

# REPORT

## **Millport Coastal Flood Protection Scheme: Environmental Statement**

### Chapter 5 Project Description

Client: North Ayrshire Council

Reference: PB4749-RHD-ZZ-XX-RP-Z-0005

Status: Final/P01.01

Date: 31 January 2020

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Document title: Millport Coastal Flood Protection Scheme: Environmental Statement

Document short title:

Reference: PB4749-RHD-ZZ-XX-RP-Z-0005  
Status: P01.01/Final  
Date: 31 January 2020  
Project name: Millport Coastal Flood Protection Scheme  
Project number: PB4749  
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Date / initials: 13/01/2020

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Approved by: Frank Fortune

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Date / initials: 13/01/2020

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Classification

Project related



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## Acronyms

Acronym	Acronym description
AOD	Above Ordnance Datum
FPS	Flood Protection Scheme
SSSI	Site of Special Scientific Interest

## Glossary

### Glossary Term

### Glossary Text

#### **Millport Coastal Flood Protection Scheme**

The scheme consists of offshore rock armour structures which will be built in the vicinity of the rock islets within Millport Bay. Onshore works will include flood walls, improvement works to existing coast protection structures, and works to raise the level of existing grass areas. Works on the foreshore include shore-connected rock armour breakwaters and rock armour revetments.

## 5 Project Description

### 5.1 General Description of the Proposed Scheme

1. This section describes the proposed Millport Coastal Flood Protection Scheme (FPS) (the proposed scheme). At this stage in the process, the preferred scheme design has been developed sufficiently to prepare the Flood Protection Scheme documents as required by Scottish Government for the consent process. There are some details that would need to be resolved when detailed design for construction is completed.
2. The town of Millport is located at the southern end of the island of Great Cumbrae, 2.5km offshore from mainland North Ayrshire in the Firth of Clyde.
3. Millport is a small town which is built within a narrow low-lying coastal strip. Most of the residential and commercial properties in the town are built on this coastal strip immediately inshore of the coastal protection structures, promenade and coastal road. Tourism is a strong component of the local economy of Millport. The town is designated as a Conservation Area for its historic townscape, and the footprint of the proposed scheme is close to or within a number of important areas of ecological interest such as Kames Bay and Ballochmartin Bay, which are designated as Sites of Special Scientific Interest (SSSI).
4. The layout of the proposed scheme is illustrated in Figure 1-1 (Volume II). The layout of the proposed scheme and illustrations of relevant cross-sections are also provided in **Appendix 5.1** (Landscape Design Drawings). The scheme consists of offshore rock armour structures which will be built in the vicinity of the rock islets within Millport Bay. Onshore works will include flood walls, improvement works to existing coast protection structures, and works to raise the level of existing grass areas. Works on the foreshore include shore-connected rock armour breakwaters and rock armour revetments.
5. The total construction period is estimated to be about 21 months, commencing in autumn 2021 (refer to Section 5.2.11). Ongoing consultation will seek to minimise potential disruption to the local community through noise, traffic, air quality and tourism activities during the construction process.
6. The process of development of the proposed scheme is described in **Chapter 4 Site Selection and Assessment of Alternatives**. The landscape design approach taken for the proposed scheme is provided in **Appendix 22.1 – Landscape Design and Access Statement**.

### 5.2 Construction Phase

#### 5.2.1 Offshore Works

##### Rock Armour Breakwaters

7. A 120m long breakwater will be built to connect The Leug and The Spoig rock outcrops. A 210m long breakwater will connect The Spoig with the southern Eilean (Figure 1-1).
8. The offshore breakwaters would be constructed using primary rock armour of between 5 and 8 tonnes. It is currently expected that the breakwater will be constructed by placing two layers of interlocking rock armour over a crushed rock (quarry-run) core and base layer. An underlayer of 0.3 tonne to 1.0 tonne rock could be used between the core and the rock armour.

9. The 120m rock breakwater between The Leug and The Spoig would be up to 60m wide at its base, reaching a height of up to 9m above the sea bed (based on a sea bed level of -4.6m AOD) . The crest level of the breakwater will be +4.4m AOD, which is 2.6m above MHS (1.8m AOD) and 5.6m above MLWS (-1.2m AOD). This initial crest level allows for long-term settlement of the rock armour.
10. The rock breakwaters between The Spoig and the southern Eilean would be up to 70m wide, and would also have a crest level of +4.4m AOD, reaching a height of up to 12m above the sea bed (based on a sea bed level of -7.6m AOD).
11. The breakwaters would be located between 300m and 700m from the shoreline. Construction will therefore take place using a barge with a long-reach excavator to place the rock armour. Delivery of rock and other materials will also be by barge. Consequently the working footprint for the scheme recognises the spatial requirements of the barges. The barges will need to manoeuvre within Millport Bay to the required position for armour placement.
12. The working area for the offshore breakwater will be off-limits to other vessels, so will be defined by marker buoys by the construction contractor. Therefore, access to Millport Pier and Harbour will be restricted because the western channel will be narrowed by this working area.

#### Dredging

13. Dredging may be required to remove loose sands and gravels from parts of the sea bed prior to constructing the breakwater. The depth of sediment over bedrock is between 1m and 2m over the footprint of the breakwater. Therefore the maximum dredge volume would be up to 45,000m<sup>3</sup> if dredging was to be undertaken over the full footprint of the breakwater. However, it is currently expected that dredging can be limited to specific small areas of loose material, or pockets of deeper sediment. Therefore it is more likely that the dredged volume will be less than 10,000m<sup>3</sup>.
14. The preferred dredging method, if required, is water injection dredging. Water injection dredging injects large volumes of water at low pressure directly onto the sediment that is to be moved. This process fluidises the sediment and remobilises it using the action of natural currents. In this way the sediment is cleared away from the specific area, without removing it from the seabed. Therefore, disposal of the dredged materials would not be required.

## **5.2.2 Works on the Foreshore**

### Shore Connected Rock Armour Breakwater

15. A shore connected rock armour breakwater will be constructed, extending seaward over the rock foreshore by up to 70m from the existing coast protection structures at the junction of Millburn Street and Crichton Street.
16. The breakwater will be up to 25m wide along its trunk, increasing to up to 35m wide at the seaward end. The height of the structure above the rock foreshore will vary depending on the level of the rock, with a maximum crest level of +4.2m AOD.
17. The rock breakwater will predominantly be constructed to the eastern side of the existing ridge of natural rock. Access to the foreshore over the western side of this ridge of rock will be maintained as far as possible.

#### Rock Armour Revetment

18. A rock armour revetment will be constructed over the existing rock foreshore to the seaward side of Clyde Street for a length of about 150m. The revetment will have a base width of up to 20m and will be up to 6m high above the foreshore, to a crest level of up to +4.2m AOD.
19. Access along the upper part of the natural rock foreshore (above +4.2m AOD) will be maintained. The lower part of the rock foreshore will be completely covered by the revetment, to below Mean Low Water Springs (-1.2m AOD). Signs will be provided warning of the risks of climbing on the rock revetment.
20. Construction works may be required to the Scottish Water sewer located along the upper foreshore between the southern end of Clyde Street and Crichton Street, as shown in Plate 5-2. The existing sewer is encased in concrete and located immediately seaward of the adjacent property boundary walls. The concrete surround has a lower crest level than the proposed rock revetment, so it is proposed that works are undertaken to alter the concrete surround so that the sewer can continue to be accessed for maintenance by Scottish Water if required. The details of these works are to be agreed with Scottish Water, but are expected to involve removing the upper part of the concrete surround and replacing this to increase its height to be similar to the property boundary walls. The crest level of the rock revetment will match the level of the property walls in this area.

#### Construction Process

21. The shore-connected breakwater and the revetment will be constructed from rock armour, with a concrete toe. The structures will most likely be built by land-based plant using a raised platform or causeway built out from the beach. The working footprint for construction is anticipated to be up to 10m in addition to the footprint of the structures.
22. It is possible that excavation of beach materials will be required to remove a limited volume of sands and gravels (up to 150m<sup>3</sup>) from over the rock outcrops prior to constructing the revetment and breakwater.
23. To form the toe of the breakwater and the revetment, steel rods will be drilled and grouted into the rock foreshore at approximately 1m intervals. A mass concrete toe beam will then be constructed as the foundation to the structures.
24. It is currently expected that the revetment and shore connected breakwater will be constructed by placing two layers of interlocking rock armour (3 to 6 tonne rocks) over a crushed rock (quarry-run) core. An underlayer of 0.3 tonne to 1.0 tonne rock could be used between the core and the rock armour.
25. The rock for the breakwater and the revetment will be delivered by sea. It is most likely that the rock armour for the foreshore works will be offloaded onto the foreshore between Clyde Street and West Bay and then moved around the foreshore to where it is needed. The materials for the toe beam and works to the Scottish Water sewer will also be delivered by sea or by road from a local concrete batching plant.

### 5.2.3 Onshore and Foreshore Works - Improvements to Coast Protection Structures

26. Construction works will be undertaken to improve the condition of existing masonry and concrete revetments and vertical walls that are present at various locations around Millport Bay, as shown in Figure 1-1.
27. Adjacent to the Cross House, a 140m length of masonry revetment (Plate 5-1) will be replaced with a concrete stepped revetment, up to 10m wide and up to 3m high, which will improve access to the foreshore as well as reducing wave overtopping. This also reduces the required height of the onshore flood wall. The plans for this area have been discussed with the community, including residents of the Cross House, during the consultation events.
28. A 70m long section of masonry and concrete revetment along Crichton Street will also be replaced with a concrete stepped revetment (Plate 5-2), up to 8m wide and up to 2m high. This revetment will be immediately seaward of the recurved concrete flood wall that is also proposed for this area (Section 5.2.5).
29. The stepped revetments will be designed to have wide treads and shallow risers, for safe access. The revetment will also incorporate higher and wider steps that will act as seats. The surface finish of the concrete will be appropriate to minimise the risk of slips and falls. Handrails will be included at suitable locations along the revetment.
30. For the remaining areas of masonry revetment and masonry and concrete sea walls around Millport Bay, the refurbishment work will include repointing or grouting of existing masonry and infilling of any voids. Additional mass concrete toe protection may be provided in some places, to a depth of up to 1.5m below the beach level.
31. Habitat enhancement works will be incorporated into the improvements to the existing coast protection structures. Where the stepped revetment ties into the adjacent rocks, it is intended that the surface profile of the concrete will be designed to mimic the natural rocks. Elsewhere around the Millport seafront, panels will be installed on the sea walls to encourage intertidal habitats to establish. We are working with Glasgow University to develop the details of these proposals, see <http://www.biogeomorph.org/greengrey/>.

#### Construction Process

32. In both locations the existing masonry revetment will be excavated. Opportunities for the reuse of the stone blocks are being considered but are not yet confirmed. Granular fill material will be placed and compacted to form the foundation to the stepped revetment. The stepped revetment will then be constructed from reinforced concrete. It is most likely that the majority of the revetment will be constructed from precast units. Some cast in-situ concrete will be required. Some excavation and reinstatement of the existing footpath/promenade is expected to be necessary as part of these works.
33. Construction activities will be undertaken from the landward and seaward side of the existing coast protection structures. These improvement works may require excavation of the beach adjacent to the existing structures, to a depth of up to 2m, over a width of up to 5m. Some footpath excavation and reinstatement would also be required as part of the construction process.

34. Wherever possible, materials and construction plant for the improvements to the coast protection structures will be delivered by barge, including the precast concrete revetment units. In-situ concrete will be delivered by barge or by road from a local concrete batching plant.



*Plate 5-1 Masonry revetment adjacent to the Cross House*



*Plate 5-2 Existing coast protection structures on Crichton Street*

## 5.2.4 Onshore Works – Improvements to Existing Sea Walls

### Works to West Bay Road, Millburn Street and Marine Parade

35. Existing coast protection structures along West Bay Road, Millburn Street and Marine Parade will be developed to improve their flood protection capabilities. These coast protection structures are located within predominantly residential areas, so the visual appearance, alignment and height of these flood protection structures have been carefully considered during the consultation process.
36. Along West Bay Road, a crest wall will be installed to the top of the existing masonry sea wall, to increase the height of the wall by up to 1100mm above the existing promenade level. Additional protection will be provided to the northern part of Millburn Street by improving the existing access ramp, including the addition of rock armour protection. To the southern part of Millburn Street, a concrete crest wall will be installed along the existing grass verge. These locations are shown in Plate 5-3.
37. Along the northern part of Marine Parade (up to 200m length, as shown on Figure 1-1), the sea wall will be increased in height by up to 900mm above the level of the adjacent footpath, by the addition of a concrete crest wall.



*Plate 5-3 Existing coast protection structures to Millburn Street and West Bay Road*

38. The crest wall to West Bay Road will be constructed by installing precast concrete crest wall units. The existing timber parapet handrail will be removed and holes drilled vertically into the existing masonry wall at intervals of 0.5m. The crest wall can be tied into the existing structure using grouted dowel bars. The raised crest wall will have a recurved profile to maximise the reduction in wave overtopping.

39. The existing concrete access ramp located opposite the junction with the junction with Crawford Street will be replaced with a new ramp up to 2.5m wide and up to 30m long. Rock armour protection will be provided to the seaward side of this ramp, with a width of up to 10m.
40. The crest wall to the south end of Millburn Street will be installed by excavating the grass area to a depth of up to 2m. The excavated surface will be prepared and blinding concrete placed to form a level surface. Precast concrete crest wall units will then be installed to form the higher crest wall. The raised crest wall will have a recurved profile to maximise the reduction in wave overtopping.
41. The crest wall to Marine Parade will be installed by removing the existing parapet handrail and excavating the footpath on the landward side of the existing masonry wall to a depth of up to 2m. There is an existing Scottish Water pumped water main located within the footpath, which will be protected during the excavation works. The excavated surface will be prepared and blinding concrete placed to form a level surface. Precast concrete crest wall units will then be installed to form the higher crest wall. The raised crest wall will have a recurved profile to maximise the reduction in wave overtopping.
42. The concrete for the crest walls will be coloured based on samples of the local beach material. An appropriate surface finish to the concrete is to be agreed with North Ayrshire Council planning team. Simple designs to reflect the local heritage may be incorporated into the surface of the concrete in places.
43. Drainage through and/or past the crest walls will be included in the design, by adding new drainage gullies, scupper holes through the crest walls, and/or adjusting falls and levels of hard surfaces to maintain drainage flow paths.

#### Works to Stuart Street

44. The existing concrete crest wall along Stuart Street will be refurbished (to improve its appearance and tie-in with the remainder of the scheme) by encasing the landward face with a 300mm thickness of concrete over its 175m length. The new concrete encasement will be tied into the existing structure by drilling and grouting dowel bars at intervals of up to 1m. The height of this wall will not be increased.
45. Additional drainage gullies will be added along Stuart Street if required.
46. Minor refurbishment works will be undertaken to the seaward side of the Stuart Street sea wall. This will include repointing of the masonry where required. Repairs to the toe of the sea wall may also be needed, using mass concrete.

#### Construction Process

47. Construction activities would be undertaken principally from the landward side of the existing sea walls. This will require some excavation of the existing footpath along Marine Parade and West Bay Road. Part of the existing road will need to be excavated to undertake the works along Millburn Street. Road and footpath surfaces will be reinstated, to their existing standard or better.
48. Some works from the seaward side of the sea walls might be necessary, for example temporary works to support the existing masonry walls whilst excavation is ongoing on the landward side.
49. The replacement of the concrete ramp on Millburn Street will require excavation of the beach in the vicinity of the ramp. The depth of excavation is expected to be less than 1m. Construction works for the ramp would need to be from the foreshore.

50. If repairs to the toe of the Stuart Street sea wall are needed then this would require excavation of the beach adjacent to the wall. The depth of excavation to reach bedrock is expected to be less than 1m.
51. Excavation of the beach is not expected to be needed in order to install the crest walls to West Bay Road, Millburn Street and Marine Parade.
52. Wherever possible, materials and construction plant for the improvements to the coast protection structures will be delivered by barge, including the precast concrete crest wall units. In-situ concrete will be delivered by barge or by road from a local concrete batching plant. Rock armour for the Millburn Street ramp will be delivered by barge and offloaded on the foreshore near to the proposed works.

### 5.2.5 Onshore Works – Flood Walls

53. A new flood wall is proposed to parts of Glasgow Street, including the 130m long section between Clifton and College Street (seaward of the Garrison House) and over a 230m length around the Cross House (from the east side of the Crocodile Jetty to Kelburn Street). A flood wall is also required to 90m of Crichton Street.
54. Glasgow Street forms part of the main promenade of Millport. It is lined by a number of historic and tourist attractions on the seaward side, including the war memorial, a wishing well and crazy golf and children's play park. Shops, houses, holiday accommodation and the Garrison House (incorporating Millport Library, the Museum of the Cumbraes and a doctors surgery) are located on the landward side of the roads. Residential properties are also located along the landward side of the road along Crichton Street. As such the height, alignment, form of construction and visual appearance of the flood wall has been carefully considered throughout the consultation process.

#### Glasgow Street (Clifton Street to College Street)

55. Between Clifton Street and College Street, the 130m long wall will be up to 700mm high. The wall will be positioned along the centre of the current footpath. This alignment was agreed with residents during consultation, as the position could enable improvements to be made to separated cycle and pedestrian access along the seafront. The alignment of the flood walls also takes into account the known locations of buried services.
56. Due to the low level of this wall, it has been designed to be multi-functional, so that it can also be used as seating. Access will be provided at either end of this length of wall, with the level of the existing paths raised if necessary to achieve a consistent flood protection level.
57. The flood walls will be constructed from precast reinforced concrete units. The concrete will be coloured based on samples of the local beach material. An appropriate surface finish to the concrete is to be agreed with North Ayrshire Council planning team. Simple designs to reflect the local heritage may be incorporated into the surface of the concrete in places.
58. The foundation of the flood wall will be up to 1m deep. The width of the base of the wall will be up to 1m, so an excavation width of 2m is expected to be required to enable installation of the precast wall units. Some footpath excavation and reinstatement will be required as part of the construction activities. An additional working area of up to 5m either side of the wall may be required by construction vehicles. It is expected that the construction of this flood wall will be undertaken within the existing footpath, but closure of the adjacent road may be necessary on occasions.

59. Drainage through and/or past the flood walls will be included in the design, by adding new drainage gullies, scupper holes through the walls, and/or adjusting falls and levels of hard surfaces to maintain drainage flow paths.

#### Glasgow Street (Crocodile Jetty to Kelburn Street - Cross House)

60. From the Crocodile Jetty to the Cross House, the 75m long flood wall will be up to 1200mm high. The flood wall will have a recurved seaward face to minimise wave overtopping.
61. The alignment of this wall is shown in Figure 1-1. This alignment was agreed with residents during consultation, and enables a wider promenade seaward of the flood wall. The alignment of the flood walls also takes into account the known locations of buried services. Access will be provided at the western end of this wall, in a similar position to the existing access routes. Landscaping of the grass bank on the landward side of the wall will minimise the visual impact of the wall from the road and adjacent properties.
62. The southern face of the 35m long garden wall to the Cross House will be replaced by a flood wall up to 1200mm high. The new flood wall will not be higher than the existing garden wall. The alignment of this wall was agreed with residents during consultation, and addresses access constraints and the known locations of buried services. The flood wall will have a recurved seaward face to minimise wave overtopping. The landward side of the wall will be faced with masonry, with a similar appearance to the existing garden wall.
63. To maintain access to the south side of the Cross House from the west, there will be a gap between the (garden) flood wall and the next section of flood wall. Due to the low threshold level of the Cross House, a flood gate will be installed across this gap, to be closed during storm conditions.
64. A low flood wall up to 700mm high will be constructed in front of the Cross House, between 5m and 10m seaward of the property. The wall will be designed so that it can also function as a seat.
65. To the east of the Cross House, a flood wall up to 1200mm high will be constructed over an 85m length. The wall alignment takes into account the known locations of buried services. The flood wall will have a recurved seaward face to minimise wave overtopping. It is currently proposed to construct concrete steps on the seaward side of this wall to mitigate the visual impact, which would be designed to function as seating.
66. The flood walls around the Cross House will be constructed from precast reinforced concrete units. The concrete will be coloured based on samples of the local beach material. An appropriate surface finish to the concrete is to be agreed with North Ayrshire Council planning team. Simple designs to reflect the local heritage may be incorporated into the surface of the concrete in places.
67. Drainage through and/or past the flood walls will be included in the design, by adding new drainage gullies, scupper holes through the walls, and/or adjusting falls and levels of hard surfaces to maintain drainage flow paths.

#### Crichton Street

68. Along Crichton Street, the 90m long flood wall will be up to 1000mm high. The flood wall will be designed to be multi-functional, so that it can also be used as seating.
69. The alignment of this wall is shown on Figure 1-1. The existing road and footpath are narrow in this area, so the alignment of this wall will be seaward of the existing footpath, constructed over the existing grass verge and natural rock outcrops. The alignment of the flood walls also takes into

account the known locations of buried services. Targeted consultation meetings were held to enable the proposals for this area to be discussed with residents and property owners.

70. To maintain access to the foreshore, there will be gaps in the flood wall in two locations, to enable access to the foreshore over the concrete stepped revetment described in Section 5.2.3. The design of this access point will minimise the risk of flooding through the gap, as shown in Figure 1-1.
71. The flood wall will be constructed from precast reinforced concrete units. The concrete will be coloured based on samples of the local beach material. An appropriate surface finish to the concrete is to be agreed with North Ayrshire Council planning team. Simple designs to reflect the local heritage may be incorporated into the surface of the concrete in places.
72. Drainage through and/or past the flood walls will be included in the design, by adding new drainage gullies, scupper holes through the walls, and/or adjusting falls and levels of hard surfaces to maintain drainage flow paths.

#### Construction Process

73. Excavation of the site and ground preparation works will be undertaken to enable the precast concrete units to be installed. The foundation of the flood walls will be up to 1.5m deep. The width of the base of the wall will be up to 2m, so an excavation width of up to 3m will be required. Around the Cross House and along Crichton Street, bedrock levels are very high and are exposed at the surface in places. It may be necessary to break out some of this rock for the foundation of the flood wall. Excavation and reinstatement of the promenade will also be required as part of the construction activities. An additional working area of up to 10m either side of the wall may be required by construction vehicles.
74. The precast concrete wall units will be lifted into place by a small crane. Footpath surfaces and grass areas will be reinstated, to their existing standard or better. The ground levels of the existing grass areas may be raised on the landward side of the flood walls to reduce the visual impact of these structures.
75. It is likely that a small proportion of the concrete flood walls (estimated as less than 5%) will need to be cast in-situ. This will require timber formwork to be constructed and a steel reinforcement cage fixed in place, followed by pouring of concrete.
76. The precast concrete flood wall units and the majority of any other materials and construction plant will be delivered by barge. In-situ concrete will be delivered by barge or by road from a local concrete batching plant.

#### **5.2.6 Onshore Works – Raise Ground Levels**

77. Elsewhere along Glasgow Street, adjacent to Kelburn Street and around Kames Bay, the flood protection requirements will be achieved by raising the level of existing grass areas. This method of providing flood protection is preferred to concrete walls wherever possible, based on feedback from consultation. The locations of these works are shown on Figure 1-1.
78. The level of the grass areas will be raised by up to 1.2m from the existing level, mounded to give a smooth profile and maintaining access across the seafront area.

79. At either end of the grass areas along Glasgow Street, short sections of flood wall may be required, where the width of the grass area is not sufficient to achieve the required crest level by mounding. These walls will be similar to those required for the Garrison House section of Glasgow Street.
80. For Kames Bay, the raised grass area will be tied into the promenade by constructing a stepped terrace. These concrete steps will act to improve the flood protection performance of this area. The aim of the design for Kames Bay is to improve access and the amenity value of the area.
81. Drainage through and/or past the raised areas will be included in the design, by adding new drainage gullies and/or adjusting falls and levels of hard surfaces to maintain drainage flow paths.

#### Construction Process

82. The grass areas will be raised by removing the existing grass and topsoil. Earth fill material will be placed to the appropriate level and compacted if necessary. Topsoil will be placed over this fill material, reusing the excavated topsoil wherever possible. Some additional topsoil is likely to be needed. Grass seeding will be undertaken and maintained appropriately until the new grass has fully established.
83. Existing access paths will be retained. In some locations the paths may need to be reconstructed to raise their level to the same as the adjacent grass areas.
84. The sections of flood wall along Glasgow Street will be constructed as described in Section 5.2.5.
85. The concrete stepped terracing is similar to the concrete revetments proposed for Crichton Street and the Cross House. Granular fill material will be placed and compacted to form the foundation to the concrete steps. The steps will then be constructed from precast reinforced concrete units. Some cast in-situ concrete may be required.
86. The stepped concrete terrace will be designed to have wide treads and shallow risers, for safe access. The terracing will also incorporate higher and wider steps that will act as seats. The surface finish of the concrete will be appropriate to minimise the risk of slips and falls. Handrails will be included at suitable locations along the concrete steps.
87. The existing promenade surfacing will be excavated and granular fill material placed and compacted to raise the level of the promenade to part of Kames Bay. The promenade surfacing will then be reinstated.
88. Wherever possible, materials for the ground raising works will be delivered by barge.

#### **5.2.7 Site Compound**

89. A site compound will be required to safely store construction plant and materials, and for the site offices. Fencing will be erected around each working area as required.
90. The most suitable location for the main site compound has been identified as the grass area near to the children's playground on West Bay Road. The Quayhead (Millport Pier) might also be used for the temporary storage of construction plant and/or materials.
91. The potential concrete batching plant could be located within the site compound at West Bay, on the Quayhead or elsewhere on Great Cumbrae. The location will be agreed with North Ayrshire Council following appointment of the contractor, and will avoid any sensitive areas (e.g. residential

areas) as far as practically possible. The concrete batching plant would most likely be constructed on site, with the component parts delivered by barge if possible.

92. Due to the extent of the site along the Millport seafront, smaller, local compounds may be established immediately adjacent to each work area (e.g. on Glasgow Street and/or Kames Bay). This would minimise the need to move construction plant to and from the main compound each day as works progress in each area.
93. These potential compound locations are identified on Figure 1-1. The location(s) of the construction compound(s) will be confirmed when the contractor has been selected.

### 5.2.8 Materials Quantities

94. The estimated quantities of construction materials expected to be required for the proposed scheme are summarised in Table 5-1.

Table 5-1 Estimated materials quantities

Item	Number	Volume (m3)
Rock armour (3 -7 tonnes)	-	47450
Rock underlayer (300kg – 1000kg)	-	21,150
Crushed rock core material (quarry run)	-	37,160
Precast reinforced concrete flood wall units (2m long, average weight 8.5 tonnes)	1114	4000
Cast in-situ concrete	-	910
Steel dowel bars	880	-
Earth fill (general)	-	6280
Topsoil	-	1140
Road surfacing materials	-	1800
Other aggregates	-	1005

### 5.2.9 Likely Construction Plant Requirements

95. The main items of construction plant likely to be required for the proposed works include:
- Water injection dredging vessel, if required
  - Jack-up barge, for construction of offshore breakwaters
  - Long-reach excavators for placing rock armour from the jack-up barge
  - Hydraulic tracked excavators for excavation and filling operations, and for general site activities
  - Wheeled excavators may be required for some foreshore works (for ease of access and to minimise damage to the rock foreshore)
  - Mobile crane for placing precast concrete units
  - Excavator-mounted hydraulic breaker for demolition of existing masonry revetments and exposed rock
  - Jack hammers for breaking our surfacing and concrete
  - Compaction rollers
  - Dumper trucks
  - Concrete trucks and pumps
  - Small wheeled plant for landscaping works

### 5.2.10 Access for Construction Works

#### Access for Deliveries of Materials and Construction Plant

96. The majority of the construction materials and construction plant will be delivered to Millport by barge, to minimise impacts on the ferry and local road traffic. This will include delivery of precast concrete units. Concrete for any cast in-situ works will either be delivered by barge or from an on-site batching plant.
97. The construction contractor will need to undertake works to provide a means of offloading deliveries of materials and construction plant, which will principally be brought to Millport by barge. This might involve:
- Refurbishment of the timber section of Millport Pier, so that a barge can safely berth against the pier for offloading.
  - Improvement works to the beach access ramps at the War Memorial and/or on West Bay, to create a larger slipway.
98. Wherever possible construction vehicle movements will be limited to within the site boundary. However, due to the site extent throughout Millport there will need to be some vehicle movements on the local roads.
99. Whilst use of the ferry for deliveries of materials, plant and people will be minimised, it remains possible that some construction traffic will need to use the ferry on occasions, e.g. for unexpected delivery requirements, or occasional visitors to site.
100. Vehicle movements associated with the construction of the proposed scheme are fully assessed in **Chapter 20 Traffic and Transport**.

#### **Potential Road Closures**

101. Temporary closures or access restrictions along local roads and footpaths may be required during the construction works. The duration of any restrictions will be minimised as far as practicably possible. The timings of any closures will be communicated with the local community and other relevant stakeholders through ongoing consultation by the construction contractor during the works.
102. Construction works on West Bay Road and Marine Parade will require temporary closure of the footpath on the seaward side of the road. Road access may be restricted to a single lane at times during these works.
103. Temporary road closures will be required during works along Millburn Street and Crichton Street. excavation works and installation of the crest wall.
104. The promenade will be closed while construction works are ongoing during works along Stuart Street, Glasgow Street, Kelburn Street and Kames Bay. Temporary closure of the footpath seaward of the road, and the Kames Bay cycleway, may also be necessary. Road access along Stuart Street and Glasgow Street (in front of the Garrison House) may need to be restricted to a single lane during works in these areas. Access will only be restricted while works are undertaken to each area; the whole promenade will not be closed at the same time.
105. No road closures would be required for the works on the foreshore (Crichton Street and Clyde Street).

106. Access to Millport Pier will be restricted during the construction works, if this is used for materials delivery and/or as a site compound.
107. It will not be possible to access the mooring buoys and small vessel anchorage area within Millport Bay during construction of the offshore breakwaters. Access to the local moorings inshore of the Eileans should still be possible from the east of the Eileans. Access to the War Memorial ramp may be restricted if this is to be used for materials deliveries.

### 5.2.11 Construction Programme and Staffing

#### Construction Programme

108. The total duration of the construction phase is estimated as 21 months. It is currently expected that the works would begin in September 2021 and be complete by the end of May 2023. A number of activities would be undertaken concurrently during this period. A draft construction programme has been produced, and is provided in **Appendix 20.5**.
109. Assuming that construction begins in autumn 2021, it is most likely that the offshore works would be carried out between the early spring and summer of 2022, with an estimated duration of 5 months.
110. Works during the summer period would be limited to those areas that are less busy in terms of tourist visitors, e.g. the Old Town Area (West Bay Road, Millburn Street, Crichton Street and Clyde Street).
111. The construction programme will depend on proposals from the appointed construction contractor, and will need to be agreed with North Ayrshire Council. It is currently expected that North Ayrshire Council will require the construction contractor to programme the works to minimise impacts on residents and tourism as far as is reasonably practicable.

#### Staffing

112. Experience from similar projects suggests that the construction contractor would have two or three gangs of plant operators and ground staff working on the onshore works scheme at any time, plus four or five supervisory staff, totalling 20 to 30 people. For the offshore works there would be a further eight to ten people working on the barge. The construction team will travel to site by minibus each day, either from accommodation on Great Cumbrae or from the mainland.

#### Working Hours

113. It is currently expected that North Ayrshire Council will authorise the following working hours for the onshore and foreshore works:
  - Monday to Friday – 08:00 hrs to 18:00hrs
  - Saturday – 08:00 hrs to 13:00hrs
  - Sunday – no noise audible at the site boundary
114. It is possible that variations to these working hours would be agreed in winter (restricted to daylight hours) and summer (extended evening working).
115. For the offshore works, it is possible that tidal working will be required to optimise the operations during periods of good weather. This might mean that operations from the barge are undertaken at night. Appropriate noise limits will be agreed between North Ayrshire Council and the construction contractor.

## 5.3 Operation Phase

### 5.3.1 Ongoing Operational Works

116. The only operational works required for the proposed scheme will be closure of a flood gate adjacent to the Cross House. The arrangements for these operations are to be agreed between the residents of the Cross House and North Ayrshire Council.
117. Maintenance works will be low level and will be the responsibility of North Ayrshire Council. Maintenance will be undertaken as required to check the integrity of the flood walls, sea walls and breakwater, and conduct any remedial works required. Maintenance of surface water drainage will require regular inspection and work as required.

### 5.3.2 Access Following Construction of the Scheme

118. Access to the seafront along Glasgow Street and around Kames Bay will not be significantly changed from the existing arrangements. The existing pedestrian access paths will be retained, and the grass areas will still allow informal access across to the promenade.
119. Vehicular access to the beach will still be possible at the access ramp adjacent to the shelter at College Street. The beach access steps at the western end of Glasgow Street will be replaced to improve the safety of beach access in this area.
120. The beach access on Millburn Street (adjacent to Crawford Street, for pedestrians and launching kayaks) will be maintained. The rock breakwater at the junction of Millburn Street and Crichton Street will be constructed so that the rock foreshore and former diving platforms can still be accessed.
121. The stepped concrete revetment proposed for Crichton Street will maintain pedestrian access to the foreshore. Two access points will be provided through the flood wall, with handrails provided to the stepped revetment in these locations.
122. The upper part of the rock foreshore along Clyde Street will continue to be accessible on foot, with signs provided advising of the risks of climbing on the rock revetment. It will no longer be possible to access the fishing platforms lower down the rock foreshore in this area, as these will be covered by the rock revetment.
123. The refurbishment of the jetties at either end of Newtown beach will incorporate mooring points for small dinghies and/or tenders for vessels mooring out in Millport Bay.

## 5.4 Decommissioning Phase

124. The structures forming the coastal flood prevention scheme will be designed to have a life of at least 50 years. As the purpose of the proposed scheme is for flood protection, it is unlikely that it will be decommissioned in entirety; it is more likely that the scheme will be repaired or sections replaced or improved if needed in the future. To ease the process of decommissioning should it be required, the project design will aim to avoid excavation or drilling into the bedrock for the toe of the rock structures. Decommissioning of the flood walls are anticipated to require a similar process to that discussed above for the construction phase.