5 Construction Strategy

5.1 Introduction

This chapter describes the strategy to construct the proposed scheme. The design, operation, maintenance and decommissioning elements of the proposed scheme are described separately in **Chapter 4**, *Description of the Proposed Scheme*.

This chapter has therefore been structured to describe the following:

i. Indicative duration and phasing during the construction period;
ii. Land use requirements to support the construction of the proposed scheme;
iii. Likely activities required to prepare the site and undertake the enabling works to support the construction of the proposed scheme;
iv. Methodologies to undertake demolition and construction activities;
v. An overview of anticipated construction traffic, relevant diversions, access points and haulage routes which will be used during construction;
vi. An overview of employment and typical site management measures associated with the construction of the proposed scheme; and
vii. The Construction Environmental Management Plan to describe the minimum requirements which will be imposed on the contractor(s). (Refer to **Appendix 5.1** for the CEMP).

Please note that figures referenced in this chapter are either provided within the body of this chapter or provided in **Appendix 5.2** *Chapter 5 Figure*s of the EIAR.

5.2 Indicative Duration and Phasing

5.2.1 Work Packages

It is expected that the scheme will be delivered through the following five Work Packages (WP):

- **WP 1:** Lowering the floor of Arklow Bridge including bridge underpinning, bridge remedial works and scour protection works. Bat tubes and bird nest boxes will also be installed under the bridge deck during and upon completion of works.
- **WP 2:** Channel dredging upstream and downstream of Arklow Bridge. Trimming of vegetation along the north bank of the river between the debris trap and Arklow Bridge. Works will include an extension of the north riverbank with planting, installation of roosting platforms upstream of Arklow Bridge and local raising of riverbed adjacent to the flood defence walls as a refuge for birds and other fauna who may use the riverbanks.

- **WP 3:** Construction of debris and gravel traps with associated maintenance access ramp. Bat tubes will also be installed on the downstream face of the debris trap piers.
- **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. Installation of bat tubes along the flood defence walls. Public realm and landscape features including footpaths, terraces, planters, lighting and seating will be constructed along the working area.
- **WP 5:** Construction of flood defence earth embankment and flood defence wall on north (left) bank along the eastern side of Arklow Town marsh including stormwater drainage diversion works. Upon completion of the earth embankment, the green space on the dry side of embankment will be planted with trees. Landscaping will be carried out on the river side of the flood defence wall.

The construction strategy described below sets out how the proposed scheme will be constructed in its entirety. Whilst the general requirements detailed in this chapter will be followed, the contractor, when appointed, will ultimately be responsible for the sequencing and implementation of the Works in a safe and secure manner and in accordance with all statutory requirements and the measures outlined in this EIAR and in the NIS.

5.2.2 Programme, Duration and Phasing

5.2.2.1 Overview

An indicative programme has been prepared for the construction phase of the proposed scheme in order to enable a reasonable and robust assessment of potential environmental effects. This is presented in **Figure 5.1** of **Appendix 5.2** *Chapter 5 Figures*.

Subject to obtaining planning approval and foreshore consent, construction of the proposed scheme is expected to take approximately 54 months to complete; over a 5-year period. Works are expected to commence in 2022 and continue to 2026[1].

The indicative programme for the construction phase of the proposed scheme as presented in **Figure 5.1** is envisaged as follows:

- Undertaking of enabling works, such as archaeological resolution and diversion of electricity cables in the marsh, commencing in Quarter (Q)2[2] of 2022 (Y1)

[1] It should be noted that throughout this EIAR, these years are sometimes described in the format Year (Y)1- Y5. Where Y1-2022, Y2-2023, Y3-2024, Y4-2025, Y5-2026.
[2] Where Q1= January- March, Q2=April- June, Q3=July-September, Q4=October-December

- Undertaking of construction works, by means of five individual 'work packages' as described in **Section 5.2.1**, commencing in Q1 of 2023 (Y2) with completion and demobilisation expected in Q4 of 2026 (Y5). Refer to **Section 5.2.2.2** for further detail on the indicative programme for each WP.

5.2.2.2 Programme Duration and Phasing

The construction duration of the proposed scheme is estimated at 54 months based on the reasonable worst case assessed herein. However, work will not be continuous over this period as the in-channel works will be restricted to the summer months (approximately from May to September inclusive).

Subject to obtaining the relevant planning/foreshore approvals, works are expected to commence in Q2 of 2022. These works will entail some enabling works which will include underwater archaeological resolution, diversion of electricity cables in the marsh and archaeological resolution in the area of the proposed embankment and adjacent maintenance track.

It is planned that the work packages will be executed in the sequence shown in **Figure 5.1** in **Appendix 5.2** *Chapter 5 Figures.* The sequencing of the work packages is selected to ensure that there is no increase in the flood risk to Arklow Town during construction. A number of work packages are expected to run in parallel in order to conform to constraints imposed by seasonal restrictions on instream works and to reduce the overall programme duration.

Construction activities within the river channel will be subject to seasonal restrictions as noted above and will only be undertaken during the fisheries open season (May to September inclusive).

The first phase of WP1 works is expected to commence in Q1 of 2023 with construction activity on the southern section of Arklow Bridge including underpinning works, bridge superstructure remedial works and the upstream and downstream scour protection works. The instream elements will run from May to September inclusive of 2023 (Y2). One underpinning option, if chosen, will be carried out from bridge deck level. This option could be undertaken in March to May, prior to the summer period. In 2024 (Y3), the WP1 works will be undertaken on a third of the arches of the Bridge, on the southern side. This will allow for continued in-channel flow through the northern two-thirds of the arches of the Bridge. On completion of the instream works in Q3 of 2023, the river levels will be lower due to the increased conveyance capacity and so allow flood defence walls and drainage works to commence in 2024 without increasing flood risk.

The second phase of WP1 works will commence in the Q1 of 2024 and run until Q4 of 2024. River flows would be facilitated through the deeper southern third of Arklow Bridge.

The third phase of WP1 will start in Q1 of 2025 and run until Q4 of 2025 with demobilisation following by the end of 2025. River flows would be facilitated through the southern two-thirds of Arklow Bridge for the third phase.

It is envisaged that construction of the flood defence walls, and drainage works on the south bank will not affect the bridge underpinning works on the northern third of Arklow Bridge.

WP2, the river dredging works, will be subject to the seasonal constraints and so will be carried out during Q2 and Q3 (May to September) 2026 on completion of WP1. Upstream and downstream dredging will be carried out at the same time, to ensure there is sufficient time in the summer period to complete it, and to coordinate with WP5 works.

WP3 will also be subject to the seasonal constraints and will commence in Q2 of 2023. Debris and gravel trap works will progress from the North bank to the South bank with completion by the end of Q3 in 2023. These works will reduce the flood risk caused by blockage of the bridge arches.

Upon completion of the first phase of the bridge works (WP1), WP4 will commence upstream of Arklow Bridge in Q2 of 2024 and will continue downstream of Arklow Bridge, along South Quay and at Arklow Dock, with completion planned by Q1 of 2026. A section of the flood defence wall on South Quay immediately downstream of Tyrells slipway will be omitted to allow access to the river for the dredging works, WP2, in Q2 and Q3 of 2026.

Finally, WP5 will run in parallel with WP 2, with completion expected in Q4 of 2026. Construction of the wall element will be undertaken when the upstream dredging has been completed. Access to the river for the upstream dredging will be through construction compound 3 (SC3). Refer to Section 5.3.2 below. The embankment construction will proceed once sufficient dredged material with the slightly elevated chloride content is available from the downstream dredging (See Section 5.5.2.1 below for an overview of the classification of the dredge material).

Testing and commissioning of the various work packages will be carried out upon completion of each work package.

Coordination of all construction activities in all work packages will be critical in order to optimise the use of shared work areas and access routes, and because some work packages have to be completed within the stipulated timeframes due to the seasonal constraints.

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

Archaeological examination of the dredge material by metal detection and visual inspection will also be undertaken. 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 of a percentage of the dredge material. This percentage will be agreed with the National Monuments Service and the National Museum of Ireland. A higher percentage of such examination is anticipated for dredge material from archaeologically sensitive locations upstream of Arklow Bridge and adjacent to Arklow Bridge itself.

A lower percentage is anticipated for dredge materials from downstream of Arklow Bridge, where the archaeological potential is lower. Archaeological examination of the dredge material at the various construction compounds is detailed further in **Sections 5.3.2** and **5.5.2** below. Refer also to **Chapter 11**, *Archaeology, Architectural and Cultural Heritage,* which addresses the archaeological sensitivity of the works areas.

Construction activities may have to be coordinated with the Arklow Wastewater Treatment Plant (WwTP) Project, depending on the construction programme for that project and the details of any agreement between OPW and Irish Water with respect to the delivery of the two projects.

The overall construction programme will be reviewed on commencement and completion of each work package.

5.2.3 Interaction with the Arklow Wastewater Treatment Plant Project

Irish Water is developing the proposed Arklow WwTP Project as described in **Chapter 2**, *Background and Need for the Scheme*. As currently proposed, the proposed Arklow WwTP works will overlap with the proposed flood relief scheme in terms of construction areas, structural components and possibly construction programme. The common work locations are set out in **Table 5.1** below.

Table 5.1: Common Work Areas

Location	Flood Relief Scheme Works	WwTP Works
Arklow Bridge	Underpinning of southern abutment and all piers, lowering of floor of 18no arches (Arch 1 to be reinstated and Arch 19 will not have any works), scour protection slab upstream and downstream of bridge and remedial works to the bridge.	Underpinning of southern abutment and the 2no southern piers of the bridge and lowering of floor of 2no southern arches. Construction of interceptor sewer beneath the southernmost arch of the bridge.
River Walk	Construction of flood defence walls, stormwater drainage and public realm works. Access for bridge works, river dredging works and for construction of gravel trap and grit trap.	Construction of interceptor sewer, manholes and stormwater overflow.
South Quay	Construction of flood defence walls, stormwater drainage and public realm works. Access for bridge works and river dredging.	Construction of interceptor sewer including widening of South Quay for approximately 265m downstream of Arklow Bridge and temporary drive and reception shafts for tunnelling works.
Ferrybank	Construction of flood defence wall and associated drainage. Access for bridge works, river dredging and construction of flood defences on north bank of river.	Construction of interceptor sewer including temporary drive and reception shafts for tunnelling works.

There are also common works required by both schemes. These are:

- Construction of new sheet piled quay wall along South Quay for approximately 260m downstream from Arklow Bridge, including the widening of South Quay;
- Underpinning of southern abutment and 2no southernmost piers of Arklow Bridge and lowering of floor of 2nd arch from the southern end of the bridge.
- Construction of new sheet piled wall along River Walk for approximately 100m upstream of Arklow Bridge including local widening of River Walk.

The promoters of the FRS, the Office of Public Works and Wicklow County Council, and Irish Water; the promoter of the WwTP Project, have agreed that whichever scheme commences first will carry out the common works. In addition, should the FRS commence first, the section of WwTP interceptor sewer that overlaps the FRS works area along River Walk and South Quay will be constructed as part of the FRS works.

Arklow WwTP common works are described in each work package under **Section 5.5** below. It is understood that the construction of the proposed Arklow WwTP will be undertaken in a particular sequence in order to mitigate against any increased flood risk.

At the time of writing, the outline programme that has been provided by the WwTP design team shows the following key work sequence:

i. Detailed design by the contractor (8 months)
ii. Interceptor Sewer (8 months)
iii. Installation of temporary causeway along River Walk and South Quay to facilitate the construction of the sheet piled wall
iv. Installation of the tunnel shafts along South Quay and Ferrybank (15 months)
v. Tunnelling of the interceptor sewer along South Quay and across the channel towards North Quay (1 year)
vi. Open cut construction of the interceptor sewer (9 months)
vii. Removal of temporary causeway in River Walk and South Quay
viii. Civil works for WwTP at Mill Road site (22 months)
ix. Installation of process, mechanical and electrical equipment as well as site landscaping at the WwTP Mill Road site (1 year)
x. Testing and commissioning (7 months)
xi. The proposed commencement date for the Arklow WwTP construction contract is currently expected to be Q3 2021.

All works on Arklow Bridge, in particular those requiring traffic management and out of hours works, will be coordinated with the proposed Arklow WwTP Project where necessary, to ensure that disruptions to the public are minimised. It is envisaged that collaborative working practices will also be required for works on South Quay and River Walk in order to minimise disruption to businesses and local residents.

It is anticipated that works for both projects would not proceed at the same time in the same area as only one contractor would have possession of the site, a significant part of the works on River Walk and South Quay will be carried out either by the WwTP contractor or the FRS contractor, not by both, and access for a second contractor would be extremely compromised. It is not foreseen that works between the two schemes will significantly overlap in other areas. However, both project teams and the contractors will collaborate on management plans (including environmental and construction traffic management) prior to implementation and commencement of the works. At No. 1 Ferrybank, either FRS (use of site compound 3) or WwTP (construction of tunnel shaft) would have to complete their works in advance of the other project.

The Office of Public Works and Wicklow County Council will continue to endeavour to minimise the in-combination effect of both schemes. A memorandum of understanding (MoU) agreement has been signed by both promoters, see **Appendix 2.1** for details. The potential for cumulative effects from the two schemes has been addressed in **Chapter 20** of this EIAR, with the reasonable worst case considered in terms of such effects for each environmental aspect. This assessment is based on the currently available information from the proposed Arklow WwTP Project and the outline programme provided by Irish Water.

5.3 Land Requirements

5.3.1 Overview

Construction of the proposed development will require land take to accommodate temporary construction activities in addition to the land take required to accommodate the permanent elements of the proposed development (as described in **Chapter 4,** *Description of the Proposed Scheme***).**

Land will also be required to accommodate construction compounds. The site boundary required to accommodate all of the above is illustrated in **Figure 5.2** which is in **Appendix 5.2** *Chapter 5 Figures* and in **Drawing No. 1065** of **Appendix 4.1**.

5.3.2 Working Areas, Construction Compounds and River Access Locations

Construction compounds have been, as much as possible, located close to the working areas. Eight construction compounds were initially assessed and of these, six are considered to be suitable and viable to support the construction activities. In addition, it is expected that local offices, welfare facilities and storage of materials will be accommodated in suitable locations within the working areas.

River access will be required for WP1 (bridge works), WP2 (channel dredging works), WP3 (gravel and debris traps) and WP4 (flood defence walls and drainage). These will be located at existing slipways where available and at other suitable locations. They are described further in **Section 5.5** below.

The construction compounds (SC) and river access (RA) locations are illustrated in **Figure 5.3** of **Appendix 5.2** *Chapter 5 Figures.*

The various construction compounds are described further below.

A construction compound (SC1) will be located in a green area off the Dublin Road at the edge of Arklow Marsh and will accommodate site offices and welfare facilities for construction employees, as well as providing an area for material storage. This compound will facilitate the construction of work packages WP1 and WP5 including all associated temporary works on site. It will also be used for archaeological examination of dredged material during WP2 (consisting of slightly elevated chloride content) and excavated inert estuarine material during WP1 and WP3. The dredged material will also be stockpiled at SC1 for reuse in the embankment construction during WP5.

A second construction compound (SC2) will be located at the southern side of Arklow Sports Field, opposite the Bridgewater Shopping Centre parking facility along Mill Road. It will be used for work package WP2 for the archaeological examination of hazardous and non-hazardous contaminated dredged material. Following archaeological examination, the material will be transported offsite to its final destination.

Site compound (SC3) will be located at a vacant site at the southern end of Ferrybank (No. 1 Ferrybank) and it will be used to enable river access for WP1 and WP2, to accommodate local welfare facilities for WP1 and to provide site access for WP5. It will also be used as a lay-down area for trucks exiting the river to allow water drain from dredged material, which is likely to contain sediment due to the movement of construction traffic through it to the river and, 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.

A construction area at the municipal carpark off Main Street (SC4) will accommodate site office and welfare facilities for construction employees, as well as providing an area for construction material storage for WP3 and WP4. The compound will also serve as an access route to Riverwalk during WP1 Phase 1.

The fifth site compound (SC5) will be located at an open area at the eastern end of North Quay (North Pier). It will be used for the management of surplus dredged material arising from the WP2. This will include stockpiling of materials with slightly elevated chloride levels for archaeological examination and onward off-site transportation.

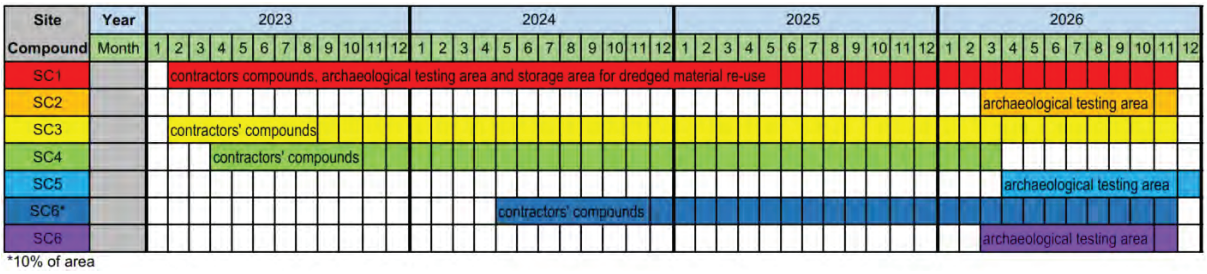
Site compound six (SC6) is situated in the green area along South Beach Road. It will accommodate site offices, welfare facilities, temporary storage and relevant activities for WP4. It will also be used for site offices, welfare facilities and temporary storage for WP2 and for archaeological examination of inert dredged material for WP2.

The uses and their duration of the site compounds are summarised in the **Table 5.2** and **Table 5.3** overleaf.

Table 5.2: Uses of Site Compounds

WP Ref	Contractor's Compound	Dredged Material Archaeological Examination	Material Temporary Storage	Comment
WP1	SC1, SC3	SC1	SC1	Dredge material from WP1; reuse in embankment
WP2	SC6, SC3	SC1	SC1	Slightly elevated chloride dredge material; Reuse in embankment
WP2		SC2	NA	Haz. & Non-hazardous contaminated dredge material prior to removal offsite
WP2		SC5	SC5	Slightly elevated chloride dredge material; temporary storage prior to removal offsite
WP2		SC6	NA	Inert dredged material prior to removal offsite
WP3	SC4	SC1	NA	Inert dredged material prior to removal offsite
WP4	SC4	NA	NA	Works along River Walk
WP4	SC6	NA	NA	Works along South Quay
WP5	SC1	NA	SC1	Dredge material from WP1&2; reuse in embankment

Table 5.3: Duration of site compound use



The working areas are shown in relevant figures in the following sections. The working areas will be made available to the contractor for use during the construction period. The working areas will be secured and will not be accessible to the public for the duration of the construction works in the relevant areas.

The construction of the flood defence walls, and drainage works in WP4 will be linear in nature, requiring a number of working areas within the planning boundary.

5.4 Preparatory Works

5.4.1 Site Investigations and Surveys

An advance standalone archaeology testing and resolution contract is planned for Arklow Marsh and the Avoca River. (Refer to **Chapter 11** *Archaeological, Architectural and Cultural Heritage* for further details).

It is also anticipated that further site investigation works will be undertaken and that a standalone contract for the site investigations will be procured during the detailed design stage of the project. This will include borehole sampling at suitable locations along the proposed flood defence walls and the storm drainage network route between Arklow Dock and South Quay area. The same environmental controls that will apply to the main works (as detailed in *Chapters 7-20* of this EIAR) will also apply to the advance archaeological contract, advance site investigations and surveys. ESB diversions in Arklow Marsh will be carried out as part of the advanced works.

The appointed construction contractors will also carry out their own site investigations to better inform their own working methods including temporary works designs.

Pre-construction surveys for Invasive Alien Species (IAS) will be carried out within the site boundaries for each specific work package, prior to commencement of any works on site for that work package and prior to the establishment of site compounds. Where IAS is identified, it will be treated in accordance with the IAS management plan. The Invasive Alien Species Management Plan (IASMP) has been included in the CEMP, in **Appendix 5.1** of this EIAR.

Pre-construction dilapidation and condition surveys will be carried out of all buildings and structures adjacent to the proposed works.

5.4.2 Utilities and Services

The majority of construction phase impacts on the existing utilities networks for the proposed scheme will occur in the vicinity of the construction sites at the proposed flood defences, drainage and bridge underpinning works. There may also be some impacts at the temporary site compounds and laydown areas. Where feasible, the flood defences and drainage pipes will be located in areas with fewer known utilities to minimise impacts and avoid any service disruptions.

Overhead and underground utilities which may be temporarily impacted during the construction works are as follows:

- Overhead and underground electricity cables
- Street lighting
- Water mains
- Foul and surface water sewers
- Gas pipelines

- Telecommunications cables, and
- Utilities owned by private parties.

These are described in **Section 5.5** below. The most likely impacts will be due to planned utility diversions as described in the Work Packages below. No service disruption is anticipated in relation to any drainage diversions required. It is possible that a short-term disruption to water, gas, telecommunications and electricity supply will occur when these diversions are being undertaken.

It is intended that significant diversions of electricity cables will be carried out in advance of the construction contracts such as in the Arklow marsh area in order to allow the construction activities to be undertaken in a safer environment and to reduce the risk of delay to the construction programme.

It will be noted that the contractor will be responsible for agreeing, with the utility owner, the method and timing of all connections and diversions to existing utilities that are required in advance of the commencement of any works. The specific details of all permanent diversion works will be set out and agreed by the contractor in advance with the utility provider. The likely significant effects on utilities are considered in **Chapter 18,** *Material Assets*.

5.4.3 Site Preparation and Enabling Works

Site preparation and enabling works are required for various aspects of the proposed development, in order to prepare the working areas identified for construction activities. Services and site lighting for construction compounds and working areas are described in detail under Section 5.6 below. Preparation of site compounds will be required as follows:

Site Compound 1 (SC1): Access will be provided from the Dublin Road. Topsoil will be stripped and stockpiled on site for reuse during reinstatement following completion of the permanent works. Archaeological monitoring and resolution will be carried out as set out in **Chapter 11** *Archaeological, Architectural and Cultural Heritage.* A suitable geotextile membrane will be placed over the ground and hardcore material will be placed over the geotextile to form a trafficable surface for construction plant. Site offices and storage units will be placed on the hardcore area on the north east corner adjacent to Circle K filling station. Water supply, wastewater and electrical services will be installed. The contractor will liaise with main service providers i.e. ESB and Irish Water for connectivity. A 2.4m high security fencing and gates will be erected around the site. Solid hoarding will be used along the eastern and southern boundaries at a minimum. Arklow Marsh pNHA will be protected by temporary low bund constructed of impermeable material. It will be situated along the western boundary and will redirect surface water run off to a siltation trap 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. The area for archaeological examination and stockpiling will be installed with suitable dust control measures such as use of water tankers to suppress any dust formed. Dust monitoring will be carried out throughout the use of the construction compound. Upon completion of works, SC1 will be landscaped as detailed in **Appendix 4.2**, *Public Realm Drawing* Nos. 305 and 306.

Site Compound 2 (SC2): Access will be provided from Mill Road. 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. A 2.4m high security fencing and gates will be erected around the site. The fencing will be in the form of solid hoarding. Suitable dust control measures such as use of water tankers to suppress any dust formed will be adopted around stockpiled material. Dust monitoring will be carried out throughout the use of the construction compound. SC2 will be returned to its current condition by levelling and reseeding the grass area.

Site Compound 3 (SC3): Access will be provided from the roundabout at Ferrybank/North Quay. The ground will be levelled to form an even surface. A 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. A 2.4m high security fence and gates will be erected around the site. 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 in **Appendix 4.2**.

Site Compound 4 (SC4): Access will be provided from Main Street through Kinsella's Lane and the carpark. Egress from the site will be via River Lane. Site offices and storage units will be placed on the carparking area. Water supply, wastewater and electrical services will be installed. A 2.4m high security fencing in the form of solid hoarding and gates will be erected around the site. A total of 42 parking spaces including two age friendly and one disabled will be lost for a period of 36 months between Q2, 2023 until Q2, 2026. Any parking spaces for the disabled or age friendly spaces impacted will be relocated within the existing carpark. SC4 will be reinstated to its existing condition on completion of the permanent works.

Site Compound 5 (SC5): Access will be provided from North Quay. A low bund, comprising precast concrete traffic barriers or similar, will be constructed around the perimeter of the site to retain the dredged material. Suitable dust control and monitoring measures will be installed around dredged material stockpile. SC5 will be reinstated to its existing condition on completion of the permanent works.

Site Compound 6 (SC6): Access will be provided from South Quay. The carpark facilities (north and south) will be maintained for public use for the duration of works between Q3, 2024 until Q4, 2026. A 2.4m high security fence and gates will be erected around the site.

A plant known as *Equisetum Moorei* (Moore's Horsetail) has been reported as being adjacent to the site (Refer to **Chapter 10** *Biodiversity* for further details). A 5m buffer zone will be created between the working area and the 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.*

Archaeological examination of inert dredge material will be on the southern half of the site compound. Topsoil will be stripped from the grass area and stockpiled on site for reuse during reinstatement following completion of the works. A suitable geotextile membrane will be placed over the ground and suitable hardcore material will be placed over the geotextile to form a working surface for the archaeological metal detecting of the dredged material. A low bund, comprising precast concrete traffic barriers or similar, will be constructed around the perimeter of the site to retain the dredged material. Suitable dust control and monitoring measures will be installed around examination and monitoring perimeter.

Contractor's compounds comprising site offices, storage units and staff parking will be placed on the northern third of SC6. Water supply, wastewater and electrical services will be installed. The contractor will liaise with main service providers i.e. ESB and Irish Water for connectivity. A 2.4m high security fence and gates will be erected around the compound. The fencing will comprise solid hoarding.

SC6 will be reinstated to its existing condition on completion of the permanent works.

The following enabling works will typically be required at each of the site compounds and the working areas:

i. Obtain appropriate approvals for construction traffic management requirements for diversions and haulage routes (refer to **Section 5.5** for further details);

ii. Establish and implement appropriate surface water management procedures as outlined in **Chapter 14** *Water*;

iii. Establish and implement appropriate procedures for monitoring of instream water levels in accordance with the requirements set out in **Section 14.6** of **Chapter 14**, *Water* of the EIAR;

iv. Construct temporary site access roads to working areas, site compounds and material laydown areas from the existing road network where required and install trafficable surfaces where required (Refer to **Section 5.5** for further details);

v. Install secure hoarding and fencing (2.4m in height as a minimum) that will remain in-situ for the duration of the construction works (Refer to **Section 5.5** for further details);

vi. Install services and site lighting for work packages and site compounds is described in **Section 5.6** below;

vii. Undertake vegetation removal and stripping of topsoil as required in relevant working areas, site compounds and material laydown areas;

viii. Install vehicle set down and material storage areas (typically by laying down hardcore to a depth of approximately 200mm) in relevant working areas;

ix. Install the main construction compounds to accommodate site offices and welfare facilities for construction activities (Refer to **Section 5.5** for further details);

x. Undertake all required utility and services diversions and provide a connection to the local sewerage network, water distribution and electrical network as required;

xi. Installation of flooding mitigation measures is as described in **Section 14.6** of **Chapter 14**, *Water*.

The overall working area that will be made available for the construction of the project is indicated in **Figure 5.2** of **Appendix 5.2** *Chapter 5 Figures*. Individual working areas for each work package are described in **Section 5.5**. The working areas will be secured and not accessible to the public for the duration of the construction contract. The contractor will not be permitted to use any other lands outside of these areas.

5.5 Indicative Construction Methodologies

5.5.1 Work Package 1: Bridge Underpinning, Bridge Remedial Works and Scour Protection

5.5.1.1 Introduction and Overview

Arklow Bridge is a nineteen arch masonry stone bridge which spans the Avoca River in Arklow and dates from the mid-1700s. The overall span of the bridge is approximately 152m while the spans of the individual arches vary from 4.55m to 6.97m. **Figure 5.4** below shows Arklow Bridge.

Figure 5.4: Arklow Bridge

The original width of the bridge was approximately 6.52m but the bridge was widened on the upstream side to 11.33m in the 1960s. The widened section of the bridge is supported on three columns adjacent to each pier. The widths of the piers are typically 1.5m to 1.9m except for the central pier which is approximately 10m wide.

The proposed works are shown on **Drawing Nos. 1004** to **1010** inclusive in **Appendix 4.1** and are described fully in **Chapter 4** *Description of Proposed Scheme*. They are summarised below.

It is proposed to lower the floor of Arches 2 through to 18 of the 19 bays of Arklow Bridge by 1.0m to which, along with associated upstream and downstream river dredging, will increase the conveyance through the bridge and hence, reduce flood levels upstream of the bridge. The riverbed at Arch 1 will be reinstated at its current level to accommodate an interceptor sewer forming part of Arklow WwTP while Arch 19 will not be altered. Refer to **Section 5.5.4** for the construction of proposed third party interceptor sewer.

An earlier historic apron to prevent scour under the bridge which takes the form of large interlocking stones is still existent in many places. This will be lost when the riverbed is lowered in Arches 2 through to 18. Arch 1 will be reinstated to its current state reusing any existing stones which can be recovered in adequate condition i.e. largely undamaged. Any stones recovered in arches 2 to 18 will be incorporated into the proposed concrete scour slab. Arch 19 is to be retained as is and will not be lowered, with its original interlocking stones retained.

The lowering of the floor of the bridge will require underpinning of the southern bridge abutment and the bridge piers and the reconstruction of the scour protection slab at the new riverbed level.

Minor defects have been identified on the older bridge as described below.

Vegetation is growing on the bridge. This may lead to deterioration of the masonry joints in the bridge over time. Refer to **Figure 5.5** below.

Figure 5.5: Vegetation Growing on Arklow Bridge

The arches of the masonry bridge were previously coated with a cementitious material – probably through guniting or shotcreting. This coating has hairline cracks and more serious cracks in places. Refer to **Figure 5.6** below.

Figure 5.6: Cracking of Bridge Soffit Repairs

The mortar joints of the old masonry work have deteriorated significantly in places with loss of mortar. This could lead to further deterioration if not addressed. Examples can be seen in **Figure 5.7** below.

Figure 5.7: Masonry Joint Defects

5.5.1.2 Working Area and Access Locations

The working area associated with the bridge works is shown in **Figure 5.8** of **Appendix 5.2** *Chapter 5 Figures.*

Dedicated construction access to the Avoca River for the bridge works will be required at four locations as described below:

- RA1 – North Quay upstream of the bridge; accessed from the roundabout at Ferrybank/North Quay junction through SC3.
- RA2 – North Quay downstream of the bridge; accessed from North Quay.
- RA6 – River Walk upstream of the bridge; accessed from Main Street via Kinsella's Lane (entrance) and River Lane (exit).
- RA7 – South Quay downstream of the bridge at the location of the partly damaged/unused slipway known as Coal Quay (see **Figure 5.9** below); accessed from South Quay. A temporary access track into the river will be constructed from the existing damaged slipway material and imported hardcore material for vehicles to access riverbed level. Access to the river will be maintained during WP1 and decommissioned during WP4 downstream works. The Coal Quay slip will be demolished as part of the permanent works for WP4. Demolition will be in the form of removal of all existing damaged slipway material and imported hardcore material from riverbed level. Further details are described in **Section 5.5.4** below.

Figure 5.9: Location of RA7 at Coal Quay slip

5.5.1.3 Construction and Demolition Waste and Surplus Excavated Materials

The breakdown of Construction and Demolition Waste and Surplus Excavated Materials is set out in **Table 5.4** below.

Table 5.4: Volumes of Construction and Demolition Waste and Surplus Excavated Material – WP1

Material Classification	Estimated Volume (m^3)	Destination
Concrete	1,888	Off site to approved facility
Inert	3,568	Archaeological testing at SC1; off site to approved facility
Non-hazardous with slightly elevated chloride concentrations	2,918	Archaeological testing at SC1; stored on site for reuse in embankment.
Total	8,374	

5.5.1.4 Traffic Management

The appointed contractor(s) for the proposed scheme will prepare a detailed Construction Traffic Management Plan covering all stages of construction. This is detailed in **Chapter 7** *Traffic and Transportation*. Any individual contractor's traffic management plan will need to reflect any other live traffic management plan prepared by the other contractors associated with the project. The Construction Traffic Management Plan(s) will demonstrate how pedestrians, cyclists and motorised vehicles can pass by the working areas safely and that measures are in place which ensure traffic operates in as an efficient manner possible. The Construction Traffic Management Plan(s) will require agreement with both Wicklow County Council and An Garda Síochána.

Construction safety signs and signals will be installed at identified locations in accordance with the construction traffic management plan. This will coordinate the direction and flow of traffic at the WP1 working areas. The contractor will be responsible for the maintenance of all construction safety signs and signals. Affected traffic routes will be communicated to Arklow residents by the contractor in advance of commencement of works as per communications procedure described in **Appendix 5.1,** *CEMP*.

An outline of the Construction Traffic Management Plan is provided in **Section 7.8.1** of **Chapter 7,** *Traffic & Transport*.

The specific traffic management measures for WP1 are as follows:

i. Traffic controls on Arklow Bridge to accommodate grouting works from the bridge deck. This will require single lane traffic on a shuttle stop/go system and will impact on traffic travelling north and south over the bridge. It is envisaged that the grouting works will be carried out during night-time (2100hrs to 0700hrs), hence noise levels at night will have to be considered so that there is no major impact on local residents. Refer to **Chapter 9**, *Noise and Vibration*, for further information. Pedestrian traffic will be maintained.

ii. Where underpinning construction is to be carried out from the deck of Arklow Bridge (see Option 3 detailed in **Section 5.5.1.5** below), single lane traffic on a shuttle stop/go system will be required and will impact on traffic travelling north and south over the bridge. It is envisaged that the works will be carried out during night-time (2100hrs to 0700hrs), hence noise levels at night will have to be considered so that there is no unacceptable impact on local residents. Refer to **Chapter 9**, *Noise and Vibration*, for further information, Pedestrian traffic will be maintained.

iii. Traffic controls on Arklow Bridge to accommodate bridge superstructure remedial works that may be carried out from a mobile work platform sited on the bridge deck, typically between the hours of 21:00 and 07:00 the following day. This will require single lane traffic on a shuttle stop/go system and will impact on traffic travelling north and south over the bridge. Pedestrian traffic will be maintained.

iv. Traffic management will be required at each of the river access locations to allow construction traffic merge with traffic on the public roads.

v. Overall, approximately 1,900m^3 of broken concrete (existing scour slab) and 6,500m^3 of estuarine material from the riverbed will be removed from Work Package 1 (WP1) work area over the three summer periods (See Table 5.4 above). The estuarine material will be brought to SC1 for archaeological examination (metal detection and visual inspection) prior to transportation off site. Concrete and other cementitious material will be brought to WP1 for the construction of the new scour protection slab and other ancillary works. In addition, riprap (boulders and broken rock) will be brought to WP1 for erosion protection of the new surfaces and the edges of the scour protection slab.

Figure 5.10 in **Appendix 5.2** *Chapter 5 Figures* indicates the construction traffic routes, highlighted in blue, serving SC1 and SC3 and the river access points for Work Package 1.

5.5.1.5 Enabling Works

Temporary enabling works will be required to facilitate the construction of the permanent works which are part of WP1. These are described as follows:

i. Bat Tubes

4 No. double bat tubes will be placed in each of the three northern arches prior to commencing works at the southern end of the bridge. On completion of the southern section of bridge works, 4no double bat tubes will be placed in each of the three southern arches prior to commencing works in the second summer. Refer to **Appendix 10.3** of **Chapter 10** *Biodiversity* for further details on the mitigation measures required as part of the Bat Derogation Licence.

ii. ***River and Site Compound Access Locations*:**

Temporary access to the Avoca River will include demolition of existing kerbs, clearing and grubbing the existing surfaces, placing and compaction of suitable hardcore material (from suitable local quarries) to form ramps from the public roads. Minor works will be required for the establishment of the entrances to the site compounds and the river access locations. The contractor will be required to carry out the following works:

- Removal of existing kerbs, paving and small amounts of excavation prior to replacement of paving and realigned kerbs. **Figure 5.11** below indicates existing kerb line affected along South Quay.

Figure 5.11: Existing kerbs along South Quay

- Temporary relocation of existing pedestrian footpaths and pedestrian crossings
- Establishment of traffic calming measures.

Relocation and/or protection of utilities and services will be carried out as follows (Refer to **Drawing 1061** in **Appendix 4.1**):

- Lighting which illuminates the Bridge arches will be removed and will be reinstated after completion of bridge works. **Figure 5.12** overleaf indicates existing lighting illuminating along Arklow Bridge,
- Overhead cables adjacent to river access locations on South Quay and River Walk will be temporarily relocated to underground.
- Decorative lighting will be removed until the scheme is completed when a decision will be made by Wicklow County Council as to its future use.

Figure 5.12: Lighting illuminating Arches on Arklow Bridge

- Water level monitoring equipment will be removed for the duration of the works and reinstalled on completion.
- Sewer outfalls will be extended to outside of the access ramps and haul roads. (Arklow WwTP project will permanently relocate these outfalls).
- Protection of ESB Sub-station, charging points and mini-pillars along River Walk
- Establishment of site entrance barriers and hoarding
- Relocation of affected parking bays along South Quay and River Walk.

iii. Construction of In-channel Access Roads:

Construction access roads within the river channel will be formed 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 reduce the impact on the work area. Access roads will be approximately 4m wide where it meets the public road, it will be constructed of protective material on its outer layer for suitable protection/ containment of the road edge to prevent scouring from the river. This will allow sufficient space for trucks to stop and allow water to drain from excavated material before the trucks enter the public road. The access roads will be located so as to allow sufficient working space around the permanent works and will be 500mm above high tide level.

Existing inert river gravels, from within the footprint of the designated work area, will be used where available to form the in-channel access roads. This will be supplemented with imported clean hardcore when required. All machinery will be cleaned prior to entering the river and will be monitored for leakages or spills as highlighted in **Appendix 5.1** *CEMP*.

Figure 5.14 of **Appendix 5.2** *Chapter 5 Figures* indicates the Phase 1 (first summer) in-channel access road, extending 60m from South Quay. River flow will be through the arches of the northern two-thirds of the bridge, while the Phase 1 works are underway.

Figure 5.15 of **Appendix 5.2** *Chapter 5 Figures* indicates Phase 2 (second summer) in-channel access road, 110m from north bank. River flow will be through the arches of the southern third of the bridge, which will have a lowered riverbed level and scour slab, while the phase 2 works are underway.

Figure 5.16 which is in **Appendix 5.2** *Chapter 5 Figures* illustrates Phase 3 (third summer) in-channel access road, 60m from north bank. River flow will be through on the arches of the southern two-thirds of the bridge, complete with a lowered riverbed level and scour slab, while the phase 3 works are underway.

During these works, the contractor will monitor water level and maintain the in-channel access roads on a regular basis. Flow through the bridge arches will be maintained, and the contractor will remove any restrictions and /or debris encountered.

iv. *Bunding around the Bridge for grouting and underpinning and demolition of existing scour protection*:

Bunds will be required to be constructed on the riverbed to isolate work areas from the river and from high tides. These will generally be formed from impermeable material or permeable material with an impermeable liner such as heavy-duty polythene. Any imported material will be clean and free of any contaminants.

The bunds will be high enough to prevent overtopping during mean high tides. Where existing river gravels are used in the bund construction, archaeological monitoring will be in place.

As described in **Section 5.2.2** above, the bunded area will be sufficient to allow works to be carried out over approximately one third of the bridge length in any one summer season with the bunded area progressing from south to north. Works for the southern third of the bridge will be accessed from the south bank while works for the middle and northern thirds will be accessed from the northern bank. This will allow river flows to continue along the remainder of the river channel and bridge. The structural integrity of the bunds will be checked and inspected on a regular basis.

Upon completion of the underpinning for each phase stated above, demolition of the existing scour protection will be carried out through concrete breaking measures, typically pneumatic & hydraulic breakers. Noise and vibrations will be monitored during this period. Broken concrete and estuarine material will be collected via excavators onto dump trucks and transferred to a suitable disposal facility.

v. ***Dewatering during Installation of Bunds:***

Bunds will be installed on a suitable formation. The water within the bund will be electro-fished to ensure all fish are removed and released into the Avoca River in advance of dewatering. Dewatering will typically be achieved by using a series of sumps and submersible pumps. Discharge from the dewatering process will be passed to a suitably sized propriety sediment removal system located within the bund before discharge to the Avoca River. The diesel pumps and settlement tanks will be located within bunded areas as and when required. Refer to **Figure 5.13** below for a typical sediment removal system.

Figure 5.13: Typical sediment control system

Any disturbance of riverbed materials, for reuse in the bunds, will be monitored by a licensed archaeologist (refer to **Chapter 11** *Archaeological, Architectural and Cultural Heritage* for details).

Otherwise, clean, hardcore material will be imported for the purpose. The toe of the access roads will be constructed with a silt trap system to be maintained during construction.

All temporary works will be removed by excavator and dump truck at the end of each summer work period and re-established where necessary at the commencement of the following summer work period. All works impacting on sediment levels in the river will be limited to 10 hours per day to allow 14 hours over a full tidal cycle for water to be cleared. Water quality will be monitored on an on-going basis upstream and downstream of Arklow Bridge as described in **Chapter 14, '***Water*'.

5.5.1.6 Construction Process

The Bridge will be underpinned using one of four possible methods. These are 1) traditional underpinning, 2) micro piling from riverbed level, 3) mini-piling from road (bridge deck) level or 4) reinforced concrete wall with extensive formation improvement under each pier. A combination of options may be utilised depending on the specific ground conditions found at each pier (Refer to **Drawing Nos. 1007-1010** of **Appendix 4.1**). Options 2, 3 and 4 will require a reinforced concrete wall to be constructed around the perimeter of each pier from the existing masonry stone level to the new concrete scour slab level. Four double bat tubes will be permanently installed on the upstream face of the three southern and northernmost arches upon completion of WP1. Refer to **Appendix 10.3** of **Chapter 10** *Biodiversity* for further details on the mitigation measures required as part of the Bat Derogation Licence.

All of the underpinning options will require grouting works as described below. The estimated overall duration of construction activities in WP1 is 36 months between Q1 2023 and the end of 2025. The construction works will be undertaken in a number of phases as follows:

1. **Grouting of Bridge Piers, Pier Foundations and the underlying Natural Materials beneath Formation Level**

   Grouting will involve the drilling of holes using an Odex system and installation of temporary steel casings to support the holes. Once the holes are drilled, grout injection will be preceded by water flushing to determine if there are any paths through to the face of the historic masonry. Flushing with water will also establish any paths that might allow grout to escape into the water and cause a pollution incident. Any routes found will be plugged with mortar appropriate to the historic masonry.

   A tube will then be installed in the hole and grout will be introduced under pressure through the tube from the bottom of the hole upwards. Grouting will be carried out from the bridge deck for the piers and areas immediately beneath the piers.

   Grouting will also be carried out from riverbed level for areas adjacent to the piers below riverbed level. The grouting will be carried out to a depth of approximately 2-3m below the existing riverbed level. 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. **Drawing 1006** in **Appendix 4.1** illustrates proposed grouting works at bridge piers.

2. Underpinning of Arklow Bridge

Four methods are set out for the underpinning of Arklow Bridge. This is to give flexibility to a contractor to select the construction methods to best suit the exact nature of the materials that are found in the bridge piers and in the formation during the grouting works. These are described below.

i) Option 1 – Traditional Underpinning

Traditional underpinning will comprise the removal of existing natural material below the existing formation level of each abutment and pier in a phased manner from the underside of each pier to a depth of approximately 1.5m below existing bed level and replaced with concrete. The work will be carried out from the existing bed level. Grouting will be utilised under the arches to control ground water and support the sides of the excavations.

It is expected that the underpinning will be carried out in two stages with the first stage taking a row of pins down to 800mm below existing bed level and the second stage taking a second row of pins from the underside of the first row of pins to the final formation level. The dimensions of each pin will be approximately 1.0m wide by 0.8m long by half of the pier depth (0.7m - 0.9m approximately).

The depth will be limited to 0.9m for the wider central pier. Construction of pins will be staggered to avoid working adjacent to a recently constructed pin. The proposed traditional underpinning details are illustrated on **Drawing No. 1007** of **Appendix 4.1**.

ii) Option 2 – Micro-piling from Riverbed Level

Micro-piling will be carried out from riverbed level. Rotary drilling will be used to form a hole approximately 200mm diameter. Reinforcement and grout will be installed in each hole. Approximately 70no. micro-piles will be installed around the perimeter of each pier except for the larger central pier which will require up to 140 micro-piles. The top of the micro-piles will be encased in a reinforced concrete ring beam. **Figure 5.17** illustrates the micro-piling option and details of micro-piling are indicated in **Drawing No. 1008** of **Appendix 4.1.**

Following the completion of the micro-piling and the lowering of the bed level, the face of the micro-piles will be clad with concrete to a depth of approximately 400mm below the new riverbed level.

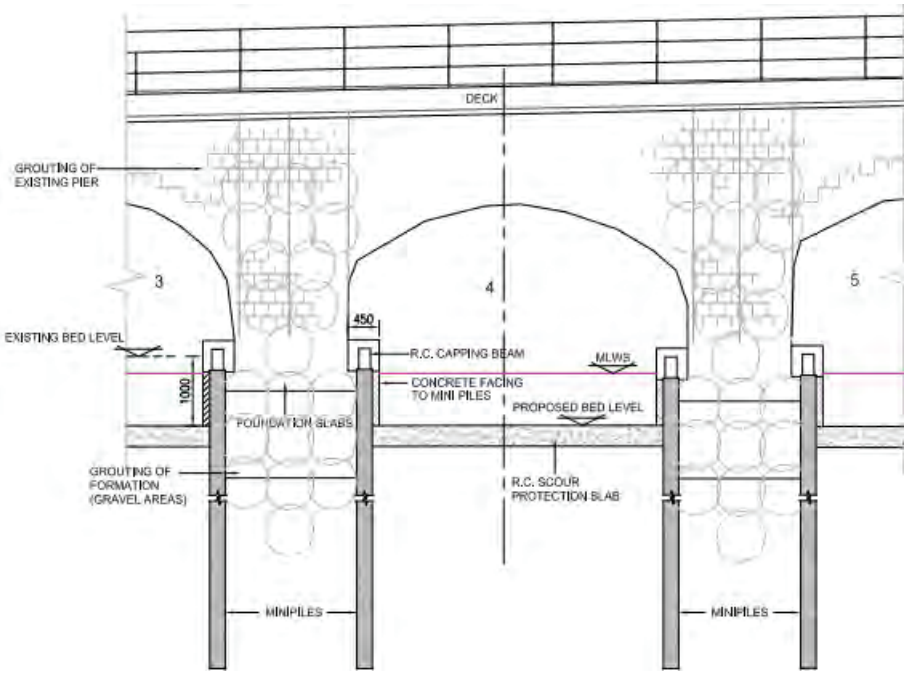


Figure 5.17: Micro-piling option (extracted from **Drawing No. 1008**) Not to scale.

iii) Option 3 – Mini-Piling from Bridge Deck Level:

Piling will be carried out from bridge deck (road) level. It will comprise the boring of 250mm diameter holes and the placing of reinforcement and concrete in the hole. The piles will be founded approximately 10m below existing riverbed level. Approximately 12no. piles will be constructed at each pier except for the larger central pier where approximately 24no. piles will be required.

Following the completion of the piling and the lowering of the bed level, the face of the material below pier level would be clad with concrete to a depth of approximately 400mm below the new bed level in a similar fashion to the underpinning i.e. the natural material would be excavated to a depth of 300mm from the face of the existing pier and replaced with concrete. **Figure 5.18** illustrates mini-piling of a bridge pier from deck level. Details of mini-piling are indicated in **Drawing No. 1009** of **Appendix 4.1.**

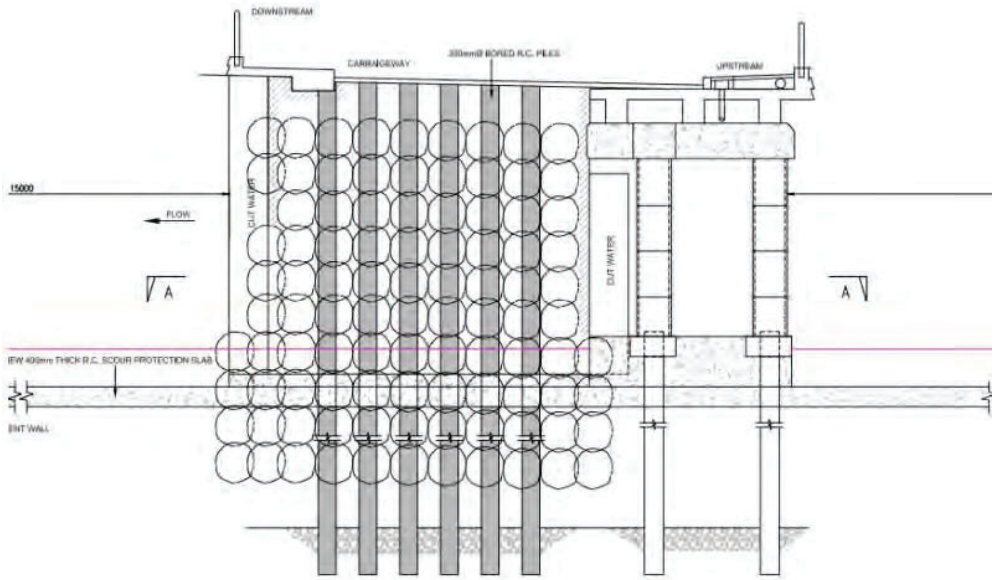


Figure 5.18: Mini-piles from bridge-deck Level (extracted from **Drawing No. 1009**) Not to scale.

iv) Option 4 – Extensive Formation Improvement

Where the soils at formation level are suitable, extensive grouting will be used to increase the bearing capacity of the pier foundations and take the load from the piers to a suitable level. The riverbed is then reduced to formation level for the concrete scour protection and a reinforced concrete (RC) wall will be constructed around the perimeter of each pier from the existing masonry stone level to 400mm below the proposed bed level. **Figure 5.19** overleaf illustrates underpinning by formation improvement and a RC wall around each pier. Details of this option are indicated in **Drawing No. 1010** of **Appendix 4.1.**

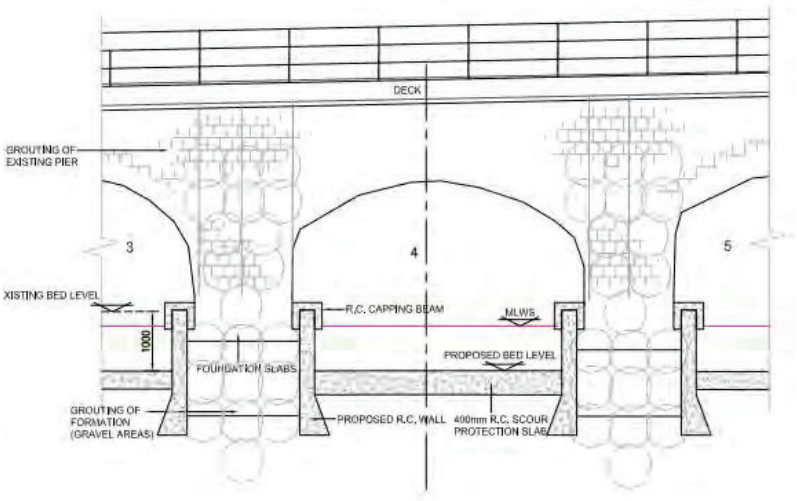


Figure 5.19: Underpinning by foundation improvement with RC wall around each pier option (extracted from **Drawing No. 1010**).

3. Lowering of the Floor of Arklow Bridge:

Lowering of the bed level will comprise the demolition of the existing concrete slab. Demolition will be carried out in the summer periods described above through conventional breaking methods (hydraulic percussion). The contractor will monitor noise and vibration levels on the bridge and surrounding vicinity. *Chapter 9 Noise and Vibration* describes the acceptable noise and vibration levels for all work packages. The existing slab will be excavated including the existing riverbed to a depth of approximately 1.4m below the existing bed level. Excavated material will be transported to SC1 for archaeological examination and, subsequently, will be transported to a designated soil recovery facility, if it cannot be reused on site. The concrete waste will be transported to demolition waste recovery facility along with all other demolition material.

4. Scour Protection of Arklow Bridge:

To ensure against potential long-term effects from scour of the riverbed, suitable protection of the piers is required. A concrete scour protection slab of 400mm thickness will be constructed. The slab will have a toe (600mm deep) at the upstream and downstream extents of the slab and will be finished at the proposed bridge floor level.

Riprap will be placed along the upstream and downstream edges of the slab to prevent erosion of the natural bed material at the interface with the new concrete slab. **Figure 5.20** overleaf illustrates the scour protection detail. Details of the scour protection is indicated in **Drawing Nos. 1006-1010** of **Appendix 4.1.**

5. Remedial Works to Arklow Bridge

Works to the masonry of the historic part of Arklow Bridge will include repairs to the previously applied gunite on 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 will be 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 underneath 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.**

Scaffolding and/or aerial work platforms (AWP) will be required to gain access to the bridge superstructure and the soffits of the bridge arches. The scaffolding will be erected from the riverbed or suspended from the bridge superstructure. The AWP will operate from the bridge deck as per the example in **Figure 5.21**.

Figure 5.21: Aerial Mobile Platform

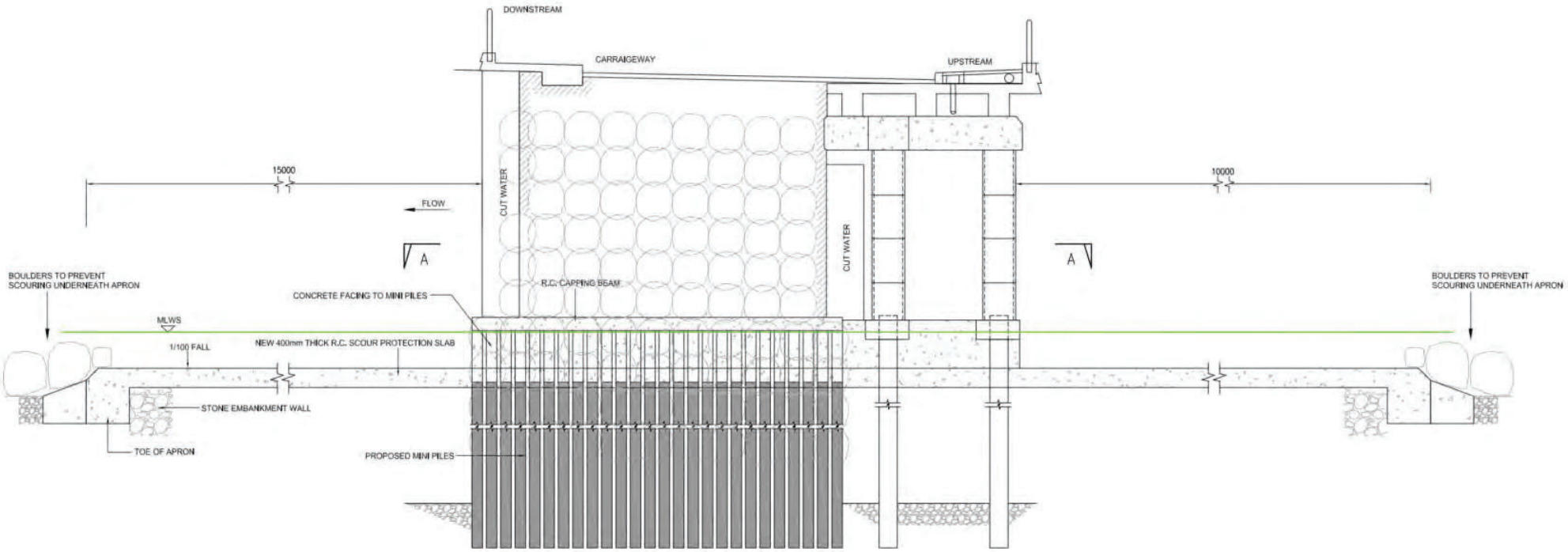


Figure 5.20: Scour Protection detail (extracted from **Drawing No. 1008**. Refer to **Drawing Nos. 1006-1010** for details of scour protection) Not to scale

5.5.2 Work Package 2: Channel Dredging

5.5.2.1 Introduction and Overview

Channel dredging works are proposed to lower the level of the riverbed in the Avoca River for 320m upstream and 520m downstream of Arklow Bridge. In general, the riverbed will be 1.0m lower at Arklow Bridge and taper to existing bed levels at the upstream and downstream extents. The dredging will extend to within 2m of the existing riverbanks or proposed river walls, as applicable. The depth of dredging will typically vary from approximately 1.2m at the channel edges to zero in the centre. Dredging at a number of high points will extend to 2.6m. The average depth of dredging will be 0.4m. The edge of the dredged areas along the north and south banks will be protected from scour and erosion through the placement of riprap along the excavated surface.

Trees and low-lying branches that lie within the flood flow within the works area will be trimmed back to avoid impacting on flood flows and catching debris floating on the river.

An extension of the northern riverbank, adjacent to the realigned drainage channel, will be constructed as mitigation for the removal of small in-river vegetated islands in the river during dredging. Suitable trees will be planted as specified in **Appendix 4.2** *Landscape Design and Public Realm.* Three roosting platforms will be installed approximately 35m upstream of Arklow Bridge.

Monitoring by a licensed archaeologist will be carried out for all dredging. As noted previously, archaeological examination of a portion of the dredged material by metal detection and visual inspection will be undertaken. The dredged material will be transported to the construction compounds prior to removal offsite (refer to Table 5.5 below). This archaeological examination will be based on a percentage of the dredge material. The percentage will be agreed with the National Monuments Service and the National Museum of Ireland. A higher percentage of such monitoring is anticipated for the dredged material from archaeologically sensitive locations upstream of Arklow Bridge and adjacent to Arklow Bridge itself. A lower percentage is anticipated for the dredged materials from downstream of Arklow Bridge, where the archaeological sensitivity is less. Refer to **Chapter 11** *Archaeological, Architectural and Cultural Heritage* for details.

During the operational stage, channel maintenance will follow a similar methodology as the capital dredging described above. Further details on channel maintenance are provided in **Section 4.6.2** of **Chapter 4** *Description of the Proposed Scheme*.

5.5.2.2 Working Area and Access Locations

The dredging works will commence on completion of the works to underpin Arklow Bridge and the construction of the scour protection slab. The working area and river access locations are shown on **Figure 5.22** of **Appendix 5.2** *Chapter 5 Figures*.

The proposed works are shown on **Drawing Nos. 1003** and **1010** to **1020** inclusive in **Appendix 4.1.**

The working area for the river dredging works will comprise two distinct dredging areas as well as river access points for archaeological examination and temporary storage of dredged material. These are shown on **Figure 5.22** of **Appendix 5.2** *Chapter 5 Figures.*

River access for the dredging works will be as follows:

- RA1 – North bank upstream of the bridge; accessed through SC3 from the roundabout at Ferrybank/North Quay junction.
- RA2 – North bank, downstream of the bridge; accessed from North Quay. Existing hardcore material in channel at RA2 will be used to form the River Access.
- RA3 – North bank, downstream of the bridge, at the location of the existing slipway; accessed from North Quay.
- RA8 – South bank downstream of the bridge immediately downstream of the existing slipway (Tyrell's boatyard); access will be created by demolition of an existing section of wall approximately 2m downstream of existing slipway and re-built to new height as described in WP4 below.

The above river access locations will be used by the dredging contractor for access to working areas. The dredging process is described in **Section 5.5.2.5** below. Dredged material will be either 1) transported directly off site; 2) to designated site compounds for archaeological examination and subsequently transported for reuse/disposal off site; 3) re-used for the extension of the north riverbank; or 4) transported to SC1 for reuse in the construction of the embankment and maintenance track (WP5).

Dedicated construction access will be required to the site compounds SC1 from the Dublin Road, SC2 along North Quay and Mill Road, SC5 along North Quay and SC6 along South Quay/South Beach Road.

5.5.2.3 Surplus Excavated Materials

A dredge material management study has been undertaken, the results of which are presented in **Appendix 15.2.** The study included an interpretation of the ground conditions of the proposed dredge material which informed the dredge material management options assessment. The results of the study as presented in Table 5.5 below indicate that bulk of the proposed dredge material will comprise of inert natural sands and gravels, with a small proportion of the dredge material comprising of a surface layer of fill (silty riverbed with fill material containing anthropogenic material). The natural sands and gravels will be suitable for reuse within the scheme and/or offsite. The fill material was identified on the south bank upstream of Arklow Bridge. Some of this fill material will require disposal to a hazardous licenced facility and the remainder of the fill material will require disposal to a non-hazardous licenced landfill.

Some of the dredged material sampled downstream of Arklow Bridge had natural slightly elevated chloride concentrations, likely due to saline intrusion given the tidal influence on this section of river.

Temporary stockpiling of this material is likely to allow natural reduction in chloride concentrations sufficiently so this material could be deemed to be inert (subject to verification testing). The proposed reuse/disposal of the dredged material is further discussed in **Chapter 15,** *Resource and Waste Management*.

The breakdown of Surplus Excavated Materials is set out in Table 5.5 below.

Table 5.5: Volumes of Surplus Excavated Material – WP2

Material Classification	Estimated Volume (m3)	Destination
Inert estuarine material	37,577	Off site to approved facility
Inert estuarine material	17,367	Archaeological testing at SC1 or SC6; off site to approved facility
Material with slightly elevated chloride concentrations	9,882	Archaeological testing at SC1; stored on site for reuse.
Material with slightly elevated chloride concentrations	3,900	Archaeological testing at SC5; off site to approved facility once tested for acceptance
Hazardous and Non-hazardous contaminated material	4,200	Archaeological testing at SC2; off site to approved facility
Hazardous and Non-hazardous contaminated material	4,200	Off site to approved facility
Total	**77,126**	

5.5.2.4 Traffic Management

Traffic management will be required at the various access locations and associated streets serving these locations.

Overall, it is estimated that approximately 77,126m^3 truckloads of dredged material will be removed from the river, based on the use of 15 tonne dump trucks, generating a significant amount of traffic. Smaller trucks will be required to access River Walk.

Approximately 9,882m^3 of dredged material (including slightly elevated chloride content dredge material) will be brought to SC1 for reuse in the construction of the embankment and maintenance track (WP5). It is expected that this material will be brought via RA1 and Ferrybank to site compound SC1 where it will be archaeologically tested and stockpiled for reuse.

In addition, approximately 4,200m^3 of dredged material (including hazardous and non-hazardous dredged material) will be brought to SC2, 3,900 m^3 to SC5 (including slightly elevated chloride content dredge material) and 17,367m^3 to SC6 (inert material) for archaeological examination (metal detection and visual inspection).

The balance of 41,777m^3 will be removed directly offsite. Refer to **Table 5.4** above and **Chapter 15**, '*Resource and Waste Management'* for details of destinations for these materials.

River access for upstream dredge works will be restricted to RA1. Downstream dredge works will be accessed via RA8, RA3 and RA2. Pedestrian footpaths and pedestrian crossings along South Quay and North Quay will be temporarily relocated where necessary to facilitate construction traffic accessing the river.

As noted previously in **Section 5.5.1.4** above, the appointed contractor(s) for the proposed scheme will prepare a detailed Construction Traffic Management Plan covering all stages of construction. Any individual contractor's traffic management plan will need to reflect any other live traffic management plan prepared by the other contractors associated with the project. The Construction Traffic Management Plan(s) will demonstrate how 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 Construction Traffic Management Plan(s) will require agreement with both Wicklow County Council and An Garda Síochána.

Construction safety signs and signals will be installed at identified locations in accordance with the traffic management plan. This will coordinate the direction and flow of traffic at the WP2 working areas. The contractor will be responsible for the maintenance of all construction safety signs and signals. Affected traffic routes will be communicated to Arklow residents by the contractor in advance of commencement of works as per communications procedure described in **Appendix 5.1,** *CEMP*.

The details of the Construction Traffic Management Plan are provided in **Section 7.8.1** of **Chapter 7,** *Traffic & Transport*.

Figure 5.23 of **Appendix 5.2** *Chapter 5 Figures.* illustrates the affected construction traffic routes, highlighted in blue, associated with the dredging works.

5.5.2.5 Enabling Works

Enabling works will be required to facilitate the construction of the permanent works which are part of WP2. Where possible, enabling works established as part of WP1 will be retained for WP2 e.g. RA1 and RA2. In addition, RA3 and RA8 will be used. Boat moorings in the river will be removed and replaced subsequently. The mooring pontoon on the north bank downstream of Arklow Bridge will be retained during construction. The enabling works are described as follows:

i. River Water Quality Monitoring:

River water quality monitoring will be carried out for a period of twelve months in advance of the commencement of the river dredging works to establish a baseline for water quality. Parameters to be monitored will include suspended solids, dissolved oxygen, temperature, pH, turbidity and BOD_5.

During the course of the dredging 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.

ii. River and Site Compound Access Locations:

Temporary access to the Avoca River will include demolition of existing kerbs, clearing and grubbing the existing surfaces, placing and compaction of suitable hardcore material to form ramps from the public roads. Minor works will be required for the establishment of the entrances to the site compounds and the river access locations. The contractor will be required to carry out the following works:

- Establishment of traffic calming measures.
- Temporary relocation of existing pedestrian footpaths and pedestrian crossings.
- Relocation and/or protection of utilities and services.
- Establishment of site entrance boundaries and hoarding.
- Relocation of affected parking bays along South Quay.

iii. Construction of Temporary Haul Roads:

Temporary haul roads (minimum 4m wide) within the river channel will be constructed adjacent to both riverbanks along the extent of channel to be dredged and also across the channel by the debris trap as indicated in **Figure 5.24** *of* **Appendix 5.2** *Chapter 5 Figures.* The temporary haul road will extend across the channel from north bank to south bank with steel/ concrete pipes installed in the haul road to convey river flow downstream. Trucks carrying dredged material will be monitored for leakages or spills as highlighted in *Appendix 5.1 CEMP*.

Existing inert river gravels from within the footprint of the designated siteworks boundary will be used where available to form the temporary haul roads. All disturbance of river gravels will be monitored by a licensed archaeologist. Otherwise, imported hardcore material will be used for the purpose. The temporary haul roads will be removed as the dredging progresses. Temporary haul road will be situated 2m away from constructed flood defence wall along River Walk.

5.5.2.6 Construction Process

The estimated duration of the dredging works is 5 months during Q2 and Q3 (the summer season) of 2026. As noted in Table 5.5 above, approximately 35,349m^3 of the dredged material will be archaeologically tested at designated site compounds. Dredged material will be tested for contaminants and stored for a 2-week period for verification purposes prior to archaeological examination. Archaeological testing will be carried out by spreading the dredged material in 200mm layers where it will be scanned by metal detector as well as visually examined by a licensed archaeologist.

Tested dredged material will be reloaded and transported to an authorised disposal facility as described in ***Section 15.4.2.3*** *of Chapter 15 Resource and Waste Management*.

The dredging work will be undertaken in the following sequence:

i. Upstream Works

The dredging works upstream of Arklow Bridge will typically involve the use of draglines for the wider sections of the river, long-reach tracked hydraulic excavators, standard-reach excavators and dump trucks.

All river access will be via RA1 (SC3) on the north bank as the flood defence walls and public realm works will have been completed along River Walk on the south bank. Dredging will progress from downstream to upstream along the south bank and then from upstream to downstream along the north bank. Material will be excavated from the river centre line towards the riverbanks.

As the dredging adjacent to the riverbanks is completed, the geotextile membrane and riprap will be placed along the excavated face by a tracked excavator using the temporary haul road.

Inert dredged material will be loaded into the dump trucks. Water run-off from the dredged material in the trucks at SC3 is likely to contain sediment which 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 will be discharged through a sedimentation tank and discharged back into the river

Inert dredged material to be archaeologically tested will be delivered to SC1 or SC6. The balance of the dredged material will be transported off-site for reuse or disposal to an approved facility.

Hazardous and non-hazardous contaminated dredge material

As noted in **Section 5.5.2.3** above and in **Appendix 15.2**, a small proportion of fill material which will require removal from the riverbed during WP2 has been classified as hazardous and non-hazardous contaminated material. Locations where the hazardous and non-hazardous contaminated dredge material is anticipated (along the south bank upstream of Arklow Bridge), as highlighted in **Appendix 15.2***,* will be isolated at low tide level. 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. A conventional excavator will be used to remove any layers of contaminated material. Contaminated material will be removed to approximately 300mm below the proposed dredge level and back filled with suitable impermeable material. The finished excavated surface will be trimmed to the required line and level at the channel edge. 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.

A portion of inert dredged material will be utilised for the extension of the riverbank along the northern bank. This will be clean material placed directly from the dredging process under archaeological monitoring. Riprap will be placed around the perimeter of the area to be filled, dredged material will be placed inside the rip-rap to the required level and soil filled geotextile sacks will be placed over the dredged material. Planting can then be carried out in accordance with the landscape design – refer to **Drawing Nos. 301** and **304** in **Appendix 4.2.** Refer also to **Figures 12.7.1** (existing view) and **12.7.2** (proposed view) of **Appendix 12.1** of **Chapter 12** *Landscape and Visual.*

Three roosting platforms will also be installed approximately 35m upstream of Arklow Bridge as shown on **Drawing No. 1003** of **Appendix 4.1**. Each platform will be anchored in position via concrete blocks and chains. Refer also to **Drawing No. 301** of **Appendix 4.2** for landscape details. Refer also to **Figures 12.5.2 and 12.7.2** photomontages (which show the proposed roosting platforms) of **Appendix 12.1** of **Chapter 12** *Landscape and Visual*. Roosting platforms details are described in **Chapter 10**, *Biodiversity*.

ii. Downstream Works

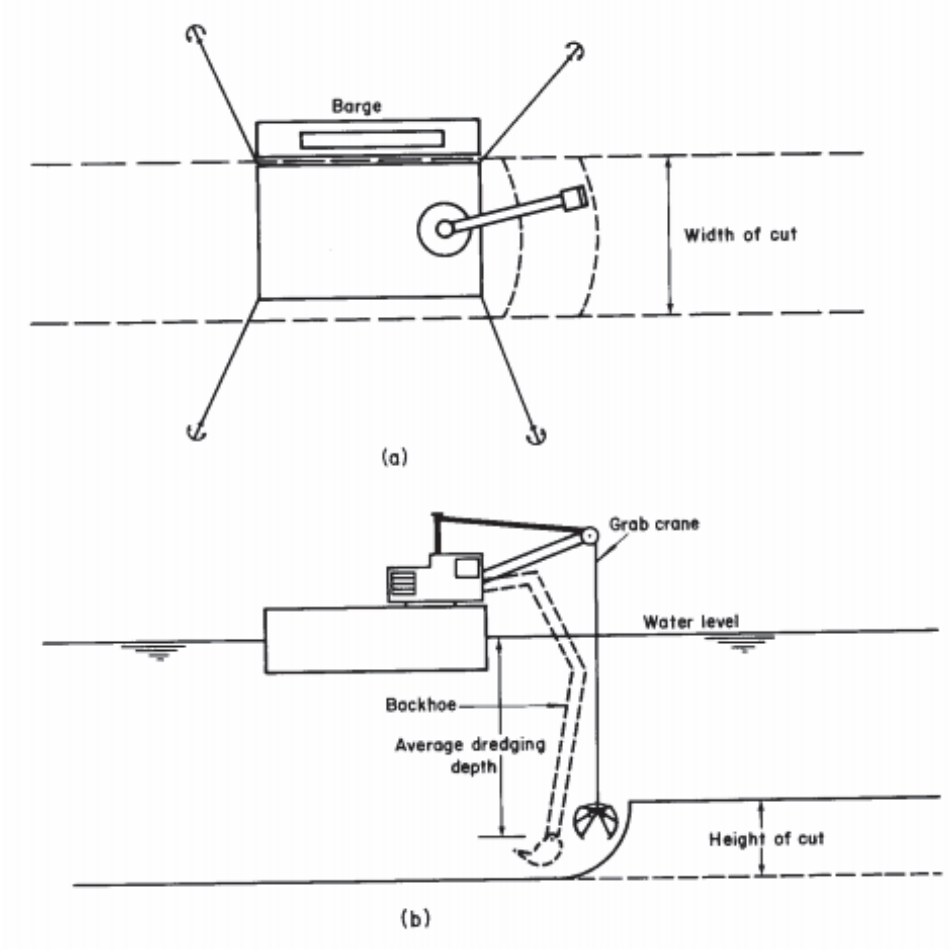
Dredging downstream of Arklow Bridge is expected to be carried out by a dragline excavator for the wider sections of river channel, and by a long reach excavator sitting on a jack-up or spud barge for other areas, and where careful excavation of materials with slightly elevated chloride content is required. The barge will typically be manoeuvred by means of a tugboat. The dredged material will be loaded onto adjacent dump trucks stationed on the haul road in the river adjacent to the north and south banks of the river.

As noted in 5.5.2.3 above, some of the dredged material sampled downstream of Arklow Bridge had natural slightly elevated chloride concentrations, likely due to saline intrusion given the tidal influence on this section of river. Temporary stockpiling of this material at site compounds SC1 and SC5 is likely to allow natural reduction in chloride concentrations sufficiently so this material could be deemed to be inert (subject to verification testing). This material is suitable for reuse in the embankment. The excavation methodology of this material from the river bed will be the same as for inert dredge material as described below.

Dredged material will be carted on dump trucks along the temporary haul roads towards river accesses (RA2, RA3, RA8). Surface water run-off at the river accesses, which is likely to contain sediment due to the movement of construction traffic through it to the river 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 will be discharged through a sedimentation tank to the river. Dredged material with slightly elevated chloride content for archaeological examination, will be transported to designated laydown areas (SC1 and SC5).

Inert dredged material for archaeological examination will be transported to a designated laydown area (SC6). The balance will be transported off site to the identified recovery facilities. Refer to **Chapter 15**, '*Resource and Waste Management'* for details.

Examples of backhoe excavators in operation are shown in **Figure 5.25** overleaf.



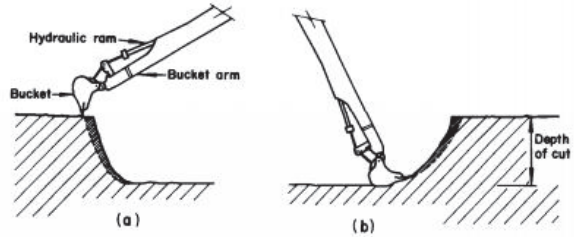


Figure 3.11 The backhoe bucket: methods of digging. a, overcutting; b, undercutting

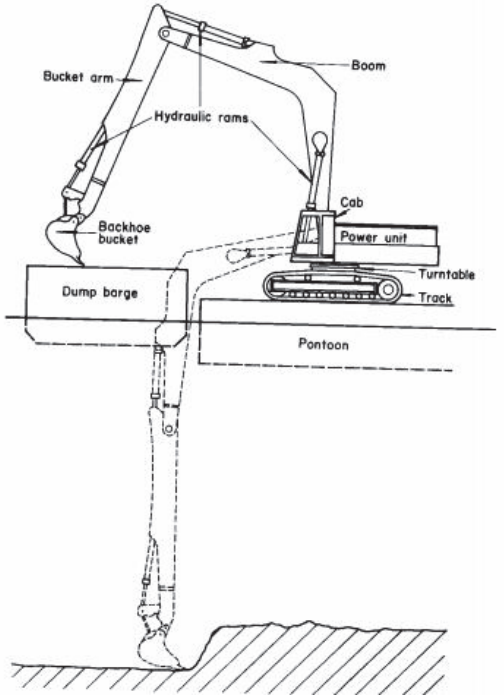


Figure 5.25: Examples of excavators for dredging work

5.5.3 Work Package 3: Debris Trap and Gravel Trap

5.5.3.1 Introduction and Overview

The debris trap will be located approximately 340m upstream of Arklow Bridge and west of the existing river access point situated at the corner of River Walk and River Lane. It is designed to catch floating debris that could otherwise be caught in Arklow Bridge, causing blockage of flow through the bridge. It will extend from the north to the south bank of the river.

The gravel trap will be located approximately 5m upstream of the debris trap. It will generally comprise a trough formed in the riverbed and extending across the width of the river. The formed surfaces will be protected with riprap.

Both the debris trap and gravel trap will require routine maintenance from time to time and a ramp will be constructed on the southern riverbank to facilitate access to the river for this maintenance work (Refer to **Section 4.4.4** of **Chapter 4**, *Description of the Proposed Scheme*).

Refer to **Drawing Nos. 1021** and **1022** inclusive in **Appendix 4.1** for further details.

5.5.3.2 Working Area and Access Location

The working area and river access locations are shown in **Figure 5.26** of **Appendix 5.2** *Chapter 5 Figures.* Access to the river will be at RA4 and RA5 which will be reached from Main Street along Kinsella's Lane and River Walk. The establishment of this work area extending from the carpark to the river will restrict public access to and from River Walk for the duration of construction of the debris and gravel traps.

5.5.3.3 Surplus Excavated Material

The breakdown of Construction and Demolition Waste and Surplus Excavated Materials is set out in Table 5.6 below.

Table 5.6: Volumes of Surplus Excavated Material – WP3

Material Classification	Estimated Volume (m^3)	Destination
Inert estuarine material	800	Archaeological testing at SC1; off site to approved facility
Total	800	

5.5.3.4 Traffic Management

Traffic management will be required to facilitate access along Kinsella's Lane and River Lane to access and exit from River Walk to Main Street. Construction traffic will not be significant, mostly associated with concrete deliveries for the debris trap.

There will be also approximately 800m^3 of riverbed material (typically sandy silty gravels) to be taken from this work area. However, the routes are narrow. Pedestrians will be provided with secure pathways when using River Lane and Kinsella's Lane during this construction period. **Figure 5.27** of **Appendix 5.2** *Chapter 5 Figures* illustrates the affected public routes, highlighted in blue, for Work Package 3.

5.5.3.5 Enabling Works

Some trees will be removed to allow construction of the temporary access road from SC4 to River Walk and along River Walk to the RA4. These are identified in **Drawing No. 300** in **Appendix 4.2**. Trees to be retained are also shown on these drawings.

A temporary haul road will be constructed from the site compound SC4 to the riverbank and on to RA4 and RA5 to facilitate construction traffic. A temporary access road will be constructed in the riverbed from RA4 downstream to the location of the debris trap and then across the river to the north bank (see **Figure 5.28** below). The southern half of the construction road will incorporate suitably sized steel pipes to convey part of the river flow. Excess flow in the river will flow over the southern half of the road. A bund (similarly as described in **Section 5.5.1.4** above) will be formed around the northern half of the debris trap to facilitate construction. On completion of the northern half of the debris trap, the bund will be removed and used to form a bund around the southern half of the debris trap. Dewatering of the bunded area will follow. On completion of the southern half of the debris trap, the material from the bund will be removed. Finally, the construction road will be removed from the gravel trap upstream to RA4.

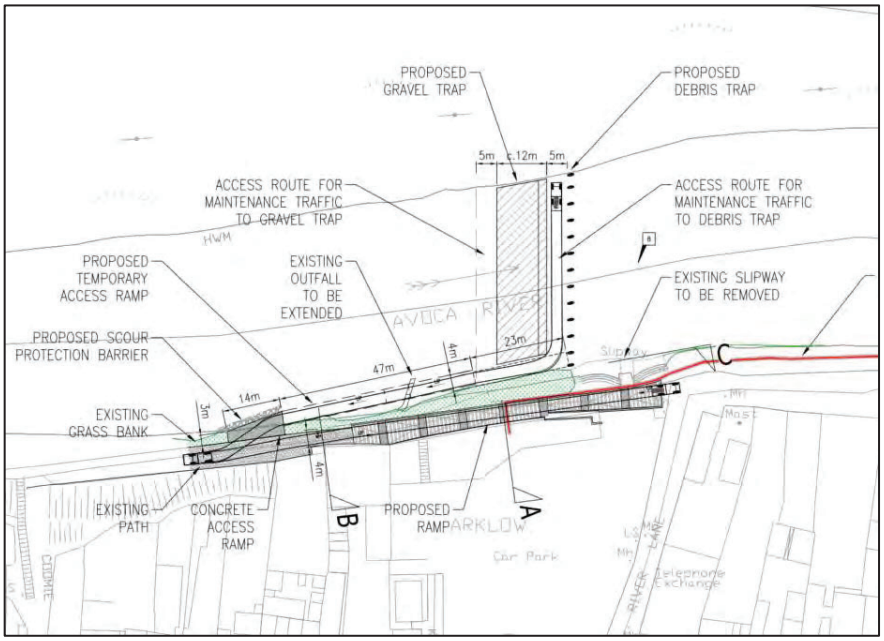


Figure 5.28: Temporary and Permanent Access road. Not to scale. Extracted from Drawing No. 300

River access RA5 will serve as an alternative traffic route on the downstream section of the debris trap. Access will be formed from existing slipway material and imported hardcore material. Upon completion of works, the access road will be removed and a new slipway will be constructed.

5.5.3.6 Construction Process

Debris Trap

The debris trap will be constructed of reinforced concrete (RC) columns founded at a suitable formation level and rising to 500mm above design flood level. Piling will be required to provide support to the foundations and permanent tension piles will also be required to resist overturning. Piles will be driven from bed level to formation depth for the northern half of the debris trap. The bed will then be excavated to formation level to allow for the construction of the foundation slab. The excavated material will likely comprise of natural soils comprising gravels, sands and silts (refer to **Section 13.3** in **Chapter 13** for further detail on the baseline conditions). All excavated material will be reused/ disposed as detailed in **Chapter 15**. A proportion will be initially transported to SC1 for archaeological examination comprising metal detection and visual examination by a licensed archaeologist before final transportation off site.

The piles will be cut down to the foundation level. A foundation slab will be cast over the northern half of the debris trap and tie into the piles. The foundation slab will incorporate starter bars for the piers and reinforcement cages will be fixed for each pier. Shuttering for the piers will be placed around the reinforcement and concrete poured. Finally, the shuttering will be removed. The process will be repeated for the southern half of the debris trap.

Bat tubes will be installed on downstream face of the debris trap columns above design flood level. These are indicated in **Drawing No. 1021** of **Appendix 4.1** *Scheme Drawings*. Refer to **Chapter 10**, *Biodiversity* for detailed description of function and use.

Gravel Trap

i. Excavation and lowering riverbed floor level by up to 1m to profile of gravel trap, working from north to south.

ii. Placement of riprap along the downstream and side excavated faces of the gravel trap.

iii. Removal of temporary access road between debris trap and gravel trap.

Finally, the permanent part of the maintenance access ramp will be constructed from reinforced concrete on the bank of the river and riprap placed along the upstream and downstream bank to prevent erosion.

5.5.4 Work Package 4: Flood Defence Walls and Drainage along South Bank

5.5.4.1 Introduction and Overview

In the 1800s, stone quay walls were constructed on each side of the river channel as part of the harbour development. The river walls extend approximately 1200 metres on the south bank and 500 metres on the north bank. The south bank walls now consist mainly of low-level stone walls with concrete facing. At the downstream end of the southern quay wall there is a high level reinforced concrete wall and sheet piled quay wall. The north bank walls will not be impacted by the proposed permanent works.

Over time, sections of the wall have undergone stabilisation works and repair which mainly comprised of the replacement of the old stone wall with a sheet piled wall, mass concrete or the placement of mass concrete along the toe of the existing wall. The maximum retained height of the walls is about 3.0m. The top of the south quay wall is at an average level of about 1.3mOD.

An assessment of the quay walls was carried out in 2008 which indicated signs of distress either in the form of cracking or ground settlement behind the wall.

Construction of new flood defence walls will commence upon the completion of the first phase of bridge underpinning works. Works will commence upstream of Arklow Bridge along River Walk for 320m. The construction of a stormwater drainage system and pump station and the section of interceptor sewer for the Arklow WwTP which overlaps with the FRS works area will be carried out in parallel with the wall construction.

Downstream of Arklow Bridge, works will continue for 1150m along South Quay from Arklow Bridge to Arklow docks. It will include a storm water drainage system and two pump stations as well as the continuation of the interceptor sewer for the Arklow WwTP Project.

Public realm and landscape works will be carried out on completion of the structural elements of the flood defences.

The proposed interceptor sewer along River Walk and South Quay will be constructed if the flood relief scheme commences ahead of Arklow WwTP Project.

The proposed flood defence walls can be seen on **Drawing Nos. 1031** and **1036 to 1049** inclusive in **Appendix 4.1.** The drainage works can be seen on **Drawing Nos. 1051 and 1053** to **1058** inclusive in **Appendix 4.1**. The proposed scheme is described in **Chapter 4 Proposed Scheme.**

5.5.4.2 Working Areas and Access Locations

The working area is shown on **Figure 5.29** in **Appendix 5.2** *Chapter 5 Figures* and are described in the following paragraphs.

Working Area 4 is located on along River Walk and South Quay and will support the construction of the flood defence walls and drainage work from River Walk to Arklow Docks.

There will also be a requirement to provide temporary accesses to the site compounds SC4 and SC6 to facilitate vehicular movement as part of the enabling works.

5.5.4.3 Construction and Demolition Waste and Surplus Excavated Materials

The breakdown of Construction and Demolition Waste and Surplus Excavated Materials is set out in Table 5.7 below.

Table 5.7: Construction and Demolition Waste and Surplus Excavated Material – WP4

Material Classification	Estimated Volume (m^3)	Destination
Natural material	5,783	Off site to approved facility
Concrete	950	Off site to approved facility
Tarmacadam	151	Off site to approved facility
Hardcore (imported)	77	Off site to approved facility
Miscellaneous	696	Off site to approved facility
Total	7,657	

5.5.4.4 Traffic Management

Traffic management will be required to facilitate traffic along Kinsella's Lane, River Walk and River Lane to access and exit from River Walk to Main Street. Construction traffic will be mostly associated with removal of excavated and demolition material and concrete deliveries and sheet piles for the new walls along with paving materials for the road, paths, raised viewing platforms and terraced areas. These routes are relatively narrow. Pedestrians will be provided with secure pathways when using River Lane and Kinsella's Lane during this construction period.

Traffic management will be required along South Quay towards Arklow docks. Residents and businesses would be affected by construction vehicle movement in and out of the working area, upstream and downstream of the bridge.

Noise and vibration mitigation measures are described in **Chapter 9,** *Noise and Vibration* and in the CEMP. Pedestrian footpaths and pedestrian crossings would be temporarily relocated along River Walk and South Quay. Truck movement at Arklow Docks will be coordinated with businesses to mitigate traffic impacts during construction.

Construction safety signs and signals will be installed at identified locations in accordance with the construction traffic management plan. This will coordinate the direction and flow of traffic at WP4 working areas. The contractor will be responsible for the maintenance of all construction safety signs and signals.

Affected construction traffic routes will be communicated to Arklow residents in advance of commencement of works.

Figure 5.30 in **Appendix 5.2** *Chapter 5 Figures* illustrates construction traffic routes to and from the working areas for Work Package 4.

Site Access

Dedicated construction access to River Walk and South Quay for flood defences and drainage will be required as described below:

Figure 5.30 in *Appendix 5.2 Figures* present affected construction traffic routes along Riverwalk and South Quay.

Minor road works will be required for the establishment of the site entrances. The contractor will be required to carry out the following works:

- Removal of existing kerbs, paving and small amounts of excavation prior to replacement of paving and realigned kerbs.
- Establishment of traffic calming measures.
- Demolition of existing flood defence walls and kerbs.
- Temporary relocation of existing pedestrian footpaths and pedestrian crossings.
- Relocation and/or protection of utilities and services identified in drawings **Drawing 1061** in **Appendix 4.1**. The following utilities were identified:
    - River Walk and River Lane: Public and decorative lighting will be removed during construction. Temporary lighting will be provided as a replacement. Public lighting will be reinstated after completion (refer to Appendix 4.2 – Landscape Design and Public Realm drawings for public lighting detail),
    - ESB Network pole for cross river transmission lines
    - South Quay: Public and decorative lighting will be relocated during construction. Public lighting will be reinstated after completion,
    - Removal of overhead electricity cables along South Quay and Harbour Road and placement underground
- Establishment of site entrance boundaries and hoarding.
- Protection of ESB Sub-stations, charging points, mini-pillars and control kiosk along Riverwalk and South Quay.
- Demarcation of affected parking bays along south quay.

5.5.4.5 Enabling Works

Mooring Posts:

Existing mooring posts with cultural heritage value will be carefully excavated and removed from South Quay and stored for reuse following the construction of the flood defence wall. Refer to **Drawing No. 1041** in **Appendix 4.1** for proposed location of mooring posts.

Trees:

Some trees will be removed to allow construction of the permanent works and provide working space along River Walk and South Quay. These are identified in **Drawing Nos. 300 to 303** inclusive in **Appendix 4.2**. Trees to be retained are also shown on these drawings.

Construction of Temporary Causeway:

To facilitate construction of the sheet piled wall along River Walk and South Quay, a temporary causeway will be required to provide a working platform for piling activities. The temporary causeway will include a sufficient working area of up to approximately 10m wide for installing manholes, drainage and sheet pile walls. Construction of the section of proposed interceptor sewer for Arklow WwTP that overlaps with the FRS working area will be included as part of the works.

The temporary causeway will be constructed from clean, suitable engineered fill (coarse granular material free from fines with a maximum particle size of 200mm) It will be required from approximately 120m upstream of Arklow Bridge to approximately 300m downstream of the bridge.

A section through the temporary causeway is illustrated in **Figure 5.31** below. **Figure 5.32** in **Appendix 5.2** *Chapter 5 Figures* presents a plan of the temporary causeway.

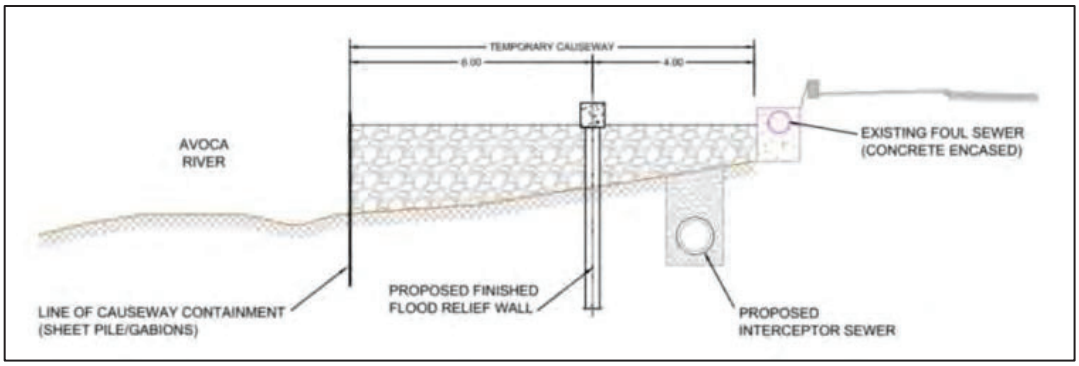


Figure 5.31: Section Through Temporary Causeway. Not to scale

The typical sequence for the construction of the temporary causeway is summarised below:

a) Works will commence on River Walk close to Arklow Bridge and progress upstream. River access (RA) will be from RA6, RA5 and RA4.

b) The causeway will be contained on the river side to mitigate against siltation migration into the Avoca River. The two most likely methods to achieve this containment will by via either be an additional row of sheet piles on the river side of the causeway, as shown in **Figure 5.31** above, or alternatively a row of stone gabions wrapped in a geotextile membrane.

c) The clean engineered fill material will be transported to the site using tipping vehicles.

This will be used as deposit material and be tipped directly into the previously contained area of the river channel from the vehicles by means of a suitable plant. Having deposited material directly at the end of the causeway, the tipping vehicles will reverse back along the causeway in order to avoid large turning circles and double handling of material. A smaller particle size, clean engineering fill material may be used along the line of the permanent sheet piles to aid their installation.

d) Following the deposition of initial loads, material will be spread out to form the temporary causeway. The deposited material will be spread within the contained area using excavators. Fill material will then be compacted using tracked machines to provide a suitable running platform for subsequent lorries. The height of the causeway will be in the order of approximately 300mm above mean high water spring tide level.

e) The construction of the temporary causeway will continue upstream in this manner until the full route of the temporary causeway is constructed.

f) Following completion of the construction of the river-based flood defences and drainage (i.e. when the causeway is no longer required) along River Walk, the causeway material will be removed from the river side of the new sheet piled wall by excavator and used as fill where required on the land side of the wall. Excess material will be removed by excavator and dump truck and used for the construction of the causeway along South Quay.

g) The installation of a temporary causeway is considered in-stream works (i.e. within the river channel), therefore the contractor will be required to seek full approval from Inland Fisheries Ireland for all activities in the river channel prior to the commencement of works.

h) All temporary measures in the river channel will be required to be carried out in accordance with the Inland Fisheries Ireland guidance. The seasonal restrictions contained in the guidance (i.e. May to September inclusive) will apply to both the installation and removal of the causeway.

Standard best practice measures in accordance with the Office of Public Works (OPW) guidance will be required to be employed by the contractor to manage silt run-off and pollution control. Refer to the *Chapter 14 Water* .

i. To provide groundwater cut off, the sheet piles will extend into the underlying cohesive deposits (which, based on the existing ground investigations data were encountered at approximately 5.2m below the existing ground level). This will be to enable foundation preparation for the interceptor sewer in channel. Once both lines of sheet piles are in place, the excavation will be dewatered and the new sewer will be laid.

ii. Dewatering will typically be achieved by using a series of sumps and submersible pumps. To reduce the amount of dewatering required at any given time, it is likely that the contractor will construct the sewer in sections.

iii. Discharge from the dewatering process will be passed to a suitably sized propriety sediment removal system before discharge to the Avoca River.

5.5.4.6 Construction Process

Upon completion of Phase 1 of bridge underpinning and remedial works, flood defence and drainage works will commence upstream and downstream of Arklow Bridge. The estimate duration of works is 23 months.

The construction of the reinforced concrete flood defence walls is likely to be carried out by traditional methods comprising the following activities:

i. Construction of Sheet Piles including End Caps/Reinforced concrete walls

In certain locations where the flood defence wall will be located within the river channel, sheet piles will form the foundation of new flood defence walls and extend from formation up to existing ground level approximately. A temporary haul road and causeway will be required in the river to construct the sheet pile walls **Figure 5.32** of **Appendix 5.2** *Chapter 5 Figures* indicates the location of the temporary haul road and causeway required for the sheet pile walls along River Walk and South Quay.

In these locations, the existing quay wall where it exists, will be enclosed within the new construction. Archaeological records of the quay wall, where required, will be carried out in advance of the commencement of construction.

Installation of Sheet Piles including RC Wall:

The sheet pile wall will be formed by driving steel sheets into the ground and the sheet piles will be interlocked to provide continuity. The sheet piles will be steel and will be driven to the required depth using a piling hammer, vibrating hammer or similar. Once the sheet piles have been completed, the top of the sheet piles will be encased with reinforced concrete to form the top of the wall. The concrete capping will be cast from a level below the top of sheet pile level to the required flood defence level. The face of the sheet pile on the river side will be clad with insitu or precast concrete panels. A precast concrete cap will be placed along the top of the wall.

Refer to **Section 4.4.7.3** of **Chapter 4**, *Proposed Scheme*, for details of the public realm works.

ii. Construction of Reinforced Concrete Walls

Reinforced concrete (RC) walls will be constructed in locations where the proposed wall will be located on the riverbank or quay side. Preparation of the foundation works will include excavation to formation level, dewatering of excavation (if required), importation of select base granular material, installation of reinforcement and casting of structure.

The construction of the RC flood defence wall at the western side of the Dock will require ramps to allow access and egress over the walls for vehicular traffic.

Refer to **Section 4.4.7.3** for details of the public realm works.

iii. Use of Existing Walls

At some locations along South Quay, the existing walls are suitable to be retained for flood defence walls. Minor works will be required including sealing any drainage openings through the walls.

iv. Construction of Stormwater Drainage and Associated Works

It is proposed to construct the stormwater drainage using the open cut method upstream and downstream of Arklow Bridge. Coordination with the Arklow WwTP Scheme will be essential as the works lies on the same work area.

The stormwater drainage pipeline ranges from approximately 450mm – 750mm in diameter and invert levels are between 1.5m and 0.6m below existing ground level.

Construction Process:

To form the trench for the stormwater drainage, the overburden will be excavated, and a drag box or trench box will be installed as the excavation progresses. The excavation areas will be sized accordingly to accommodate the trench box/drag box.

The use of trench box/drag box will minimise the working area by providing stability to the upper sides of the excavation.

Following this, the excavated material will be removed (using excavators at ground level). This process will be repeated until formation level has been reached to enable the laying of the stormwater drainage.

Due to the relatively high-water table in the area (approximately 2m below ground level), dewatering works will be required at some locations. Dewatering will typically be achieved by using a series of sumps and submersible pumps. To reduce the amount of dewatering required at any given time, it is likely that the contractor will construct the sewer in sections. Due to the nature of the weathered rock, groundwater cut off will not be possible using trench boxes and would only be achieved if temporary sheet piles are employed on either side of the trench excavation. This is thought to be an unlikely approach for the contractor.

Discharge from the dewatering process will be passed to a suitably sized propriety sediment removal system before discharge to the Avoca River.

Once the excavation is dewatered, the drainage pipe will be laid on granular bedding material and the trench will be filled with suitable fill material to near ground level. The area will subsequently be reinstated to its pre-construction condition.

Pump Stations:

The proposed scheme requires the construction of storm water drainage network with three pump stations, which will include:

a) An underground wet well/dry well pumping station constructed from reinforced concrete; and

b) A pump station kiosk which hosts the motor starters and controls system.

Details of the pumping stations are shown on **Drawing Nos 1056** to **1058** inclusive in **Appendix 4.1**. In order to construct the wet well/ dry well pumping stations, it is considered that the contractor will likely use standard excavation techniques through soil, with shoring to provide stability to the sides of the excavation.

Upon completion of the excavation works, construction of the wet well/ dry well pumping station will likely be completed using standard reinforced concrete construction method including placement of reinforcement steel, shuttering and concrete pouring activities.

The pumping station will include construction of the following above ground features using standard construction techniques:

- Kiosk: A reinforced concrete plinth approximately 300mm thick will be installed at ground level at each of the 3 no. kiosk locations. The plinth will be placed on a suitable sub-base and the kiosk will be fixed directly on top of the plinth. The kiosk will be approximately 1.5m high x 2.0m wide x 0.45m deep and will be a prefabricated cabinet made of either hot dipped galvanised stainless steel or GRP. The kiosk will be green in colour.

v. Public Realm and Landscape

Landscaping along the flood defence works will be constructed using conventional methods. Hard landscaping will be installed along the flood defence walls in the form of kerbs, roads and pathways with concrete and gravel finishes and appropriate marking and parking added. Soft landscaping in the form of the placing of soil, levelling and planting of vegetation will also be undertaken.

The proposed ground levels will tie in with the existing road levels. Green amenities, road and pedestrian walkway finishes will be installed as indicated in **Appendix 4.2,** *Public Realm Drawing (nos. 6545-301 and 6545-303)* and described in **Chapter 4** *Proposed Scheme.*

vi. Construction of Arklow WwTP Interceptor Sewer

This section of works physically overlaps with the proposed Arklow WwTP. The proposed interceptor sewer will be constructed along the southern bank from River Walk to South Quay. The sewer will vary in diameter from 450mm, 112m upstream of River Lane junction to 1200mm on South Quay. Refer to **Drawings Nos. 1053 to 1055** inclusive in **Appendix 4.1**, for the length of the sewer to be installed.

The interceptor sewer network will not be commissioned until such a time as the WwTP is fully commissioned and accepting wastewater for treatment.

The existing wastewater and stormwater network will therefore be required to be functional until the Arklow WwTP is operational.

a) Open cut Sewers (Land Based)

It is proposed to construct the sewer using open cut methods on the upstream, land-based section on Riverwalk (i.e. from the 112m upstream of River Lane junction to 10m upstream of Arklow Bridge). Construction activities will be carried out during Q4-Y3 till Q2-Y4(October to March) following consultation with Wicklow County Council and Irish Water.

Construction Process:

To form the trench for the sewer, the overburden will be excavated, and a drag box or trench box will be installed as the excavation progresses. The excavation areas will be sized accordingly to accommodate the trench box/drag box. The use of the trench box/drag box will minimise the working area by providing stability to the upper sides of the excavation. Following the excavation of the overburden, rock breaking, or rock ripping will take place. This will be achieved by percussive breaking or rock ripping techniques. The excavated material will be removed (using excavators at ground level). This process will be repeated until formation level has been reached to enable the laying of the sewer.

A relatively high-water table is expected in the area (approximately 2m below ground level), dewatering works will be required to support the open cut construction of the sewer (described in **Section 5.5.4.4** above). Due to the nature of the weathered rock, groundwater cut off will not be possible using trench boxes and would only be achieved if temporary sheet piles are employed on either side of the trench excavation.

Upon completion of the dewatering process, the sewer will be laid on granular bedding material and the trench will be filled with suitable fill material to ground level. The area will be reinstated as per public realm and landscape details above.

b) Open cut Sewers (River Based)

Construction of the interceptor sewer in the river channel will be constructed upon completion of proposed flood defence wall (sheet pile installation). Locations affected include 10m upstream of Arklow Bridge to Chainage 300m downstream of Arklow Bridge along South Quay.

The sewer will be laid on granular bedding material and the trench will be filled with suitable engineered fill, free from contamination and in accordance with the relevant engineering specifications.

5.5.5 Work Package 5: Flood Defence Walls, Embankment and Drainage along North Bank

5.5.5.1 Introduction and Overview

Construction of new flood defence earthen embankment and wall will be undertaken in parallel with the river dredging works (WP2) to facilitate the reuse of some of the dredged material. Works will commence upstream of Arklow Bridge along the eastern edge of Arklow Marsh. The embankment will be constructed over 550m approximately and include the construction of a land drain at the toe of embankment on its eastern side. A sheet piled wall flood defence wall with concrete capping will be constructed from the northern abutment of Arklow Bridge over a length of 60m before interfacing with the flood defence embankment.

Other associated works include diversion of the existing channel, which connects the canal to the Avoca River, westwards to facilitate the construction of the wall and embankment and placing of riprap to protect the river bank where it is close to the proposed wall and embankment.

The proposed works are shown on **Drawing Nos. 1031** to **1035** inclusive in **Appendix 4.1,** *Scheme Drawings* and described in **Chapter 4 Proposed Scheme**.

5.5.5.2 Working Areas and Access Locations

Work Package 5 working area is located on the north bank of the river channel upstream of Arklow Bridge. The working area will support the construction of the flood defence earthen embankment and sheet piled wall from the north riverbank for 610m approximately north of the riverbank, along the eastern edge of Arklow Marsh. The working area and river access locations for work package 5 is shown on **Figure 5.33** of **Appendix 5.2** *Chapter 5 Figures.*

5.5.5.3 Surplus Excavated Materials

The breakdown of Surplus Excavated Materials is set out in Table 5.8 below.

Table 5.8: Volume of Surplus Excavated Material – WP5

Material Classification	Estimated Volume (m^3)	Destination
Natural material	9,928	Off site to approved facility
Miscellaneous	993	Off site to approved facility
Total	10,920	

5.5.5.4 Traffic Management

Traffic management will be required at the access locations to SC1 and SC3 and associated streets serving the working area. Dredged material, as described from **Section 5.5.2**, will be hauled along Ferrybank and the Dublin Road to SC1.

Construction safety signs and signals will be installed at identified location in accordance with the traffic management plan. This will coordinate the direction and flow of traffic at WP5 working area. The contractor will be responsible for the maintenance of all construction safety signs and signals. Affected traffic routes will be communicated to Arklow residents in advance of commencement of works.

Figure 5.34 of **Appendix 5.2** *Chapter 5 Figures* illustrates the affected public roads, highlighted in blue, associated with the WP5 works.

5.5.5.5 Enabling Works

Archaeology:

Archaeological testing will be carried out along the locations of the proposed permanent works in advance of the commencement of the construction works to augment previous archaeological testing and to resolve known archaeology in the area. Refer to **Chapter 11** *Archaeological, Architectural and Cultural* for further details.

Diversions:

Overhead and underground electrical cables, which run from River Walk across the Avoca River to the Dublin Road and again from this line to Ferrybank, conflict with the proposed works in places. Permanent diversion of these cables will be carried out in advance of the construction works. For relocation and/or protection of utilities and services, refer to **Drawing 1062** of **Appendix 4.1,** *Scheme Drawings.* These utilities and services will be repositioned and placed underground to avoid the flood embankment. There are also underground cables running from the marsh to Ferrybank which will require to be diverted. All overhead cables situated along the working area will be diverted to underground cables. These works will be carried out as advanced works in 2022 prior to commencement of the permanent works in 2023. All relocated services will be positioned to ensure that they are at a safe distance from the works.

An existing channel (canal) which conveys surface water from the west (Avoca River Park industrial Estate) towards Ferrybank will be diverted westwards towards Avoca River. Diversion of the channel will be carried out in the marsh. Excavation of the channel up to 2m depth will be carried out using excavators. Topsoil removed will be reused during the reinstatement of the riverbank at SC3. The existing channel opening will be filled during the construction of the earth embankment.

Trees:

Some trees will be removed to allow construction of the permanent works and provide working space along the west of Ferrybank. These are identified in **Drawing Nos. 304 to 306** inclusive, in **Appendix 4.2**. Trees to be retained are also shown on these drawings.

Temporary enabling works will be required to facilitate the construction of the permanent works which are part of WP5. The enabling works are described as follows:

Site Compound Access Locations:

Temporary access to the site compound SC1 from the public road will be in place from WP1. Minor works will be required for the establishment of the entrances to the site compounds. The contractor will be required to carry out the following works:

i. Removal of existing kerbs, paving and small amounts of excavation prior to replacement of paving and realigned kerbs
ii. Establishment of traffic calming measures
iii. Temporary relocation of existing pedestrian footpaths and pedestrian crossings
iv. Re-alignment of channel situated in the Marsh. Refer to **Drawing Nos. 1032** to **1035** inclusive of **Appendix 4.1.**
v. Establishment of site entrance boundaries and hoarding

A temporary haul road will be constructed along both sides of the proposed wall and embankment. The haul road will be left as a 4.0m wide maintenance track on the dry (east) side of the embankment to facilitate ongoing inspection and maintenance.

5.5.5.6 Construction Process

Construction of the WP5 will include an earthen embankment, sheet piled flood defence wall with concrete capping and drainage. The construction works will be undertaken as follows:

i. Construction of Sheet Piles with concrete capping

Installation of Sheet Piles including Reinforced Concrete Retaining Wall:

The sheet pile wall will be formed by vibrating steel sheet piles into the ground and the sheet piles will be interlocked to provide continuity. The sheet piles will be steel and will be driven to the required depth using a piling hammer or similar.

Once the sheet pile has reached the required depth, the top of the sheet pile will be encased with reinforced concrete to the required flood defence height. See **Figure 5.35** below.

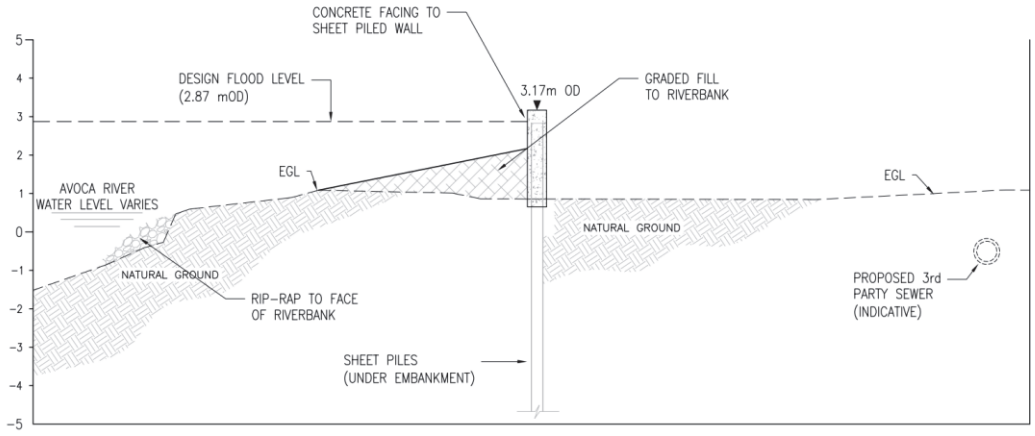


Figure 5.35: Section through sheet pile with RC cap. Not to scale

ii. Construction of Earth Embankment

Foundation Preparations:

Foundation preparations will consist of clearing vegetation, grubbing, to remove stumps and large roots to approximately a 1m depth, and stripping to remove sod, topsoil, boulders, organic materials, and other unsuitable materials. The highly compressible soils, which occur in a thin surface layer or isolated pockets, will be removed.

After stripping, the foundation surface will be in a loose condition and will be compacted. Stump holes would be filled and compacted by power-driven hand tampers. 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. A geotextile membrane will be placed over the formation to strengthen the foundation and suitable dredged material will be spread over the geotextile to form a suitable surface for the remaining construction works. Sheet piles will be driven through the formation to a suitable depth to provide cut-off of surface water passing beneath the embankment from the wet (marsh) side to the dry (Ferrybank) side.

Dewatering the Working Area:

Trenches: Where cut off or drainage trenches extend below the water table, a complete dewatering will be provided to properly prepare the foundation and to compact the first lifts of embankment fill. All dewatering will be disposed through sediment settlement tanks.

Embankment Compaction:

The embankment varies in height from the Avoca River towards the Dublin Road within the marsh. **Drawing 1035 of Appendix 4.1** illustrates the typical sectional details of the embankment. Suitable material, including the dredged material in the core and impermeable material, typically clay, surrounding the core, will be placed in layers and compacted.

Compaction will be undertaken by using a tamer foot roller or sheepsfoot roller. As a rule of thumb, to obtain the required compaction effort, the following will be considered:

i. All fill material for the embankment will be placed in layers no greater than 150mm thick.

ii. Each layer would be thoroughly compacted before the next layer is placed. A minimum of 6 passes to achieve the required compaction effort is generally required.

iii. The compaction effort achieved would be on average 98% Standard Maximum Dry Density (MDD) (non-structural fill).

The material forming the embankment will be placed with sufficient moisture to ensure proper compaction. The moisture content will be in the range of -1% to +3% of optimum moisture content (OMC). If the material is too dry, water will be added. If the material is too wet, it will be spread and mixed with drier material.

Before each additional 150mm lift is added to the embankment, the preceding lift will be scarified to ensure that the two lifts are properly joined.

A wheeled scraper or truck will be used to place the selected soil material (clay).

French Drain at Toe of Embankment:

The French drain will be constructed as follows:

i. Excavate trench to required depth

ii. Line the trench with a geotextile material

iii. Place perforated drainage pipe over drainage granular layer

iv. Back fill with pea gravel and suitable dredged material

Landscaping:

Landscaping along the flood defence works will be constructed using conventional methods. Soft landscaping in the form of the placing of soil, levelling and grass-seeding will be undertaken. Permanent landscaping in the form of trees will be planted at site compound (SC1) as specified in **Drawing Nos. 304 to 306** inclusive in **Appendix 4.2**, *Public Realm Drawings.*

The proposed ground levels in the marsh will tie in with the existing adjacent ground levels on the east side of the embankment.

5.6 Construction Management

5.6.1 Services and Site Lighting

The contractor will liaise with third party service providers such as ESB and Irish Water for temporary connectivity of services at Site Compounds. Refer to **Chapter 18**, *Material Assets* for further details.

Construction lighting will generally be provided by tower mounted 1000W metal halide floodlights (LED – light emitting diodes), which will be cowled and angled downwards to minimise spillage of light from the site. These will be powered by mains supplies or diesel generators where an electrical supply is not available.

Works to the arches of Arklow Bridge will require task lighting onto the surface of the arches. Similarly, works to the parapet and superstructure of Arklow Bridge will require task lighting directed horizontally onto the work area.

No lighting will be directed at the arches with bat tubes following completion of the work on the bridge.

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. Lighting will generally be used only during periods of construction.

At Site Compounds, River Access and Working Area lighting will be provided on exterior of hoarding at footpaths for public safety where public lighting has been removed to facilitate construction works.

5.6.2 Hours of Working

The timing of construction activities, core working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising nuisance and significant effects.

The core construction working hours for the proposed development will be:

7am – 7pm: Monday to Friday; and

8am – 2pm: Saturday

The exception to the above will be when grouting, piling and remedial works to the bridge superstructure are being carried out from the bridge deck on Arklow Bridge (WP1). These works will be carried out between 21:00 and 7:00 the next day in order to minimise disruption to traffic crossing Arklow Bridge. These working hours correspond to the current construction programme, sequencing and durations as described in **Section 5.5.2**.

Works within the river and, in particular dredging works, may utilise low and/or high tides depending on their plant to maximise their productivity and so, working times will alter to reflect the times of tides. The removal of surplus material off site by road, and regular deliveries to site, will be generally be confined to daytime hours, but outside of peak traffic hours, i.e. 10am to 4pm.

The exception will be for WP1 night-time works and WP2 – river dredging – which will require traffic movements over a continuous 10-hour period.

It may be necessary, in exceptional circumstances, to undertake certain other activities outside of the construction core working hours. Any construction outside of the construction core working hours will be agreed in advance with Wicklow County Council and scheduling of such will have regard to nearby sensitive receptors.

5.6.3 Construction Safety

A site boundary in the form of hoarding or fencing will be established around each of the working areas before any significant construction activity commences. The hoarding/ fencing would be a minimum of 2.4 m high to provide a secure boundary to what can be dangerous environment for those who have not received the proper training and are unfamiliar with construction operations.

Site hoarding also performs an important function in relation to minimising nuisance and effects including:

i. Noise emissions (by providing a buffer);
ii. Visual impact (by screening the working areas, plant and equipment); and
iii. Dust minimisation (by providing a buffer).

The erection of the hoarding will be a similar nature to what is carried out on most construction sites. Mounting posts will be erected by using a mini-digger and the posts will be set in concrete.

The size and nature of the posts and hoarding will depend on the requirements for any acoustic mitigation as well as preferences that the contractor may have. Where practicable, hoarding and fencing will be retained, re-configured and re-used between working areas as the construction activities progress.

5.6.4 Environmental Management

A Construction Environmental Management Plan (CEMP) (see **Appendix 5.1**) and schedule of mitigation measures has been prepared (Refer to **Chapter 21**, *Summary of Mitigation and Monitoring*). These documents define the minimum standards required of the contractor as they affect the environment, amenity and safety of local residents, businesses, the general public and the surroundings in the vicinity of the proposed scheme.

The contractor is required to integrate these measures into a detailed CEMP following appointment (prior to the commencement of any construction activities). The detailed CEMP will be required to have a regard to the guidance and industry best practice. The CEMP will be implemented throughout the construction of the scheme and the contractor will be required to review and update the CEMP as construction progresses. Effective implementation of the CEMP will ensure that disruption and nuisance are kept to a minimum throughout the construction of the proposed scheme.