5 Demolition and Construction Description

5.1 Introduction

5.1.1 This chapter describes the demolition and construction programme for the proposed development and the key works and activities that would be undertaken during the demolition and construction stage. The information presented within this chapter has formed the basis of the demolition and construction assessments in Chapters 6-19 of ES Volume 1 and associated technical appendices in ES Volume 2.

5.1.2 It is important to note that this chapter does not assess the magnitude of potential impacts, nor the significance of likely effects during the demolition and construction stage, as these are considered within the individual technical assessments (Chapters 6-19 of ES Volume 1 and associated technical appendices in ES Volume 2).

5.1.3 Impacts arising during the demolition and construction stage are generally temporary, short-term, and intermittent. Detailed construction method statements and specifications have not yet been prepared and the main contractor(s) have not yet been appointed to undertake the required works. However, the design has been developed to a sufficient detail to be able to assess the worst-case scenario and to understand the likely construction methods and plant that will be used by the contractor. Assumptions on methods and plant have been based on preliminary advice from contractors and experience of the project and client team, with reference to similar developments. Where there is uncertainty in plant, a worst-case has been assumed and used in assessments, with assumptions set out in this chapter and the relevant technical chapter.

5.1.4 This chapter is supported by the following technical appendix within ES Volume 2:

- Technical Appendix 5.1: Outline Construction Environment Management Plan (OCEMP);
- Technical Appendix 5.2: Outline Site Waste Management Plan (OSWMP); and
- Technical Appendix 5.3: Best Practicable Environmental Option (BPEO) for Dredging Assessment.

5.1.5 The OCEMP provided in Technical Appendix 5.1 would form the basis of a detailed Construction Environmental Management Plan (CEMP) to be prepared by the main contractor(s) and implemented during the demolition and construction works, which would be secured by means of appropriately worded planning and marine licence conditions. The OCEMP describes the standard construction management controls that form part of the development proposals that would be implemented to avoid, minimise and where not possible, mitigate the magnitude of likely significant effects. It defines relevant policies, legislative requirements, thresholds/limits, procedures, roles and responsibilities for the implementation of environmental and management controls throughout the duration of the works. Due to the standard nature of these controls, these have been considered as embedded mitigation within technical assessments. However, where *additional* discipline specific controls are required, these are set out within the mitigation section of technical ES chapters (Chapters 6-19).

5.2 Programme of Works

Demolition and Construction Programme

5.2.1 A detailed demolition and construction programme has not yet been produced, and will be dependent on a number of variables including the following key factors:

- **Funding** – market conditions and funding streams available and how this links to delivery of the proposed development, both in terms of extent of the proposed development that is funded, and the programme within which the proposed development needs to be delivered;
- **Contractor** – approach to procuring the contractor (s) and their preferred method and programme of work.

5.2.2 Consequently, there needs to be an element of flexibility in how the proposed development is constructed, whilst ensuring that a worst-case scenario in EIA terms has been assessed.

5.2.3 To enable a worst-case assessment of likely environmental effects within the EIA, an indicative programme has been developed by the Applicant based on the most efficient and intense use of plant and equipment deemed practicable, whereby the works at each wharf are undertaken in parallel and demolition and construction activities occurring in different areas of the site overlap. As a worst-case, it is also assumed that Falmouth Docks would remain operational whist demolition and construction activities are on-going.

5.2.4 Table 5.1 and Figure 5.1 present the indicative worst-case demolition and construction programme for the proposed development, which has formed the basis of the technical assessments. For the purpose of this EIA, based on commencement of works in Q4 2025, the demolition and construction is anticipated to be undertaken over an approximately 42-month period, finishing in Q1 2029. The majority of the wharfs, however, will be completed after 27 months (in Q4 2027) and therefore the earliest operational year, which is deemed the worst-case opening year in EIA terms[1], is 2027. 2027 has therefore been used as the opening year in technical assessments.

5.2.5 It is anticipated that the demolition and construction stage would be delivered through five key activities:

- Activity 1: Strengthening and Enabling Works;
- Activity 2: Demolition;
- Activity 3: Dredging;
- Activity 4: Construction; and
- Activity 5: Finishing Works and Upgrades.

5.2.6 As shown in Table 5.1 and Figure 5.1, strengthening and enabling, demolition, and dredging works would be undertaken across all areas of the site in the first instance to make most efficient use of plant. Piling and construction activities would then be undertaken at each wharf in immediate succession, starting at Western Wharf and progressing anti-clockwise around the site. The indicative programme shows that a small number of bays (referred to as the 'FLOW Dolphins') at the FLOW Deck could be constructed early in the indicative programme to allow FLOW activities to commence by Q4 2027, with the remaining length of the FLOW Deck being constructed after Q4 2027 (and finishing in Q1 2029). To facilitate FLOW activities, the strengthening of Duchy Wharf would also occur early in the indicative programme.

5.2.7 The demolition and construction activities described within Table 5.1 and Figure 5.1, and any assumptions made for the purposes of developing the indicative programme and enabling the assessment of likely significant effects within the EIA, are detailed in Section 5.3.

Table 5.1: Proposed Indicative Demolition and Construction Programme

Activity	Estimated Duration (weeks)	Estimated Commencement Date	Estimated Completion Date
Western Wharf			
Strengthening and Enabling Works	8	Q4 2025	Q4 2025

[1] Worst-case in terms of operational traffic generation commencing and associated effects being realised in terms of air quality and noise.

Table 5.1: Proposed Indicative Demolition and Construction Programme

Activity	Estimated Duration (weeks)	Estimated Commencement Date	Estimated Completion Date
Demolition (timber Western Wharf and temporary buildings)	12	Q4 2025	Q1 2026
Dredging	20	Q3 2026	Q4 2026
Construction, including Reclamation	48	Q4 2026	Q4 2027
Finishing Works and Upgrades	28	Q3 2027	Q4 2027
Northern Wharf			
Strengthening and Enabling Works	8	Q4 2025	Q1 2026
Demolition (Northern Arm)	12	Q4 2025	Q1 2026
Dredging	18	Q1 2026	Q2 2026
Construction	22	Q2 2027	Q4 2027
Finishing Works and Upgrades	8	Q4 2027	Q4 2027
Queen's Wharf – Existing and Extension			
Strengthening and Enabling	4	Q1 2026	Q1 2026
Dredging	Included in Northern Wharf dredging		
Construction	11	Q3 2027	Q4 2027
Finishing Works and Upgrades	4	Q4 2027	Q4 2027
FLOW Deck			
Strengthening and Enabling	12	Q1 2026	Q1 2026
Dredging	20	Q4 2026	Q1 2027
Construction	40	Q2 2026	Q3 2028
Finishing Works and Upgrades	24	Q4 2028	Q1 2029
Duchy and County Wharf			
Strengthening and Enabling	20	Q2 2026	Q3 2026
Finishing Works and Upgrades	8	Q3 2026	Q3 2026
Dock Quayside Areas			
Building Demolition	4	Q1 2026	Q1 2026
Landscaping (subject to BNG requirements)	12	Q2 2026	Q2 2026

5.2.8 Whilst the indicative programme shown in Table 5.1 and Figure 5.1 is considered to be the worst-case and therefore forms the basis of the EIA, as mentioned previously, it is possible that due to market conditions and funding, as well as the choice of contractor, the demolition and construction stage could occur over a longer duration, or the wharfs could be constructed in a different order.

5.2.9 For example, the wharfs could be constructed discretely, as and when funding becomes available, with each wharf constructed independently of the next. As such, the various construction activities in different areas of the site would not overlap, and the demolition and construction stage overall would be longer. If wharfs were constructed sequentially, one after another with minimal break in construction, the construction programme would be around 66 months on site (approximately 2 years longer than the worst-case indicative programme). The wharfs could be delivered in any order, and this could be flexible, depending on market conditions and the Applicant's requirements.

5.2.10 Any permutation of the demolition and construction programme in which the wharfs are constructed independently of each other, and in succession rather than in parallel/overlapping, is generally considered to be a better case than the indicative programme assessed within this EIA (presented in Table 5.1 and Figure 5.1), in terms of environmental impacts and effects. This is due the demolition and construction activities being less intense and not overlapping, which will reduce the magnitude of impacts, whilst still being regarded as temporary effects in terms of duration.

Hours of Work

5.2.11 The port currently operates 24 hours per day, 7 days per week, and it is anticipated that the majority of construction works will also be undertaken on this basis, with the exception of the following activities, which would not be undertaken at nighttime:

- Demolition works;
- Piling; and
- Compaction works.

Demolition and Construction Workforce

5.2.1 Based on experience of projects of a similar nature and scale, it is anticipated that workforce levels could peak at 100 construction workers per day when there are potential overlaps of dredging, piling and construction of wharfs. As a worst-case, it is assumed that there will be 100 construction workers per day from Q1 2026 to Q4 2027. Where suitably skilled local labour is available, this would be used where viable to do so. Sustainable travel modes for construction workers will be encouraged and used where possible and will be set out in a construction traffic management plan, once the contractor is appointed.

	Estimated Duration
Total Programme Duration	**27 months to complete Western Wharf, Northern Wharf, Queen's Wharf, FLOW Dolphins and Duchy Wharf. 42 months on site to complete all structures.**
Western Wharf	**27 months on site**
Financial Investment Decision	
Mobilisation, site setup	12 weeks
Enabling works - stabilisation of causeway	8 weeks
Enabling works - demolition of timber Western Wharf	12 weeks
Enabling works - excavation of existing revetment	4 weeks
Enabling works - demolition of buildings	4 weeks
Enabling works - demolition of Northern Arm	12 weeks
Stabilisation - bored pile toe walls	2 weeks
Construction - reclamation	6 weeks
Marine dredging	20 weeks
Removal of dredge arisings by HGV	19 weeks
Construction - installation of piles 164No	16 weeks
Construction - new revetment	16 weeks
Construction - suspended deck	24 weeks
Landside works - fender panels, quay furniture, cathodic protection	8 weeks
New power and electrical	20 weeks
Roadway improvements	20 weeks
Northern Wharf	**15 months on site**
Financial Investment Decision (includes dredging to Queen's Wharf)	
Enabling works - bored pile toe walls at Queen's Wharf / Northern Wharf interface	4 weeks
Enabling works - excavation of existing revetment	4 weeks
Marine dredging (including north of Queen's Wharf)	18 weeks
Removal of dredge arisings by HGV	9 weeks
Construction - installation of piles, 80No	9 weeks
Construction - new revetment	4 weeks
Construction - suspended deck	9 weeks
Landside works - fender panels, quay furniture, cathodic protection	2 weeks
New power and electrical	8 weeks
Queens Wharf Extension	**6 months on site**
Stabilisation - bored pile toe walls (existing Queen's)	4 weeks
Marine dredging - assume dredging all done as part of northern wharf	Included in Northern Wharf
Financial Investment Decision	
Construction - installation of piles, 48No	5 weeks
Construction - suspended deck	6 weeks
Landside works - fender panels, quay furniture, cathodic protection	2 weeks
New power and electrical	4 weeks
FLOW Deck	**25 months on site**
Financial Investment Decision (includes dredging to Duchy Wharf)	
Enabling works - excavation of existing revetment	4 weeks
Stabilisation - bored pile toe walls	8 weeks
Marine dredging (includes Duchy Wharf)	20 weeks
Removal of dredge arisings by HGV	24 weeks
FLOW Dolphins (Early Works) Optional to meet FLOWMIS requirements	
Construction - installation of piles, 40No	6 weeks
Construction - new revetment	4 weeks
Construction - suspended deck	6 weeks
Construction - installation of piles, 195No	20 weeks
Construction - new revetment	4 weeks
Construction - suspended deck	26 weeks
Landside works - fender panels, quay furniture, cathodic protection	8 weeks
New power and electrical	20 weeks
Roadway improvements	8 weeks
Duchy and County Wharf	**5 months on site**
Stabilisation - bored pile toe walls	12 weeks
Financial Investment Decision	
Strengthening - piled crane platforms, piles	8 weeks
landside works - reinforced concrete pads, mooring bollards	8 weeks
Dock Quayside Areas	**4 months on site**
Building demolition	4 weeks
Landscaping (programme subject to BNG requirements)	12 weeks

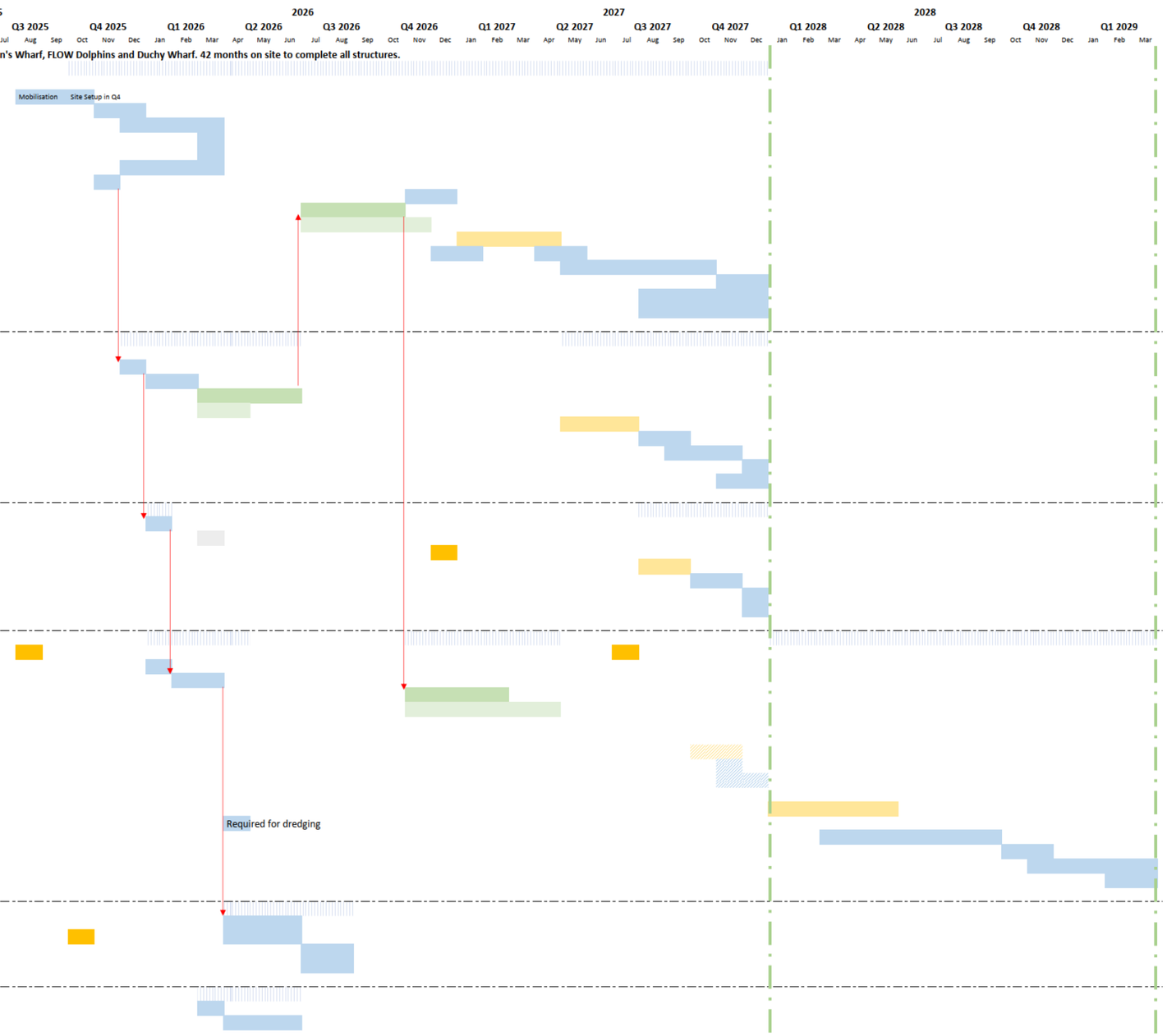

Figure 5.1: Indicative Worst-Case Programme, Assessed within EIA

5.3 Description of Works

Site Mobilisation

Construction Compound

5.3.1 The main construction compound would be located in the west of the site (to the south of Duchy Wharf), as illustrated on Figure 5.2. This will include appropriate welfare facilities for construction workers.

General Site Access

5.3.2 Vehicular access to the site would be via the land in A&P's ownership, which is itself accessed via the A39, onto Bar Road and then Tinners Walk (see Figure 5.2). A&P's land is not accessible to the public; all personnel and vehicles accessing the site would be required to access the site via the main A&P gate.

5.3.3 Dedicated routes for construction personnel, vehicles, plant and deliveries would be established within the site (see Figure 5.2), with temporary traffic lights used to control the flow of traffic if necessary, as per existing traffic control measures on site. Segregated vehicle and pedestrian routes would be created by use of barriers, providing safe access to the various work areas. These routes would be modified and adapted as works progress.

Figure 5.2: Plan showing Proposed Site Access/Egress Routes and Construction Compound

Strengthening and Enabling Works

5.3.4 The following strengthening and enabling works are required across the site, to allow dredging and construction activities to occur:

Stabilisation of Existing Causeway

5.3.5 The existing central causeway is required to be stabilised, to enable the demolition and removal of the timber wharf at Western Wharf. Either a cross-tied wall or ground anchored combi-wall is proposed to stabilise the causeway, and would be installed using the following method:

- Drive steel vibro-driven or impact-driven piles for the wall, with steel sheet piles between to retain fill material or bored and cased concrete piles;
- Install cross-ties or ground anchors through boring and grouting;
- Construct capping beam over piles;
- Backfill with well graded granular material; and
- Form new revetment and place rock armour.

Excavation of Existing Revetments

5.3.6 Excavation of the existing revetment at Western Wharf is required to allow dredging to be undertaken. This will be undertaken with a long reach excavator, to form a stable slope from bed level to the existing ground level. Excavation of the head of the existing causeway and the existing revetment surrounding Northern Arm is also required prior to the demolition of the Northern Arm, in order to form a stable slope. Temporary rock armour may be required to protect the newly formed slope during the works. Excavation of the existing revetments at the FLOW Deck will also be required.

Toe Walls

5.3.7 Toe walls are required at the toe of revetments across the site. The toe walls would retain the existing revetments and land behind where the proposed dredging will undermine the toe. This is required to accommodate the new proposed dredge depth. Locations requiring toe walls include:

- Along the quay to the south of Western Wharf and west of the dry docks;
- Immediately north of the FLOW Deck;
- Along the southern extent of the FLOW Deck;
- Beneath Duchy Wharf;
- Along the existing Queen's Wharf; and
- At the interface of Queen's Wharf and Northern Wharf.

5.3.8 Two options for the installation of the toe walls have been developed, to allow for highly weathered or competent rock. If the rock is found to be weathered, sheet piles are proposed to be driven to depth. Alternatively, a cased bored secant wall would allow for the toe walls to be installed into competent rock.

5.3.9 For both options, the area would first be surveyed and seabed obstructions removed on the line of the piled wall, including any rocks that may have slipped out of position from the revetment.

5.3.10 The proposed process for installation of driven sheet piles (in the case of weathered rock) is to vibro-drive steel sheets into position to a 'set', and then to impact-drive sheets to the required toe level.

5.3.11 The proposed process for bored secant piles (in the case of competent rock) is to first install unreinforced piles at approximately 0.8 pile diameters apart, and to then install reinforced concrete piles between the unreinforced piles. The installation of each unreinforced pile would be undertaken using the following methodology:

- Bore hole for softer 'slow gain' unreinforced piles. Temporary casings will be required from water level to approximately 1 m below bed level to prevent loss of material into the water and may be required to prevent collapse of softer material into the bored hole;
- Pour slow gain weak mix concrete into the bored hole and extract casings for reuse. The underwater concrete placement is envisaged to be undertaken by tremie placing concrete from the bottom of the bored hole; and
- Compact concrete (or use a self-compacting concrete mix).

5.3.12 The installation of each reinforced pile would then be undertaken to complete the bored secant wall, using the following methodology:

- Bore holes for reinforced concrete piles. These bored holes will overlap the softer unreinforced piles by approximately 0.1 pile diameters each side, to create a suitable interlock. Casings may be required to prevent collapse of softer material into the bored hole;
- Pour structural concrete and extract casings for re-use; and
- Place reinforcement cage into pile.

Demolition

Demolition of Terrestrial Buildings

5.3.13 The demolition and removal of 8 no. terrestrial buildings on the dock quayside area may be required to facilitate the proposed development. The locations of the buildings to be demolished are shown in Figure 5.3. The buildings to the south of Duchy Wharf are warehouses principally used for storage, whilst the buildings south of Western Wharf are currently occupied by Falfish, a commercial fishing company. Falfish would be re-located and accommodated within the site as part of the proposed development.

Figure 5.3: Plan Showing Proposed Terrestrial Buildings to be Demolished

5.3.14 Buildings shown in grey on Figure 5.3 have previously been demolished as part of dock operations under permitted development rights by the Applicant.

5.3.15 The buildings would be demolished down to ground level, with the below ground foundations remaining. However, during demolition there is the potential for minimal below ground disturbance which is assumed to be no greater than -1 m below ground level (BGL).

5.3.16 The hardstanding would remain and would comprise the construction compound during the demolition and construction stage, including space for handling and storage of construction materials and arisings and waste. In addition, to allow A&P to continue with day-to-day operations, the hardstanding could be utilised for container storage.

Demolition of Western Wharf Timber Jetty

5.3.17 The existing Western Wharf is a timber jetty, formed from timber piles, beams and deck, in addition to a sheet pile wall driven in front of the jetty and tied by timber piles to the Western Wharf. The timber piles and above surface infrastructure require demolition.

5.3.18 The timber wharf in the southern corner of Western Wharf would be demolished following the construction of the causeway stabilising structure, as follows:

- Remove timber decking planks and joists;
- Backfill between cross tied wall or ground anchored combi-wall and the existing quay wall, burying lower sections of the Western Wharf in a new revetment;
- When fill material reaches a suitable height, cut out timber beams and piles above fill material; and
- Backfill to final required level.

5.3.19 The remaining Western Wharf deck would then be demolished using the following method:

- Remove timber decking and joists;
- Place revetment material in front of Western Wharf to form a stable slope to retain existing revetment beneath timber wharf. Temporary rock armour may be required to protect the slope during construction. Revetment is to be placed to a suitable level to provide stability to the existing gravity wall; and
- Remove timber beams and cut out timber piles above the revetment.

Removal of Western Wharf Temporary Buildings

5.3.20 A number of temporary portacabin type buildings, used as offices, are located at the Western Wharf as shown in Figure 5.4. These will be temporarily re-located within the site during the construction stage to facilitate the Western Wharf works.

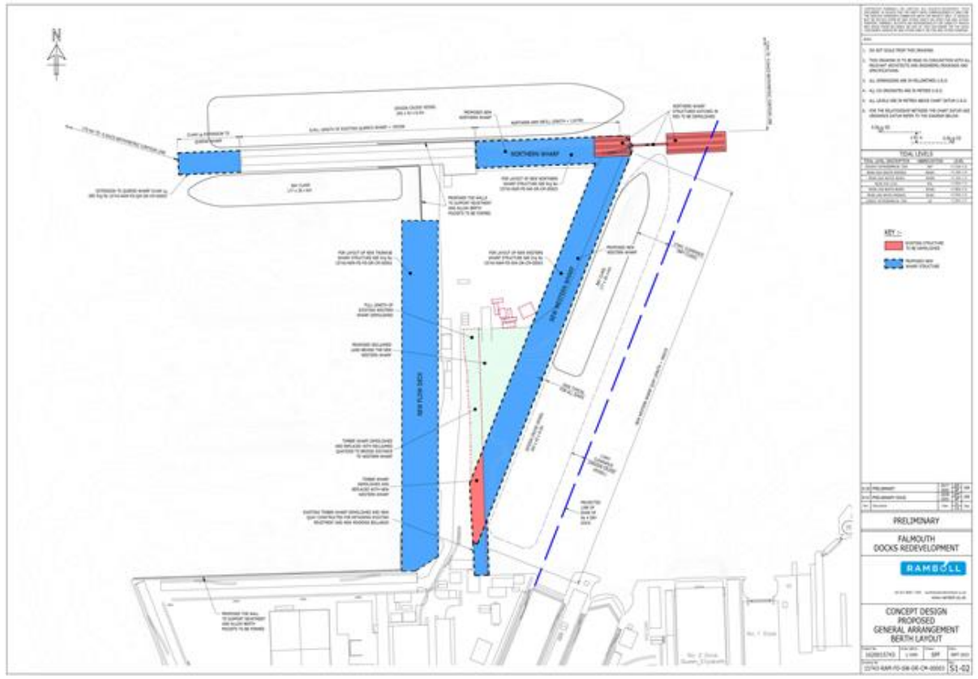

Figure 5.4: Plan Showing Proposed Marine Structures to be Demolished

Demolition of Northern Arm

5.3.21 The Northern Arm structure consists of precast blocks placed on a rock outcrop as walls, in-situ concrete walls formed over this, and an interior void with lean mix concrete (6:1), in addition to remaining timber structures. The concrete structure and substructure would be demolished to below seabed level and the gang walkway and old timber piles located west of this structure would also be removed.

5.3.22 Demolition of the Northern Arm would comprise the demolition of its upper section (in-situ concrete down to MLWS) followed by demolition of its lower section (precast and lean mix concrete down to the rock head). The demolition method for the upper section is anticipated to be as follows:

- Wire cut the mass concrete walls and capping slab into liftable pieces;
- Use mobile crane or excavator with grab / grapple to remove pieces;
- Remove cut pieces from site; and
- Excavate fill material by excavator and stock-pile for potential re-use as walls are reduced.

5.3.23 The demolition method for the lower section is anticipated to comprise:

- Excavate fill material by wire saw cutting, hydraulic breaker (used up to a total of 1-hour in any 24hrs) and excavator and stock-pile for potential re-use, thereby loosening the blocks from the structure;
- Lift concrete blocks out with excavator and grab/grapple;
- Remove mass concrete blocks from site;
- Excavate rock head to required dredge level; and
- Remove any remaining timber piles or obstructions.

5.3.24 The demolition works associated with the marine infrastructure are shown in red in Figure 5.4.

5.3.25 An Outline Site Waste Management Plan (OSWMP) has been prepared and accompanies the applications for full planning permission and a marine licence (see Technical Appendix 5.2). The main contractor will prepare a detailed SWMP prior to commencing works on-site.

5.3.26 Table 5.3 presents an estimation of the volume of arisings from demolition. As described in the relevant technical assessments of ES Volumes 1 and 2, materials would be recycled and re-used on-site wherever possible.

Table 5.3: Proposed Development Estimated Arisings from Demolition

Activity	Material	Estimated Bulk Quantities (m^3)
Excavation	Fill material (Central Causeway)	36,840
Northern Arm	Concrete	21,220
Western Wharf	Timber	684
Terrestrial Buildings	Concrete, Steel, Cladding	506

Dredging

5.3.27 As presented in Figure 5.5 and Table 5.4, it is proposed to dredge pockets along the berths at Western Wharf, north and south of Queen's Wharf and in the western basin adjacent to the proposed FLOW Deck. The berth pockets are proposed to be dredged to -10.5 m CD to achieve the required bed depths and underkeel clearances associated with the FLOW devices and the various vessels that would berth at the site. These dredge depths are to the clear draught of the design vessel with an additional 1 m underkeel clearance at Lowest Astronomical Tide (LAT) and 300 mm siltation allowance. The remaining elements of King's Wharf and Empire Wharf to the west of the causeway would be removed and surface-skimming of the eastern side of the causeway to -5.5 m CD would be undertaken.

5.3.28 The total dredged area would be approximately 232,500 m^2, whilst the total volume of dredged material would be approximately 643,000 m^3. Dredged material would comprise seabed material in addition to rock material that has been identified in the dredge pockets through ground investigation surveys. Stable batter slopes would be formed as part of the dredge process to ensure stability of the existing ground and prevent debris falling into the berth pockets. The sides of the dredge pockets would be graded and, if required, rock scour protection would be placed in the berth pockets. The dredge areas would then be surveyed again, and any missed areas or slipped material from batter slopes would be removed.

5.3.29 The dredge pockets would be formed using a backhoe dredger(s) to minimise sediment mobilisation. In addition, an 'environmental bucket' will be used. This is a lidded bucket which is designed to minimise the release of suspended sediment losses to the water column. The size of the bucket assumed for the EIA is a 10 m^3 lidded bucket, which is considered a precautionary approach for modelling purposes. The final choice of plant will be defined by the contractor; however, it will not be larger than the plant simulated.

5.3.30 Dredging will be limited to occur during the flood tide. Following investigation of the sensitivity of released sediment deposition in the area, the timing of the period of dredging was amended to be from 1.75 hours before low water to 1.75 hours before high water, which further minimises fine sediment deposition in the more sensitive areas.

5.3.31 The production rate for the dredger using a 10 m^3 bucket will be approximately 11,000 m^3 per week. As shown in the indicative demolition and construction programme (Figure 5.1), dredging could be undertaken over a 58-week period, which is the quickest timeframe that this could realistically be undertaken. This assumes a 10 m^3 closed bucket is used for all dredge material and that dredging

would only be undertaken on a flood tide (amended to 1.75 hours before low water to 1.75 hours before high water).

5.3.32 Using a smaller bucker with a longer programme is predicted to decrease sediment dispersion, and therefore modelling the largest bucket deemed practicable (10 m^3) is deemed the worst-case in terms of sediment dispersion. In practice, the dredge production rate and therefore duration of dredging would depend on the size of the backhoe dredger and bucket deemed most appropriate by the contractor, as well as the rate at which this can be disposed of on land and/or storage options, which may be the limiting factor.

Table 5.4: Approximate Dredge Quantities

	Area (m^2)	**Volume (m^3)**
Western Wharf, Northern Wharf and north of Queen's Wharf to -10.5 m CD	55,500	230,000
South of Queen's Wharf to -10.5 m CD	9,800	33,000
FLOW Deck, Duchy Wharf and Western Basin to -10.5 m CD	60,000	224,000
Graded sides	55,000	123,000
Surface Skim to Eastern Basin	46,700	27,000
Removal of obstructions (previous King's and Empire Wharves) in Western Basin	5,500	6,000
Total	**232,500**	**643,000**

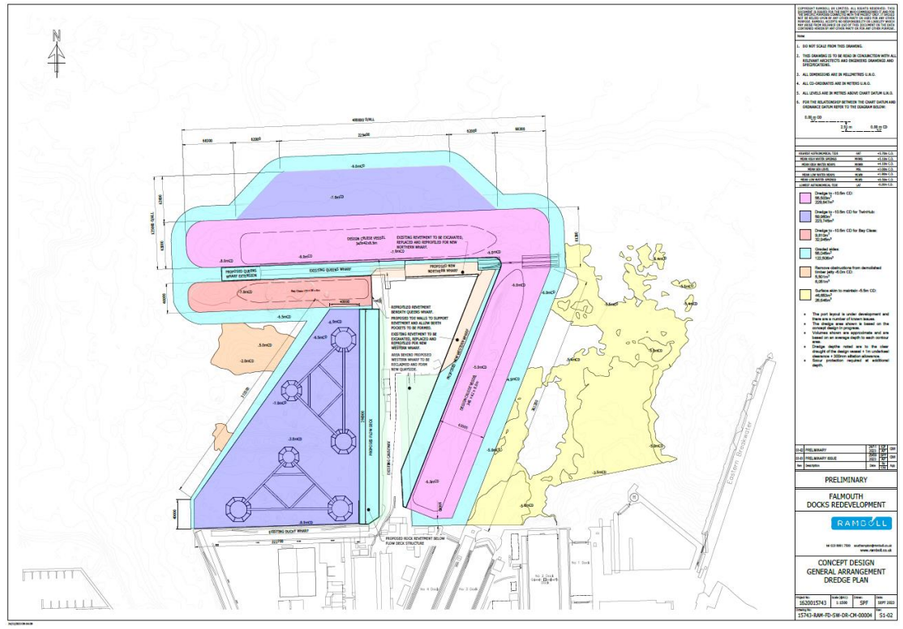

Figure 5.5: Proposed Development Dredging Plan

5.3.33 As described within the Best Practicable Environmental Option (BPEO) Assessment submitted with the marine licence application, the proposed management and disposal of the dredged material has sought to manage environmental concerns and follow the waste hierarchy as far as reasonably possible to minimise adverse environmental impacts. Consultation with Cefas was undertaken to seek agreement on the approach to the management of contaminated material and the volume of material suitable for disposal at sea (see Technical Appendix 5.3).

5.3.34 For the purposes of assessment in the EIA, the management and disposal of the dredge arisings is assumed to be as described in Table 5.5, which provides two potential scenarios in terms of the volume of dredge material that could be disposed of at sea. This will be agreed with Cefas in terms of final volumes. In addition, once further GI is undertaken at detailed design stage, more material may be deemed suitable for re-use on site.

Table 5.5: Anticipated Management and Disposal of Dredged Arisings

Disposal	Anticipated Type of Material	Approx. Volume of Material (m^3)
Re-use on site	Rock	65,000 – 135,000
Suitable for disposal at sea at an approved marine disposal site	Rock and/or seabed material	357,000 (scenario 2) – 394,000 (scenario 1)
Requires disposal on land	Contaminated seabed material	184,000 (scenario 1) - 221,000 (scenario 2), of which 99,950 is estimated to be hazardous)
TOTAL		643,000

5.3.35 It has been assumed as a more conservative estimate that 34% of the dredge arisings will not be suitable for disposal at sea due to contamination and therefore will require disposal on land. However, it is possible that this could apply to 29% of dredge arisings (pending confirmation by Cefas, see Ground Investigation Interpretative Report for further detail).

5.3.36 Up to approximately 135,000 m^3 of rock dredge material may be suitable for re-use on site as fill material in the area of reclaimed land, providing it is competent. A conservative approach has been used in the EIA, whereby it has been assumed that only approximately 50% of the rock dredge material (approximately 65,000 m^3) will be competent and able to be re-used on site.

5.3.37 The dredged material suitable for disposal at sea would be loaded directly onto barges and taken to the disposal site, Falmouth Bay (B) Disposal Site (PL075), in line with the marine licence requirements.

5.3.38 The contaminated dredge material would be landed and removed from site by HGV. For the purpose of assessment within the EIA, it has been assumed that the material would be transported whilst saturated with water and the material is therefore estimated to have a mass of approximately 414,375 tonnes (assuming a sediment density of 1.5 tonnes/m^3 and 25% water saturation). Approximately 20,719 loads of 20 tonne capacity HGVs would therefore be required to remove the material from the site. As it has been assumed that a maximum of 8 no. 20 tonne HGVs could be loaded with contaminated dredge material per hour at the docks, the contaminated material would be transported off-site via HGV over a period of 52 working weeks (working 10 hour working days, Monday – Friday). This equates to 16 two-way HGV movements per hour over the period of 52 working weeks for removal of contaminated sediment.

5.3.39 The above-described removal of contaminated material from the site via HGV is considered to be the worst-case, working as quickly as possible and with a maximum possible number of HGV loads being removed from the site per hour. It is anticipated that the number of HGV movements per hour would be lower than this, and that the removal of material would therefore occur over a longer time period.

5.3.40 Should the rate of dredging exceed the rate at which the contaminated material can be removed from site, temporary stock-piling of contaminated material will be required. The material would either be stored temporarily on a barge within the site (either at Queen's Wharf or Duchy Wharf), or stockpiled on the dock quayside area within the site (likely to be at Duchy Wharf). Adequate control

measures would be put in place and adhered to for any temporary storage of contaminated material in line with Government guidance[2], including appropriate secondary containment.

5.3.41 Limited maintenance dredging is proposed. The anticipated volume of maintenance dredging is estimated to be up to approximately 8,000 m^3 every 5 years (or depending on operational requirements, up to approximately 16,000 m^3 every 10 years), as required, mostly within the eastern berth pocket (Western Wharf). For further detail refer to ES Chapter 6: Coastal Processes and Technical Appendix 6.2. Maintenance dredging would be undertaken in line with the requirements of the marine licence, with proposed disposal at the Falmouth Bay Disposal site.

Construction

5.3.42 The proposed new wharf structures would each be constructed following the same structural form and methodology. The suspended decks would consist of a combination of vertical and raking piles, supporting a series of longitudinal and transverse reinforced concrete beams with a reinforced concrete deck over. With the exception of the Queen's Extension, new revetment would be constructed beneath the decks, as well as transition slabs positioned at the landward edge of the quay, bridging between the reclaimed land behind and the new structures. An area of land reclamation in the zone between the existing causeway and the new Western Wharf would be constructed.

5.3.43 The key infrastructure required for each wharf, which would be constructed and installed, is summarised in Table 5.6, and described in the subsequent paragraphs.

Installation of Steel Tubular Vertical Piles

5.3.44 The installation of the steel tubular piles is considered to be similar regardless of the option chosen for providing lateral stability. The construction process will include:

- Rock armour would be removed locally to the proposed pile position and piles driven into the ground, using vibro-driving as far as possible (to minimise noise and impact on the surroundings) and using impact driving if required pile depths are not achieved through vibro-driving.
- Precast concrete troughs would then be placed over the piles, positioned to allow plant to track forward and drive the remaining piles through a similar drive/place/drive approach. Alternatively, a temporary steel working platform may be used. The contractor may prefer to have two teams working simultaneously, one driving piles and one placing concrete to allow the construction process to continue with minimal interruption between processes.

5.3.45 The steel tubular raking piles for Queen's Wharf Extension are envisaged to be installed with a similar method to the steel vertical piles, working out from the existing Queen's Wharf.

5.3.46 A piling rig would be utilised to undertake the percussive piling. It is estimated that approximately 6 hours is required for the installation of each pile, of which approximately 2 hours would comprise percussive piling (up to a total 4 hours of percussive piling on a given day). Piling would utilise soft-start procedures in line with JNCC Guidance (JNCC, 2010)[3].

Table 5.6: Main Infrastructure Required at each Wharf

Wharf	Requirements
Western Wharf	• Area of land reclamation in the zone between the existing causeway and the new wharf • New revetment (330 m in length) • A transition slab positioned at the landward edge of the quay, bridging between the reclaimed land behind and the new structure • 164 no. 1,270 mm diameter steel vertical piles • 46 no. reinforced concrete raking piles installed within the existing causeway revetment and area of reclaimed land behind • Suspended deck
Northern Wharf	• New revetment (160 m in length) • A transition slab positioned at the landward edge of the quay, bridging between the reclaimed land behind and the new structure • 80 no. 1,270 mm diameter steel vertical piles • 46 no. reinforced concrete raking piles • Suspended deck
Queen's Wharf	• 28 no. 1,016 mm diameter steel vertical piles • 20 no. 914 mm diameter steel raking piles • Suspended deck
FLOW Deck*	• New revetment (290 m in length) • Transition slab positioned at the landward edge of the quay, bridging between the reclaimed land behind and the new structure • 195 no. 1,321 mm diameter steel vertical piles • 140 no. reinforced concrete raking piles • Suspended deck
*Minimum requirement for FLOW to be operational (i.e. the FLOW Dolphins)	• New revetment (290 m in length) • 40 no. 1,321 mm diameter steel vertical piles • 32 no. reinforced concrete raking piles

Provision of Lateral Stability

5.3.47 To provide lateral stability, two options are being considered, and the most suitable will be selected following a detailed ground investigation.

5.3.48 The first option to provide lateral stability is through the installation of raking piles on land behind the suspended decks and within the reclaimed land behind. The raking piles are proposed to be bored and cased reinforced concrete piles to resist tension and compression.

5.3.49 An alternative to the concrete raking piles (should the bedrock be found to be suitable in the detailed ground investigation) is to bore rock sockets for the vertical piles to a point of fixity which would allow a bending moment to develop at the toe of the piles. This process would be installing the piles through vibro-driving as above, followed by coring of the driven pile into the rock layer below

[2] Pollution prevention for businesses - GOV.UK (accessed 14 November 2024)

[3] JNCC 2010. Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise. August 2010.

through a process of 'drive-drill-drive'. The toe of the piles would then be grouted to fill any void between the steel piles and rock socket. This would likely have to be completed with marine plant.

Placement of New Revetment

5.3.50 New revetments would be formed by placing fill, filter layer and permanent rock armour and reinstatement of rock armour removed prior to dredging. Some compaction of the fill will be required.

Construction of Suspended Deck

5.3.51 Once the revetments and rock armour are completed, the suspended deck would be constructed by placing the remaining precast concrete trough elements by crane, to form the transverse and longitudinal beams. The deck would then be formed over the beams by placing precast concrete planks as form for the decking slab. The final *in situ* slab forming the load-bearing surface of the wharf would be the final concrete element to be constructed, by placing reinforcement over the precast planks in a combination of lifting pre-made cages into position by crane and fixing loose bars for both beams.

5.3.52 Estimates of bulk material quantities for key construction components are provided in Table 5.7. Whilst options for utilising recycled construction materials (for example, recycled steel) would be explored during the procurement stage, recycled materials may be less durable than new materials. Thus, the need to ensure the durability of the marine structures and minimise maintenance and replacement requirements over their design life would be balanced with the use of recycled materials.

Table 5.7: Estimated Bulk Quantities During Construction

Activity	Estimated Bulk Quantities
Fill Material (including revetments)	278,298 m^3 (of which 202,668 m3 / 344536 t is imported)
Rock Armour	25,311 m^3 / 37,967 t
Reinforced Concrete	54,373 m^3 / 135,933 t
Steel Reinforcement	5,665 t
Steel (excluding reinforcement)	3,296 t

Finishing Works and Upgrades

Strengthening of Duchy and County Wharfs

5.3.53 Duchy Wharf would be strengthened through the construction of piled crane platforms and new mooring bollards on the land behind it, to allow mooring and fit out of FLOW devices. The crane platforms would be formed from bored concrete piles with a reinforced concrete deck over, to allow cranes to position at the rear of Duchy Wharf. The mooring bollards would be formed from reinforced concrete pads.

5.3.54 Some strengthening works may be required to Duchy and County Wharf piles. This is dependent upon the recommendations of a condition survey and structural assessment which will be undertaken during the detailed design phase.

Landside Works to Wharves

5.3.55 The final construction processes for each wharf would include the installation of braces to the seaward piles and then the fenders, fender panels and quay furniture (bollards, ladders, grab chains, etc.) to allow the wharf to service vessels. Installation of cathodic protection onto the steel piles is likely to be adopted to increase the service life of the structures.

Electrical Power Supply

5.3.56 Electrical power supply would be provided to each of the wharfs once they are constructed.

Roadway Improvements

5.3.57 Minor internal roadway improvements would be undertaken at Western Wharf and FLOW Deck comprising the marking of internal routes.

Landscaping Works

5.3.58 Landscaping works for the proposed development will involve the installation of a number of trees in planters within the site.

5.4 Vehicles, Vessels, Plant and Equipment

5.4.1 During the demolition and construction stage, deliveries of equipment and materials to the site and removal of arisings and waste from the site would occur via land (using HGVs) and via sea (using vessels).

5.4.2 As there is limited storage space on-site, deliveries would generally be 'just-in time' to avoid storing large volumes of materials and preventing over-purchasing which could lead to waste. All deliveries would be brought onto the site without delay and dealt with within the confines of the site boundary. To represent a worst-case scenario in terms of traffic movements, it has been assumed that all material could potentially be brought to the site by road (except piles), and the profile of these deliveries has been aligned to the worst-case programme, representing the potential highest number of daily HGVs (based on a 5 day working week, from 08.00 to 18.00). Table 5.8 summarises the total HGVs associated with the main construction activities, with further detail provided in the Transport Assessment (Technical Appendix 13.1). The number of HGVs peaks at 187 deliveries per day in Q4 2026.

Table 5.8: Summary of Construction Traffic (Worst-case)

Construction Activity	Total HGV Deliveries (one-way movements)
Enabling/ demolition works	1,414
Dredging	20,719
Construction - fill	6,797
Construction – rock armour	10,133
Construction – wharfs	1,898

5.4.3 In terms of vessel movements during construction, the most significant vessel movements would be associated with the disposal of dredged material that is suitable for disposal at sea. It is proposed that suitable material is taken to the disposal site at Falmouth Bay by barge with a capacity of 700 m^3. It is likely that two barges would be in operation, so that a barge is always alongside the dredger to accept arisings, whilst the other is transiting to the disposal site. Based on the indicative programme, it is estimated that this could equate to a maximum of 4 - 6 one-way barge movements per day for the duration of the dredging, which is approximately 36 weeks for the material that is suitable for disposal at sea.

5.4.4 Consideration has also been given to the types of plant and equipment that are likely to be used on-site for the proposed development. The equipment associated with each key element of the demolition and construction process is set out in Table 5.9.

Table 5.9: Anticipated Demolition and Construction Plant and Equipment	
Plant and Equipment	Activity
Long reach excavators, and long reach excavators fitted with buckets for excavation, wire cutting saws and grabs/grapples	Demolition, dredging, excavating revetments, placing rock armour
Wire cutting saws	Demolition
Excavators (buckets for excavation, grabs/grapples, hydraulic breakers (peckers)), compaction equipment	Demolition, excavating revetments, placing and compaction of fill, placing rock armour, stockpiling dredge arisings, Western Wharf reclamation
Earthmovers (dump trucks)	Stockpiling dredge arisings
Forklifts	Construction of suspended decks
Spud leg barge	Dredging, construction of the cross-tied wall or ground-anchored combi wall, demolition of the eastern part of Northern Arm
Backhoe dredger vessel	Dredging
Barges (towed or self-propelled)	Removal of dredge arisings, removal of demolition arisings
Workboat	Fender installation, supporting divers installing the CP system
Mobile cranes	Positioning piles, driving piles, placing precast, placing reinforcements, positioning tremie/concrete placement, removal of cut sections of concrete and timber elements
Piling hammer	Driving piles
Piling rigs (crane mounted hammers)	Construction of suspended decks
Rotary piling rig (or sheet piling impact hammer)	Coring concrete piles (for bored piles, if required)
Concrete batching plant	Construction
Concrete pump	Placing concrete in-situ
General power tools	Demolition and construction

5.5 Deconstruction of the Proposed Development

5.5.1 The proposed development would extend the design life of the marine infrastructure, including minimum proposed deck levels that are set approximately 600 mm above the peak maximum modelled flood level, the 1 in 1,000-year event adjusted for climate change, whilst accounting for the maximum increased wave allowance as determined in the HR Wallingford Wave Modelling Assessment. The marine infrastructure would have a 50-year design life, although it is not currently anticipated that the development would be deconstructed.