construction Environmental Management Plan (CEMP), as outlined in **Appendix 5.1** of the EIAR. This included of the Construction Environmental Management Plan, detailed construction methodologies, phasing and equipment and, mitigation measures. The appointed Contractor(s) will revise these sections, as appropriate, prior to the commencement of works.

The CEMP will outline how the appointed Contractor(s) will comply with the noise criteria set out in this section and will deal specifically with construction activities in a strategic manner to remove or reduce significant noise and vibration impacts associated with the construction of the proposed development. The CEMP will detail the provision and installation of localised acoustic screens, the best practice noise measures that the appointed Contractor(s) will be required to adhere to for construction activities and the noise and vibration monitoring programme that the appointed Contractor(s) will be required to undertake during the construction works.

In addition, the appointed Contractor(s) will prepare detailed method statements addressing the likely noise and vibration levels that will be generated as a result of the construction activities once the specific details of the proposed plant items and construction methodologies are known.

Where considered necessary, structural surveys will be undertaken at sensitive receptors in close proximity to the works to establish their condition and tolerance for vibration impacts.

##### *General*

The following section describes measures to minimise the potential for noise and vibration disturbance to the surrounding area which will be employed by the contractor to ensure the construction noise and vibration criteria outlined in and are not exceeded.



The Contractor will take specific noise abatement measures and comply with the recommendations of BS 5228-1 and 2:2009+A1:2014. *Code of practice for noise and vibration control on construction and open sites. Noise and vibration and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.*

The following specific measures will be implemented during the construction phase:

- A site representative shall be appointed to be responsible for matters relating to noise and vibration;
- Construction of temporary infrastructure (e.g. haul roads) will be with materials that minimise noise and vibration and design of haul roads will minimise reversing;
- Internal haul roads shall be well maintained;
- No unnecessary revving of engines, equipment should be switched off when not required;
- Rubber linings shall be used in chutes and dumpers etc. to reduce noise;
- Drop heights of materials shall be minimised;
- Water pumps and generators will be located away from sensitive receivers and will be enclosed;
- Selection of equipment, construction methods and programming with the objective of reducing noise and vibration where possible. Only equipment, including road vehicles, conforming to relevant national or international standards, directives and recommendations on noise and vibration emissions, will be used;
- Plant and vehicles shall be started sequentially rather than all together;
- Selecting electrically powered plant that is quieter than diesel or petrol-driven plant, if interchangeable;
- Fitting suitable anti-vibration mountings where practicable, to rotating and/or impacting equipment;
- Using noise-control equipment such as jackets, shrouds, hoods, and doors, and ensuring they are closed;
- Locate plant, as far as is reasonably practicable, away from receptors or as close as possible to noise barriers or hoardings where these are located between the source and receptor;
- Regular and effective maintenance by trained personnel shall be carried out to reduce noise and/or vibration from plant and machinery;
- Ensuring that all plant is maintained regularly to comply with relevant national or international standards and operation of plant and equipment that minimises noise emissions;
- Ensuring that plant is shut down when not in use;

- Ensuring that air lines are maintained and checked regularly to prevent leaks;
- Designing all audible warning systems and alarms to minimise noise. Non-audible warning systems can be used in preference, i.e. cab-mounted CCTV or the use of banksmen. If required, ensure that audible warning systems are switched to the minimum setting required by the Health and Safety Authority and where practicable use ‘white noise’ reversing alarms in place of the usual ‘siren’ style reversing alert
- A c. 2.4m hoarding of density of at least 7kg/m<sup>2</sup> shall be provided around construction works.
- Handling all materials, particularly steelwork, in a manner that minimises noise. For example, storing materials as far as possible away from sensitive receptors and using resilient mats around steel handling areas;
- During construction, regular inspections will be undertaken to ensure that the noise and vibration minimising methods, plant and mitigation identified in the specimen design stage are adopted on site and are working effectively. If applicable, it is proposed that construction method inspections be integrated into any health and safety or quality surveillance regime;
- Typically, site activities shall be limited to 7am – 7pm, Monday to Friday; and 8am – 2pm, Saturday. As outlined in **Chapter 9 Noise and Vibration** of the EIAR, night-time works may be required if Option 3 (micro piling from bridge) for WP2 is selected. It is anticipated that there will be other times due to exceptional circumstances that construction works will be necessary outside of the standard hours. This will be agreed in advance with Wicklow County Council and communicated to local residents with an estimation of the timing and duration
- A Communications Management Plan shall be prepared to provide for effective community liaison to help ensure the smooth running of construction activities and to address any issues that may arise.

#### *Night-time Works (WPI)*

As outlined in **Chapter 9 Noise and Vibration** of the EIAR, night-time works (for Bridge Grouting and Option 3 (micro piling from bridge)) are predicted to generate moderate, short term, negative impacts. As these impacts are during night-time more targeted mitigation measures are specified;

- A c. 2.4m hoarding of density of at least 7kg/m<sup>2</sup> shall be provided around construction works both at deck level and river level. This hoarding will be placed as close to the noise sources as possible and moved continuously as the works progress along the bridge.
- Using noise-control equipment such as jackets and shrouds around any pumps and engine, including excavators, at river level.

Effective implementation of these measures will reduce the impact during the quietest periods of night-time works from; moderate, short term, negative impacts to slight, short term, negative impacts.

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#### *Drainage Works (WP4)*

As outlined in **Section 9.5.1.6**, the impact ratings associated with these works at less than 10m are moderate, negative and temporary. As such, more targeted mitigation measures are specified.

- A c. 2.4m hoarding of density of at least 7kg/m<sup>2</sup> shall be provided around construction works. This hoarding will be placed as close to the noise sources as possible and moved continuously as the works progress along.

Effective implementation of these measures will reduce the from; moderate, short term, negative impacts to slight, short term, negative impacts.

#### *Monitoring*

The Main Contractor(s) shall be required to carry out continuous noise and vibration monitoring at the three closest sensitive receptors to the proposed development works during the construction phase. Environmental noise monitoring will be undertaken only by suitably trained and experienced staff.

Vibration monitoring will be undertaken on the piers of the bridge and measured against the TII guidance limits in **Table 9.7** of **Chapter 9** of the EIAR. In the unlikely event of vibration limits being exceeded, works will cease, and alternative construction methods will be used.

Noise and vibration levels will be compared to the limit values outlined in **Table 9.4** and **Table 9.7** of **Chapter 9** of the EIAR, respectively.

### **Operation**

No mitigation measures are proposed during the operational or maintenance phase of the proposed development.

No monitoring is proposed during the operational or maintenance phase of the proposed development.

## **21.2.4 Biodiversity**

### **Construction**

The biological receptors identified for the provision of mitigation measures to ensure likely significant effects do not occur during the construction and operational phases of the proposed FRS development are listed in **Table 10.15** in **Chapter 10 Biodiversity** of the EIAR, alongside the associated Impact Mechanisms and a brief description of potential effects.

It should be noted that the mitigation measures not specifically designed to address potential effect in the specific species groups listed in **Table 10.15** but will be implemented as a matter of course during the Arklow FRS and also to

address potential effects associated with the Arklow WwTP project are also listed in the sections below.

### *Habitats*

The site preparation of the compounds will be as described in Section 5.4.3 of **Chapter 5 Construction Activities** of the EIAR.

For the duration of the construction period when SC1 is in use and during WP5, Arklow Marsh pNHA and the river area will be protected from runoff by the installation of a temporary low bund constructed of impermeable material. It will be situated along the western boundary and will redirect surface water run off towards siltation traps before discharge.

Dredge material will be managed in an area situated on the south eastern portion of SC1 behind Circle K filling station. A low bund will be installed around the area on top of geotextile membrane and hardcore material. A localised stormwater drainage system will be constructed within the area to convey runoff to a sedimentation collection system. The collection system will be periodically monitored during material testing. Run-off collected will be directed to a siltation trap before discharge. These measures will ensure that the likelihood of impacts is low. SC1 will be planted as described below in the following section on completion of the permanent works and as shown in the landscape design and public realm drawings in **Appendix 4.2** of the EIAR.

The site preparation of SC2 will be as described in Section 5.4.3 of **Chapter 5 Construction Activities** of the EIAR. In summary, a suitable geotextile membrane will be placed over the existing ground and suitable hardcore material will be placed over the geotextile to form a trafficable surface. A low bund, comprising precast concrete traffic barriers or similar wrapped in an impermeable membrane, will be constructed around the perimeter of the site to retain the temporary surface and the dredged material. The temporary surface will be graded to allow any water from dredged material to flow to a shallow drain around the perimeter by which it will flow to a sump from where it will be pumped to a storage tank for collection by tanker for disposal. SC2 will be returned to its current condition by levelling and reseeded the grass area.

At SC3, suitable geotextile membrane will be placed over areas of soft ground and hardcore material will be placed over the site to form a trafficable surface. Surface water run-off at SC3, which is likely to contain sediment due to the movement of construction traffic through it to the river and to WP5 works, will be prevented from running into the adjacent Avoca River by the construction of a low bund along the river edge and the diversion of any runoff to a sump from where it can be discharged through a sedimentation tank. SC3 will be grassed as per the Drawing No 304 (**Appendix 4.2**).

At SC5 and SC6, a low bund, comprising precast concrete traffic barriers or similar, will be constructed around the perimeter of the site to retain the dredged material.

At SC6, a 5m buffer zone will be created between the working area and the *Equisetum Moorei* habitat through the construction of a low bund (approximately

0.5m high) and 1.5m high fence. The bund will prevent any runoff from the dredged material flowing into the habitat of the *Equisetum Moorei*.

SC5 and SC6 6 will be reinstated to their existing condition on completion of the permanent works.

The northern bank, upstream of Arklow Bridge, will be extended into the river channel for a length of c.75m and up to 12.0m in width. The realigned river bank will be formed using rip rap at the river bed level and inert dredge material and earth will be placed on top to match the levels of the existing river bank. The extended river bank will be landscaped with mixed native woodland trees. This area is referred to as Area No 1 on Dwg 304 (**Appendix 4.2** of the EIAR) and will consist of: *Alnus glutinosa* (Black Alder), *Salix aurita*, *Salix cinerea oleifolia*, *Salix caprea*, *Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals and birds (Refer to (refer to Drawing Nos. 1003, 1013 and 1016 in **Appendix 4.1** of the EIAR).

### *Planting*

Tree/landscape planting will be undertaken to address the loss of terrestrial habitat to accommodate the FRS. The landscape design/public realm drawings (**Appendix 4.2**) provide details on the planting types and species proposed in addition to the identification of trees to be retained within the planning boundary. Further details are also provided in **Chapter 11 Landscape and Visual**. The following details on the drawings are of particular relevance for habitat mitigation:

- **Dwg 300:** River Walk (South Bank) Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Betula pendula* (Birch), *Crataegus laevigata* 'Paul's Scarlet' (Hawthorn), *Pinus sylvestris* (Scot's Pine), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- **Dwgs 301, 302 and 303:** South Quay to Arklow Harbour (South Bank) - Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Ulmus* "Lobei" (Elm), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- The landscaping at Arklow Marsh (adjacent to the proposed embankment) and the extension to the north river bank upstream of Arklow Bridge will provide some opportunities for habitat creation and mitigation of direct and indirect effects on biodiversity due to the loss of in-river vegetated islands and loss of habitat in the marsh pNHA. Further details are provided below.
- Native Woodland planting (Area No 1) is proposed along the new extended north bank of the river (Refer to **Dwg 304**) and will consist of: *Alnus glutinosa*

(Black Alder), *Salix aurita*, *Salix cinerea oleifolia*, *Salix caprea*, *Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).

- Irish Native species rich grass and wildflower mixture is proposed along the river side of the new floodwall on north bank (SC3) and along the length of the embankment (Refer to **Dwg 304, 305** and **306**).
- Native Woodland planting (Area No 2) is proposed along the east side of the embankment and in SC1 (Refer to **Dwg 304, 305** and **306**) and will consist of: *Alnus glutinosa* (Black Alder), *Salix spp.* (Willow) and *Betula pubescens* (Downy Birch), *Prunus spinosa* (Blackthorn), *Crataegus monogyna* (Hawthorn) and *Viburnum opulus* (Guelder Rose).
- Upon completion of the works, in-stream (aquatic) vegetation will be allowed to re-colonise naturally, however, this will be monitored and if deemed necessary additional planting of suitable aquatic plant species will be undertaken.
- Upon completion of the works any other grassland areas disturbed during the construction works, will be re-sown with an appropriate species-rich grass and/or native wildflower seed mix option (refer to planting detail above and landscape drawings in **Appendix 4.1**).

#### *Tree Removal*

The plans for tree removal for construction of the proposed scheme are shown in the landscape drawings in **Appendix 4.2** of the EIAR. Mitigation measures for bats during tree felling are described below under the Bats section.

#### *Bryophytes*

It is considered that the bridge does not support a bryophyte flora of conservation interest. However, it does support moderate to high bryophyte cover in some areas (e.g. the top concrete).

Bryophyte cover on the bridge be retained where possible. Where bryophytes do need to be removed from a surface, the surface shall be replaced with similar material and the use of very smooth surfaces will be avoided where possible. Urban and aquatic bryophytes tend to quickly re-colonise surfaces as long as there is some texture to the surface.

#### *Non-native Invasive Species*

Invasive alien plant species have been identified and documented within the proposed works areas. Construction (and potentially operational maintenance works) could potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations. The invasive plant species which have been identified in the proposed works areas include Butterfly-bush (*Buddleia davidii*), and Rhododendron (*Rhododendron ponticum*).

Outside of the planning boundary along the Avoca River, Himalayan balsam (*Impatiens glandulifera*) and Japanese Knotweed (*Fallopia japonica*) have both been previously recorded.

A strategy to manage and prevent the spread of the invasive plants is outlined in the Invasive Alien Plant Species Management Plan of the CEMP in **Appendix 5.1** of the EIAR. The management plan includes specific mitigation measures regarding the eradication and biosecurity procedures to protect the habitats and fauna. The management plan also details the careful application of herbicide to treat these species.

Prior to commencement, all works areas, site compounds and access routes will be re-surveyed for non-native plant species to ensure that new infestations have not been established. If found, appropriate mitigation strategies will need to be devised and implemented. Monitoring for re-emergence of non-native invasive species will be undertaken by the Contractor's Ecologist or a suitably qualified Ecologist.

#### *Use of Herbicide at Arklow Bridge*

Specific mitigation measures regarding the careful application of herbicide to remove woody vegetation in the bridge during WP1 are presented the CORA report in **Appendix 11.8** of **Chapter 11** *Archaeological, Architectural and Cultural Heritage* of the EIAR.

#### *Diadromous Fish Species*

It shall be a requirement of the Contract that the CEMP will provide the minimum requirements that the Contractor will be required to implement.

The Contractor shall submit a detailed programme of work to the client and to Inland Fisheries Ireland showing the order of procedure and the method by which it is proposed to carry out the authorised works, together with a timetable for completion of such work. These works shall comply with the IFI guidance.

The seasonal restrictions contained in the guidance has been modified in consultation with Inland Fisheries Ireland, in respect of the proposed scheme, to take account of the presence and seasonal passage on migration of Habitats Directive Annex II listed fish species Atlantic Salmon, River Lamprey, and potentially also Sea Lamprey in the Avoca River and Estuary. All instream works including the installation and removal of sheet piling or geotextile wrapped gabions required to provide barriers between works areas /temporary haul roads and aquatic habitats will be carried out during the five months of May to September inclusive.

The following mitigation measures will apply:

- Four weeks' notice shall be given in writing to the Employer's Representative and Inland Fisheries Ireland before the authorised works commence;
- To further reduce any potential effect of the dredging on migrating fish species *e.g.* Lamprey and Salmon, dredging shall not be carried out between October to April.

- A suitably qualified Environmental Clerk of Works shall be appointed to oversee and monitor all measures taken to protect the aquatic environment;
- The Contractor shall pay all statutory fees associated with the works;
- The Contractor shall be responsible for maintaining flows in the river at all times. The Contractor will be permitted to construct temporary haul roads in the river however the flow must be maintained throughout this period to enable free passage of fish. The details of the all temporary works in and immediately adjoining the Avoca River shall be subject to approval by the Employer's Representative and by Inland Fisheries Ireland;
- The Contractor shall take all practicable measures to prevent the deposition of silt or other material in, and the pollution or damage to the Avoca River;
- Any construction equipment and vehicle which in the opinion of the Employer's Representative presents a risk of affecting the Avoca River shall be removed from Site;
- Instream machine works shall be minimised, and any machines working in the watercourse must be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels;
- Instream earthworks must be executed so as to minimise the suspension of solids. Construction works, especially ones involving the pouring of concrete, must be conducted in the dry;
- De-watering of any in-stream or marine sheet piled areas will be via a screened water intake pipe, to avoid injury or mortality to any fish that may be present;
- Search for and safe removal to safe waters of any fish trapped in enclosed works areas in the aquatic environment will be carried out by suitably qualified and licenced personnel, using methodologies to be agreed with Inland Fisheries Ireland (e.g. electrofishing);
- Discharge from the dewatering process will be passed to a suitably sized settlement tank or a propriety silt removal system, before discharge to the Avoca River or the local sewer network. Back-up equipment will be required to be maintained ready for use at all works sites.;
- In order to minimise the volumes of water required to be removed from contained works areas in which in-situ cement works and/or excavation are required, works areas will be covered overnight and other periods when works are not in progress, in order to minimise infiltration of rainfall into works areas;
- To minimise the risk of spills and/or leaks, standard good practice will be followed with regard to pollution prevention as part of the appointed Contractor's detailed CEMP(s);
- All in-situ cement works will be monitored by the appointed contractor's Environmental Manager to ensure that spill prevention and remediation measures are in place, to minimise the risk and extent of spills and to rapidly deploy clean up equipment;



- Machinery maintenance work, re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles / equipment will take place in designated bunded areas within the temporary construction compounds. All waste oil, empty oil containers and other hazardous wastes will be disposed of in compliance with the requirements of the Waste Management Acts 1996, as amended. All of the construction machinery operating near any watercourse will be systematically checked in order to avoid leaks of oils, hydraulic fluids and fuels; and
- Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

Every effort will be made to prevent pollution incidents associated with spills during the construction of the proposed scheme. The risk of oil/fuel spillages and leaks will exist on the site and any such incidents will require an emergency response procedure. The following steps provide the procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill/leak and alert people working in the vicinity;
- Notify the Environmental Manager immediately giving information on the location, type and extent of the spill/leak so that they can take appropriate action;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the spill/leak using the spill control materials, track mats or other material as required. Do not spread or flush away the spill/leak;
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats;
- If possible, clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
- The Environmental Manager shall inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring; and
- The Environmental Manager will notify the appropriate stakeholders such as WCC, National Parks and Wildlife Service, Department of Communications, Climate Action and Environment and Department of Housing, Planning and Local Government and/or the EPA.

With regard to potential risk of run off from dredge material stock-piled at the site compounds for archaeological investigation, all excavated soil including dredge spoil materials will be stockpiled using an appropriate method to minimise the impacts of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. This included the use of suitable silt traps to capture any excess silt in the run-off.

Any surplus suitable material excavated that is not required elsewhere for the proposed development, shall be used for other projects where possible, subject to appropriate approvals/notifications or removed from site for disposal in a suitable authorised facility.

### *Resident Bird Species*

The proposed planting strategy will mitigate the loss of terrestrial habitat for birds, in particular in the Arklow town marsh pNHA (Refer to Refer to **Dwg 304, 305 and 306 in Appendix 4.2** of the EIAR).

The proposed river dredging will remove the in-river gravel banks. It is proposed to replace the habitat provided by these sandbanks through the use of three manmade roosting platforms (floating islands) (8m x 5m each). These will be low platforms with timber edges and finished in a layer of gravel and will provide roosting areas for birds at all tides. These will be anchored to the bed of the river, upstream of Arklow Bridge, with concrete anchor blocks and chains.

The proposed installation of these three roosting platforms in the river channel upstream of Arklow Bridge will provide for some mitigation of direct and indirect effects on birds due to the loss of in-river gravel beds due to the river dredging works (Refer to Dwg 304 and 301 in **Appendix 4.2** of the EIAR, refer also to **Dwg 1003 in Appendix 4.1** of the EIAR). Refer also to Figures 12.5.2 and 12.7.2 photomontages (which show the proposed roosting platforms) of **Appendix 12.1** of the EIAR.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals and birds (Refer to Dwg 1003, 1013 and 1016 in **Appendix 4.1** of the EIAR).

In addition, new riparian habitat will be created along the northern bank to mitigate direct and indirect effects of the river dredging works on birds.

All vegetation clearance works and site preparatory works will be conducted outside of the bird nesting season (March to August inclusive). If this is not possible, a breeding bird survey will be undertaken by a suitably qualified ecologist in advance of the works to ensure that there will be no impacts on nesting birds. If nests are found, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged.

In addition, nesting boxes for the Red-listed species Grey wagtail and for Pied wagtail will be provided in alternate arches of Arklow Bridge, on ledges above high water level in the existing concrete structure on the upstream side of the bridge, in order to provide nesting habitat for these species that feed extensively along the river channel. The nest boxes designs will be suitable for use beneath bridges. The Contractor will be required to consult with a suitably qualified ecologist in the design and installation of the nest boxes.

### *Bat Species*

A Derogation Licence for the Arklow FRS has been issued. Refer to the specific mitigation measures detailed in **Appendix 10.3** of this EIAR and as detailed below.

As all bat species recorded within the planning boundary of the proposed scheme are protected under Annex IV of the Habitats Directive, the works to be carried out to Arklow Bridge will require a derogation from the National Parks and Wildlife Service of the Department of Culture, Heritage and the Gaeltacht to allow works that will create a risk to bats and will remove existing roosting options. The measures proposed will meet the requirements for protecting the bats availing of Arklow Bridge.

The measures proposed specifically for the two southernmost arches of Arklow Bridge derogation include:

- Examination of the bridge prior to works by the licensed bat specialist for evidence of bats.
- Exclusion of bats if necessary with one-way valves devised by the bat specialist.
- Capture of any bats that are still present prior to works and retention until the risk of injury or re-entry to the bridge has been removed.

To ensure that there is no possibility of direct disruption to a summer roost during repairs, the following is proposed:

- The roost on the southern side of the bridge will be excluded during the autumn / early winter season (2021) before construction commences during summer 2022 under the bridge.
- 3 bat boxes will be temporarily installed on the northern side of the bridge as an interim measure to mitigate for the loss of roost (in the period summer/autumn 2021).
- Once the works on the southern side are complete, bat boxes shall be installed on the southern side.
- If bats are using the interim bat boxes on the northern side, these will need to be excluded before works are carried out on the northern side.
- Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat boxes must be attached to the bridge in an unlit area above high-water mark. Refer to Drawing No 1005 of Appendix 4.1 of the EIAR which shows the location of the bat tubes on the bridge,
- Provision of additional bat boxes in the flood walls. It is proposed that 6 Schwegler 1FR bat tubes will be incorporated into the flood walls on the southern section of the project (Refer to Drawing Nos 1036, 1039, 1040 and 1041 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the walls,).

13 x 1FR bat tubes shall be incorporated in the concrete piers of the proposed debris trap which will be located across the river channel upstream of Arklow Bridge (Refer to Drawing Nos 1021 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the concrete piers).

- This shall be achieved in two phases: Works to southern half of the bridge in the first year requires that only the three bat tubes are installed in the first year of works. Works to the northern half of the bridge in the third year requires that the bat boxes for the southern section of the bridge are installed for the third year of repair work. Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat tubes must be attached to the bridge in an unlit area above high-water mark. All remaining shall be installed once all works liable to disturb or damage them has been completed.

*Examination of all mature trees, and bat boxes along River Walk with roost potential prior to removal*

All mature trees along River Walk along the South Quay and in the works area for work package 5 in Arklow Marsh shall be examined for bats prior to felling. This may be achieved through a bat detector assessment if undertaken in the active season (prior to November and after March) or alternatively may require supervision at the time of felling. Any mature trees will require survey prior to felling.

*Lighting at the site compounds*

External lighting will be installed around the contractor's compounds for the safety and security of staff on the site. The lighting will be kept close to the buildings and only operate when there is movement. The lighting will be designed in consultation with the licenced bat expert, using emerging lighting technologies and having regard to best practice.

Mitigation for bats includes the following additional lighting considerations:

- Floodlights will be LED, as these have glass lenses which can be used to direct the light to the working area and reduce light spillage;
- Floodlights for working areas will make use of multiple lights to produce a more uniform light output and to lower the individual output from a single source – these will however still be quite high output;
- The site lighting incorporates the use of street lights to light the roadway around the building. The street lights will be selected to minimize upward lighting spill, hoods, louvres, shields or cowls will be fitted on the lights to reduce light spillage, and will incorporate the use of presence detection;
- Perimeter fence lighting will also incorporate presence detection, and will be off by default until motion is detected;
- Low level (~ 1m high) bollard lighting is being used in selected areas (refer to architect's landscape plans);

- Lights will be of low intensity. It is better to use several low intensity lights than one strong light spilling light across the entire area. The source of light will be Light Emitting Diodes (LEDs) as this is a narrow beam highly directional highly energy efficient light source. They shall allow for a light level of 3 lux at ground level. This low lighting is thus easier to control both the direction but also the actual light level because it is so close to the target area (if using bollard lighting);
- Narrow spectrum lighting shall be used with a low UV component. Glass also helps reduce the UV component emitted by lights.

In the event of security lighting being required, it is recommended that infra-red lighting and infra-red cameras are employed to record anti-social activity to assist in crime solving and prevention. This will not raise the visible light levels that will affect mammals and birds to a much greater extent.

### *Otter*

Whilst otter holts were not identified during the walkover surveys within the planning boundary, otter have been observed using the river in the Arklow area and it is likely that the vegetation at the banks of the Arklow Town pNHA may provide suitable habitat for the species. Although, habitat surveys undertaken at the pNHA also did not report evidence of otter runs or slides in the area. Therefore, prior to commencement of works, a survey to identify the presence of any new Otter resting places/holts within 200m of the works areas will be undertaken. If found and likely to be damaged/disturbed by the works, a derogation licence shall be applied for from NPWS. This licence will include otter resting places and holts identified during the pre-construction survey. Any further mitigation measures required by the derogation licence shall be implemented.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals such as otter.

To minimise the potential for otters becoming trapped, all excavations will be left open for the minimum possible time, and not over-night. If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape.

Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.

All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by an Otter, or any other large mammals.

### *Badger*

In order to mitigate construction impacts on Badger potentially commuting and foraging in the works area the following mitigation measures will be implemented:

- To minimise the potential for Badgers becoming trapped, all excavations will be left open for the minimum possible time, and not over-night.

If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape. Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.

- All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by Badger, or any other large mammals.
- Prior to commencement, all works areas, site compounds and access routes will be re-surveyed to ensure that new Badger setts have not been established. If found, appropriate mitigation strategies will need to be devised and implemented. This can be coupled with the survey for otter activity.

### **Pollution Prevention Measures**

In addition to the measures proposed in **Chapter 14** Water of the EIAR, the following measures will be implemented to ensure that the water quality of the Avoca River is not adversely affected through pollution incidents and silt mobilisation. This mitigation will include:

- Appropriate sediment control measures will be employed.
- Any chemical, fuel and oil stores will be located on an impervious base within a secured bund with a storage capacity 110% of the stored volume.
- Biodegradable oils and fuels will be used where possible.
- Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 10m).
- Emergency spill kits will be available on site and staff trained in their use.
- Operators will check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages will be reported immediately.
- Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded.
- Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage.
- All washing out of grout pumps will be carried out in designated areas away from the river, such as in the lined compound area. At no point will grout pumps be washed out at the worksite.

The procedure for excavating the hazardous and non-hazardous contaminated dredge material along the south bank upstream of Arklow Bridge will be as described in **Chapter 5** *Construction Activities*. This will include

- the installation of a temporary bund made up of impermeable material, approximately 500mm above high tide level will be constructed around the location.

- Dewatering, following removal of any fish for visibility of the riverbed and to enable the contractor to carry out the excavation process, will be required.
- The excavated contaminated dredge material will be transferred onto watertight trucks for transfer to SC2 for archaeological testing and monitoring or transported directly offsite.
- This material will be disposed offsite to an approved hazardous licenced facility or a non-hazardous licenced landfill as appropriate.

### *Enhancement Work*

As detailed in the relevant sections above, planting is proposed as part of the outlined mitigation measures to replace lost habitat. The landscape design/public realm drawings (**Appendix 4.2** of this EIAR) provide details on the planting types and species proposed in addition to the identification of trees to be retained within the planning boundary.

As part of this mitigation, it is intended that the tree and grassland planting will be embraced by the Council and OPW to fulfil not only the mitigation function for habitat loss for bat and other species, but to uphold our national Policy for ‘No Net Loss’ as outlined in the National Biodiversity Action Plan 2017 -2021.

Action 1.1.3 of the National Biodiversity Action Plan 2017 -2021 states that ‘All Public Authorities and private sector bodies will move towards no net loss of biodiversity through strategies, planning, mitigation measures, appropriate offsetting and/or investment in Blue-Green infrastructure. This will help ensure not only the ‘no net loss’ principal is upheld but that some enhancement effort is made to reverse the direction of biodiversity loss and carbon deficit overall.

To this effect, the planting plan has been designed with this in mind. One area of obvious biodiversity opportunity is the north bank and marsh area. Specific grass and native tree planting has been proposed in this location. In addition, some of the grassed areas will be planted with a pollinator-friendly rich seed mixes. These areas can be adapted to be populated by a suitably biodiverse plant assemblage using a pollinator-friendly rich seed mix, adapted to the soil type present. The Irish based company Design by Nature can supply and provide advice on various wildflower mixes suitable for a range of pollinators local to the area.

The creation of pollinator friendly grasslands will be considered wherever possible throughout the scheme and wherever areas require re-seeding, a bee-friendly grass /wildflower seed mix will be used.

The landscaping at Arklow Marsh (adjacent to the proposed embankment) and the extension to the north river bank upstream of Arklow Bridge will provide some opportunities for habitat creation and mitigation of direct and indirect effects on biodiversity due to the loss of in-river vegetated islands and loss of habitat in the marsh.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals such as otter.

The proposed installation of three roosting platforms in the river channel upstream of Arklow Bridge will provide for some mitigation of direct and indirect effects on birds due to the loss of in-river gravel beds due to the river dredging works.

Bat boxes and bat tubes will be permanently installed in the arches of Arklow Bridge (upstream side), in the flood walls and in the RC columns of the debris trap to mitigate direct and indirect effects on bats due to the construction works at Arklow Bridge.

### *Monitoring*

Prior to any work commencing, both aquatic and terrestrial biological surveys shall be carried out throughout the area including at the six site compounds to establish a pre-construction baseline.

Aquatic surveys shall include sampling the river bed upstream and downstream of the bridge and at the site of the proposed gravel and branch trap to record numbers of species and numbers of individuals of invertebrates and also to document sediment chemistry conditions including granulometry, organic carbon and depth of the REDOX layer.

Terrestrial surveys shall be designed to re-map plant communities and habitats throughout the work area. A survey of Site Compound 6 shall be undertaken in the summer months of 2021 to determine if *E.x moorei* is present or not.

All areas of the banks of the Avoca River that will be affected by the proposed plan shall be walked over to ensure that no otter holts or badger setts are present.

A monthly survey of water quality at a number of locations in the Avoca River, the Avoca Estuary and the Arklow Marsh shall be established if possible, a year in advance of construction to establish levels of suspended solids, dissolved oxygen and salinity. Additionally, direct recording current meters and tide gauges shall be deployed upstream and downstream of the Arklow Bridge to record flow directions and velocities and pressure.

Monitoring for re-emergence of non-native invasive species will be undertaken by the Contractor's Ecologist or a suitably qualified Ecologist. Any new sighting will be reported the Employer's Representative during the construction phase and Wicklow County Council post construction and recommendations for treatment and eradication proposed.

Acceptance of boxes/tubes by bats can be less predictable than those for birds. Therefore, it is essential to monitor their use over a period of time. Those boxes/tubes that remain unused within two years of date of erection will be re-located. Bat boxes will also be checked in wintertime for general wear and tear and to remove droppings from the previous summer use.

Bat boxes will be inspected, by bat licence holder (bat specialist), at least once within 12 months of erection at appropriate season in order to monitor bat use and the species using boxes. This will be followed up with another inspection within 24 months of setting up. At this point, any bat boxes not used will be relocated to a new site. Any bats found will be counted and identified to species level. All data collected will be submitted to Bat Conservation Ireland.



Additionally, the bat box scheme will be registered with Bat Conservation Ireland and monitoring to be undertaken annually for 2 years.

### *Maintenance*

The scope and nature of maintenance works for the proposed scheme is detailed in Chapter 4, however at this time the exact locations and frequency of maintenance activities are unknown.

Maintenance works (such as the gravel and debris traps and occasional channel dredging) which require in-stream works will follow the same mitigation measures for the protection of biodiversity and water quality set out above for construction stage.

Tree removal shall be limited to the removal of fallen trees or overhanging branches, unless identified as dead or diseased trees that are a risk of blockage. Tree roots shall not be removed from the river-bank.

If a derogation licence is required for maintenance works, e.g. otter and bats, this shall be acquired prior to the decision to progress with the maintenance activities. Any further mitigation measures required by the derogation licence shall also be implemented during the channel maintenance activities.

## **21.2.5 Archaeology, Architecture and Cultural Heritage**

### **Construction**

#### *Project Archaeologist*

Due to the complex nature of the work packages proposed for this scheme, a Project Archaeologist shall be appointed to provide a consistent, independent approach to the portfolio of individual work packages and to manage a centralised framework for the development of all archaeological, architectural and cultural heritage considerations.

Subject to obtaining planning approval it is expected that the scheme will be delivered through the following five Work Packages (WP) over a number of years (Refer to **Chapter 5 Construction Strategy** for details):

- WP 1: Lowering the floor of Arklow Bridge including Bridge underpinning, Bridge remedial works and scour protection works.
- WP 2: Channel dredging upstream and downstream of Arklow Bridge.
- WP 3: Construction of debris and gravel traps with associated maintenance access ramp.
- WP 4: Construction of flood defence walls along River Walk, South Quay and around the dock on the south (right) bank, upstream and downstream of Arklow Bridge including the adjacent stormwater drainage.
- WP 5: Construction of flood defence earth embankment and wall on north (left) bank along eastern side of Arklow Town marsh.

In addition to making consistent recommendations and approving mitigation strategies and ensuring open lines of communication, the Project Archaeologist can provide archaeological training to operators and provide an advisory role, offering practical advice on specific archaeological issues encountered in the field while promoting awareness of cultural heritage assets.

Given that works will be taking place on a number of different fronts, Project Archaeologist will be employed to develop a framework for the archaeological works (including advance archaeological contracts) while securing an approach that will allow the development and construction to proceed in an effective and efficient manner.

The Project Archaeologist will be engaged prior to the construction phase of the project to organise and devise the advance archaeological contracts and oversee the implementation of these contracts and the appointment of the contracting archaeologists.

The appointment of a Project Archaeologist will ensure the smooth running of this scheme while providing a control on budgets. In addition to this the list of services and expertise, a Project Archaeologist can bring to the FRS includes:

- Design of tender specifications and archaeological contracts.
- Programme the sequencing of archaeological investigations in line with the proposed work packages.
- Oversee the conduct of the archaeological excavations.
- Review the archaeological and conservation requirements as the works proceed. Implement any required changes to approved methodologies as works and investigations proceed.
- Certify all archaeological costs.
- Oversee all post excavation works and certify all post excavation costs.
- Review the content of reports prepared by the Archaeological Contractor and ensure that the archaeological contractor provides all appropriate reports on their work in accordance with the contract conditions.
- Provide ongoing consultation with the heritage authorities.
- Ensure all work is proceeding according to archaeological licensing or consent requirements.
- Identify the requirement for additional testing or excavation works.
- Where possible implement time and cost-effective strategies that are in line with best practice guidelines and statutory authority approvals.
- Provide advice to Wicklow County Council and the OPW.
- Provide advice to the design and construction team including the contractor.

### *Archaeological Management Measures*

The programme and schedule for the site preparation/ construction phase and each of the Work Packages (WP1-WP5) will be made available to the Project Archaeologist and the contracted archaeologists, with up to date information on where and when the various elements and ground disturbances and dredging will take place.

It is essential for the client and all contractors to provide sufficient notice to the Project Archaeologist and contracting archaeologist/s in advance of the site preparation/ construction works commencing. This will allow for prompt arrival on site to undertake additional surveys and to monitor ground disturbances. As often happens, intervals may occur during the construction phase. In this case, it is also necessary to inform the archaeologist/s as to when ground disturbance works will recommence.

In the event of archaeological features or material being uncovered during the construction phase, it is crucial that any machine work cease in the immediate area to allow the archaeologist/s to inspect any such material.

Once the presence of archaeologically significant material is established this will be reported to the statutory authorities by the Project Archaeologist. If it is not possible for the construction works to avoid the material, full excavation will be recommended. The extent and duration of excavation will be advised by the Project Archaeologist and is a matter for discussion between the client and the licensing authorities.

It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This will be complimented in the event of a full excavation. The team will include provision for an archaeological dive team, in the event that discoveries are made underwater during dredging.

Site offices and facilities will be provided on or near those sites where excavation is required.

Secure wet and dry storage for artefacts recovered during the course of the monitoring and related work will be provided on or near those sites where excavation is required.

Adequate funds to cover excavation, post-excavation analysis, and any testing or conservation work required will be made available.

Machinery traffic during construction must be restricted as to avoid any of the selected sites and their environs.

Spoil management will take place and no spoil will be dumped on any of the selected sites or their environs.

### *Mitigation Prior to Construction – Advance Contracts*

Subject to obtaining planning approval and due to programme and seasonal constraints, a series of advance archaeological works will be conducted throughout the scheme. Such work will be licensed by the Department of Housing, Local Government and Heritage.

These advance surveys, investigations and excavations will take place at the following area of the scheme and will take the form of:

*Embankment at Ferrybank, relocation of utilities*

Prior to any work taking place at Ferrybank and Marsh townlands, the electricity overhead lines and any underground buried cables within the proposed works area will have to be diverted. All work will be archaeologically monitored and undertaken in accordance to the EirGrid Guidelines (2015).

The removal of these constraints will allow further archaeological test excavation to take place within an agreed wayleave.

*Arklow Bridge*

As Arklow Bridge is a protected structure and it falls within the zone of archaeological potential for the historic town of Arklow, works taking place to this structure will be carried out with the advice of a conservation engineer in order to preserve the functionality, character and special interest of the structure and ensure its stability through compatible and durable interventions.

Further site investigation works will be undertaken as a standalone contract at Arklow Bridge. These will be procured during the detailed design stage of the project and will progress on a phased basis over the first year of the programme. This work will include a detailed assessment of the existing masonry bridge structure to fully define the extent of specialist masonry repair works required. This assessment will confirm the presence of previous grouting regimes and will allow an appropriate grouting regime to be established where grouting is required to the piers. Further site investigations will assist in fully understanding the existing foundation detail including the presence and condition of starling piles and the ground conditions under the piers. Site investigation works will be in the attendance of an underwater archaeologist who will systematically record all historic detail and fabric that may be revealed as a result of the works. This work will be carried in accordance with best practice procedure under a detailed methodology agreed with the heritage authorities.

The former historic stone apron consisting of large interlocking stones identified in Appendix 11.8, CORA 2021 and Appendix 11.6 and 11.7 ADCO, Brady 2021(Plate 58) will be fully recorded by a geodetic survey, photographic record and written description. The stone apron that exists between the bridge arches lies underneath a concrete skim in places (this will be lifted where possible to aid recording) and comprises substantial stones bedded in a mortar mix. Investigation to date has concluded that the inclusion of plastic and modern material indicates that the apron is not original to the construction of the bridge and not of a significant age. The stone apron is still part of the historic makeup of the structure and as such it will be fully recorded.

As a conservation measure after recording has taken place, the stones that form the stone apron under Arch No. 1 will be labelled, removed (where possible recovered intact and largely undamaged), stored securely, and reinstated to their original form after the works have been carried out (section 11.5.4.5 of Chapter 11 of the EIAR). No work will take place at Arch. No. 19 where the scour apron will be retained insitu.

All temporary access work in the river, required to facilitate the test investigation work at the bridge will be carried out in agreement with the heritage authorities. Any disturbance of riverbed materials will be monitored by a licensed archaeologist. Design proposals associated with stabilizing the bridge ahead of excavation of the river gravels will be reviewed by an archaeologist and a conservation engineer to ensure that the proposals are in line with best practice from a conservation perspective.

### Underwater Archaeology

An experienced and competent licence-eligible maritime archaeologist will be appointed directly by the client to advise the project team on archaeological and cultural heritage matters during construction; to acquire any consents required to conduct the work, and to supervise and direct the archaeological measures associated with the scheme, including to undertake the advance works archaeological mitigations, and to undertake the construction phase archaeological monitoring.

The consents required include an archaeological Excavation Licence. Licence applications are made by the licence-eligible archaeologist on behalf of the client to the National Monuments Service at the Department of Housing, Local Government and Heritage. In addition to a detailed method statement, the applications must include a letter from the client on client letterhead that confirms the availability of adequate funding. There is a prescribed format for the letter that must be followed. Other consents include a Dive Survey licence to conduct archaeological dive work, and a Detection Device licence to use a metal-detector.

All management issues associated with carrying out an underwater archaeological survey assessment are detailed in **Appendix 11.6, Section 5.3**, ADCO 2020).

It is proposed that investigation of the timbers F11–F17 (**Appendix 11.6**, ADCO 2020, **Figure 9**) and associated riverbed will take place as an advance works underwater archaeological contract, to safeguard against the discovery of a composite archaeological feature/s immediately upstream of Arklow Bridge in a location that will be impacted directly by the proposed new upstream bridge apron. Such work will be an underwater archaeological investigation where a team of archaeological divers employing Surface Supplied Diving Equipment will excavate a trench/es across the riverbed at the location of the known timbers to assess the presence of archaeological material in the riverbed. Should the investigation observe that the timbers are associated with a larger feature/s, that feature/s will need to be archaeologically resolved in advance of construction works. Sufficient lead time will be allowed for in the project schedule to permit the investigation and resolution of features in this location.

It is proposed that investigation of the boat wreck feature F19 (**Appendix 11.6, ADCO 2020, Figure 9**) and associated riverbed will take place as an advance works underwater archaeological contract, to safeguard against the discovery of a larger boat wreck feature at this location downstream of Arklow Bridge and close to the former Tyrell's boatyard slipway. Such work will be an underwater archaeological investigation where a team of archaeological divers employing Surface Supplied Diving Equipment will excavate around the piece of boat wreck to expose it more fully and to ascertain whether there are related elements buried or close by. The investigation should result in the proper recording of the vessel remains on the riverbed, and its removal from the riverbed for storage in secure waterlogged conditions that meet the requirements of the National Museum of Ireland. Such will permit the fuller study of the vessel remains and will inform decisions as to its permanent storage context.

An archaeological examination of the quay side will take place in advance of the River Access works (RA1-8) to establish the presence of original quay material. This will take the form of a visual inspection, stripping any existing render and recording all historic material (photographic and written description). All locations of historic fabric will be mapped and surveyed.

#### Debris and Gravel Trap Investigation

It is proposed that investigation of the riverbed at the gravel trap will take place as an advance works underwater archaeological contract, to safeguard against the discovery of archaeological material at the location of the former harbour of Arklow town (**Appendix 11.6, ADCO 2020, Figure 8**). Such work will be an underwater archaeological investigation where a team of archaeological divers employing Surface Supplied Diving Equipment will excavate a trench across the riverbed at the location of the silt trap to assess the presence of archaeological material in the riverbed. Construction of the gravel trap will involve the excavation of a trench 12m wide by up to 1.0m deep in the river bed for the full width of the river channel upstream of the debris trap

In tandem with the underwater archaeological investigation, the working area shown in **Figure 4.17 of Chapter 4, Description of the Proposed Scheme** (Drawing Nos. 1003, 1021-1023) will be subject to archaeological investigation as part of the advance archaeological contract.

#### South Quay Wall and Mooring Posts

In order for remedial and repair work to take place at the existing quay wall that will be exposed at the 'pinch point' – a conservation engineer will be required to advise on the design and conservation specifications at the detailed design stage of the project.

At the 'pinch point' and to the north of it- where the quay wall is already exposed (approx. 74m, South Green – The Green, South Quay), this section of wall will be subject to advance contract works in the form of a rectified photographic record and detailed recording.

Where the sheet pile wall transitions from going in-front of the old quay wall to behind the old quay wall (i.e. where it becomes exposed)- a small section of the old quay wall will be removed either site- at these transition locations. The contractor will seek to reuse this stone in repairing the old quay wall in other locations/capping. The transition section/face of the old quay wall will therefore become exposed on either side. Detailed recording by photographic record will occur in the advance works contract and full archaeological recording will take place during the dismantling of these sections of the wall.

Where reconstruction works are required to tie into the existing wall at these transition areas, salvaged stone can be reused as required.

Similarly, where there are any other interventions with the old quay wall throughout the scheme, these interventions will also be monitored and recorded by the Project Archaeologist as part of the construction programme.

The Mooring posts will be removed locally by archaeological excavation and will be accommodated within a 2m area between the old quay wall and the new quay wall, thereby retaining their authenticity along the quay side (**Drawing No. 6545-302 Landscape Design and Public Realm Appendix 4.2**). Once removed these stones will be labelled, stored at a secure location until reinstatement can take place.

### Compounds

Advance archaeological test excavation has taken place (Appendix 11.9) Red Arc Ltd 2021) at SC1, SC3, SC6. There are no anticipated excavation works at compounds SC2, SC4 and SC5 and therefore no archaeological mitigation works are required.

In Marsh townland, the extant remains of Ferrybank House that were revealed through test excavation (**Appendix 11.9**) will be excavated as an archaeological exercise in advance of works taking place for SC3.

The extant remains of a linear stone-faced water channel and stone arch at SC3 that were previously identified by archaeological testing (Appendix 11.9) will be excavated, surveyed and recorded as an advance contract .

At SC6 no further archaeological work is anticipated at the site preparation as no archaeological features were revealed as a result of archaeological testing.

### *Mitigation During Construction Phases Work Packages 1-5*

#### Compounds

Advance archaeological test excavation has taken place (Red Arc Ltd 2021) at SC1, SC3, SC6. There are no anticipated excavation works at compounds SC2, SC4 and SC5 and therefore no archaeological mitigation works are required.

At SC1 given the archaeological findings, it is proposed to topsoil strip the area proposed for the compound as an archaeological exercise. Should archaeological features be detected these shall be excavated by a team of archaeologists.

Excavation at SC1 will take place once the utilities have been diverted. The archaeological works will take place in advance of any construction works associated with WP5 and site preparations for SC1. Within the construction programme, a suitable amount of time will be allowed for the archaeological excavation to take place.

At SC3 once the excavation of Ferrybank House has taken place and the stone faced water channel has been recorded monitoring will take place during the relocation of utilities in this area. All clearance and site preparation works will be archaeologically monitored. Should any archaeological finds, deposits or material be encountered all work will cease in that given area and be archaeologically investigated.

The proposed relocation of utility services (powerlines) at Arklow Marsh (Drawing No. 1062) will be archaeologically monitored in advance of the archaeological investigations taking place. If it is decided to bury the powercables, this activity (trenching) will be monitored as well.

At SC6 no further archaeological work is anticipated at the site preparation as no archaeological features were revealed as a result of archaeological testing.

### Embankment

The proposed embankment on the north bank (**Drawing Nos 1031 to 1035** inclusive, **Appendix 4.1**) will be constructed running north-south on the eastern side of Arklow Marsh. It will be approximately 545m long. A permanent 4.0m wide track will be constructed along the dry side of the embankment to facilitate future inspection and maintenance.

Once the utilities have been diverted, archaeological inspection and test excavation of the line of the embankment and associated permanent works will take place. The archaeological works will take place in advance of any construction works associated with WP5. Within the construction programme, a suitable amount of time will be allowed for the archaeological investigation to take place.

A programme of archaeological test trenching will be designed in order to establish the presence or absence, as well as the nature and extent, of any archaeological deposits that may be present within the landtake of the Proposed Permanent Works.

Should any subsurface archaeological stratigraphy, material, feature be encountered, an appropriate ameliorative strategy approved by the authorities will be implemented. This will entail licensed archaeological excavation in full or part of any identified archaeological remains (preservation by record) or preservation insitu (by design).

### Archaeological Monitoring

Archaeological monitoring licensed by the Department of Housing, Local Government and Heritage is required of all ground and riverbed disturbances associated with the Proposed Scheme.



This will be designed in order to establish the presence or absence, as well as the nature and extent, of any archaeological deposits, features or sites that may be present within the land take of the Proposed Scheme, where ground investigation and earth-moving works are taking place. This includes but is not exclusive to:

- All works taking place within the designated ZAP for the historic town of Wicklow (WI040-029).
- All proposed works to the bridge will be archaeologically monitored and surveyed by an archaeologist experienced in recording bridge structures and working in a riverine environment.
- Archaeological monitoring of works associated with extending downward all the bridge piers, and the excavation and removal of the bridge's stone apron and underlying river shingle will be carried out. This work will be conducted with the aim of recording all bridge elements that are exposed in the course of such works and before such elements may be removed by such works. The monitoring will record fully such features in writing and photographically, and will include metrically accurate measurements and drawings to permit the generation of scaled drawings that illustrate the history of bridge construction that may be revealed in the course of such work.
- All works (including enabling works) within the river including bunds to enable the remedial works for Arklow Bridge, temporary haul roads and the temporary causeway will require archaeological monitoring.
- Construction access roads from RA1, 2, 6 and 7 (**Figure 5.5.3 of Chapter 5, Construction Strategy**) within the river channel will be formed on top of the bunds to run from the river access points to the bridge work areas. These may be located wholly or partially on top of the bunds to avoid and reduce the impact on the work area. The access road will approximately be 4m wide where it meets the public road with suitable protection/ containment of the road edge. This will allow sufficient space for trucks to stop and allow drain water to drain from excavated material. All disturbance of riverbed materials will be monitored by a licensed archaeologist.
- Monitoring will take place at all River Access areas 1-8, in order to identify any features or deposits of an archaeological nature. For example, the bankside works at River Access 4 and 5 will impact on made ground surfaces that are built up over pre-existing ground levels that could retain cultural layers and deposits. This is the case upstream of Arklow Bridge where the works will take place along the south bank that is reclaimed land adjacent to the medieval town and its former harbour.
- Archaeological monitoring of the active dredging phases is required to ensure that material exposed/recovered during the dredging works is recovered and stored securely. Such dredging faces include the works required to establish way leaves and bunds where such work requires the use of river gravels whose excavation have not been previously archaeologically monitored.

The movement and relocation of drainage diversion, utilities and services will require archaeological monitoring.

- Archaeological monitoring will take place in the greenfield and brownfield areas proposed for the compounds and the proposed access roads.
- Archaeological monitoring will take place during the construction of the sheet pile walls along the quays.
- Part of the quay wall is obscured and already encased in concrete or has other additions such as a low plinth attached to the top. It is anticipated that the quay wall will be left in situ and retained behind the sheet pile wall. Where interventions are required, a monitoring archaeologist will undertake a photographic and written record as part of the construction programme. As this section of the quay wall is essentially hidden, monitoring will occur as works are scheduled and as areas are revealed.

Archaeological monitoring will ensure the full recognition of, and the proper excavation and recording of, all archaeological soils, features, finds and deposits which may be disturbed below the ground surface and within the Avoca River.

All archaeological issues will be resolved to the satisfaction of the Project Archaeologist, DHLGH and the NMI. The licensed archaeologist will have provision to inspect all excavation to natural soil level and to temporarily halt the excavation work, if and as necessary. They will be given provision to ensure the temporary protection of any features of archaeological importance identified.

#### *Examination of dredged spoils at site compounds*

Archaeological monitoring licensed by the Department of Housing, Local Government and Heritage will be required of all ground and riverbed disturbances associated with the proposed scheme.

Archaeological examination of the dredge material by metal detection and visual inspection will be required. The dredge material will be transported to the construction compounds prior to removal offsite. This will provide a second opportunity to assess the archaeological potential of the sediments and recover material of archaeological interest. This archaeological examination will be based on a percentage of the dredge material to be agreed with the National Monuments Service and the National Museum of Ireland. A higher percentage of such monitoring is anticipated for dredge material from archaeologically sensitive locations upstream of Arklow Bridge and from Arklow Bridge itself. A lower percentage is anticipated for dredge materials from downstream of Arklow Bridge, where the archaeological sensitivity is less. Archaeological examination of the dredge material at the various construction compounds is detailed further in Sections 5.3.2 and 5.5.2 below.

#### *Architectural Heritage*

The Avoca River played a vital role in the historical development of Arklow's seafaring economy and maritime culture, providing a transport conduit for the import and export of minerals to service the upstream mining activities around Avoca.

In order to provide an appropriate level of flood defence, this scheme will alter the existing river embankments and quay walls and necessitate works to Arklow Bridge, a protected structure (A26). In response to this and in parallel with the civil engineering works, a public realm design has been developed. The objective of the Public Realm project is to ensure the effective integration of the infrastructural project with the townscape and river setting in a manner that seeks to ensure the value of the river frontage in its new form can contribute positively to the townscape taking into consideration the historic and maritime heritage of Arklow (**Drawing Nos. 6545-300-306 Landscape Design and Public Realm – Appendix 4.2**). In the long term, there is a significant positive impact on the architectural heritage structures of Arklow due to the prevention of flooding.

The public realm design has been developed iteratively in collaboration with Arklow WwTP and the Flood Relief Scheme so as to ensure the new infrastructure does not obscure the important downstream elevation of the bridge and that none of the infrastructural components clutter or detract from the character of the bridge.

All works carried out at Arklow Bridge (as detailed in **Section 11.5.2.2** of the EIAR) will be assessed by a conservation engineer.

The conservation engineer will identify suitable locations for vibration monitors to be placed for the duration of works at and in proximity to Arklow Bridge. Vibration monitors will be set in accordance to standard guidance for protected structures (historic buildings). In the unlikely event of vibration limits being exceeded, works will cease and alternative construction methods will be used (**Chapter 9 Noise and Vibration**).

As part of the conservation mitigation measures for Arklow Bridge, the riverbed of Arch 1 is to be reinstated to its original form and Arch 19 is to be retained as is, keeping in place the historic stone scour apron (section 11.5.3.2)(**Appendix 11.8 CORA 2021**).

A detailed methodology of all the proposed interventions in terms of grouting, underpinning (type and combination to be employed) and the lowering of the riverbed will be agreed with a conservation engineer and statutory authorities in advance of the finalised detail design.

Maintenance and localised repair works including vegetation growth, mortar loss, loose stonework, corroding ties and obscured issues behind later shotcrete have been identified as issues to address in the conservation structural report (**Appendix 11.8 CORA 2021**). Specifications for repair works are outlined in **Appendix 11.8** within Appendices 4.3 and 4.4 and drawings SK-01-SK-10 (CORA 2021) show where these works need to take place. These works will be undertaken at the appropriate time under the guidance and advice of a conservation engineer.

Works to the masonry of the historic part of Arklow Bridge will include repairs to the previously applied gunite to the soffits of the arches, repairs to the masonry of the older sections of Arklow Bridge and removal of the vegetation growing on the bridge. Defective joints will be raked out and repointed.

Deeply embedded roots will be drilled and injected with a suitable herbicide where to remove them would prove destructive to the integrity of the masonry. All loose stones will be re-seated and eroded mortar raked out and repointed with appropriate mortars. The render to the underside of the arches will be checked for integrity and where defective, removed and the masonry repaired. Areas of render requiring repair / reinstatement will be carried out in materials more appropriate to the original stonework. All works will be in accordance with the Conservation Engineering Report contained in **Appendix 11.8**.

Where required, method statements for the river access areas (RA1, 2, 6 and 7) located in proximity to the bridge structure detailing the construction strategy will be developed for approval from the statutory authorities including the Architectural Heritage Unit of the Department.

A continuous river side promenade will be provided along River Walk and South Quay to Arklow Harbour. From South Green - The Green at South Quay, the promenade will incorporate a section of the original stone wall quay by locating the proposed new flood relief wall inside the original quay wall (**Drawing No. 6545-302, Landscape Design and Public Realm – Appendix 4.2**). A conservation engineer will examine the existing quay wall (**Appendix 11.3, AH6**) and advise on the remedial and repair work.

At Ferrybank to the rear of properties facing onto Ferrybank Road, the setting of structures of an architectural heritage interest will be offset by proposed native woodland planting, landscaping and screening works that will assist in blending in the new works in Arklow Marsh.

### *Cultural Heritage*

There is potential to have a significant, positive and permanent impact on the setting and understanding of the historic maritime significance of Arklow along the new quay side through improved access, upgrading of public realm works and heritage signage.

Where the South Quay wall (AH6, Appendix 11.3) cannot be presented and retained as described in section 11.5.3.5 of the EIAR, it will be recorded. Section 11.5.4.3 of the EIAR describes how the quay wall and river banks will be archaeologically recorded. Where interventions are required, a monitoring archaeologist will undertake a photographic and written record as part of the construction programme. As these sections of the quay wall are essentially hidden or obscured as the wall is encased in concrete or has other additions such as a low plinth attached to the top, monitoring will occur as works are scheduled and as areas are revealed.

The historic slip known as Tyrrell's slip and boat tracks (AH5) will be recorded by means of photography and written description prior to commencement of works so a full record of the feature is present prior to any interventions. All works in the vicinity of the historic slip will be archaeologically monitored.

Glass panels will be inserted into the flood defence walling proposed across the slip way, so the structure can be viewed. At present there is heritage signage providing information about this feature.

In consultation with interested stakeholders, local heritage groups and the Maritime Museum of Arklow it is proposed to provide a newly developed heritage trail that provides information at points of industrial heritage and maritime interest along the quays.

A seated amenity area (AH8) with an anchor forming the focal point in Tinahask Lower will be enhanced and incorporated into the public realm works.

Features of a cultural heritage interest that are required to be removed on a temporary basis or for a short-term period, will be removed, under archaeological supervision and in accordance with a method statement agreed with the statutory authorities. This will protect the heritage asset from any adverse impacts and ensure that it is stored safely at an agreed location.

Mooring posts (**Appendix 11.3, AH7**) removed as part of the advance works (Section 11.5.3.5) will be reinstated along the south quay reasserting their connection with the original quay wall.

The removal of the ruined and broken up slipway (**Appendix 11.3, AH4**) at Coal Quay will be archaeologically recorded by a written description, photographic and scaled drawing record.

Boat rails (AH15) that traverse the road from a former ship-building yard to Arklow Docks on the Dock Road in Tinnahask Lower townland will be lifted and removed prior to trench excavation taking place for drainage works. The rails will be stored at an agreed location and will be re-instated upon the completion of the works and the resurfaced road.

The Project Archaeologist will ensure that contractors are made aware of features of a cultural heritage interest that align the river at the South Dock and at Ferrybank. If necessary, protection measures such as localised hoarding will be put in place to protect features in situ, for example AH16, Mooring points and AH12, a water pump (**Appendix 11.3**).

At Tinnahask Lower (along the south quay and at the south Dock) it will be important to maintain the authenticity and integrity of the mooring points (**Appendix 11.3, AH10**) with the original quay wall. While they are movable objects, they are set in the ground and will be removed under archaeological supervision and stored at an agreed and secure location for the duration of the project. The intent is to reinstate them or as agreed with the statutory authorities to move them locally to an optimum location.

In Marsh townland, the infilled stone line water channel (**Appendix 11.9**) that was identified on the northern boundary of SC3 will be archaeologically recorded in advance of works taking place and the area monitored as part of the construction contract.

At Ferrybank, a former laneway (AH1) will be traversed by the permanent works for the embankment. The section of causeway to be impacted will be recorded by a photographic and written survey and these works will be archaeological monitored.

National Monuments Legislation (1930–2004) states that in the event of the discovery of archaeological finds or remains, the National Museum of Ireland should be notified immediately. Provision must be made to allow for, and fund any, archaeological work that may be needed if any remains should be noted during ground preparation works or during construction. As described above, if features are revealed, the area will need to be investigated, allowing no further development to take place until the site is fully identified, recorded and excavated or, alternatively, avoided.

## Operation

All heritage issues will be resolved during the pre-construction and construction phase.

An ongoing maintenance review of works to the historic fabric of Arklow Bridge will be undertaken at appropriate intervals by a conservation engineer who will advise if any future remedial works are necessary.

Archaeological monitoring will take place during maintenance clearances at the debris and gravel trap and at periodic and ongoing dredging operations in the river.

## 21.2.6 Landscape and Visual Impact

### Construction

Construction activity and disruption of a physical and visual nature of the townscape, and of the use of the town and its environs, represents the greatest potential impact on landscape/townscape and visual aspects.

Mitigation during construction of all work packages therefore relates to the establishment and maintenance of organised and tidy site and work compounds, and effective management of pedestrian and vehicular diversions.

In addition, where works are close to existing trees that are to be retained, tree protection fencing must be erected in accordance with BS 5837:2012.

The project includes extensive public realm and landscaping proposals that will be implemented during the construction stage after the heavy civil engineering works and will gradually mitigate the construction appearance and deliver the new public realm and landscaping. Details of these works are included in **Appendix 4.2** of the EIAR, **Dwgs 300 to 306** inclusive.

A Construction Environmental Management Plan (CEMP) will be required to ensure the mitigation measures set out above are implemented during construction, and that any shortcomings are remedied immediately. A CEMP is included in **Appendix 5.1** of the EIAR. The appointed contractor will have a community liaison office to liaise with residents and other stakeholders in advance of establishing working areas so as to ensure such working areas have the minimum potential impact of residents and their properties.

## Operation

Mitigation measures for the flood defence project are primarily inherent in the multi-disciplinary design of the flood defence infrastructure together with the wider and associated public space, public amenity and streetscape modifications that are included in **Appendix 4.2** of the EIAR, Dwg 300 to 306 inclusive. These also include details of tree and landscape planting proposed at different areas throughout the project.

### *Planting*

Tree/landscape planting will be undertaken to address the loss existing vegetation and terrestrial habitat to accommodate the FRS.

- **Dwg 300:** River Walk (South Bank) Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Betula pendula* (Birch), *Crataegus laevigata* 'Paul's Scarlet' (Hawthorn), *Pinus sylvestris* (Scot's Pine), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- **Dwgs 301, 302 and 303:** South Quay to Arklow Harbour (South Bank) - Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Ulmus* "Lobei" (Elm), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.

At Arklow Marsh adjacent to the proposed embankment and at the extension to the north river bank upstream of Arklow Bridge, landscaping proposals include:

- Native Woodland planting (Area No 1) is along the new extended north bank of the river (Refer to **Dwg 304**) comprising: *Alnus glutinosa* (Black Alder), *Salix aurita*, *Salix cinerea oleifolia*, *Salix caprea*, *Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).
- Irish Native species rich grass and wildflower mixture along the river side of the new floodwall on north bank (SC3) and along the length of the embankment (Refer to **Dwg 304, 305 and 306**).
- Native Woodland planting (Area No 2) along the east side of the embankment and in SC1 (Refer to **Dwg 304, 305 and 306**) and comprising: *Alnus glutinosa* (Black Alder), *Salix spp.* (Willow) and *Betula pubescens* (Downy Birch), *Prunus spinosa* (Blackthorn), *Crataegus monogyna* (Hawthorn) and *Viburnum opulus* (Guelder Rose).

The physical changes along River Walk and South Bank will be mitigated by the public realm proposals combined with tree and shrub planting as described in **Dwgs 300 to 303** in **Appendix 4.2** of the EIAR).

### *Arklow Bridge*

The main works to the bridge are associated with physical strengthening and underpinning of the bridge, and with limited if any change in the appearance and character of the Arklow Bridge above water level. Maintaining and enhancing the visual integrity of the bridge has been a key objective of the design process.

The proposals maintain full visibility of the 19 arch structure, and the design of the interface with South Quay presents a clean, contemporary and high quality wall detail that clearly distinguishes the historic bridge structure from the new flood defence structures.

The interlocking rocks that form the scour protection under the arches will be reinstated under arches 1 and 19 at their existing level. Existing lighting on Arklow Bridge will be reinstated upon completion of the bridge works.

### *River Dredging*

Once river dredging has been completed during the construction, there is no ongoing landscape/townscape impact associated with this work package. There may be occasional routine channel maintenance dredging and clearance of vegetation if the levels of gravels and vegetation become a risk to blockage.

Mitigation measures included in the design for the loss of the small group of in-channel bushes and vegetation close to the north bank, and removal of the gravel banks that facilitate gathering of colonies of birds at low tide, include extension of the northern river bank to provide additional habitat areas, and also the provision of three floating roosting platforms anchored to the river bed upstream of Arklow Bridge.

### *Debris and Gravel Traps*

Mitigation associated with the introduction of the debris and gravel trap infrastructure includes locating these elements closer to the built environment of the town core rather than further upstream in a more natural environment. This keeps any new built elements such as the debris trap piers within the built context of the town, and also ensures that periodic access for gravel trap clearance is kept within the built environment of the town core.

Additionally, such periodic maintenance access will be facilitated through the establishment of a temporary causeway within and across the river channel that will be accessed from a small permanent access ramp located upstream of the debris and gravel trap on the south bank. The temporary causeway will be removed entirely following clearance of the debris and gravel traps.

### *Southern Flood Defences*

Mitigation associated with the southern flood defences has been described in **Chapter 12** under Operational Effects and is focussed on the integrated design for the civil engineering infrastructure of the flood defences of the public realm and open spaces along the south bank.

The primary design objectives have been to seek to maintain the height flood defence wall along the riverside promenade at 1,150mm so as to maintain the visual connection with the river and north bank. The provision of the promenade itself as a major public realm enhancement, together with landscaping and general streetscape enhancements, and raised pathways, terraces and viewing areas, all contribute to reinventing how the river edge is used in combination with the flood defences.



The materials used are of high quality, with the inner face of the wall being clad in textured concrete panels, and paving materials being of a natural stone finish. Additionally, and as the flood wall is c. 400mm thick, it has been possible to include a capping profile on the wall that is chamfered so that the vertical surface of the wall is only 900mm high, with the additional 250mm being formed across the chamfer. This has the effect of the wall appearing lower towards the promenade while maintaining its effective flood defence height.

At River Walk, where the height of flood defence is greatest, a series of elevated pathways and terraces, combined with ramps, steps, landscape areas and raised viewing platforms are designed to bring pedestrians along the upper levels with only 1,150mm height of wall between them and the river, and to add visual diversity and amenity along River Walk. These facilities also extend over the wall onto the river edge where a separate pathway, together with a terrace, stepped terrace and a floating pontoon are all accessible to the public along the edge of the water.

### *Northern Flood Defences*

Mitigation of the north flood defences includes minimising the encroachment into the Arklow Town Marsh by keep the embankment as far eastwards as possible, and by including newly established areas of river bank where the defences join the Avoca River so as to facilitate the reinstatement of river edge planting and to provide new habitat areas along the river bank.

New mixed woodland planting will be provided between the embankment and the rear of the existing properties at Ferrybank and this woodland planting will extend northwards and into the lands that will be used for Site Construction compound number 1.

Maintenance access to the embankment will be from the Dublin Road with a permanent access track along the eastern side of the embankment ensuring no additional impact on the Arklow Town Marsh.

Monitoring during operation relates principally to the maintenance and aftercare of new public realm and landscaping as appropriate to ensure appropriate presentation of the built environment and proper establishment of soft landscape. Any plants or trees that fail will be required to be replaced in the next available planting season.

## **21.2.7 Land and Soil**

### **Construction**

As outlined in **Section 5.5 of Chapter 5** of the EIAR and in the CEMP (Refer to **Appendix 5.1** of the EIAR), the adopted construction techniques will comply with the requirements of statutory bodies (inspections by the Health and Safety Authority and the Office of Public Works inspections and compliance with Employer's Requirements).

Mitigation measures for erosion and sediment control are primarily addressed in **Chapter 14, Water** of the EIAR (Section 21.2.8 below). Mitigation measures for accidental leaks and spills are in the CEMP (Refer to **Appendix 5.1** of the EIAR).

During construction, the following generic measures will be used to avoid or reduce the significance of potential impacts:

*Encountering known or unknown existing contamination*

- The historical illegal dumping of waste on Arklow Town Marsh has been recovered by WCC:
  - Should any further illegal dumping take place on the site these materials will be removed by WCC prior to works commencing.
  - A site investigation to determine the quality of soils and groundwater within the working area in Arklow Town Marsh will be conducted prior to intrusive works to determine if soil or groundwater contamination is present in the working area.
- During enabling works, a suitable geotextile membrane will be installed at all site compounds where historical land use indicates potential contamination may be present, to avoid interaction with overlying storage materials or equipment. At SC1 topsoil will be stripped and a suitable geotextile membrane will be installed and overlaid with hardcore. Intrusive works will not take place on SC2 and SC5, a suitable geotextile liner will be installed and overlaid with hardcore. SC3 is the site of a demolished house and is partly hard cored. Topsoil will be stripped from the western side of the property and a suitable geotextile membrane will be installed and overlaid with hardcore. SC4 is located on an existing carpark. SC5 is a semi-derelict site with a largely hardcore base, a suitable geotextile liner will be installed in an area of soft soils on the site compound. At SC6 topsoil will be stripped and a suitable geotextile membrane will be installed and overlaid with hardcore.
- A bund system, as described in **Section 5.4.3 of Chapter 5, Construction Strategy**, will be installed at site compounds SC1, SC2, SC5 and SC6 to contain stored dredge materials so it is not anticipated that there will be interaction between materials stored at site compounds and any underlying existing contamination, if present. All hazardous material will be stored in banded site compounds.

If contamination is encountered in geology, soils or groundwater, suitable measures will be put in place to avoid mobilising the contamination based on the most appropriate industry best practice guidance for contaminated land management. These measures, should they be required, will be documented in the soil management plan and revised as needed.

*Accidental leaks and spills*

A contingency plan for accidental leaks and spillages is included in the CEMP and will be further developed by the contractor prior to the commencement of the works and regularly updated during construction.

This contingency plan identifies the actions to be taken in the event of a pollution incident in accordance with the CIRIA guidance 741 *Environmental good practice on site*, and includes:

- Containment measures;
- Emergency discharge routes;
- List of appropriate equipment and clean-up materials;
- Maintenance schedule for equipment;
- Details of trained staff, location and provision for 24-hour cover;
- Details of staff responsibilities;
- Notification procedures to inform the EPA or Environmental Department of the Wicklow County Council;
- Audit and review schedule;
- Telephone numbers of NPWS and IFI; and
- List of specialist pollution clean-up companies and their telephone numbers.

The plan must include adequate measures and processes to ensure that any spillages will be immediately contained, and that contaminated soil will be removed from the proposed development and properly disposed at a suitable facility.

Measure to avoid and reduce the risks of minor leaks and spill are set out in the CEMP (**Appendix 5.1** of the EIAR), as are good housekeeping measures which also contribute to avoiding leaks and spills. These include:

- Potential pollutants will be adequately secured against vandalism and will be provided with proper containment according to the relevant codes of practice.
- Vehicles and equipment will be maintained by a suitably trained person and checked on a regular basis.
- Daily vehicle and equipment checks will include a visual assessment for oil or lubricant leaks prior to use.
- Vehicles will be parked on hardstanding areas overnight or when not in use, as applicable.
- Vehicles will minimise tracking over natural, exposed or unfinished surfaces, where practicable.
- Vehicles will not track over recently reinstated soils.
- Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks during refuelling. Where practicable, cleaning and refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage.
- Good housekeeping in line with industry best practises (e.g. CIRIA) will be adhered to including daily site clean-ups, use of disposal bins, etc.).

- Discharges from dredge material stored in site compounds are not considered an accidental leak or spill and the construction strategy contains measures designed to avoid and reduce any potential negative impacts to underlying soils and land, including through use of geotextile lines and bunds, as appropriate, at site compounds and the adoption of a procedure of temporary halts of loaded haulage vehicles on slopes within an appropriate vicinity of the river source to allow for drainage to remain within the source area, thus minimising movement of discharge across the site.

*Use of imported materials during construction*

See **Chapter 15**, *Resource and Waste Management* of the EIAR.

*Compression of Substrata*

All WPs:

- Ground settlements will be controlled through the selection of a foundation type and method of construction which are suitable for the particular ground conditions,
- Excavations shall be kept to a minimum, using shoring or trench boxes where appropriate. For more extensive excavations, a temporary works designer will be appointed to design excavation support measures in accordance with all relevant guidelines and standards.

WP5: The potential impact of the installation would likely to be localised to the vicinity of the footprint of the embankment and works would be temporary. Soft soils will be removed during construction of the foundation to create a stable base and a geotextile membrane will be placed over the formation to strengthen the foundation. During construction of foundations, stump holes will be filled and compacted by power-driven hand tampers. Additionally, if a silty or clayey foundation soil has a high-water table and high degree of saturation, the surface will be compacted using lightweight compaction equipment. This activity will be confined to the footprint of the embankment and will take place after stripping and storage of topsoil. The embankment will be constructed of suitable, compacted materials to ensure stability.

*Potential impact on surrounding ground*

Ground settlements will be controlled through the selection of a foundation type and method of construction which are suitable for the particular ground conditions.

WP1: Mitigation measures for ground stability during intrusive works is designed into **Chapter 5**, *Construction Strategy* of the EIAR and chiefly comprises the grouting works at Arklow Bridge and the temporary works design.

During WP4 and WP5, at some locations, existing walls will be retained for flood defence walls, where practicable – Refer to **Chapter 4** of the EIAR.

Appropriate dewatering methodologies must be used (see **Chapter 5**, *Construction Strategy* for further detail).

### *Trafficability of soils*

During all WPs:

- Significant project vehicle and equipment movements will be along agreed predetermined routes along existing national, regional and local routes. Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to a condition if at least equal quality to the original surface.
- Vehicles will minimise tracking over natural or unfinished surfaces, where practicable.
- Vehicles will not track over recently reinstated soils, should these be present.
- River access will be constructed of a suitable hard material such as hardcore
- Heavy vehicles and equipment will be parked on hardstanding areas overnight or when not in use, as applicable.
- Where practicable, compaction of any soil or subsoil which is to remain in situ in the works area will be avoided.
- Care will be taken to ensure that the side slope surfaces of bunds and haul roads are stable to minimise erosion.

In WP1, the river access may be developed on top of the bund to minimise the extent of potential impacts and reduce the overall effects, if practicable.

In WP2, where suitable, inert dredge material may be used as infill material in the construction of the embankment during WP5.

### *Loss of geology and soils*

All WPs:

- A soil management plan is included in the CEMP and will be developed further by the contractor prior to the commencement of the works and updated, as required, during construction. This plan identifies the actions that will be taken to avoid reducing the quantity of soils present on the site. Measure will include:
  - Topsoils and subsoils will not be mixed
  - Soil stockpiles will be covered with suitable materials
  - Vehicles will not track over recently reinstated soils, should these be present.
- Care will be taken to ensure that the side slope surfaces are stable to minimise erosion. This will be achieved through the selection of suitable material and adoption of an appropriate side slopes. If there is insufficient space to allow for a suitable side slopes, supports to sides will be provided by precast concrete traffic barriers.
- Suitable inert material will be used as infill, wherever this is required,

- Where possible excavated material will not be stockpiled within 10m of the Avoca River or the channel in the Arklow Town Marsh. Where this measure is not implementable, then specific silt control measures will be implemented as part of the detailed method statement for site works in each specific area (refer to **Chapter 5**, *Construction Strategy* of the EIAR for detail).
- Precautions will be taken to minimise the runoff of soils into watercourses through the implementation of erosion and sediment control measures as set out in the **Chapter 14**, *Water* of the EIAR.
- Soil and materials will be transported in appropriate dump trucks to minimise the loss of material in transport.
- Earthworks operations will be carried out such that surfaces will be designed with adequate falls, profiling and drainage to promote safe runoff and prevent ponding and flooding.
- Soils removed during excavation activities will be reinstated where possible.

During all Work Package with in-river work areas:

- Bunding of any in-river working areas will be used to minimise the loss of riverbed or bank sediments
- Bunds will be formed of suitable inert materials. These will generally be formed from permeable material with an impermeable liner such as heavy-duty polythene or sandbags.

During WP 4 and WP5:

- All excavated material will, where possible, be reused as construction fill. The appointed contractor will ensure acceptability of the material for reuse for the proposed development with appropriate handling, processing and segregation of the material.
- This material will have to be shown to be suitable for such use and subject to appropriate control and testing according to the Earthworks Specification(s). These excavated soil materials will be stockpiled locally within the working area where possible, using an appropriate method to minimise the impacts of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. Any surplus suitable material excavated, that is not required elsewhere for the proposed development, will shall be used for other projects where possible, subject to appropriate approvals/notifications.
- It is anticipated that excavated topsoil will be reused in soft landscaping, where practicable.
- Water for disposal will be pumped to sedimentation tank before discharge to canal or river.

#### *Potential impact of dewatering - in river dewatering*

An appropriate dewatering methodology will be selected for works. This will consider the risk of any ground instability arising from dewater activities to potentially sensitive receptors in proximity to the works area.

Arklow Bridge will be considered a sensitive receptor in WP1. Sensitive structures are comprised of material assets and would typically include but not be limited to, nearby buildings, highways, and protected structures.

During WP1 and WP3:

- Discharge from the dewatering process will be passed through a proprietary silt removal system located within the working area where possible, before discharge to the Avoca River.
- Industry best practices will be followed in the use of bunds.

During WP 3 there will be two stages of stage development in the construction of the debris trap, where on completion of the northern half of the debris trap, the bund material will be removed and used to form a bund around the southern half of the debris trap.

For mitigation measures for potential impact on surrounding ground from dewatering, refer to subsection '**Potential impact on surrounding ground**' above.

#### *Potential impact of dewatering - terrestrial dewatering*

An appropriate dewatering methodology will be selected for works. This will consider the risk of any ground instability arising from dewater activities to potentially sensitive receptors in proximity to the works area. Sensitive structures would typically include but not be limited to, nearby buildings, highways and protected structures such as Arklow Bridge.

During WP1, WP3, and WP4:

- Discharge from the dewatering process will be passed to a proprietary silt removal system located within the working area before discharge to the Avoca River.

For mitigation measures for potential impact on surrounding ground from dewatering, refer to subsection '**Potential impact on surrounding ground**' above.

#### *Potential impact on bedrock aquifer.*

Mitigation not proposed as impact is considered to be negligible.

Excavations in made ground will be monitored by an appropriately qualified person to ensure that any contaminated material is identified, segregated and disposed of appropriately. Any identified hotspots shall be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure that the hotspot does not cross-contaminate clean soils elsewhere.

Any excavation shall be monitored during earthworks to ensure the stability of side slopes and to ensure that the soils excavated for disposal are consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations. Refer to **Chapter 15, Resource and Waste Management** of the EIAR.

Monitoring for settlement will take place during in all work packages, refer to **Chapter 5, Construction Strategy** of the EIAR for details.

## **Operation**

Mitigation measures, proposed for the construction phase, will be implemented for maintenance operations, where relevant.

### *Maintenance of debris trap and gravel trap*

WCC will adhere to OPW guidance (Brew and Gilligan 2019) to ensure due care is taken during debris and gravel trap clearance and periodic routine dredging prior to works commencing. Suitable permanent river access measures will be developed during construction for river access.

WCC will undertake appropriate testing of materials prior to their removal from the river to determine the physio-chemical properties of material and classify the material so it can be identified as suitable for reuse or disposed of at an appropriate facility. Refer to **Chapter 15, Resource and Waste Management** of the EIAR for detail on the management of general construction waste during operations.

Appropriate testing of dredged material to identify potential contamination will be undertaken prior to dredging and at suitable intervals during dredging.

### *Installed infrastructure*

Ongoing routine inspection of the infrastructure for leaks will be carried out during operation.

## **21.2.8 Water**

### **Construction**

#### *Hydrology and Flood Risk Management*

#### *Sequencing of Works*

The planned construction sequence of the work packages has been selected to ensure that there is no increase in the current flood risk from fluvial and coastal sources during construction. WP1 which includes the bridge underpinning and lowering of the floor of Arklow Bridge, is due to be carried out at the beginning of the scheme and will result in a reduced flood risk, once it has been completed.

The completion of the first section of the bridge works will provide sufficient benefit to allow the commencement of WP4, the construction of flood defence walls along the south bank, ensuring that there will be no increase in flood risk due to the construction of the WP4 works.

WP3 includes the construction of the gravel and debris traps and is planned for the first summer. These works will reduce the risk of blockage of Arklow Bridge and so, reduce flood risk further.



WP5, the construction of the flood defence embankment and wall on the north bank will follow the completion of WP1, WP3 and WP4 and though it will increase flood levels, it will result in an overall reduction in the current flood risk. WP2, the dredging works, will be carried out at the same time as WP5 and will reduce the flood risk further.

#### *Work Package 1: Bridge Underpinning, remedial and scour protection*

There will be an increase in flood risk during the first stage of the bridge works due to the temporary bunds in the river channel. The proposed mitigation measures to manage this increased flood risk are:

- Works will be carried out in the summer months when river flows and wave action are typically lower.
- Bund heights will be set at a level so that they will be effective during the expected range of river flows and tide levels for the summer months but will be overtopped if exceptional large events occur.
- A flood monitoring and warning system will be implemented so that all plant and equipment will be removed from the work areas in the event of an imminent large river flow or exceptional high tide.
- In the event of a warning of an extreme flood event, the temporary bund will be reduced in height or removed in part or entirely if time allows to further reduce any flood risk.
- The Works Contractor will be required to take measures to mitigate any increase in flood risk arising from his activities. This will include measures to safely evacuate the working area, monitoring of water levels (see also below) and weather patterns.

After the first section of works are completed, the increased capacity of the bridge arches in this section will provide additional conveyance capacity and offset any impact on conveyance due to the temporary bunds for the middle and northern sections of the bridge.

The increase in flooding risk due to the construction of WP1 following the above mitigation measures is considered to be imperceptible temporary.

#### *Work Package 2: Channel Dredging*

The proposed dredging works upstream and downstream of Arklow Bridge have the potential to increase flood risk due to the construction of haul roads within the river channel, parallel to the banks and across the channel. These haul roads may impact on the conveyance capacity at the narrower sections of the channel. Factors for the mitigation of flood risk are as follows.

- The dredging works will be carried out in the summer months when river flows and wave action are typically lower.
- The haul roads will be set at a level so that they will be effective during the expected range of river flows and tide levels for the summer months but will be overtopped if exceptional large events occur.

- Flood levels from coastal processes will not be impacted by the proposed temporary works.
- The bridge underpinning works will be completed thereby increasing the conveyance capacity through the bridge and offsetting and increase in flood levels upstream of Arklow Bridge.
- An increase in flood levels upstream of the proposed dredge works will not impact properties due to the high ground levels on the south bank and the marsh on the north bank upstream of the haul roads. Flood flows will be able to flow through the marsh if levels are sufficiently high and bypass the narrower section of river channel at the upstream extent of the dredging works.
- The Works Contractor will be required to safely evacuate working area, during monitoring of water levels and when extreme weather patterns occur.

The potential increase in flooding risk due to the construction of WP2, following the above mitigation measures, is considered to be imperceptible temporary.

#### *Work Package 3: Debris and Gravel Trap*

The construction of these works will impact on flood levels upstream of the proposed location for the traps due to the construction of the haul road and bund within the river. The following mitigation measures will be implemented:

- Construction of the debris and gravel traps will not impact on flood risk as the increase in flood levels will only occur upstream of the works area and flood flows will be retained by the high ground levels on the south bank. Flood flows will be able to flow through the marsh if levels are sufficiently high and bypass the works.
- The works will be carried out in the summer months when river flows are typically lower.
- The haul road and bund will be set at a level so that they will be effective during the expected range of river flows for the summer months but will be overtopped if exceptional large events occur.
- A flood monitoring and warning system will be implemented so that all plant and equipment will be removed from the work areas in the event of an imminent large river flow.
- In the event of a warning off an extreme flood event, the temporary bunds can be reduced in height or removed in part or entirely if time allows to further reduce any flood risk.
- The Works Contractor will be required to safely evacuate working area, during monitoring of water levels when extreme weather patterns occur.

It should be noted that an increase in flood levels upstream of the proposed debris trap works will not impact properties due to the high ground levels on the south bank and the marsh on the north bank upstream of the proposed works.

Flood flows will be able to flow through the marsh and bypass the work area if levels are sufficiently high.

The potential increase in flooding risk due to the construction of WP3 following the above mitigation measures is considered to be imperceptible temporary.

*Work Package 4: Flood Defences and storm water drainage works on South Bank*

The construction of the temporary causeway for approximately 300m within the river channel to facilitate the construction of the sheet-piled wall downstream of Arklow Bridge will increase flood risk from a fluvial flood event. It will not change the flood risk from a coastal flood event. The proposed causeway will not be constructed until the first section of the bridge underpinning, and associated lowering of the floor of Arklow Bridge, is completed. Consequently, the temporary causeway will not increase flood risk over the current level.

A temporary causeway will also be constructed within the river channel for approximately 120m upstream from Arklow Bridge to facilitate construction of the sheet-piled wall along River Walk. The temporary causeway will be contained on the river side by either gabions or sheet piles, with these raised to the height of the causeway, to be effective. The proposed elevation of the temporary causeway is c. 0.8m OD which accounts for highwater mean spring tide of 0.5m OD plus 0.3m freeboard.

As the causeway will be constructed within the wider section of the river channel, it will not impact on fluvial flood flows. The proposed causeway will not be constructed until the first section of the bridge underpinning, and associated lowering of the floor of Arklow Bridge, is completed. Consequently, the temporary causeway will not increase flood risk over the current level.

The Works Contractor will be required to safely evacuate from river channel during flood risk arising from his activities.

The potential increase in flooding risk due to the construction of WP4 following the above mitigation measures is considered to be imperceptible temporary.

*Work Package 5: Flood earth embankment and flood defence wall along North bank*

The construction of the proposed flood defence embankment and wall will not commence until the bridge underpinning and associated lowering of the floor of Arklow Bridge is fully completed. As such, the proposed embankment and wall will not increase flood risk over the current level.

The Works Contractor will be required to safely evacuate from river channel during flood risk arising from his activities.

### *Monitoring*

The following monitoring will be carried out during the construction stages:

- Visual monitoring of river levels during instream work will be carried out in the morning, during midday and in the evening by observing the staff gauges at Arklow Bridge and the Dock. In the event that the Arklow Bridge gauge has to be removed temporarily to facilitate construction works, a temporary gauge will be established at the opposite (north) end of the bridge.
- Monitoring the weather forecast for heavy rainfall events and river water levels will be carried out twice daily.
- Monitoring of the tide forecast will be carried out twice daily.
- Advance monitoring of extreme weather conditions will also be carried out.

### *Existing Drainage Infrastructure*

Where the existing drainage system requires diversion or alteration during construction, the contractor responsible will be required to have alternative drainage facilities in place. These may include temporary diversions if a suitable route for gravity flow is available or over-pumping where a gravity solution cannot be identified.

### *Water Quality*

In order to further reduce any potential effect of the dredging on migrating fish species e.g. Lamprey and Salmon, dredging will not be carried out between October and April.

The standard best practice measures in the CEMP (**Appendix 5.1** of the EIAR) for the proposed scheme will mitigate significant negative effects on surface water quality during construction. A range of site-specific measures are presented below:

- During construction, contaminated surface water runoff in working areas will be collected by the temporary drainage systems installed by the contractor and then treated or desilted on-site before discharge to the Avoca River or stored and removed off site if not suitable for discharge to the Avoca.
- Site compound SC1, where archaeological testing of the dredged material including material with slightly elevated chloride concentrations will be conducted, will be prepared with the installation of a geotextile membrane with suitable hardcore placed over it to provide a trafficable surface. Arklow Marsh pNHA will be protected by a temporary low bund constructed of impermeable material. The bund will be situated along the western boundary and will redirect surface water run off towards siltation traps. Dredge material will be managed in an area situated on the south eastern portion of SC1 behind Circle K filling station. A low bund will be installed around the area on top of geotextile membrane and hardcore material. A localised stormwater drainage system will be constructed within the area to convey runoff to a sedimentation collection system before percolating into the ground.

The collection system will be periodically monitored during material testing. Silt fences will be installed around stockpiled material.

- Site compound SC2, where archaeological testing of the contaminated dredged material will be conducted, will be prepared with the installation of a geotextile membrane and an impermeable membrane with suitable hardcore placed over these to provide a trafficable surface. A low bund, comprising precast concrete traffic barriers or similar wrapped in an impermeable membrane, will be constructed around the perimeter of the site to retain the temporary surface and the dredged material.
- A drainage channel with sumps will be constructed around the perimeter of the storage area to collect any water draining from the dredged material. Water draining from contaminated material stored at SC2 and will be collected in a suitable tanker to be taken to a suitable waste disposal facility. Groundworks operations will be carried out such that the surfaces are provided with adequate slope to promote safe runoff and prevent flooding.
- Site compound SC5, where archaeological testing of the dredged material with slightly elevated chloride concentrations will be conducted, will be prepared with the installation of a geotextile membrane with suitable hardcore placed over it to provide a trafficable surface. A suitable bund will be constructed around the storage area.
- Water draining from the material at SC5 will be allowed to drain by overland flow to the sea. Groundworks operations shall be carried out such that the surfaces are designed with adequate falls to promote safe runoff and prevent flooding.
- Site compound SC6, where archaeological testing of the inert dredged material will be conducted, will be prepared with the installation of a geotextile membrane with suitable hardcore placed over it to provide a trafficable surface. A suitable bund will be constructed around the storage area. A drainage channel with sumps will be constructed around the perimeter of the storage area to collect any water draining from the dredged material. Any runoff will be discharged through a suitable sediment removal system for discharge.
- Good housekeeping such as site clean ups, use of disposal bins etc will be adopted in construction areas.
- In order to prevent accidental release of hazardous materials such as fuels, lubricants, cleaning agents, hazardous construction materials, etc. into surface water during construction, all hazardous materials will be stored within appropriately bunded containment areas designed to retain spillages.
- Dewatering will be achieved using a series of sump and submersible pumps and discharging through a suitably sized proprietary sediment removal system. The contractor will regularly maintain the sedimentation tank to ensure that it is not full of sediment. This is aims to prevent pollution of the Avoca River through the release of sediments.

- Locations where contaminated material are anticipated, will be isolated at low tide level. A temporary bund made up of impermeable material, approximately 500mm above high spring tide level will be constructed around the location. Dewatering for visibility of the riverbed and to enable the contractor to carry out the excavation process will be undertaken. A conventional excavator will be used to remove any layers of contaminated material. The excavation will extend approximately 300mm below the proposed dredge level and will be back filled with clean dredged material. The finished excavated surface will be trimmed to the required line and level at the channel edge. This will have an imperceptible temporary negative impact on water quality.
- The grouting process at Arklow Bridge will be preceded by water flushing to determine if there are any paths through to the face of the historic masonry. Any routes found will be plugged with mortar appropriate to the historic masonry. The grouting material will consist of cement only or a mixture of cement and bentonite, depending on the purpose of the grouting and the permeability of the material to be grouted.
- Dredging works in the river will be confined to either the northern half or the southern half of the channel at any one time to minimise the impact of suspended sediment in the water.
- Dredging works in the river will be limited to 10 hours per day to allow 14 hours for the water to clear and any migratory aquatic species to travel past the work area.
- Restricting the dredging hours, as described above, will also limit the impact on coastal waters off the mouth of the estuary. Sediment plumes emanating from the Avoca River estuary are an existing feature of high flows in the Avoca River.
- Refer also to specific pollution control measures detailed in Section 21.2.4 *Biodiversity* above and summarised below:
  - i. Appropriate sediment control measures will be employed.
  - ii. Any chemical, fuel and oil stores will be located on an impermeable base within a secured bund with a storage capacity 110% of the stored volume.
  - iii. Biodegradable oils and fuels will be used where possible.
  - iv. Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 10m).
  - v. Emergency spill kits will be available on site and staff trained in their use.

- vi. Operators will check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages will be reported immediately.
  - vii. Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded.
  - viii. Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage.
  - ix. All washing out of grout pumps will be carried out in designated areas away from the river, such as in the lined compound area. At no point will grout pumps be washed out at the worksite.
- Specific mitigation measures regarding the careful application of herbicide to treat Invasive Alien Plant are presented the Invasive Alien Plant Species Management Plan in the CEMP (**Appendix 5.1** of the EIAR).
  - Specific mitigation measures regarding the careful application of herbicide to remove woody vegetation in the joints in the masonry of the bridge during WP1 are presented the CORA report (**Appendix 11.8** of the EIAR)

#### *Water Quality Monitoring during Construction*

River water quality monitoring will be carried out for a period of twelve months in advance of the works to establish a baseline for water quality. Parameters to be monitored will include suspended solids, dissolved oxygen, temperature, pH, turbidity and BOD<sub>5</sub>. During the course of the works, monitoring will be continued and any significant changes will be investigated. Construction practices will be adjusted if found to be having an unacceptable negative impact on water quality.

Monitoring will be carried out both upstream of the proposed works and downstream to ensure that any changes in the levels of these parameters do not create an unacceptable condition for aquatic life in the river (Refer to **Chapter 14 Water** of the EIAR for baseline water quality parameters). Monitoring will be carried out in the morning, midday and mid-afternoon.

#### *Silt Management Procedures*

Silt management onsite will be carried out in accordance with OPW Guidance as described below. This mitigation procedure will be adopted across all site compounds and working areas.

- i. A suitably qualified Environmental Clerk of Works shall be appointed to oversee and monitor all measures taken to protect the aquatic environment;
- ii. Ensure works area within waterbody does not become dry in an unmanaged fashion, killing fish or other aquatic species;
- iii. Monitor the effectiveness of any installed silt control measures,

- iv. Minimise increase silt levels, when removing control measures,
- v. Manage site compounds and work area runoff effectively including wheel washing of transport;
- vi. Minimise in-channel works and design temporary haul roads and crossing points effectively, to allow fish transition at all times;
- vii. Management excavated spoil and dredge material effectively;
- viii. Consider allowing river to return to background silt levels when required, use turbidity monitoring or other data manage effectively
- ix. Ensure reporting procedure in place in the event of a pollution event;

## **Operation**

### *Hydrology and Flood Risk Management*

No mitigation will be required during the operation of the scheme as the proposed scheme will improve the flow regime in the Avoca River towards the Irish Sea and the net impact is moderate medium-term significantly positive effect.

There will be on-going recording of water levels in the Avoca river, to monitor any immediate change in flood risk and to provide a long-term assessment of any change in flood risk due to changes in climatic conditions and/or catchment characteristics.

### *Water Quality*

The proposed scheme will moderate medium-term positive impact on water quality in the Avoca River preventing flood waters from washing contaminants from land-based activities into the river and out to sea. Channel maintenance will be carried out within the river channel, sediment plume development will occur during this period. Accidental spills and leakages will be mitigated by measures already described above.

Provision of localised location for the removal of gravel and debris and carrying out the works during summer are positive mitigation measures. Gravel removal from the gravel trap will be limited to a maximum of 10 hours in a 24-hour period, as and when required. This will lead to a positive medium-term effect on water quality in the Avoca Estuary.

On-going monitoring of water quality is proposed during the operation. It is envisaged that WCC and EPA will continue to monitor the water quality under the River Basin Management Plan in compliance with the Water Framework Directive after completion of the scheme.

During the maintenance operations which will involve works in the river and adjacent to it such as the channel maintenance dredging, debris and gravel trap maintenance, water quality monitoring will be carried out as described above for construction stage.



## 21.2.9 Resource and Waste Management

### Construction

A Construction and By-Products Waste Management Plan (CBWMP) has been prepared (refer to **Appendix 15.4** of the EIAR). This CBWMP plan will be required to be updated by the contractor(s) following appointment and prior to commencing works on site. The CBWMP addresses waste generation and arrangements made for prevention, reuse, recycling, disposal and collection of recyclables and wastes.

The CBWMP has been prepared in line with the guidance<sup>1</sup>. The CBWMP addresses the following:

- Description of the project (refer to **Chapter 4** and **Chapter 5** of the EIAR);
- Wastes arising including procedures for minimisation/segregated storage/reuse/recycling;
- Estimated cost of waste management;
- Roles and responsibilities for implementing the CBWMP;
- Procedures for training of workforce and plan dissemination programme;
- Record keeping procedures;
- Waste collectors, and recycling and disposal sites including copies of relevant permits or licences; and
- Waste auditing protocols.

Using the information identified in this section, the contractor(s) will be required to update the CBWMP, with its/their detailed procedures and the names of staff with assigned roles in the plan prior to commencement of construction, and as required during the construction of the proposed scheme.

In addition to the inherent design measures which will be implemented during construction, the following mitigation measures will be implemented:

- A pre-demolition audit will be undertaken in order to facilitate selective demolition. Selective demolition will be undertaken in order to enable removal and safe handling of hazardous substances and to facilitate re-use and high-quality recycling. The pre-demolition audit will be undertaken in accordance with the *EU Guidelines for the waste audits before demolition and renovation works of buildings* (European Commission, 2018), or similar guidance. The aim of the guidance is to facilitate and maximize recovery of materials and components from demolition or renovation of buildings and infrastructure for beneficial reuse and recycling, without compromising the safety measures and practices outlined in the *EU Construction and Demolition Waste Management Protocol* (European Commission, 2016). The above guidelines provide guidance on best practices for undertaking a ‘waste audit’,

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<sup>1</sup> DoEHLG (2006) Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.

i.e. the assessment of construction and demolition waste streams prior to demolition or renovation of buildings and infrastructures.

- The contractor will minimise waste disposal so far as is reasonably practicable. Opportunities for reuse of materials, by-products and wastes will be sought throughout the construction stage of the proposed scheme.
- Possibilities for re-use of clean non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use. Where excavated material may not be re-used within the proposed works the contractor will endeavour to send material for reuse on another site, recovery or recycling so far as is reasonably practicable.
- Waste from the proposed scheme will be transported by authorised waste collectors in accordance with the Waste Management (Collection Permit) Regulations, 2007 as amended.
- Waste from the proposed scheme will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996, as amended.
- Source segregation: Where possible metal, timber, glass and other recyclable material will be segregated and stored separately, during construction and removed off site to a permitted/licensed facility for recycling. Waste stream colour coding will be used to facilitate segregation and each container will have photographs of wastes to be placed in that container, as required. Where waste generation cannot be avoided source segregation will maximise the quantity and quality of waste delivered for recycling and facilitate its movement up the waste hierarchy away from landfill disposal and reduce its environmental impact.
- Material management: ‘Just-in-time’ delivery will be used so far as is reasonably practicable to minimise material wastage.
- Materials will be stored in appropriate conditions, and if outdoors, will be raised above the ground and covered, as required, to prevent deterioration and spoiling due the effects of the weather.
- Supply chain partners: The contractor will engage with the supply chain to supply products and materials that use minimal packaging, and segregate packaging for reuse.
- Waste Auditing: The contractor will record the quantity in tonnes and types of waste and materials leaving site during the construction phase.
- Waste fuels/oils may be generated from equipment used on-site during construction and may be classified as hazardous waste. Such wastes will be stored in a secure, bunded area on-site prior to collection by a contractor who holds the appropriate waste collection permit.
- The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show which material is recovered and which is disposed of.

- The contractor(s) will ensure that any off-site interim storage or waste management facilities for excavated material have the appropriate waste licences or waste facility permits in place.

Export of hazardous waste from the proposed scheme out of the State is subject to a Europe-wide control system founded on EU Regulation 1013/2006 on the Shipments of Waste (known as the Transfrontier Shipment Regulations), as amended. A Trans Frontier Shipment (TFS) licence is a licence which must be approved by the origin/destination/transit authorities consenting to the movement/transit and acceptance of wastes between EU member states. This licence tracks waste from origin to destination and ensures that each authority is aware of the status of the waste until final recovery when the individual TFS notification annex consigned with each shipment is signed off as having been received and treated by the receiver. This completed licence is then circulated back to the producer as well as all relevant authorities

EU Regulation 1013/2006 is supplemented by the Waste Management (Shipments of Waste) Regulations 2007, as amended, which makes Dublin City Council responsible for the enforcement of this regulatory system throughout Ireland. Export of hazardous waste from the site out of the State will comply with the procedures set out in this legislation. The above procedures will be applied to any hazardous waste generated during the construction phase.

The monitoring, as specified in the CBWMP and CEMP (Appendix 5.1 of the EIAR) in relation to wastes, will be undertaken and recorded by the contractor(s).

## Operation

The mitigation measures described above will be implemented, where relevant, during the operation and maintenance of the proposed development.

Monitoring of the maintenance waste generated during the operational phase will be carried out to determine its appropriate suitability for re-use, recovery or disposal off site.

### 21.2.10 Population and Human Health

The mitigation and monitoring measures relating to construction and operation of the proposed flood relief scheme have been addressed in the specific assessment chapters of the EIAR, as follows:

- **Chapter 7** *Traffic and Transport* of the EIAR,
- **Chapter 8** *Air Quality and Odour* of the EIAR,
- **Chapter 9** *Noise and Vibration* of the EIAR,
- **Chapter 11** *Archaeological, Architectural and Cultural Heritage* of the EIAR,
- **Chapter 12** *Landscape and Visual* of the EIAR,
- **Chapter 13** *Land and Soils* of the EIAR,
- **Chapter 14** *Water* of the EIAR,

- **Chapter 15** *Resource and Waste Management* of the EIAR,
- **Chapter 17** *Material Assets* of the EIAR,
- **Chapter 18** *Major Accidents and Disasters* of the EIAR,
- **Chapter 19** *Climate* of the EIAR,
- **Appendix 5.1 Construction Environmental Management Plan (CEMP)** of the EIAR.

From the perspective of the Population and Health assessment, the mitigation proposed in these chapters is sufficient to address potential effects on sensitive receptors including pedestrians, cyclists, residents, businesses and visitors, and for amenity activity, especially during the summer and for festivals and tourism events.

In addition to the above, a Pest Control Plan has been included in the CEMP, as outlined in **Chapter 16** *Population and Human Health* of the EIAR, in order to ensure the control of pests in the spreading of the dredge material.

Further, access to the existing slipway and set-down pontoon at Arklow Harbour/Dock will be maintained during the summer months (June-August).

### 21.2.11 Material Assets

#### Construction

As described in **Chapter 5**, *Construction Strategy* of the EIAR and outlined in **Appendix 5.1** of the EIAR, the contractor will be required to prepare and maintain a CEMP during the construction phase of the proposed scheme. The appointed contractor will be required to comply with the CEMP. Effective implementation of the CEMP will ensure that disruption and nuisance are kept to a minimum throughout the construction of the proposed scheme. The CEMP will be required to have regard to the guidance<sup>2</sup> and industry best practice. The CEMPs will be effective throughout construction and the contractor will be required to review and update the CEMP as construction progresses.

Every effort will be made to ensure that any significant effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme.

#### *Land and Property Ownership*

Wherever possible, mitigation by avoidance of negative effects on property was a priority during the design development of the proposed scheme. However, as outlined in **Chapter 17** *Material Assets* of the EIAR, the proposed scheme will require land take to accommodate construction activities and to accommodate control and maintenance of flood relief measures within the foreshore, during the operational phase.

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<sup>2</sup> CIRIA (2015) Environmental Good Practice on Site Guide, 4th Edition

Access to all residential properties will be maintained at all times during the construction of the proposed development. This may require temporary alternate access arrangements at some locations.

Landowners will be compensated as appropriate for land acquisition, in accordance with the relevant legislation. The details of any individual agreements will be private and confidential and therefore mitigation measures in the form of compensation are not specific or detailed herein.

It is proposed that closure of the existing slipway and set-down pontoon at Arklow Harbour/Dock be avoided during the summer months (Jun-Aug).

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

#### *Electricity and Lighting*

All utilities and service diversions will be agreed and undertaken as part of the enabling works and in advance of the commencement of construction activities. In the event of disruption to services- these will be planned and communicated to the public in advance and carried out in accordance with the relevant codes of practice.

All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Temporary construction lighting will be provided throughout the duration of the construction phase in lieu of the public lighting.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

#### *Telecommunications*

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider. All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

### *Gas*

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider.

All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

### *Water Supply Infrastructure*

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider. All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

### *Sewer Network and Drainage Infrastructure*

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider. All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

### *Additional Material Assets*

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

## **Operation**

### *Land and Property Ownership*

Landowners will be compensated as appropriate for permanent land acquisition, in accordance with legislation. The details of any individual agreements will be private and confidential and therefore mitigation measures in the form of compensation are not specific or detailed in this EIAR.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

#### *Electricity and Lighting*

Lighting which was removed as part of the construction works for the proposed scheme will be reinstated or replaced during operation.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

#### *Telecommunications*

No mitigation measures regarding telecommunications are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

#### *Gas*

No mitigation measures regarding gas infrastructure are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

#### *Water Supply Infrastructure*

No mitigation measures regarding water supply infrastructure are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

#### *Sewer Network and Drainage Infrastructure*

No mitigation measures regarding the sewer network and drainage infrastructure are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

#### *Additional Material Assets*

No mitigation measures regarding the drainage channel or pipeline are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

## 21.2.12 Major Accidents and Disasters

### Construction

The appointed contractor's proposed method and sequence of working will be highly critical in maintaining the overall stability of the bridge and the appropriate stipulations will be incorporated into all tender and construction documents to make sure this process is adhered to.

### Operation

No mitigation or monitoring measures are proposed specific to reducing the risk of major accident/disaster during operation.

## 21.2.13 Climate

As no significant adverse effects are predicted to occur during the construction or operation of the proposed development, no mitigation measures are required.

## 21.3 Residual Significant Effects

This EIAR has been prepared by competent experts in accordance with Article 1(2)(g) of the EIA Directive to identify the likely significant effects associated with the proposed scheme in accordance with the relevant legislation and guidance.

A range of likely significant effects have been avoided or reduced through the implementation of mitigation measures and monitoring, therefore leading to the residual effects as outlined in **Sections 21.3.1-21.3.13**.

### 21.3.1 Traffic and Transport

The construction of the proposed scheme will result in a slight increase in traffic congestion within the town, particularly when construction works are taking place on Arklow Bridge. These effects will be temporary in nature and following the completion of the construction works will have no residual effects.

During all construction stages, the individual working areas will result in some restrictions and inconvenience to the movement of people and traffic. These restrictions will be temporary in nature and particularly felt in the immediate vicinity of the proposed working areas.

Should the construction of the Arklow Flood Relief Scheme coincide with the construction of the Arklow Wastewater Treatment, there will be a greater increase in traffic in Arklow resulting in a temporary slight increase in traffic congestion along the primary road network. It is expected that at North Quay, South Quay, South Green and Tinahask Road that the impacts on traffic delays and queuing will be greatest should the two construction projects be carried out in tandem, however these temporary impacts will be over a shorter duration.



During the operation of the proposed scheme the projected increases in traffic flows will be very small, with only occasional service traffic expected.

The annual removal of material from debris trap will have a temporary and short-term impact on traffic movement in the operational phase but impacts will be significantly less than those stated in construction impact assessment.

The proposed maintenance dredging of the river channel which is proposed approximately every 10 years will result in temporary and short-term effects on traffic movement. These effects will similarly be less than those stated in construction impact assessment.

### 21.3.2 Air Quality and Odour

With the implementation of the mitigation measures, no significant adverse residual negative effects on air quality are envisaged during the construction or operation of the proposed development.

Similarly, with the implementation of the mitigation and monitoring measures, no significant adverse residual negative effects on odour are envisaged during the construction phase of the proposed development.

### 21.3.3 Noise and Vibration

A noise assessment of the construction phase impacts has shown that compliance with noise limit values in can be achieved at the nearest sensitive receptors to the proposed works for WP1 (daytime) and WP2. For all other WPs, noise limits are predicted to be exceeded at the nearest sensitive receptors.

The implementation of the mitigation measures outlined in **Section 9.6** of **Chapter 9** of the EIAR and in Section 21.2.3 above will assist in reducing the impact on nearby sensitive receptors. Residual short-term, slight to moderate negative impacts are predicted during the construction phase of the proposed development. **Table 21.1** summaries the residual impacts during the construction phase.

**Table 21.1** Summary of Residual Impacts During Construction Phase

Construction phase	Summary of impact Post Mitigation
WP1 – daytime assessment	Short term, slight and negative.
WP1 – night-time assessment	Short term, slight and negative.
WP2 – daytime assessment	Temporary, slight and negative.
WP3 – daytime assessment	Temporary, slight to moderate, and negative.
WP4 – daytime assessment	Short term, slight to moderate, and negative.

Construction phase	Summary of impact Post Mitigation
WP5 – daytime assessment	Not significant to moderate, short term and negative.

No residual impacts are predicted during the operation and maintenance phase of the proposed development.

### 21.3.4 Biodiversity

#### *Habitats and Flora*

With the implementation of the mitigation measures, residual effects on habitats and flora, are assessed as not significant during construction and operation.

#### *Diadromous Fish Species*

With the implementation of mitigation measures, residual effects on diadromous fish from construction and operation are assessed as not significant. No likely significant direct residual effects will arise diadromous fish from discharges during construction and operation.

#### *Resident Bird Species*

With the implementation of the mitigation measures, residual *in situ* effects on the resident bird species, are assessed as not significant during construction and operation.

#### *Otter and Badger*

With the implementation of the mitigation measures, residual effects on resident otter and badger, are assessed as not significant during construction and operation.

#### *Bat Species*

With the implementation of the mitigation measures specified in **Section 10.6** of the EIAR, residual effects on species including Habitats Directive Annex IV listed bat species (Common pipistrelle, Soprano pipistrelle, Leisler's bat and Daubenton's bat), are assessed as not significant during construction and operation.

### 21.3.5 Archaeology, Architecture and Cultural Heritage

No residual effects were identified during the course of the assessment on heritage assets.

Should any archaeological remains be uncovered, they will be fully resolved prior to the main construction stage where possible, either through preservation in situ or preservation by record.

There is an opportunity to provide a coherent and cohesive cultural heritage identity, incorporating the maritime and industrial heritage features of the town's historic past into the proposed public realm design works.

The provision of information panels at features and items of an historical heritage interest will result in a slight positive residual effect on cultural heritage.

### 21.3.6 Landscape and Visual Impact

Residual landscape/townscape effects will generally relate to the widening and alteration and enhanced public realm of South Quay and River Walk, the presentation of the Avoca River corridor leading through the town, and also the embankment along the eastern side of the Arklow Town Marsh.

In relation to the Arklow Town Marsh, the nature of the marsh and existing vegetation is such as to preclude taking baseline eye-level photography for the purposes of preparing photomontages to illustrate landscape and visual effects. The latter are nonetheless described in the foregoing and predicted to be localised, moderate and adverse.

Beyond the Arklow Town Marsh, residual landscape/townscape effects will vary considerably throughout the townscape of Arklow town and these are described with reference to the series of photomontage views prepared from 11 representative locations throughout the proposed development and included in **Appendix 12.1** of the EIAR. The photomontage view locations are shown in **Figure 12.20** in **Chapter 12** of the EIAR.

#### *Photomontages*

##### **View 1**

View 1, **Figure 12.1.1** in **Appendix 21.1** of the EIAR, is from River Walk as existing upstream of the carpark as is where River Walk transitions from its riverine and rural upstream character to its riverine and urban setting. The north bank is clearly defined by strong mixed woodland edge. River Walk includes built elements such as the retaining walls to the rear of properties and parts of the carpark and road network with the town are coming into view. The river bank is a simple grass bank incorporating a number of early mature and mature trees.

View 1, **Figure 12.1.2** in **Appendix 21.1** of the EIAR, shows the proposed development with the main intervention being the introduction of the ramped River Walk pathway and associated floor defence wall along the river edge leading to a cantilevered viewing platform at the high point and the removal of the existing river bank trees. Additionally, the debris trap columns are readily visible traversing the river and the permanent ramp access for maintenance is visible in the foreground. The absence of the existing river bank trees is notable however this also opens up the wider view of the river corridor. The proposed development brings the rural to urban transition along River Walk slightly upstream from its current location.

Landscape and visual effects will be perceived as moderate and adverse, however will become positive as the amenity value of the revised river edge detail within the urban setting is fully realised.

##### **View 2**

View 2, **Figure 12.2.1** in **Appendix 21.1** of the EIAR, is from the junction of River Walk and River Lane adjacent to the town carpark and looking upstream along the Avoca River. The existing low flood defence wall defines the edge of the footpath and roadway and there is a short section of river bank formed in concrete that provides passive amenity at the river edge. The heavily wooded north bank is distinctive and the occasional trees on the south bank are visible together with the trees on the grass embankment between River Walk and the carpark.

View 2, **Figure 12.2.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the flood defence wall at c. 1.85m above River Walk and leading to the newly ramped section of River Walk beyond and the cantilevered viewing platform at the high point. The flood defence wall will be at its highest at this location however it will incorporate glass panels so as to permit visibility to the river corridor and also to the proposed new terrace area, walkway and floating mooring platform.

Whereas the current junction of River Walk and River Lane is primarily a vehicular carriageway, the proposed development will transform the junction to one of high pedestrian amenity with stronger and more direct connections along River Walk and to the town carpark

Landscape and visual effects are likely to be perceived initially as significant and adverse, however in the context of the new continuous river promenade and enhanced public realm along the southern river bank throughout the town, this will reduce over time as the change becomes accepted and the full amenity value of River Walk within its urban context is realised.

### View 3

View 3, **Figure 12.3.1** in **Appendix 21.1** of the EIAR, is from River Walk near Condren's Lane and illustrates the simple yet attractive green space on the inside of the low flood defence wall overlooking the river where there is a concrete pathway. Car parking can be seen to the right and the carriageway of River Walk runs along the parking area before the rear boundary walls of private properties. The Arklow Bridge is apparent in the distance however it is the modern 1960s concrete side that presents upstream to River Walk. There are a number of trees of mixed species and maturity within the landscaped space and in the river bank.

View 3, **Figure 12.3.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the flood defence wall at typically c. 1.15m above the proposed promenade and terrace level, with some sections following the profile of the outer pedestrian ramp as it rises to meet the elevated viewing platform cantilevered over the wall and river. The carriageway level remains at its existing level however the promenade and terraces are elevated and separated from the carriageway by low planters that will also serve as permanent seating. The promenade and terraces are distinctly pedestrian in character, with high quality paving and bespoke precast polished concrete panels to finish the wall. Dual lighting provides for the pedestrian spaces and carriageway, and comprises LED luminaries with high cut-off so as to minimise any light spill to the river corridor. Parking spaces are defined along the carriageway and new tree planting will be

provided to enhance to overall character of River Walk and to further reinforce the elevated promenade as a pedestrian only zone.

The proposed development will represent a substantial change along River Walk as the visual connection with the river corridor will be less open than at present, however, the enhanced public realm and amenity space along River Walk will provide a high quality and attractive amenity and visual and physical connections to the river will be maintained over the walls and from the elevated viewing platform and fully accessible outer pedestrian ramps.

Landscape and visual effects are likely to be perceived initially as significant and adverse, however the new high quality pedestrian environment will ultimately draw additional pedestrian activity to River Walk and to the river area, and the revised public space will become a positive asset for the town.

#### **View 4**

View 4, **Figure 12.4.1** in **Appendix 21.1** of the EIAR, is also from River Walk approaching the Arklow Bridge and opposite the existing café. The river edge includes a concrete pathway and a low flood defence wall. A buffer space between the wall and carriageway incorporates sections of landscaping, car parking and a small paved area that serves as a spill out area for the café. The floor levels of the café and adjoining buildings are raised and ramps are required to access these premises.

View 4, **Figure 12.4.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the new flood defence wall constructed further into the river channel. The new wall alignment facilitates a substantial increase in pedestrian and amenity space along the river front, and this will be developed as raised terrace areas that are continuous with the overall river front promenade and incorporate raised and flush planters with new tree planting and ground cover landscaping. The carriageway level between the terraces and buildings will be paved as a shared surface, but will also be raised so as to eliminate the need for ramped access to the properties along River Walk. The public space is primarily pedestrian, with private vehicular access only to the apartment building and for café deliveries. The widened River Walk will become an attractive and high quality riverfront space that is a destination along the overall promenade and will support existing businesses at River Walk and catalyse further regeneration. The flood wall is only 1.15m above the elevated terrace level permitting direct visibility of the river corridor and yet incorporates three sections of glazing so as to ensure visual connection for those seated on the terraces.

The proposed development will represent a substantial change along River Walk as the visual connection with the river corridor will be less open than at present, however, the enhanced public realm and amenity space as a destination and gathering point along the promenade will provide an attractive amenity space for the town and contribute to further redevelopment and regeneration along River Walk.

Landscape and visual effects may be perceived initially as moderate and adverse, however the establishment of a new high quality public space will ultimately result in moderate and positive landscape and visual effects.

### **View 5**

View 5, **Figure 12.5.1** in **Appendix 21.1** of the EIAR, is from Bridge Street approaching River Walk and provides an open and attractive view to the north bank and upstream of the Avoca River and of River Walk. The vehicular character of River Walk is apparent and the rear boundary walls of the properties are just out of view. A narrow pedestrian ramp leads from Bridge Street to the concrete walkway along the river bank.

View 5, **Figure 12.5.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the new flood defence wall constructed further into the river channel and facilitating the establishment of a substantial new public space along the river front.

The new terraces areas are contiguous with the overall proposed river front promenade and are elevated so that the flood defence wall is only 1.15m high and facilitates views over the wall to the river corridor. Additionally, sections of glazing are incorporated into the wall so as to ensure visual connections with the river for those seated on the terraces. The terraces include multiple stepped and ramped connections to the lower shared surface carriageway that optimise permeability between the buildings and businesses at River Walk and the river front public space. The terraces also include raised and flush planters with new tree planting and ground cover to further enhance the amenity value of the public space.

The proposed development will represent a substantial change along River Walk however the changed visual relationship with the river corridor will be offset by the establishment of a high quality public amenity space and landscape and visual effects will ultimately be moderate and positive.

### **View 6**

View 6, **Figure 12.6.1** in **Appendix 21.1** of the EIAR, is from the Arklow Bridge looking upstream toward River Walk and illustrates the existing low level of the river edge and the mixed quality and usage of River Walk for both pedestrian and vehicular use. Ornamental planting defined the pedestrian ramp connection to Bridge Street and occasional trees of varying maturity and species are apparent further upstream along River Walk. As the view is taken close to low tide, the gravel beds used by roosting birds are visible within the river channel.

View 6, **Figure 12.6.2** in **Appendix 21.1** of the EIAR, shows the proposed development including new alignment and height of the river edge defined by the new concrete faced wall, with the additional parapet height above the elevated River Walk promenade expressed as a high quality concrete finish with a precast concrete capping and sections of glazing at each of the main terrace areas. The parapet wall leads to the elevated cantilevered viewing platform at the bend in the river further upstream. New tree planting is visible along River Walk.

The scale and extent of the flood defence infrastructure is more readily apparent when viewed from the river channel. It is noted that the view was photographed close to low tide and presents the worst case scenario and the wall be less prominent at higher tide levels. Rip rap will be placed along the river edge where hydrological requirements permit so as to soften the visual appearance of the bottom of the wall where it joins the water. The use of different concrete finishes will also assist in reducing the vertical scale of the wall.

The proposed development will represent a substantial change in the appearance of the river bank as a continuous built element along River Walk replaces a more diverse range of river edge conditions. Landscape and visual effects will initially be perceived as significant and adverse, however this will reduce over time to moderate as the public space along River Walk establishes and the new construction becomes weathered and more established.

### **View 7**

View 7, **Figure 12.7.1** in **Appendix 21.1** of the EIAR, is from the Arklow Bridge looking upstream towards the north bank and Arklow Town Marsh and illustrates the existing riverine character and mixed woodland setting of the river corridor. The view is taken close to low tide and the gravel can be seen just below the water in the foreground together with the row of in channel bushes and vegetation towards the north bank.

View 7, **Figure 12.7.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the removal of the in channel vegetation, extension of the north bank into the river, modifications to the north bank adjoining the Arklow Bridge and one of the three floating roosting platforms.

Post construction, there will be a noticeable change in the existing river bank character and consequent significant adverse landscape and visual effects, however, as the new mixed woodland planting on the extended north bank and the native species rich grass and wildflowers on the embankment become established, the revised landscape will become more visually integrated with the background and landscape and visual effects will become minor and adverse.

### **View 8**

View 8, **Figure 12.8.1** in **Appendix 21.1** of the EIAR, is from the Arklow Bridge looking downstream toward South Quay and illustrates the existing low level of the river edge and the mixed quality and usage of South Quay and the diversity of building types and ages on the Quay. The narrow width of South Quay approaching Arklow Bridge is clearly visible and elements of the existing drainage infrastructure can be seen along the outside of the quay wall. The photograph is taken close to low tide and presents close to the worst case scenario in this regard.

View 8, **Figure 12.8.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the new alignment of the river edge defined by the new

concrete faced wall, with the additional parapet height required for flood defence above the level of South Quay expressed as a high quality concrete finish with a precast concrete capping. New tree planting is clearly visible as a continuous feature along South Quay that will define the new promenade located immediately behind the parapet wall.

As with View 6 of River Walk, the scale and extent of the flood defence infrastructure is more readily apparent when viewed from the river channel. Rip rap will also be placed along the river edge where hydrological requirements permit so as to soften the visual appearance of the bottom of the wall where it joins the water. The same approach to using different concrete finishes as at River Walk will also assist in reducing the vertical scale of the wall.

The proposed development will represent a substantial change in the appearance of the river bank as a continuous built element along River Walk replaces a more diverse range of river edge conditions.

Landscape and visual effects will initially be perceived as significant and adverse, however this will reduce over time to moderate as the new high quality and tree-lined promenade amenity is established the new construction of the flood defence wall weathers.

### **View 9**

View 9, **Figure 12.9.1** in **Appendix 21.1** of the EIAR, is from South Quay near South Green where the cappings of the original quay wall can be seen forming the quay edge and the historic granite mooring posts are located in the grass verge. Young street trees are set within the quayside grass verge at regular spacings and are mostly *Acer platanoides* (Norway Maple) and category C2. The carriageway is wide and there are no footpath on either side of the road. Wide grass verges and extended driveways form the residential side of the roadway.

View 9, **Figure 12.9.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the provision of a new promenade along the river front and the establishment of the parapet section of the flood defence wall up to a height of 1.15m above promenade. New tree planting will be located in the new grass verge between the promenade and the carriageway provide a distinctly pedestrian amenity that is segregated from the carriageway. The parapet will be clad in polished precast concrete panels and profiled cappings such that the inner edge of the parapet is c. 900mm high and rising to 1.15m at the outer edge.

The proposed development will represent a substantial change in the appearance of South Quay however the provision of a dedicated high quality tree-lined public promenade with inherent flood defence will ultimately result in landscape and visual effects that are moderate and positive.

### **View 10**

View 10, **Figure 12.10.1** in **Appendix 21.1** of the EIAR, is from South Quay at the Tyrell slipway and illustrates South Quay becoming narrower towards the slipway and the presence of the original boatyard rail lines set in the roadway and



leading to the slipway. A low flood defence wall is located either side of the slipway and a demountable barriers are in place at the head of the slipway.

View 10, **Figure 12.10.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the provision of a new promenade along the river front, the establishment of the parapet section of the flood defence wall up to a height of 1.15m above promenade and reconfiguration of the carriageway so as to provide continuous pedestrian facilities and landscaped verges along both sides of South Quay. The carriageway at the slipway be paved and the original boatyard rail lines retained and expressed in the paving and the line of the rails will also be expressed in the paving pattern across the promenade to the head of the slipway. Glazing panels will be incorporated within the parapet wall along the head of the slipway so to preserve the historical connection between the former boatyard and the slipway and river. Interpretive panels will be installed along the parapet wall to provide historical information about the boatyard

The proposed development will give rise to landscape and visual effects that are moderate and positive.

### **View 11**

View 11, **Figure 12.11.1** in **Appendix 21.1** of the EIAR, is from South Quay at the Sea Farer's Memorial Garden. The amenity has evolved over time with the help of the local community and is an appropriate an important memorial to those members of the Arklow community who served and were lost at sea. While the amenity has been maintained, it is in part suffering lack of investment and upkeep. It is also located beside an exceptionally wide double road junction that cuts it off from the residential side of the quays. Trees include the Norway Maple at regular spacings along the kerb side as well as a number of ornamental Coryline within the space.

View 11, **Figure 12.11.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the continuation of the proposed promenade along South Quay leading to and connecting with memorial garden. The carriageway and adjoining junction are rationalised and paved as a raised table to as to reduce vehicular dominance and speed and provide a more pedestrian friendly environment. The memorial garden will be repaved using a similar high quality paving material to the promenade and seating, the anchor and interpretive panel will be refurbished or replaced as appropriate. New trees consistent with those of the overall promenade will be planted in the adjacent landscape spaces and the flood defence parapet will be extended along the memorial facing the river channel.

The proposed development will give rise to landscape and visual effects that are moderate and positive.

## **21.3.7 Land and Soil**

With the implementation of the proposed mitigation measures and monitoring, the effect of the proposed development on land and soils is considered to be of negligible magnitude and imperceptible significance during construction and operation.

The significance ranking of ‘imperceptible’ is the lowest ranking available in the NRA (2008) impacts assessment methodology. The majority of potential impacts are considered to be of ‘imperceptible’ significance prior to mitigation. The residual effects during construction are considered for the following features that rank of greater significance than ‘imperceptible’ prior to mitigation.

#### *Trafficability of soils*

It is anticipated that the mitigation measures will reduce the ‘magnitude’ of the potential impact ranking to ‘negligible’ and the residual significance ranking of the potential impact will be ‘imperceptible’.

#### *Loss of geology and soils*

It is anticipated that the mitigation measures will reduce the ‘magnitude’ of the potential impact ranking to ‘negligible’ and the residual significance ranking of the potential impact would be ‘imperceptible’.

The residual significance remains ‘slight’ for loss of geology and soils where dredge is permanently removed from the river bed.

#### *Accidental leaks and spills*

Mitigation measures are proposed to reduce the risk of leaks or spills occurring by adopting measures to avoid leaks or spills occurring and/or to reduce the degree of the potential impact should leaks or spills occur. It is anticipated that the mitigation measures would reduce the magnitude of attribute to ‘negligible’ during all work packages and the residual significance ranking of the potential impact would be ‘imperceptible’. This considers the risk of normal ‘day-to-day’ activities and minor incidents and does not include major accidents which are discussed in **Chapter 18, Major Accidents** of the EIAR.

#### *Encountering known or unknown existing contamination*

Mitigation measures are proposed to reduce the likelihood of encountering and/or disturbing contamination, and accidentally transporting contamination across of beyond the scheme area. It is anticipated that the mitigation measures would reduce the ‘magnitude’ of the potential impact ranking to ‘negligible’ for all work packages and the residual significance ranking of the potential impact would be ‘imperceptible’.

Neutral residual effects are anticipated during operation, with periodical localised and short-term dredging used to prevent the continual accumulation of materials at the gravel trap and debris trap during maintenance activities.

The residual significance ranking of the potential impacts would likely be ‘imperceptible’ to ‘slight’ and in line with Work Package 3.

### **21.3.8 Water**

#### *Hydrology and Flood Risk Management*

With the implementation of the mitigation measures, a imperceptible temporary negative impact will occur during the construction of the first section of the bridge underpinning and new scour slab.

With the implementation of mitigation measures, it is expected that this residual risk can be effectively managed.

There will be no significant residual effect on hydrology and flood risk during construction.

The hydraulic modelling of the proposed flood defences indicates an improved flow regime through Arklow Bridge by restricting flooding along Ferrybank and Dublin Road and along River Walk and South Quay and adjoining streets.

All 19 arches of Arklow Bridge will be underpinned and lowered by 1m which will mitigate against rise in flood levels upstream of the Avoca Bridge. Channel dredging for upstream and downstream of Arklow Bridge by 1m will also improve the flow regime.

Flood defences along North Quay within the Arklow Town Marsh will mitigate flooding of properties along Ferrybank and Dublin Road. Therefore, there will be an overall significant reduction in the existing flood risk following construction of the proposed scheme which will be a moderate medium to long term positive effect.

During operation, river flow will be confined in-channel with a freeboard allowance of 300mm to 600mm above the design flood level for flood defences along River Walk and South Quay on the south bank and along the marsh on the north bank. Therefore, a significant positive residual impact on flood risk is expected during operation of the proposed scheme.

#### *Drainage*

There will be no significant residual effect on drainage during construction.

#### *Water Quality*

With the implementation of the mitigation measures and monitoring measures included in **Chapter 14 Water** of the EIAR, the residual effects on water quality will be imperceptible temporary negative during the construction of the proposed scheme and not cause any deterioration in the overall status of the water quality once the works are completed.

During operation, the proposed scheme will convey fluvial flow (including surface water run-off) in-channel towards the Irish Sea. Through reducing flood risk along north and south bank, pollutants from adjacent properties will not be conveyed to the Avoca River thereby providing a slight short-term positive impact. The collection of sediment at the gravel trap upstream of the Arklow Bridge will allow sediment to be removed at a single controlled location which will have a slight short-term negative impact. Maintenance dredging of the channel will be occasionally required. It is expected that this activity will have a short-term negative impact.

It should be noted that the sheet pile wall constructed as part of the proposed scheme will also serve as advance works for the interceptor sewers to be built as part of the proposed Arklow WwTP Project. It is recognised that once constructed, the proposed Arklow Wastewater Treatment Plant Project would bring about further positive, cumulative effects on water quality.

Overall:

- the residual effect on surface water quality of the affected surface water bodies will be short-term positive impact from the operation of the proposed scheme;
- the scheme will not cause any medium or long-term deterioration in either the overall status or the status of each individual quality element of the relevant water bodies;
- the scheme will not prevent the RBMP objective of protecting/enhancing/restoring the affected water bodies to Good Status and in fact will assist in reaching this objective.

### **21.3.9 Resource and Waste Management**

Following implementation of the mitigation measures, the residual effects are as follows:

- The residual effect of site clearance and demolition waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be slight, negative and short-term.
- The residual effect of land based excavation waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be slight, negative and short-term.
- The residual effect of excavation waste from the riverbed on the capacity of waste management facilities and waste industry trends in Ireland is expected to be slight, negative and short-term.
- The residual effect of general construction waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be imperceptible and short term.
- The residual effect of operational waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be imperceptible and long term.

### **21.3.10 Population and Human Health**

Residual effects during construction are expected, with regards traffic movements, the economy and tourism and amenity. These will range from slight-significant but will be temporary in nature.

During all construction stages, the individual working areas will result in some restrictions and inconvenience to the movement of people and traffic. These

restrictions will be temporary in nature and particularly felt in the immediate vicinity of the proposed working areas. A slight negative but temporary residual effect on local traffic movements is therefore identified during the construction phase of the proposed scheme.

Works on the bridge during the first three summers will occur close to businesses, including the hotel at Bridge Street and cafés on River Walk, with access to the bridge supports being needed from each corner of the bridge. During the construction phase of the proposed scheme, construction traffic movement has the potential to impact on business access and have an economic impact, but this should not be significant. Restrictions on car parking, and the removal of approximately half of the ~80 spaces at the Main Street Car Park during this time, will have an impact on local businesses, although spaces will be maintained for people with disabilities. It is intended that access for deliveries and pedestrians will remain, although occasional disruption will be possible due to construction traffic. A slight negative but temporary residual effect on the local economy is therefore identified during the construction phase of the proposed scheme.

The steps/slipway along River Walk will be demolished during the construction period to facilitate WP4. A moderate negative, but temporary residual effect on amenity is therefore identified at this location. A pontoon will be installed at this location during the operational phase of the proposed scheme.

Existing floating moorings and berths at the pontoon at North quay will be required to be relocated during the construction phase. A significant negative but temporary effect on boat users currently using these facilities is therefore identified.

The construction phase of the proposed scheme is expected to have a residual significant negative but temporary effect (North Quay slip), residual slight negative and permanent effect (Coal Quay slip), residual moderate negative and permanent effect (public slip at Tyrells Yard).

Given that access to the existing slipway and set-down pontoon at Arklow Harbour/Dock will be maintained during the summer months (June-August), a residual moderate negative but temporary effect on river access for amenity purposes is identified at the public slip/ 'set-down' pontoon at Arklow Dock.

There will be moderate-significant negative residual effects on tourism and amenity during the construction phase of the proposed scheme, due the physical presence of construction works and associated restrictions to amenity areas and river access locations, as well as restricted use of the river during WP2. Access to the harbour will be maintained throughout the construction period.

During the construction phase of the proposed scheme, the physical presence of construction works along River Walk and South Quay will reduce the amenity and community use of these areas.

During the construction phase of the proposed scheme, the physical presence of construction works along River Walk and South Quay will reduce the amenity and community use of the following land-parcels.

- Land along River Walk and South Quay- which are used for amenity purposes<sup>3</sup>
- Site Compounds 2 and 6 (Land Parcels No. 127 and 125 respectively)- which are currently open green space and used for amenity purposes.

A temporary, significant negative residual effect on amenity and community-use is therefore identified during the construction phase of the proposed scheme at the above land-parcels.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative effect on amenity and community use at this location is therefore identified during the construction phase.

In the long term, in the operational phase, the reduction in flood risk and investment in the public realm will provide a significant positive effect. The proposed Arklow Flood Relief Scheme will significantly reduce the risk of flooding in the area. This will provide significant economic benefits in terms of avoided flood damage to residences, businesses, utilities and movement and social benefits too in terms of personal movement, safety and health.

Impacts identified in **Chapter 2, Background and Need** of the EIAR that are of particular relevance from a socio-economic perspective include the avoidance of damage to, or functional loss of, buildings and property, damage or disruption to infrastructure and utilities, loss of earnings, loss of retail or commercial income, travel inconvenience and associated costs, and potentially the avoidance of the temporary evacuation of residents.

Likewise, the flood protection measures will reduce the risk of flood damage to tourism amenities in the area such as shops, cafes, restaurants, hotels and guesthouses. This includes the subsequent cost of clean-up and repair operations.

There will also be benefits for residents and businesses from improved access to affordable commercial buildings and property insurance.

As a result, the scheme will have a long-term significant positive impact both for residents, local amenities, tourism and economic activities. The increased flood protection will contribute to securing businesses and jobs in the area. Existing properties will benefit from the greater flood protection and this will also contribute towards attracting additional investment and jobs to the area as properties become more attractive to rent or buy. Areas that might previously have been subject to flood risk or consequent development restrictions will potentially be available for new development and investment.

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<sup>3</sup> Land Parcels (Refer to Appendix 17.1): 114a, 114b, 114c, 118a, 118 b, 119a, 119c, 119d, 119e, 120a, 120b, 120c, 120d, 120 e, 120f, 120g, 120h, 120j, 120k, 120l, 120m, 120n, 121a, 124a, 124b, 124c

The overall impact of the scheme on the local amenity value will be significantly positive and permanent with flood defence measures designed to protect local amenities such as shops and restaurants. The improved public realm along River Walk and South Quay will also result in a significant positive effect on local amenity through the creation of a more accessible and attractive public realm.

A new pontoon will be installed at River Walk as part of the proposed scheme, resulting in a positive effect on amenity at this location. The operational phase of the proposed scheme is however expected to have a residual slight negative effect (Coal Quay slip), residual significant negative effect (public slip at Dock) and residual moderate negative effect (public slip at Tyrells Yard) on river access for amenity purposes.

The key benefit of the proposed flood relief scheme will be to provide much needed flood protection to existing homes and businesses in Arklow town. This positive benefit will also extend to future developments and new infrastructure in Arklow town. While it is acknowledged that, following construction of the proposed scheme, access to the Avoca River may be restricted at the locations outline above, any removal or restriction of access to the river was considered integral to the design and implementation of the flood relief scheme.

The Avoca river will be significantly improved from a navigational point of view, following the dredging of the same.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative residual effect on amenity and community use at this location is therefore identified during the operational phase.

No adverse effect during the construction phase on human health is predicted. Significant positive impacts in terms of public health and socio-economic benefits with resultant benefits for human health are predicted on the basis of having an effective flood relief scheme.

### 21.3.11 Material Assets

#### *Land and Property Ownership*

As outlined in **Chapter 17 Material Assets** of the EIAR, land acquisition will occur in advance of the construction phase of the proposed scheme. As land-take will be permanent, all likely effects identified in **Appendix 17.1** of the EIAR are residual effects.

**Appendix 17.1** of the EIAR includes an assessment of the likely significant effects on land and property ownership during both the construction and operational phase of the proposed scheme. Where land is acquired from private

landowners, moderate negative effects on property ownership are identified. Access to all existing residential properties, will be maintained at all times during the construction of the proposed development. This may require temporary alternate access arrangements at some locations.

The proposed scheme also involves the removal of a material asset- the existing above-ground piping from the former IFI site now owned by Crag Digital Avoca Ltd (Echelon Data Centres). The section of pipeline within the FRS planning boundary will be removed and will be disposed of at a licenced waste facility. Removal of the pipes will occur during the construction phase but will not be reinstated prior to operation. A permanent but significant negative effect on this material asset is therefore identified.

The steps/slipway along River Walk will be demolished during the construction period to facilitate WP4. A moderate negative, but temporary residual effect on this material asset is therefore identified. The steps/slipway at this location will be replaced by a new pontoon in the operational phase.

During WP2 (Q2-Q3 2026), the pontoon located in the North Quay side of the Avoca River, will effectively be rendered inaccessible from the water as dredging will be ongoing during this period. Any boats using the existing berths at the pontoon will be required to relocate in order to facilitate the river dredging. Similarly, the existing floating mooring facilities within the Avoca River will be removed to facilitate the dredge works and any boats using these will also be required to relocate for the duration of the river dredging. A negative residual effect on both the mooring facilities and the berths is therefore identified during construction.

However, as the berths and moorings will only be rendered inaccessible during the river dredging works, (Q2-Q3 2026), these effects are considered to be slight negative and temporary in nature. All mooring and berth facilities will be reinstated following completion of construction.

The proposed bridge underpinning works (WP1), river dredging (WP2), as well as the construction of the flood defence walls along South Quay (WP4) will render the existing Coal Quay slip permanently inaccessible, from the commencement of works (Q1 2023) until the slip is eventually demolished as part of WP4. However, it should be noted that this slip is currently in disrepair and is not extensively used by the public. A permanent slight, negative significant residual effect on this material asset is therefore identified.

The existing slipway at North Quay will be used to facilitate RA3 during WP2 and, as such, will be rendered inaccessible for the duration of those works (May-September in-river works 2026)). A temporary, significant negative residual effect on this material asset is therefore identified during WP2 of the construction phase.

The proposed river dredging, as well as the construction of the flood defence walls along South Quay will also render the existing Tyrells Yard slip permanently inaccessible, from the commencement of the South Quay element of WP 4 (Q2 2025). It should be noted however that currently, access to the river via this slipway is not continuously maintained due to the demountable barrier currently in place. Nevertheless, a permanent moderate, negative significant



residual effect on this material asset is therefore identified as a result of the loss of this river access.

The existing public slipway at Arklow Harbour/Dock will be inaccessible for a temporary period during the construction of the flood defence walls (WP4). Similarly, the 'set-down' pontoon at Arklow Harbour will be rendered inaccessible from the land at this time. River access will likely only be unavailable at these locations for the short period in which the flood walls are being constructed at Arklow Harbour/Dock and not for the entire duration of WP4, or indeed for the full timeframe for the South Quay element of the work between Q2 2025-Q1 2026. A significant negative, but temporary residual effect on this material asset is therefore identified during the construction phase of the proposed scheme. It is proposed that closure of the existing slipway and set-down pontoon at Arklow Harbour/Dock be avoided during the summer months (Jun-Aug). When temporarily inaccessible, the slipway at North Quay will be available for use depending on its suitability for users.

Land acquisition will occur in advance of the construction phase of the proposed scheme and remain in place throughout operation. As land-take will be permanent, all likely effects identified in **Appendix 17.1** of the EIAR are residual effects.

During the operational phase of the proposed scheme, access to, and use of the pontoon along the North Quay, as well as the floating moorings in the river, will be re-instated and the river dredging will give rise to an improved estuarine environment for moorings, in the operational phase. The existing slipway at North Quay will be reinstated in the operational phase of the proposed scheme.

The Coal Quay slipway will be removed. However, it should be noted that this slip is currently in disrepair and is not extensively used by the public. A permanent slight, negative significant residual effect on this material asset is therefore identified.

The existing slipway at South Quay (Tyrells Yard) while maintained during the operational phase, will be rendered inaccessible. It should be noted however that currently, access to the river via this slipway is not fully maintained due to the demountable barrier currently in place at this location. As such, a permanent moderate negative residual effect on this material asset is identified.

The existing slipway at Arklow Harbour is to be maintained during the operational phase of the proposed scheme. However, a demountable flood defence is to be installed at this location. Access arrangements will be put in place to allow interested parties to gain access to the slipway during operation, as required. The existing pedestrian access to the 'set-down' pontoon at Arklow Harbour will also be restricted. A permanent slight negative residual effect on these material assets are therefore identified.

At River Walk, a new floating pontoon will replace the demolished steps/slipway, resulting in a positive effect on amenity at this location.

The proposed scheme will provide protection from the 1% AEP fluvial flood event and the 0.5% coastal flood event. This will result in very significant positive

impacts in a number of areas such as tangible and intangible flood damages, financial loss, extensive community disruption, health and safety issues and development restrictions as described below. Damages due to flooding include direct damages to residential and non-residential properties, commercial buildings, agricultural lands, damage to infrastructure and utility assets and the cost of emergency services will be avoided for all flood events up to the design event.

### *Electricity and Lighting*

As previously outlined, the proposed scheme will interact with the overhead electricity cables along River Walk and South Quay and as such, these will be relocated or diverted underground as part of the enabling works for WP1 and WP4 and remain in place throughout operation. The ESB Overhead cables which are located within Arklow Town Marsh will be repositioned during the enabling works of WP5 to avoid the flood embankment. Overhead services which branch off the main line will be diverted underground.

All diversions will occur during the construction phase but remain in place throughout operation. A permanent, but not-significant residual construction phase effect on electricity infrastructure is therefore identified.

There may be some temporary disruption to services during the construction phase of the proposed scheme. However, these will be planned and communicated to the public in advance and carried out in accordance with the relevant codes of practice.

The existing decorative and bridge lighting will be removed along River Walk and South Quay during construction. A slight-negative residual effect on lighting features is therefore identified during construction. Temporary construction lighting will be provided.

All diversions will occur during the construction phase but remain in place throughout operation. A permanent, but not-significant residual operational effect on electricity infrastructure is therefore identified.

Lighting that is removed during the construction phase will be reinstated during operation. No residual effects on electricity or lighting are therefore anticipated during the operational phase of the proposed scheme.

### *Telecommunications*

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on telecommunications during the operational phase of the proposed scheme are anticipated.

### *Gas*

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on gas infrastructure during the operational phase of the proposed scheme are anticipated.

#### *Water Supply Infrastructure*

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on water supply infrastructure during the operational phase of the proposed scheme are anticipated.

#### *Sewer Network and Drainage Infrastructure*

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on the sewer network and drainage infrastructure during the operational phase of the proposed scheme are anticipated.

#### *Additional Material Assets*

The existing drainage channel in Arklow Town Marsh will be diverted to the east of the proposed embankment. This diversion will occur during the construction phase but remain in place throughout operation. A permanent, but not-significant effect on material assets is therefore identified

### **21.3.12 Major Accidents and Disasters**

The risk of a major accident and/or disaster occurring during either the construction or operational phases of the proposed development is considered low.

### **21.3.13 Climate**

In relation to climate, over the lifespan of the proposed development, no significant effects are predicted.

## **21.4 References**

CIRIA (2015) *Environmental Good Practice on Site Guide, 4th Edition*

DoEHLG (2006) *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.*

European Communities (2001) *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001*

Irish Water (2018) Arklow Wastewater Treatment Plant Project.  
<https://www.water.ie/planning-sites/arklow-wastewater/docs/environmental-documents/volume-2/Arklow%20WWTP%20EIA%20-%20Chapter%2010%20Noise%20Vibration.pdf>