3 DESCRIPTION OF THE PROPOSED SCHEME

3.1 Introduction

The proposed scheme comprises demolition of the existing wharf, jetties and other minor infrastructure along the river bank at South Bank (including an electrical substation), capital dredging (to deepen the northern half of the Tees Dock turning circle, a section of the existing approach channel and to create a berth pocket), offshore disposal of dredged sediments and construction and operation of a new quay (to be set back into the riverbank). Further detail regarding the various elements of the proposed scheme are detailed below.

3.2 Site compound

The proposed scheme would initially comprise the establishment of a site compound. This would be used to store machinery, construction materials, offices, welfare facilities and provide car parking for the duration of the construction activities.

It has been assumed that foul sewage from the welfare facilities would be tankered off site on a regular basis, rather than welfare facilities connecting directly into the sewage network.

The exact location of the compound is unknown at this stage, but it would fit in with the proposed phasing for construction of the proposed quay.

3.3 Demolition

The site of the proposed scheme is currently occupied by a dilapidated wharf approximately 750m in length, two jetties immediately downstream, a further jetty at the extreme downstream end of the proposed scheme footprint with associated conveyor and various buildings and structures on the riverbank and the adjacent hinterland (including a live substation).

STDC has submitted prior approval applications to RCBC for the demolition of the majority of existing infrastructure within the landward part of the proposed scheme footprint. Such prior approval applications comprise the demolition of:

- Five quayside heavy oil tanks and associated structures and pipework (R/2020/0281/PND). RCBC confirmed on 7 July 2020 that prior approval for such demolition is not required (meaning demolition can proceed without planning permission).
- Buildings on land east of Smiths Dock Road at South Bank (R/2020/0302/PND). RCBC confirmed on 10 July 2020 that prior approval for such demolition is not required.
- Pumping station (excluding the pipework which previously abstracted water from the Tees estuary). RCBC confirmed in October 2020 that prior approval for such demolition is not required.

Although the demolition of the above infrastructure is proposed as enabling works to be undertaken in advance of the main scheme, the removal of the heavy duty oil tanks and buildings on land east of Smiths Dock Road was included as part of the scheme description for the landside EIA on the basis that permissions for demolition had not been granted at the point the landside EIA was submitted. As noted above, RCBC has confirmed that demolition of such infrastructure can commence without planning permission, and works to demolish such infrastructure has started. As a result, there is no requirement for the demolition of that infrastructure to be included within the scheme description which is the subject of this report. In addition to the above, a building is present at the extreme downstream end of the proposed scheme footprint. The

demolition of this building has been incorporated into the landside EIA and associated planning application and is therefore not included as part of the proposed scheme which is the subject of this report.

Demolition works to be undertaken as part of the proposed scheme which is the subject of this report are therefore limited to the dilapidated wharf, three jetties downstream of the wharf (with the associated conveyor at the downstream end), a live electrical substation on the hinterland, pipework which previously abstracted water from the Tees estuary associated with the pumping station. In addition, it has been assumed that underground utilities and pipework infrastructure would need to be grubbed out / excavated / diverted / capped as part of the demolition process prior to construction of the quay. It has also been assumed that any material stockpiled or stored on the site would need to be removed in advance of works commencing. The assumed approach to demolition of these assets is detailed below.

It should be noted that consultation with the Harbour Master in July 2020 has confirmed that no vessels have utilised any of the jetties within the proposed scheme footprint for a number of years.

The concrete deck of the existing jetties and locally on the wharf is likely to be either broken up using a long reach excavator with hydraulic demolition attachments, working from the shore (and supported by a jack-up barge, slave barge and safety/workboat). Alternatively, the demolition may include cutting sections of the deck and lifting them onto the land for disposal. Best practice working methods would be adopted to ensure that transport of debris into the Tees is minimised. Should any debris fall into the river channel during demolition, this would be removed as early as practicable. It has been assumed that concrete would be crushed on site and re-used as fill as part of the proposed scheme (or by STDC within the wider development areas being brought forward under the STDC Regeneration Masterplan).

The timber parts of the deck of the existing wharf would be removed using a long reach excavator working from the shore, and supported by a jack up barge, slave barge and safety boat. As with the concrete deck, best practice demolition techniques would be adopted to ensure transport of debris into the Tees is minimised, with any debris that does fall into the river being removed as early as practicable. It is proposed that the timber is transported offsite for disposal at an appropriately licensed facility, on the assumption that it would not be suitable for re-use as part of the proposed scheme.

The piles supporting the concrete jetties and the wharf, as well as the pipework feeding the pumping station would all be removed to avoid issues arising during the subsequent capital dredge. It is proposed that the piles would be extracted using vibration techniques. It is anticipated that such works would be undertaking using a jack-up barge with crawler crane, a slave barge and a safety/workboat. This marine plant would be supported through the use of divers.

The demolition of the substation will be undertaken using land-based plant. The building materials are proposed to be crushed and re-used on site as fill. Services feeding into and out of the substation will be diverted in advance of demolition commencing so that works could be undertaken safely.

3.4 Quay construction

3.4.1 Quay envelope

The proposed scheme requires the construction of a new solid piled quay structure with approximate dimensions of 30m wide and 1,230m in length (providing approximately 1,050m of usable quay for berthing) (see **Drawing PC1084-RHD-SB-DN-DR-C-1380**, **Drawing PC1084-RHD-SB-DN-DR-C-1383** and **PC1084-RHD-SB-DN-DR-C-1384**). Although the useable surface of the quay itself would be up to 30m wide, the overall footprint of the works required to construct the quay would be up to 50m wide due to the proposals to construct an anchor structure further inland of the quay deck.

PC1084-RHD-SB-DN-DR-C-1380

PHASE 1
QUAY STRUCTURE
(PC1084-RHD-SB-DN-DR-C-1383)

PHASE 1
HEAVY LOAD PLATFORM
(PC1084-RHD-SB-DN-DR-C-1383)

PHASE 2
HEAVY LOAD PLATFORM
(PC1084-RHD-SB-DN-DR-C-1383)

PHASE 2
QUAY STRUCTURE
(PC1084-RHD-SB-DN-DR-C-1383)

HAZARD
TOXIC RELEASE FROM
SURROUNDING HEAVILY
INDUSTRIALISED AREAS

HAZARD
INTERFACE WITH LANDSIDE
DEVELOPMENT WORKS

PHASE 1
BERTH POCKET DREDGING AREA
(PC1084-RHD-SB-DN-DR-C-1381)

PHASE 2
BERTH POCKET DREDGING AREA
(PC1084-RHD-SB-DN-DR-C-1381)

PHASE 1 BERTH LENGTH 450M

PHASE 2 BERTH LENGTH 585M

EXISTING TARMAC WHARF
STRUCTURES FOR DEMOLITION

EXISTING DOLPHIN WHARF
STRUCTURES FOR DEMOLITION

EXISTING SOUTH BANK WHARF
STRUCTURES FOR DEMOLITION

PHASE 1
CHANNEL DREDGING AREA
(PC1084-RHD-SB-DN-DR-C-1381)

PHASE 2
CHANNEL DREDGING AREA
(PC1084-RHD-SB-DN-DR-C-1381)

OVERHEAD POWER LINES

HAZARD
ABOVE RIVER
POWER LINE
CROSSING

HAZARD
BELOW RIVER
SERVICE TUNNELS

HAZARD
RIVER TRAFFIC

SUB-RIVER PIPE TUNNEL

HAZARD
OPERATIONAL
PETROCHEMICALS
FACILITIES

GENERAL ARRANGEMENT
1 : 2000

PHASE 1 TURNING CIRCLE
DREDGING AREA
(PC1084-RHD-SB-DN-CR-C-1381)

SITE PLAN TRUE NORTH
1 : 12000

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM (mCD) UNLESS NOTED OTHERWISE

KEY:

PHASE 1 DEVELOPMENT AREA

PHASE 2 DEVELOPMENT AREA

REV	DATE	DESCRIPTION	DRW	CHK	APR
P01	24.08.20	FOR REVIEW AND COMMENT	CH	CF	TJR

REVISIONS

CLIENT

South Tees Development Corporation

PROJECT

TEES STUDY

TITLE

CONCEPT DESIGN
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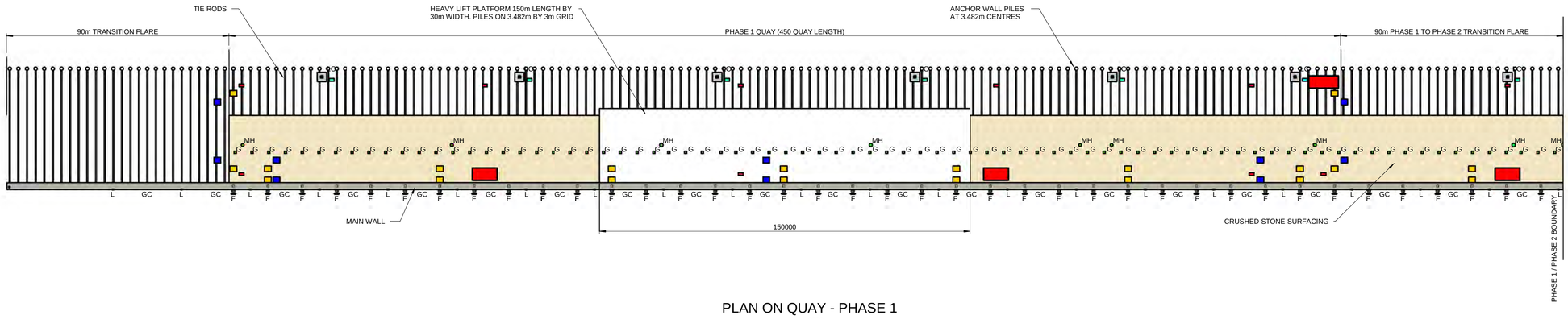
DRAWN	CHECKED	APPROVED
CH	CF	TJR

DATE	SCALE AT A1	REF.
24/08/20	As indicated	

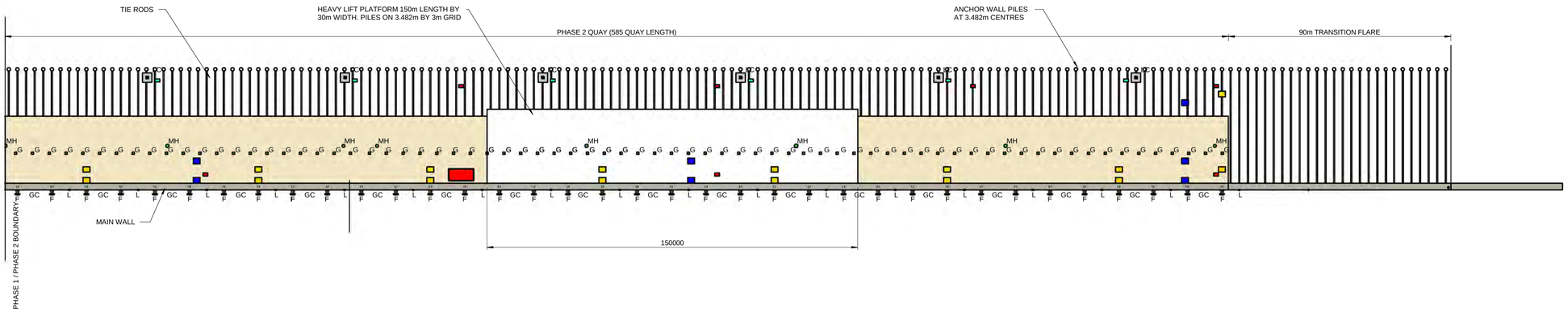
DRAWING No.	SUITABILITY	REVISION
PC1084-RHD-SB-DN-DR-C-1380	S3	P01

PC1084-RHD-SB-DN-DR-C-1383



PLAN ON QUAY - PHASE 1

1 : 1000



PLAN ON QUAY - PHASE 2

1 : 1000

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM (mCD) UNLESS NOTED OTHERWISE

KEY:

G	GULLY
LC	LIGHTING COLOUMN
F	FENDER
GC	GRAB CHAIN
L	LADDER
MH	MANHOLE
	BOLLARD
	POTABLE WATER SYSTEM (REFER TO DRAWING PC1084-RHD-SB-DN-DR-C-1387
	FIRE WATER SYSTEM (REFER TO DRAWING PC1084-RHD-SB-DN-DR-C-1387)
	LV ELECTRICAL SYSTEM (REFER TO DRAWING PC1084-RHD-SB-DN-DR-C-1386)
	HV ELECTRICAL SYSTEM (REFER TO DRAWING PC1084-RHD-SB-DN-DR-C-1386)
	DRAINAGE SYSTEM (REFER TO DRAWING PC1084-RHD-SB-DN-DR-C-1385)
	SURFACING

REV	DATE	DESCRIPTION	DRW	CHK	APR
P01	24.08.20	FOR REVIEW AND COMMENT	CH	CF	TJR

REVISIONS

CLIENT

South Tees Development Corporation

PROJECT

TEES STUDY

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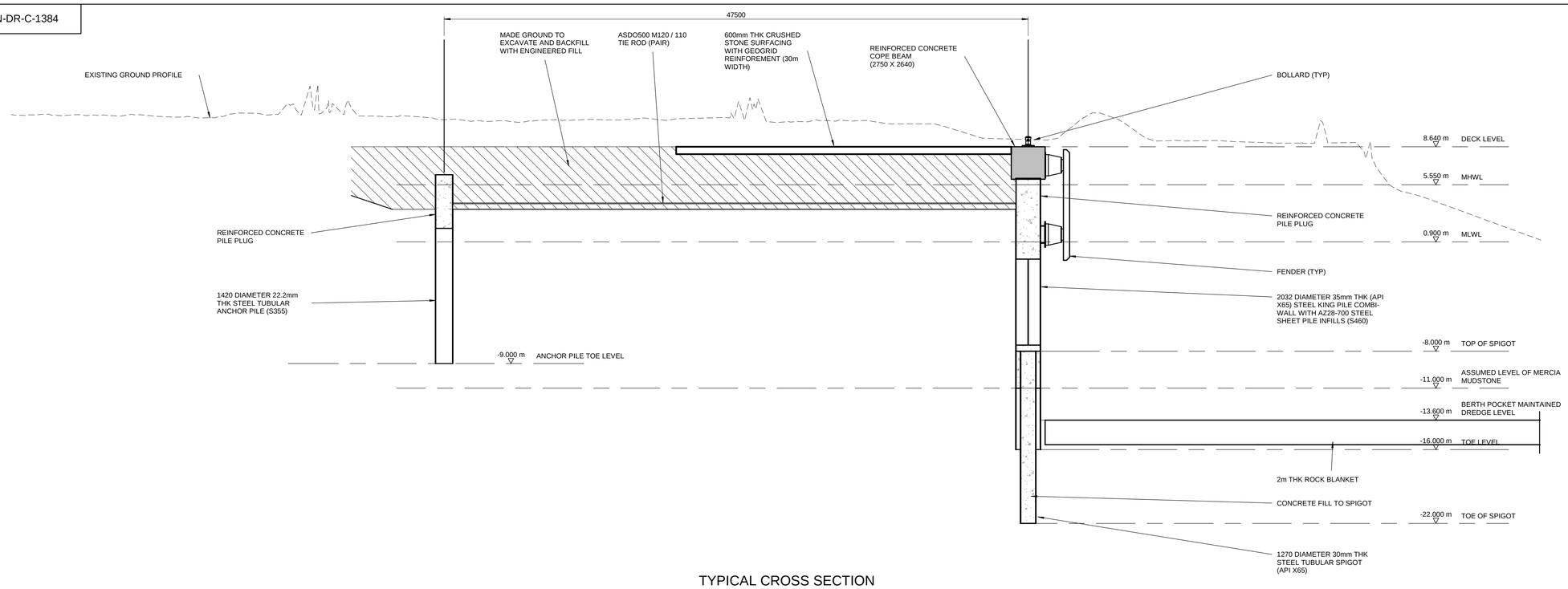
DRAWN	CHECKED	APPROVED
CH	CF	TJR
DATE: 24/08/20	SCALE AT A1: As indicated	REF.

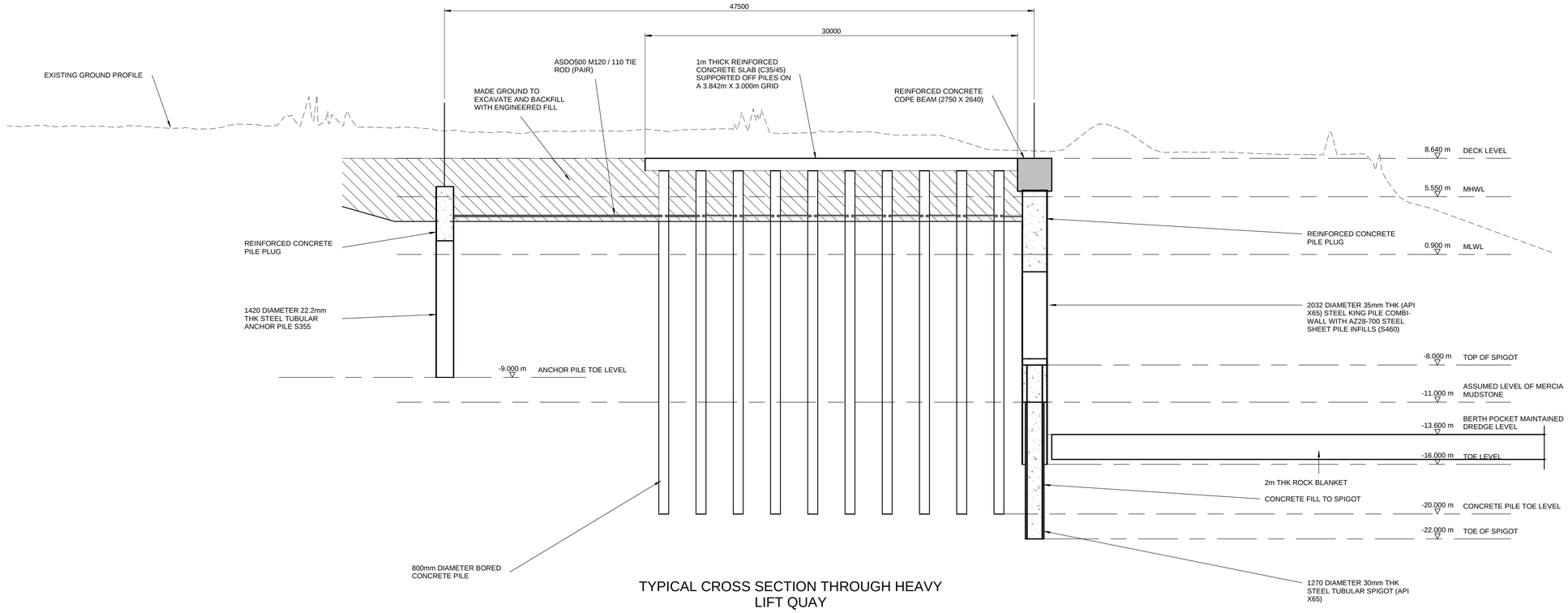
DRAWING No.	SUITABILITY	REVISION
PC1084-RHD-SB-DN-DR-C-1383	S3	P01

PC1084-RHD-SB-DN-DR-C-1384



TYPICAL CROSS SECTION

1 : 200



TYPICAL CROSS SECTION THROUGH HEAVY LIFT QUAY

1 : 200

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM (mCD) UNLESS NOTED OTHERWISE

REV	DATE	DESCRIPTION	DRW	CHK	APR
P01	24.08.20	FOR REVIEW AND COMMENT	CH	CF	TJR

REVISIONS

CLIENT

South Tees Development Corporation

PROJECT

TEES STUDY

TITLE

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DRAWN	CHECKED	APPROVED
CH	CF	TJR

DATE	SCALE AT A1	REF.
24/08/20	1 : 200	

DRAWING No.	SUITABILITY	REVISION
PC1084-RHD-SB-DN-DR-C-1384	S3	P01

The exact alignment of the quay is to be confirmed and, therefore, for the purposes of assessment, a maximum quay envelope of 1,300m x 75m has been assessed (see **Figure 1.1**). STDC does not intend to construct the quay up to the maximum width of this envelope; however, the envelope approach provides flexibility to STDC with regard to its final alignment.

As noted in **Section 1**, it is envisaged that the proposed quay would be utilised predominantly by the renewable energy industry, as well as supporting more general industrial and storage/distribution activities. The use of the proposed quay by vessels that would support the offshore wind industry is considered to be a worst-case scenario from a vessel size and navigation risk perspective. This navigation risk issue has resulted in the proposed quay being set back into the riverbank.

3.4.2 Form of construction

The assessed form of construction for the quay wall is a combi-wall comprising steel tubular king piles with steel sheet pile infills, as shown on **Drawing PC1084-RHD-SB-DN-DR-C-1384**. As noted above, an anchor structure (typically a steel sheet pile wall/combi-wall or discrete anchor structures such as tubular steel piles) would be constructed approximately 50m inland of the combi-wall to provide lateral restraint to the combi-wall. Tie rods would be used to connect the combi-wall to the anchor structure. It has been assumed that the ground level for the quay would be formed with stone surfacing, with the exception of two heavy lift areas which would have a concrete surface. Approximately 25,000m^3 of crushed stone is proposed to be imported to create the surfacing on the quay.

The quay would be constructed at a level of approximately 8.64m chart datum (CD). King piles for the combi-wall would be up to 2,500mm in diameter and it is assumed that these would be installed using percussive techniques through the softer material to a depth of approximately -16mCD, and then drilled into the underlying Mercia mudstone. Up to 400 piles are envisaged for the combi-piled wall. The form of construction for the anchor structure is yet to be confirmed, however it would either comprise steel sheet piles or tubular piles; if a steel sheet piled wall is progressed, up to 1,250m of sheet piles would be required. Alternatively, up to 400 tubular piles of up 1,500mm in diameter would be used.

The quay is proposed to contain two heavy lift areas along its length which would comprise concrete ground slabs supported on approximately 500 vertical bored cast in-situ piles to support each of the heavy lift areas (i.e. up to 1000 piles for the heavy lift areas). Each heavy lift area would be approximately 150m x 30m in size.

A relieving platform is also proposed behind the combi-wall; the purpose of the platform is to take the vertical load from an applied surcharge and carry this on a piled platform. Should a retaining platform be utilised, the diameter of the anchor wall piles would reduce, and the thickness of the combi-wall and the anchor wall would reduce. Given the uncertainty in the design at this stage, the worst-case scenario is that a relieving platform is adopted as part of the design. The relieving platform would require in the order of 1,200 bored concrete piles approximately 800mm in diameter. The assessed pile requirements are summarised in **Table 3.1**.

All piles would be installed through soils on land; no piling is proposed in the river channel. It has been assumed that all piling works will be undertaken using land-based plant, with a safety / workboat proposed to support any activities following the removal of material in front of the quay. The number of piling rigs to be used on site would be driven by the construction programme; however, for the purposes of assessment, it is envisaged that up to four piling rigs would be working at the same time.

Table 3.1 Assessed piling requirements

Feature	Type of pile	Maximum pile diameter	Maximum number of piles
Combi-wall	King piles – installed using percussive techniques then drilled into the Mercia Mudstone	2,500mm	400
Anchor wall	Tubular steel piles / sheet piles	1,500mm	400
Heavy load platform	Bored concrete piles	800mm	1,000
Relieving platform	Bored concrete piles	800mm	1,200
Total number of piles			**3,000**

Fixed infrastructure to be installed on the quay would be limited to mooring bollards, Demand Side Units (DSUs), lighting towers and a new electrical substation. Lighting towers are proposed to be up to 30m in height. There would be water supply (both potable and fire water) at the quay, as well as the provision for ship to shore power connection (cold ironing).

3.4.3 Site access and transportation of materials to site

Given the proposals to utilise land-based plant for the proposed quay construction, it is envisaged that access to site for construction plant and personnel will be via Smiths Dock Road and / or Tees Dock Road.

All construction materials are predicted to be transported to site by road, with the exception of the following which are anticipated to arrive on site by vessel:

- steel required for piling – delivered using up to six vessels in Phase 1 and six vessels in Phase 2 (12 vessels in total);
- rock required for the rock blanket in the berth pocket – delivered using up to six vessels in Phase 1 and seven vessels in Phase 2 (13 vessels in total); and,
- tie rods – delivered using up to one vessel per phase of development (two vessels in total).

It is anticipated that the vessels transporting the steel and tie rods would arrive to site by sea, with vessels likely to berth in Tees Dock or at a suitable berth along the river channel. The piles and tie rods would then be offloaded onto HGVs and transported to site using the existing road network. Rock for the rock blanket is anticipated to be placed directly into position on the riverbed.

3.4.4 Excavation of soils

There would be a requirement for the excavation of approximately 275,000m^3 of existing soils behind the proposed combi-wall in order to install the tie rods. Such material would be removed using long reach excavators. It has been assumed that the excavated material could be re-used on site, avoiding the requirement for offsite disposal. If the material is not suitable for re-use on site, up to 215,000m^3 of fill material would need to be imported onto site, with the excavated material being removed from site to an appropriately licensed facility.

3.5 Environmental enhancement measures

As the berth length at the proposed quay (1,050m) is less than the proposed quay length (up to 1,330), there is space at the upstream and downstream ends of the quay to undertake environmental enhancement works. There is also the potential to incorporate environmental enhancement works into the berthing, as long as such works do not interfere with the availability to berth at the quay.

A review of the Tees Estuary Edges Enhancement Study (IECS, 2018) and the Greening the Grey framework (Naylor *et al*, 2017) has been undertaken to better understand the opportunities for environmental enhancement. It is considered that there is potential for incorporation of 'verti-pools' into the quay face; these pools are pocket rock pools that are designed to be applied to vertical sea defences to create water retentive habitat features. It is proposed that a number of verti-pools are positioned along the length of the quay face at different heights within the tidal frame to provide a range of different habitat opportunities.

3.6 Capital dredging of marine sediments and excavation of soils / landside materials within the riverbank

Drawing PC1084-RHD-SB-EN-DR-EV-1113 below shows the proposed dredge footprint. For the purposes of this EIA, a dredge envelope has been assessed (**Figure 1.1**). As shown on the drawing, dredging is anticipated to be required within part of the Tees Dock turning circle (currently maintained at a depth of 8.8m below Chart Datum (bCD)), within parts of the existing navigation channel (in areas currently maintained at depths of 8.5m bCD, 7.2m bCD and 5.7m bCD) and within areas not currently subject to maintenance dredging to create a berth pocket. The Tees Dock turning circle and areas of navigation channel are proposed to be deepened to 11m bCD (maintained at 10.4m bCD). The berth pocket is proposed to be dredged to a depth of 15.6m bCD (maintained at a depth of 13.0m bCD). The berth pocket is proposed to be dredged to 15.6m bCD initially in order to allow for the installation of a 2m thick rock blanket (discussed in Section 3.6 below).

As shown on **Drawing PC1084-RHD-SB-EN-DR-EV-1113**, the proposed berth pocket would straddle an area that is currently partly land and estuarine. There would, therefore, be a requirement for dredging of estuarine (marine) sediments and excavation of soils / landside materials within the riverbank to create the berth pocket. The proposed scheme (and consequently the dredging requirements) has been designed to avoid the pipe tunnels which cross underneath the Tees estuary downstream of the proposed quay, as well as the overhead power lines and pylons upstream of the proposed quay.

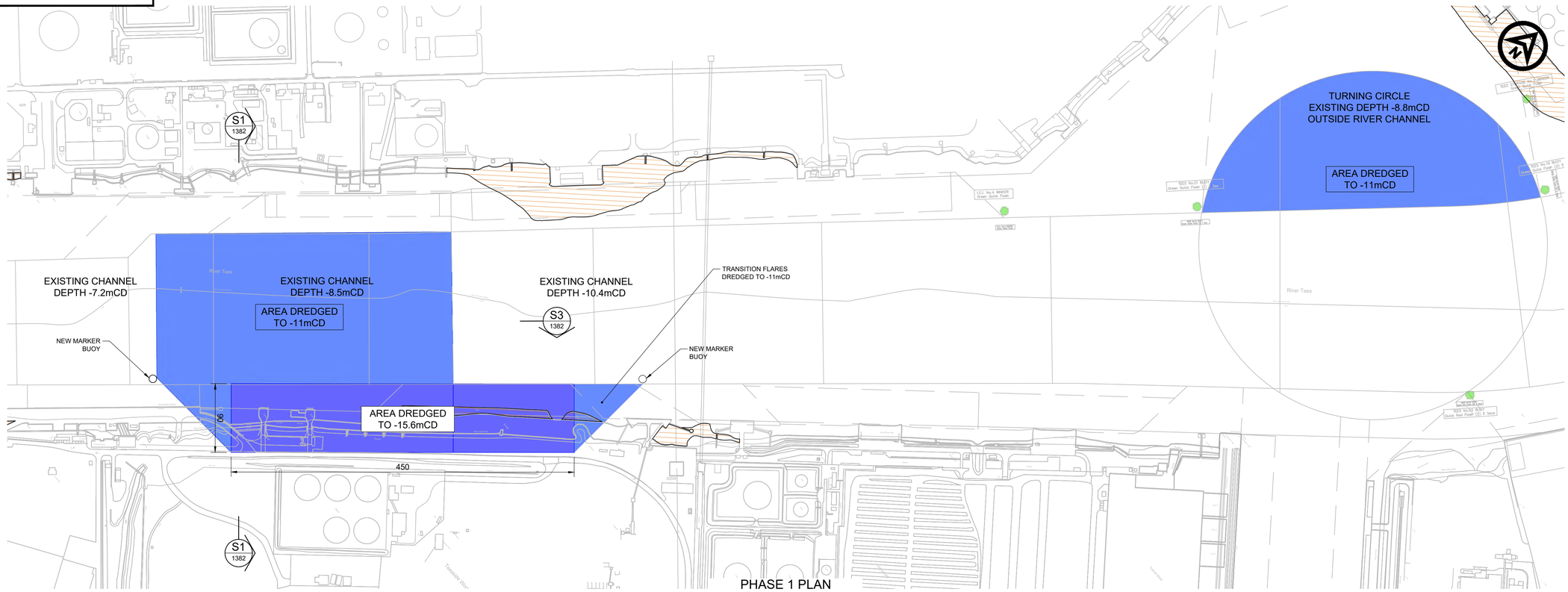
A summary of the proposed design levels and dredge volumes for marine sediments is detailed in **Section 3.4.1 and 3.4.2**, with further information regarding the excavation of soils / materials in the riverbank provided in **Section 3.4.3**.

3.6.1 Volume of marine sediments to be dredged

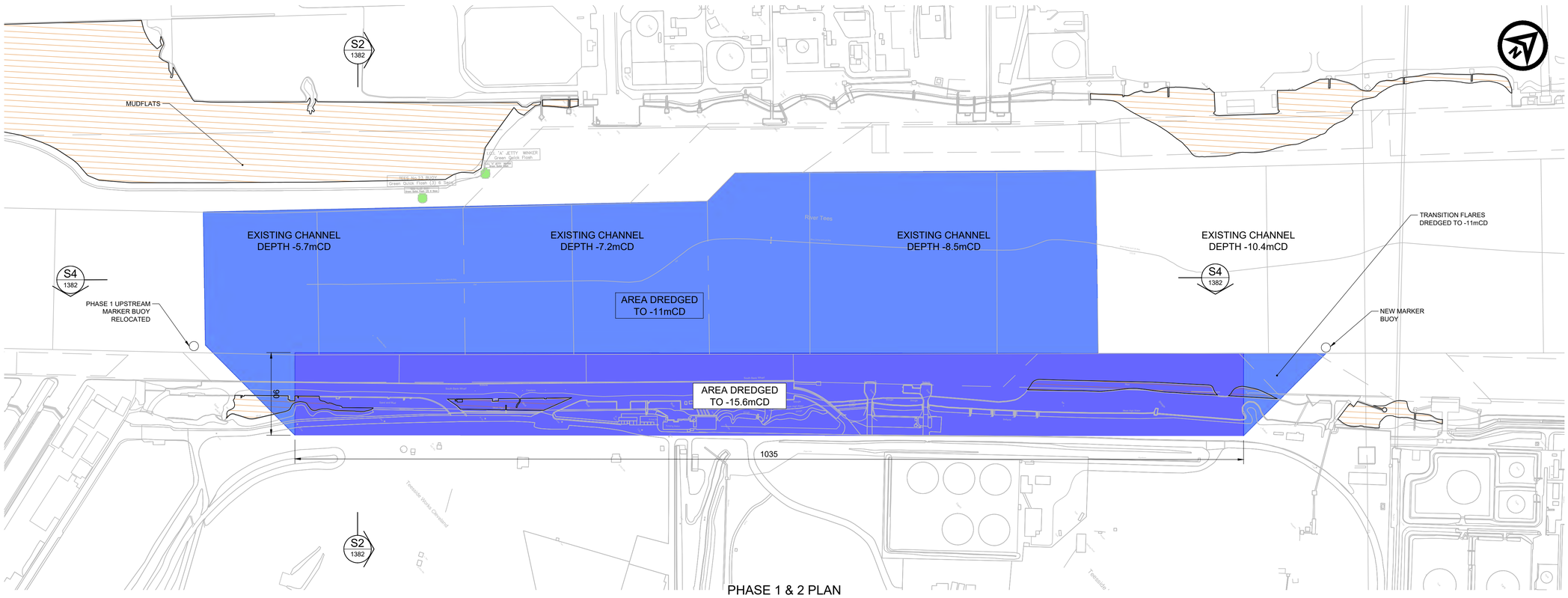
The total dredge volume for marine sediments is predicted to be approximately 1,800,000m^3. As detailed in **Table 3.2**, the dredge is proposed to be undertaken in two phases to match the anticipated phased construction of the quay however the assessment undertaken within this EIA assumes that the dredging is carried out in one campaign as a worst-case scenario. A relatively large proportion of the total volume of dredged material is anticipated to comprise geological material (i.e. mudstone) (approximately 340,000m^3), below an assumed level of 11m bCD (based on recent investigation works). The remaining 1,460,000m^3 of marine sediment is anticipated to comprise Tidal Flat Deposits and Glacial Till. It is proposed that all areas would be dredged to 11m bCD with the exception of the berth pocket which will be dredged to 15.6m bCD.

DRAWING No.
PC1084-RHD-SB-EN-DR-EV-1113

DO NOT SCALE



PHASE 1 PLAN
SCALE 1:3000



PHASE 1 & 2 PLAN
SCALE 1:2500

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN (mOD). FOR RELATIONSHIP BETWEEN ORDNANCE DATUM AND CHART DATUM REFER TO DIAGRAM BELOW.

3. REPORTED AREAS OF MUDFLAT EXTRACTED FROM NATURAL ENGLAND'S PRIORITY HABITAT INVENTORY DATA SET.

KEY:

- DREDGE TO -11.0mCD
- DREDGE TO -15.6mCD
- MUDFLATS

REV	DATE	DESCRIPTION	BY	CHK	APP
P01	28.10.20	FOR REVIEW AND COMMENT	CC	CF	TJR

REVISIONS

CLIENT

South Tees Development Corporation

PROJECT

TEES STUDY

TITLE

DREDGING PLAN

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DRAWN	CHECKED	APPROVED
CC	CF	TJR
DATE	SCALE	REF.
28.10.20	AS SHOWN	

DRAWING No.	SUITABILITY	REVISION
PC1084-RHD-SB-EN-DR-EV-1113	S3	P01

Table 3.2 Proposed volumes of marine sediments to be dredged (excluding over-dredge volumes)

Material classification	Phase 1 dredge volume (m^3)	Phase 2 dredge volume (m^3)	Total dredge volume (m^3)
Soft material	670,000	790,000	1,460,000
Hard material (mudstone)	150,000	190,000	340,000
Total	**820,000**	**980,000**	**1,800,000**

It is anticipated that dredging will be undertaken using a combination of a Trailing Suction Hopper Dredger (TSHD) and a backhoe dredger. It is envisaged that up to three barges will be required to support with the transport of sediment dredged using the backhoe dredger to the offshore disposal site. It is assumed that a TSHD would be used to dredge soft material and it has been assumed for the purposes of assessment that the overflow within the hopper will be used.

It is expected that the backhoe dredger would be used for both the near surface soft material and the hard material (mudstone). For the purposes of the assessment, it has been assumed that the dredge process would be undertaken in the following stages:

- Removal of soft material above -5m bCD using a backhoe dredger (approximately four weeks).
- Removal of soft material below -5m bCD using a backhoe dredger and a TSHD (approximately four weeks).
- Removal of soft material in the turning circle using a backhoe dredger and a TSHD (approximately one week).
- Removal of hard material using a backhoe dredger (approximately 10 weeks).

3.6.2 Volume of soils / landside materials to be excavated

In addition to the removal of marine sediments, the proposed scheme will require the excavation of soils/landside materials within the riverbank in order to create the berth pocket (as the berth line has been set approximately 90m inland from the edge of the channel). It is anticipated that such material would be excavated using standard long reach excavators working from the land.

This material to be excavated is additional to that which is to be excavated behind the proposed combi-wall in order to install the tie rods to the anchor wall. The total volume of soils / landside materials to be excavated to create the berth pocket is predicted to be 1,140,000m^3 (440,000m^3 during Phase 1 and 700,000m^3 during Phase 2). It has been assumed that such material would be re-used either on site or within the wider STDC development footprint.

3.7 Installation of rock blanket

It has been conservatively assumed that there is a requirement to install a rock blanket within the footprint of the proposed berth pocket (shown in **Drawing PC1084-RHD-SB-DN-DR-C-1380**). This is required to avoid the risk of a jack-up barge 'punching' into the underlying sediments when berthed at the quay during the operation phase. Such an effect could result in instability of the berthed vessel as well as potentially destabilising the quay wall. The implication is that the berth pocket would need to dredged to a greater depth initially (15.6m bCD) to allow placement of the 2m thick rock blanket. The berth pocket would then be maintained at a depth of 13.0m bCD. It has been assumed that a split hopper barge would be used to supply and deposit rock within the berth pocket. Approximately 200,000m^3 of rock is proposed to form the rock blanket, with a weight of 400,000 tonnes.

3.8 Disposal of dredged material

There are two active disposal sites that potentially could accept dredged material from the Tees estuary: Tees Bay A (TY 160) and Tees Bay C (TY 150). Tees Bay C has predominantly been used in the past for capital dredged material but has received quantities of maintenance material in some years. Tees Bay A (the site closest to the shore) has been used in the past for soft non-cohesive maintenance material (ABPmer, 2005, cited in Royal Haskoning, 2006). DEFRA records from Tees Bay C show periodic small-scale usage with a peak volume deposited in 1999 totalling 1.9 million wet tonnes. However, the typical yearly volume is 0.1 million wet tonnes, with some years showing no usage at all.

For the purposes of assessment and the marine licence application, it has been assumed that all dredged sediments from the river channel would be deposited offshore within the Tees Bay C disposal site. As noted above, soils / landside materials excavated from the riverbank are proposed to be re-used on site, on the assumption that they are suitable for re-use. Should this not be the case following analysis of the results of ground investigations, soils would be disposed of to an appropriately licensed facility.

3.9 Programme of construction works

STDC is intending to commence construction of the facility during 2021 to enable operation of the facility by 2023 (an approximately three-year construction phase). It is proposed that the quay is constructed in phases, with an initial berth length of approximately 450m proposed in Phase 1, housing one heavy lift area.

The Phase 1 quay wall would extend 90m either side of the berth pocket to retain the dredged slopes back up to the existing bed level, resulting in a Phase 1 quay length of up to 630m (usable berth length of 450m). The quay would be extended (equating to a total useable berth length of 1,050m) as required in Phase 2, based on market demands. Phase 2 may be constructed many years following completion of Phase 1, and may not be constructed at all if market conditions do not require it. In addition, the length of quay to be constructed during each phase may also be subject to change depending on financial availability and the market requirements at the time of construction.

In order to provide the greatest flexibility with regard to phasing of the proposed scheme, the EIA has assessed the worst-case scenario of building the quay and dredging the channel in one phase. However, the assessment recognises that the reported effects or impacts would only be partially realised should the development be constructed in phases. In reality, there would be construction phase effects or impacts arising during Phase 1, followed by repeated effects / impacts of a similar magnitude (or likely less magnitude in most instances) during Phase 2.

It is envisaged that construction works would be undertaken 24 hours a day, seven days per week. The anticipated durations of each of the main tasks required during the construction phase are detailed in **Table 3.3** below.

It is anticipated that the proposed works would be undertaken in the sequence set out above; i.e. demolition would take place first, following by construction of the quay and then excavation in front of the quay wall and capital dredging (see **Drawing PC1084-RHD-SB-DN-DR-C-1388**). The rock blanket would be installed following completion of the dredge.

It should be noted that piling would not be continuous through the full construction phase for the quay. There would be periods of downtime associated with transport of the piling rig(s) to the next location to undertake works. Piling across the two phases of work is predicted to take approximately 15 months in total (seven months for Phase 1 and eight months for Phase 2).

DRAWING No.
PC1084-RHD-SB-DN-DR-C-1388

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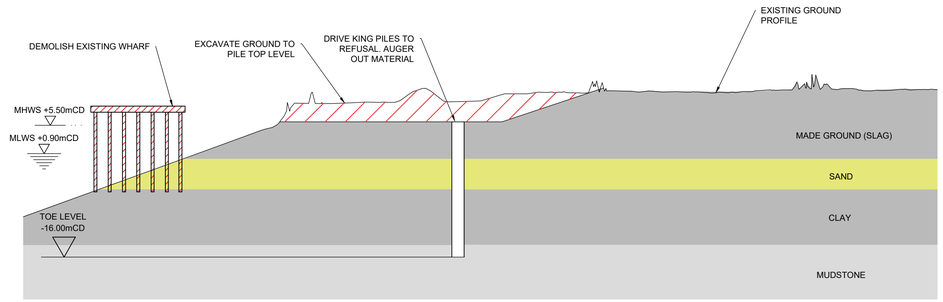

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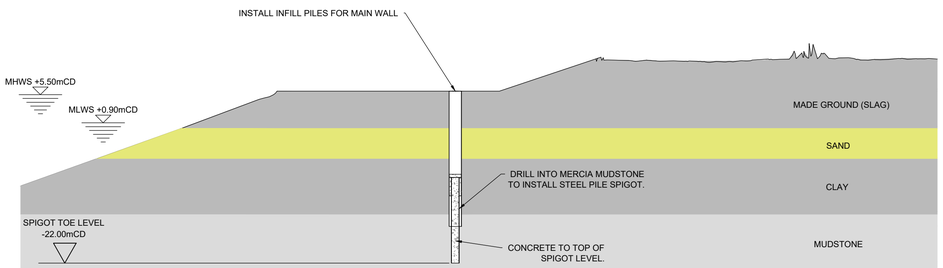

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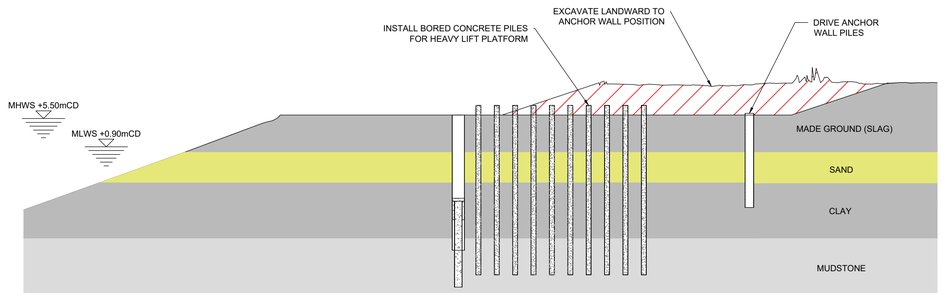

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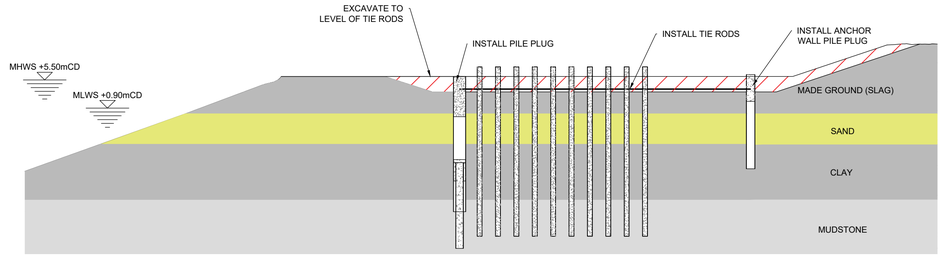

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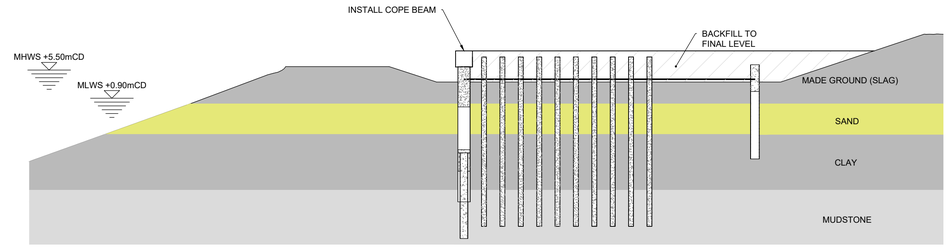

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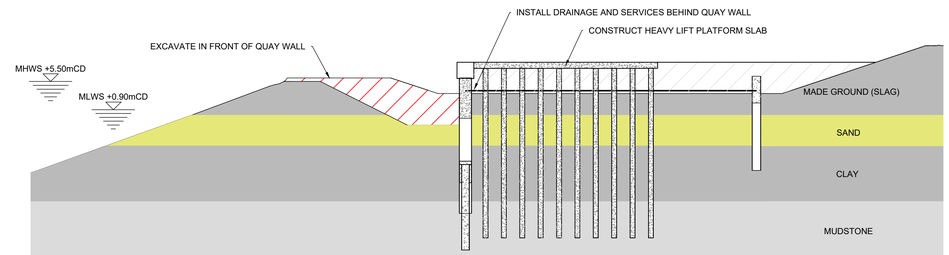

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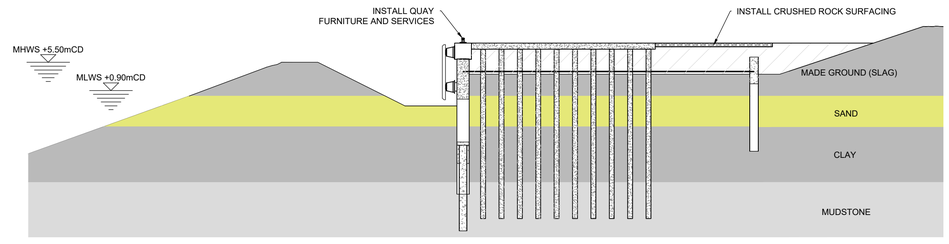

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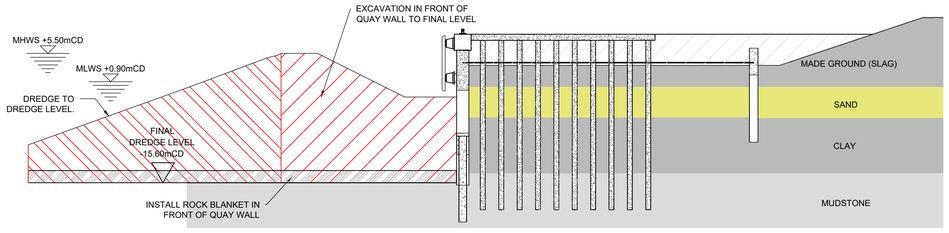
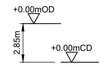


STAGE 8
SCALE 1:500

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM (mCD). FOR RELATIONSHIP BETWEEN CHART DATUM AND ORDNANCE DATUM REFER TO DIAGRAM BELOW.



REV	DATE	DESCRIPTION	BY	CHK	APP
P01	19.08.20	FOR REVIEW AND COMMENT	BM	CF	TJR

REVISIONS

CLIENT

South Tees Development Corporation

PROJECT

TEES STUDY

TITLE

CONCEPT DESIGN CONSTRUCTION SEQUENCE

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Enhancing Society Together

DRAWN	CHECKED	APPROVED
BM	CF	TJR
DATE	SCALE	REF.
12.08.20	1:500	

DRAWING No.	SUITABILITY	REVISION
PC1084-RHD-SB-DN-DR-C-1388	S3	P01

Table 3.3 Indicative durations of proposed main activities

Activity	Phase 1 duration	Phase 2 duration	Phase 1 and 2 combined	Comment
Demolition	-	-	12 months	
Quay construction	14 months	14 months	28 months	-
Excavation of soils in front of the quay wall	4 months	5 months	9 months	-
Capital dredging	2 months	3 months	5 months	This assumes all dredging plant are working at full capacity without any restrictions.
Installation of rock blanket in berth pocket	2 months	2 months	4 months	-

Whilst capital dredging is taking place, there is potential for PDT to be undertaking maintenance dredging within other sections of the Tees estuary at the same time. The potential implications of this have been considered further within the CIA (**Section 27**).

3.10 Construction phase employment

Based on the indicative construction phase costs and the construction phase programme, it is anticipated that a peak of approximately 110 employees would be required to construct the proposed scheme.

3.11 Summary of plant to be used during demolition and construction

It is envisaged that the demolition and construction phases would be undertaken using the following plant:

- Demolition
  - Jack up barge with crawler crane (marine plant)
  - Slave barge (marine plant)
  - Safety / workboat (marine plant)
  - Long reach excavator (land-based plant)
  - Concrete crusher (land-based plant)
- Construction
  - Split hopper barge (marine plant)
  - Coaster vessel (marine plant)
  - Long reach excavator (land-based plant)
  - Piling rigs (land-based plant)
  - Mobile cranes (land-based plant)
  - Rollers (land-based plant)
  - Dump trucks (land-based plant)
  - JCBs (land-based plant)
  - Concrete crusher (land-based plant)
- Dredging plant
  - TSHD
  - Backhoe dredger
  - Barges to transport material from the backhoe dredger to the offshore disposal site.
  - Safety / workboats.

3.12 Embedded mitigation measures

Measures to manage the risk from accidental spillages of oils, fuels and chemicals
During the various construction activities, there is the potential for pollution from spills or leaks of fuel and oil. The risk of this arising can be minimised by following standard good practice with regard to pollution prevention guidance.

The appointed contractor would undertake the construction works in accordance with the Environment Agency's Pollution Prevention Guidelines (PPG) No. 5 on works in, near and liable to affect watercourses, and all vessels would adhere to the requirements of the MARPOL Convention Regulations, in particular the requirement that all ships over 400GT should carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). Whilst it is noted that the Environment Agency's PPG No.5 has been withdrawn, they still provide good reference material for protection of water courses when working in and around water. STDC would also ensure that the works are undertaken in accordance with Construction Industry Research and Information Association (CIRIA) Coastal and marine environmental site guide (2nd edition) (C744); and CIRIA Guidance note C741Environmental Good Practice on Site Guide (4th Edition).

In the unlikely event of a spill, appropriate spill kits will be available on board the barges and all crew will be trained to use them. In addition, all vessels and plant will ensure that suitable bunding and storage facilities are employed to prevent the release of fuel oils, lubricating fluids associated with the plant and equipment into the marine environment.

In addition to the above, best practice working methods would be adopted during demolition / excavation adjacent to the Tees estuary to ensure that transport of debris into the Tees is minimised as far as possible. Should any debris fall into the river channel during demolition, this would be removed as early as practicable. Any risks to water quality (and consequently marine ecological receptors) will therefore be reduced as far as possible. Such best practice measures would be detailed within a Construction Environmental Management Plan (CEMP) to be produced in advance of construction commencing.

Measures to manage the risk of spreading of introducing invasive species
As reported within **Section 9**, invasive non-native species (INNS) have been identified within the subtidal environment in the Tees estuary. There is a risk that these INNS may be spread to other locations as a result of capital and maintenance dredging, as well as INNS being introduced or spread from ship ballast water exchange and the fouling of ships' hulls. Best practice working methods will be adhered to during construction and operation to minimise the risk of introduction and spread of INNS. These measures are likely to include the production of a biosecurity plan or ballast water management plan. Either of these plans may include management measures such as filtering or treating of ballast water prior to being discharged into the water when not needed. These plans will be in line with any management measures relating to biosecurity or ballast water management that are already in place and enforced by PDT.

In addition to the above, Japanese rose and Japanese knotweed is known to be present within the landside parts of the proposed scheme footprint (see **Section 11**). Construction works risk spreading seeds, plant fragments or contaminated soil from these plants (and any other INNS which subsequently establishes within 10m of the footprint of the proposed scheme), which would constitute a legal offence under Schedule 9 of the Wildlife and Countryside Act 1981. In order to avoid the risk of spreading such invasive species, the following works are proposed:

- An Invasive Species Management Plan will be prepared, focusing on the species listed on Schedule 9 of the Wildlife and Countryside Act, 1981, as amended, which will include best practice measures to be implemented to minimise the risk of construction activities spreading non-native invasive species.

- Equipment, plant and personal protection equipment (PPE) brought to site would be clean and free of material and vegetation.
- A toolbox talk detailing the importance of these plant species will be delivered by a suitably qualified ecologist to all personnel working on site.
- Rigorous inspections are undertaken of all equipment delivered to site, following the Check Clean and Dry campaign.
- A pre-construction survey will be undertaken (between May and August) to ascertain up-to-date locations of any non-native invasive species within the footprint of the proposed scheme and a 250m buffer.
- Known Japanese rose and Japanese knotweed stands (and any other invasive non-native species subsequently recorded) in or within 10m of the proposed scheme footprint will be treated during the season before construction work commences where possible.
- The Invasive Species Management Plan will be included in the CEMP which will detail the policies and good working practices which will be followed to avoid spread of an INNS, including the measures which will be taken if the pre-construction treatment programme is unsuccessful, and any associated removal or disposal activities required.
- A fenced buffer of 10m will be placed around strands of invasive species that have not been treated and are subsequently found on site after construction has begun.

Implementation of the measures detailed in the outline remediation strategy

An outline remediation strategy has been produced (Wood, 2019) in order to manage the risks associated with land quality across the STDC development areas in Tees Valley. Although the outline remediation strategy does not cover the entirety of the proposed scheme footprint which is the subject of this report, it does encompass most of it with the exception of a narrow strip of land bordering the Tees estuary. For the purposes of this EIA, it has been assumed that the measures detailed in the outline remediation strategy (detailed below) will be adopted across the entirety of the proposed scheme footprint.

The outline remediation strategy (Wood, 2019) includes the placement of a capping layer on the surface in order to break pollutant linkages. This technique includes the placement of either hardstanding or chemically 'suitable for use' materials up to 0.3m in thickness over contaminated ground. Clean service runs are also recommended, to protect both future land users and utility assets. The option for selective excavation and disposal at the adjacent hazardous waste facility of limited 'hotspots' of contamination is also recommended to complement the capping layer remediation approach.

The outline remediation strategy (Wood, 2019) also recommends the testing of soils and materials for re-use within the proposed scheme footprint to determine their suitability and provides chemical re-use criteria for soils to ensure protection of human health under a commercial land-use scenario. No 'suitable for use' chemical criteria for soils or groundwater (in order to protect controlled waters) are provided. The embedded 'control of the works' measures incorporated into the outline remediation strategy will also be implemented within the proposed scheme. These include adherence to Construction (Design and Management) Regulations 2015, development of a materials management plan (MMP) and development of an Environmental Management Plan. The measures detailed within the outline remediation strategy have been built into the proposed scheme as embedded mitigation.

3.13 Operational phase

3.13.1 Proposed use of the quay

During the operational phase, it is envisaged that the proposed quay would be utilised predominantly to support with the construction of offshore wind farms, as well as supporting more general industrial and storage/distribution activities linked to the works to be undertaken within the general industrial units proposed for the backing land (which have been subject to a separate planning application and EIA).

With regard to the wind farm industry, it has been assumed that the quay would be used to support both staging (pre-assembly and storage) and manufacturing of wind farm components.

The proposed quay has been designed with two heavy lift platforms along its length. It has been assumed as a worst-case scenario that two crawler cranes would be present on the quay, up to 192m in height, with up to two smaller cranes also likely to be present. Such cranes would be utilised to assist with the lifting of wind turbine components and general cargo on and off vessels when berthed at the quay. It has also been assumed that wind turbine components of up to 150m in height would be temporary stored on the quay for loading onto vessels. It is also envisaged that the quay would be used by Self-Propelled Modular Transporters (SPMTs) and generators to power small tools and welding equipment.

3.13.2 Operational phase vessel calls

Assuming a worst-case scenario from a vessel size perspective (whereby the scheme is utilised for the offshore wind industry), the proposed scheme has been designed to accommodate a vessel with an overall length of up to 169m, breadth of up to 60m and laden draft of 11m. In addition to the vessels used to support with the manufacturing and staging of wind farm components, it is envisaged that other smaller installation vessels would also utilise the quay including general cargo vessels.

It has been estimated that up to 390 offshore wind vessel calls would take place at the facility on an annual basis. This includes approximately 300 vessel calls per year associated with offshore wind staging and 90 vessel calls per year associated with offshore wind manufacturing activities.

As noted earlier, the proposed scheme has been designed to avoid impacts to the pipe tunnels which are known to cross underneath the Tees estuary. As dredging is not proposed to be undertaken above the pipe tunnels, a tidal restriction will be placed on certain sized vessels accessing / egressing to and from the proposed quay. Analysis has shown that vessels with a draft of less than 8.4m would not be subject to tidal restrictions. As noted above, the maximum draft of vessels anticipated to use the quay during operation is 11m; analysis has illustrated that such a vessel would not be subject to tidal restrictions for the vast majority of the time.

3.13.3 Lighting and power

It has been assumed that approximately 18 lighting towers (high masts) up to 30m will be utilised during the operational phase. The lighting towers are envisaged to have 50 Lux and will be spaced approximately 80m apart along the quay. As noted above, a new electrical substation is proposed to be constructed on the quay in order to provide the necessary power requirements. Given the proposal to include shore power into the scheme design, it has been assumed that all vessels to be used during operation would connect to the shore power, rather than running auxiliary engines when berthed at the quay.

3.13.4 Surface water runoff and foul sewage

It is anticipated that the quay would be surfaced with crushed stone. Surface water would drain through the crushed stone into the underlying material without the need for a formal drainage system.

A drainage system would however be required on the heavy lift areas, as such areas are proposed to be surfaced with concrete. Such a system would capture surface water runoff from the heavy lift areas through a series of gullies. The collected water will be discharged into the Tees estuary through the quay wall, via an interceptor.

Welfare facilities are not proposed on the quay itself in order to maximise the available space to support with operations; there would therefore be no foul sewage generated as a result of the proposed scheme.

3.13.5 Operational phase employment

It has been assumed that a workforce of approximately 10 employees would be required during the operational phase of the proposed scheme.

3.14 Decommissioning phase

The proposed scheme does not have a planned decommissioning phase, and therefore decommissioning has not been considered further in this report.

3.15 Description of alternatives

3.15.1 Alternative locations for the facility with the Tees estuary

STDC considered a number of locations within the Tees estuary for the proposed facility prior to selecting the South Bank site as the preferred option. The options which were originally considered comprised the existing Redcar Bulk Terminal (RBT), the currently undeveloped Bran Sands site and the disused South Bank site.

All three sites were considered to be environmentally feasible solutions, however the RBT site would have resulted in complex and potentially time-consuming discussions regarding land ownership / lease agreements / commercial agreements. The existing RBT quay structure has also likely exceeded its original design life and therefore it was anticipated that a new quay wall would be required riverward of the existing wall to provide the required design life for the proposed scheme. RBT was therefore removed from further consideration.

The Bran Sands site is complicated by the existence of a Development Consent Order (DCO) held by Anglo American (formerly Sirius Minerals) for the construction of a harbour facility to export polyhalite. Detailed commercial discussions would have been required with Anglo American to progress that site, as well as detailed discussions with legal representatives, the Planning Inspectorate and the Department for Transport (DfT) to understand the implications regarding amendments of the DCO. The Bran Sands site was removed from further consideration. The South Bank site was selected as the preferred location for the proposed scheme.

The environmental impacts associated with each of the three possible options were largely the same, and therefore the decision regarding which site to progress was predominantly driven by technical and commercial decisions. However, the South Bank site is beneficial from an environmental consenting (timescale) perspective, as a third party had previously undertaken an environmental scoping exercise for construction of a new port facility at the site in 2019, as well as submitting a sampling plan request to the

MMO. The responses provided to the third party in 2019 which are publicly available online were therefore advantageous with regard to progression of the South Bank site, as they provided a steer to the scale of assessment likely to be required.

3.15.2 Alternative designs

Alternative designs and construction techniques for the quay wall
A number of options for construction of the quay wall have been considered by STDC, namely:

- Concrete block wall.
- Concrete caisson wall.
- Tied sheet walls to create a gravity structure.
- Combi piled wall.
- Seacant wall.
- Suspended deck.

The concrete block wall would require heavy marine plant to place the blocks and a casting yard / loading facility. Due to the difficulties in accurately placing concrete blocks in a silt laden river, this option was not considered viable from an engineering perspective. The concrete caisson wall would require caissons to be cast and floated to the site; given the difficulties with securing a facility to cast the caissons, this option was not considered viable. The tied sheet wall to create a gravity structure was also not considered viable due to the need for placing the lower ties underwater, as well as the requirement to double handle excavated material.

A piled suspended deck structure would be technically feasible, however this option would require more extensive excavation on land (approximately 370,000m^3 more compared to the combi-piled wall) and piling within the river channel. More extensive excavation on land compared to the solid piled wall options would result in greater disturbance impacts and result in a requirement to re-us or dispose of greater volumes of soils.

Piling within the river channel would result in the creation of underwater noise disturbance to fish, marine invertebrates and marine mammals; such impacts would not arise from the solid piled wall options. The suspended deck option also reduces the potential for the incorporation of environmental enhancement measures into the design; a solid piled wall has potential to incorporate a range of enhancement measures such as ‘verti-pools’. The suspended deck also offers reduced future flexibility compared to the combi-piled wall in terms of sustainability and futureproofing; significant engineering works would be required to the suspended deck should STDC seek to increase the load rating of the quay in the future. The suspended deck option was therefore ruled out due to both environmental and engineering options.

Whilst a seacant wall remains a feasible solution, the anchored combi-piled retaining wall has been selected as the assessed solution based on the ground conditions at the site and the buildability of the anchored combi-piled wall from a technical perspective.

Alternative dredging plant
There is likely to be a requirement to utilise a number of different types of dredger depending on the nature of the material being dredged. Therefore, for different parts of the dredging it will be necessary to use a TSHD or backhoe. The environmental implications of using these dredgers have been assessed and no other alternatives exist that could undertake the work.

Approach channel and berthing pocket dredge
The proposed dredged depth in the navigation channel has been chosen to maximise the tidal window to which the quay and channels are accessible for vessels of particular drafts. The proposed depth of the berthing pocket is required to enable berthing of vessels at the quayside throughout the tidal cycle. The width of the proposed berth pocket has been set by the widest vessel which is anticipated to use the facility. There are no real alternatives to the proposed design depths and widths as these are inherent to the proposed scheme design.

Phasing of the development
Phasing of the development (specifically phasing of the construction of the quay wall) has not yet been defined and will be subject to the capital cost of the first phase of the development, taken together with the customer demand and the utilisation of the existing facilities. Options with respect to phasing include differing lengths for an initial phase of the development with the completion of the remaining length during a subsequent phase (or number of phases). For the purposes of the assessment, it has been assumed that the scheme would be constructed in phases, with an initial berth length of 450m, being subsequently extended as required up to the full 1,050m.

Alternative positions along the river axis
The South Bank site is bounded at the upstream end by a large electricity pylon with overhead power lines, and a set of pipe tunnels which cross underneath the River Tees at the downstream end. These constraints severely limit the alternative positions for the proposed quay along the river axis.

3.15.3 Alternative uses of dredged material

The Waste Framework Directive provides a general duty to ensure that waste is dealt with in an environmentally acceptable manner. In accordance with the Directive, it is necessary to seek alternative uses for the dredged arisings, with disposal at sea being the least preferred option (in accordance with the waste hierarchy, see Figure 4.1). Alternative uses can include habitat creation or improvement and use in reclamation projects. The alternative options that have been considered for the disposal of dredged material are presented below.

Use as engineering fill within construction projects
The proposed dredge is predicted to give rise to boulder clay, sand and silts. Sand and boulder clay could have the required geotechnical properties to be used as engineering fill for construction purposes. However, STDC is not aware of any construction projects within the local area that require the use of dredged material, and, therefore, this option is not considered to be a viable solution at the time of writing. STDC will however continue to remain open to the re-use of dredged material within construction projects.

Creation of bird roost sites / breeding areas
During production of the recent Hartlepool approach channel EIA Report (Royal HaskoningDHV, 2019), Hartlepool Borough Council (HBC) recommended that the creation of safe, shorebird roost island(s) (possibly doubling as little tern nesting islands) could be created using the dredged material from Hartlepool channel. In terms of Hartlepool borough and the wider Teesmouth and Cleveland Coast, HBC also advised that the lack of safe shorebird roost islands is a conservation issue of great concern to the Council, particularly as existing ‘slag’ islands have eroded and recreational disturbance is adversely affecting wader roosts.

Further consultation with HBC was undertaken during September 2018 to discuss possible locations for the creation of bird islands. HBC identified four locations at the mouth of the Tees estuary which could be suitable locations for the re-use of dredged sediment; three were located adjacent to the South Gare Breakwater, with one adjacent to the North Gare Breakwater. Consultation with Natural England in October

2018 prior to submission of the Northern Gateway Container Terminal (NGCT) marine licence application confirmed that the creation of bird islands as an environmental enhancement measure to the proposed scheme by beneficially re-using dredged material would be welcomed. It is considered that such beneficial re-use of dredged material could also represent a possible option for the South Bank scheme.

STDC will continue to investigate the option of creating bird islands using dredged material, possibly linking with the aims and desires of the Tees Estuary Partnership. Such creation of bird islands at the mouth of the Tees (or any beneficial use of dredged material in the marine environment) would require a separate marine licence application to deposit dredged material, or potentially a variation to the marine licence for the proposed scheme (if granted) should it be possible to implement the bird islands in parallel with the proposed scheme. STDC will continue to liaise with the Tees Estuary Partnership and will aim to develop or input into strategic beneficial use schemes to benefit the overall Tees estuary and the wider Teesmouth and Cleveland coast. However, for the reason set out above, it has been assumed that beneficial use to create bird islands would not be undertaken as part of the proposed scheme.