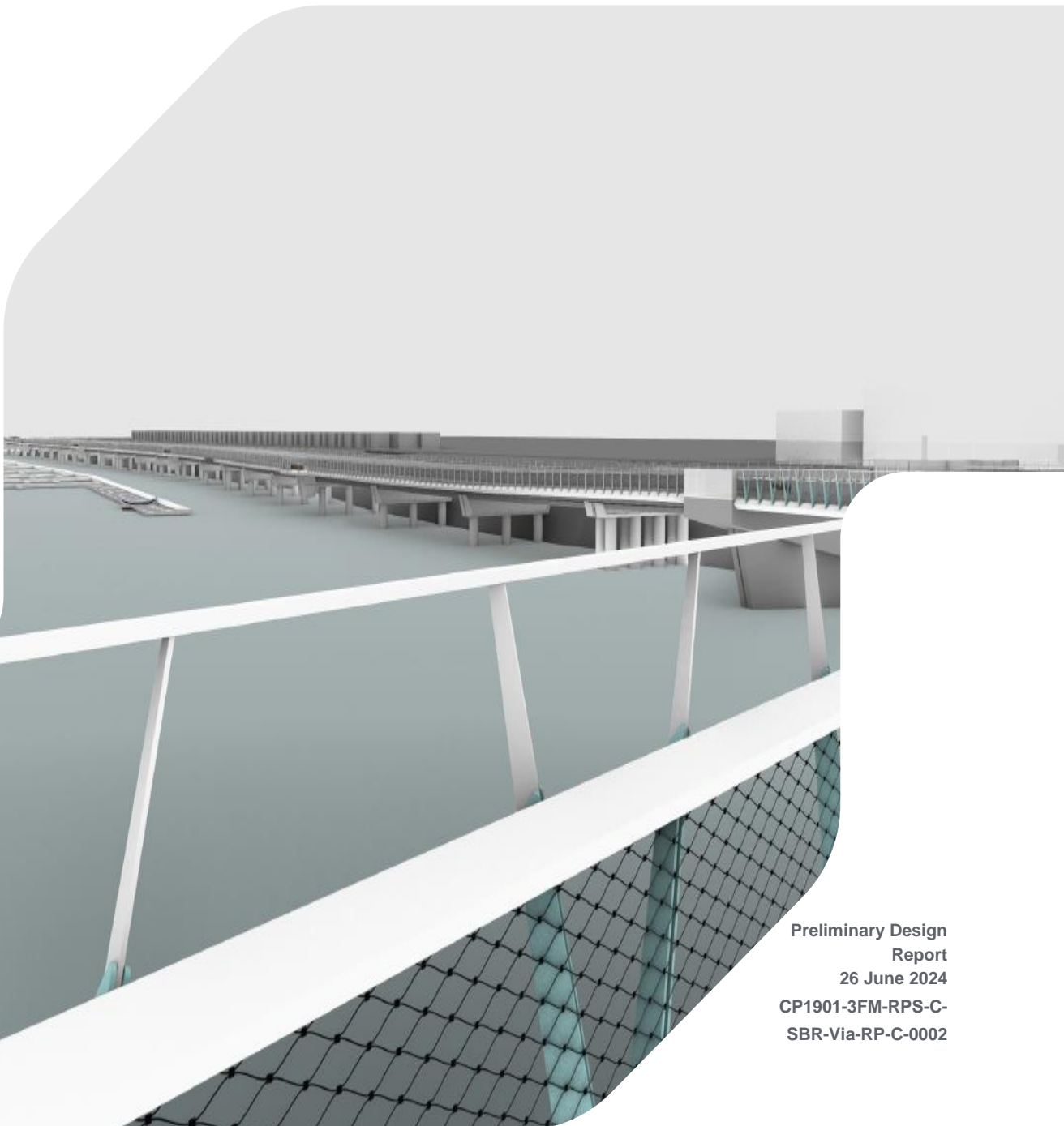


RPS, Southern Port Access Road Viaduct, Preliminary Design Report



SOUTHERN PORT ACCESS ROUTE VIADUCT

Preliminary Design Report



Preliminary Design
Report
26 June 2024
CP1901-3FM-RPS-C-
SBR-Via-RP-C-0002

PRELIMINARY DESIGN REPORT

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26/06/2024

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Prepared by:

RPS

Prepared for:

Dublin Port Company

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STA-1b

Category 3

Scheme

Name and Location: Southern Port Access Route (SPAR) Viaduct

Structure(s)

Name and nature of the Structure(s): Southern Port Access Route (SPAR) Viaduct

Preliminary Design Report

Reference: IE000336-RPS-00-XX-RP-C-RP0002

Revision: S3 P03

Date: 26/06/2024

Submitted by:

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Position: Senior Associate

Organisation: RPS Consulting Engineers Ltd.

Date: 26/06/2024

Structures Section confirmation of consultation:

Signed:

Name:

Position:

Date:

EXECUTIVE SUMMARY

STRUCTURE

Name:	Southern Port Access Route Viaduct
Structure Ref No:	TBC
Primary Function:	To support the southern port access route from the opening bridge to the west to the Maritime Village to the east.
Check Category:	3
Loading:	IS EN 1991-2 – LM1, LM3 (SV 196), LM4

PASSAGES

Primary:	Southern Port Access Route (SPAR)
Secondary:	River Liffey

1 INTRODUCTION

1.1 Instructions or brief given to the authors

This report has been prepared to inform the planning application for the Dublin Port Company's (DPC) 3FM Project. The 3FM project is DPC's third and final masterplan project. The project focuses on developing the Southern Estate of the Port on the Poolbeg Peninsula without which, Dublin Port would reach its maximum capacity limit prior to 2040, which in turn would risk a national port capacity shortage.

1.2 Background information covering the origins for the need of the structure

Intensification of the DPC owned lands on the Poolbeg Peninsula is limited by the single carriageway Tom Clarke Bridge. Since conception it has been recognised that the intensification of the Port lands was only feasible if additional road capacity connecting the Southern Estate to the Northern Estate and the M50 (Dublin Tunnel) was provided.

The concept for the Southern Port Access Route (SPAR) was developed in association with and subsequently detached from the Dublin Eastern Bypass (DEB). The NRA initially released a feasibility study in 2007 which included options for the DEB to be evaluated further. The concept for the SPAR developed following the creation and subsequent reviews/revisions of the Dublin Port Masterplan 2040, the Alexandra Basin Redevelopment and further feasibility assessments for the NTA Transport Strategy for the Greater Dublin Area 2022-2042. The SPAR will be a public road with restricted use.

1.3 Previous Studies and their recommendations

In 2007, NRA (now TII) released a feasibility study of the Dublin Eastern Bypass (DEB). Sector A Dublin Port to Sandymount had 5 options as shown in Figure 1-1 below taken from Page 47 of the report.

- Option A1 – Medium level bridge close to East Link / Tom Clarke Bridge
- Option A2 – Shallow Cut & Cover Tunnel close to East Link / Tom Clarke Bridge
- Option A3 – Bored Tunnel on most direct route across the central port
- Option A4 – High level skew bridge on most direct route across the central port
- Option A5 – High level square bridge between central and eastern port areas

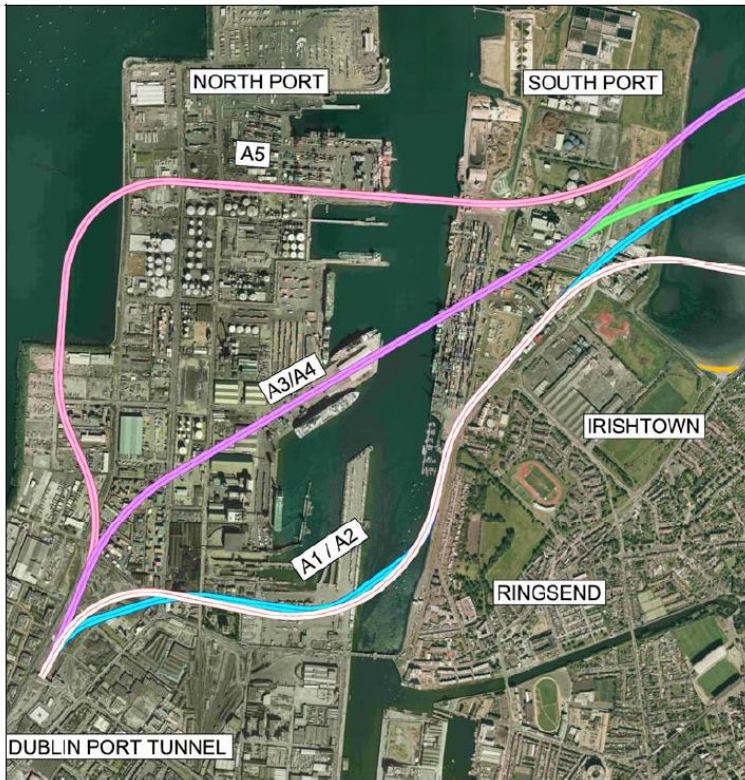


Figure 1-1 NRA Dublin Eastern Bypass Feasibility Study – Sector A Route Options

Options A1, A2 and A4 were identified to be brought forward for further evaluation.

Further appraisals were carried out in the intervening period culminating with the introduction of the Southern Port Access Route (SPAR) and the removal of the DEB from Policy. A Route Options for SPAR Working Paper carried out in 2021 identified that the preferred route option for the SPAR would be a medium level bridge close to Tom Clarke Bridge (similar to Option A1 from the 2007 DEB Feasibility Study).

1.4 Proposed Development

The proposed road network will primarily consist of a new section of carriageway that will connect the Northern Estate to the Southern Estate, referred to as the Southern Port Access Route 'SPAR'. The SPAR itself is defined as the entire route from North Wall Quay Extension in the north, to the Area O access point at the south, as shown in Figure 1-2 below, with a total length of 2.3km.



Figure 1-2 3FM Project Preliminary General Arrangement Layout (May 2024)

At the northern end, the SPAR will connect into the proposed Berth 18 Access Road which connects to Alexandra Road, providing a congestion free link across the River Liffey on a new bridge and viaduct, landing on the southern shoreline in close proximity to the proposed Maritime Village. The SPAR will then connect into a re-aligned Whitebank Road which connects into the Pigeon Hose Road and South Bank Road. The 3FM Project will also provide upgrades to the existing road network throughout the Southern Port.

1.5 SPAR

1.5.1 Function (Operational Considerations)

The SPAR will be a public road with restricted use. The SPAR will accommodate port-related traffic on Areas K, L, N and O and connect them to the Northern Estate and the M50 (Dublin Tunnel). Although the majority of SPAR traffic will be HGVs connected with the operation of the Port, the SPAR will also accommodate other traffic flows such as Public Transport, traffic movements from the Encyclis (formerly Covanta) Waste-to-Energy Plant and other Goods vehicles.

The key principles behind the development of the SPAR are;

- The HGV vehicles will be removed from the external DCC road network,
- Port traffic will be relocated further from residential areas,
- Traffic flows will be relatively free-flowing.

These principles should reduce the impact of the HGVs on traffic capacity, congestion, air quality and noise.

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The SPAR has been developed with an opening bridge section across the River Liffey and a viaduct running alongside the existing R131 until landing on the southern shoreline near the Maritime Village. The bridge section and viaduct will accommodate active travel to provide sustainable transport connections for staff and visitors of the 3FM scheme, in addition to providing a community gain and interconnection between public realm schemes.

2 SITE & FUNCTION

2.1 Site location

The SPAR Viaduct is located in east-central Dublin. The viaduct extends from the opening bridge to the west to the proposed Maritime Village to the east over a length of 591.5m. The viaduct is located immediately north of the existing R131 and extends over the southern revetment of the River Liffey east of the existing Tom Clarke Bridge. The SPAR will link the north and south port areas taking Heavy Goods Vehicles (HGVs) off the existing R131.

A location map for the structure is given in Appendix B.

2.2 Function of the structure and obstacles crossed

The SPAR Viaduct is a two-lane carriageway that will traverse the southern revetment/bank of the River Liffey in an east-west direction. The primary aim of the viaduct is to establish a connection between the northern and southern parts of the port, by connecting the SPAR opening bridge to the Maritim Village. The SPAR will play a crucial role in supporting Dublin port economic growth. It is anticipated that a high proportion of HGVs will use this route which will significantly reduce the volume of traffic on the existing R131 and Tom Clarke bridge.

The viaduct will include an active travel facility on the north side of the bridge which will provide pedestrians with a 2.0m walkway, while cyclists will have access to a 3.0m wide two-way cycleway. The active travel facility will connect with the existing active travel routes along the R131 and Poolbeg Peninsula.

Overall, the 3FM project will facilitate efficient transportation of goods and people in the region, while also promoting active travel and reducing traffic congestion on existing routes.

2.3 Choice of location

The chosen alignment was determined as a result of studies in CP1901_3FM-RPS_26-HGN-XX-RP-C-00001. The tie-in points for the viaduct are dictated by the locations of the southern end span of the SPAR opening bridge to the west and the location and features of the Maritime Village to the east.

2.4 Site description and topography

The structure is located in the Dublin Port. The viaduct is located immediately north of the existing R131 and extends over the southern revetment of the River Liffey east of the existing Tom Clarke Bridge. The existing topography for the extents of the viaduct is generally flat.

2.5 Vertical and horizontal alignments

The horizontal road alignment is curved to the west to meet the curved end span of the SPAR opening bridge and follows a curved profile to follow the existing revetment/road alignment (up to approximately chainage 1025). From chainage 1025 – 1350 the horizontal alignment is straight until it meets the Maritime Village.

The vertical alignment of the viaduct is straight (flat with no longitudinal gradients) to keep the finished deck levels, parapet levels and barrier levels as low as reasonably possible. This requirement stems from visual impact studies undertaken which studied the impact of the proposed viaduct on river views from existing residences on Pigeon House Road.

2.6 Cross sectional dimensions on the alignments

The general cross-sectional dimensions of the viaduct are shown in Table 2-1.

Table 2-1 Minimum Cross Section of Viaduct

Element	Width (m)
Parapet Edge beam	0.5
Walkway	1.951
Cycleway	3.567
Barrier	0.355
Hard shoulder	0.471
Carriageway westbound	4
Carriageway eastbound	4
Hard shoulder	0.471
Barrier	0.355
Maintenance walkway	1.179
Parapet Edge beam	0.5
Total	17.349

2.7 Existing underground and overground services

An underground ESB 220kV cable crosses the proposed viaduct location on the eastern side of the bridge. The location was determined from scans. The cable is located within the soft clay layer, between 3-5.0m below ground. The feasibility report (CP1901_3FM-RPS-S26-HGN-XX-RP-C-00001) discusses services along the SPAR route.

2.8 Geotechnical summary

The geotechnical design is discussed in Section 7. Historical boreholes, undertaken in 2011, at the proposed structured location provide information of the anticipated ground conditions. These boreholes indicate a depth of 4-6m of very soft material which would be unsuitable as a founding layer for the viaduct structure.

2.9 Hydrology and hydraulic summary

The proposed viaduct will have negligible impact on the hydrology of the River Liffey. The tidal levels at the viaduct are provided in Table 2-2.

Table 2-2 Tidal levels at viaduct

	Highest Astronomical Tide	Mean High Water Spring	Mean High Water Neap	Mean Sea Level	Mean Low Water Neap	Mean Low Water Spring	Lowest Astronomical Tide
	HAT	MHWS	MHWN	MSL	MLWN	MLWS	LAT
Chart Datum (Dublin)	+4.5m	+4.1m	3.4m	+2.4m	+1.5m	+0.7m	-0.1m
Ordnance Datum (Malin)	+1.99m	+1.59m	+0.89m	-0.11m	-1.01m	-1.81m	-2.61m

2.10 Archaeological summary

An Environmental Impact Assessment (EIA) is being prepared for the project. It is not expected that the viaduct will have any impact on any Archaeological features in the area.

2.11 Environmental summary

The environmental constraints in the vicinity of SPAR viaduct will be determined during the Environmental Impact Assessment process. This report forms part of the basis for the EIA, therefore the conclusions and recommendations of the EIA report will be considered at the detailed design phase of the project.

3 STRUCTURE & AESTHETICS

3.1 General description of recommended structure and design working life

The viaduct comprises 22 spans of a repeating 27m grid for an overall length of 591.5m. The deck comprises precast prestressed concrete Y4 beams acting compositely with a 200mm thick in-situ reinforced concrete deck slab. Reinforced concrete cantilevers project transversely from the deck to support a steel edge beam and parapet assembly.

The substructure comprises a reinforced concrete crosshead beam supported from discrete projecting piles that are socketed in rock. The cross-head consists of a precast concrete outer shell which is placed on the pile heads and integrated via an in-situ concrete pour to complete the cross-head profile.

The structure is divided into four discrete and separate frames/bays to allow for thermal expansions and contractions. Expansion joints are provided at interface points between adjacent frames/bays. Viewing points and rest points are provided at four intermediate locations along the north of the viaduct.

Solid in-bound precast concrete barriers are bolted to the deck slab to retain errant vehicles and to provide flood protection to a level of +3.95m.

A connection point for active travel is provided from the western end of the viaduct to the existing R131 to the south. The structure supporting the active travel connection comprises a reinforced concrete cantilever slab supported on reinforced concrete bored piles.

The viaduct will have a design life of 120 years. The design life for replaceable structural parts (i.e., waterproofing systems, expansion joints, parapets and safety barriers) shall be 50 years.

The construction of the viaduct is not expected to impact on the R131 revetment sufficiently. However, monitoring of the revetment shall be undertaken during construction.

General arrangement drawings are given in Appendix B.

3.2 Aesthetic considerations

The key consideration for the design of the viaduct is to ensure a smooth transition between the SPAR bridge and the SPAR viaduct and provide a degree of consistency to the journey along the crossing, especially on the active travel path.

3.2.1 Transition between Structures and Break Pier

Both structures have a different structural form – due to the different constraints and demands on the structures – and different widths, meaning there are necessary differences in their cross sections. The transition between the typical SPAR viaduct cross section and the typical SPAR cross section is managed across the Westernmost two spans of the viaduct. The join between the two structures is managed at a shared pier that terminates both viaducts in line with the pedestrian crossing and the active travel link back to land.

The shared pier provides a visual break point that manages the change in structure, extending beyond the parapet on the active travel pathway to express this break point. Either side of the break pier the line of the active travel parapet continues smoothly, as do the active travel pathways. The carriageway also passes smoothly across the two structures. The Western active travel walkway on the SPAR Bridge terminates at the break pier where the active travel path links back to land, as does the Southern maintenance walkway on the SPAR viaduct. On deck there is also a transition between the VRS systems.

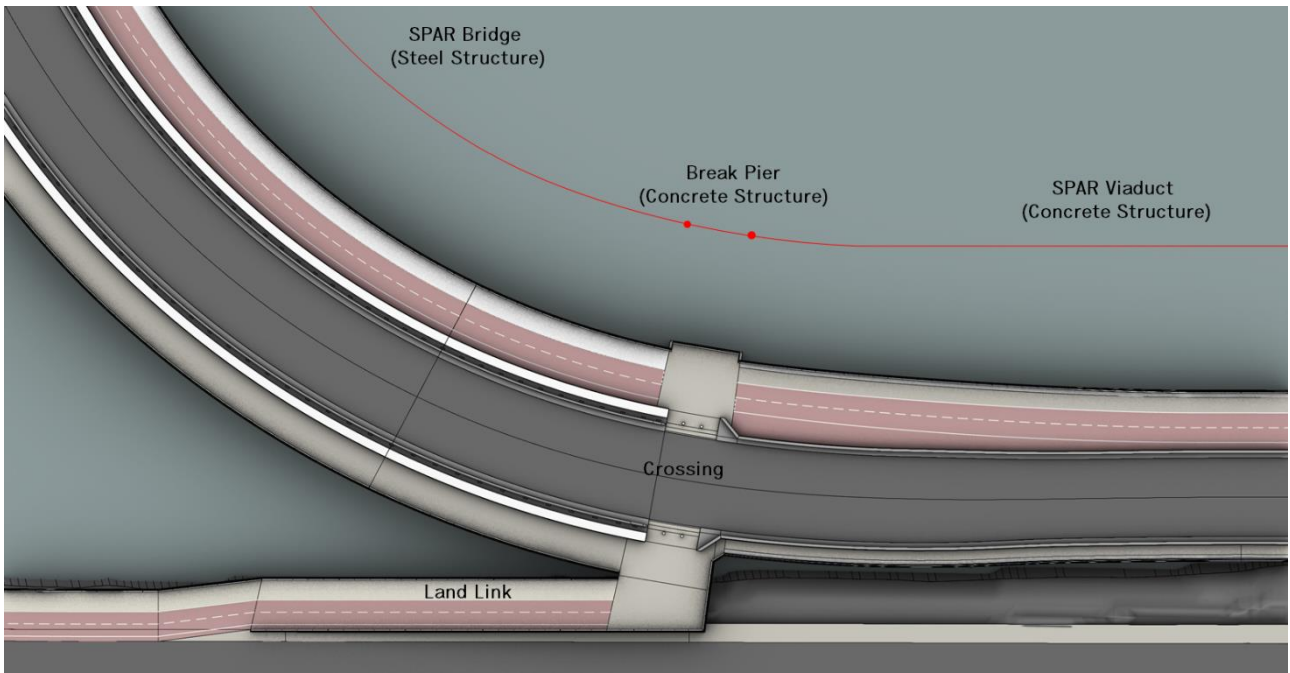


Figure 3-1: Viaduct Transition Plan

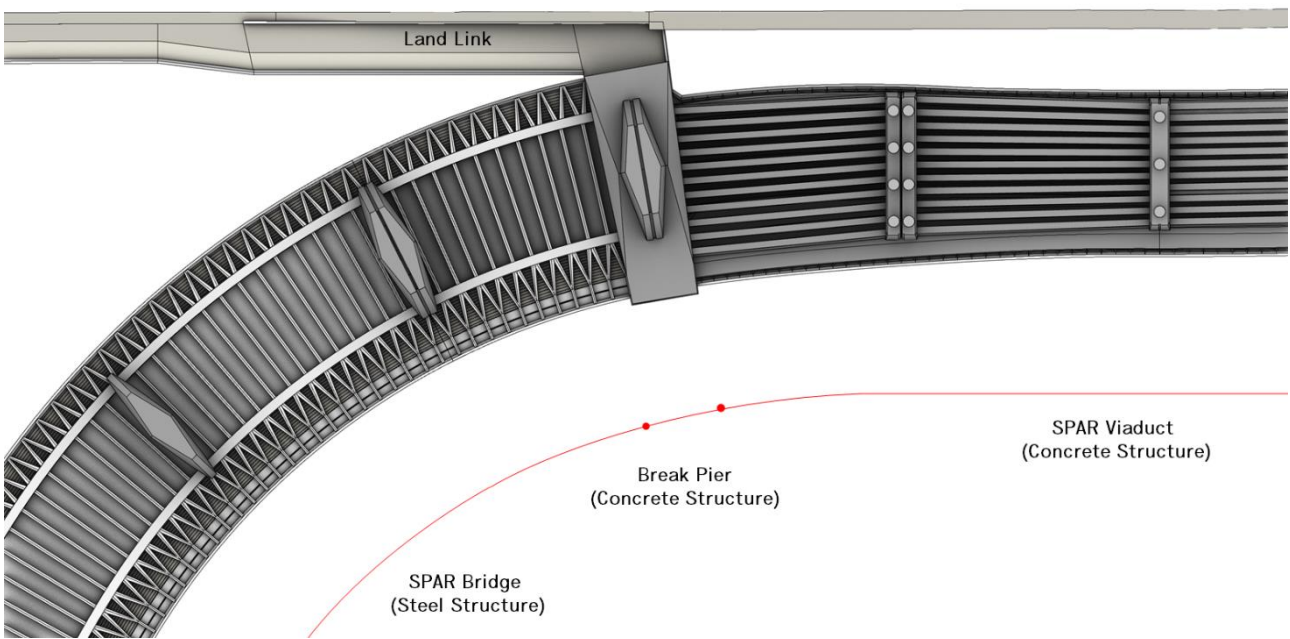


Figure 3-2: Viaduct Transition Soffit Plan

3.2.2 Typical Cross Section - Thin Edge & Pedestrian Experience

The proposed viaduct utilises a maximum 3.5m cantilever beneath the Active Travel path which reduces the number of Y-beams required and reduces the width of the substructure. The cantilever provides a thin edge to the bridge that matches that of the SPAR moveable bridge, and puts the structure below in shadow reducing its visual prominence. This narrower substructure results in a reduction of the visual impact of the piles supporting the bridge as well as disguising the petrol separators beneath the cantilever.

The parapet is visually related to those proposed to the SPAR opening bridge to provide a consistent experience for active travel users. The height of the VRS barriers will be limited to 3.950mOD to ensure a view of the River Liffey is maintained for the residents along the southern side of the R131. The concrete VRS barriers provide segregation between the carriageway and active travel pathway. This physical separation between the vehicular traffic and Active Travel users gives a greater feeling of safety and increases the comfort of the bridge users.

Locating the active travel paths on the outside edge of the carriageway allows uninterrupted views off the bridge, allowing views straight down to the water. Physically separating the active travel paths from the carriageway also allows a more lightweight cantilevered structure with slimmer steel edge beams fixed to the concrete structure to be used for the active travel paths. As the paths form the outside elevation of the structure this thin edge reduces the visual impact of the bridge.

Separating the active travel paths from vehicles also opens up opportunities for different surface materials on the paths and allows a lightweight parapet to the outer edges of the bridge. This is especially important as these are the elements that members of the public will come into direct contact with.

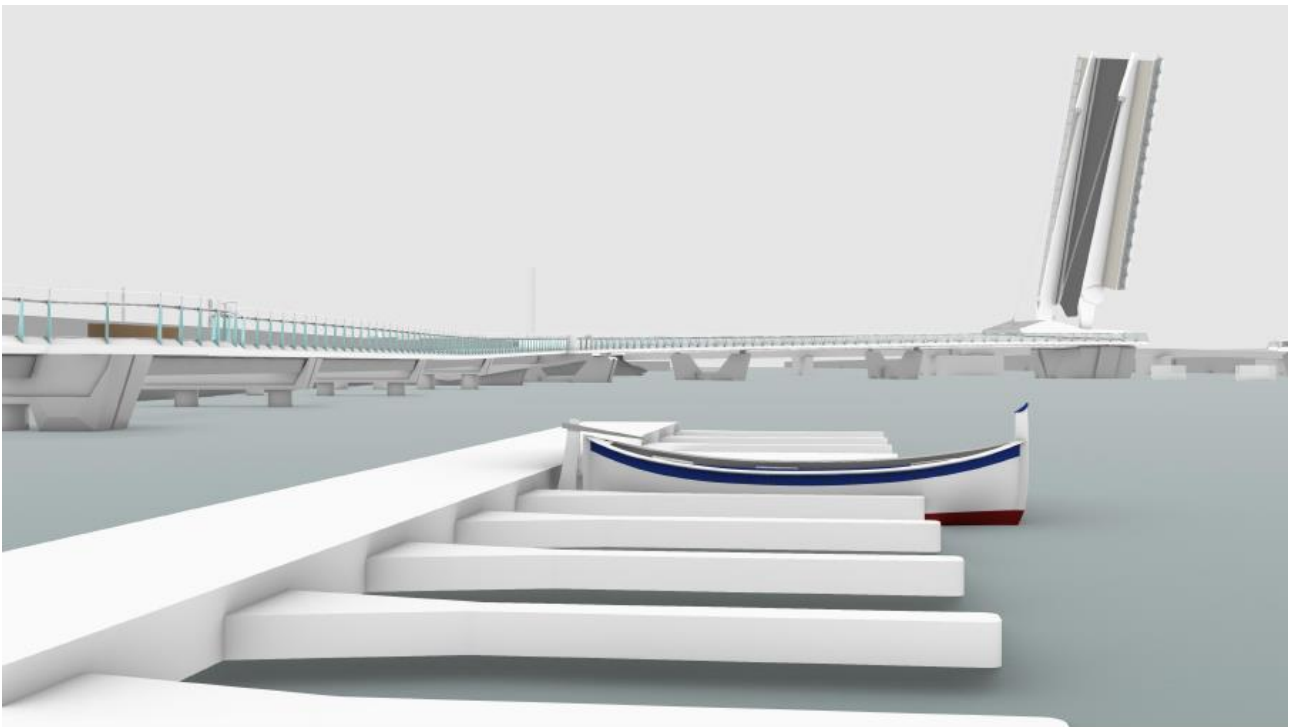


Figure 3-3: Diagram showing continuity of edge condition across the SPAR structures

3.2.3 Y-beam Fascia and Pier Crossheads

A pre-cast fascia is provided as part of the external Y-beams to provide shape to the visible face of the beams. The precast concrete cross head shells are shaped to match the fascia and mask the in-situ connections between the beams. The form is repetitive across all piers, with variations to incorporate the double piers at movement joints and house the petrol separators beneath the resting points.

The break pier is a large pre-cast concrete pier with a geometry intended to relate to both the SPAR Viaduct and SPAR Bridge piers.

3.2.4 Parapet

As noted in Section 3.2.1, locating the pedestrian walkways outside of the vehicular containment system allows a more lightweight parapet system more suited to a pedestrian environment. Section 3.3.10 describes the technical requirements for the parapet to act as edge protection for the pedestrian and cyclists.

Located on the edges of the bridge the parapet is an important part of the appearance of the bridge from a distance. Simultaneously, as one of the elements closest to the active travel users it is also an important part of the experience from on the bridge.

The proposed parapet consists of a bespoke assembly consisting of an array of twin plate painted steel posts and stainless steel rails with a lightweight stainless steel tension mesh infill. The system is intended to match the parapet system on the SPAR Bridge – albeit with a simplified post geometry – providing a visual and tactile consistency.

The twin-posts support a stainless steel lean rail at 1.1m above deck that encourages pedestrians to pause and take in the views out to sea. The lean rail also conceals lighting for the active travel path.

The tips of the twin posts support a minimal top rail at 1.45m above deck, proposed as a rectangular stainless steel flat. The cross-section of this should be minimised to reduce impact on the views off the bridge.

An infill is required to ensure that there are no gaps in the edge protection through which a sphere >100mm in diameter may pass. The proposed infill is a stainless-steel tension mesh that offers a lightweight infill. The mesh forms a continuous run, broken at the lifting span, and spans vertically between continuous cables fixed to the parapet lugs.

At the break pier wider stainless steel posts frame 3 bays of glazed parapet infill providing a resting point and a visual break between the two related parapet systems on the active travel pathway.

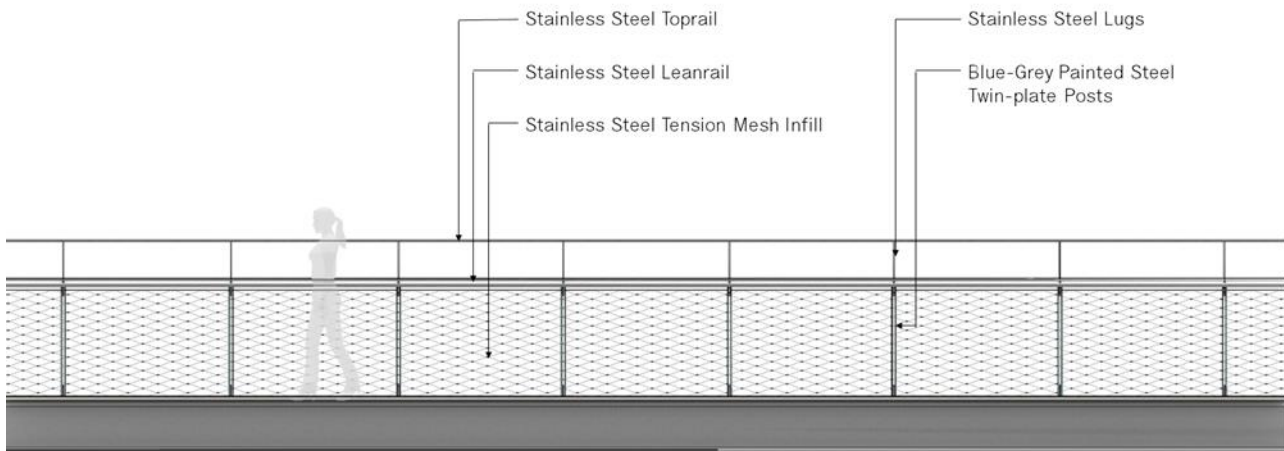


Figure 3-4: Internal Parapet Elevation

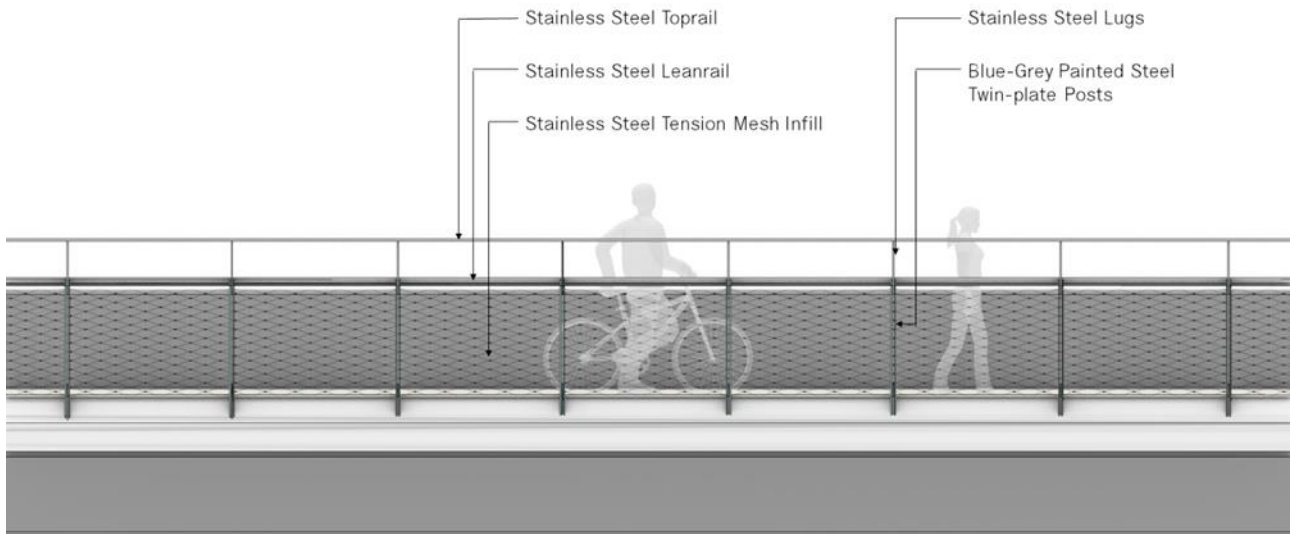


Figure 3-5: External Parapet Elevation

3.2.5 Lighting

The functional lighting should be integrated into the elements of the bridge for consistency with the SPAR Bridge. Lighting should be contained within the bridge to avoid excess light pollution or light spilling off the deck into the water and impacting marine life. LED lighting is proposed to provide a compact, low-energy solution.

The proposal to achieve the functional lighting for the active travel pathways is to integrate the luminaires into the parapets. Provision is made within the lean rail for a LED fittings to be mounted discreetly beneath the lean rail. Lighting from beneath the lean rail is intended to wash the walking surface whilst avoiding glare for the bridge users. This provides a consistent solution across the SPAR Bridge and Viaduct.

The functional lighting for the carriageway is proposed to be integrated into the VRS system. Provision is made for linear luminaires to be mounted within the pre-cast concrete VRS barriers

The functional lighting design has been developed in conjunction with RPS Lighting team to verify the low-level lighting solution can meet the required lux levels.

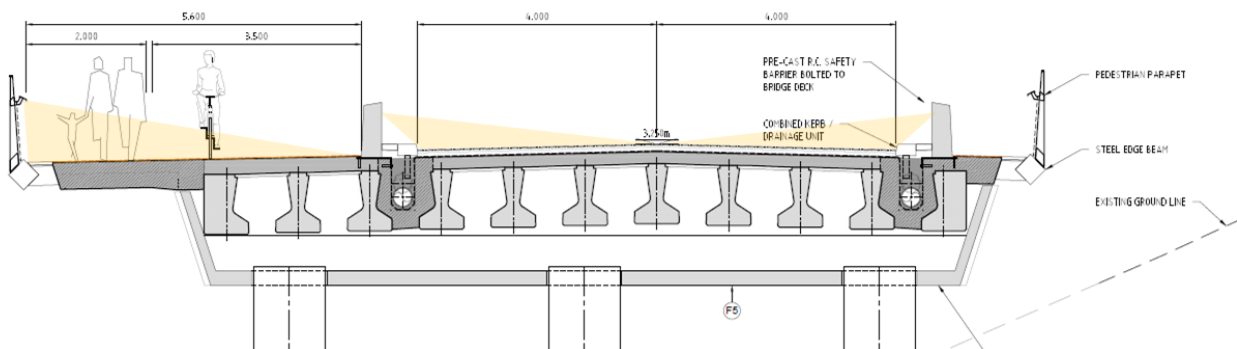


Figure 3-6: Low-level Lighting on Viaduct

3.2.6 Surfacing

The SPAR Viaduct surfacing finishes are intended to work with the material palettes established on the SPAR Bridge and the wider active travel scheme. On the main active travel path and the supplementary maintenance path, a grit bounded epoxy combined waterproofing and anti-slip surfacing is proposed. This is applied directly to the structure, offering slip-resistance and a robust finish. Different tones of aggregate will be used for consistency with the wider active travel path surfacing; buff aggregate on the pedestrian walkway and dark red aggregate on the cycleway, white painted lines demarcate the cycle lanes.

The use of aggregate on both pedestrian and cycleway provides is consistent with the wider active travel scheme. The aluminium decking proposed on the SPAR Bridge cannot be used here due to the use of concrete cantilevers on the SPAR viaduct. The buff aggregate finish is proposed over the break-pier also, managing the transition to the finishes on the SPAR Bridge and demarcating the break in the cycleways at the crossing.

At joints in the deck or access hatches stainless steel trims will be provided to contain the aggregate surfacing. The same aggregate surfacing should be provided to the top of hatches for visual consistency.

A strip of stainless steel grating is proposed adjacent to the edge beams on both walkways. This serves to enable access to the fixings for the edge beam for inspection and maintenance, provide drainage to the active travel path through the open slats and highlight the connection to the water below. The grating slats will be laid transversely to the direction of travel, texture to the top of the grating offers slip resistance

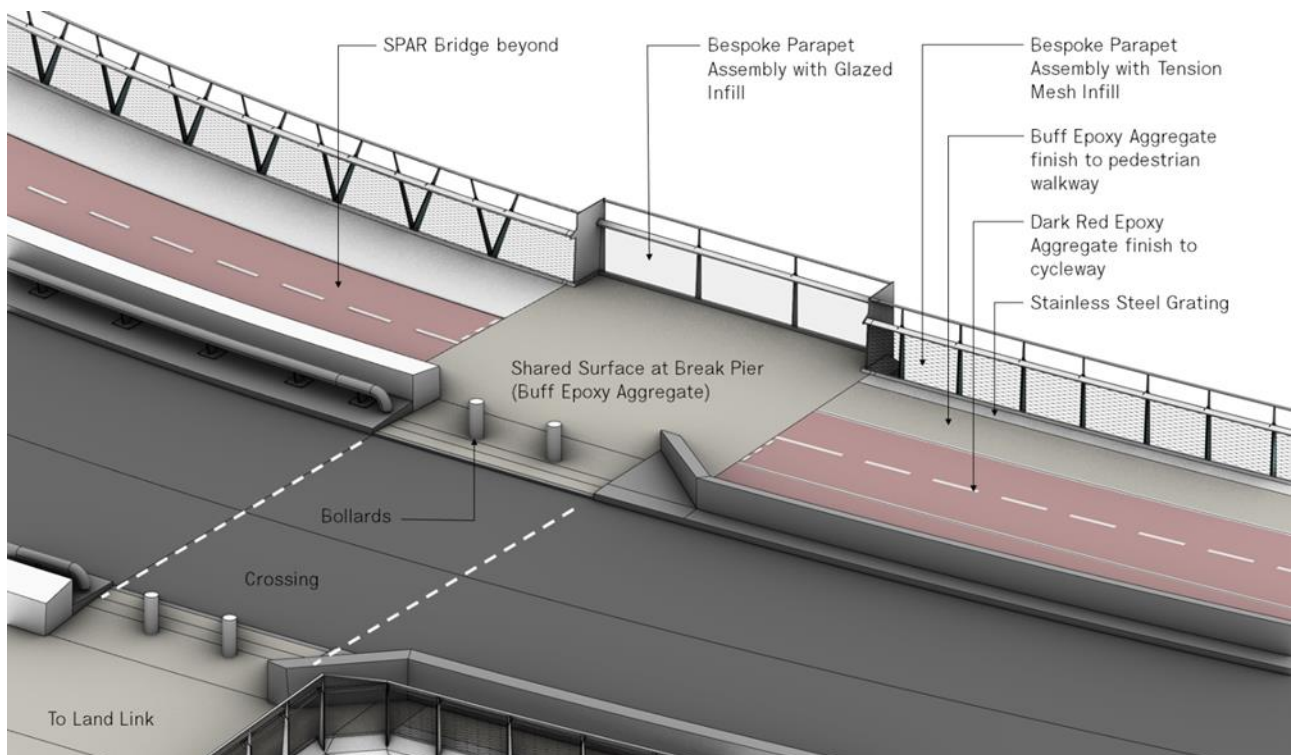


Figure 3-7: Surfacing on Viaduct and Break Pier

3.2.7 Resting Points

Resting points are provided at regular intervals along the viaduct. The deck widens at these points providing space to pause without interrupting the flow of pedestrians on the active travel pathway. These locations are co-ordinated with the petrol separators in the piers below – this offers support to the wider deck whilst the extension to the deck also serves to keep the petrol separators in shadow.

The parapet and surfacing at these locations match the typical parapet and active travel walkway surfacing along the rest of the SPAR Viaduct. The resting point geometry and parapet grid shall be coordinated, bespoke corner posts allow the parapet to turn the corner cleanly.

Additional bespoke timber and stainless steel benches are proposed to offer seating. This improves the accessibility of the active travel path by breaking up the length of the journey.

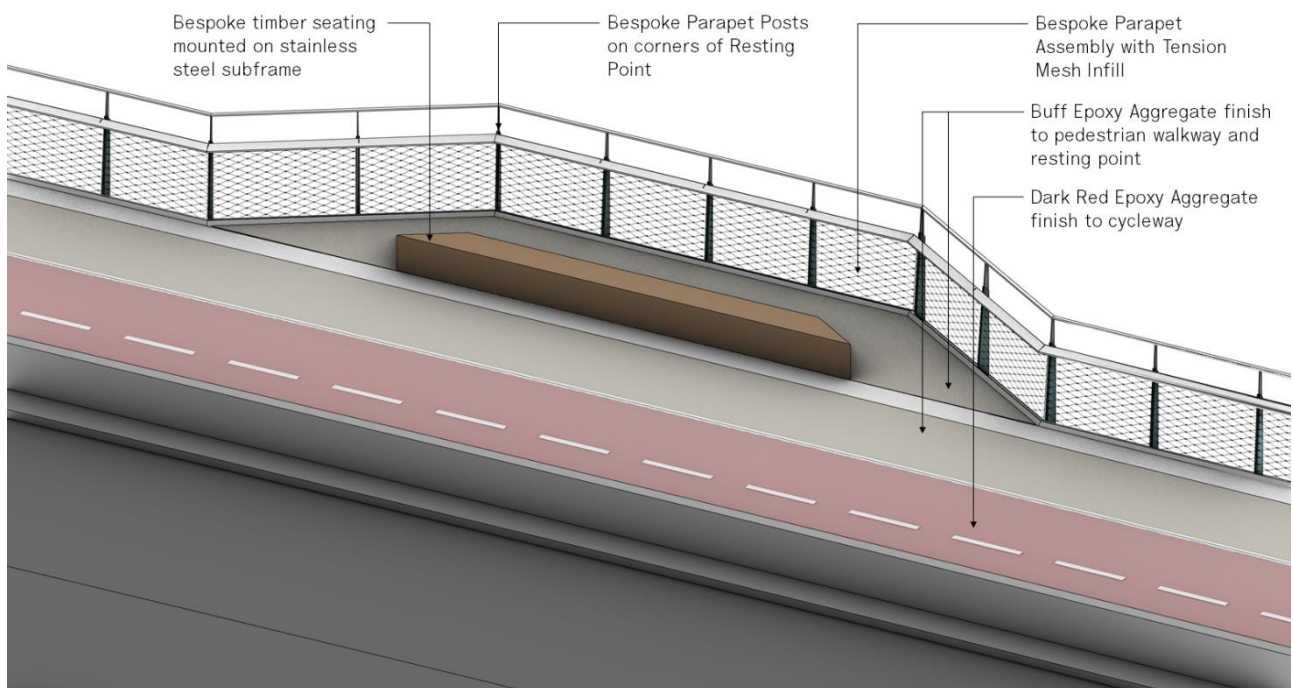


Figure 3-8: Resting Points

3.2.8 East Abutment

At the East Abutment the carriageway continues onto land at a low-level, whilst the active travel path separates to meet the public realm at a higher level. This requires the walkway over the final span to diverge from the carriageway alignment as described in the design drawings. The footway rises at a gradient $<1:40$ to meet the ramps on land at the abutment.

As the active travel pathway raises relative to the carriageway the potential drop on the carriageway side of the VRS increases. The height of the VRS is maintained at 3.950mOD to maintain views to the River Liffey for the residents along the southern side of R131. Therefore, an additional post and rail parapet assembly with a lightweight and visually permeable, tension mesh infill, is introduced to the top of the concrete VRS to provide fall protection. This parapet is a variation of the typical viaduct parapet to provide visual and material consistency.

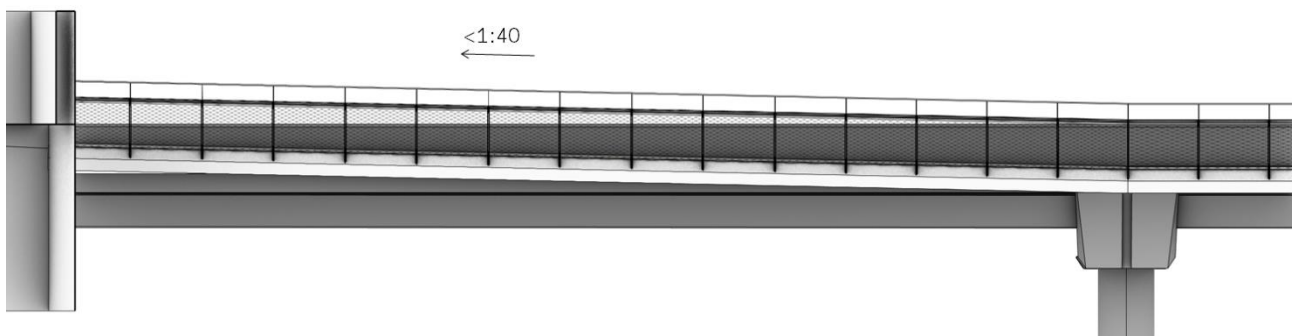


Figure 3-9: Elevation diagram showing footway gently ramp up to meet active travel path at abutment

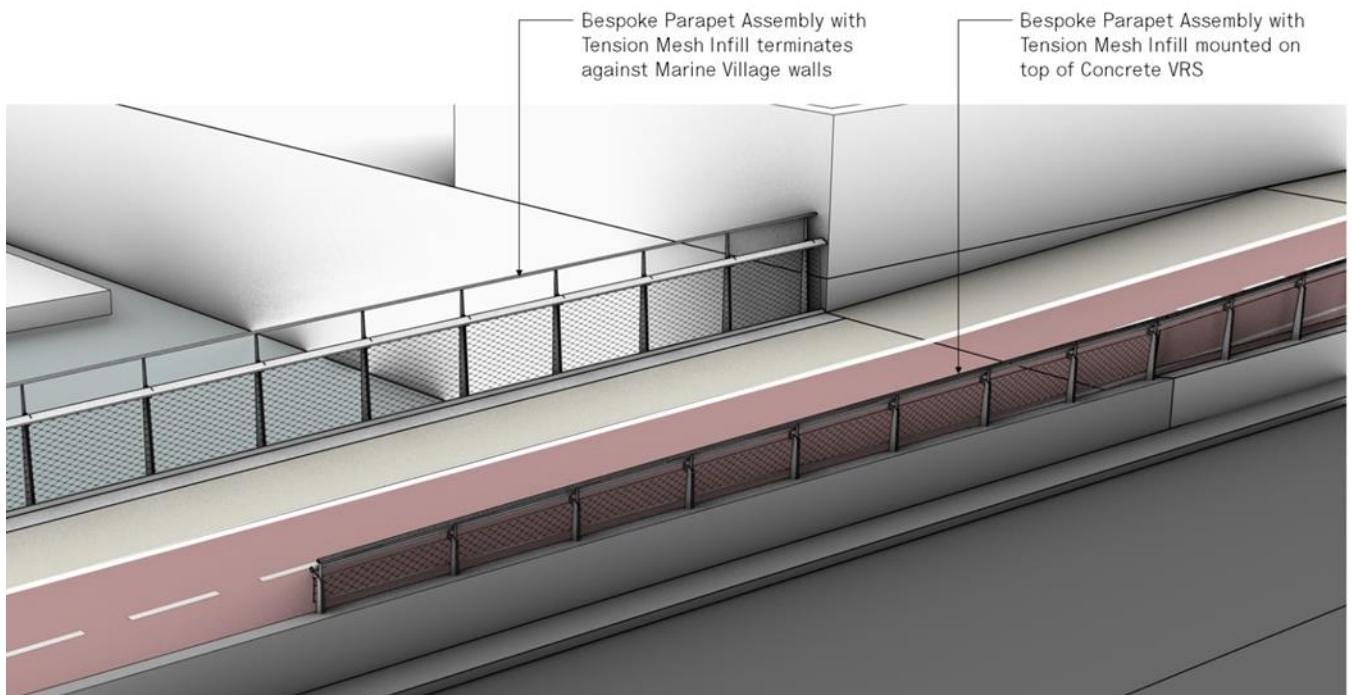


Figure 3-10: Parapet termination at abutment

3.2.9 Material Summary

SPAR Viaduct		
<i>Element</i>	<i>Material / Colour</i>	<i>Reference Image</i>
Typical Viaduct Structure	Precast Concrete	
Carriageway Surfacing	Asphalt	
Carriageway Kerbs	Concrete	
VRS System	Precast Concrete with inset carriageway lighting	
Active Travel Surfacing	Epoxy Aggregate Surfacing in with Stainless Steel trims at joints/access hatches.	See Figures 3-7 & 3-8
	Stainless steel drainage grate at edge of walkway	
Parapet Posts	Blue-Grey Painted Steel	See Figures 3-4 & 3-5
Parapet Rails and Lugs	Stainless Steel	
Parapet Infill	Stainless Steel Tension Mesh	
Parapet Infill at Break Pier	Glazed	
Benches	Timber mounted on stainless steel subframe	See Figure 3-8

3.3 Proposals for the recommended structure

3.3.1 Proposed Category

The proposed structure is Category 3 in accordance with TII DN-STR-03001 clause 3.4.

3.3.2 EN1990 Classes and Levels

In accordance with IS EN1990 Annex B and TII GE-POL-01008 Table A.2 the structure is classified as follows:

Class	Appendix B	Classification
Consequence Class	Table B1	CC2
Reliability Class	Table B2	RC2
Design Supervision Level	Table B4	DSL3
Inspection Level	Table B5	IL2

3.3.3 Span arrangements

The viaduct comprises 22 spans of a repeating 27m grid for an overall length of 591.5m

3.3.4 Minimum headroom provided

The viaduct beam soffit will be at a level of +1.750mOD compared to a Mean Sea Level of -0.11mOD.

3.3.5 Approaches including run-on arrangements

The viaduct will connect on the western end to the SPAR opening bridge with a transition span. The road at the eastern end of the structure will be on fill material. It is not proposed to provide run-on slabs to the structure.

3.3.6 Foundation type

Based on the geotechnical information, the ground has limited bearing capacity and shallow spread foundations are not feasible. It is proposed to use 1.2m diameter rotary bored piles, with permanent steel casings and a typical length of 33m. The casing will be driven to rock formation. The inside of the steel casing will be rotary bored and have rock sockets. The piles will include a temporary collar to allow placement of the precast crosshead members.

3.3.7 Substructure

The substructure consists of reinforced concrete crosshead beams. The crossheads will be precast concrete shells lifted into position on top of the bored pile collars. Reinforcement and in-situ concrete infill will make the crosshead shells integral with the top of the bored piles and bridge deck.

3.3.8 Superstructure

The superstructure comprises precast prestressed concrete Y4 and YE4 beams acting compositely with an in-situ concrete deck slab. FRC permanent formwork spans between beams to support the deck slab pour. The beams will be lifted into position on top of the crosshead beams. The deck and diaphragms will be poured in-situ through a defined pour sequence to form an integral structure. Transverse reinforced concrete cantilevers project from the deck edge to support the steel edge beam and parapet assembly at deck edges.

3.3.9 Articulation arrangements, joints and bearings

The viaduct consists of four discrete frames with expansion joints located at the interface of each frame. Each discrete frame is fully integral across its spans. The expansion joints are at approximately 165m intervals between discrete frames.

3.3.10 Vehicle Restraint System and Pedestrian Parapets

800mm high, precast concrete parapets to DN-REQ-03034 with N2 Containment Level to DN-REQ-03034 are proposed. These will be designed to BS 6779-2 (1991) Highway Parapets for Bridges and Other Structures – Part 2 – Specification for Vehicle Containment Parapets of Concrete Construction.

An opening between the vehicle-resistant system of the viaduct and the SPAR opening is located on the transition to allow for the active travel route from the R131 to the north side of the viaduct. The vehicle restraint system will have flared ends at the opening to mitigate against end-on impact.

The top of the concrete vehicle restraint barrier is 3.950mOD to maintain views of the River Liffey for the residents along the southern side of R131.

At the active travel crossing point, vehicular bollards will be provided to preclude vehicles from accessing the active travel route.

Pedestrian parapets are located on deck edges. The parapet on the northern edge of the structure, adjacent to the active travel facility, will have a minimum height of 1.45m. The parapet on the southern edge of the structure will have a minimum height of 1.25m. The pedestrian parapets will be a bespoke design, and the design will comply with TII DN-STR-03011, TII DN-REQ-03034 & PD CEN/TR 16949:2016. The design loading on the parapet will be combined as defined in PD CEN/TR 16949:2016 Annex A

The pedestrian parapets will comprise painted steel twin plate posts and railings with a lightweight tension mesh infill and will offer visual consistency with the SPAR Bridge as well as a lighter, more open appearance

for the structure for active travel users on the viaduct. The parapet leans out slightly, combined with the mesh infill, making it more challenging for the parapet to climb or achieve a foothold on the parapet

3.3.11 Drainage

The vertical alignment of the viaduct is straight (flat with no longitudinal gradients) to keep the finished deck levels, parapet levels and barrier levels as low as reasonably possible. This requirement stems from visual impact studies undertaken which studied the impact of the proposed viaduct on river views from existing residences on Pigeon House Road.

The deck incorporates transverse cross-falls of 2.5% to collect surface water on the carriageway within combined kerb and drainage units located at each edge. The kerb drains will outfall directly to carrier pipes located within drainage troughs provided within the deck profile. The carrier pipes are 300mm diameter and incorporate longitudinal falls of 1 in 350. The drainage system has a capacity for up to a 1 in 100 year storm with 20% climate change. The carrier pipes discharge at regular intervals corresponding to bay ends and outfall transversely at diaphragm locations to petrol interceptors housed within bespoke cross-head profiles.

A transverse fall is incorporated to the transverse deck cantilevers with direct outfalls provided at deck edges through perforated grills in the steel decking.

3.3.12 Construction and Buildability

The River Liffey channel will undergo a two stage dredging process. The first stage of the dredging process will dredge the marina area. The second stage of dredging will involve the installation of block stone mattress along the southern side of the channel to protect against undermining of the existing revetment.

Stage 1 of the dredging will be undertaken prior to the construction of both the SPAR opening bridge and the viaduct. Stage 2 dredging includes the installation of the block stone mattress after completion of the substructures.

Restrictions on access from the existing R131 require that construction and logistics is primarily executed from the water via a mix of jack-up barges and floating barges.

It is envisaged that a site compound will be established at the north quay for the purpose of constructing both the viaduct and the opening bridge. The compound will have a plan extents of approximately of 200x75m. Delivery of precast concrete and steel elements to the site will be facilitated through the M50 Port Tunnel. In-situ concrete can be transported to the site through either the M50 Port Tunnel or the concrete batching plant located at South Bank Road. Materials brought to the site compound will be transported by barge to the works area as required minimising construction traffic on the public road system.

It is envisaged that in-situ concrete supply will be provided through either:-

- a. Concrete supply barge using double-pumping methods;
- b. Concrete supply line crossing a temporary jetty at the SPAR opening bridge and onward pumping.

The envisaged construction sequence drawings for the SPAR Viaduct are included in Appendix C. An overview is given in Table 3-1.

Table 3-1 Construction sequence overview

Stage	Work
1.	<ul style="list-style-type: none"> • Stage 1 dredging of marina
2.	<ul style="list-style-type: none"> • Site compound set up at north quay, • Set up clear work zone of approximately 3.0m set-back and load spreading measures at north wall quay to limit loading on existing heritage wall during lifting operations • Traffic management set-up as required at north wall quay

PRELIMINARY DESIGN REPORT

Stage	Work
3.	<ul style="list-style-type: none"> Long reach excavator placed on jack up barge Localised temporary works installed at toe of revetment (as required); Jack up barge position at each pier and a long reach excavator will locally excavate toe of revetment to form pocket for subsequent piling Excavate bed locally at each foundation to increase draught (as required).
4.	<ul style="list-style-type: none"> A piling rig will be set-up on a jack-up barge and positioned at each pier, The piling rig will be supported by a crane, concrete and supply barges Once all permanent piles are installed, temporary mooring piles will be installed at each pier location.
5.	<ul style="list-style-type: none"> Installation of the precast cross-head shell on temporary pile collars The cross-head will be fitted with access platforms and edge protection. Gangways to be connected from the top of the revetment for additional access as required. Stage 1 pour to complete cross-head profile
6.	<ul style="list-style-type: none"> Complete Stage 2 dredge/stone apron
7.	<ul style="list-style-type: none"> Precast beams to be delivered to site compound and lifted on to a supply barge Float precast beams to the crane barge, crane into position on cross-heads Install FRC permanent formwork between beams.
8.	<ul style="list-style-type: none"> Pour diaphragms and deck slabs following a defined pour sequence
9.	<ul style="list-style-type: none"> Cantilever deck edge pour (either in-situ or precast)
10.	<ul style="list-style-type: none"> Install barriers and parapets
11.	<ul style="list-style-type: none"> Complete finishes i.e. surfacing and lighting

Table 3-2 provides a preliminary anticipated construction durations for the viaduct.

Table 3-2 Preliminary construction durations

Element	Duration (months)
Piling	12 months
Substructure (crossheads/piers)	5 months
Deck (beams, deck slab & diaphragms)	10 months
Finishes (parapets, surfacing, verges etc)	2 months
Total	29 months

3.3.13 Durability

All elements of the viaduct will satisfy TII publication DN-STR-03012 Design for Durability.

All exposed concrete in the bridge superstructure and substructure will be impregnated with a hydrophobic pore liner in accordance with the TII Specification for Road Works.

Bridge deck waterproofing systems will be spray applied, satisfy the requirements of TII DN-STR-03012 and will be capable of being non-destructively tested. The following surfaces will be protected with a bridge deck waterproofing system:

- The deck slab between parapet upstands;
- The parapet upstands to a height of 100mm minimum above the adjacent deck slab level;
- The back of the abutment from bridge deck level to a level 200mm below the construction joint between superstructure and substructure.
- All buried concrete surfaces apart from those coated with bridge deck waterproofing will be protected with two coats of epoxy resin waterproofing. All exposed concrete in the bridge superstructure and substructure will be impregnated with a hydrophobic pore liner in accordance with the TII Specification for Road Works.
-

Concrete:

The proposed concrete will have minimum exposure class XS3 to the beams and diaphragms.

Concrete strength are as follows:

- Piles C40/50
- Diaphragm C40/50
- Deck C40/50
- Precast beams
 - Transfer C35/45
 - Service C50/50

Steelwork

Grade S355 W to EN 10025.

The structural steel members shall receive paintwork protection in accordance with TII CC-SPW-0190.

Reinforcement:

Reinforcement to be grade 500B or C ribbed bars to BS 4449:2005

Stainless steel reinforcement to be type 1.4301 or 1.4362 to IS EN 10088. Ribbed bars grade 500 to BS 6744:2016 (parapet edge beams). Stainless steel will be used only for links tying the parapet edge beam to the superstructure in accordance with 4.4 of TII DN-STR-03012.

Prestressing strands:

Prestressing strands to be 7 wire manufactured from steel Y1860S7 to BS 5896 2012.

3.3.14 Sustainability

The primary structural material of the proposed viaduct is reinforced concrete. The concrete material shall largely comprise of 50% Ground Granulated Blast Furnace Slag (GGBS) cement, as it has been proven to possess a lower carbon footprint compared to Ordinary Portland Cement. The proposed structure has been designed to be structurally efficient, thus employing a minimum of materials. At the end of its lifespan, the structure can be readily demolished, and all materials can be recycled.

3.3.15 Inspection and Maintenance

The concrete abutments should not require structural maintenance for the design life of the structure. The integral nature of the structure is expected to minimise the maintenance activities throughout the structure.

The configuration of the superstructure has been undertaken to afford good access for inspection and maintenance. Inspection of all components of the soffit of the deck can be done visually by boat from the River Liffey.

The structure will be inspected every 6 years or as required by the TII Eirspan Bridge Management system.

The deck surfacing will need maintenance and replacement after 20 years. Bridge movement joints will need to be inspected and maintained regularly and replaced after 50 years.

4 SAFETY

4.1 Traffic management during construction including land for temporary diversions

Vehicular or pedestrian traffic management will not be required during the construction of the bridge as the structure will be constructed offline. Minor provision of traffic management at the entrance to the north quay staging area for construction traffic during construction will be required.

There is a possibility of using the transition span as a temporary staging area, where localised traffic management from the R131 may be required for construction traffic.

4.2 Safety during construction

In addition to the general obligations and duties under the Safety, Health and Welfare at Work Act 2005, the consultant carrying out the detailed design of the proposed bridge will also undertake the duties of Project Supervisor Design Process (PSDP) and prepare a Preliminary Safety & Health Plan and Designers Risk Assessment for the works. The Designer will take account of the General Principles of Prevention as specified in the First Schedule of the Safety, Health and Welfare at Work (General Application) Regulations and liaise with the Project Supervisor for the Construction Stage (PSCS), as required by the Safety, Health and Welfare at Work (Construction) Regulations 2013.

It is envisaged that the appointed contractor will be experienced in bridge construction of this type and will be appointed PSCS for the duration of the works.

4.3 Safety in use

Inspection and maintenance requirements for the structure are minimised due to the structural form chosen. The completed scheme will represent an improvement in safety compared to the existing road conditions.

4.4 Lighting

The functional lighting for the active travel pathways will be integrated into the parapet hand rails. The functional lighting for the carriageway is proposed to be integrated within the concrete barrier system. The proposed lighting is similar to the SPAR opening bridge to ensure continuity between the structures.

5 DESIGN ASSESSMENT CRITERIA

5.1 Actions

5.1.1 Permanent Actions

The material densities and permanent loading will be as per IS EN 1991-1-1 Annex A. The loading of any proprietary system used in the construction of the bridge will be as per the products datasheet and specifications.

Table 6-1: List of Material Weights for Shannon Bridge Crossing

Material	Weight kN/m ³
Structural steel	78.5
Reinforced Concrete	25.0
Backfill soil	18-20

5.1.2 Snow, wind and Thermal Actions

The wind loading at the structure will be designed in accordance with IS EN 1991-1-4.

The structure will be designed for uniform thermal effects in accordance with IS EN 1991-7. Uniform temperature for the bridge location is determined using Figures NA.1 and NA.2 of the Irish national to IS EN 1991-1-5.

The structure will be designed for a vertical differential temperature IS EN1991-1-5 Figure 6.2b. The temperature difference will be considered to act simultaneously with uniform temperature change, as recommended in Irish national Annex, if that is more onerous. The bridge is a Type 2 bridge as per Table 6.1 of IS EN1991-1-5 as such the ΔT_1 can be interpolated from Table B.2

For road bridges in the normal climatic zone, significant snow loads and traffic loads cannot generally act simultaneously. The effects of the characteristic snow loads on a bridge deck are less onerous than the characteristic value of traffic loads and will not be considered in the design of the bridge.

5.1.3 Actions relating to normal traffic

The structure will be designed as per IS EN 1991-2 Load Model 1 (LM1) and Load Model 2 (LM2). The assessment of surcharge for normal loading will be assessed in accordance with IS EN 1991-2 NA.2.36.2. The bridge will be designed for two notional lanes as per IS EN1991-2 clause 4.2.3 table 4.1.

LM1 generally reproduces traffic effects to be taken into account for global and local verifications. The load model is composed of two concentrated axle loads and a uniformly distributed load in each lane. The loading is given in Table 6-2 and the adjustment factor is applied as per the Irish National Annex Clause NA2.12 Table NA.1 of EN1991-2.

Table 6-2: Load Model 1 loading

Location	Tandem system TS Axle loads Q_{ik} (kN)	UDL system q_{ik} kN/m ²	Tandem system TS With adjustment factor to IS NA Axle loads Q_{ik} (kN)	UDL system With adjustment factor to IS NA q_{ik} kN/m ²
Lane 1	300	9	300	5.5
Lane 2	200	2.5	200	5.5
Lane 3	100	2.5	100	5.5
Other lanes	0	2.5	0	5.5
Remaining area (q_{ik})	0	2.5	0	5.5

Load Model 2 reproduces traffic effects on short structural members. LM2 consist of a single axle load and is intended for local verification only. The axle load of LM2 is 400kN with dynamic amplification include as per EN1991-2 clause 4.33.

5.1.4 Actions relating to abnormal traffic

The structure will be designed for IS EN 1991-2 load models LM3 (SV80, SV100 & SV196). The assessment of surcharge for abnormal loading will be assessed in accordance with IS EN 1991-2 NA.2.36.3. The simplified methods to represent these actions in PD6694-1 (amendment A1 2020) Section 7.6.2 will also be used.

5.1.5 Footway or footbridge live loading

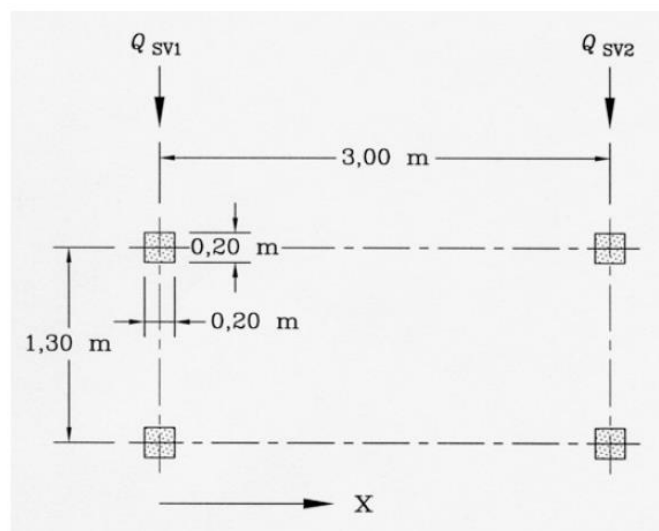
The footway/cycleways will be designed for Load Model 4 (crowd loading) in accordance with Section 4.3.5 and 5.3.1 of I.S. EN 1991-2. This consists of a uniformly distributed load and a concentrated load; these loads are not coexistent.

Table 6-3: Footway Variable loading

EN 1991-2 Clause	Loading type	Load
5.3.2.1(1) and NA2.38	Vertical uniformly distributed variable load q_{fk}	5.0kN/m ²
5.3.2.2(1) and NA2.39	Vertical concentrated variable load Q_{fk}	20 kN over a 0.2m x 0.2m patch
5.4.(2)	Horizontal variable load Q_{fk}	10% of total q_n

The foot/cycle will be design to for the accidental vehicle of foot bridge as given by FIGXX. This vehicle is to represent a service vehicle on the active travel route. The vehicle consist of two axles, the front axle of 40kN and the back axle of 80kN, a wheel base 3.0m, and a wheel centre to centre of 1.3m. A 60% braking force will be associated with the vehicular load. No other variable load will accompany the vehicle on any associated span.

Figure 5-1 Accidental loading/service loading



Key
 x : Bridge axis direction
 $Q_{sv1} = 80 \text{ kN}$
 $Q_{sv2} = 40 \text{ kN}$

5.1.6 Provision for exceptional abnormal loads

Not applicable

5.1.7 Accidental actions

Collision forces on the bridge parapet will be considered in accordance with IS EN 1991-2. Parapet supporting structures will be designed for accidental load effects corresponding to 1.25 times the characteristic resistance of the vehicular parapet system.

5.1.8 Actions during construction

The structure will be designed for the construction loading in accordance with EN 1991-1-6 table 4.1. The construction loading will be based on the envisaged construction sequence given in Section 3.3.11. The construction sequence will be further developed during detail design with appropriate allowances for temporary works based on the developed construction methodology. These allowances will be noted on the drawings.

5.1.9 Any special loading not covered above

None proposed.

5.1.9.1.1 Grouping of traffic loading

The characteristic values of traffic actions acting simultaneously with non-traffic action are defined by the five Group Models in EN1991-2 Table NA.3 of IS EN 1991-2. It is proposed to design the bridge for the following group models:

Table 6-4: Assessment of Group Traffic Loads

Load	Carriageway			Footways and Cycle Tracks
	Vertical forces		Horizontal forces	Vertical forces only a
References	4.3.2	Annex A	4.4.1	5.3.2.1 Equation (5.1)
Load System	LM1 (TS and UDL)	LM3 (Special vehicles)	Braking and acceleration forces	Uniformly distributed load forces
Groups of loads	gr1a	Characteristic		0,6 times Characteristic
	gr5	Frequent	Characteristic	
	gr6		Characteristic	Characteristic
		Dominant component action		

5.2 Authorities consulted and any special conditions required.

The following authorities were consulted during the conceptual design phase:

- Dublin Port Company

- Dublin City Council,
- TII,
- OPW
- ESB

5.3 Proposed Departures from Standards

None proposed.

5.4 Proposed methods of dealing with aspects not covered by Standards

None proposed.

6 GROUND CONDITIONS

6.1 Geotechnical Classification

The geotechnical classification of the proposed structure is Category 2 as per BS EN 1997-1.

6.2 Description of the ground conditions and compatibility with proposed foundation design

A Geotechnical Design Report (GDR) is being prepared. Historical boreholes were carried out around the location of the proposed structure in 2011 and this information provides an anticipation of the ground conditions of the site. A summary and approximation of the information obtained from the boreholes in the vicinity of the proposed structure are shown in Table 7-1. The bore logs are provided in Appendix D.

A general description of the ground conditions encountered in the historical boreholes is detailed below, in Table 7-1.

Table 7-1: Summary of Ground Conditions

Material Type	Depth to top of unit (m bgl)	Range of unit thickness (m)	Typical Description	Material Type
Pavement – bound layers	0	0.06 to 0.50	Bitmac, concrete and paving stones. At some locations, paved surfacing was underlain by a second concrete/bitmac layer	Pavement – bound layers
Made Ground – Sub-base	0.06 to 0.50	0.30 to 1.20	Sandy rounded fine to coarse GRAVELS with medium cobble content and low boulder content overlying gravelly silty fine to coarse SANDS with low cobble content and fragments of construction materials or gravelly sandy SILTS with fragments of construction materials	Made Ground – Sub-base
Made Ground – Fill	0.15 to 0.50	2.50 to 6.80*	Reworked sandy gravelly CLAY/ SILT fill or sandy silty/clayey GRAVEL or gravelly silty/ clayey SAND fill with varying amounts of concrete, red brick, timber, steel and glass fragments as well as varying amounts of wire, plastic, cloth, and ash	Made Ground – Fill
Marine Beach Deposits	2.50 to 6.80	11.20 to 15.10	Medium dense to dense SANDS and GRAVELS interspersed with layers of sandy gravelly CLAY frequently with shell fragments encountered across the site to a maximum depth of 20.10m in	Marine Beach Deposits
Port Clay	15.00 to 20.10	10.40 to 14.75	Firm to stiff sandy silty CLAY often with laminations of silty sand	Port Clay
Glacial Till / Fluvioglacial deposits	26.80 to 36.50	3.00 to 11.45	Very stiff sandy gravelly CLAY or very dense sandy clayey GRAVEL	Glacial Till / Fluvioglacial deposits

**Note – A depth of Made Ground – Fill to a depth of 15.80m was encountered in BH130 and a depth of 15.40m in BH131. This location is through an existing caisson, and aside from this the maximum depth was 6.80m in the south of the site, which is a former landfill area.*

7 DRAWINGS AND DOCUMENTS

7.1 List of all documents accompanying the submission

Table 8-1 lists drawings are included in Appendix B of the report.

Table 8-1: Drawing List

Drawing No.	Status	Rev.	Title
CP1901-3FM-RPS-C-SBR-Via-RP-C 0102-01	S3	P02	SPAR-Proposed Viaduct Location Plan (sheet 1 of 1)
CP1901-3FM-RPS-C-SBR-Via-RP-C—0103- 01	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 1 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-0103-02	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 2 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-0103-03	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 3 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-103-04	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 4 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-0103-05	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 5 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-0103-06	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 6 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-0103-07	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 7 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C -0103-08	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 8 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-0103-09	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 9 of 10)
CP1901-3FM-RPS-C-SBR-Via-RP-C-0103-10	S3	P02	SPAR-Proposed Viaduct General Arrangement (sheet 10 of 10)

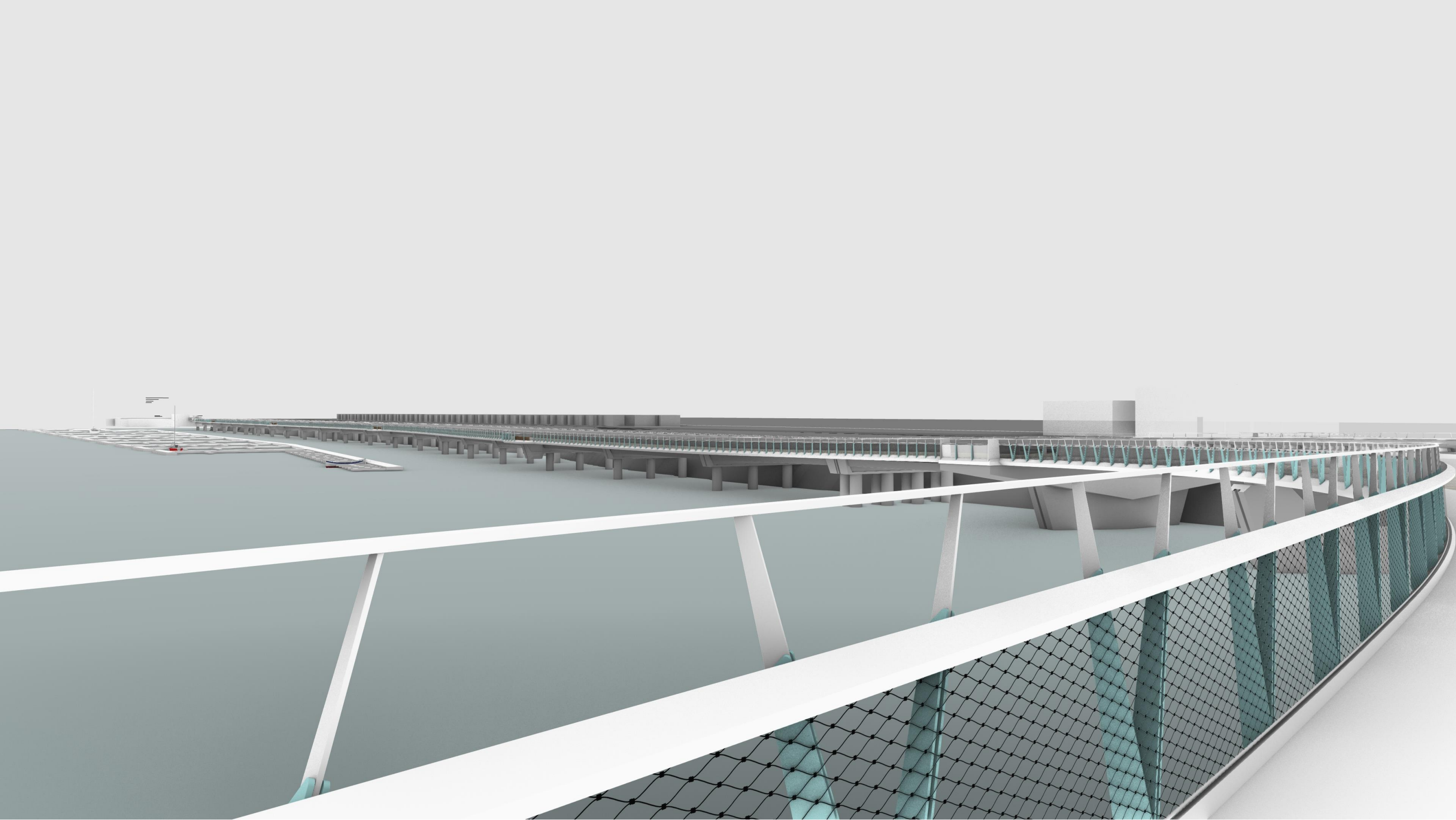
7.2 Documents

The Appendices to this report are:

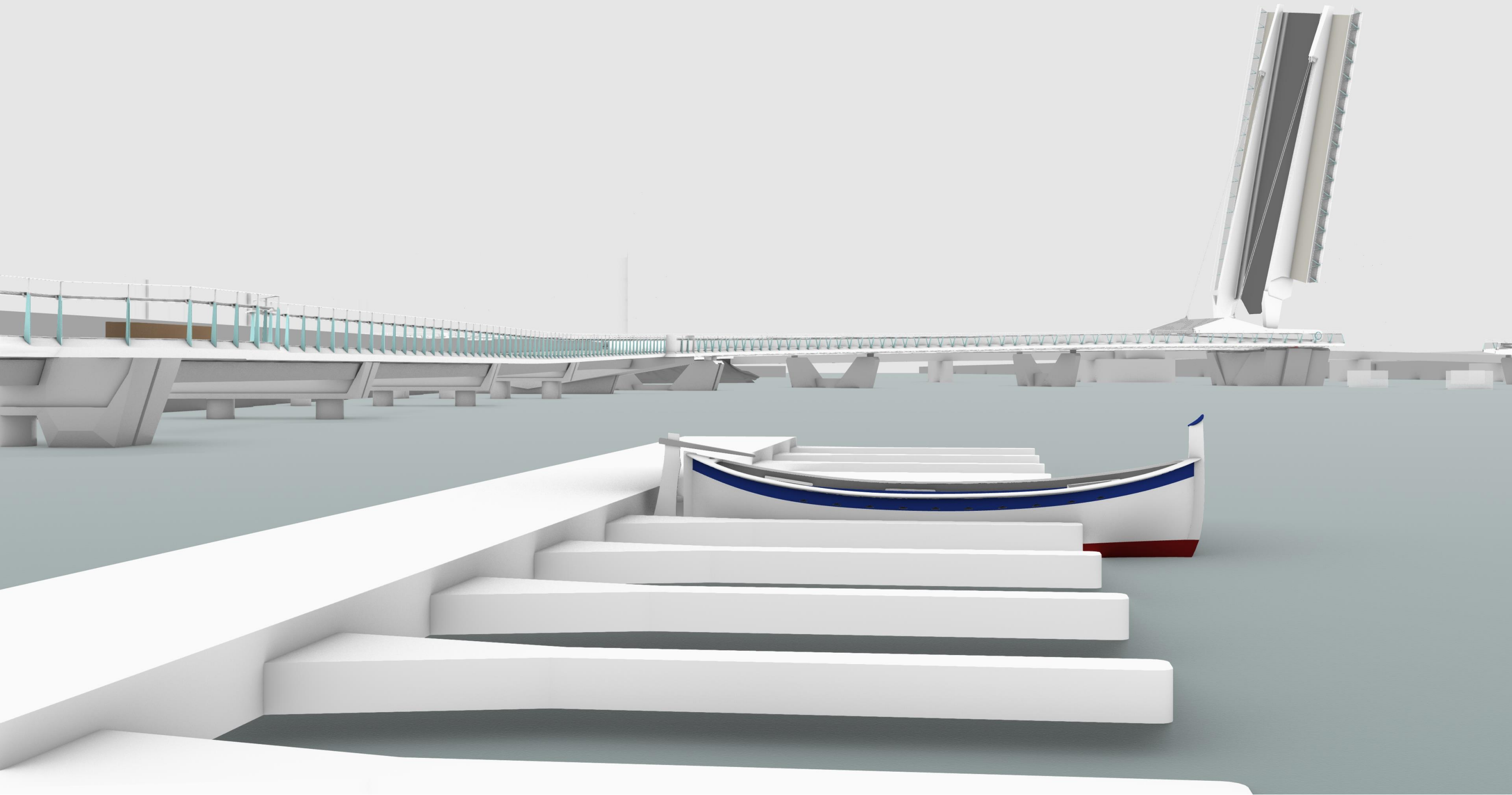
- Appendix A Photographs and photomontages
- Appendix B General Arrangement Drawings
- Appendix C Construction sequence drawings
- Appendix D Geotechnical Information

Appendix A

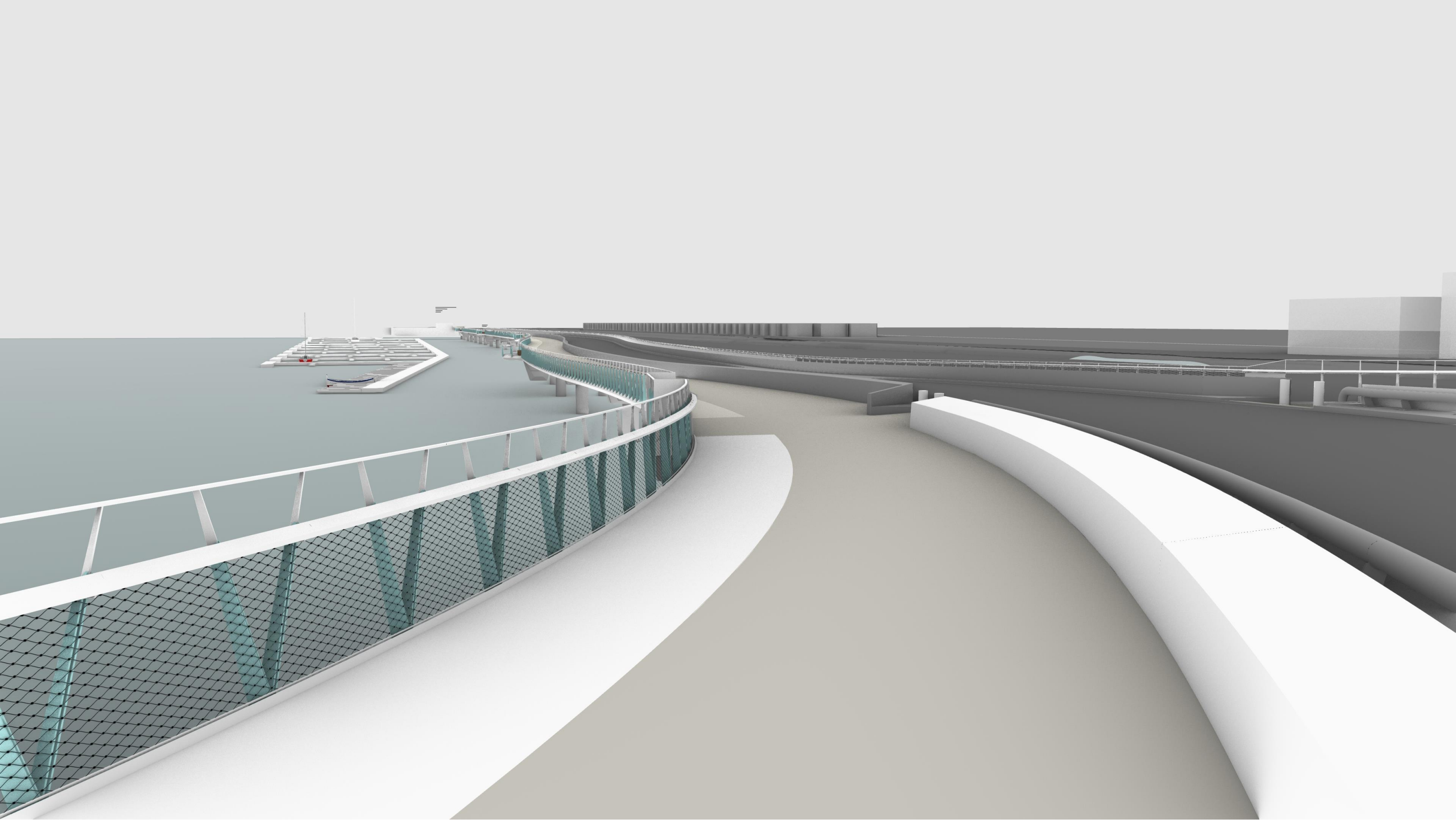
Photographs and photomontages



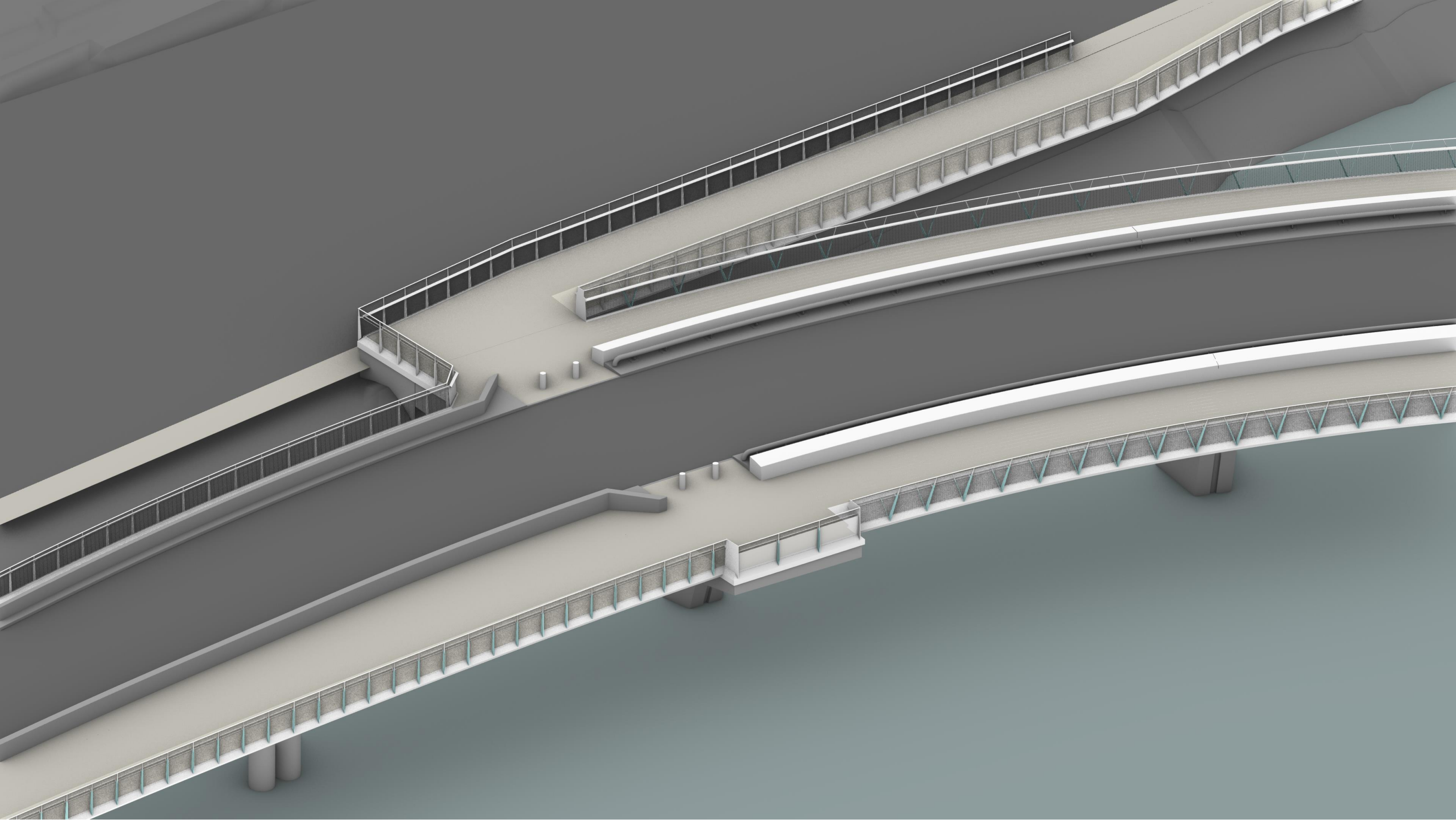
Viaduct



Viaduct

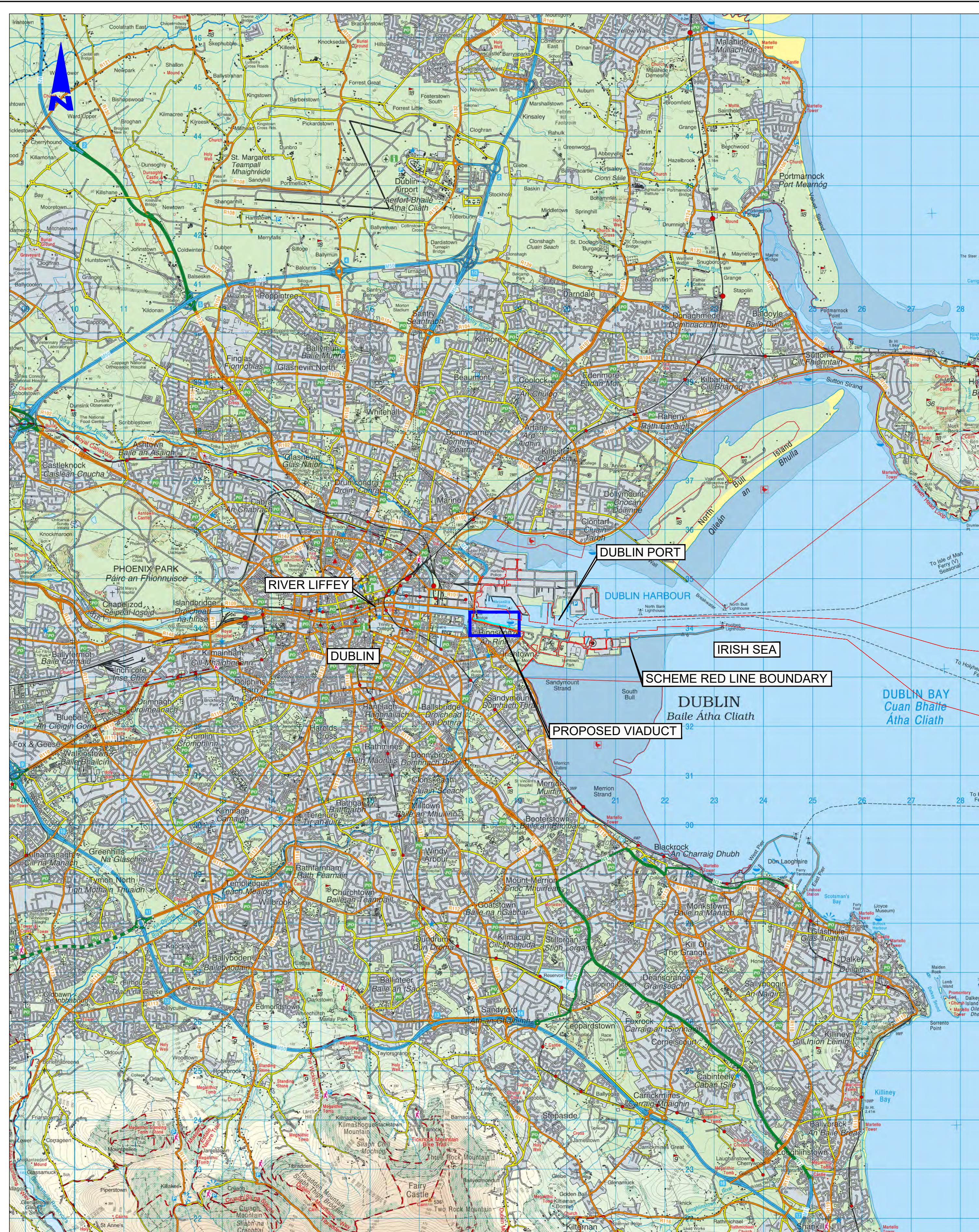


Viaduct

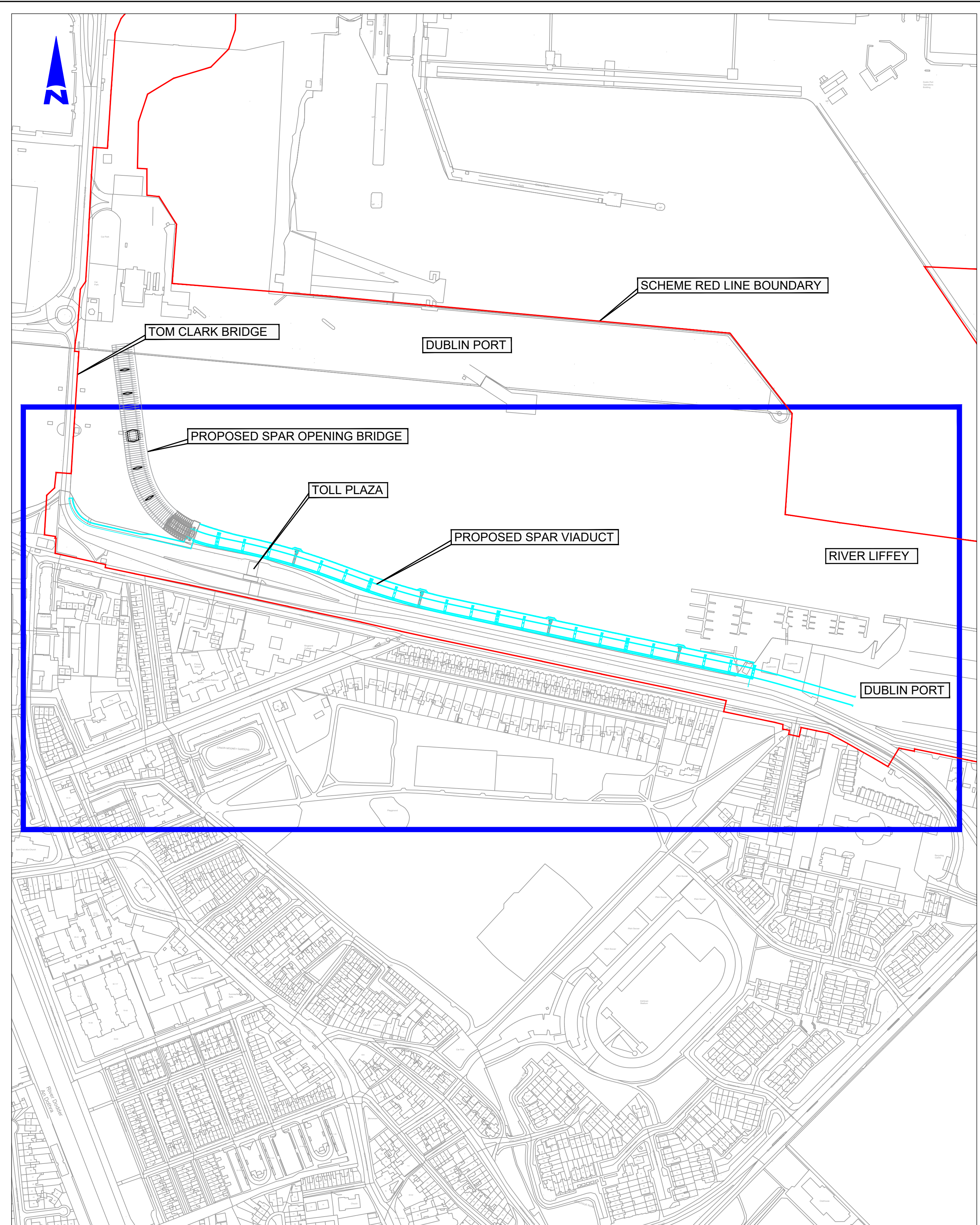


Viaduct

Appendix B General Arrangement Drawings



SITE LOCATION - 1 : 50,000
(Scale 1 : 50,000)



SITE LOCATION - 1 : 2,500
(Scale 1 : 2,500)



Client
**COMHLACHT CHALAFORT
ÁTHA CLIATH
DUBLIN PORT COMPANY**

General Notes
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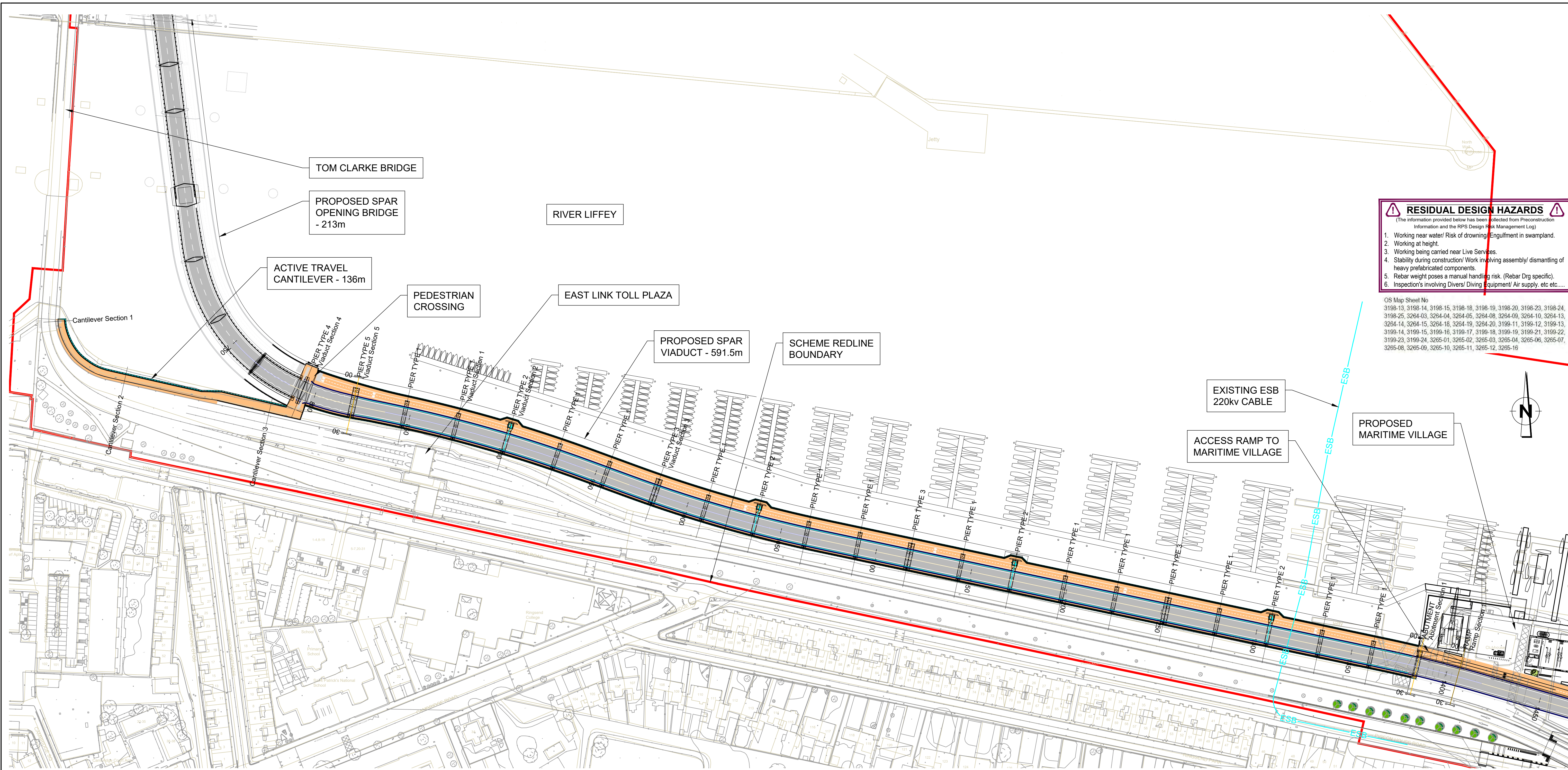
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Rev	Date	By	App	Amendment / Issue
01	May 24	DC	DC	Issue For Approval
02	Oct 23	DC	DC	Issue For Approval

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Scale	As shown @ A1 Half @ A3	Project	3FMProject Bringing Dublin Ports To 2040
Created on	Oct 23	Title	SPAR-Proposed Viaduct Location Plan (Sheet 1 of 1)
Sheets	01 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0102 - 01
Status	S3	Rev	P02

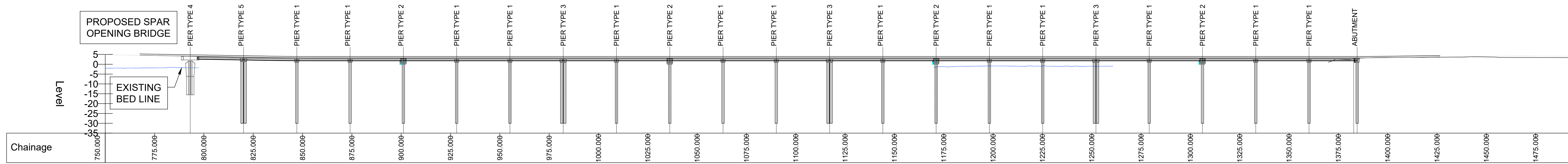
R:\IE000336 - Dublin Port SPAR&0 Drawings\B\CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0102.dwg



- RESIDUAL DESIGN HAZARDS**
 (The information provided below has been selected from Preconstruction Information and the RPS Design Risk Management Log)
1. Working near water/ Risk of drowning/ Engulfment in swampland.
 2. Working at height.
 3. Working being carried near Live Services.
 4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
 6. Inspection's involving Divers/ Diving equipment/ Air supply, etc etc.....

OS Map Sheet No
 3198-13, 3198-14, 3198-15, 3198-16, 3198-17, 3198-18, 3198-19, 3198-20, 3198-21, 3198-22, 3198-23, 3198-24, 3198-25, 3264-03, 3264-04, 3264-05, 3264-06, 3264-07, 3264-08, 3264-09, 3264-10, 3264-11, 3264-12, 3264-13, 3264-14, 3264-15, 3264-16, 3264-17, 3264-18, 3264-19, 3264-20, 3199-11, 3199-12, 3199-13, 3199-14, 3199-15, 3199-16, 3199-17, 3199-18, 3199-19, 3199-20, 3199-21, 3199-22, 3199-23, 3199-24, 3265-01, 3265-02, 3265-03, 3265-04, 3265-05, 3265-06, 3265-07, 3265-08, 3265-09, 3265-10, 3265-11, 3265-12, 3265-16

PLAN LAYOUT
 (Scale 1 : 1,000)



VIADUCT LONG SECTION
 (Scale 1 : 1,000)

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Client

**COMHLACHT CHALAFORT
 ÁTHA CLIATH
 DUBLIN PORT COMPANY**

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Stability	Rev	Date	Dim Ck'd	Amendment / Issue	App
\$	2	May 24	Do	Issue For Approval	MM
\$	1	Oct 23	Do	Issue For Approval	MM

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Model File Identifier
 CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000

Scale	As shown @ A1 Half @ A3
Created on	Oct. 23
Sheets	01 of 10

Project

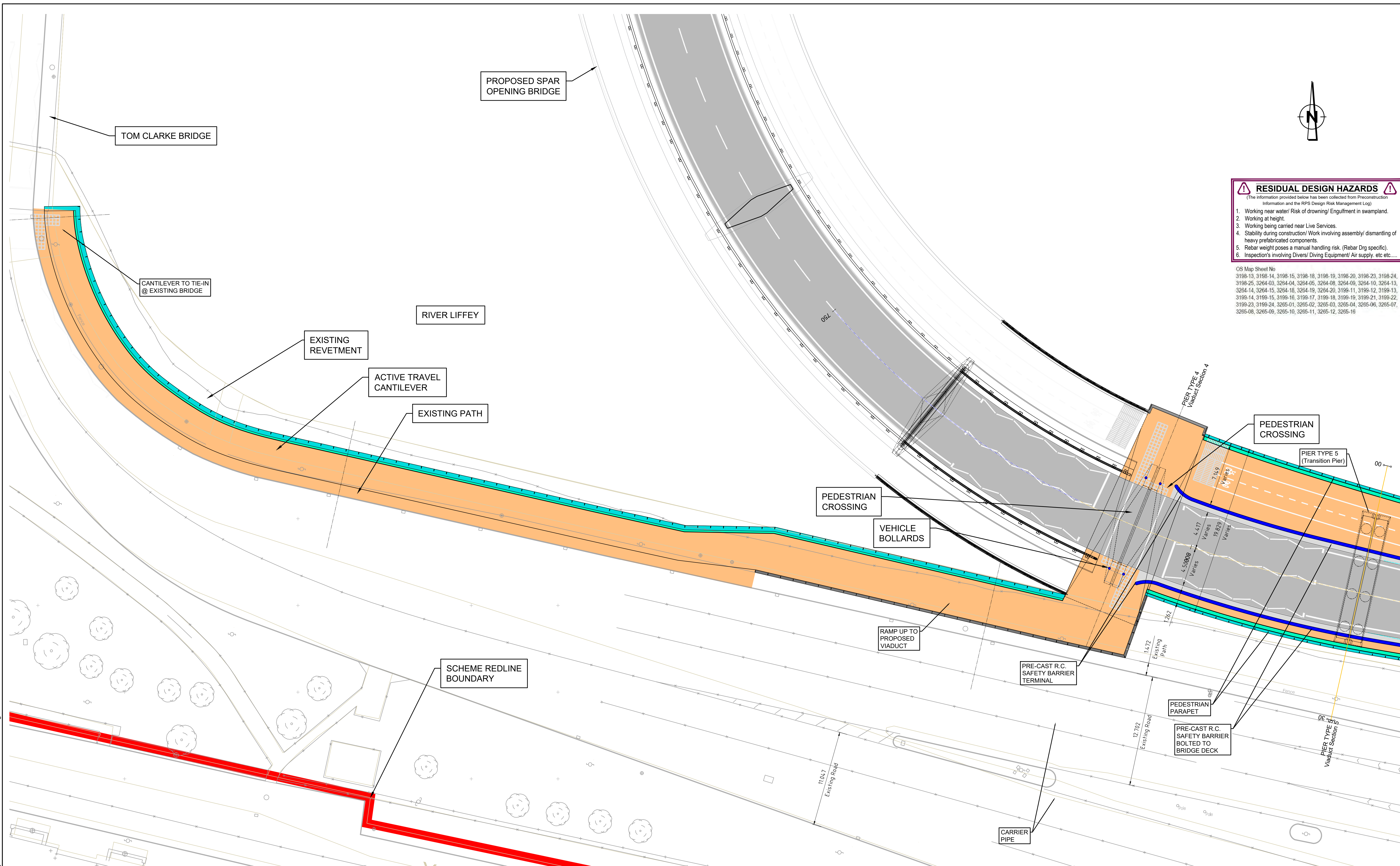
3FMProject
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Title

**SPAR-Proposed Viaduct
 GENERAL ARRANGEMENT**
 (Sheet 1 of 10)

File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0103 - 01	Status	S3	Rev	P02
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- RESIDUAL DESIGN HAZARDS**
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 6. Inspection's involving Divers/ Diving Equipment/ Air supply. etc etc.....

OS Map Sheet No
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PLAN LAYOUT - WESTERN TIE-IN
 (Scale 1 : 200)

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St/Rev	Date	Dim Chk	Amendment / Issue	App
01	May 24	DC	Issue For Approval	MM
02	Oct 23	DC	Issue For Approval	MM

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Model File Identifier
 CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000

Scale
 As shown @ A1
 Half @ A3

Created on
 Oct. 23

Sheets
 02 of 10

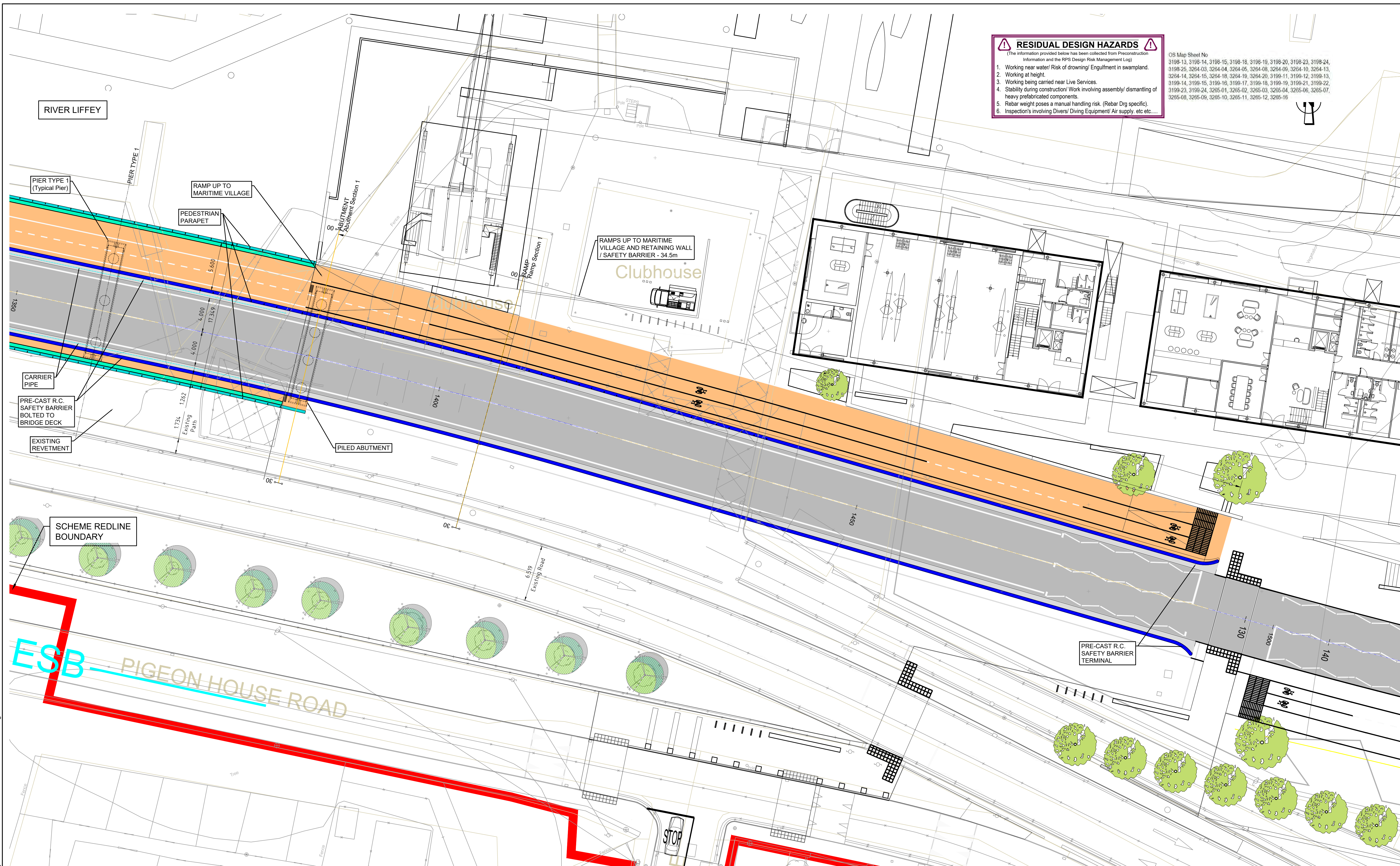
Project
3FMProject Bringing Dublin Port To 2040

Title
**SPAR-Proposed Viaduct
 GENERAL ARRANGEMENT**
 (Sheet 2 of 10)

File Identifier
 CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0103 - 02

Status
 S3

Rev
 P02



- RESIDUAL DESIGN HAZARDS**
 (The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)
- Working near water/ Risk of drowning/ Engulfment in swampland.
 - Working at height.
 - Working being carried near Live Services.
 - Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 - Rebar weight poses a manual handling risk. (Rebar Drg specific).
 - Inspector's involving Divers/ Diving Equipment/ Air supply, etc etc....

OS Map Sheet No
 3198-13, 3198-14, 3198-15, 3198-18, 3198-19, 3198-20, 3198-23, 3198-24, 3198-25, 3264-03, 3264-04, 3264-05, 3264-08, 3264-09, 3264-10, 3264-13, 3264-14, 3264-15, 3264-18, 3264-19, 3264-20, 3199-11, 3199-12, 3199-13, 3199-14, 3199-15, 3199-18, 3199-17, 3199-18, 3199-19, 3199-21, 3199-22, 3199-23, 3199-24, 3265-01, 3265-02, 3265-03, 3265-04, 3265-06, 3265-07, 3265-08, 3265-09, 3265-10, 3265-11, 3265-12, 3265-16

PLAN LAYOUT - EASTERN TIE-IN
 (Scale 1 : 200)

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Stipule	Rev	Date	Dim Cmk	Amendment / Issue	App
\$	02	May 24	DC	Issue For Approval	MM
\$	01	Oct 23	DC	Issue For Approval	MM

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Model File Identifier
 CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000

Scale
 As shown @ A1
 Half @ A3

Created on
 Oct. 23

Sheets
 03 of 10

Project
3FMProject Bringing Dublin Port To 2040

Title
**SPAR-Proposed Viaduct
 GENERAL ARRANGEMENT**
 (Sheet 3 of 7)

File Identifier
 CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0103 - 03

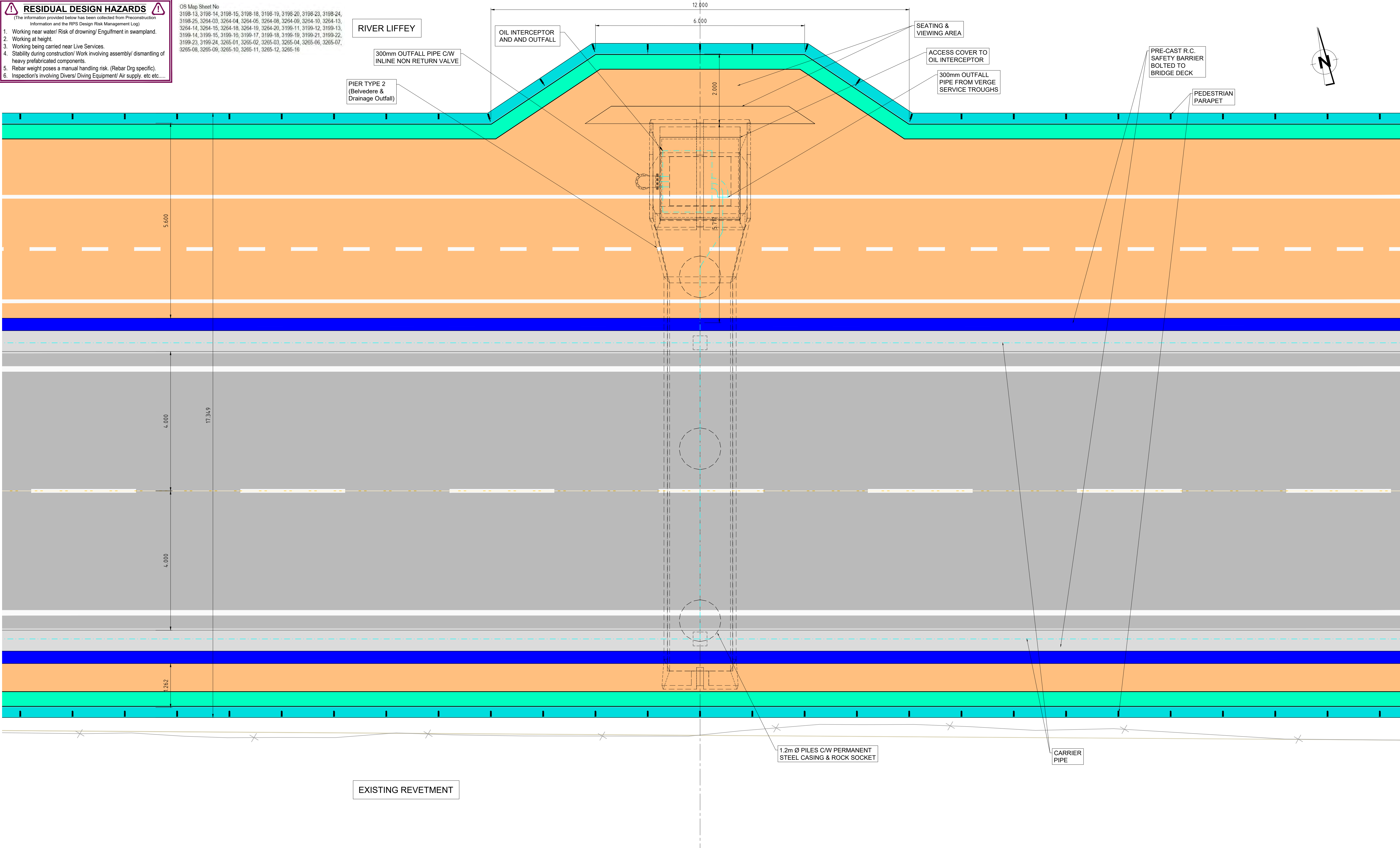
Status
 S3

Rev
 P02

RESIDUAL DESIGN HAZARDS
 (The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)

1. Working near water/ Risk of drowning/ Engulfment in swampland.
2. Working at height.
3. Working being carried near Live Services.
4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
6. Inspection's involving Divers/ Diving Equipment/ Air supply, etc.....

OS Map Sheet No
 3198-13, 3198-14, 3198-15, 3198-16, 3198-17, 3198-18, 3198-19, 3198-20, 3198-21, 3198-22, 3198-23, 3198-24, 3198-25, 3264-03, 3264-04, 3264-05, 3264-06, 3264-07, 3264-08, 3264-09, 3264-10, 3264-11, 3264-12, 3264-13, 3264-14, 3264-15, 3264-16, 3264-17, 3264-18, 3264-19, 3264-20, 3199-11, 3199-12, 3199-13, 3199-14, 3199-15, 3199-16, 3199-17, 3199-18, 3199-19, 3199-20, 3199-21, 3199-22, 3199-23, 3199-24, 3265-01, 3265-02, 3265-03, 3265-04, 3265-05, 3265-06, 3265-07, 3265-08, 3265-09, 3265-10, 3265-11, 3265-12, 3265-16



EXISTING REVETMENT

PLAN LAYOUT - BELVEDERE & DRAINAGE OUTFALL
 (Scale 1 : 50)

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\$3	01	May24	DC	MM	Issue For Approval
\$3	02	Oct.'23	DC	MM	Issue For Approval

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Model File Identifier
 CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000

Scale
 As shown @ A1
 Half @ A3

Created on
 Oct.'23

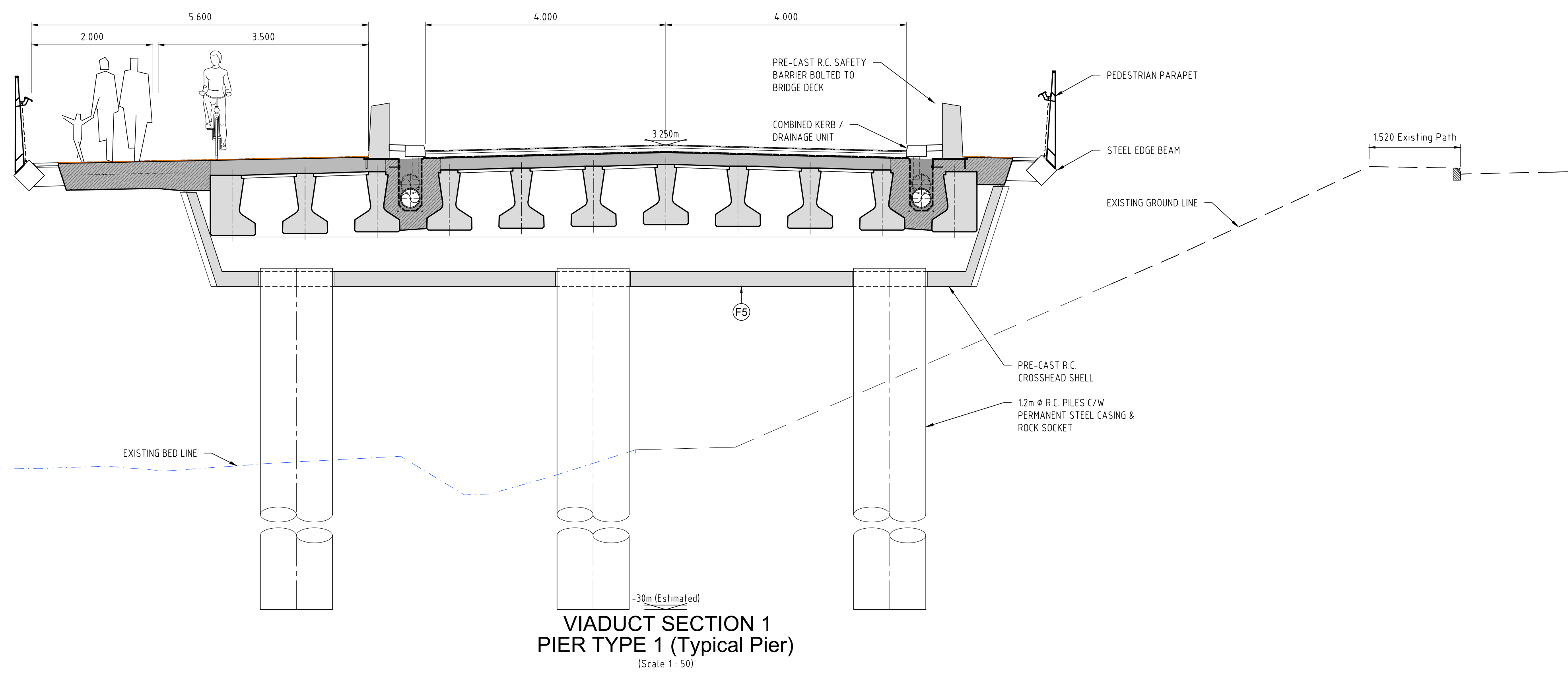
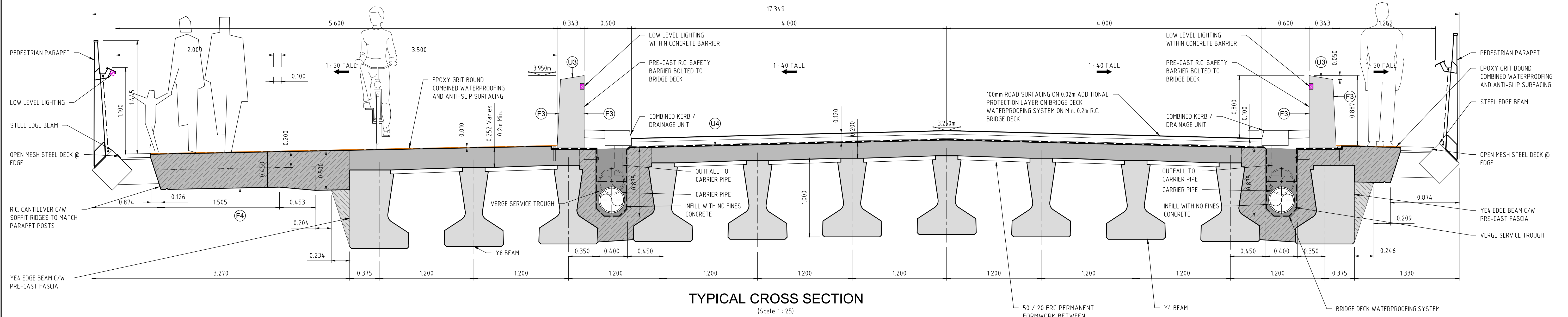
Sheets
 04 of 10

Project
3FMProject
 Bringing Dublin Port To 2040

Title
 SPAR-Proposed Viaduct
 GENERAL ARRANGEMENT
 (Sheet 4 of 7)

Status
 S3

Rev
 P02



- H.A.T. +4.50m C.D. [+1.99m O.D.]
- M.H.W.S. +4.10m C.D. [+1.59m O.D.]
- M.H.W.N. +3.40m C.D. [-0.89m O.D.]
- M.S.L. +2.40m C.D. [-0.11m O.D.]
- M.L.W.N. +1.50m C.D. [-1.01m O.D.]
- M.L.W.S. +0.70m C.D. [-1.81m O.D.]
- L.A.T. -0.1m C.D. [-2.61m O.D.]

RESIDUAL DESIGN HAZARDS
 (The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)

1. Working near water/ Risk of drowning/ Engulfment in swampland.
2. Working at height.
3. Working being carried near Live Services.
4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
6. Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

Client

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Stability	Rev	Date	Dim Chk	App	Amendment / Issue
Sp	01	May 24	DC		Issue For Approval
Sp	02	Oct 23	DC		Issue For Approval

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Model File Identifier
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Scale	As shown @ A1 Half @ A3
Created on	Oct. 23
Sheets	05 of 10

Project

3FMProject Bringing Dublin Fort To Life

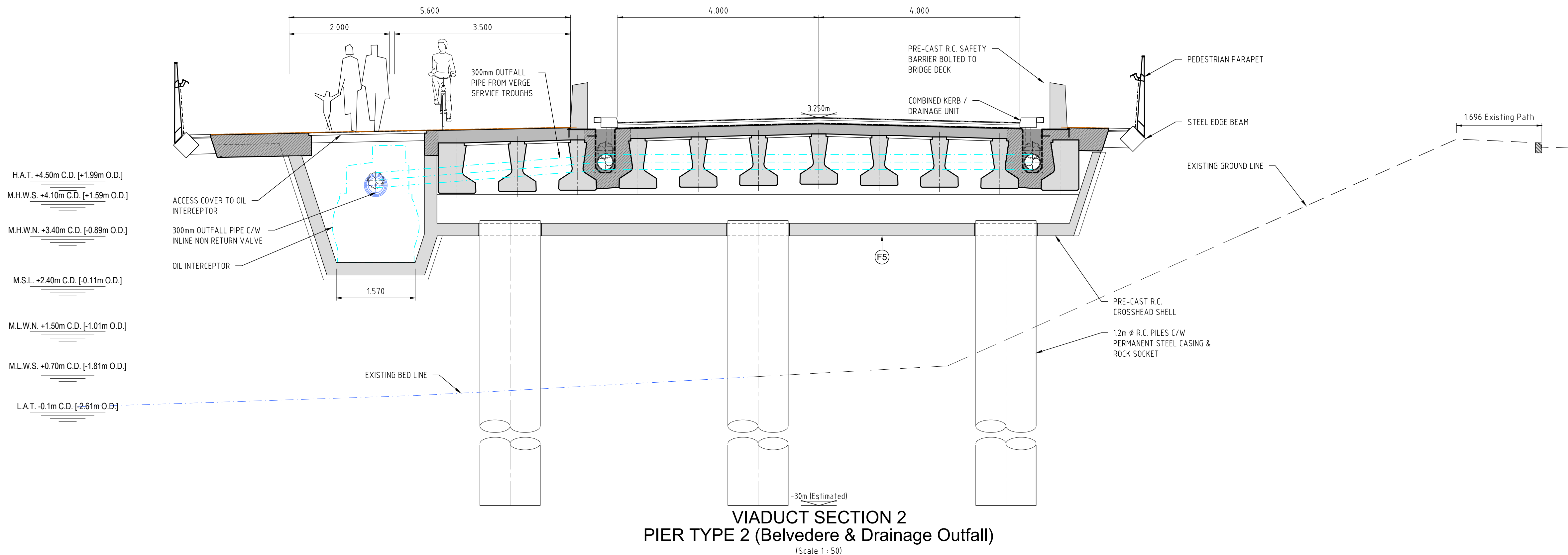
Title
SPAR-Proposed Viaduct General Arrangement
 (Sheet 5 of 10)

File Identifier
 CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0103 - 05

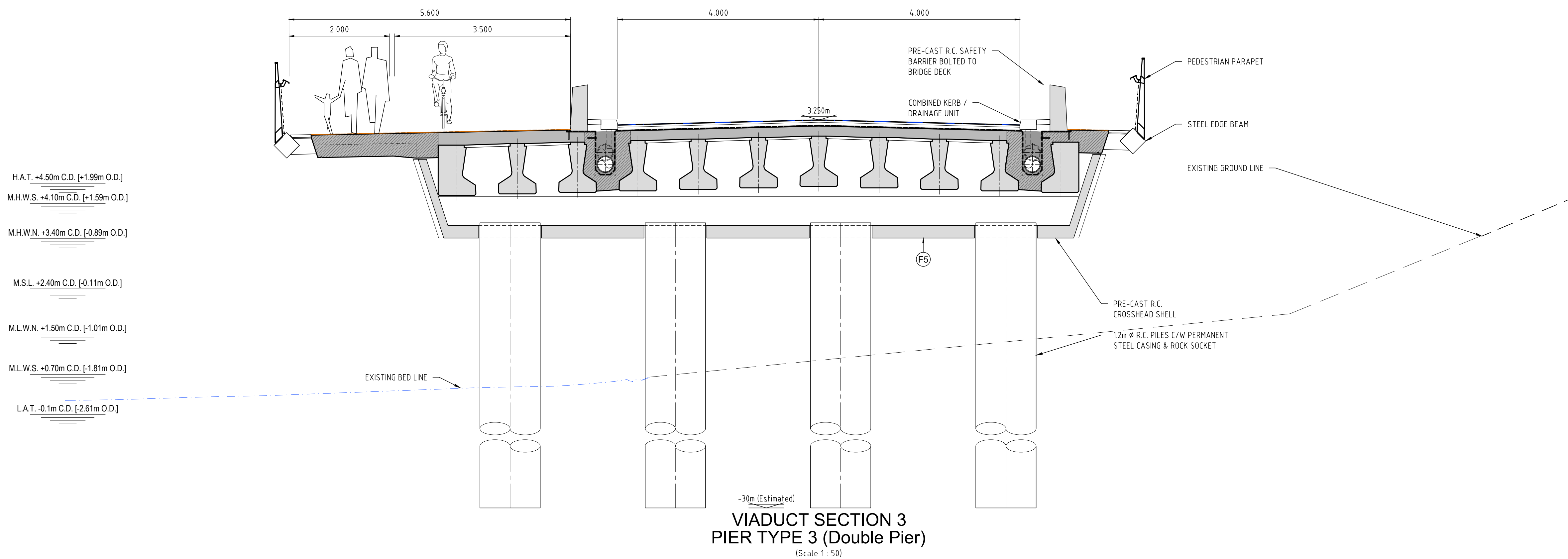
Status
S3

Rev
P02

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VIADUCT SECTION 2
PIER TYPE 2 (Belvedere & Drainage Outfall)
(Scale 1: 50)



VIADUCT SECTION 3
PIER TYPE 3 (Double Pier)
(Scale 1: 50)

RESIDUAL DESIGN HAZARDS	
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)	
1.	Working near water/ Risk of drowning/ Engulfment in swampland.
2.	Working at height.
3.	Working being carried near Live Services.
4.	Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
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6.	Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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St/Rev	Date	Dim Chk	App	Amendment / Issue
S3	May 24	DC	DC	Issue For Approval
S2	Oct 23	DC	DC	Issue For Approval

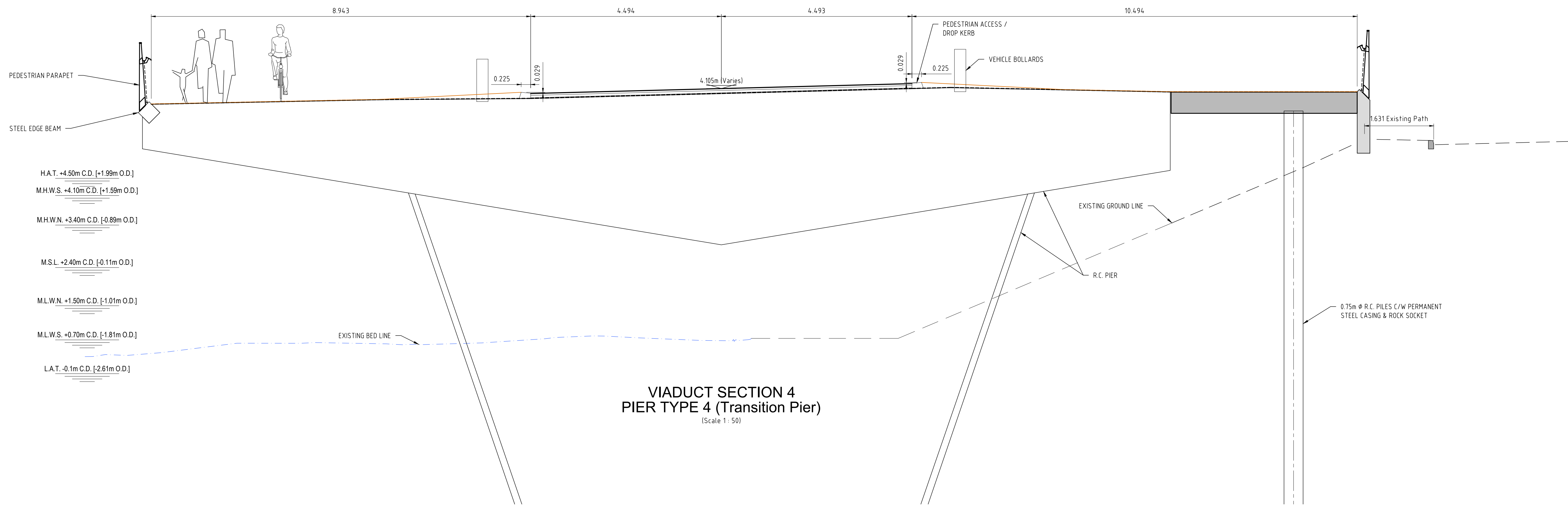
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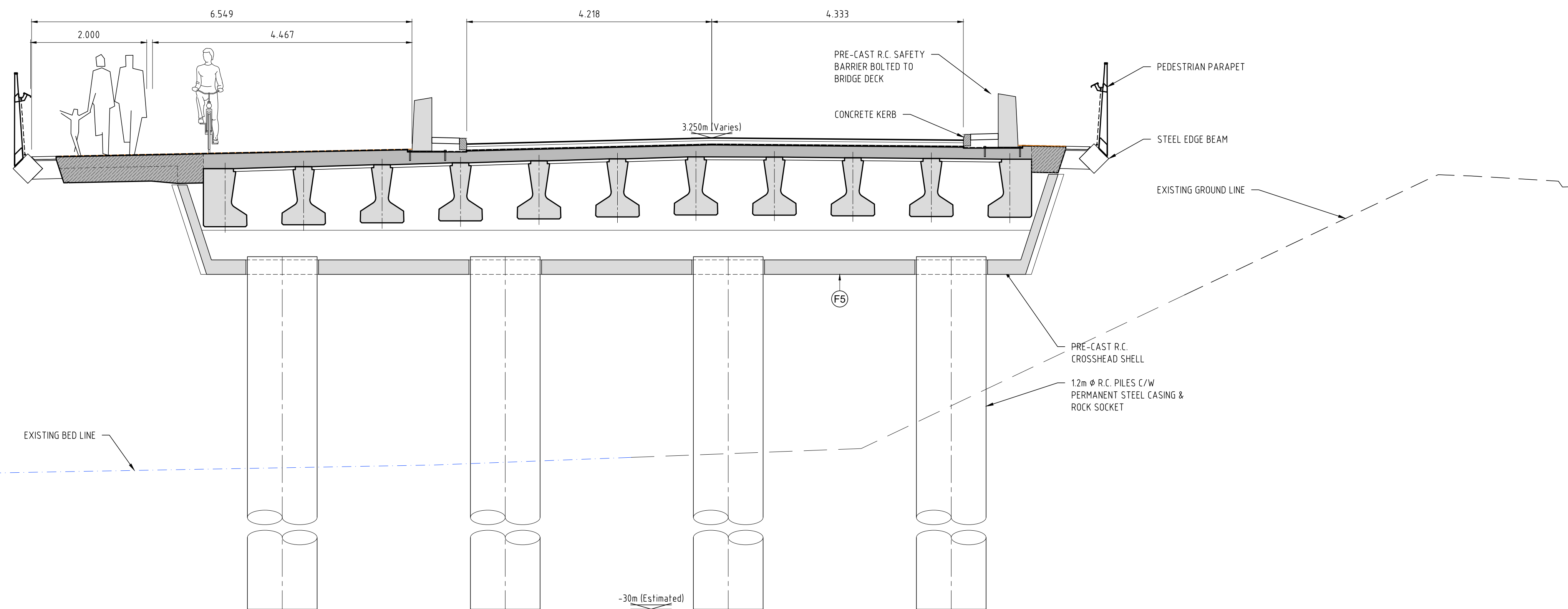
Model File Identifier
CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000

Scale	As shown @ A1 Half @ A3
Created on	Oct. 23
Sheets	06 of 10

Client	COMHLACHT CHALAFORT ÁTHA CLIATH DUBLIN PORT COMPANY
Project	3FMProject Dublin Port 70 0040
Title	SPAR-Proposed Viaduct General Arrangement (Sheet 6 of 10)
File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0103 - 06
Status	S3
Rev	P02



**VIADUCT SECTION 4
PIER TYPE 4 (Transition Pier)**
(Scale 1: 50)



**VIADUCT SECTION 5
PIER TYPE 5 (Transition Pier)**
(Scale 1: 50)

RESIDUAL DESIGN HAZARDS	
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)	
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2.	Working at height.
3.	Working being carried near Live Services.
4.	Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5.	Rebar weight poses a manual handling risk. (Rebar Drg specific).
6.	Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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Client

**COMHLACHT CHALAFORT
ÁTHA CLIATH
DUBLIN PORT COMPANY**

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St/Rev	Date	Dim Chk	Amendment / Issue	App
S3	Oct '23	DC	Issue For Approval	MM

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Scale	As shown @ A1 Half @ A3
Created on	Oct. '23
Sheets	07 of 10

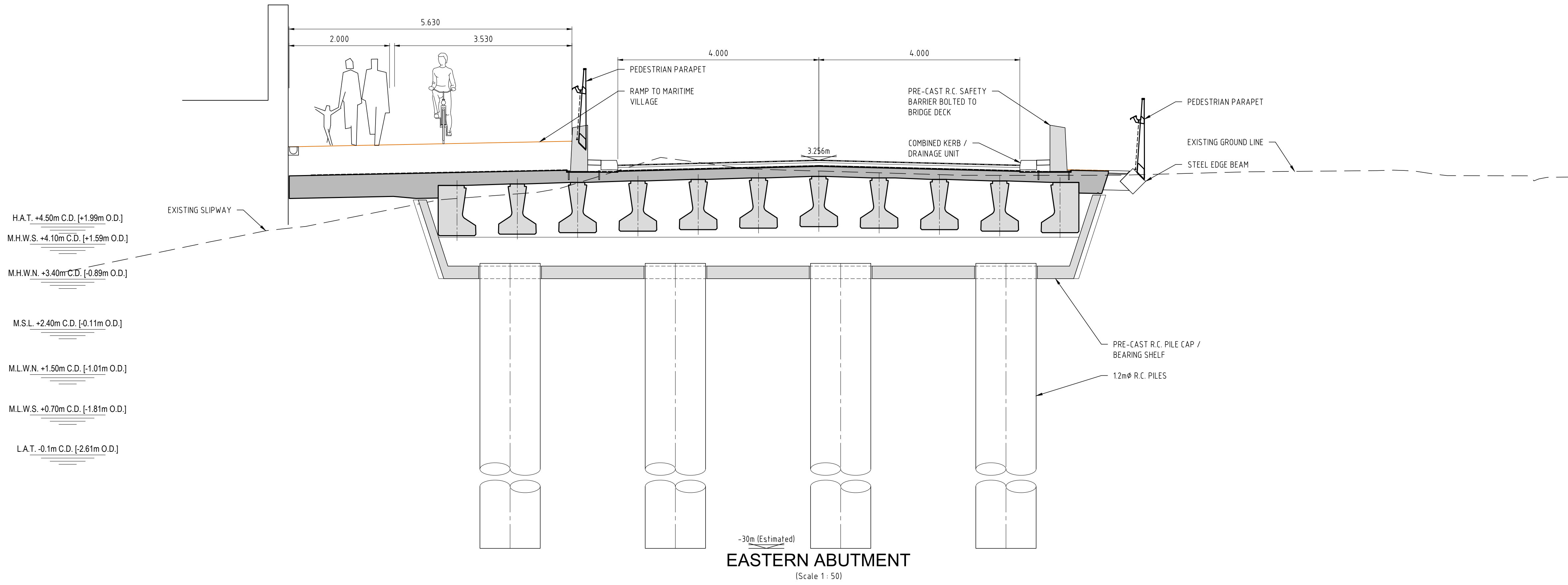
Project

3FMProject
Bringing
Dublin Port
To 2040

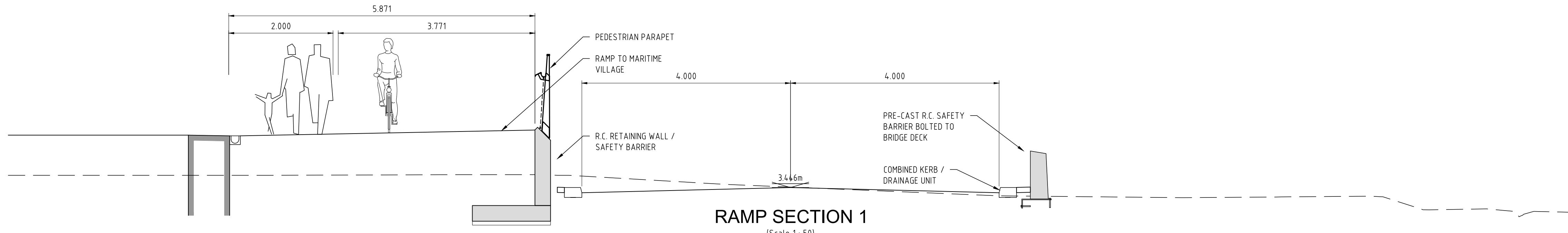
Title

**SPAR-Proposed Viaduct
General Arrangement**
(Sheet 7 of 10)

File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0103 - 07	Status	S3
Model File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000	Rev	P02



EASTERN ABUTMENT
(Scale 1: 50)



RAMP SECTION 1
(Scale 1: 50)

RESIDUAL DESIGN HAZARDS
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)

- Working near water/ Risk of drowning/ Engulfment in swampland.
- Working at height.
- Working being carried near Live Services.
- Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
- Rebar weight poses a manual handling risk. (Rebar Drg specific).
- Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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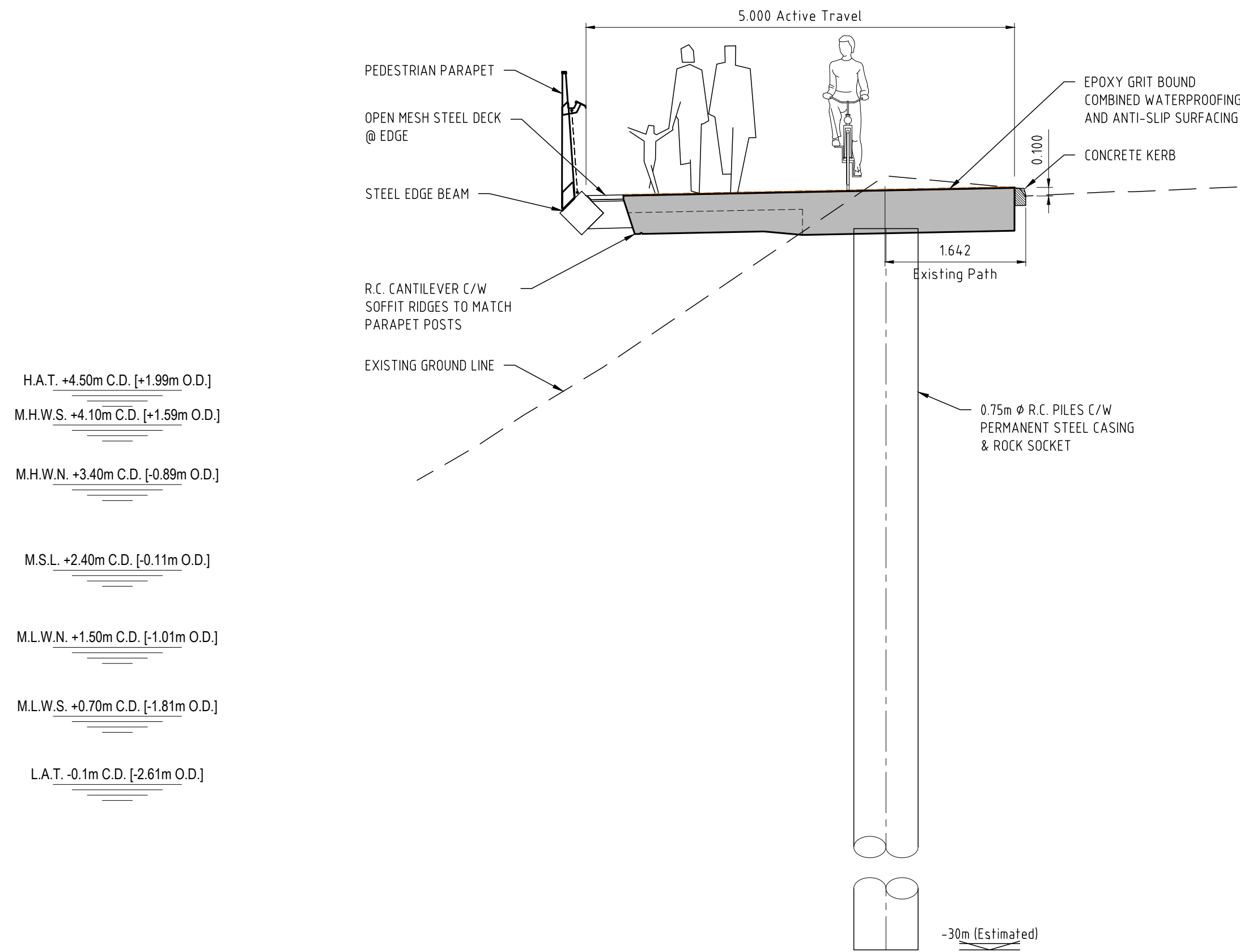
(v) All Levels refer to Ordnance Survey Datum, Malin Head.

Stab/Rev	Date	Dim Chk	Amendment / Issue	App
\$5	May'24	DC	Issue For Approval	MM
\$5	Oct.'23	DC	Issue For Approval	MM

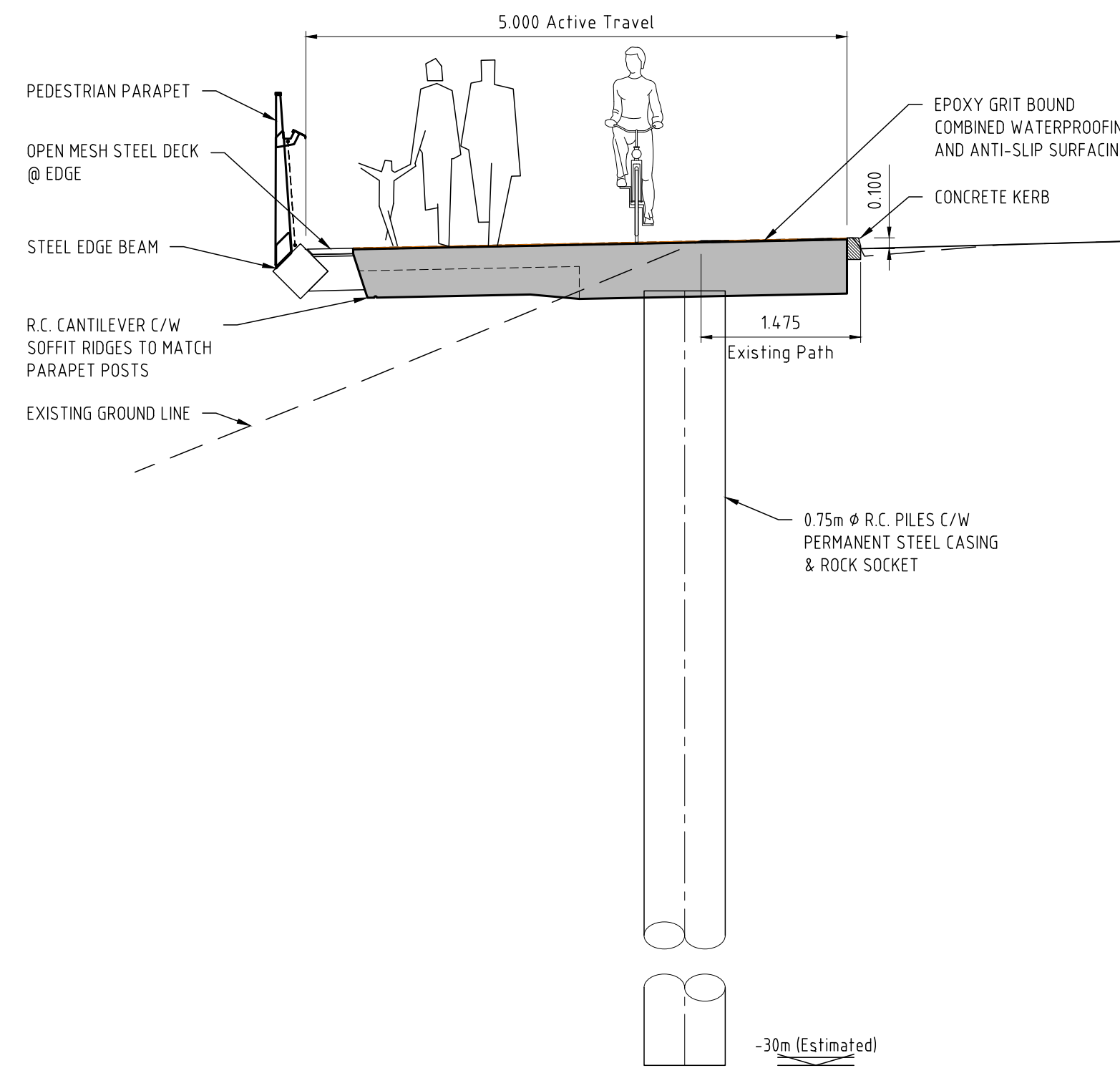
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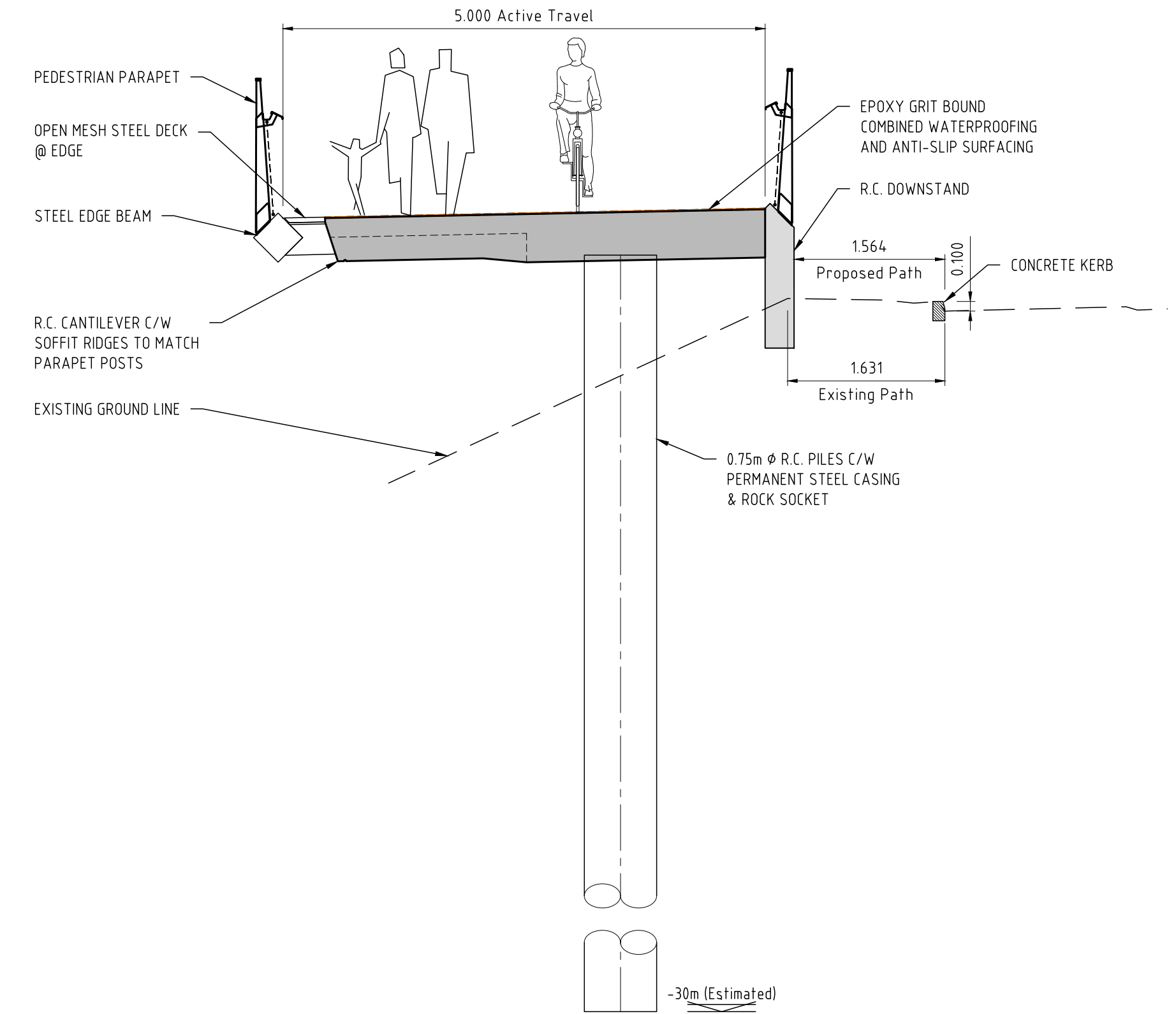
Scale	As shown @ A1 Half @ A3	Project	3FMProject Bringing Dublin Port To 2040
Created on	Oct.'23	Title	SPAR-Proposed Viaduct General Arrangement (Sheet 8 of 10)
Sheets	08 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0103 - 08
Model File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000	Status	S3
Rev	P02	Rev	P02



CANTILEVER SECTION 1
(Scale 1:50)



CANTILEVER SECTION 2
(Scale 1:50)



CANTILEVER SECTION 3
(Scale 1:50)

- H.A.T. +4.50m C.D. [+1.99m O.D.]
- M.H.W.S. +4.10m C.D. [+1.59m O.D.]
- M.H.W.N. +3.40m C.D. [+0.89m O.D.]
- M.S.L. +2.40m C.D. [-0.11m O.D.]
- M.L.W.N. +1.50m C.D. [-1.01m O.D.]
- M.L.W.S. +0.70m C.D. [-1.81m O.D.]
- L.A.T. -0.1m C.D. [-2.61m O.D.]

RESIDUAL DESIGN HAZARDS
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)

1. Working near water/ Risk of drowning/ Engulfment in swampland.
2. Working at height.
3. Working being carried near Live Services.
4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
6. Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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Stab/Rev	Date	Dim Ck	App	Model File Identifier
SS	May 24	DC	MM	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR0000
SS	Oct '23	DC	MM	

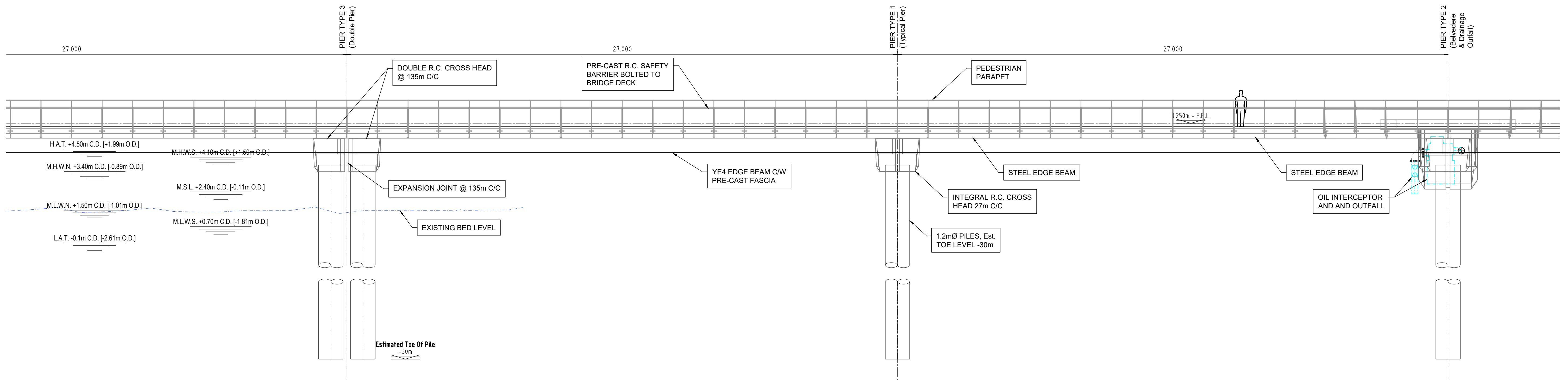
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Scale: As shown @ A1 Half @ A3
Created on: Oct. '23
Sheets: 09 of 10

Project: **3FMProject** (Bringing Dublin Port To 2040)
Title: **SPAR-Proposed Viaduct General Arrangement** (Sheet 9 of 10)

Status: S3
Rev: P02



TYPICAL SPAN ELEVATION
(Scale 1 : 100)

RESIDUAL DESIGN HAZARDS
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)

- Working near water/ Risk of drowning/ Engulfment in swampland.
- Working at height.
- Working being carried near Live Services.
- Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
- Rebar weight poses a manual handling risk. (Rebar Drg specific).
- Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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S3	May 24	Do	Issue For Approval	MM
S3	Oct '23	Do	Issue For Approval	MM

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Model File Identifier
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Scale
As shown @ A1
Half @ A3

Created on
Oct. '23

Sheets
10 of 10

Project
3FMProject Bringing Dublin Port To 2040

Title
SPAR-Proposed Viaduct General Arrangement
(Sheet 10 of 10)

Status
S3

Rev
P02

Appendix C

Construction sequence drawings

- RESIDUAL DESIGN HAZARDS**
 (The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)
1. Working near water/ Risk of drowning/ Engulfment in swampland.
 2. Working at height.
 3. Working being carried near Live Services.
 4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
 6. Inspection's involving Divers/ Diving Equipment/ Air supply. etc etc.....



STAGE 1 - ESTABLISH STAGING AREA AND COMPOUNDS

(Scale 1 : 1,000)



General Notes

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Model File Identifier

Scale: As shown @ A1 Half @ A3
 Created on: Oct. 23
 Sheets: 01 of 10

Client: **COMHLACHT CHALAFORT ÁTHA CLIATH DUBLIN PORT COMPANY**

Project: **3FMProject** (Bringing Dublin Port To 2040)

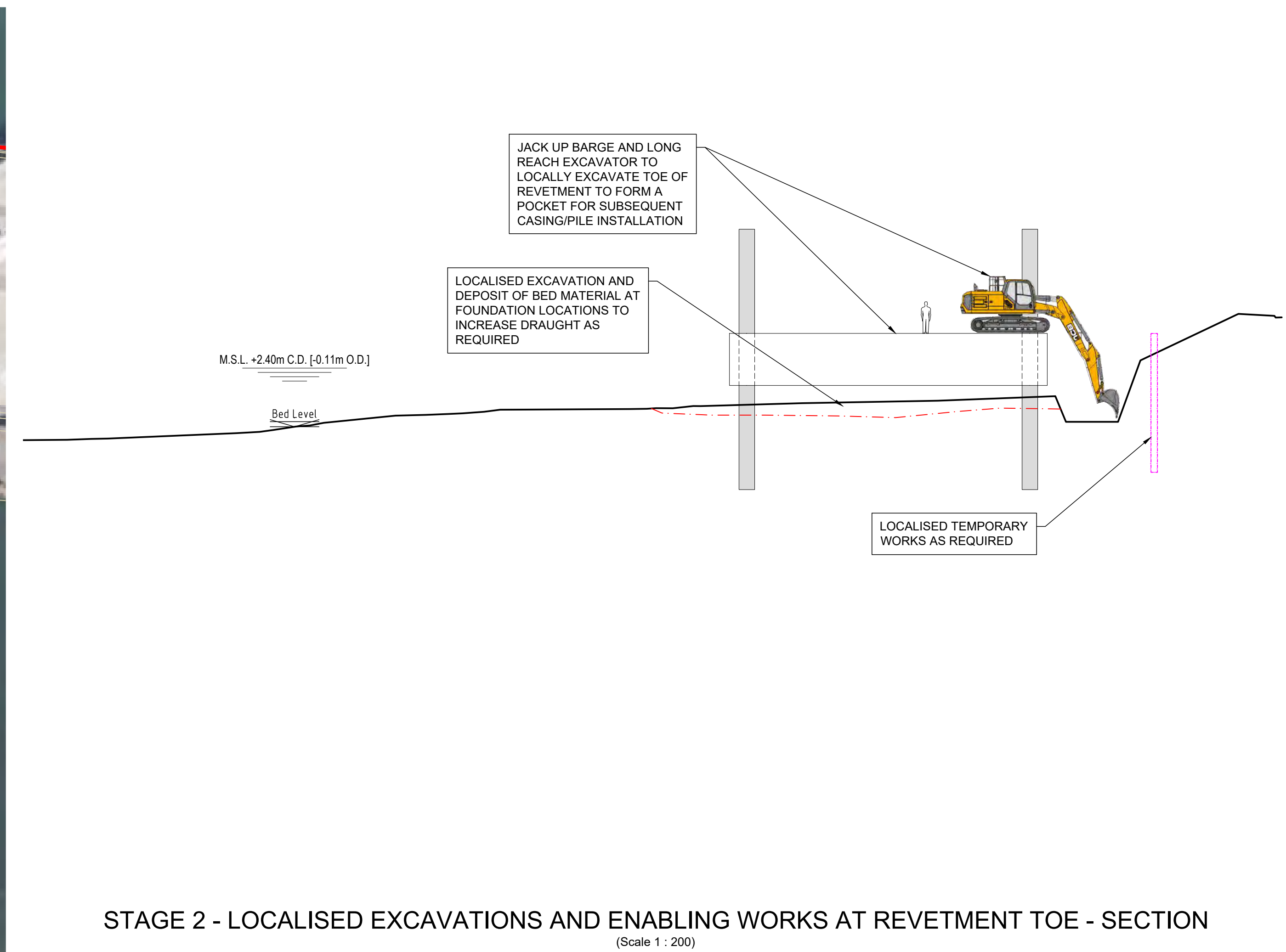
Title: **SPAR-Proposed Viaduct Construction Sequence - Stage 1** (Sheet 1 of 10)

File Identifier: CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 01

Status: **S3**

Rev: **P02**

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STAGE 2 - LOCALISED EXCAVATIONS AND ENABLING WORKS AT REVETMENT TOE - SECTION
(Scale 1 : 200)

RESIDUAL DESIGN HAZARDS	
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)	
1.	Working near water/ Risk of drowning/ Engulfment in swampland.
2.	Working at height.
3.	Working being carried near Live Services.
4.	Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5.	Rebar weight poses a manual handling risk. (Rebar Drg specific).
6.	Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

STAGE 2 - LOCALISED EXCAVATIONS AND ENABLING WORKS AT REVETMENT TOE - PLAN
(Scale 1 : 1,000)

Client

**COMHLACHT CHALAFORT
ÁTHA CLIATH
DUBLIN PORT COMPANY**

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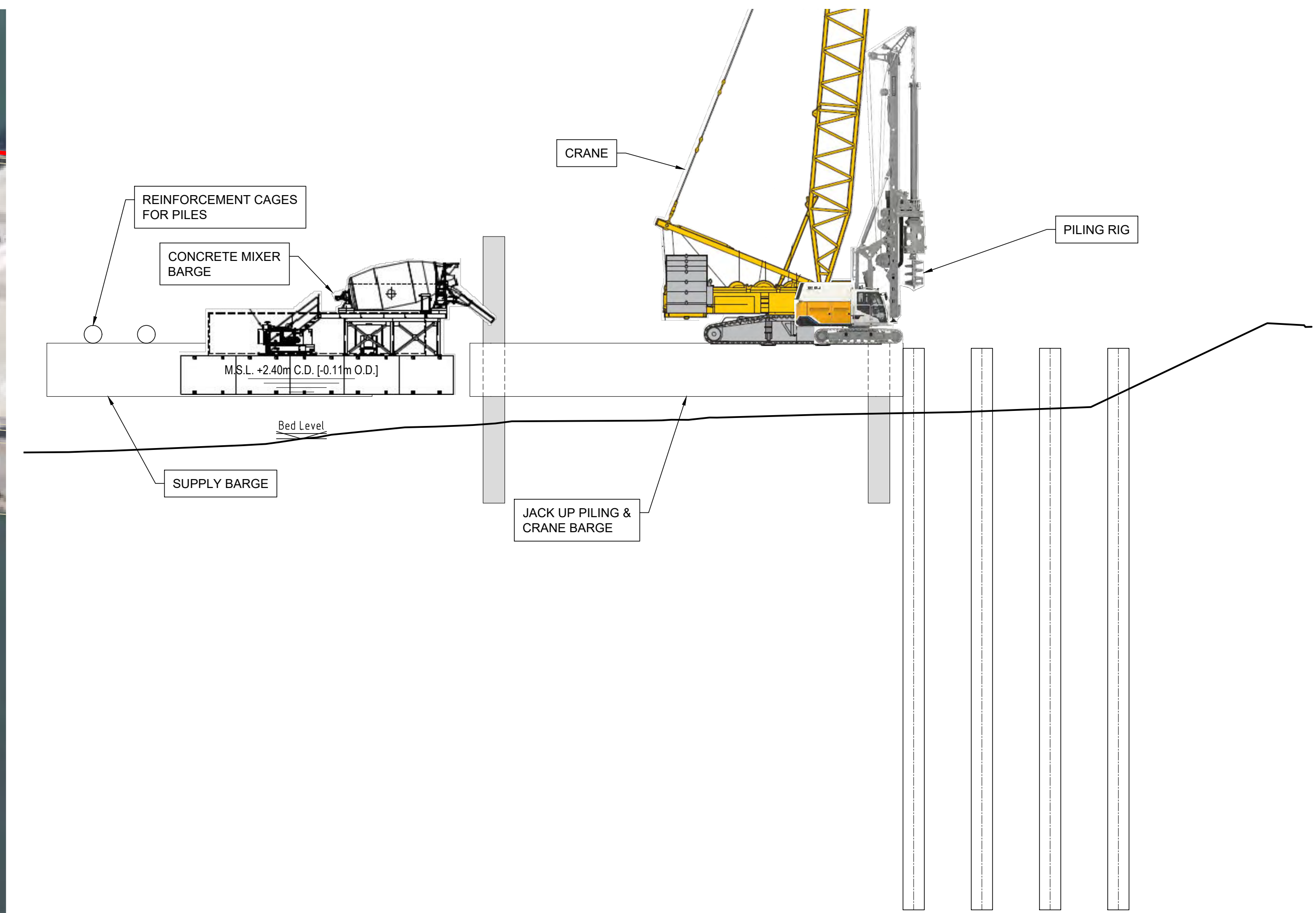
Stability	Rev	Date	Dim Ck	App	Model File Identifier
\$3	Py2	May24	Dc	Yo	Issue For Approval
\$3	Py1	Oct.23	Dc	Yo	Issue For Approval

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Created on	Oct.23	Title	SPAR-Proposed Viaduct Construction Sequence - Stage 2 (Sheet 2 of 10)
Sheets	02 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 02
Status	S3	Rev	P02

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STAGE 3 - PERMANENT PILING - SECTION
(Scale 1 : 200)



STAGE 3 - PERMANENT PILING - PLAN
(Scale 1 : 1,000)

RESIDUAL DESIGN HAZARDS	
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)	
1.	Working near water/ Risk of drowning/ Engulfment in swampland.
2.	Working at height.
3.	Working being carried near Live Services.
4.	Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5.	Rebar weight poses a manual handling risk. (Rebar Drg specific).
6.	Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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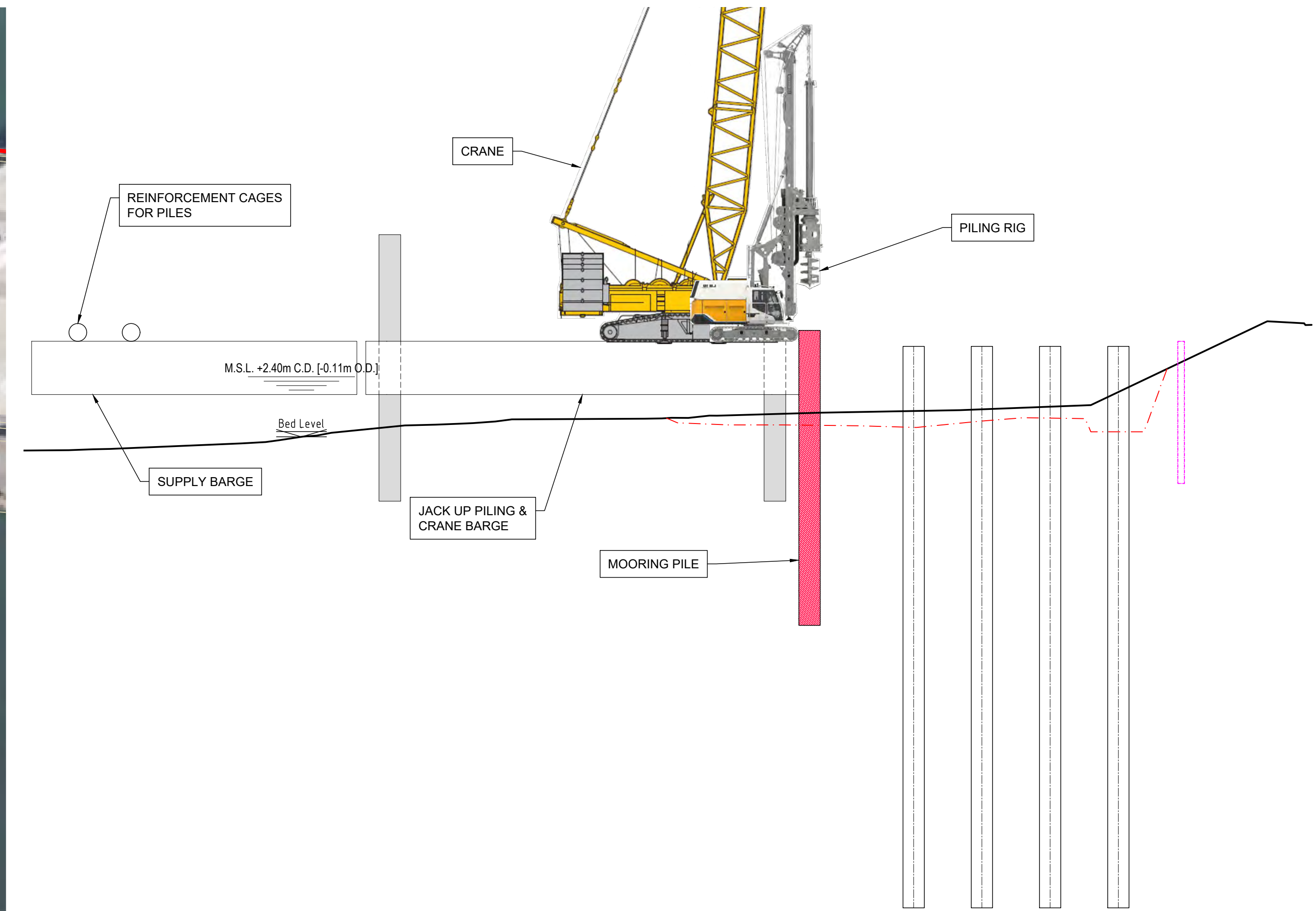
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Created on	Oct.23	Title	SPAR-Proposed Viaduct Construction Sequence - Stage 3 (Sheet 3 of 10)
Sheets	03 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 03
Status	S3	Rev	P02



STAGE 4 - MOORING PILING - PLAN
(Scale 1 : 1,000)



STAGE 4 - MOORING PILING - SECTION
(Scale 1 : 200)

- RESIDUAL DESIGN HAZARDS**
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1. Working near water/ Risk of drowning/ Engulfment in swampland.
 2. Working at height.
 3. Working being carried near Live Services.
 4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
 6. Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc....

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Client

**COMHLACHT CHALAFORT
ÁTHA CLIATH
DUBLIN PORT COMPANY**

General Notes

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

St/Rev	Date	Dim Chk	Amendment / Issue	App
\$3	May24	DC	Issue For Approval	MM
\$2	Oct.23	DC	Issue For Approval	MM

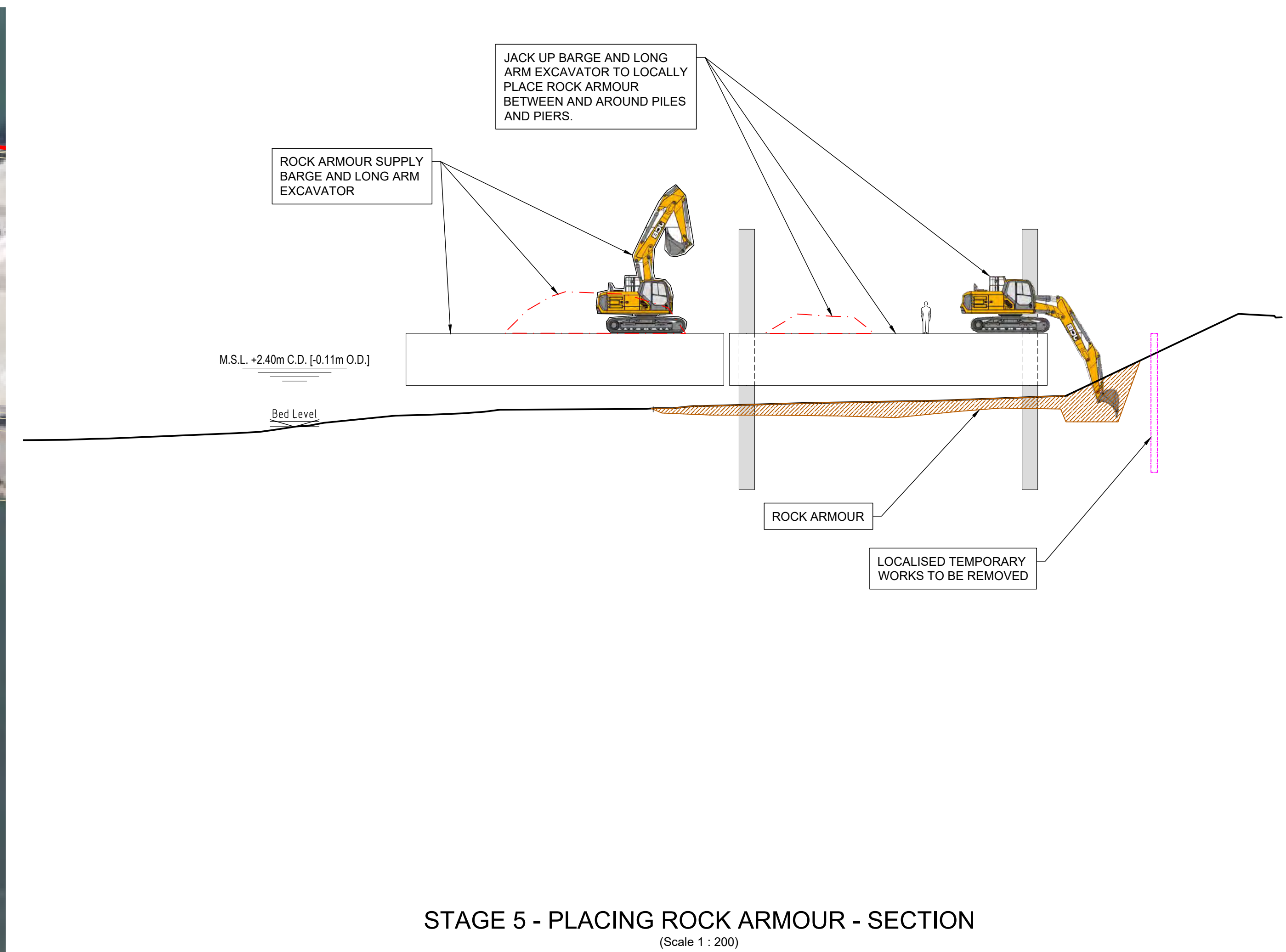
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Created on	Oct.23	Title	SPAR-Proposed Viaduct Construction Sequence - Stage 4 (Sheet 4 of 10)
Sheets	04 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 04
Status	S3	Rev	P02



STAGE 5 - PLACING ROCK ARMOUR - PLAN
(Scale 1 : 1,000)



STAGE 5 - PLACING ROCK ARMOUR - SECTION
(Scale 1 : 200)

- RESIDUAL DESIGN HAZARDS**
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)
1. Working near water/ Risk of drowning/ Engulfment in swampland.
 2. Working at height.
 3. Working being carried near Live Services.
 4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
 6. Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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Client

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Stab/Rev	Date	Dim Cnk	Amendment / Issue	App
\$3	May24	DC	Issue For Approval	MM
\$3	Oct.23	DC	Issue For Approval	MM

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Model File Identifier

Scale: As shown @ A1 Half @ A3

Created on: Oct.23

Sheets: 05 of 10

Project: **3FMProject** Bringing Dublin Port To 2040

Title: SPAR-Proposed Viaduct Construction Sequence - Stage 5 (Sheet 5 of 10)

File Identifier: CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 05

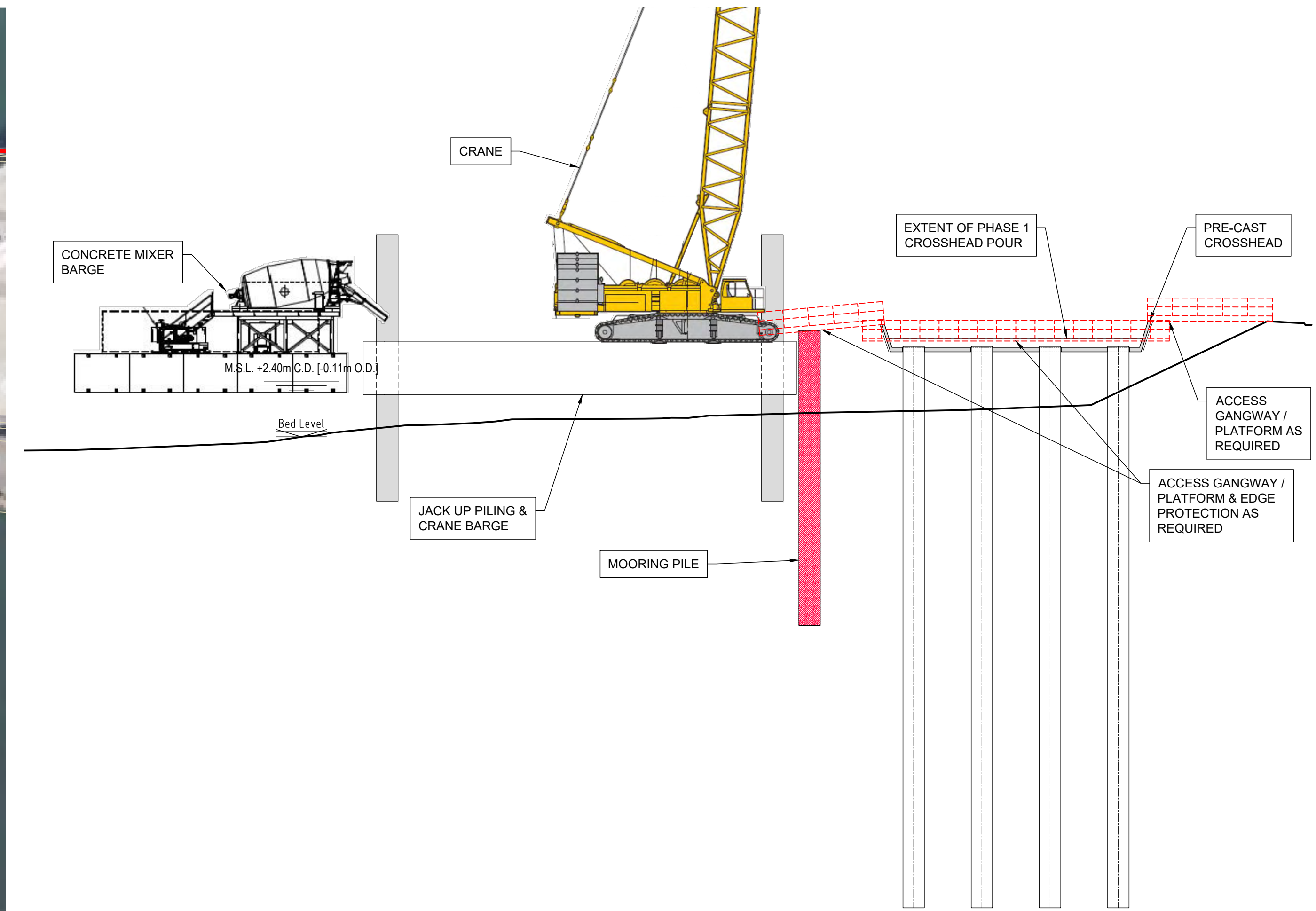
Status: S3

Rev: P02



STAGE 6 - PRE-CAST CROSSHEAD INSTALLATION AND IN-SITU POUR - PLAN

(Scale 1 : 1,000)



STAGE 6 - PRE-CAST CROSSHEAD INSTALLATION AND IN-SITU POUR - SECTION

(Scale 1 : 200)

RESIDUAL DESIGN HAZARDS	
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)	
1.	Working near water/ Risk of drowning/ Engulfment in swampland.
2.	Working at height.
3.	Working being carried near Live Services.
4.	Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5.	Rebar weight poses a manual handling risk. (Rebar Drg specific).
6.	Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....



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 (v) All Levels refer to Ordnance Survey Datum, Malin Head.

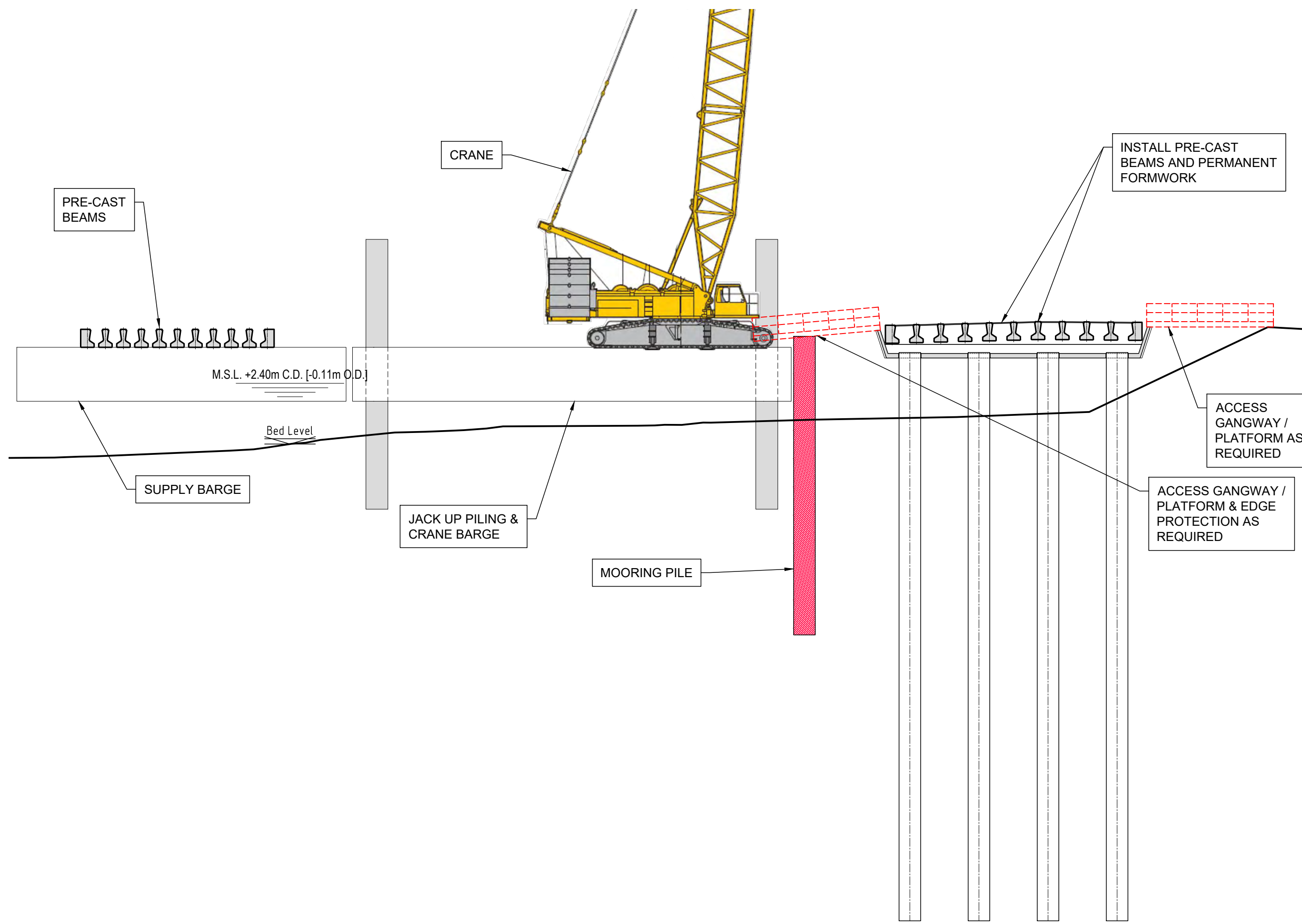
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\$3	May 24	DC	Issue For Approval	MM
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Scale	As shown @ A1 Half @ A3
Created on	Oct. 23
Sheets	06 of 10

Client	COMHLACHT CHALAFORT ÁTHA CLIATH DUBLIN PORT COMPANY	Project	3FMProject
Title	SPAR-Proposed Viaduct Construction Sequence - Stage 6 (Sheet 6 of 10)	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 06
Status	S3	Rev	P02

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STAGE 7 - INSTALLATION OF PRE-CAST BEAMS AND PERMANENT FORMWORK - SECTION
(Scale 1 : 200)

- RESIDUAL DESIGN HAZARDS**
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)
- Working near water/ Risk of drowning/ Engulfment in swampland.
 - Working at height.
 - Working being carried near Live Services.
 - Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 - Rebar weight poses a manual handling risk. (Rebar Drg specific).
 - Inspector's involving Divers/ Diving Equipment/ Air supply, etc etc.....

STAGE 7 - INSTALLATION OF PRE-CAST BEAMS AND PERMANENT FORMWORK - PLAN
(Scale 1 : 1,000)

Client

**COMHLACHT CHALAFORT
ÁTHA CLIATH
DUBLIN PORT COMPANY**

General Notes

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

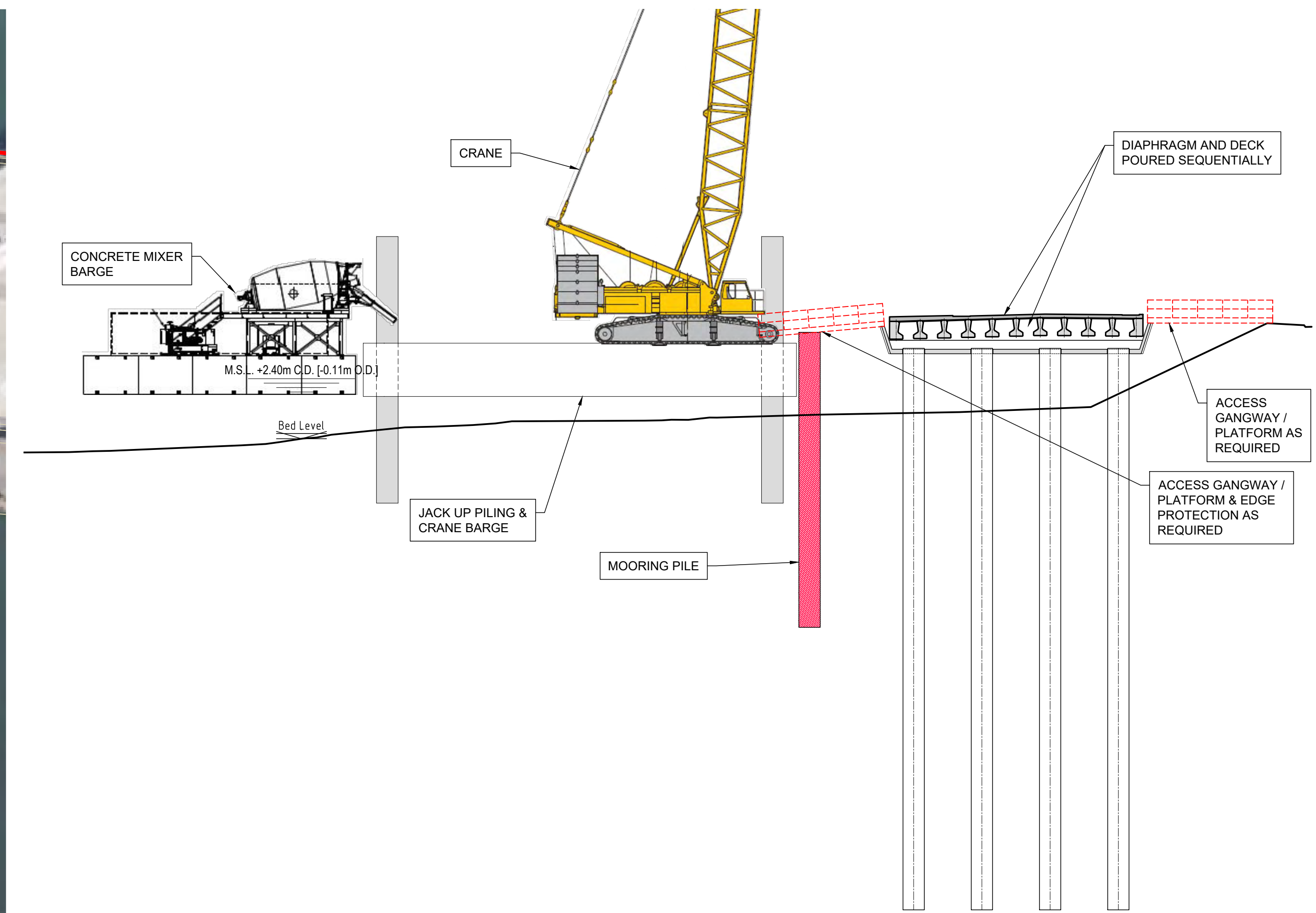
Stable Rev	Date	Dim Chk	Amendment / Issue	App
\$3	May 24	DC	Issue For Approval	MM
\$3	Oct 23	DC	Issue For Approval	MM

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Scale	As shown @ A1 Half @ A3	Project	3FMProject Bringing Dublin Port To 2040
Created on	Oct. 23	Title	SPAR-Proposed Viaduct Construction Sequence - Stage 7 (Sheet 7 of 10)
Sheets	07 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 07
Status	S3	Rev	P02

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STAGE 8 - DIAPHRAGM SECOND POUR AND DECK POUR - SECTION
(Scale 1 : 200)

- RESIDUAL DESIGN HAZARDS**
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)
1. Working near water/ Risk of drowning/ Engulfment in swampland.
 2. Working at height.
 3. Working being carried near Live Services.
 4. Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 5. Rebar weight poses a manual handling risk. (Rebar Drg specific).
 6. Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

STAGE 8 - DIAPHRAGM SECOND POUR AND DECK POUR - PLAN
(Scale 1 : 1,000)

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Client

General Notes

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

Stable	Rev	Date	Dim Ck	Amendment / Issue	App
\$3	Pop	May24	DC	Issue For Approval	MM
\$3	Py	Oct.23	DC	Issue For Approval	MM

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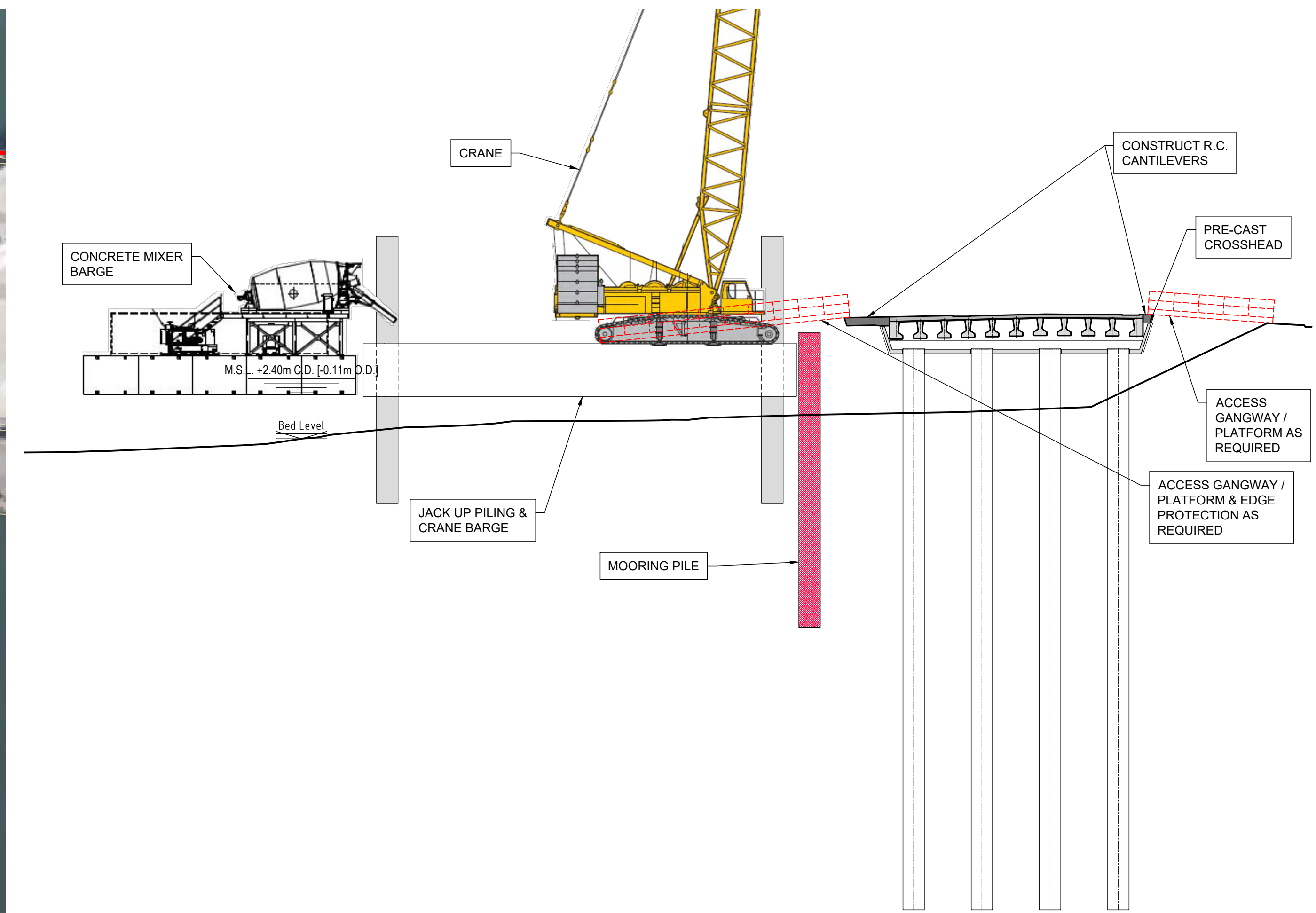
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Created on: Oct.23
Sheets: 08 of 10

Project: **3FMProject**
Title: **SPAR-Proposed Viaduct Construction Sequence - Stage 8**
(Sheet 8 of 9)

File Identifier: CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 08
Status: S3
Rev: P02



STAGE 9 - CONSTRUCT R.C. CANTILEVERS - PLAN
(Scale 1 : 1,000)



STAGE 9 - CONSTRUCT R.C. CANTILEVERS - SECTION
(Scale 1 : 200)

- RESIDUAL DESIGN HAZARDS**
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)
- Working near water/ Risk of drowning/ Engulfment in swampland.
 - Working at height.
 - Working being carried near Live Services.
 - Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
 - Rebar weight poses a manual handling risk. (Rebar Drg specific).
 - Inspection's involving Divers/ Diving Equipment/ Air supply, etc etc.....

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Client

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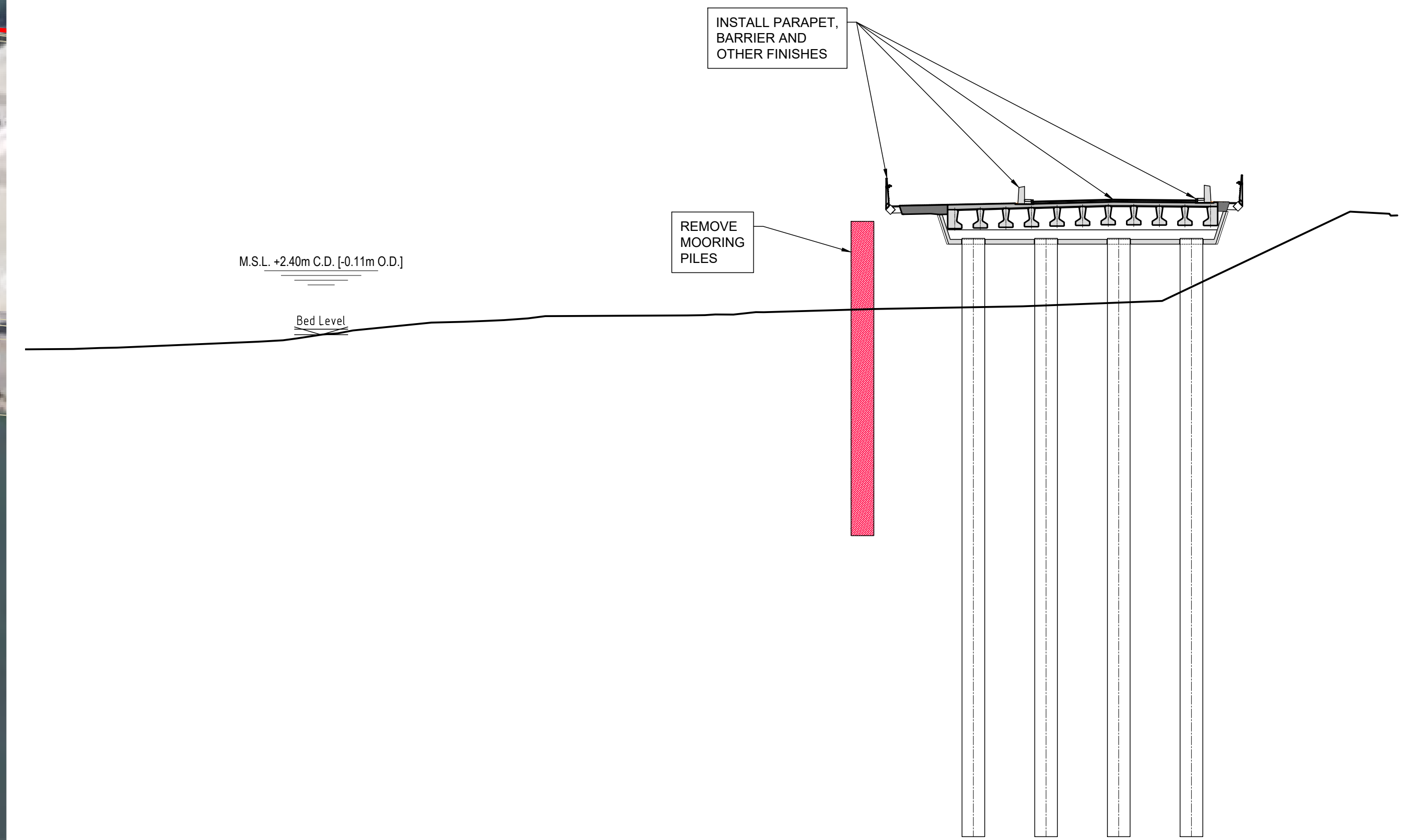
(v) All Levels refer to Ordnance Survey Datum, Malin Head.

St/Rev	Date	Dim Chk	Amendment / Issue	App
\$3	May 24	DC	Issue For Approval	MM
\$2	Oct 23	DC	Issue For Approval	MM

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Scale	As shown @ A1 Half @ A3	Project	3FMProject Bringing Dublin Port To 2040
Created on	Oct. 23	Title	SPAR-Proposed Viaduct Construction Sequence - Stage 9 (Sheet 9 of 10)
Sheets	09 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 09
Status	S3	Rev	P02



STAGE 10 - INSTALL PARAPETS, BARRIER & FINISHES - SECTION
(Scale 1 : 200)

RESIDUAL DESIGN HAZARDS	
(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)	
1.	Working near water/ Risk of drowning/ Engulfment in swampland.
2.	Working at height.
3.	Working being carried near Live Services.
4.	Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5.	Rebar weight poses a manual handling risk. (Rebar Drg specific).
6.	Inspector's involving Divers/ Diving Equipment/ Air supply, etc etc.....

STAGE 10 - INSTALL PARAPETS, BARRIER & FINISHES - PLAN
(Scale 1 : 1,000)

Client

**COMHLACHT CHALAFORT
ÁTHA CLIATH
DUBLIN PORT COMPANY**

General Notes

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

St/Rev	Date	Dim Chk	Amendment / Issue	App
S3	May 24	DC	Issue For Approval	MM
S2	Oct 23	DC	Issue For Approval	MM

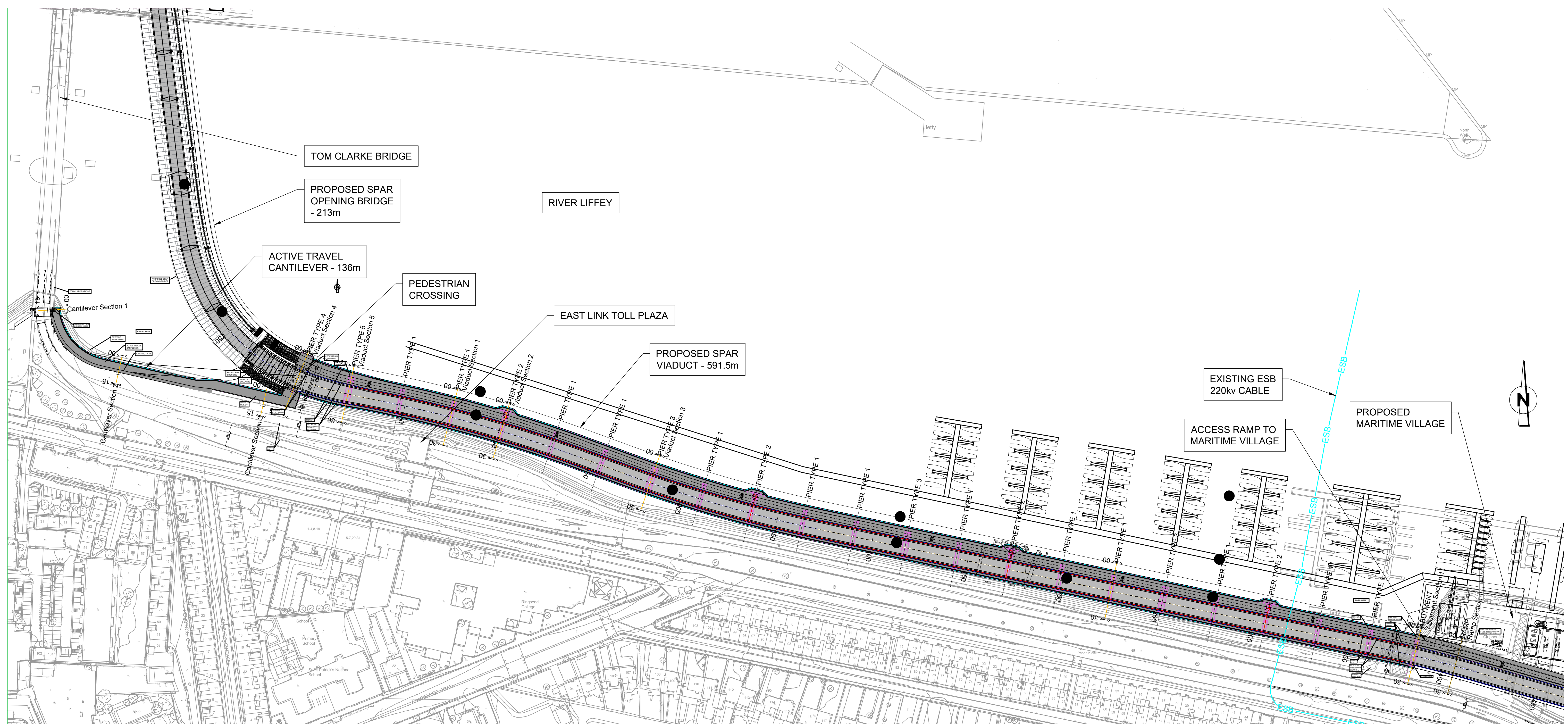
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Scale	As shown @ A1 Half @ A3	Project	3FMProject Bringing Dublin Port To 2040
Created on	Oct. 23	Title	SPAR-Proposed Viaduct Construction Sequence - Stage 10 (Sheet 10 of 10)
Sheets	10 of 10	File Identifier	CP1901-3FM-RPS-C-SBR-Via-DR-C-BR1116 - 10
Status	S3	Rev	P02

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Appendix D Geotechnical Information



PLAN LAYOUT - Ch.840 to Ch.1380
(Scale 1 : 1,000)

RESIDUAL DESIGN HAZARDS	
<small>(The information provided below has been collected from Preconstruction Information and the RPS Design Risk Management Log)</small>	
1.	Working near water/ Risk of drowning/ Engulfment in swampland.
2.	Working at height.
3.	Working being carried near Live Services.
4.	Stability during construction/ Work involving assembly/ dismantling of heavy prefabricated components.
5.	Rebar weight poses a manual handling risk. (Rebar Drg specific).
6.	Inspection's involving Divers/ Diving Equipment/ Air supply, etc....

Client

COMHLACHT CHALAFORT
ÁTHA CLIATH
DUBLIN PORT COMPANY

General Notes

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

Status	Rev	Date	Dim Ck	App	Amendment / Issue
S3	01	Feb. '23	Doc	AOB	Issue For Approval

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Model File Identifier
IE000336-RPS-00-ST01-DR-C-BR0000

Scale	As shown @ A1 Half @ A3
Created on	Feb.'23
Sheets	01 of 7

Project

3FMProject
Bringing Dublin Port To 2040

Title

SPAR-Proposed Viaduct
PLAN LAYOUT
(Sheet 1 of 1)

File Identifier	Ground Model Drawing 2 - 01	Status	S3	Rev	P01.04
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FUGRO	Contract Name	Dublin Port MP2_3FM			Location ID	3FM_BH-S-01
	Client	Dublin Port Company			Sheet 1 of 1	
	Fugro Reference	F211210				
	Coordinates (m)		Ground Elevation (m Datum)			
	Hole Type	Cable Percussion to Rotary Coring			Status	Preliminary

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	16.64	CP	04/11/2022	05/11/2022	Comacchio MCS1200, Pilcon Wayfarer			JW, SB, CR, AB	PG, SI	
16.40	28.50	RC	05/11/2022	05/11/2022	Comacchio MCS1200			JW, SB, CR, AB	SI, FS	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
04/11/2022	10:30	0.00	0.00		Fine	16.40	17.10	W	100	Grey	00:09	16.40	17.10	102
04/11/2022	11:30	9.30	9.30		Good	17.10	17.80	W	100	Black	00:07	17.10	17.80	102
04/11/2022	19:15	12.10	9.20			17.80	18.60	W	100	Black	00:12	17.80	18.60	102
05/11/2022	02:19	16.64	16.40			18.60	19.50	W	100	Black	00:12	18.60	19.50	102
05/11/2022	02:30	16.40	16.40			19.50	21.00	W	100	Black	00:16	19.50	21.00	102
05/11/2022	06:14	24.00	16.40			21.00	22.50	W	100	Grey	00:23	21.00	22.50	102
05/11/2022	07:45	24.00	16.40			22.50	24.00	W	100	Grey	00:20	22.50	24.00	102
05/11/2022	19:00	28.50	16.40			24.00	25.50	W	100	Black	00:22	24.00	25.50	102
						25.50	27.00	W	100	Black	00:21	25.50	27.00	102
						27.00	28.50	W	100	Black	00:23	27.00	28.50	102

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
9.30	200	9.30	200
16.64	200	16.00	200
24.00	146	16.40	200
28.50	146		

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
12.10	12.40	00:42	
16.00	16.40	01:42	

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater observation not recorded over water.	Borehole advanced using cable percussion with sampling and standard penetration testing (SPT). Client instructed rotary switch at 16.40m. Borehole was terminated at 28.50m metres below mudline level.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	28.50	Grout	05/11/2022

Notes
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By		Elevation Datum	Dublin Port Chart Datum	Grid Coordinate System	ITM	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	08/11/2022



Contract Name	Dublin Port MP2_3FM		Location ID	3FM_BH-S-01
Client	Dublin Port Company		Sheet 1 of 6	
Fugro Reference	F211210			
Coordinates (m)		Ground Elevation (m Datum)		
Hole Type	Cable Percussion to Rotary Coring		Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50 0.00 - 0.50	B D	1 2							Very soft black slightly sandy clayey SILT with rare decomposed wood fragments (<10mm) and moderate sulphurous odour. Sand is fine. [RECENT ESTUARINE DEPOSITS]					
0.50 - 0.95 0.50 - 0.95	D SPT	3	0/450 (S)							(1.00)				
1.00 - 1.50 1.00 - 1.50	B D	4 5					1	Very soft to soft black slightly sandy silty CLAY with occasional wood fragments (<5mm x 30mm). Sand is fine. [RECENT ESTUARINE DEPOSITS]		1.00 (0.50)				
1.50 - 2.50 1.50 - 2.50 1.50 - 2.50	B D PS	7 8 6						Firm black slightly sandy slightly gravelly silty CLAY with some shell fragments (<20mm) and rare brown silt burrows (<5mm x 30mm) and moderate hydrocarbon odour. Sand is fine. Gravel is angular fine to coarse of limestone. [RECENT ESTUARINE DEPOSITS]		1.50 (1.00)				
2.50 - 2.95 2.50 - 2.95	D SPT	9	0/450 (S)				2	Very soft to soft black slightly sandy slightly gravelly silty CLAY with occasional rootlets (<1mm x 20mm) shell fragments (<50mm) of scallop and bivalves. Sand is fine. Gravel is angular fine to coarse gravel of limestone. [RECENT ESTUARINE DEPOSITS]		2.50				
2.95 - 3.00 3.00 - 3.50 3.00 - 3.50	D B D	10 11 12					3							
3.50 - 4.50	PS	13								(2.40)				
4.50 - 4.95 4.50 - 4.95	D SPT	14	0/450 (S)											
5.00 - 5.50 5.00 - 5.50	B D	15 16						Soft dark brown to brown slightly sandy slightly		4.90				
Continued next page														

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID	3FM_BH-S-01
Client	Dublin Port Company		Sheet 2 of 6	
Fugro Reference	F211210		Status	
Coordinates (m)		Ground Elevation (m Datum)		
Hole Type	Cable Percussion to Rotary Coring			

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
5.50 - 6.00	UT	17	22/450 mm						gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of limestone. [ESTUARINE DEPOSITS]	(1.00)				
6.00 - 6.20	B	18						6	Grey clayey very gravelly SAND. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of limestone, quartzite and psammite. [ESTUARINE DEPOSITS]	5.90 (0.30)				
6.20 - 6.50	D B	19 20							Firm to stiff light brown slightly sandy slightly gravelly silty CLAY with occasional lenses (<150mm) of silty fine to coarse sand. Sand to coarse. Gravel is angular to subrounded fine and medium of limestone and psammite. [ESTUARINE DEPOSITS]	6.20				
6.50 - 6.95	D D SPT	21 22	N = 23 (S)							(1.30)				
7.00 - 7.50	D	23						7						
7.50 - 7.95	D B SPT	24 25	N = 12 (S)						Very soft to soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine of limestone. [ESTUARINE DEPOSITS]	7.50 (0.50)				
8.00 - 8.50	B	26						8	Stiff dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone, psammite and quartzite. [PORT CLAY]	8.00				
8.50 - 8.95	D D SPT	27 28	N = 27 (S)											
9.20 - 9.50	B	29						9						
9.50 - 9.95	D SPT	30	N = 27 (S)							(3.00)				
10.00 - 10.50	B	31												

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-01
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)		Ground Elevation (m Datum)	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 10.95	D SPT	32	N = 36 (S)											
11.00 - 11.50	B	33						11	Very stiff dark grey sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone, psammite, quartzite. Cobbles (<140mm x 80mm) are angular of dark grey limestone. [PORT CLAY]	11.00				
11.50 - 11.94	D SPT	34	50/295 mm (S)											
12.00 - 12.50	B	35						12						
12.50 - 12.89	D SPT	36	50/245 mm (S)											
13.00 - 13.50	B	37						13						
13.50 - 13.95	D SPT	38	N = 42 (S)							(5.40)				
14.00 - 14.50	B	39						14						
14.50 - 14.93	D SPT	40	50/285 mm (S)											
15.00 - 15.50	B	41												

Continued next page

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-01
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)		Ground Elevation (m Datum)	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
15.50 - 15.87 15.50 - 15.88	D SPT	42	50/225 mm (S)											
16.00 - 16.40	B	43						16						
16.40 - 16.64	SPT		50/85 mm (S)							16.40				
16.40 - 17.10				71	0	0		17	Very dense dark grey and greenish grey slightly sandy clayey GRAVEL with low cobble content and rare seams (<70mm) of dark grey sandy gravelly clay. Gravel is angular to subrounded fine to coarse of limestone psammite. Cobbles (<140mm x 90mm) are angular to subrounded of strong dark grey limestone. [GLACIAL DEPOSITS] 16.40m to 16.60m; assumed zone of core loss.					
17.10 - 17.80				100	0	0				(2.20)				
17.80 - 17.84	SPT		50/0 mm (C)						17.80m to 17.90m; assumed zone of core loss.					
17.80 - 18.60				87	0	0		18						
18.60 - 18.69 18.60 - 18.85	C	44					4		Medium strong and strong dark grey and grey LIMESTONE with rare inclined (70-90°) calcite veins (<30mm). Fresh locally distinctly weathered and destructured. Discontinuities; bedding plane fractures, inclined (0-10°), closely spaced, planar, smooth, very tight, clean. Set#2, joints, inclined (80-90°), closely spaced, planar, smooth, very tight, clean. [LIMESTONE BEDROCK] 19.85m to 18.95m; extremely weak. Destructured with very weak angular fine to coarse gravel-sized lithorelicts. 19.13m to 19.25m; non-intact. Recovered as angular and subangular fine to coarse gravel-sized fragments. 19.25m to 19.35m; very weak. Destructured with weak angular and subangular fine to coarse gravel-sized lithorelicts. 19.35m to 19.40m; non-intact. Recovered as angular and subangular fine and coarse gravel-sized fragments. 19.40m to 19.50m; assumed zone of core loss.	18.60				
18.95 - 19.13 18.60 - 19.50 19.13 - 19.25				89	33	14	11	19						
19.35 - 19.40							-							
19.50 - 19.74							8							
19.74 - 20.01							-							
Continued next page														

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM	Location ID 3FM_BH-S-01
	Dublin Port Company	
	F211210	Sheet 5 of 6 Status Preliminary
	Ground Elevation (m Datum)	

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater					
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation				
20.03 - 20.20	C	45						19.74m to 20.01m; non-intact. Recovered as angular fine to coarse gravel and cobble-sized fragments.	(4.30)									
19.50 - 21.00 20.01 - 20.59								90							60	46	9	20.59m to 20.73m; distinctly weathered with extremely closely spaced bedding plane fractured to destructured with angular fine and medium gravel-sized lithorelicts.
20.73 - 20.85								8							20.85m to 21.00m; assumed zone of core loss.			
21.00 - 21.15 21.10 - 21.26 21.15 - 21.20	C	46						21.15m to 21.20m; non-intact. Recovered as angular fine and medium gravel-sized fragments.										
21.20 - 21.43								13							21.43m to 21.69m; distinctly weathered with extremely closely spaced bedding plane fractures.			
21.00 - 22.50								4							100	70	31	22.12m to 22.23m; inclined (85°) calcite vein (<20mm).
21.69 - 22.90	D	47						22.32m to 22.50m; inclined (70°) calcite vein (<35mm).										
22.65 - 22.70								8							22.50m to 22.72m; inclined (70°) calcite vein (<20mm).			
22.90 - 22.97								-							Medium strong to strong locally very weak dark grey to black LIMESTONE. Fresh to slightly weathered locally destructured. Predominately non-intact, recovered as angular coarse gravel and cobble-sized fragments. Discontinuities; Set#1, bedding plane fractures, inclined (0-10°), very closely spaced, planar, smooth, clean. Set#2, joints, inclined (60-80°), planar and undulating, smooth, clean. [LIMESTONE BEDROCK]			
22.50 - 24.00 23.04 - 23.55	B	48						22.90m to 22.97; non-intact. Recovered as angular coarse gravel-sized fragments.	(1.43)									
23.70 - 23.96								100							33	0	18	22.97m to 23.04m; very weak. Destructured with angular fine and medium gravel-sized lithorelicts.
23.55 - 24.33								-							23.04m to 24.00m; partially non-intact recovered as angular coarse gravel-sized fragments. Bedding plane fractures present.			
24.55 - 24.88	C	49						24.00m to 24.33m; non-intact, Recovered as angular fine and medium gravel-sized fragments.										
24.00 - 25.50								100							70	47	Strong dark grey and black locally grey LIMESTONE with rare inclined (70-90°) calcite veins (<3mm). Fresh locally destructured. Discontinuities; Set#1, bedding plane fractures, inclined (0-10°), extremely closely to medium spaced, planar and undulating, smooth, tight to very tight, clean. Set#2, joints, inclined (80-90°), planar and undulating, smooth and rough, very tight to tight, clean and with calcite coating.	

Continued next page

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM	Location ID 3FM_BH-S-01 Sheet 6 of 6 Status Preliminary
	Dublin Port Company	
	F211210	
	Ground Elevation (m Datum)	
	Cable Percussion to Rotary Coring	

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
24.33 - 25.70							16		[LIMESTONE BEDROCK]					
25.50 - 25.67	C	50												
25.70 - 25.81							-		25.70m to 25.81m; non-intact, possibly distinctly weathered. Recovered as angular fine to coarse gravel-sized fragments.					
25.81 - 25.92							36		25.80m to 27.71m; persistent joint inclined (80-90°).					
25.92 - 26.11							10	26						
25.50 - 27.00				100	46	14	-		26.11m to 26.44m; non-intact. Recovered as angular medium and coarse gravel-sized fragments. Bedding plane fractures present.	(4.17)				
26.11 - 26.44														
26.44 - 26.72							11							
26.72 - 26.82							-		26.72m to 26.82m; non-intact. Recovered as angular fine to coarse gravel-sized fragments.					
26.82 - 27.00							17							
27.00 - 27.41	C	51						27						
27.00 - 27.40							3							
27.40 - 27.51							-		27.40m to 27.51m; non-intact. Recovered as angular and subangular medium and coarse gravel-sized fragments. Possibly destructured.					
27.51 - 27.71							5							
27.00 - 28.50				100	70	44			27.71m to 27.77m; destructured with angular and subangular medium and coarse gravel-sized lithorelicts.					
27.77 - 28.23							11	28						
28.23 - 28.31							-		28.23m to 28.31m; non-intact. Recovered as angular and subangular medium and coarse gravel-sized fragments.					
									28.31m to 28.50m; destructured with angular and subangular fine and medium gravel-sized lithorelicts.	28.50				
									End of Borehole at 28.50 m					
								29						

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

FUGRO	Contract Name	Dublin Port MP2_3FM			Location ID	3FM_BH-S-02
	Client	Dublin Port Company			Sheet 1 of 1	
	Fugro Reference	F211210				
	Coordinates (m)		Ground Elevation (m Datum)			
Hole Type	Cable Percussion to Rotary Coring			Status	Preliminary	

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	14.56	CP	03/11/2022	03/11/2022	Comacchio MCS1200, Pilcon Wayfarer			CR, AB, JW, SB	SI, PG	
14.40	28.60	RC	03/11/2022	05/11/2022	Comacchio MCS1200			CR, AB	SI, PG	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
03/11/2022	11:00	0.00	0.00		Fair	14.40	15.10	W	100	Grey	00:06	14.40	15.10	102
03/11/2022	18:40	10.88	10.50			15.10	15.85	W	100	Grey	00:04	15.10	15.85	102
03/11/2022	19:00	10.50	10.50			15.85	16.60	W	100	Grey	00:05	15.85	16.60	102
03/11/2022	23:18	14.56	14.50			16.60	17.60	W	100	Grey	00:06	16.60	17.60	102
04/11/2022	23:25	14.40	14.40			17.60	18.10	W	100	Grey	00:05	17.60	18.10	102
05/11/2022	05:36	28.60	14.40			18.10	18.85	W	100	Grey	00:05	18.10	18.85	102
						18.85	19.60	W	100	Grey	00:06	18.85	19.60	102
						19.60	21.10	W	100	Black	00:20	19.60	21.10	102
						21.10	22.60	W	100	Black	00:16	21.10	22.60	102
						22.60	24.10	W	100	Black	00:18	22.60	24.10	102
						24.10	25.60	W	100	Black	00:22	24.10	25.60	102
						25.60	27.10	W	100	Black	00:20	25.60	27.10	102
						27.10	28.60	W	100	Black	00:20	27.10	28.60	102

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
10.88	200	10.20	200
14.56	200	14.40	200
28.60	146		

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
9.10	9.40	01:18	
10.20	10.40	00:42	
14.10	14.40	01:30	

Water Strike					Water Added	
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater observation not recorded over water.	Borehole advanced using cable percussion with sampling and standard penetration testing (SPT). Client instructed rotary switch at 14.40m. Borehole was terminated at 28.60m metres below mudline level.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	28.60	Grout	05/11/2022

Notes
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	Elevation Datum	Dublin Port Chart Datum	Grid Coordinate System	ITM
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW			Print Date	07/11/2022



Contract Name	Dublin Port MP2_3FM		Location ID	3FM_BH-S-02
Client	Dublin Port Company		Sheet 1 of 6	
Fugro Reference	F211210		Status	
Coordinates (m)		Ground Elevation (m Datum)		
Hole Type	Cable Percussion to Rotary Coring			

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50 0.00 - 0.50	B D	2 1							Very soft black slightly sandy clayey SILT with strong sulphurous odour. Sand is fine. [RECENT ESTUARINE DEPOSITS]					
0.50 - 0.95 0.50 - 0.95	D SPT	3	0/450 (S)							(1.00)				
1.00 - 1.50 1.00 - 1.50	B D	4 5					1	Very soft black slightly sandy silty CLAY with rare plastic fragments (<0.1mm x 50mm x 100mm) and slight to moderate hydrocarbon odour. Sand is fine. [RECENT ESTUARINE DEPOSITS]		1.00				
1.50 - 2.50 1.50 - 2.50	D PS	7 6					2							
2.50 - 2.95 2.50 - 2.95	D SPT	8	0/450 (S)					2.50m to 3.00m; moderate hydrocarbon odour.						
3.00 - 3.50 3.00 - 3.50	B D	9 10					3	3.00m to 3.50m; rare plastic fragments (<0.1mm x 50mm x 100mm).		(3.70)				
3.50 - 4.50	PS	11					4							
4.50 - 4.95 4.50 - 5.00 4.50 - 4.95	D B SPT	12 13	N = 4 (S)							4.70				
5.00 - 5.50 5.00 - 5.50	B D	14 15						Firm to stiff brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone and quartzite.		(0.30)				
								Continued next page		5.00				

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID	3FM_BH-S-02
Client	Dublin Port Company			
Fugro Reference	F211210			
Coordinates (m)		Ground Elevation (m Datum)	Sheet 2 of 6	
Hole Type	Cable Percussion to Rotary Coring		Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
5.50 - 6.00	UT	16	60/450 mm						[ESTUARINE DEPOSITS] Firm to stiff grey silty CLAY. [ESTUARINE DEPOSITS]	(0.50)				
6.00 - 6.50	B D	17 18						6	Soft to firm greyish brown slightly gravelly locally very sandy silty CLAY. Sand is fine and medium. Gravel is angular to subrounded fine and medium of limestone and quartzite. [ESTUARINE DEPOSITS]	5.50				
6.50 - 6.95 6.50 - 7.00 6.50 - 6.95	D D SPT	19 20	N = 34 (S)						Dense greyish brown very silty SAND. Sand is fine and medium. [ESTUARINE DEPOSITS]	6.70 (0.30)				
7.00 - 7.50 7.00 - 7.50	B D	21 22						7	Soft to firm slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium of limestone and quartzite. [ESTUARINE DEPOSITS]	7.00 (0.50)				
7.50 - 8.00 7.50 - 8.00 7.50 - 8.00	B D UT#	25 24 23	80/ mm						Soft brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone, quartzite and psammite. Cobbles (<100mm x 100mm x 120mm) are subangular and subrounded of limestone. [ESTUARINE DEPOSITS]	7.50 (0.50)				
8.00 - 8.50 8.00 - 8.50	B D	26 27						8	Very dense dark brownish grey clayey very sandy GRAVEL with frequent pockets of stiff brownish grey slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular and subrounded fine to coarse of limestone, quartzite and psammite. [ESTUARINE DEPOSITS]	8.00 (0.70)				
8.50 - 8.95 8.50 - 8.95	D SPT	28	N = 45 (S)						Very stiff dark grey slightly sandy gravelly CLAY with occasional fine and medium grey sand lenses (<200mm). Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone, psammite and quartzite. [PORT CLAY]	8.70				
9.00 - 9.50 9.00 - 9.50	B D	29 30						9						
9.50 - 9.95 9.50 - 9.95	D SPT	31	N = 34 (S)											
10.00 - 10.50 10.00 - 10.50	B D	32 33							Continued next page					

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-02
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)		Ground Elevation (m Datum)	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 10.88 10.50 - 10.88	D SPT	34	50/226 mm (S)							(3.30)				
11.00 - 11.50	B	35						11						
11.50 - 11.91 11.50 - 11.92	D SPT	36	50/265 mm (S)											
12.00 - 12.50	B	37						12	Very stiff dark grey slightly sandy gravelly CLAY with low cobble content and with occasional fine and medium grey sand lenses (<200mm). Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone, psammite and quartzite. Cobbles (<90mm x 70mm) are angular of dark grey limestone. [PORT CLAY]	12.00				
12.50 - 12.82 12.50 - 12.82	D SPT	38	50/175 mm (S)											
13.00 - 13.50	B	39						13		(2.40)				
13.50 - 13.81 13.50 - 13.81	D SPT	40	50/160 mm (S)											
14.00 - 14.40	B	41						14						
14.40 - 14.56	SPT		50/65 mm (C)							14.40				
14.40 - 15.10				71	0	0			Very dense dark grey slightly sandy clayey GRAVEL with low cobble content and with rare seams (<70mm) of firm dark grey sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone, psammite. Cobbles (<140mm x 90mm) are dark grey and greenish grey angular to subrounded of strong dark grey limestone.					
Continued next page														

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-02
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)		Ground Elevation (m Datum)	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
15.10 - 15.40	D SPT	42	100 mm						[GLACIAL DEPOSITS] 14.40m to 14.60m; assumed zone of core loss. 15.10m to 15.20m; very stiff gravelly slightly sandy clay Sand is fine to coarse. Gravel is angular to subrounded fine and medium of limestone.					
15.10 - 15.40			50/150 mm (S)											
15.10 - 15.85				87	0	0				(2.20)				
15.85 - 16.60								16	15.85m to 16.00m; assumed zone of core loss.					
16.60 - 16.74	SPT		50/60 mm (S)						16.00m to 16.10m; very closely spaced subhorizontal calcite veins (<2mm).					
16.60 - 16.74														
16.60 - 17.60				0	0	0		17	Assumed zone of core loss. 16.60m to 16.74m; SPT no recovery.	16.60				
17.60 - 18.10										(1.75)				
18.10 - 18.22	D SPT	43	80 mm						18.10m to 18.18m; very stiff gravelly slightly sandy clay. Sand is fine to coarse. Gravel is angular to subrounded fine and medium of limestone. 18.18m to 18.35m; assumed zone of core loss.					
18.10 - 18.23			50/50 mm (S)											
18.10 - 18.85				89	0	0			Very dense dark grey slightly sandy clayey GRAVEL with low cobble content with occasional pockets (<20mm) of firm dark grey sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine and medium of limestone. Cobbles (110mm x 80mm) are angular to subrounded strong dark grey and grey limestone [GLACIAL DEPOSITS]	18.35				
18.85 - 19.60								19	Assumed zone of core loss.	(0.50)				
19.60 - 19.73	SPT		50/50 mm (S)							18.85				
19.60 - 19.73				0	0	0				(0.75)				
19.80 - 19.90	C	44							Medium strong to strong locally weak dark grey LIMESTONE locally with extremely closely spaced inclined (80-90°) calcite veins (<4mm). Fresh locally distinctly weathered to destructured. Discontinuities; Set#1, bedding	19.60				
19.80 - 20.10									3					

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



FUGRO	Contract Name	Dublin Port MP2_3FM	Location ID	
	Client	Dublin Port Company	3FM_BH-S-02	
	Fugro Reference	F211210	Sheet 5 of 6	
	Coordinates (m)		Ground Elevation (m Datum)	
Hole Type	Cable Percussion to Rotary Coring	Status	Preliminary	

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
20.20 - 20.40 19.60 - 21.10				87	79	21	15	21	plane fractures, inclined (0-10°), very closely to closely spaced, planar, smooth very tight, clean. [LIMESTONE BEDROCK] 19.60m to 19.80m; assumed zone of core loss. 20.10m to 20.20m; weak. Distinctly weathered to destructured with angular and subangular fine and medium gravel-sized lithorelicts. 20.40m to 20.50m; weak. Distinctly weathered to destructured with angular and subangular fine and medium gravel-sized lithorelicts.	(1.50)					
20.50 - 20.66							19		20.66m to 20.76m; non-intact. Recovered as angular and subangular fine to coarse gravel sized fragments.						
20.66 - 20.76 20.76 - 20.89	C	45					-		21						
20.76 - 21.10							12	21							
21.25 - 21.50 21.40 - 21.50	C	46					12		Medium strong to strong locally moderately weak and weak grey and dark grey LIMESTONE locally with frequent to abundant fossil fragments (<5mm) including crinoids. Fresh locally distinctly weathered and destructured. Discontinuities; Set#1, bedding plane fractures, incline (0-10°), extremely closely spaced to closely spaced, planar smooth, very tight, clean. Set#2, joints, inclined (80-90°), planar, smooth, very tight, calcite mineralisation (<2mm). [LIMESTONE BEDROCK]	21.10					
21.10 - 22.60				90	39	0		22	21.10m to 21.25m; assumed zone of core loss. 21.50m to 21.94m; moderately strong. Distinctly weathered with thin laminations to extremely closely spaced bedding plane fractures. 21.94m to 22.17m; weak. Destructured with angular and subangular fine and medium gravel-sized lithorelicts.	(2.04)					
22.42 - 22.60	C	47					8		22.17m to 22.60m; inclined (85°) joint with calcite mineralisation (<2mm). 22.20m to 22.60m; inclined (80°) calcite vein (<20mm).						
22.17 - 23.14							8	23	22.60m to 23.14m; frequent to abundant white fossil fragments (<5mm) including crinoids and with an inclined (80°) calcite vein (<10mm).						
22.91 - 23.14	C	48							Medium strong to strong locally very weak to weak dark grey locally grey LIMESTONE with rare white fossil fragments (<2mm). Fresh locally distinctly weathered and destructured. Discontinuities; Set#1, bedding plane fractures, incline (0-10°), extremely closely spaced to medium spaced, planar smooth, very tight, clean. locally with clay smear (<0.5mm). Set#2, joints, inclined (80-90°), widely spaced, planar and undulating, smooth, very tight, clean. [LIMESTONE BEDROCK]	23.14					
23.14 - 23.18 23.25 - 23.42 22.60 - 24.10 23.26 - 23.74	D C	49 50		100	68	51	4	24	23.14m to 23.26m; very weak to weak. Destructured with angular to subangular fine and medium gravel-sized lithorelicts.						
23.14 - 23.18 23.25 - 23.42 22.60 - 24.10 23.26 - 23.74									23.74m to 24.00m; distinctly weathered to destructured with angular and subangular fine to coarse gravel-sized lithorelicts.						
24.47 - 24.60 24.50 - 24.63 24.63 - 24.67	C	51					8	24	24.00m to 24.50m; very weak to weak. Distinctly weathered with extremely closely spaced bedding plane fractured to destructured with angular to subangular fine and medium gravel-sized lithorelicts.						
24.47 - 24.60 24.50 - 24.63 24.63 - 24.67							-		24.63m to 24.67m; non-intact. Recovered as angular fine and medium gravel sized fragments.						
24.10 - 25.60 24.67 - 25.18 24.98 - 25.09	C	52		100	65	35	6								

Notes
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM	Location ID 3FM_BH-S-02
	Dublin Port Company	
	F211210	Sheet 6 of 6 Status Preliminary
	Ground Elevation (m Datum)	

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
25.18 - 25.35							-		25.18m to 25.35m; non-intact to partially intact. Recovered as angular fine and medium gravel-sized fragments.	(4.01)				
25.35 - 25.77 25.60 - 25.77	C	53					5							
25.77 - 26.00							48	26	26.00m to 26.45m; incipient fracture at 70 degrees planar. 26.15m to 26.45m; inclined (80-90°) calcite vein (<10mm).					
25.60 - 27.10 26.00 - 26.78				100	75	37	8							
26.57 - 26.80	C	54												
26.78 - 26.90							-		26.78m to 26.90m; non-intact. Recovered as angular and subangular fine to coarse gravel-sized fragments.					
26.90 - 27.15							8	27						
27.15 - 27.80 27.59 - 27.80	C	55					11		27.10m to 27.15m; 50mm gain of limestone bedrock. Strong grey and dark grey fine grained shelly LIMESTONE with abundant shell fossils (<5mm), predominately crinoids. Fresh. Discontinuities; Set#1, bedding plane fractures, inclined (0-10°) very closely to closely spaced, planar, smooth and rough, tight and very tight, clean or with slight grey staining. [LIMESTONE BEDROCK]	27.15				
27.10 - 28.60 27.97 - 28.06 27.95 - 28.22	C	56		100	75	35		28	Medium strong locally moderately weak dark grey to black LIMESTONE. Slightly weathered locally distinctly weathered to destructured. Discontinuities; Set#1, bedding plane fractures, inclined (0-10°), extremely closely spaced to closely spaced, planar smooth, very tight, clean. [LIMESTONE BEDROCK]	27.80				
28.22 - 28.65 28.47 - 28.53	C	57					23		27.80m to 27.95m; weak to moderately weak. Distinctly weathered with extremely closely spaced bedding plane fractures to destructured with angular fine and medium gravel-sized fragments.,	(0.80)				
									End of Borehole at 28.60 m	28.60				
								29						

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM			Location ID	3FM_BH-S-02
Client	Dublin Port Company				
Fugro Reference	F211210			Sheet 1 of 1	
Coordinates (m)		Ground Elevation (m Datum)			
Hole Type	Cable Percussion and Rotary Coring			Status	Preliminary

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	0.50	0.00
2.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	2.50	0.00
4.50	S	35	N=4 (0,0/0,0,1,3)	450	AR3214	54	4.50	0.00
6.50	S	0	N=34 (4,9/8,9,9,8)	450	AR3214	54	6.50	0.00
8.50	S	0	N=45 (5,7/8,12,11,14)	450	AR3214	54	8.50	0.00
9.50	S	0	N=34 (4,9/8,9,9,8)	450	AR3214	54	9.50	0.00
10.50	S	0	N=50 (9,12/50 for 226mm)	376	AR3214	54	10.50	0.00
11.50	S	0	N=50 (7,6/50 for 265mm)	415	AR3214	54	11.50	DRY
12.50	S	0	N=50 (5,7/50 for 175mm)	325	AR3214	54	12.50	DRY
13.50	S	0	N=50 (9,13/50 for 160mm)	310	AR3214	54	13.50	DRY
14.40	C	0	N=50 (25 for 95mm/50 for 65mm)	160	AR3214	54	14.40	DRY
15.10	S	0	N=50 (7,13/50 for 150mm)	300	AR3214	54	15.10	0.00
16.60	S	0	N=50 (25 for 75mm/50 for 60mm)	135	AR3214	54	16.60	0.00
18.10	S	0	N=50 (25 for 75mm/50 for 50mm)	125	AR3214	54	18.10	0.00
19.60	S	0	N=50 (25 for 75mm/50 for 50mm)	125	AR3214	54	19.60	0.00


In Situ Vane Test Results

In Situ Hand Penetrometer Results

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)	Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)	Test Depth (m)	PID Result (ppm)

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		Dublin Port MP2_3FM			Location ID	
	Client		Dublin Port Company			3FM_BH-S-03	
	Fugro Reference		F211210				
	Coordinates (m)		E718452.50 N734125.00	Ground Elevation (m Datum)		0.79	Sheet 1 of 1
	Hole Type		Cable Percussion to Rotary Coring			Status	Preliminary

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	16.81	CP	09/11/2022	09/11/2022	Comacchio MCS1200, Pilcon Wayfarer			CR, AB, JW, SB	FS, SI	
16.50	29.00	RC	10/11/2022	10/11/2022	Comacchio MCS1200			CR, AB	FS, SI	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
09/11/2022	11:05	0.00	0.00		Windy, dry	16.50	16.50	W	0	Clear	00:09	16.50	17.50	102
09/11/2022	18:30	12.95	12.95		Windy, dry	16.50	17.50	W	100	Grey	00:10	17.50	19.00	102
09/11/2022	19:00	12.50	12.50			17.50	19.00	W	100	Grey	00:12	19.00	20.50	102
10/11/2022	00:00	16.81	16.50			19.00	20.50	W	100	Grey	00:11	20.50	22.00	102
10/11/2022	00:01	16.50	16.50			20.50	22.00	W	100	Grey	00:05	22.00	22.75	102
10/11/2022	04:08	29.00	16.50			22.00	22.75	W	100	Grey	00:05	22.75	23.50	102
						22.75	23.50	W	100	Black	00:13	23.50	25.00	102
						23.50	25.00	W	100	Black	00:17	25.00	26.50	102
						25.00	26.50	W	100	Black	00:16	26.50	28.00	102
						26.50	28.00	W	100	Black	00:16	28.00	29.00	102
						28.00	29.00	W	100	Black				

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
12.95	200	12.95	200
16.81	200	15.80	200
29.00	146	16.50	200

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
15.80	16.30	02:00	

Water Strike		Water Added	
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)

Water Strike Remarks				General Remarks			
Groundwater observation not recorded over water.				Borehole advanced using cable percussion with sampling and standard penetration testing (SPT). Client instructed rotary switch at 16.50m. Borehole was terminated at 29.00m metres below mudline level.			

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	29.00	Grout	10/11/2022

Notes
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	Elevation Datum	Dublin Port Chart Datum	Grid Coordinate System	ITM	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW				Print Date	14/11/2022



Contract Name	Dublin Port MP2_3FM		Location ID	3FM_BH-S-03	
Client	Dublin Port Company		Sheet 1 of 6		
Fugro Reference	F211210		Status		Preliminary
Coordinates (m)	E718452.50 N734125.00	Ground Elevation (m Datum)	0.79		
Hole Type	Cable Percussion to Rotary Coring				

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50 0.00 - 0.50	B D	1 2							Very soft to soft black slightly sandy silty CLAY with occasional shells (<40mm x 30mm) and strong sulphurous odour. Sand is fine and medium. [RECENT ESTUARINE DEPOSITS]					
0.50 - 0.95 0.50 - 1.50 0.50 - 0.95	D B SPT	3 4	0/450 (S)							(1.00)				
								1	Black slightly sandy very clayey GRAVEL with rare shells (<75mm x 50mm) and strong sulphurous odour. Sand is fine. Gravel is angular and subangular fine and medium of limestone and sandstone. [RECENT ESTUARINE DEPOSITS]	1.00 (0.50)	-0.21			
1.50 - 1.95 1.50 - 1.95	D SPT	5	N = 13 (S)						Soft black silty CLAY with strong sulphurous odour. [RECENT ESTUARINE DEPOSITS]	1.50 (0.30)	-0.71			
2.00 - 2.50	B	6						2	Medium dense dark grey slightly sandy GRAVEL with frequent pockets of firm brown very sandy clay and strong hydrocarbon odour. Sand is medium. Gravel is angular to rounded fine to coarse of limestone sandstone calcite and quartz. [ESTUARINE DEPOSITS]	1.80 (0.70)	-1.01			
2.50 - 2.95 2.50 - 2.95	D SPT	7	N = 10 (S)						Medium dense dark grey silty SAND. Sand is fine and medium. [ESTUARINE DEPOSITS]	2.50 (0.50)	-1.71			
3.00 - 3.50	B	8						3	Dark grey sandy GRAVEL with occasional pockets of soft clay (<70mm x 50mm x 40mm) and with 1 No. wood fragment (<95mm x 10mm x 5mm) and with strong hydrocarbon odour. Sand is medium and coarse. Gravel is subangular fine of limestone and sandstone. [ESTUARINE DEPOSITS]	3.00 (0.50)	-2.21			
3.50 - 3.95 3.50 - 3.95	D SPT	9	N = 4 (S)						Loose dark grey silty SAND. Sand is fine and medium, predominantly fine. [ESTUARINE DEPOSITS]	3.50 (0.50)	-2.71			
4.00 - 4.50	D	10						4	Dark grey slightly clayey sandy GRAVEL. Sand is medium and coarse. Gravel is subangular fine of limestone and sandstone. [ESTUARINE DEPOSITS]	4.00 (0.50)	-3.21			
4.50 - 4.95 4.50 - 5.50 4.50 - 4.95	D B SPT	11 12	N = 12 (S)						Medium dense dark grey very silty SAND with occasional shells (<50mm x 50mm) and shell fragments (<5mm x 2mm) rare wood fragments (<15mm x 10mm x 5mm) and strong sulphurous odour. Sand is fine and medium, predominantly fine. [ESTUARINE DEPOSITS]	4.50 (0.50)	-3.71			
Continued next page														

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-03
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)	E718452.50 N734125.00	Ground Elevation (m Datum) 0.79	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
5.50 - 5.95 5.50 - 6.50 5.50 - 5.95	D B SPT	13 14	N = 2 (S)							(1.50)				
6.50 - 7.50	PS	15						6 7	Soft dark grey slightly sandy slightly gravelly CLAY with strong sulphurous odour. Gravel is angular to subrounded fine to coarse of limestone. [ESTUARINE DEPOSITS]	6.00 (0.50)	-5.21			
7.50 - 7.95 7.50 - 8.50 7.50 - 7.95	D B SPT	16 17	0/450 (S)					8	Soft brownish grey silty CLAY with strong sulphurous odour. [ESTUARINE DEPOSITS]	6.50 (1.00)	-5.71			
8.50 - 8.95 8.50 - 9.00 8.50 - 8.95	D B SPT	18 19	N = 17 (S)					9	Firm brownish grey slightly sandy silty CLAY with rare wood fragments (<5mm x 4mm x 1mm) and strong sulphurous odour. Sand is fine. [ESTUARINE DEPOSITS]	7.50 (0.50)	-6.71			
9.00 - 9.50	B	20							Firm brownish grey gravelly CLAY with occasional wood fragments (<10mm x 5mm x 2mm) and occasional shell fragments (<10mm x 2mm) with moderate sulphurous odour. Gravel is subangular and subrounded fine to coarse of sandstone and limestone. [ESTUARINE DEPOSITS]	8.00 (0.50)	-7.21			
9.50 - 10.00 9.50 - 9.95 9.50 - 9.95	B D SPT	22 21	N = 29 (S)						Medium dense grey slightly sandy GRAVEL. Sand is medium and coarse. Gravel is subangular to rounded fine to coarse of limestone sandstone quartz and calcite. [ESTUARINE DEPOSITS]	8.50 (0.50)	-7.71			
10.00 - 10.50	B	23							Grey very sandy GRAVEL. Sand is medium and coarse. Gravel is subangular to rounded fine to coarse of limestone sandstone psammite and calcite. [ESTUARINE DEPOSITS]	9.00 (0.50)	-8.21			
									Medium dense grey slightly clayey slightly sandy GRAVEL. Sand is medium and coarse. Gravel is subangular and subrounded fine and medium of limestone sandstone and calcite. [ESTUARINE DEPOSITS]	9.50 (0.50)	-8.71			
									Continued next page	10.00	-9.21			

Notes
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID
Client	Dublin Port Company		3FM_BH-S-03
Fugro Reference	F211210		
Coordinates (m)	E718452.50 N734125.00	Ground Elevation (m Datum)	0.79
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Sheet 3 of 6

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 10.95	D	24	N = 25 (S)						Dark grey sandy very clayey GRAVEL with low cobble content. Gravel is subangular to rounded fine to coarse of limestone. Cobbles (<160mm x 75mm x 30mm) are subangular of limestone. [ESTUARINE DEPOSITS]	(0.50)				
10.50 - 11.00	B	25							Medium dense dark grey clayey sandy GRAVEL. Sand is medium and coarse. Gravel is subangular and subrounded fine to coarse of limestone and sandstone. [ESTUARINE DEPOSITS]	(0.50)	-9.71			
10.50 - 10.95	SPT													
11.00 - 11.50	B	26					11	Dark grey slightly silty gravelly SAND with 1 No. cobble and with rare pockets of sandy clay (<85mm x 60mm x 40mm). Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone sandstone quartz. Cobble (<100mm x 75mm x 50mm) subrounded of limestone. [ESTUARINE DEPOSITS]	(0.50)	-10.21				
11.50 - 11.95	D	27	N = 34 (S)						Dense dark grey very sandy GRAVEL with frequent pockets of firm brownish grey clay. Sand is medium and coarse. Gravel is subangular to rounded fine to coarse of limestone sandstone and calcite. [ESTUARINE DEPOSITS]	(1.00)				
11.50 - 12.00	B	28												
11.50 - 11.95	SPT													
12.00 - 12.50	B	29					12							
12.50 - 12.95	D	30	N = 43 (S)						Dense dark brown slightly clayey SAND. Sand is medium and coarse. [ESTUARINE DEPOSITS]	(0.50)	-11.71			
12.50 - 13.00	B	31							12.80m to 12.95m; stiff dark brown slightly sandy clay. Sand is fine.	(0.50)				
12.50 - 12.95	SPT													
13.00 - 13.50	B	33					13	Very stiff dark grey slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of dark grey limestone and siltstone. Cobbles (<80mm x 90mm x 120mm) are subrounded of limestone. [PORT CLAY]	(1.00)	-12.21				
13.00 - 13.50	D	32												
13.50 - 13.95	D	34	N = 40 (S)						13.50m to 13.60m; dark grey and grey fine to coarse sand.	(0.50)				
13.50 - 13.95	SPT													
14.00 - 14.50	B	35					14							
14.50 - 14.92	D	36	50/265 mm (S)							(3.50)				
14.50 - 14.92	SPT													
15.00 - 15.50	B	37												

Continued next page

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM			Location ID 3FM_BH-S-03	
Client	Dublin Port Company				
Fugro Reference	F211210				
Coordinates (m)	E718452.50 N734125.00	Ground Elevation (m Datum)	0.79		
Hole Type	Cable Percussion to Rotary Coring			Sheet 4 of 6	
				Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
15.50 - 15.90 15.50 - 15.90	D SPT	38	50/245 mm (S)						15.00m to 15.20m; dark grey subangular and subrounded fine to coarse gravel of limestone and siltstone.					
16.00 - 16.50 16.00 - 16.50	B D	39 40						16	16.00m to 16.50m; dark grey and brownish grey subangular and subrounded fine to coarse gravel of limestone and siltstone.					
16.50 - 16.81	SPT		50/160 mm (S)						Assumed zone of core loss.	16.50 (0.30)	-15.71			
17.00 - 17.25 16.50 - 17.50	B	41		70	0	0		17	Very dense dark grey to brownish grey sandy clayey GRAVEL with low cobble content. Gravel is subangular and subrounded fine to coarse of dark grey limestone siltstone and subrounded white calcite. Cobbles (<60mm x 100mm x 120mm) are subrounded of dark grey limestone. [GLACIAL DEPOSITS].	16.80	-16.01			
17.50 - 17.80	SPT		50/151 mm (S)						17.80m to 18.20m; assumed zone of core loss.	(1.40)				
18.20 - 18.55 17.50 - 19.00	B	42		53	0	0		18	Dark grey and brownish grey slightly clayey GRAVEL. Gravel is subangular to subrounded fine to coarse of dark grey limestone, brownish grey siltstone and possible schist. [GLACIAL DEPOSITS].	18.20 (0.35)	-17.41			
									Dark grey slightly clayey slightly sandy gravelly COBBLES. Gravel is subangular and subrounded medium to coarse of limestone. Cobbles (<80mm x 90mm x 120mm) are subrounded dark grey limestone with frequent calcite veins (<3mm). [GLACIAL DEPOSITS].	18.55 (0.45)	-17.76			
								19	18.93m to 19.00m; very clayey gravel.	19.00	-18.21			
19.40 - 19.70	B	43							Dark grey to brownish grey slightly clayey GRAVEL with low cobbles content. Gravel is subangular and subrounded fine to coarse of dark grey limestone, siltstone, white calcite and greenish grey possible schist. Cobbles are (<50mm x 65mm x 100mm) of subrounded dark grey limestone. [GLACIAL DEPOSITS].	(0.70)				
19.00 - 20.50				47	0	0			19.60m to 19.70m; very clayey gravel.	19.70	-18.91			
									Assumed zone of core loss.					
Continued next page														

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-03 Sheet 5 of 6 Status Preliminary
	Dublin Port Company		
	F211210		
	E718452.50 N734125.00	Ground Elevation (m Datum) 0.79	
Cable Percussion to Rotary Coring			

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
20.50 - 22.00				0	0	0		21		(3.05)				
22.00 - 22.75				0	0	0		22						
22.75 - 23.10	C	44	100 mm	100	15	0	-	23	Strong dark grey LIMESTONE. Fresh to slightly weathered. Predominately non-intact, recovered as angular and subangular medium to coarse gravel-sized fragments. Discontinuities; Set#1, bedding plane fractures, inclined (0-5°), very closely to closely spaced, vert tight to tight, planar and undulating, smooth, clean and with clay smears (<0.3mm). [LIMESTONE BEDROCK].	22.75	-21.96	[Limestone Bedrock Pattern]		
23.10 - 23.20							13			(0.75)				
23.20 - 23.25														
23.25 - 23.60							-							
23.60 - 23.70	C	45	280 mm	95	77	40	5	24	Strong dark grey locally grey LIMESTONE. Slightly weathered. Discontinuities; Set#1; bedding plane fractures, inclined (0-5°), very closely to closely spaced, planar and undulating, smooth and rough, tight, clean occasional to frequent clay smears and some orangish brown staining. [LIMESTONE BEDROCK]. 23.60m to 24.17m; partially non-intact along inclined (80-90°) calcite vein (<30mm).	23.50	-22.71	[Limestone Bedrock Pattern]		
23.70 - 23.80							-			(0.67)				
23.80 - 24.17							12							
24.17 - 24.32							-		Strong to very strong dark grey locally grey LIMESTONE. Fresh. Discontinuities; Set#1, bedding plane fractures, inclined (0-5°), very closely to medium spaced, planar and undulating, smooth and rough, very tight to partially open, clean and with occasional to frequent orangish brown staining occasional clay smears. Set#2, joints, inclined (70-80°), planar, smooth to rough, tight, clay smear. [LIMESTONE BEDROCK] 24.17m to 24.32m; non-intact. Recovered as angular and subangular medium to coarse	24.17	-23.38	[Limestone Bedrock Pattern]		
24.32 - 24.60														
24.32 - 24.67	8													
24.67 - 24.74							-							
24.74 - 24.93							10							

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-03
	Dublin Port Company		
	F211210		
	E718452.50 N734125.00	Ground Elevation (m Datum) 0.79	Sheet 6 of 6
	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
25.00 - 25.70									gravel-sized fragments. 24.67m to 24.74m; non-intact. Recovered as angular and subangular medium and coarse gravel-sized fragments. 24.93m to 25.00m; assumed zone of core loss.					
25.00 - 26.50				100	98	89		26						
26.05 - 26.40 25.70 - 26.50	C	46	350 mm				5	26						
26.50 - 26.74								20	26.60m to 26.72m; medium strong. Moderately weathered becoming distinctly weathered.	(4.83)				
26.86 - 27.04	C	47	180 mm					10	26.73m to 26.82m; 2 No. conjugated inclined (80-90°) calcite veins (<20mm).					
26.74 - 27.23								27						
26.50 - 28.00				100	86	47		30						
27.23 - 27.55								-						
27.55 - 27.59								10	27.55m to 27.59; non-intact. Recovered as dark grey slightly clayey angular and subangular fine to medium gravel-sized fragments.					
27.59 - 27.68								-	27.68m to 27.72; non-intact. Recovered as dark grey slightly clayey angular and subangular fine to medium gravel-sized fragments.					
27.68 - 27.72								11	27.90m to 28.28m; grey.					
27.72 - 28.00								28						
28.00 - 28.28								14						
28.28 - 28.50								27						
28.00 - 29.00				100	89	32								
28.64 - 29.04	C	48	410 mm					4						
28.50 - 29.00								29	28.90m to 29.00m; inclined (70-80°) joint.					
									End of Borehole at 29.00 m	29.00	-28.21			

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



	Contract Name	Dublin Port MP2_3FM			Location ID
	Client	Dublin Port Company			
	Fugro Reference	F211210			
	Coordinates (m)	E718452.50 N734125.00	Ground Elevation (m Datum)	0.79	Sheet 1 of 1
	Hole Type	Cable Percussion and Rotary Coring			Status

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214		0.50	0.00
1.50	S	0	N=13 (0,1/3,3,3,4)	450	AR3214		1.50	0.00
2.50	S	0	N=10 (2,1/2,3,3,2)	450	AR3214		2.50	0.00
3.50	S	0	N=4 (0,0/1,2,1,0)	450	AR3214		3.50	0.00
4.50	S	0	N=12 (3,2/2,2,4,4)	450	AR3214		4.50	0.00
5.50	S	0	N=2 (2,1/0,0,1,1)	450	AR3214		5.50	0.00
7.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214		7.50	0.00
8.50	S	0	N=17 (3,3/3,5,4,5)	450	AR3214		8.50	0.00
9.50	S	0	N=29 (8,7/7,8,7,7)	450	AR3214		9.50	0.00
10.50	S	0	N=25 (5,4/5,6,6,8)	450	AR3214		10.50	0.00
11.50	S	0	N=34 (3,4/6,7,9,12)	450	AR3214		11.50	0.00
12.50	S	0	N=43 (4,5/8,14,9,12)	450	AR3214		12.50	0.00
13.50	S	0	N=40 (8,8/8,9,10,13)	450	AR3214		13.50	0.00
14.50	S	0	N=50 (6,7/50 for 265mm)	415	AR3214		14.50	0.00
15.50	S	0	N=50 (3,8/50 for 245mm)	395	AR3214		15.50	0.00
16.50	S	0	N=50 (10,12/50 for 160mm)	310	AR3214		16.50	0.00
17.50	S	0	N=50 (10,11/50 for 151mm)	301	AR3214		17.50	0.00

In Situ Vane Test Results

In Situ Hand Penetrometer Results

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)	Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)	Test Depth (m)	PID Result (ppm)

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Dublin Port MP2_3FM			Location ID	3FM_BH-S-04
	Client	Dublin Port Company			Sheet 1 of 1	
	Fugro Reference	F211210				
	Coordinates (m)	E718454.50	N734150.50	Ground Elevation (m Datum)	0.33	
	Hole Type	Cable Percussion to Rotary Coring			Status	Preliminary

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	18.72	CP	06/11/2022	07/11/2022	Comacchio MCS1200, Pilcon Wayfarer			JW, SB, CR, AB	SI, FS	
18.72	28.90	RC	07/11/2022	07/11/2022	Comacchio MCS1200			JW, SB	SI, FS	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
06/11/2022	08:30	0.00	0.00		windy	18.72	19.50	W	100	Grey	00:05	18.72	19.50	102
06/11/2022	19:00	12.00	12.00		Good	19.50	20.00	W	100	Grey	00:04	19.50	20.00	102
06/11/2022	19:24	14.50	14.50			20.00	20.50	W	100	Grey	00:05	20.00	20.50	102
07/11/2022	06:35	16.50	16.50			20.50	21.00	W	100	Grey	00:03	20.50	21.00	102
07/11/2022	07:00	16.50	16.50			21.00	21.50	W	100	Grey	00:04	21.00	21.50	102
07/11/2022	11:50	18.72	18.50			21.50	22.00	W	100	Grey	00:03	21.50	22.00	102
07/11/2022	19:00	25.00	18.50			22.00	22.50	W	100	Grey	00:05	22.00	22.50	102
08/11/2022	08:00	25.00	18.50			22.50	23.00	W	100	Grey	00:04	22.50	23.00	102
08/11/2022	09:20	26.50	18.50			23.00	23.50	W	100	Black	00:10	23.00	23.50	102
08/11/2022	10:30	27.40	18.50			23.50	24.25	W	100	Black	00:30	23.50	24.25	102
08/11/2022	11:30	28.90	18.50			24.25	25.00	W	100	Black	00:25	24.25	25.00	102
08/11/2022	19:00	28.90	18.50			25.00	26.50	W	100	Black	00:27	25.00	26.50	102
						26.50	27.40	W	100	Black	00:35	26.50	27.40	102
						27.40	28.90	W	100	Black	00:35	27.40	28.90	102

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
12.00	200	10.90	200
16.50	200	15.00	200
18.72	200	18.20	200
25.00	146	18.50	200
28.90	146		

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
9.10	9.40	00:48	
10.90	11.20	01:00	
14.50	15.00	01:12	
16.90	17.20	01:00	
18.20	18.50	01:30	

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater observation not recorded over water.	Borehole advanced using cable percussion with sampling and standard penetration testing (SPT). Client instructed rotary switch at 18.72m. Borehole was terminated at 28.90m metres below mudline level.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	25.00	Grout	07/11/2022

Notes
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	Elevation Datum	Dublin Port Chart Datum	Grid Coordinate System	ITM
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW			Print Date	10/11/2022



Contract Name	Dublin Port MP2_3FM		Location ID
Client	Dublin Port Company		3FM_BH-S-04
Fugro Reference	F211210		
Coordinates (m)	E718454.50 N734150.50	Ground Elevation (m Datum)	0.33
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Sheet 1 of 6

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50	B	1							Very soft dark grey silty CLAY with strong putrid odour. [RECENT ESTUARINE DEPOSITS]					
0.50 - 0.95 0.50 - 0.95	D SPT	2	0/450 (S)							(1.50)				
1.00 - 1.50	B	3						1						
1.50 - 2.50	PS	4							Very soft black silty CLAY with strong hydrocarbon odour. [RECENT ESTUARINE DEPOSITS]	1.50	-1.17			
2.50 - 2.95 2.50 - 2.95	D SPT	5	0/450 (S)					2						
3.00 - 3.50	B	6						3		(3.40)				
3.50 - 4.50	PS	7												
4.50 - 4.95 4.50 - 4.95	D SPT	8	N = 11 (S)					4						
5.00 - 5.50	B	9							Dark grey and brownish grey slightly sandy	4.90	-4.57			

Continued next page

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID
Client	Dublin Port Company		3FM_BH-S-04
Fugro Reference	F211210		
Coordinates (m)	E718454.50 N734150.50	Ground Elevation (m Datum)	0.33
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Sheet 2 of 6

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
5.50 - 6.00	UT	10	8/500 mm						CLAY with strong putrid odour. Sand is fine. [ESTUARINE DEPOSITS]	(0.60)				
6.00 - 6.50	B	11						6	Soft brownish grey silty CLAY locally with occasional shell fragments (< 8mm x 5mm) and locally with rare wood fragments (<25mm x 10mm x 10mm)and with strong putrid odour. [ESTUARINE DEPOSITS]	5.50	-5.17			
6.50 - 6.95 6.50 - 6.95	D SPT	12	0/450 (S)						6.60m to 6.85m; occasional shell fragments (< 8mm x 5mm).	(2.50)				
7.00 - 7.50	B	13						7						
7.50 - 8.00	UT	14	16/500 mm						7.50m to 8.00m; rare wood fragments (<25mm x 10mm x 10mm).					
8.00 - 8.50	B	15						8	Firm grey CLAY with occasional wood fragments (<55mm x 40mm x 20mm) and with occasional pockets (< 80mm x 50mm x 30mm) of amorphous peat and strong putrid odour. [ESTUARINE DEPOSITS]	8.00	-7.67			
8.50 - 8.95 8.50 - 9.00 8.50 - 8.95	D B SPT	16 17	N = 41 (S)						8.00m to 8.50m; occasional pockets (<80mm x 50mm x 30mm) of amorphous peat.	(1.00)				
9.00 - 9.50	B	18						9	Dark grey slightly sandy GRAVEL with medium cobble content. Sand is coarse. Gravel is angular to rounded fine to coarse of limestone. Cobbles (<130mm x 100mm x 65mm) are subangular to rounded of limestone. [ESTUARINE DEPOSITS]	9.00	-8.67			
9.50 - 9.95 9.50 - 9.95	D SPT	19	N = 25 (S)							(1.00)				
10.00 - 10.50	B	20							Continued next page	10.00	-9.67			

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID
Client	Dublin Port Company		3FM_BH-S-04
Fugro Reference	F211210		
Coordinates (m)	E718454.50 N734150.50	Ground Elevation (m Datum)	0.33
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Sheet 3 of 6

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 10.80	UT B	21	100/300 mm						Firm dark grey slightly sandy slightly gravelly CLAY. Sand is medium. Gravel is angular to subrounded fine of limestone. [ESTUARINE DEPOSITS]	(0.50)				
10.50 - 11.00		22							Dark grey sandy GRAVEL. Sand is medium and coarse. Gravel is angular to subrounded fine and medium of limestone. [ESTUARINE DEPOSITS]	10.50	-10.17			
11.00 - 11.50	B	23					11			(1.00)				
11.50 - 11.95	D SPT	24	N = 47 (S)						Stiff dark grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of of limestone psammite and quartzite. [ESTUARINE DEPOSITS]	11.50	-11.17			
11.50 - 11.95														
12.00 - 12.50	B	25					12							
12.50 - 12.95	D SPT	26	N = 46 (S)											
12.50 - 12.95														
13.00 - 13.50	B	27					13							
13.50 - 13.95	D SPT	28	N = 40 (S)											
13.50 - 13.95														
14.00 - 14.50	B	29					14							
14.50 - 14.74	D SPT	30	50/95 mm (S)						14.50m to 14.74m; dark grey slightly sandy clayey gravel. Sand is fine to coarse. Gravel is fine and medium of limestone.					
14.50 - 14.74														
15.00 - 15.50	B	31												
									Continued next page	15.00	-14.67			

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID
Client	Dublin Port Company		3FM_BH-S-04
Fugro Reference	F211210		
Coordinates (m)	E718454.50 N734150.50	Ground Elevation (m Datum)	0.33
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Sheet 4 of 6

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
15.50 - 15.95	D	32	N = 47 (S)						Dark grey sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone psammite and quartzite. Cobbles (<100mm x 80mm) are angular fragments of dark grey limestone. [ESTUARINE DEPOSITS]	(0.50)				
15.50 - 15.95	SPT									Very stiff dark grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone psammite and quartzite. Cobbles (<100mm x 80mm) are angular of dark grey limestone. [ESTUARINE DEPOSITS]	(0.50)	-15.17		
16.00 - 16.50	B	33					16	Dark grey gravelly SAND with rare clay pockets (<30mmx40mm). Sand is fine to coarse. Gravel is angular to subrounded fine and medium of limestone psammite and siltstone. [ESTUARINE DEPOSITS]	(0.50)		-15.67			
16.50 - 16.88	D	34	50/230 mm (S)						Dark grey gravelly SAND with low cobble content and pockets of very stiff dark grey clay. Sand is medium and coarse. Gravel is subangular and subrounded fine to coarse of limestone. Cobbles (<170mm x 130mm x 120mm) are subrounded of limestone. [ESTUARINE DEPOSITS]	(0.50)		-16.17		
16.50 - 17.00	B	35												
16.50 - 16.88	SPT													
17.00 - 17.50	B	36					17			(1.00)				
17.50 - 17.95	D	37	N = 35 (S)						Dark grey sandy GRAVEL with pockets of stiff dark grey clay and with low cobble content. Sand is coarse. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles (<130mm x 110mm x 80mm) are subangular of limestone. [ESTUARINE DEPOSITS]	(0.50)		-17.17		
17.50 - 18.00	B	38												
18.00 - 18.50	B	39					18	Dark grey sandy GRAVEL with pockets of dark grey stiff clay. Sand is coarse. Gravel is subangular and subrounded fine to coarse of limestone and sandstone. [ESTUARINE DEPOSITS]	(0.50)		-17.67			
18.50 - 18.72	D	40	50/151 mm (S)						Stiff dark grey slightly sandy slightly gravelly CLAY. Sand is medium and coarse. Gravel is angular to subrounded fine and medium of limestone. [PORT CLAY]	(0.50)		-18.17		
18.50 - 18.72	SPT													
18.72 - 19.50				0	0	0	19			(1.17)				
19.50 - 19.67	D	41	50/100 mm (S)											
19.50 - 19.67	SPT													
19.50 - 20.00				0	0	0		Assumed zone of core loss.			-19.34			
Continued next page														

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM			Location ID	3FM_BH-S-04
Client	Dublin Port Company			Sheet 5 of 6	
Fugro Reference	F211210				
Coordinates (m)	E718454.50 N734150.50	Ground Elevation (m Datum)	0.33		
Hole Type	Cable Percussion to Rotary Coring			Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
20.00 - 20.50				0	0	0				(1.33)				
20.50 - 20.86	D SPT	42	50/210 mm (S)											
20.50 - 20.86														
20.50 - 21.00				0	0	0								
21.00 - 21.40	B	43						21	Dark grey slightly sandy clayey GRAVEL. Sand is fine and medium. Gravel is subangular to rounded fine to coarse of limestone, rare psammite, rare quartz and rare calcite. [GLACIAL DEPOSITS]	21.00	-20.67			
21.00 - 21.50				80	0	0			21.20m to 21.50m; stiff dark grey slightly sandy slightly gravelly clay. Sand is fine and medium. Gravel is fine and medium of limestone, rare calcite and rare quartz.					
21.50 - 21.80	B	44							21.40m to 21.50m; assumed zone of core loss.	(1.10)				
21.50 - 22.00				60	0	0			21.80m to 22.00m; assumed zone of core loss.					
								22	Assumed zone of core loss.	22.10	-21.77			
22.00 - 22.50				20	0	0								
22.50 - 22.74	D SPT	45	50/90 mm (S)							(0.95)				
22.50 - 22.74														
22.50 - 23.00				0	0	0								
								23	Dark grey slightly clayey slightly sandy GRAVEL. Sand is medium. Gravel is subangular and subrounded medium and coarse of limestone sandstone and amphibolite. [GLACIAL DEPOSITS]	23.05	-22.72			
23.00 - 23.50				90	18	0				(0.36)				
23.41 - 23.50	C	46	90 mm											
23.54 - 23.77	C	47	130 mm						Strong dark grey LIMESTONE with occasional inclined (60-70°) calcite veins (<3mm). Fresh. Discontinuities; Set#1, bedding plane fractures, inclined (0-10°), closely to medium spaced, planar and undulating, smooth, very tight, clean. [LIMESTONE BEDROCK]	23.41	-23.08			
23.41 - 23.90							12		23.41m to 23.90m; inclined (80°) calcite vein (<30mm).					
23.50 - 24.25				50	50	0			23.90m to 24.25m; assumed zone of core loss.					
								24						
24.36 - 24.48	C	48	120 mm							(1.77)				
24.25 - 25.00				100	96	47								
24.25 - 25.18							6							
Continued next page														

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-04
	Dublin Port Company		
	F211210		
	E718454.50 N734150.50	Ground Elevation (m Datum) 0.33	
	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater			
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation		
25.18 - 25.27							-	26	Medium strong dark grey to black LIMESTONE. Fresh locally distinctly weathered to destructured. Discontinuities; Set#1, bedding plane fractures, inclined (5-15°), very closely to medium spaced, planar, smooth, very tight, clean. [LIMESTONE BEDROCK] 25.18m to 25.27m; non-intact. Recovered as angular and subangular fine to coarse gravel-sized fragments. Possibly drilling disturbed distinctly weathered. 25.68m to 25.75m; non-intact. Recovered as angular and subangular fine to coarse gravel-sized fragments. Possibly drilling disturbed distinctly weathered. 25.83m to 26.03m; distinctly weathered to destructured with angular and subangular fine and medium gravel-sized lithorelicts. 26.40m to 26.50m; assumed zone or core loss.	25.18	-24.85					
25.27 - 25.68						10										
25.68 - 25.75				100	74	40	-									
25.75 - 25.83						17										
25.83 - 26.03						-										
26.03 - 26.37	C	49	340 mm													
26.03 - 26.40						4										
26.40 - 26.50																
26.50 - 26.86						14	27			Strong dark grey LIMESTONE with inclined (70-90°) calcite veins (<20mm). Fresh. Discontinuities; Set#1, bedding plane fractures, inclined (0-10°), very closely to closely spaced, planar and undulating, smooth and rough, tight, clean and with orangish brown staining. Set#2, joints, inclined (60-80°), planar, rough, tight and partly open with calcite mineralisation (<20mm). [LIMESTONE BEDROCK] 26.86m to 27.01m; non-intact. Recovered as subangular to subrounded medium and coarse gravel and cobble-sized fragments with calcite veins (<20mm).	26.50		-26.17			
26.86 - 27.01				100	51	0					-					
26.90 - 27.40	B	50	50 mm													
27.01 - 27.40						13										
27.40 - 27.67							15	28	Medium strong to strong dark grey to black locally grey LIMESTONE. Fresh locally moderately weathered. Discontinuities; Set#1, bedding plane fractures, inclined (0-10°), very closely spaced to medium spaced planar, smooth and rough, very tight, clean and with silt smear (<0.3mm) and clay smear (<0.5mm). Set#2, joints, inclined (40-50°), widely spaced, planar, smooth, very tight to tight, clean. [LIMESTONE BEDROCK] 27.40m to 27.60m; partially non-intact, possibly drilling induced. 27.60m to 27.66m; moderately weathered with development of extremely closely spaced bedding plane fractures. 28.10m to 28.11m; grey with frequent black speckling (<4mm x 2mm). 28.80m to 28.90m; assumed zone of core loss.	27.40	-27.07					
27.67 - 28.07																
27.40 - 28.21	C	52	140 mm	93	84	67	7									
27.40 - 28.90																
27.67 - 28.80								29	End of Borehole at 28.90 m	28.90	-28.57					
28.31 - 28.63	C	51	320 mm													

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-04
	Dublin Port Company		
	F211210		
	E718454.50 N734150.50	Ground Elevation (m Datum) 0.33	
	Cable Percussion and Rotary Coring		Status Preliminary

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	0.50	
2.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	2.50	
4.50	S	0	N=11 (0,3/4,5,1,1)	450	AR3214	54	4.50	
6.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	6.50	
8.50	S	0	N=41 (6,9/11,13,9,8)	450	AR3214	54	8.50	
9.50	S	0	N=25 (4,3/4,6,7,8)	450	AR3214	54	9.50	
11.50	S	0	N=47 (4,6/8,11,12,16)	450	AR3214	54	11.50	
12.50	S	0	N=46 (3,5/8,10,10,18)	450	AR3214	54	12.50	
13.50	S	0	N=40 (4,6/8,7,11,14)	450	AR3214	54	13.50	
14.50	S	0	N=50 (11,14/50 for 95mm)	245	AR3214	54	14.50	
15.50	S	0	N=47 (4,6/9,13,13,12)	450	AR3214	54	15.50	
16.50	S	0	N=50 (11,12/50 for 230mm)	380	AR3214	54	16.50	
17.50	S	0	N=35 (6,4/4,7,9,15)	450	AR3214	54	17.50	
18.50	S	0	N=50 (25 for 65mm/50 for 151mm)	216	AR3214	54	18.50	
19.50	S	0	N=50 (25 for 70mm/50 for 100mm)	170	AR3214	54	19.50	
20.50	S	0	N=50 (7,18/50 for 210mm)	360	AR3214	54	20.50	
22.50	S	0	N=50 (6,17/50 for 90mm)	240	AR3214	54	22.50	

In Situ Vane Test Results

In Situ Hand Penetrometer Results

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)	Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)	Test Depth (m)	PID Result (ppm)

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

FUGRO	Contract Name	Dublin Port MP2_3FM			Location ID	3FM_BH-S-05
	Client	Dublin Port Company			Sheet 1 of 1	
	Fugro Reference	F211210				
	Coordinates (m)	E718615.00 N734103.90	Ground Elevation (m Datum)	0.53		
	Hole Type	Cable Percussion to Rotary Coring			Status	Preliminary

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	17.42	CP	13/11/2022	14/11/2022	Comacchio MCS1200, Pilcon Wayfarer			JW, SB, CR, AB	OD, FS, PD	
17.00	29.40	RC	14/11/2022	14/11/2022	Comacchio MCS1200			JW, SB, CR, AB	OD, FS, PD	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
13/11/2022	15:30	0.00	0.00		Good	17.00	17.50	W	100	Grey	00:03	17.00	17.50	102
13/11/2022	18:30	7.50	7.50		Windy, Chilly	17.50	18.00	W	100	Grey	00:04	17.50	18.00	102
13/11/2022	19:00	7.50	7.50			18.00	18.50	W	100	Grey	00:04	18.00	18.50	102
14/11/2022	05:01	16.30	16.00			18.50	19.00	W	100	Grey	00:05	18.50	19.00	102
14/11/2022	07:45	16.00	16.00			19.00	19.50	W	100	Grey	00:05	19.00	19.50	102
14/11/2022	10:15	17.42	17.42			19.50	20.00	W	100	Grey	00:05	19.50	20.00	102
14/11/2022	18:30	26.00	17.00			20.00	20.50	W	100	Grey	00:05	20.00	20.50	102
14/11/2022	19:00	26.00	17.00			20.50	21.00	W	100	Grey	00:05	20.50	21.00	102
14/11/2022	21:24	29.40	17.00			21.00	21.50	W	100	Grey	00:05	21.00	21.50	102
						21.50	22.00	W	100	Grey	00:05	21.50	22.00	102
						22.00	22.50	W	100	Grey	00:06	22.00	22.50	102
						22.50	23.00	W	100	Grey	00:06	22.50	23.00	102
						23.00	23.50	W	100	Grey	00:07	23.00	23.50	102
						23.50	24.00	W	100	Grey	00:07	23.50	24.00	102
						24.00	24.50	W	100	Grey	00:06	24.00	24.50	102
						24.50	25.00	W	100	Grey	00:06	24.50	25.00	102
						25.00	25.50	W	100	Grey	00:06	25.00	25.50	102
						25.50	26.00	W	100	Grey	00:06	25.50	26.00	102
						26.00	26.50	W	100	Grey	00:06	26.00	26.50	102
						26.50	26.80	W	100	Grey	00:07	26.50	26.80	102
						26.80	28.10	W	100	Grey	00:16	26.80	28.10	102
						28.10	29.40	W	100	Grey	00:16	28.10	29.40	102

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
7.50	200	0.00	200
16.30	200	15.00	200
17.42	200	17.00	200
26.00	146		
29.40	146		

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
10.70	11.00	00:48	
15.40	16.00	02:00	
16.00	17.00	02:15	

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater observation not recorded over water.	Borehole advanced using cable percussion with sampling and standard penetration testing (SPT). Client instructed rotary switch at 17.00m. Borehole was terminated at 29.40m metres below mudline level.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date

Notes
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	Elevation Datum	Dublin Port Chart Datum	Grid Coordinate System	ITM
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Contract Name	Dublin Port MP2_3FM		Location ID
Client	Dublin Port Company		3FM_BH-S-05
Fugro Reference	F211210		
Coordinates (m)	E718615.00 N734103.90	Ground Elevation (m Datum)	0.53
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Sheet 1 of 6

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50	B	1							Dark grey slightly clayey sandy GRAVEL with rare shell fragments (<20mm x 12mm) and strong hydrocarbon odour. Sand is fine and medium. Gravel is rounded medium and coarse of sandstone limestone and mudstone. [POSSIBLE MADE GROUND]	(0.50)				
0.50 - 0.95	D	2	N = 10 (S)						Loose dark grey and grey sandy GRAVEL with strong hydrocarbon odour. Sand is fine to coarse. Gravel is subangular to rounded fine and medium of limestone sandstone quartz calcite and siltstone. [POSSIBLE MADE GROUND]	0.50	0.03			
0.50 - 1.00	B	3								(0.50)				
0.50 - 0.95	SPT													
1.00 - 1.50	B	4						1	Grey gravelly SAND with frequent shells (<45mm x 30mm) and frequent shell fragments (<25mm x 20mm). Sand is fine and medium. Gravel is angular to subrounded fine and medium of mixed lithologies including sandstone limestone quartz and siltstone. [POSSIBLE MADE GROUND]	1.00	-0.47			
1.50 - 1.95	D	5	N = 5 (S)						Loose grey slightly silty SAND with frequent shells (<30mm x 20mm) and frequent shell fragments (<20mm x 10mm). Sand is fine and medium. [POSSIBLE MADE GROUND]	1.50	-0.97			
1.50 - 2.00	B	6								(0.50)				
1.50 - 1.95	SPT													
2.00 - 2.50	B	7						2	Soft greyish brown slightly gravelly sandy CLAY with some shell fragments (<30mm x 20mm) and moderate sulphurous odour. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of limestone and sandstone. [ESTUARINE DEPOSITS]	2.00	-1.47			
2.50 - 3.50	B	9	0/450 (S)						Soft greyish brown sandy silty CLAY with strong sulphurous odour. Sand is fine. [ESTUARINE DEPOSITS]	2.50	-1.97			
2.50 - 3.50	PS	8								(1.00)				
									3					
3.50 - 3.95	D	10							Soft greyish brown slightly sandy silty CLAY with rare shell fragments (<5mm x 3mm) and strong sulphurous odour. Sand is fine. [ESTUARINE DEPOSITS]	3.50	-2.97			
3.50 - 3.95	SPT													
4.00 - 4.50	B	11						4						
4.50 - 5.50	B	13												
4.50 - 5.50	PS	12								(2.50)				
Continued next page														

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-05
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)	E718615.00 N734103.90	Ground Elevation (m Datum) 0.53	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
5.50 - 5.95 5.50 - 5.95	D SPT	14	0/450 (S)											
6.00 - 6.50 6.00 - 6.50	B D	16 15						6	Soft greyish brown silty CLAY. [ESTUARINE DEPOSITS]	6.00 (0.50)	-5.47			
6.50 - 7.50	PS	17						7	Very soft and soft, locally firm, greyish brown slightly sandy silty CLAY with some shell fragments (<3mm x 50mm). Sand is fine. [ESTUARINE DEPOSITS].	6.50	-5.97			
7.50 - 8.00 7.50 - 8.00	B D	19 18												
8.00 - 8.45 8.00 - 8.45	D SPT	20	0/450 (S)					8	8.00m to 8.45m; firm locally fissured.					
8.50 - 9.00 8.50 - 9.00	B D	21 22												
9.00 - 9.20 9.00 - 9.50	PS B	23 24						9	Very soft brownish grey gravelly silty CLAY with low cobble content. Gravel is subangular and angular medium to coarse of limestone. Cobbles (<60mm x 80mm x 110mm) are subangular of dark grey limestone. [ESTUARINE DEPOSITS].	9.00 (0.50)	-8.47			
9.50 - 10.00	B	25							Dense dark brown and grey silty sandy GRAVEL with low to medium cobble content, becoming sandy gravelly CLAY with depth. Sand is fine to coarse. Gravel is subangular and subrounded, elongated, fine to coarse of limestone, siltstone and sandstones. Cobbles (<30mm x 80mm x 80mm) are of limestone.	9.50	-8.97			
10.00 - 10.45 10.00 - 10.45	D SPT	26	N = 31 (S)						Continued next page					

Notes
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM			Location ID 3FM_BH-S-05
Client	Dublin Port Company			
Fugro Reference	F211210			
Coordinates (m)	E718615.00 N734103.90	Ground Elevation (m Datum)	0.53	
Hole Type	Cable Percussion to Rotary Coring			Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 11.00	B	27							[ESTUARINE DEPOSITS].	(1.50)				
10.50 - 11.00	D	28						10.70m to 11.00m; sandy gravelly clay						
11.00 - 11.45	D	29	N = 39 (S)					11	Very stiff to stiff dark brownish grey fissured slightly sandy silty CLAY. Sand is fine to coarse, predominately fine. [PORT CLAY]. 11.00m to 11.45m; slightly gravelly. Gravel is subangular and rounded fine of limestone.	11.00	-10.47			
11.00 - 11.45	SPT													
11.50 - 12.00	B	30												
11.50 - 12.00	D	31												
12.00 - 12.45	D	32	N = 21 (S)					12	12.00m to 12.45m; firm to stiff.	(1.50)				
12.00 - 12.45	SPT													
12.50 - 13.00	B	33							Soft and firm gravelly CLAY. Gravel is subangular to subrounded fine to coarse of limestone. [PORT CLAY].	12.50	-11.97			
13.00 - 13.50	UT	34	92/500 mm					13	Very stiff dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of dark grey limestone. [PORT CLAY].	(0.50)				
13.50 - 14.00	B	35												
14.00 - 14.45	D	36	N = 28 (S)					14		13.00	-12.47			
14.00 - 14.45	SPT													
14.50 - 15.00	B	37								(3.00)				
15.00 - 15.42	D	38	50/265 mm (S)											
15.00 - 15.42	SPT								Continued next page					

Notes
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-05
	Dublin Port Company		
	F211210		
	E718615.00 N734103.90	Ground Elevation (m Datum) 0.53	Sheet 4 of 6
	Cable Percussion to Rotary Coring	Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
15.50 - 16.00	B	39												
16.00 - 16.30 16.00 - 16.50 16.00 - 16.30	D B SPT	40 41	50/190 mm (S)					16	Very dense brown silty gravelly SAND with pockets (<90mm x 50mm x 30mm) of silty clay. Sand is medium and coarse. Gravel is angular to subrounded fine to coarse of limestone. [GLACIAL DEPOSITS]	16.00	-15.47			
16.50 - 17.00	B	42								(1.00)				
17.00 - 17.42 17.00 - 17.42	D SPT	43	50/270 mm (S)					17	Assumed zone of core loss.	17.00	-16.47			
17.00 - 17.50				0	0	0				(0.50)				
17.50 - 18.00 17.80 - 17.90	D	44	100 mm	80	0	0			Very dense dark brown slightly sandy very clayey GRAVEL. Sand is medium and coarse. Gravel is subangular and subrounded fine to coarse of limestone. [GLACIAL DEPOSITS]	17.50	-16.97			
18.00 - 18.29 18.00 - 18.29	D SPT	45	50/140 mm (S)					18	Assumed zone of core loss.	17.90	-17.37			
18.00 - 18.50				0	0	0				(0.60)				
18.70 - 18.80 18.50 - 19.00	D	46		82	0	0			Very dense dark brown slightly sandy clayey GRAVEL with low cobble content. Sand is medium and coarse. Gravel is subangular and subrounded fine to coarse of limestone. Cobbles (<90mm x 75mm x 65mm) are subangular of limestone. [GLACIAL DEPOSITS]	18.50	-17.97			
19.00 - 19.42 19.00 - 19.42	D SPT	47	50/270 mm (S)					19	Assumed zone of core loss.	18.91	-18.38			
19.00 - 19.50				0	0	0				(0.59)				
19.70 - 19.80 19.50 - 20.00	D	48		100	0	0			Dark brownish grey slightly sandy very clayey GRAVEL with low cobble content. Sand is medium and coarse. Gravel is subangular and subrounded fine to coarse of limestone. Cobbles (<100mm x 75mm x 50mm) are subrounded of limestone. [GLACIAL DEPOSITS]	19.50	-18.97			
20.00 - 20.45 20.00 - 20.45	D SPT	49	N = 39 (S)						Continued next page	20.00	-19.47			

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-05
	Dublin Port Company		
	F211210		
	E718615.00 N734103.90	Ground Elevation (m Datum) 0.53	Sheet 5 of 6
	Cable Percussion to Rotary Coring	Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
20.00 - 20.50				0	0	0			Assumed zone of core loss.	(0.50)				
20.70 - 20.83 20.50 - 21.00	D	50		66	0	0		21	Dark brownish grey slightly sandy clayey GRAVEL. Sand is medium and coarse. Gravel is subangular to rounded fine to coarse of limestone. [GLACIAL DEPOSITS]	(0.33)	-19.97			
21.00 - 21.36 21.00 - 21.36	D SPT	51	50/210 mm (S)						Assumed zone of core loss.	(0.67)	-20.30			
21.00 - 21.50				0	0	0								
21.60 - 21.70 21.50 - 22.00	D	52	100 mm					22	Dark brownish grey slightly sandy clayey GRAVEL. Sand is medium and coarse. Gravel is subangular to rounded fine to coarse of limestone. [GLACIAL DEPOSITS]	(0.50)	-20.97			
22.00 - 22.45 22.00 - 22.45	D SPT	53	N = 40 (S)						Assumed zone of core loss.	(0.50)	-21.47			
22.00 - 22.50				0	0	0								
22.60 - 22.70 22.50 - 23.00	D	54		80	0	0		23	Dark brownish grey slightly sandy clayey GRAVEL. Sand is medium and coarse. Gravel is subangular to rounded fine to coarse of limestone and sandstone. [GLACIAL DEPOSITS]	(0.40)	-21.97			
23.00 - 23.38 23.00 - 23.38	D SPT	55	50/230 mm (S)						Assumed zone of core loss.	(0.60)	-22.37			
23.00 - 23.50				0	0	0								
23.60 - 23.70 23.50 - 24.00	D	56		60	0	0		24	Very dense dark brownish grey slightly clayey slightly sandy GRAVEL. Sand is medium. Gravel is angular to subrounded medium and coarse of limestone. [GLACIAL DEPOSITS]	(0.30)	-22.97			
24.00 - 24.40 24.00 - 24.40	D SPT	57	50/250 mm (S)						Assumed zone of core loss.	(0.70)	-23.27			
24.00 - 24.50				0	0	0								
24.50 - 24.60 24.50 - 25.00	D	58		54	0	0		24	Very dense dark grey slightly clayey slightly sandy GRAVEL. Sand is fine. Gravel is subangular coarse of limestone. [GLACIAL DEPOSITS]	(0.27)	-23.97			
25.00 - 25.39 25.00 - 25.39	D SPT	59	50/240 mm (S)						Assumed zone of core loss.	(0.70)	-24.24			
Continued next page														


Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-05
	Dublin Port Company		
	F211210		
	E718615.00 N734103.90	Ground Elevation (m Datum) 0.53	Sheet 6 of 6
	Cable Percussion to Rotary Coring	Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
25.00 - 25.50				0	0	0				(1.23)				
25.50 - 26.00				0	0	0								
26.00 - 26.38 26.00 - 26.38	D SPT	60	50/226 mm (S)					26	Very dense dark grey slightly clayey slightly sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of limestone, sandstone and schist. Cobbles (<40mm x 60mm x 140mm) are subangular and subrounded of limestone and green schist. [GLACIAL DEPOSITS]	26.00	-25.47			
26.00 - 26.50				100	0	0				(0.80)				
26.50 - 26.80 26.50 - 26.80	B	61		100	0	0				26.80	-26.27			
26.80 - 27.09							14	27	Medium strong to strong dark grey LIMESTONE locally with some crinoids fragments (<2mm). Fresh locally slightly weathered. Discontinuities; Set#1, bedding plane fractures, inclined (20-30°), very closely to closely spaced, planar, undulating and stepped, smooth and rough, very tight to partially open, clean locally infilled with clay (<0.5mm), and occasional to frequent clay smears (<0.3mm). [LIMESTONE BEDROCK] 27.09m to 27.20m; distinctly weathered with very closely spaced bedding plane fractures to non-intact recovered as angular fine to medium gravel-sized fragments.	(1.30)				
26.80 - 28.10 27.20 - 28.10				100	86	55	4							
27.87 - 28.08	C	62	210 mm					28	27.87m to 28.10m; some crinoids fragments (<2mm).	28.10	-27.57			
28.10 - 29.06 28.73 - 28.99 28.10 - 29.40	C	63	260 mm	100	79	54	6	29	Strong dark grey mottled grey LIMESTONE with abundant crinoids fragments (<2mm) some shell fragments (<2mm x 10mm) occasional possible grey burrow (<30mm x 45mm) and occasional calcite veins (<2mm) and rare incipient fractures. Fresh. Discontinuities; Set#1, bedding plane fractures, inclined (0 to 20°), very closely to medium spaced, planar, rough, very tight, clean. Set#2; joints, inclined (50-60°), widely spaced, planar, smooth and rough, very tight, clean. [LIMESTONE BEDROCK] 28.46m to 28.62m; some and frequent stylolites.	(1.30)				
29.06 - 29.13 29.13 - 29.24 29.24 - 29.40							-		29.06m to 29.13m; non-intact. Recovered as angular and subangular fine to coarse gravel-sized fragments.	29.40	-28.87			
							9		29.12m to 29.26m; inclined (80-90°) bifurcating calcite vein (<3mm).					
							-		29.24m to 29.40m; non-intact. Recovered as angular and subangular fine to coarse gravel-sized fragments.					
									End of Borehole at 29.40 m					

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		Dublin Port MP2_3FM			Location ID	
	Client		Dublin Port Company			3FM_BH-S-06	
	Fugro Reference		F211210				
	Coordinates (m)		E718621.80 N734133.30	Ground Elevation (m Datum)		-1.05	Sheet 1 of 1
	Hole Type		Cable Percussion to Rotary Coring			Status	Preliminary

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	17.00	CP	12/11/2022	13/11/2022	Comacchio MCS1200, Pilcon Wayfarer			JW, SB	FS, OD, PD	
17.00	28.80	RC	13/11/2022	13/11/2022	Comacchio MCS1200			CR, SB	PD/FS/OD	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
12/11/2022	08:00	0.00	0.00		Dry Windy	17.00	17.50	W	80	Grey	00:08	17.00	17.50	102
12/11/2022	18:30	12.95	12.95		Dry Windy	17.50	19.00	W	100	Grey	00:13	17.50	19.00	102
12/11/2022	19:16	12.50	12.50			19.00	20.50	W	100	Grey	00:11	19.00	20.50	102
13/11/2022	01:25	17.00	17.00			20.50	22.00	W	100	Grey	00:14	20.50	22.00	102
13/11/2022	05:17	28.80	17.00			22.00	22.75	W	100	Grey	00:06	22.00	22.75	102
						22.75	23.50	W	100	Grey	00:05	22.75	23.50	102
						23.50	24.25	W	100	Grey	00:06	23.50	24.25	102
						24.25	25.00	W	100	Grey	00:07	24.25	25.00	102
						25.00	26.50	W	100	Black	00:14	25.00	26.50	102
						26.50	28.00	W	100	Black	00:16	26.50	28.00	102
						28.00	28.80	W	100	Black	00:08	28.00	28.80	102

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
12.95	200	8.00	200
17.00	200	16.30	200
28.80	146	17.00	200

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
8.00	8.30	01:00	
15.20	15.50	01:00	
16.30	16.50	00:30	

Water Strike					Water Added	
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater observation not recorded over water.	Borehole advanced using cable percussion with sampling and standard penetration testing (SPT). Client instructed rotary switch at 17.00m. Borehole was terminated at 28.80m metres below mudline level.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date

Notes
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	Elevation Datum	Dublin Port Chart Datum	Grid Coordinate System	ITM
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Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-06
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)	E718621.80 N734133.30	Ground Elevation (m Datum) -1.05	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater			
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.00 - 0.50	B	1							Very soft black slightly sandy silty CLAY with strong sulphurous odour. Sand is fine. [RECENT ESTUARINE DEPOSITS].						
0.50 - 0.95	D	2													
0.50 - 1.50	B	3	0/450 (S)												
0.50 - 0.95	SPT														
1.50 - 2.50	B	5													
1.50 - 2.50	PS	4									(3.50)				
2.50 - 2.95	D	6													
2.50 - 3.50	B	7	0/450 (S)												
2.50 - 2.95	SPT														
3.50 - 4.50	B	9								Soft black sandy silty CLAY with frequent plant rootlets (<50mm x 2mm) and moderate hydrocarbon odour. Sand is fine. [RECENT ESTUARINE DEPOSITS]					
3.50 - 4.50	PS	8									3.50	-4.55			
4.50 - 4.95	D	10													
4.50 - 5.50	B	11	0/450 (S)												
4.50 - 4.95	SPT														
									Continued next page	(3.00)					

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM		Location ID 3FM_BH-S-06
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)	E718621.80 N734133.30	Ground Elevation (m Datum) -1.05	
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
5.50 - 6.50	B	13							5.50m to 6.50m; slightly sandy.					
5.50 - 6.50	PS	12												
6.50 - 6.95	D	14	0/450 (S)					6						
6.50 - 7.50	B	15								6.50	-7.55			
6.50 - 6.95	SPT									(0.50)				
7.50 - 7.95	D	16	N = 46 (S)					7	Dense dark grey slightly clayey sandy GRAVEL with low cobble content. Sand is medium and coarse. Gravel is angular to subrounded fine to coarse of limestone. Cobbles (<120mm x 75mm x 30mm) are subangular of limestone sandstone and calcite. [ESTUARINE DEPOSITS]					
7.50 - 8.00	B	17								7.00	-8.05			
7.50 - 7.95	SPT									(1.00)				
8.00 - 8.50	B	18						8	Dense grey sandy GRAVEL with medium cobble content. Sand is medium and coarse. Gravel is subangular to rounded fine to coarse of limestone, sandstone, quartz, calcite and green schist. Cobbles (<110mm x 110mm x 50mm) are subangular and subrounded fine to coarse of limestone and sandstone. [ESTUARINE DEPOSITS]					
8.50 - 8.95	D	19	N = 35 (S)							8.00	-9.05			
8.50 - 9.00	B	20								(0.50)				
8.50 - 8.95	SPT									8.50	-9.55			
										(0.50)				
9.00 - 9.50	B	21						9	8.90m to 8.95m; firm dark brown clay. Stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular fine of limestone and sandstone. [ESTUARINE DEPOSITS]					
										9.00	-10.05			
9.50 - 10.00	B	23	N = 45 (S)											
9.50 - 9.95	D	22									9.50		-10.55	
9.50 - 9.95	SPT									(0.50)				
10.00 - 10.50	B	24												
										(1.00)				

Notes
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	Dublin Port MP2_3FM			Location ID	3FM_BH-S-06
Client	Dublin Port Company			Sheet 3 of 6	
Fugro Reference	F211210				
Coordinates (m)	E718621.80 N734133.30	Ground Elevation (m Datum)	-1.05		
Hole Type	Cable Percussion to Rotary Coring			Status	Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Groundwater					
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation			
10.50 - 10.95	D	25	N = 16 (S)					11	Firm brown slightly sandy silty CLAY. [ESTUARINE DEPOSITS]	10.50	-11.55						
10.50 - 11.00	B	26															
10.50 - 10.95	SPT																
11.50 - 12.00	UT	27	82/600 mm							(1.50)							
12.00 - 12.50	B	28						12	11.85m to 11.95m; gravelly. Firm to stiff dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular and subangular fine and medium of limestone and sandstone. [PORT CLAY]	12.00	-13.05						
12.50 - 12.95	D	29	N = 36 (S)						12.50m to 12.95m; stiff.	(1.50)							
12.50 - 12.95	SPT																
13.00 - 13.50	B	30						13									
13.00 - 13.50	D	31															
13.50 - 13.95	SPT																
13.50 - 13.95	D	32	N = 48 (S)						Very stiff dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded, locally elongated, fine to coarse of dark grey limestone, brown sandstone and metamorphic. [PORT CLAY]	13.50	-14.55						
14.00 - 14.50	B	33						14									
14.50 - 14.85	D	34	50/200 mm (S)						14.50m to 14.85m; slightly gravelly coarse sand.								
14.50 - 14.85	SPT																
15.00 - 15.50	B	35							Continued next page								

Notes
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Contract Name	Dublin Port MP2_3FM			Location ID 3FM_BH-S-06
Client	Dublin Port Company			
Fugro Reference	F211210			
Coordinates (m)	E718621.80 N734133.30	Ground Elevation (m Datum)	-1.05	
Hole Type	Cable Percussion to Rotary Coring			Status Preliminary

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
15.50 - 15.74	D	36	50/95 mm (S)						15.50m to 15.74m; sandy gravel. Sand is medium to coarse. Gravel is subangular and subrounded fine to medium of limestone, siltstone sandstone and possible schist.	(3.50)				
15.50 - 15.74	SPT													
16.00 - 16.50	B	37						16						
16.50 - 16.84	D	38	50/185 mm (S)						16.50m to 17.00m; slightly gravelly.					
16.50 - 17.00	B	39												
16.50 - 16.84	SPT													
17.00 - 17.30	B	40						17	Very dense dark grey to brownish grey sandy clayey GRAVEL with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded of fine to coarse of dark grey limestone and brownish grey siltstone. Cobbles (<50mm x 80mm x 90mm) are subrounded and rounded of dark grey limestone [GLACIAL DEPOSITS].	17.00	-18.05			
17.00 - 17.50				100	0	0				(0.50)				
17.30 - 18.00	B	41						18	Dark grey and brownish grey clayey gravelly COBBLES. Gravel is subangular to subrounded of medium to coarse of dark grey and grey limestone, brownish grey brown siltstone and green schist. Cobbles (<70mm x 80mm x 120mm) are subrounded of dark grey limestone with some calcite veins (<5mm) [GLACIAL DEPOSITS]	17.50	-18.55			
17.50 - 19.00				80	0	0			18.70m to 19.00m; assumed zone of core loss.	(1.97)				
19.50 - 19.90	B	42						19	19.30m to 19.47m; 1 No. subrounded cobble (<60mm x 90mm x 170mm) of very strong dark grey limestone with occasional subhorizontal calcite veins (<2mm). Fresh.	19.47	-20.52			
19.00 - 20.50				60	0	0			Dark grey to brownish grey sandy clayey GRAVEL with low cobble content. Sand is fine to coarse. Gravel is subangular to rounded, locally elongated, fine to coarse of limestone siltstone calcite and metamorphic. Cobbles (<60mm x 90mm x 170mm) are subrounded	(0.43)				
									Continued next page	19.90	-20.95			

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Contract Name	Dublin Port MP2_3FM		Location ID
Client	Dublin Port Company		3FM_BH-S-06
Fugro Reference	F211210		
Coordinates (m)	E718621.80 N734133.30	Ground Elevation (m Datum)	-1.05
Hole Type	Cable Percussion to Rotary Coring		Status Preliminary

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Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
20.50 - 22.00				29	0	0		21	and rounded of very strong and strong dark grey limestone [GLACIAL DEPOSITS]. Assumed zone of core loss	(0.60)				
								21	Dark grey to brownish grey sandy clayey GRAVEL. Gravel is subangular to rounded, locally elongated, of fine to coarse of limestone siltstone calcite and metamorphic. [GLACIAL DEPOSITS]	20.50 (0.43)	-21.55			
22.00 - 22.75				0	0	0		22	Assumed zone of core loss.	20.93 (1.82)	-21.98			
								22						
22.75 - 23.15	B	43						23	Dark grey to brownish grey slightly clayey GRAVEL. Gravel is subangular to rounded, locally elongated, fine to coarse of limestone siltstone, calcite and metamorphic, possibly schist. [GLACIAL DEPOSITS].	22.75 (0.40)	-23.80			
								23	Assumed zone of core loss	23.15 (1.10)	-24.20			
23.50 - 24.25				0	0	0		24						
								24						
24.25 - 24.65	B	44						24	Dark grey to brownish grey slightly clayey GRAVEL. Gravel is subangular to rounded of fine to coarse of limestone siltstone and metamorphic, possible schist. [GLACIAL DEPOSITS].	24.25 (0.75)	-25.30			
								24						
24.25 - 25.00				100	0	0				25.00 (0.75)	-26.05			
Continued next page														

Notes
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Contract Name Client Fugro Reference Coordinates (m) Hole Type	Dublin Port MP2_3FM		Location ID 3FM_BH-S-06 Sheet 6 of 6 Status Preliminary
	Dublin Port Company		
	F211210		
	E718621.80 N734133.30	Ground Elevation (m Datum) -1.05	
Cable Percussion to Rotary Coring			

Depth (m)	Sampling and In Situ Testing			Core Recovery				Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)						Water Strike	Backfill / Installation
25.00 - 25.15	C	45	150 mm	100	47	33	-	Strong to very strong locally medium strong dark grey locally mottled grey LIMESTONE. Fresh to slightly weathered, locally distinctly weathered. Discontinuities, Set#1; bedding plane fractures, inclined (0-30°), very closely to medium spaced, planar and undulating, smooth and rough, very tight to tight, clean and with clay (<2mm) and calcite infill (<5mm) some to frequent clay smears. Set#2, joints, inclined (60-90°), planar, undulating and rough, very tight and tight, clean. [LIMESTONE BEDROCK]	(3.80)					
25.15 - 25.38							9							
25.57 - 25.72							20							
25.51 - 25.90							26							
25.00 - 26.50							9							
26.30 - 26.50							-							
26.60 - 26.70							2							
26.70 - 26.80							-							
26.80 - 26.85							5							
26.85 - 27.28							9							
26.50 - 28.00	C	46	190 mm	100	74	55	-	25.00m to 25.15m; non-intact. Recovered as angular and subangular medium and coarse gravel and cobble-sized fragments. 25.38m to 25.51m; moderately weak. Distinctly weathered to destructured with angular and subangular fine to coarse gravel-sized fragments, locally moderately weathered with inclined (70-80°) calcite veins (<8mm). 25.50m to 25.73m; inclined (70-80°) calcite vein (<10mm). 25.84m to 25.90m; inclined (50°) calcite vein (<20mm). 25.90m to 26.30m; moderately weak. Distinctly weathered to destructured with angular and subangular fine to coarse gravel-sized fragments and locally clayey. 26.30m to 26.50m; moderately weak. Moderately weathered. 26.50m to 26.60m; assumed zone of core loss. 26.60m to 26.70m; non-intact. Recovered a coarse gravel to cobble-sized fragments. 26.80m to 26.85m; non-intact. Recovered as angular fine to coarse gravel-sized fragments. 26.85m to 27.28m; inclined (0-10°) drilling induced fractures associated with inclined (85-90°) calcite vein. 27.00m to 27.28m; incline (85-90°) calcite vein (<5mm). 27.28m to 27.35m; non-intact. Recovered as clayey angular to subangular fine and medium gravel-sized fragments. 27.43m to 27.48m; non-intact.						
27.28 - 27.35							9							
27.35 - 27.43							-							
27.43 - 27.48							28							
27.81 - 28.00	C	47	230 mm	100	89	43	9	28.00m to 28.30m; partially non-intact due to bedding plane fractures associated with inclined (60-90°) joint. 28.00m to 28.50m; some inclined (70-80°) calcite veins (<3mm).						
27.48 - 28.80							-							
28.00 - 28.80							29							
28.57 - 28.80	End of Borehole at 28.80 m								28.80	-29.85				

Notes
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Contract Name	Dublin Port MP2_3FM		
Client	Dublin Port Company		
Fugro Reference	F211210		
Coordinates (m)	E718621.80 N734133.30	Ground Elevation (m Datum)	-1.05
Hole Type	Cable Percussion and Rotary Coring		

Location ID	3FM_BH-S-06
Sheet 1 of 1	
Status	Preliminary

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	0.50	0.00
2.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	2.50	0.00
4.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	4.50	0.00
6.50	S	0	N=0 (0,0/0,0,0,0)	450	AR3214	54	6.50	0.00
7.50	S	0	N=46 (7,12/11,11,13,11)	450	AR3214	54	7.50	0.00
8.50	S	0	N=35 (8,13/7,8,8,12)	450	AR3214	54	8.50	0.00
9.50	S	0	N=45 (3,5/8,10,11,16)	450	AR3214	54	9.50	0.00
10.50	S	0	N=16 (3,2/3,5,3,5)	450	AR3214	54	10.50	0.00
12.50	S	0	N=36 (3,4/7,7,10,12)	450	AR3214	54	12.50	0.00
13.50	S	0	N=48 (6,6/8,10,12,18)	450	AR3214	54	13.50	0.00
14.50	S	0	N=50 (8,10/50 for 200mm)	350	AR3214	54	14.50	0.00
15.50	S	0	N=50 (25 for 140mm/50 for 95mm)	235	AR3214	54	15.50	0.00
16.50	S	0	N=50 (10,12/50 for 185mm)	335	AR3214	54	16.50	0.00

In Situ Vane Test Results

In Situ Hand Penetrometer Results

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)	Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)	Test Depth (m)	PID Result (ppm)

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