Appendix J.3
Preliminary Design Report
Non TII Retaining Walls

Tallaght / Clondalkin to City Centre Core Bus Corridor Scheme Non TII Retaining Walls Preliminary Design Report

BCIDA–ACM-STR_ZZ–0809_XX_00–RP–CB–0002

Client – National Transport Authority
Stage – Stage 2

Project Reference: BusConnects Package A
Project Number: 60599123
BCIDA – ACM - STR_ZZ – 0809_XX_00 – RP – CB – 0002

Date (9th March 2022)

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
L01	09/03/22	Issue for Approval	NR	Niamh Rodgers	Regional Director

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Preliminary Design Report – Consultation

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Categories 1, 2 & 3

Scheme

Name and Location BusConnects – CBC 00708 Clondalkin/Tallaght to City Centre

Structures(s)

Name and nature of the Structure(s) RW01 Calmount Road Retaining Wal No.1; RW02 Calmount Road Retaining Wall No.2; RW03 Long Mile Road Retaining Wall; RW04 Naas Road Retaining Wal No.1; RW05 Naas Road Retaining Wall No.2

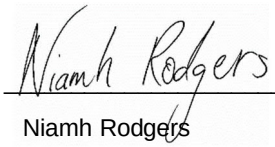
Preliminary Design Report

Reference BCIDA–ACM-STR_ZZ–0809_XX_00–RP–CB–0002

Revision L01

Date 09 / 03 / 2022

Submitted by

Signed 

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Date 09 / 03 / 2022

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1. Introduction

1.1. Brief

The BusConnects Dublin – Core Bus Corridor (CBC) Infrastructure Works (herein after called the CBC Infrastructure Works) involves the development of continuous bus priority infrastructure and improved pedestrian and cycling facilities on twelve radial core corridor schemes in the Greater Dublin Area.

The National Transport Authority (NTA) have appointed AECOM in a joint venture with Mott MacDonald to undertake the design of the infrastructure works for Package A of the BusConnects Programme. Package A includes the following three CBC routes:

Clongriffin to City Centre Core Bus Corridor Scheme;

Lucan to City Centre Core Bus Corridor Scheme; and

Tallaght/Clondalkin to City Centre Core Bus Corridor Scheme.

Each route contains several bridge structures and retaining walls with various structural forms. As part of the scope AECOM have agreed to take all structures through the *Technical Acceptance of Road Structures on Motorways and Other National Roads* procedure as outlined in DN-STR-03001.

This Preliminary Design Report (PDR) will focus on a family of retaining walls which will be found along the Tallaght/Clondalkin to City Centre BusConnects scheme. These walls will be located along Calmount Road, Long Mile Road, and Naas Road. The PDR is a deliverable at Phase 4 of the Technical Acceptance process.

This PDR refers to the following retaining walls:

RW01 Calmount Road Retaining Wall No.1

RW02 Calmount Road Retaining Wall No.2

RW03 Long Mile Road Retaining Wall

RW04 Naas Road Retaining Wall No.1

RW05 Naas Road Retaining Wall No.2

These retaining walls are required due to proposed changes to the existing road alignments and existing cross-sectional widths to meet the objectives of the CBC infrastructures works.

1.2. Background Information

BusConnects plans to transform Dublin's bus and cycle network, with an aim of increasing the attractiveness of public transport and cycling encouraging a modal shift from private car. The scheme consists of twelve radial Core Bus Corridor's (CBC), which will be supplemented at a later stage with a network of orbital corridors. Overall the scheme will provide 230kms of continuous bus priority lanes and 200kms of cycle tracks/lanes throughout Dublin. The Tallaght/Clondalkin to City Centre CBC has been identified as one of the twelve routes proposed along the Core Bus Network.

The Tallaght/Clondalkin scheme commences in Tallaght at the Square Shopping Centre, proceeds through Tallaght Village and along the R819 Greenhills Road. The route proceeds through Greenhills, Walkinstown, Crumlin, Drimnagh and the Liberties to its terminus point in the city centre near Christchurch Cathedral. The scheme also includes a section between Clondalkin and Drimnagh commencing on the R134 New Nangor Road at the junction with Woodford Walk progressing via the R134 New Nangor Road, Naas Road, Walkinstown Avenue and Long Mile Road where it connects to the remainder of the scheme at the junction with Walkinstown Road.

1.3. Previous Studies and their recommendations

The following table is a list of documents as part of previous studies for the development of the proposed retaining walls:

Date	Document Reference	Report Title	Author
Feb 2022	BCIDA-ACM-STR_ZZ-0809_XX_00-RP-CB-0001	Non TII Retaining Walls Structures Options Report (SOR)	AECOM
2021	BCIDA-ACM-PRW_ZZ-0008_XX_00-RP-ZZ-0001	CBC008 Second and Third Public Consultation Summary Report	AECOM
2021	BCIDA-ACM-PRG_ZZ-0008_XX_00-RP-ZZ-0005	CBC008 Preferred Route Option Report	AECOM
2020-2021	BCIDA-ACM-PMG_ZZ-0809_XX-RP-ZZ-0001	Clondalkin to Drimnagh and Tallaght (Greenhills) to City Centre Preliminary Design Report	AECOM

The Structures Options Report (SOR) dated February 2022 assessed three different options for each retaining wall. The report assessed each option based on a Multi Criteria Assessment (MCA) and recommended the following structural forms:

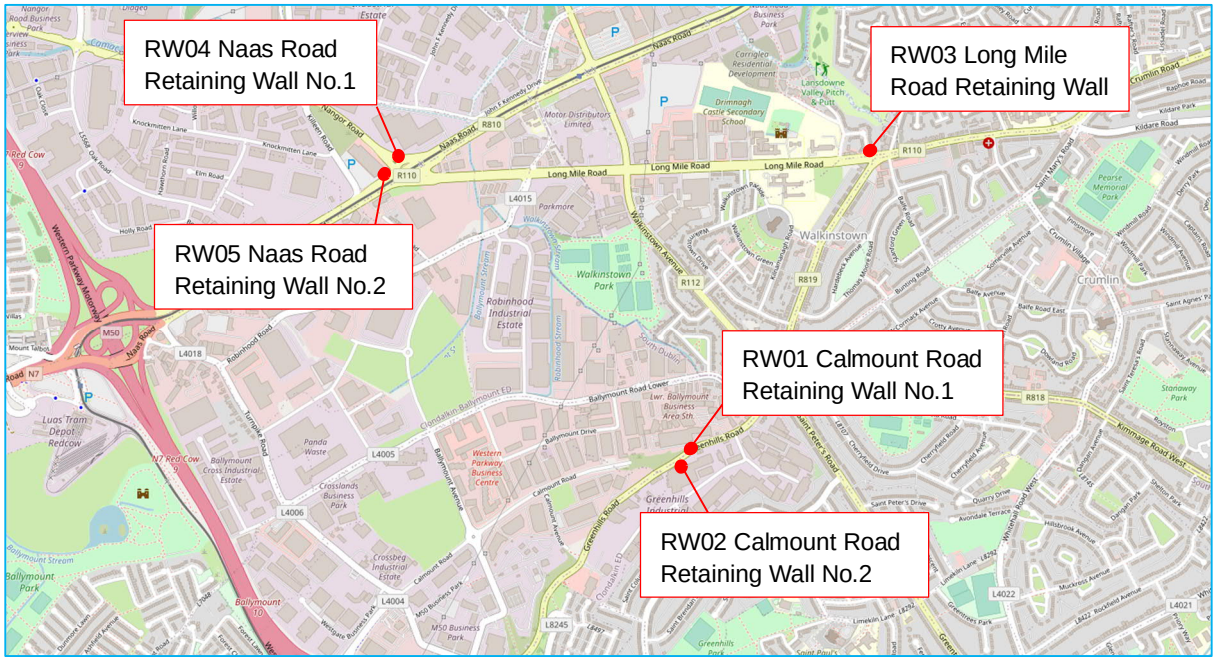
- RW01 Calmount Road Retaining Wall No.1 – Reinforced Earth Retaining Wall
- RW02 Calmount Road Retaining Wall No.2 – Reinforced Earth Retaining Wall
- RW03 Long Mile Road Retaining Wall – Gravity Retaining Wall
- RW04 Naas Road Retaining Wall No.1 – Gravity Retaining Wall
- RW05 Naas Road Retaining Wall No.2 – Gravity Retaining Wall

2. Site and Function

2.1. Site location

The retaining walls are located along Calmount Road, Long Mile Road and the Naas Road respectively. The ITM co-ordinates of the retaining walls are as follows:

- RW01 Calmount Road Retaining Wall No.1 – 710,754.565 (N), 730,696.05 (E)
- RW02 Calmount Road Retaining Wall No.2 – 710,853.130 (N), 730,710.35 (E)
- RW03 Long Mile Road Retaining Wall – 711,363.699 (N), 731,741.457 (E)
- RW04 Naas Road Retaining Wall No.1 – 709,646.023 (N), 731,736.535 (E)
- RW05 Naas Road Retaining Wall No.2 – 709,663.327 (N), 731,633.766 (E)



©Open Street Map

Figure 2-1 Location Map

2.2. Function of the structure and obstacles crossed

The Calmount Road Retaining Wall No.1 and No.2 are required along the eastbound and westbound carriageways of the proposed alignment connecting the existing Calmount Road with Greenhills Road. The retaining walls will retain the earthworks embankment required as part of this proposed alignment.

Long Mile Road Retaining Wall is required to replace the existing retaining wall separating Slievebloom Park housing estate from the Long Mile Road. The new retaining wall will allow for a widening of the Long Mile Road providing a new eastbound cycle lane.

The Naas Road Retaining Walls are required to retain the widened footpath/verge which will accommodate the approach ramp and pedestrian steps to the planned ST02 Naas Road Pedestrian and Cycle Bridge.

2.3. Choice of location

The Calmount Road Retaining Wall will be located between Calmount Road and the R819 Greenhills Road, the locations of the walls has been determined based on the proposed alignment. The walls will create a new boundary line between existing industrial units and the Greenhills Road.

Long Mille Road Retaining Walls will be located along the eastbound carriageway of the road at the junction with Walkinstown road, and will create a new boundary line between the Slievebloom Park housing estate and Long Mile Road.

The Naas Road Retaining Walls No.1 and No.2 will be located along the southbound and eastbound carriageways of R134 New Nangor Road respectively at its junction with the R810 Naas Road. In both case the walls will replace the existing boundary walls on site.

2.4. Site description topography

The areas surrounding the retaining walls are a busy urban environment with several existing structures, infrastructure and street furniture acting as constraints to the design, location and construction of the retaining walls.

The Calmount Road Retaining Walls are located parallel to the traffic route with regular congestion which poses construction constraints. To the north and south of the road there are a large number of trees which poses a constraint in reducing the effect the construction would have on these trees.

The Long Mile Road Retaining Wall is located parallel to the busy traffic route which experiences high congestion and poses a significant construction constraint. To the north of the wall there is an existing estate.

The Naas Road Retaining Walls are located parallel to Naas Road, which is a busy traffic route seeing regularly high traffic volumes which would pose a significant construction constraint. To the north of both retaining walls there are existing commercial buildings with associated car parking.

2.5. Vertical and horizontal alignment

At the Calmount Road Retaining Walls the road has a maximum longitudinal fall of 3.2% from east to west at the wall location. The horizontal alignment is on a curve with radius varying from 240m to 900m along the length of the walls.

At the Long Mile Road Retaining Wall the road has a maximum longitudinal fall of 0.4% from west to east over a length of 96m at the wall location. The horizontal alignment is on a straight of length 86.7m at the wall location.

The vertical alignment at the Naas Road Retaining Walls varies from a highpoint towards the centre of the walls falling north and south either side of this high point with gradients varying between 1.9% and 2.2%. The horizontal alignment varies between curved and straight across the length of the walls. The maximum and minimum curvature of the alignment are curves of radius 1000m over 10.2m and 600m over 34.3m respectively. The straights vary in length from 78.9m to 8.6m at the location of the walls.

2.6. Cross sectional dimensions on the alignments

The Calmount Road Cross Section at Calmount Road Retaining Wall No.1 & 2 is as follows:

Section	Width (m)
Footpath	2.00
Eastbound Cycle Track	2.00
Bus Lane	3.00
Two Way Traffic Lane	6.00
Westbound Cycle Track	2.00
Footpath	2.00
Total	**17.00**

Table 2-1 Calmount Road Cross Section

The Long Mile Road Cross Section at the Long Mile Road Retaining Wall is as follows:

Section	Width (m)
Footpath	1.71
Eastbound Cycle Track	2.00
Parking Bay	3.06
Eastbound Bus Lane	3.00
Eastbound Carriageway	5.94
Central Reserve	2.13
Westbound Traffic Lane	3.00
Westbound Bus Lane	2.91
Westbound Cycle Track	1.51
Footpath	2.00
Total	27.26

Table 2-2 Long Mile Road Cross Section

The Nangor Road cross section at Naas Road Retaining Wall No.1 is as follows:

Section	Width (m)
Footpath	1.80
Two-Way Cycle Track	2.33
Southbound Bus Lane	3.50
Southbound Carriageway	8.00
Northbound Carriageway	6.00
Northbound Bus Lane	3.15
Northbound Cycle Track	2.00
Footpath	1.90
Total	28.68

Table 2-3 Nangor Road Cross Section

The Naas Road Cross Section at Naas Road Retaining Wall No.2 is as follows:

Section	Width (m)
Footpath	1.90
Eastbound Cycle Track	2.25
Eastbound Carriageway	16.26
Luas Line	12.00
Westbound Carriageway	11.00
Westbound Cycle Track	2.11
Footpath	4.60
Total	**50.12**

Table 2-4 Naas Road Cross Section

2.7. Existing underground and overground services

A number of existing services have been recorded in the area surrounding the proposed retaining walls. The following table summarises the service providers and their utilities.

Retaining Wall	Service Provider	Services	Location
RW01 Calmount Road Retaining Wall No.1	ESB	Existing Medium Voltage (underground)	Eastbound Greenhills Road
	EIR	Existing EIR Network	Eastbound Greenhills Road
	Irish water	Existing Water Network	Eastbound Greenhills Road
			Cuts Across Greenhills Road
RW02 Calmount Road Retaining Wall No.2	ESB	Existing Medium Voltage (underground)	Eastbound Greenhills Road
	EIR	Existing EIR Network	Eastbound Greenhills Road
	Irish Water	Existing Water Network	Eastbound Greenhills Road
			Cuts Across Greenhills Road
RW03 Long Mile Road Retaining Wall	EIR	Existing EIR Network	Eastbound on Long Mile Road
			North Adjacent to Long Mile Road
	Gas Network Ireland	Existing LP Gas Network	Eastbound on Long Mile Road
			North Adjacent to Long Mile Road
	Virgin Media	Existing Virgin Media Network	Eastbound on Long Mile Road
	ESB	Existing LV Electricity (underground)	Eastbound on Long Mile Road
	DCC	Existing Drainage	Eastbound on Long Mile Road
	Irish Water	Existing Sewage Network	Cuts Through Long Mile Road
		Existing Water Network	Eastbound on Long Mile Road

Retaining Wall	Service Provider	Services	Location
RW04 Naas Road Retaining Wall No.1	EIR	Existing EIR Network	Southbound New Nangor Road
			Harris/DHL Compound
	Virgin Media	Existing Virgin Media Network	Southbound New Nangor Road
	ENET	Existing ENET Network	Southbound New Nangor Road
	Gas Network Ireland	Existing TELCO Duct	Southbound New Nangor Road
RW05 Naas Road Retaining Wall No.2	EIR	Existing EIR Network	Eastward Naas Road
			Northbound New Nangor Road
	Gas Network Ireland	Existing TELCO Duct	Eastward Naas Road
		Existing LP Gas Network	Eastward Naas Road
	Virgin Media	Existing Virgin Media Network	Eastward Naas Road
	ENET	Existing ENET Network	Eastward Naas Road
	Irish Water	Existing Sewage Network	Eastward Naas Road

Table 2-5 List of Service Providers

Rerouting and diversion of any of the existing underground and overground services to facilitate construction of each structure will be carried out as required as part of the overall BusConnects scheme.

2.8. Geotechnical summary

2.8.1. Calmount Road Retaining Walls Ground Summary

Multiple cable percussion boreholes and trial pits were completed along Calmount Road. R9CP06 and R9CP10 were located along the extent of RW01 & RW02. The figure below shows the approximate locations of the boreholes.

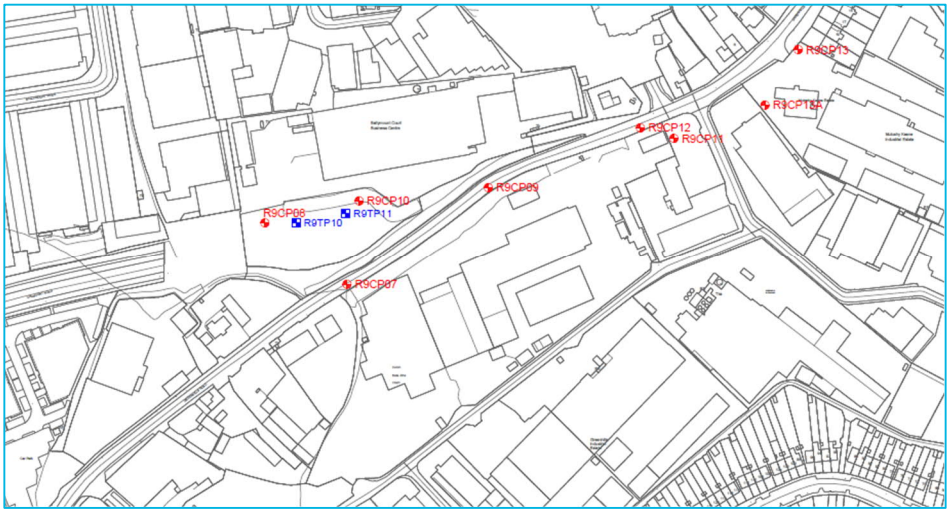


Figure 2-2 Calmount Road Retaining Walls Borehole Locations

R9CP06 recorded a made ground of Gravel for depths of 0.1m, followed by made ground of Clay until depths of 4m. For the depth to 6m, gravel was record with the borehole terminated at a recorded SPT blow count of 50.

R9CP07 recorded made ground of Gravel down to 0.5m. Following this Gravel was found to a depth of 6m, where the borehole was terminated.

R9CP09 recorded made ground down to a depth of 0.4m. Sand was then recorded to a depth of 2.3m, where the borehole was terminated at a recorded SPT blow count of 50.

R9CP10 recorded made ground of Gravel down to a depth of 0.2m, followed by made Clay to 1.4m. This was overlain by Gravel to 2.6m, after which Bedrock recorded as Grey Boulder was returned.

Stratum	Typical Stratum Description	Depth at Top of Stratum (m bgl)	Level at Top of Stratum (m AOD)	Thickness Range (m)	Occurrence
Made Ground	Fine to course Gravel	0	66.71 – 66.61	0.1 – 0.5	R9CP06, R9CP07, R9CP09, R9CP10
Clay	Sandy gravelly Clay	0.1 – 0.5	66.61 – 52.52	2.4 – 3.9	R9CP06, R9CP10
Gravel	Fine to course Gravel	0.5 – 4.0	63.22 – 57.72	2.0 – 5.5	R9CP06, R9CP07
Bedrock	Grey Boulder	4	52.52	0.4	R9CP10

Table 2-6 Calmount Road Retaining Walls Ground Summary

2.8.2. Long Mile Road Retaining Wall Ground Summary

At the time of writing this report no ground Investigations had been carried out at or around the location of Long Mile Road Retaining Wall. A detailed ground investigation will be required in advance of detailed design of the wall.

2.8.3. Naas Road Retaining Walls Ground Summary

Numerous boreholes were carried out at the Naas Road junction with New Nangor/Long Mile Road. R8CPGS01 is the nearest borehole to the location of the two retaining walls. The approximate locations of the boreholes are shown in the figure below.

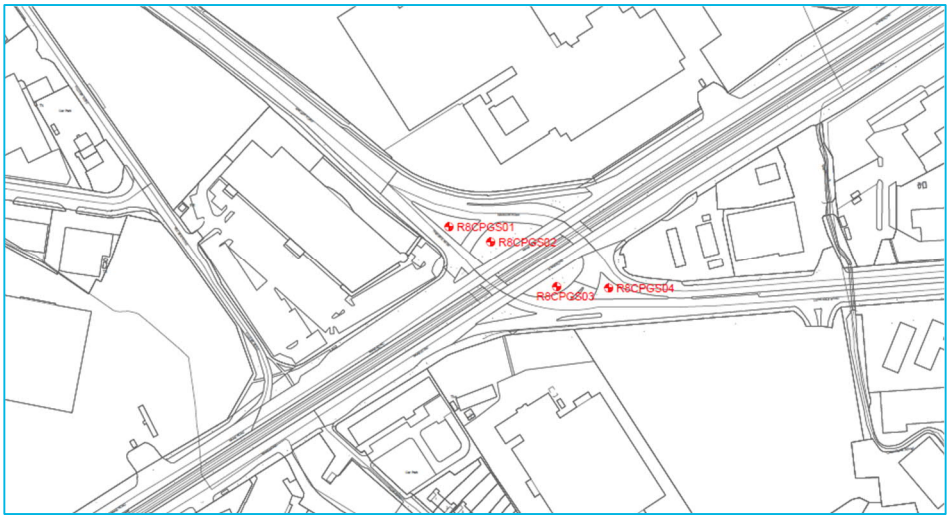


Figure 2-3 Naas Road Retaining Walls Borehole Locations

R8CPGS01 was put down to completion by light percussion boring techniques using a Dando Terrier dynamic sampling rig. The borehole log indicates that the first 1.2m depth is man-made ground, overlying Clay to depths of 4.3m. At this depth bedrock recorded as Grey Limestone was returned.

Stratum	Typical Stratum Description	Depth at Top of Stratum (m bgl)	Level at Top of Stratum (m AOD)	Thickness Range (m)	Occurrence
Made Ground	Fine Gravel	0	48.09 – 46.99	1.2	R8CPGS01
Clay	Slightly sandy slightly gravelly Clay	1.2	46.99 – 43.89	3.1	R8CPGS01
Bedrock	Grey Limestone	4.3	43.89 – 38.19	5.7	R8CPGS01

Table 2-7 Naas Road Retaining Walls Ground Summary

2.9. Hydrology and hydraulic summary

A review of the OPW flood mapping (www.floodinfo.ie) shows that there are no historical events of flooding in the area surrounding the retaining walls, however the Harris/DHL Compound to the north of the Naas Road Retaining Wall No.1 is located within the 1 in 100 year flooding zone, also referred to as an Annual Exceedance Probability of 1%. It is unlikely that construction of the wall will impact this flood zone, however review of the flood mapping in the area should be revisited in the detailed design stage to review any possible updates of the flood record.

2.10. Archaeological summary

No sites of major archaeological importance were identified at the proposed retaining wall locations.

2.11. Environmental summary

The work related to the EIA will be carried out and completed as part of the required planning application for the entire Tallaght/Clondalkin to City Centre CBC. The EIA team will be an independent team consisting of experts from ARUP, Jacobs and SYSTRA. The submission of the EIA will be in accordance with Section 51 of the Roads Act 1993 (as amended). The preparation of the environmental investigation will be carried out based on the Preferred Route Options Report and completion of the Public Consultation.

The EIA team will investigate the effects the project will have on traffic, including pedestrians, cyclists, and buses, and how the project will affect transport during the construction phase. The impacts on air pollution will be investigated, mainly during the construction phase, and will focus primarily on the emission of dust particles. As the route is in a rural area, noise and vibration studies will be done in order to check whether the works would affect the surrounding environment. Potential traffic routes will also be evaluated.

3. Structure & Aesthetics

3.1. General description of recommended structure or family of structures and design working life

The RW01 and RW02 Calmount Road Retaining Walls propose the use of a reinforced earth retaining wall. The reinforced earth is created by reinforcing a bank of earth with steel reinforcing straps located between successive layers of compacted granular fill. The strips are usually formed from geosynthetic material or galvanised steel, the latter being used for high static and dynamic design loads and are then bolted to facing panels prevent loss of backfill. These facing panels are typically precast modular units which can have variety of desired finishes. The strips act as a stabiliser to create a large mass of reinforced soil which acts together and resists overturning or sliding. Reinforced earth needs to be designed to avoid failure from global instability of the entire reinforced area and to withstand pull-out and internal sliding forces on each individual reinforcing strap.

The proposed retaining wall dimensions are as follows:

Parameter	Dimension
Retained Length	229.00m
Max Retained Height	7.60m
Min Retained Height	0.00m
Boundary Wall Height	1.30m

Table 3-1 RW01 Calmount Road Retaining Wall No.1 Geometry

Parameter	Dimension
Retained Length	151.40m
Max Retained Height	3.30m
Min Retained Height	0.00m
Boundary Wall Height	1.30m

Table 3-2 RW02 Calmount Road Retaining Wall No. 2 Geometry

Reinforced earth walls are very simple to construct with an extremely quick installation time and low maintenance. In addition, the reinforced earth is self-supporting and stable as each layer is constructed avoiding the need for major temporary works. These walls have much lower ground bearing requirements compared to the other options as they avoid the need for large spread foundations making them economical and flexible with an ability to retain heights of up to 10m.

The RW03 Long Mile Road and RW04 & RW05 Naas Road Retaining Walls propose the use of a gravity retaining wall. This wall would be formed by using either insitu concrete, or a precast concrete solution. The geometry of the footing will vary across each location and will be dependent on the predicted loading and the available working area for construction. The walls will be designed with a toe to the front of the footing moving the centre of gravity away from the point of overturning, in turn reducing the quantity of materials required. This type of wall is generally considered to be economical for retained heights up to 3m. A boundary wall will be provided to the top of both retaining walls which shall tie into existing walls on site. These boundary walls will help to increase the self-weight of the wall while also preventing falls from height from the retained side.

The proposed retaining wall dimensions are as follows:

Parameter	Dimension
Retained Length	63.90m
Max Retained Height	1.50m
Min Retained Height	0.00m
Boundary Wall Height	1.00m
Wall Thickness	0.35m
Footing Length	2.15m
Footing Thickness	0.35m

Table 3-3 RW03 Long Mile Road Retaining Wall Geometry

Parameter	Dimension
Retained Length	277.60m
Max Retained Height	4.50m
Min Retained Height	2.50m
Boundary Wall Height	1.00m
Wall Thickness	0.35m
Footing Length	3.25m
Footing Thickness	0.35m

Table 3-4 RW04 Naas Road Retaining Wall No.1 Geometry

Parameter	Dimension
Retained Length	90.00m
Max Retained Height	1.50m
Min Retained Height	1.00m
Boundary Wall Height	1.00m
Wall Thickness	0.35m
Footing Length	3.25m
Footing Thickness	0.35m

Table 3-5 RW05 Naas Road Retaining Wall No.2 Geometry

The gravity wall will be designed to resist sliding, overturning and bearing forces. Gravity walls can resist these horizontal forces from the soils loading due to their large mass which in combination with the toe prevent overturning and failure of the wall. The substantial dead weight of the concrete wall coupled with friction between the founding stratum acts to resist horizontal sliding forces.

The design working life of the retaining walls will be a minimum of 120 years as defined in the TII publication, DN-STR-03012 - Design for Durability. Maintainable elements and components listed below are subject to greater wear and will require replacement within the design life. Careful design and detailing combined with thorough routine

inspections, quality control and supervision on site will help achieve the minimum expected design life listed in the below table:

Component	Years
Expansion Joints	50
Drainage Systems	50

Table 3-6 Minimum Design Life for Structural Elements

3.2. Aesthetic considerations

The retaining wall designs incorporate the basic principles of structures aesthetics which respects the surrounding landscape and minimises the environmental intrusion. The walls can be detailed and finished to match their surroundings effectively blending with the existing environment. Plain concrete, pattern profile concrete and blockwork are the most suitable finishes for the five retaining walls.

The quality of concrete finish will have a large effect on the aesthetics of a plain concrete finish. The finish can be specified in formed or unformed and range in quality from 1 to 5 with 5 being the highest quality finish achievable. Where the wall is visible by users an F4 or F5 finish shall be specified to ensure the aesthetics of the wall are not compromised.

For the larger exposed areas, a pattern profile is recommended in order to avoid stains from water and avoid streaking. Surfaces with linear grooves and vertical ribs have worked well in past projects channelling this water down the surface of the wall. Consistency in the profile is important to ensure the aesthetic of the wall remains intact and will depend on materials and colour.

The table below outlines the desired finish for each wall:

Retaining Wall	Finish Required
RW01 Calmount Road Retaining Wall No.1	Pattern Profile Concrete Finish
RW02 Calmount Road Retaining Wall No.2	Pattern Profile Concrete Finish
RW03 Long Mile Road Retaining Wall	Plain Concrete Finish
RW04 Naas Road Retaining Wall No.1	Plain Concrete Finish
RW05 Naas Road Retaining Wall No.2	Plain Concrete Finish

Table 3-7 Required Finishes

3.3. Proposals for the recommended structure or family of structures

3.3.1. Proposed Category

Calmount Road Retaining Wall No.1 will be classified as Category 2 (retaining structures >5m) and thus requires a check by another Engineer in the same firm but within a different Design Team. All other retaining walls shall be classified as Category 1 (retaining structures >1.5m and <5m) and thus requires a check by another Engineer within the same Design Team.

3.3.2. Span Arrangements

The retaining walls will be required to retain the existing and proposed embankments for a length of 229.0 (Calmount Road Retaining Wall No.1), 151.4m (Calmount Road Retaining Wall No.2), 63.9m (Long Mile Road Retaining Wall), 277.6m (Naas Road Retaining Wall No.1), and 90m (Naas Road Retaining Wall No.2) respectively.

3.3.3. Minimum headroom provided

Not applicable – unrestricted headroom will be provided on all retaining walls.

3.3.4. Approaches including run-on arrangements

All retaining walls will be required to tie into the existing boundary walls. The Long Mile Road and Naas Road Retaining Walls will tie into the existing plain concrete finish of the existing boundary walls. The Calmount Road Retaining Walls will tie into the existing pattern profile concrete finish of the existing boundary walls.

3.3.5. Foundation type

The gravity retaining walls at Long Mile Road and Naas Road will be formed using a spread foundation. The preliminary size of the footing will be 3.25m long and 0.35m deep at Naas Road Retaining Wall No.1 & 2 and 2.15m long and 0.35m deep at the Long Mile Road Retaining Wall. The final foundation sizing will be confirmed during the detailed design stage and will be dependent on the soil parameters and predicted loading.

The reinforced earth retaining walls at Calmount Road do not require foundations. A small concrete levelling pad footing will be provided to the base of the wall for ease of construction and setting out of the walls.

3.3.6. Substructure

Not applicable

3.3.7. Superstructure

The Gravity Retaining Wall will consist of a reinforced concrete wall connected to the foundation and the Reinforced Earth Retaining Wall will be composed of a reinforced earthworks and concrete pads along the height of the wall. The height of this wall varies depending on the required retaining height. The maximum height of the walls including the boundary walls is 8.9m (Calmount Road Retaining Wall No.1), 4.6m (Calmount Road Retaining Wall No.2), 2.5m (Long Mile Road Retaining Wall), 5.5m (Naas Road Retaining Wall No.1), and 2.5m (Naas Road Retaining Wall No.2). The wall thickness shall be 0.35m for all gravity retaining walls and all retaining wall facades will be finished in either a plain concrete finish or a patterned profile concrete finish.

3.3.8. Articulation arrangements, joints, and bearings

Expansion joints shall be located along the length of the gravity walls at maximum spacing of 10m. Where expansion joints are provided, they shall be detailed in accordance with Series 2300 of the Specification. All joints shall be filled with a suitable closed cell polyethylene filler material, the thickness of filler shall be dependent on the expected thermal movement. The joints shall also be sealed with a two-part polysulphide sealant to prevent water leakage through the joint from the retained soil. The earth retained walls at Calmount Road do not require expansion joints as they are composed of smaller concrete elements.

3.3.9. Vehicle Restraint System

A vehicle restraint system is required to the top of RW01 and RW02 to prevent vehicular accidents along the length of Calmount Road.

No vehicle restraint system is required to the other retaining walls. A boundary wall shall be provided to the top of each wall to prevent falls from height from the retained side.

3.3.10. Drainage

A 225mm wide permeable drainage layer coupled with a perforated drainage pipe shall be provided to the rear of the walls to prevent the build-up of pore water pressure to the back of the wall. The drainage shall be a positive drainage system in accordance with DN-STR-03012. Future access for rodding and maintenance of the drainage system shall also be provided.

3.3.11. Durability

The retaining walls will be designed in accordance with the TII publication DN-STR-03012 - Design for Durability with a minimum design life of 120 years. The design life for replaceable parts such as expansion joints and drainage systems will be 50 years in accordance with DN-STR-03012. The design working life of the retaining walls will be working life category 5 while replaceable parts will be working life category 2 in accordance with GE-POL-01008.

All buried concrete surfaces will be treated with two coats of epoxy resin waterproofing in accordance with DN-STR-03012 – Design for Durability and CC-SPW-02000 Specification for Road Works Series 2000 – Waterproofing for Concrete Structures.

All exposed concrete surfaces will receive a hydrophobic pore lining impregnation in accordance with DN-STR-03012 – Design for Durability and CC-SPW-02000 Specification for Road Works Series 2000 – Waterproofing for Concrete Structures.

3.3.12. Sustainability

The use of Ground Granulated Blast Slag (GGBS) will be maximised to reduce the cement usage and reduce the environmental impact of the concrete production. These replacement levels will be in accordance with the levels specified within IS EN 206:2013.

At the end of the service life a large proportion of the concrete of the wall can be recycled and reused as aggregate material or hard core for road construction.

3.3.13. Inspection and maintenance

Maintenance and inspection of the retaining walls will be required throughout their service life. The inspections will be carried out in line with the TII EIRSPAN Bridge Management System. The EIRSPAN system was introduced in 2001 to provide an integrated management system for the bridges and structures in Ireland. The system coordinates activities such as inspection, repairs and maintenance work to ensure optimal management of the bridge stock. As a minimum the following inspection regime should be implemented:

- Routine Inspection – every year;
- Principal Inspection - every six years.

For all options, routine inspections will be carried out from the finished ground level, however for principal inspections and possibly maintenance, the larger walls such as the walls on Calmount Road, will require an appropriate method of working from height such as an MEWP. These inspections should check for deterioration in the wall, or any movements of the wall out of plane since the previous inspection.

Maintenance of back wall drainage systems will be very important during the service life of the wall, to avoid any built-up water pressure in the retained soil, which if untreated could lead to failure.

4. Safety

4.1. Traffic management during construction including land for temporary diversions

The Long Mile Road and Naas Road Retaining Walls will be constructed parallel to the highly congested road. The construction sequence will need to avoid construction on these roads where possible and reduce the affect construction will have on the traffic management. Lane closure is unavoidable for Calmount Road Retaining Walls as the road is being re-routed. During all lane closures suitable traffic management in accordance with Chapter 8 of the Traffic Signs Manual will need to be installed.

4.2. Safety during construction

As part of the design development, a Designer's Risk Assessment (DRA) has been prepared in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 and the amendments of 2019,2020 and 2021. The DRA shall be viewed as a working document to be developed further as the design develops. The DRA includes all risks identified and the resulting mitigation measures or alterations incorporated within the design, where no mitigation is possible the DRA will be used to communicate the risks to the Contractor and site personnel.

Where possible, the hierarchy of risk control will be implemented within the design and construction, with the Designer and Contractor aiming to control all risks through elimination. Where this is not possible, reduction, isolation or mitigation controls will be incorporated to ensure safety during construction.

The following list of particular risks has been identified for the retaining walls:

- Traffic around Dublin can be very busy, particularly for the Naas Road Retaining Walls as they are located beside a dual carriageway which experiences heavy congestion. It is important that it is clearly communicated how workers will access the site, in order to avoid any possible conflicts with traffic.
- Some of these retaining walls are larger structures, reaching 7.6m, and so it is crucial that all temporary slopes are constructed with suitable benching to minimise the risk of earth falls.
- Considerations should be made regarding cyclists and pedestrians during construction with possible alternate routes clearly communicated to ensure that safety is maintained.
- The risk of working near live services should be considered. A health and safety plan should be prepared to determine the correct procedure in the event of contact with live services.

4.3. Safety in use

Safety of the end user will be considered as part of the Designer's Risk Assessment. An Engineer Routine inspection will be carried out at least once a year or after any significant event in line with the recommendations contained within the EIRSPAN Bridge Management System, as defined by TII. The routine inspection will take account of any defects and establish whether the retaining wall requires a Principal Inspection to be carried out or if routine maintenance consisting of simple remedial works is sufficient to maintain the safety. A Principal Inspection can only be carried out by an approved Principal Inspection Team Leader according to the TII Bridge Management Section. The Principal Inspection shall record all findings on the EIRSPAN database for future reference.

Vehicle restraint systems shall be provided to RW01 and RW02 to prevent vehicle accident. Boundary walls have been included to the top of the remaining walls to prevent falls from height from the retained side. These boundary walls have a minimum height of 1m and shall be detailed with copping units which prevent climbing.

4.4. Lighting

No public lighting is proposed as part of the retaining wall design.

5. Cost

5.1. Budget Estimate in current year

The construction costs provided below have been based on quantities calculated from the preliminary retaining wall design. Elements associated with retaining walls such as earthworks, concrete and reinforcement have been included. Rates have been based on AECOM's internal cost database or based on Spon's Civil Engineering and Highway Works Price Book 2022 as required. It should be noted that costs are indicative only and may vary depending on the detailed design and the Contractor's methodology.

Allowances have been made for preliminaries, consultancy fees and contingency. A budget of 10% of the construction cost has been provided for preliminaries to cover traffic management, PSCS, temporary accommodation etc. The contingency is 15% of the construction cost and will cover minor elements such as drainage, fencing, landscaping works and any unforeseen unknowns. Finally, an allowance of 10% of the construction cost has been provided for professional fees to deliver the retaining walls through detailed design and handover. These fees will include detailed design, CAT I/II checks, construction supervision and handover.

The rates used to calculate the amounts presented below are all exclusive of VAT. No allowance has been made for land acquisition within the costs provided below. The cost of land acquisition will be covered under the construction costs for the entire BusConnects Clondalkin/Tallaght to City Centre route.

Series	Amount (€)
CC-SPW-00400 – Road Restraint Systems	€80,791.00
CC-SPW-00600 – Earthworks	€256,533.00
CC-SPW-01700 – Structural Concrete	€181,419.00
CC-SPW-02000 – Waterproofing	€6,709.00
Construction Cost	**€525,453.00**
Preliminaries (10% of Construction Cost)	€52,545.00
Contingency (15% of Construction Cost)	€78,818.00
Professional Fees (10% of Construction Cost)	€52,545.00
Total Cost	**€709,361.00**

Table 5-1 RW01 Calmount Road Retaining Wall No.1 Budget Estimate for the current year

Series	Amount (€)
CC-SPW-00400 – Road Restraint Systems	€53,426.00
CC-SPW-00600 – Earthworks	€110,617.00
CC-SPW-01700 – Structural Concrete	€78,228.00
CC-SPW-02000 – Waterproofing	€2,893.00
Construction Cost	**€245,165.00**
Preliminaries (10% of Construction Cost)	€24,516.00
Contingency (15% of Construction Cost)	€36,775.00
Professional Fees (10% of Construction Cost)	€24,516.00
Total Cost	**€330,972.00**

Table 5-2 RW02 Calmount Road Retaining Wall No.2 Budget Estimate for the current year

Series	Amount (€)
CC-SPW-00400 – Road Restraint Systems	€8,859.00
CC-SPW-00600 – Earthworks	€43,075.00
CC-SPW-01700 – Structural Concrete	€47,413.00
CC-SPW-02000 – Waterproofing	€15,450.00
Construction Cost	**€114,797.00**
Preliminaries (10% of Construction Cost)	€11,480.00
Contingency (15% of Construction Cost)	€17,219.00
Professional Fees (10% of Construction Cost)	€11,480.00
Total Cost	**€154,975.00**

Table 5-3 RW03 Long Mile Road Retaining Wall Budget Estimate for the current year

Series	Amount (€)
CC-SPW-00400 – Road Restraint Systems	€27,736.00
CC-SPW-00600 – Earthworks	€57,427.00
CC-SPW-01700 – Structural Concrete	€229,703.00
CC-SPW-02000 – Waterproofing	€93,800.00
Construction Cost	€ 408,665.00
Preliminaries (10% of Construction Cost)	€ 40,867.00
Contingency (15% of Construction Cost)	€ 61,300.00
Professional Fees (10% of Construction Cost)	€ 40,867.00
Total Cost	€ 551,698.00

Table 5-4 RW04 Naas Road Retaining Wall No.1 Budget Estimate in the current year

Series	Amount (€)
CC-SPW-00600 – Earthworks	€39,552.00
CC-SPW-01700 – Structural Concrete	€86,571.00
CC-SPW-02000 – Waterproofing	€26,500.00
Construction Cost	**€152,623.00**
Preliminaries (10% of Construction Cost)	€15,262.00
Contingency (15% of Construction Cost)	€22,893.00
Professional Fees (10% of Construction Cost)	€15,262.00
Total Cost	**€206,041.00**

Table 5-5 RW05 Naas Road Retaining Wall No.2 Budget Estimate in the current year

6. Design Assessment Criteria

6.1. Actions

6.1.1. Permanent Actions

Permanent actions and material densities will be applied in accordance with IS EN 1991-1-1 and the Irish National Annex. Material/partial factors will be detailed in IS EN 1990 and the Irish National Annex. The accepted densities for principal construction materials are as follows:

Material	Density
Reinforced Concrete	25 kN/m^3
Backfill to structures	21 kN/m^3

Table 6-1 Materials Densities for Design

6.1.2. Snow, Wind and Thermal Actions

Snow loads are not deemed a critical load case and will not be considered in accordance with the National Annex to IS EN 1991-1-3.

Wind loading will be considered in accordance with IS EN 1991-1-4 and the Irish National Annex. Wind loads will be taken to act simultaneously with other loads in accordance with the NA to IS EN 1990. Wind loads will not be considered in combination with thermal loading in accordance with clause A2.2.2 (6) of the NA to IS EN 1990.

Thermal loading will be considered in accordance with IS EN 1991-1-5 and the Irish National Annex. The combination of thermal and wind loading will not be considered in accordance with the National Annex to IS EN 1990.

6.1.3. Actions relating to normal traffic

The retaining walls will be designed for surcharge loading associated with LM1 and LM2 live Loading in accordance with IS EN 1991-2.

6.1.4. Actions relating to abnormal traffic

The retaining walls RW01, RW02, RW04, RW05 will be designed to resist the surcharge loading due to the abnormal load effects of Load Model 3, specifically SV80, SV100 and SV196, as detailed in IS EN 1991-2. RW03 Long Mile Road Retaining Walls will not be required to resist these surcharge loads as they are located in a housing estate.

6.1.5. Footway or footbridge live loading

Surcharge actions on the retaining walls due to LM4 footway loading will be considered in accordance with IS EN 1991-2 and the Irish National Annex.

6.1.6. Provision for exceptional abnormal loads

Not applicable.

6.1.7. Accidental actions

All retaining walls are located inside the clear zone of the carriageways and so were designed to resist these loads in accordance with IS EN 1990 and the Irish National Annex.

6.1.8. Actions during construction

Actions arising during construction will be considered in accordance with IS EN 1991-1-6 and the Irish National Annex.

6.1.9. Any special loading not covered above

Not applicable.

6.2. Authorities consulted and any special conditions required

The following authorities have been consulted as part of the development of the scheme:

- South Dublin County Council
- National Transport Authority

6.3. Proposed departures from standards

No departures from standards are envisaged for the design and construction of the retaining walls.

6.4. Proposed methods of dealing with aspects not covered by Standards

Not applicable.

7. Ground Conditions

7.1. Geotechnical Classification

Applying the guidance in IS EN 1997-1, it is considered that Geotechnical Category 2 is currently the most appropriate for the proposed retaining walls.

Geotechnical Category 2 applies to conventional types of structures and foundations with no exceptional risk or difficult loading conditions. This includes spread footing, raft foundations, piled foundations, walls or other structures retaining or supporting water, excavations, bridge piers and abutments, embankments and earthworks, ground anchors and other systems and tunnels in hard, non-fractured rock and not subjected to special water tightness or other requirements.

7.2. Description of the ground conditions and compatibility with proposed foundation design

7.2.1. RW01 Calmount Road Retaining Wall No.1

Preliminary geotechnical analysis of the foundation options found that provided the reinforced earth founded on the Sandy Gravelly Clay layers could achieve Serviceability Limit State settlements of less than 25 mm. This settlement would be dependent on the adequate compaction of the required 6I/6J backfill layers to the rear of the reinforced earth.

7.2.2. RW02 Calmount Road Retaining Wall No.2

Preliminary geotechnical analysis of the foundation options found that provided the reinforced earth founded on the Sandy Gravelly Clay layers could achieve Serviceability Limit State settlements of less than 25 mm. This settlement would be dependent on the adequate compaction of the required 6I/6J backfill layers to the rear of the reinforced earth.

7.2.3. RW03 Long Mile Road Retaining Wall

No ground investigation information is available for the area surrounding the Long Mile Road. It is assumed that the existing ground conditions are composed of made ground overlying clay. All made ground, topsoil and soft clays should be removed. Preliminary geotechnical analysis has assumed that the foundations are supported on a clay stratum which is the typical founding stratum in the general area surrounding the wall. Spread foundations are being progressed as part of the preliminary design.

7.2.4. RW04 Naas Road Retaining Wall No.1

Preliminary geotechnical analysis of the foundation options found that provided the foundations are adequately sized during the detailed design phase, spread foundations founded on the sandy gravelly clay could achieve Serviceability Limit State settlements of less than 25 mm. All topsoil and soft clays should be removed and replaced with 6N structural fill. Spread foundations are being progressed as part of the preliminary design.

7.2.5. RW05 Naas Road Retaining Wall No.2

Preliminary geotechnical analysis of the foundation options found that provided the foundations are adequately sized during the detailed design phase, spread foundations founded on the sandy gravelly clay could achieve Serviceability Limit State settlements of less than 25 mm. All topsoil and soft clays should be removed and replaced with 6N structural fill. Spread foundations are being progressed as part of the preliminary design.

8. Drawings and Documents

8.1. List of all documents accompanying the submissions

The following table lists the drawings accompanying this submission. The drawings are contained within Appendix B:

Drawing Number	Revision	Drawing Title
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0121	L01	RW01 Calmount Road Retaining Wall No.1
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0131	L01	RW02 Calmount Road Retaining Wall No.2
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0141	L01	RW03 Long Mile Road Retaining Wall
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0101	L01	RW04 Naas Road Retaining Wall No.1
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0111	L01	RW05 Naas Road Retaining Wall No.2

Table 8.1 Drawing List

Appendix A Photographs and Photomontages

Figure 8-1 RW01 Calmount Road Retaining Wall No.1

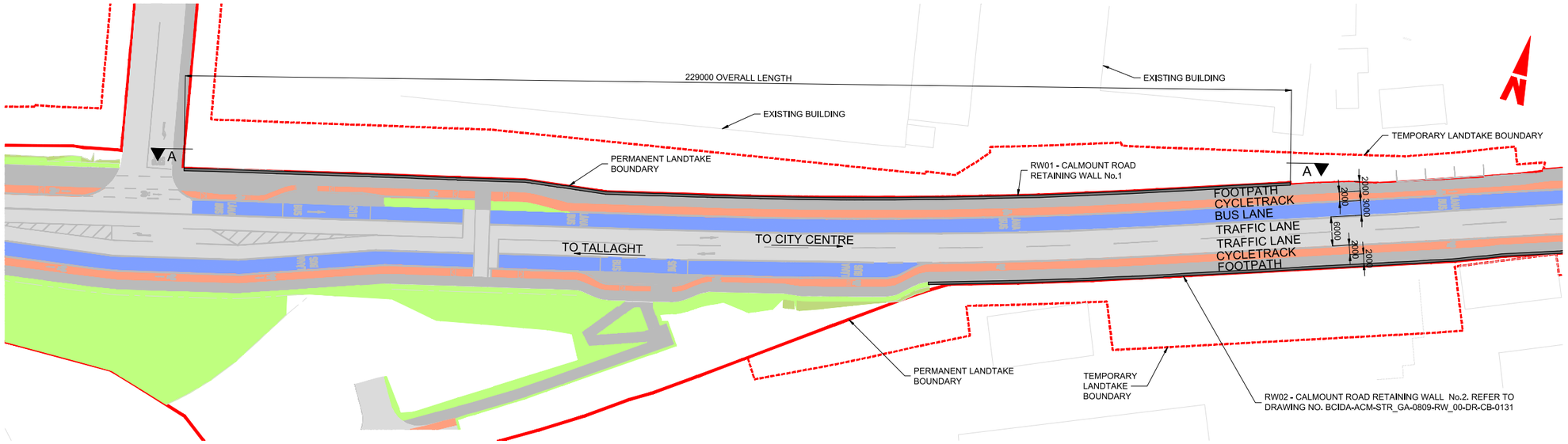
Figure 8-2 RW02 Calmount Road Retaining Wall No.2

Figure 8-3 RW03 Long Mile Road Retaining Wall

Figure 8-4 RW04 Naas Road Retaining Wall No.1

Figure 8-5 RW05 Naas Road Retaining Wall No.2

Appendix B Drawings



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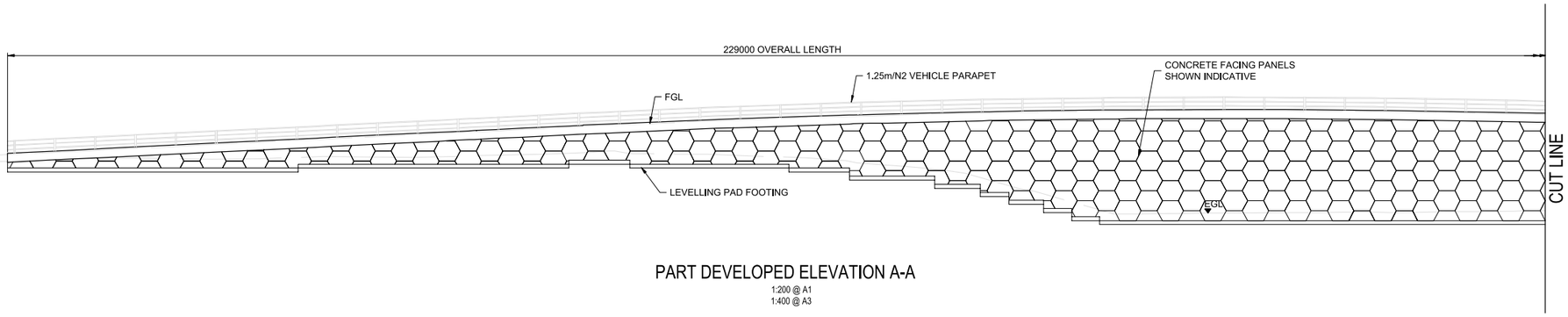

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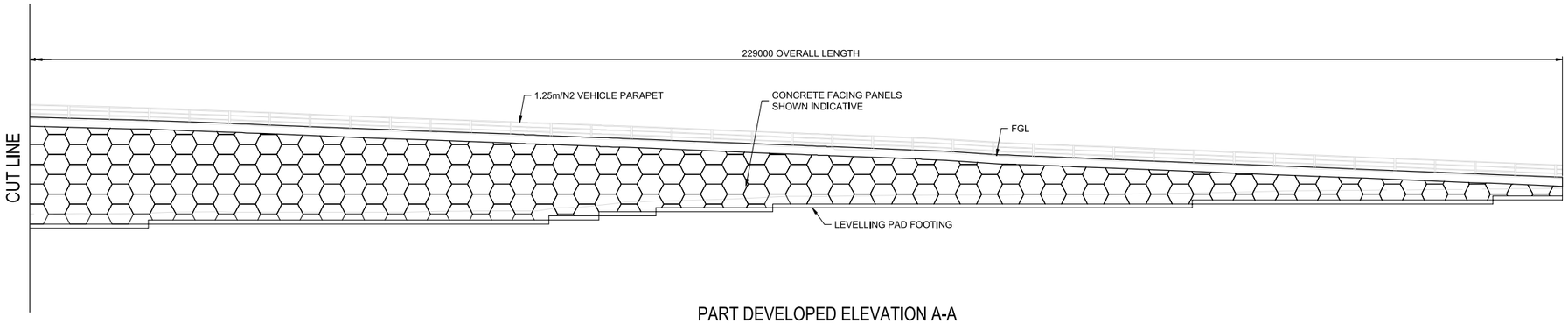

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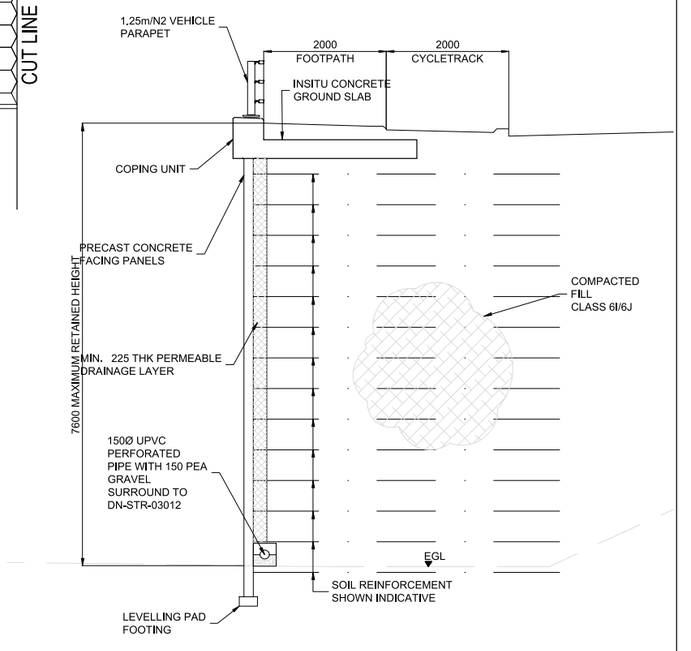

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Engineering Designer: AECOM / MOTT MACDONALD

Date	Scale	Drawn	Checked	Approved
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Project Code	Originator Code	QMS Code
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Programme Title: **BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS**

Drawing Title: TALLAGHT/CLONDALKIN TO CITY CENTRE SCHEME
RW01 CALMOUNT ROAD RETAINING WALL NO.1
GENERAL ARRANGEMENT

Drawing File Name	Sheet Number	Status	Rev
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0121	1 of 1		L01.1

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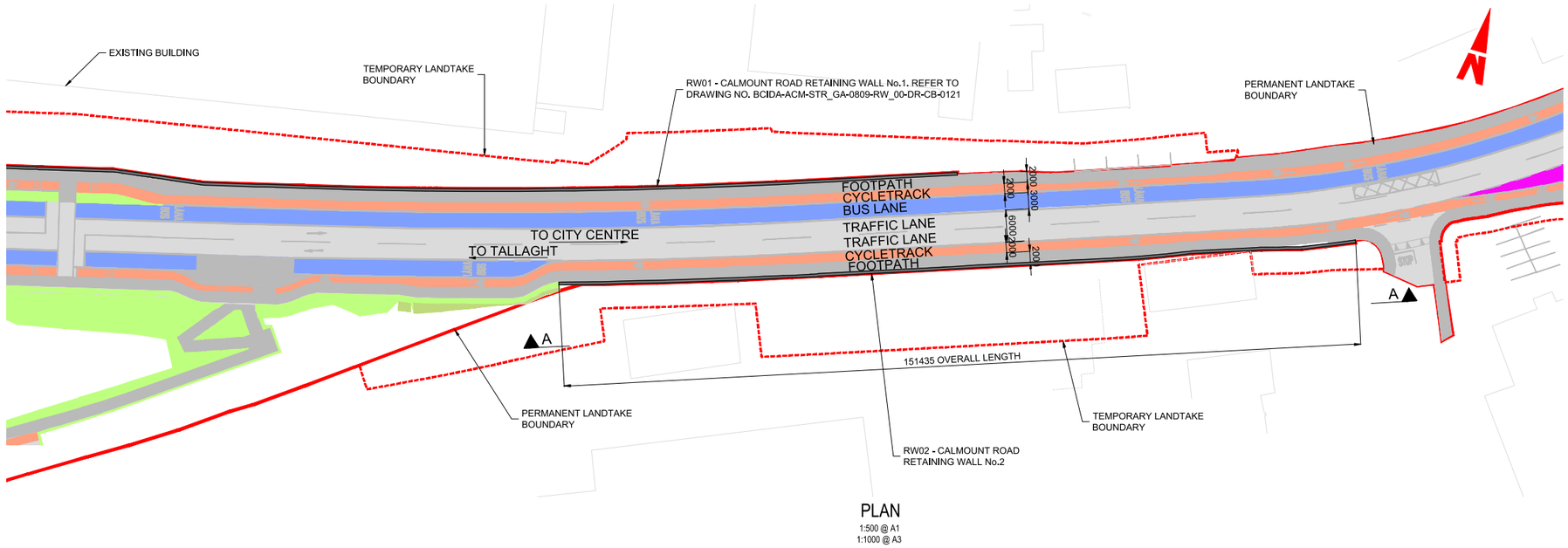

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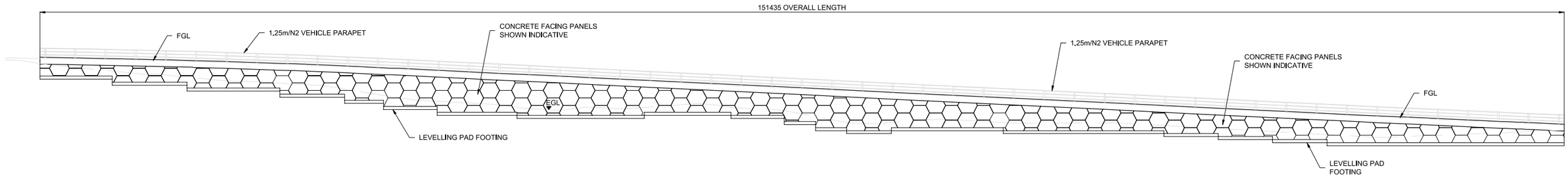

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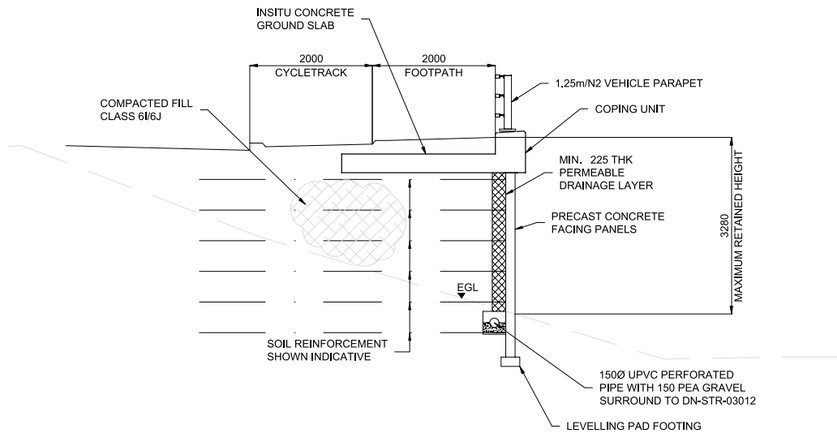

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Programme Title: **BUSCONNECTS DUBLIN**
CORE BUS CORRIDORS INFRASTRUCTURE WORKS

Drawing Title:
TALLAGHT/CLONDALKIN TO CITY CENTRE SCHEME
RW02 CALMOUNT ROAD RETAINING WALL NO.2
GENERAL ARRANGEMENT

Drawing File Name	Sheet Number	Status	Rev
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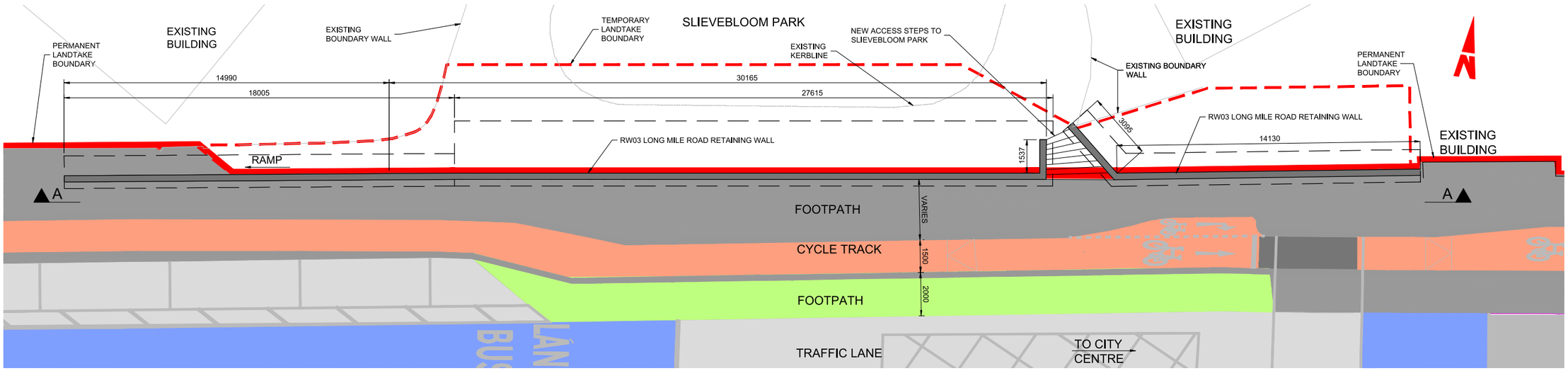

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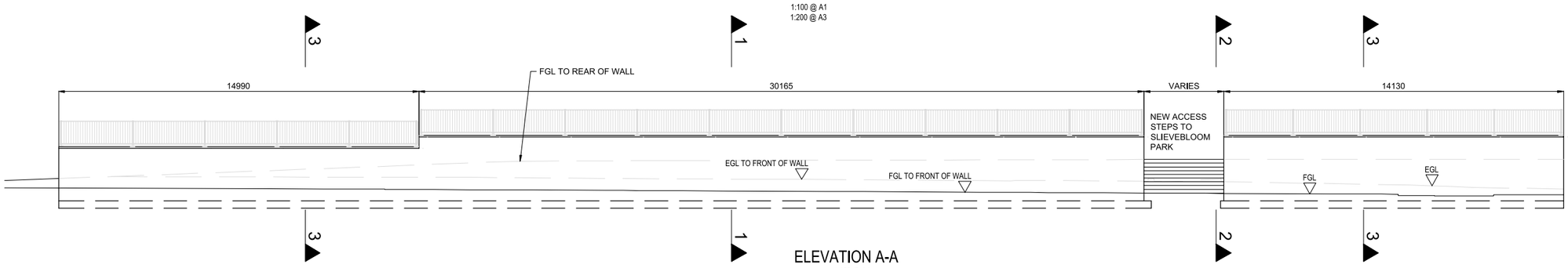

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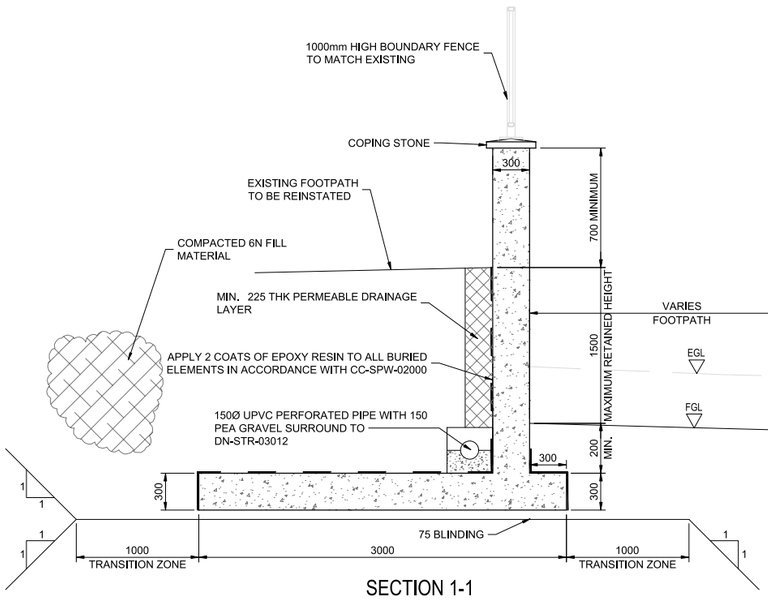

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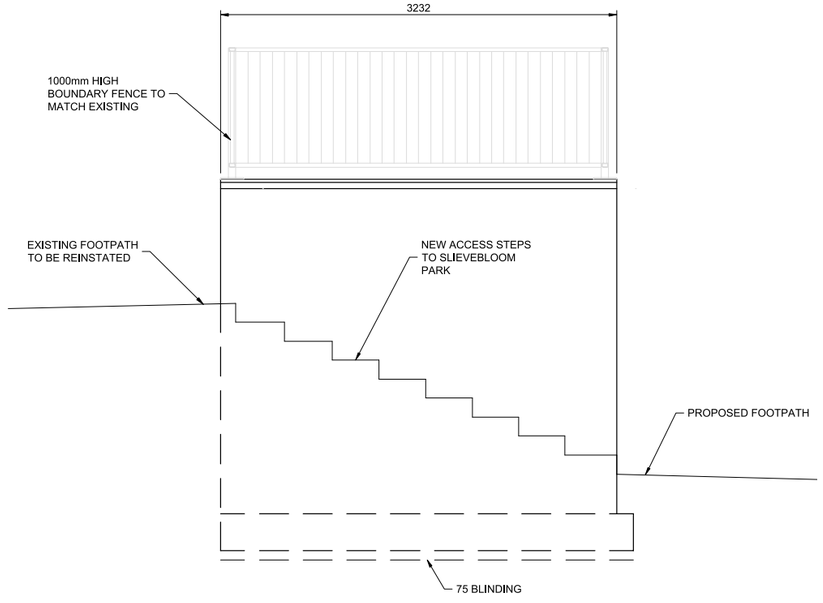

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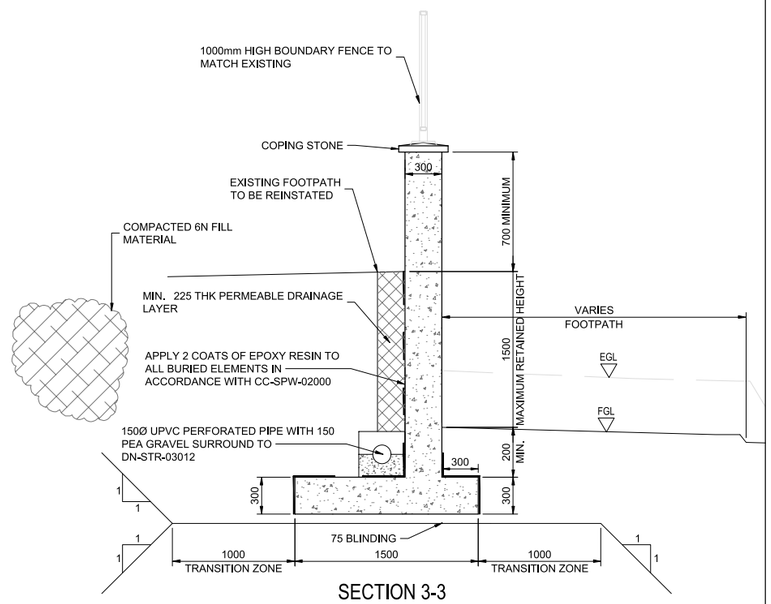

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Programme Title: **BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS**

Drawing Title: TALLAGHT/CLONDALKIN TO CITY CENTRE SCHEME
RW03 LONG MILE ROAD RETAINING WALL
GENERAL ARRANGEMENT

Drawing File Name	Sheet Number	Status	Rev
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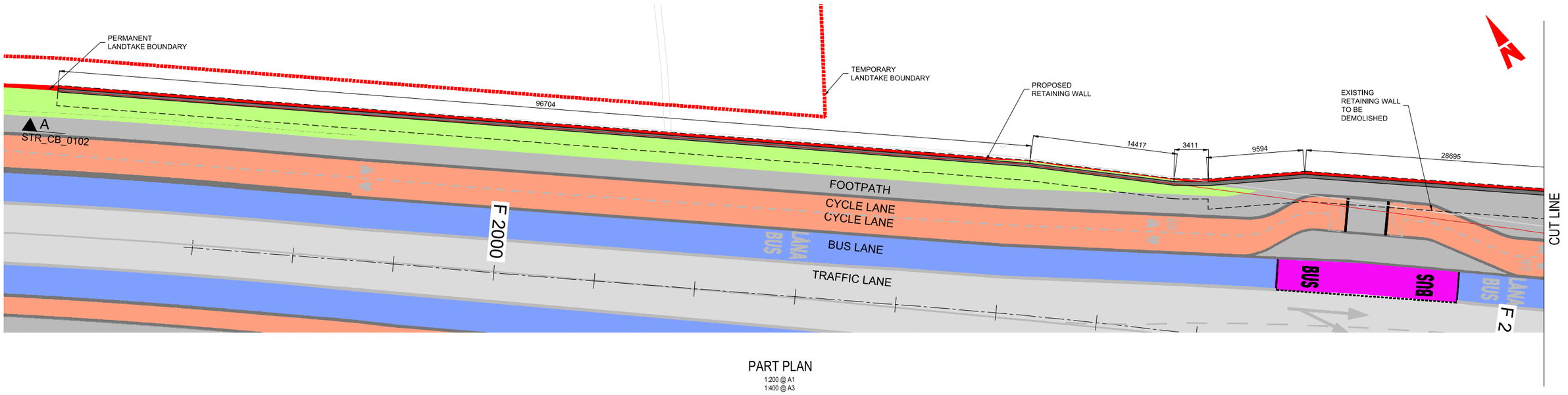

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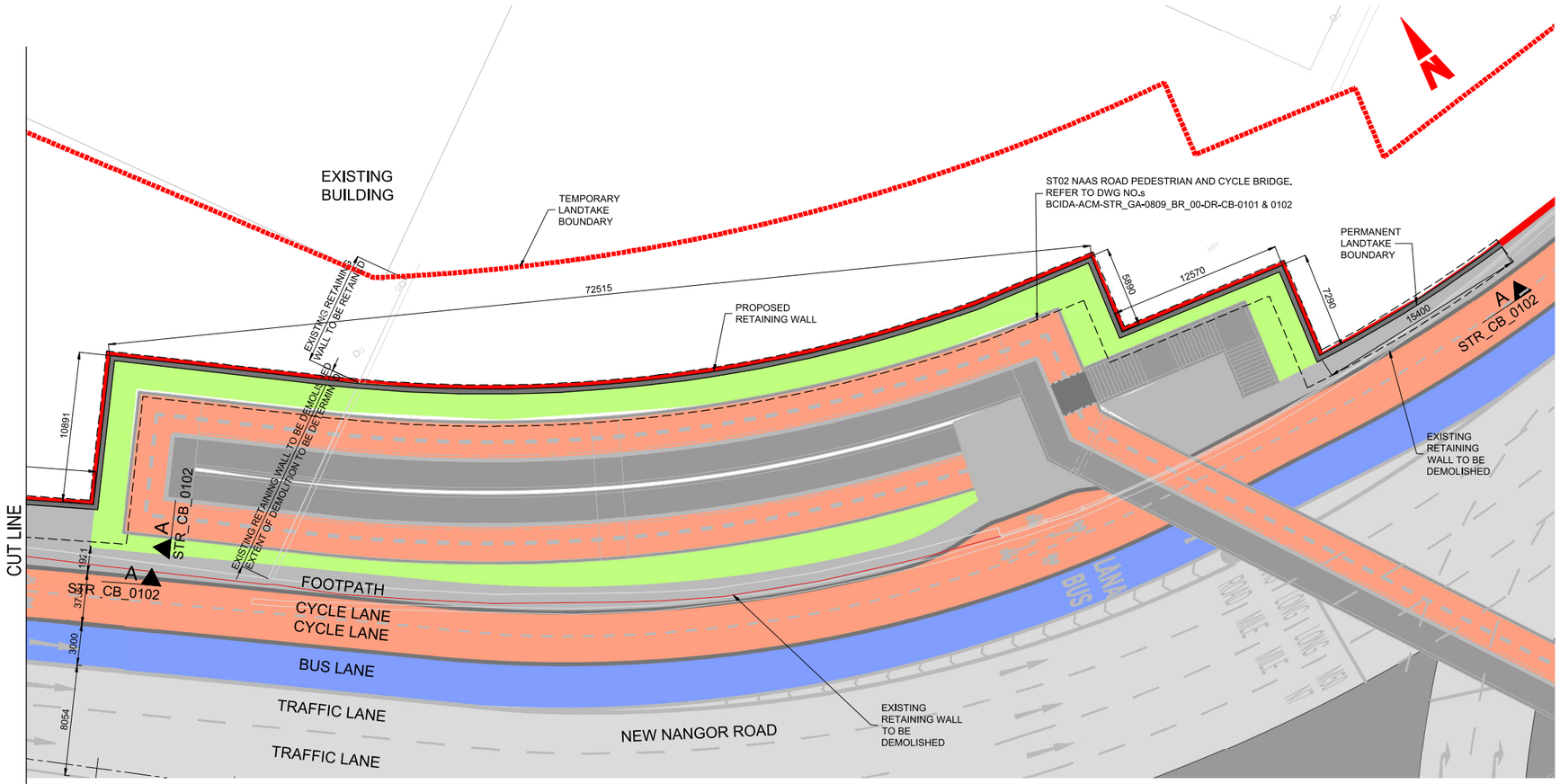

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Programme Title: BUSCONNECTS DUBLIN
CORE BUS CORRIDORS INFRASTRUCTURE WORKS

Drawing Title: TALLAGHT/CLONDALKIN TO CITY CENTRE SCHEME
RW04 NAAS ROAD RETAINING WALL NO.1
PLAN

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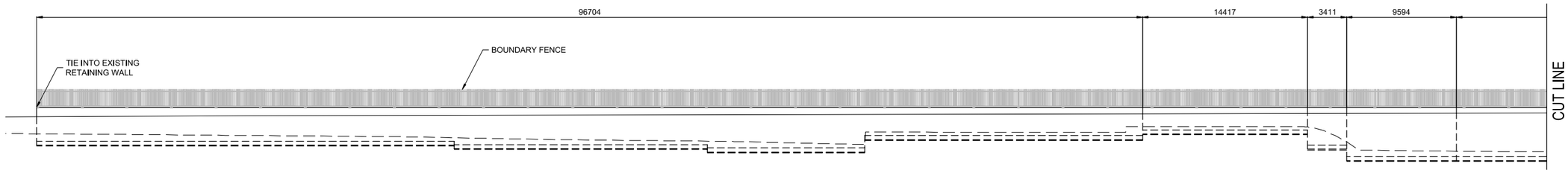

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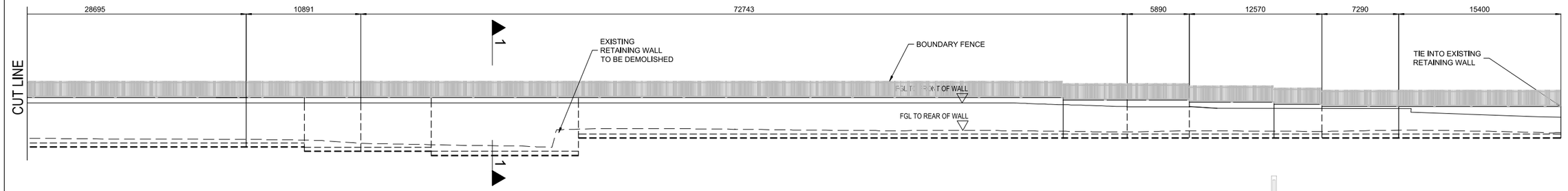

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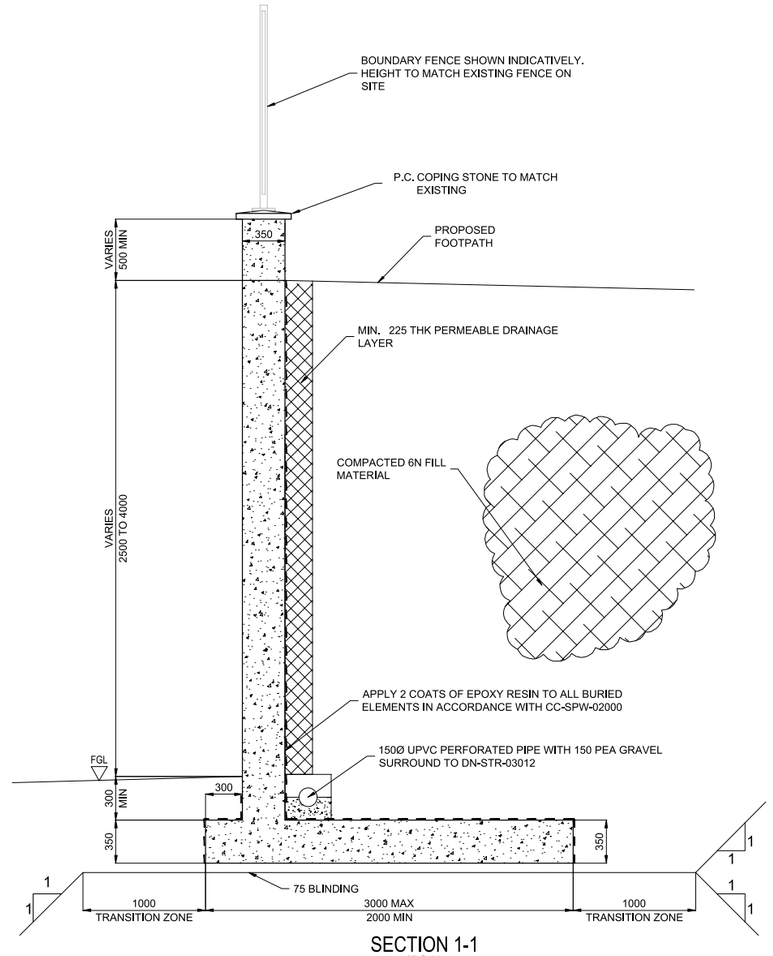
1:200 @ A1
1:400 @ A3



SECTION 1-1

1:25 @ A1
1:50 @ A3

Project Ireland 2040
Building Ireland's Future

Rev	Date	Drn	Chk'd	App'd	Description
L01.1	03/02/22	DH	AD	CA	ISSUE FOR PEER REVIEW

Client: NTA — Údarás Náisiúnta Iompair, National Transport Authority

Engineering Designer: AECOM / MOTT MACDONALD

Date	Scale	Drawn	Checked	Approved
03/02/22	AS SHOWN @ A1 AS SHOWN @ A3			

Project Code	Originator Code	QMS Code
BCIDA	ACM	

Programme Title: **BUSCONNECTS DUBLIN**
CORE BUS CORRIDORS INFRASTRUCTURE WORKS

Drawing Title: TALLAGHT/CLONDALKIN TO CITY CENTRE SCHEME
RW04 NAAS ROAD RETAINING WALL NO.1
DETAILS

Drawing File Name	Sheet Number	Status	Rev
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0102	1 of 1		L01.1

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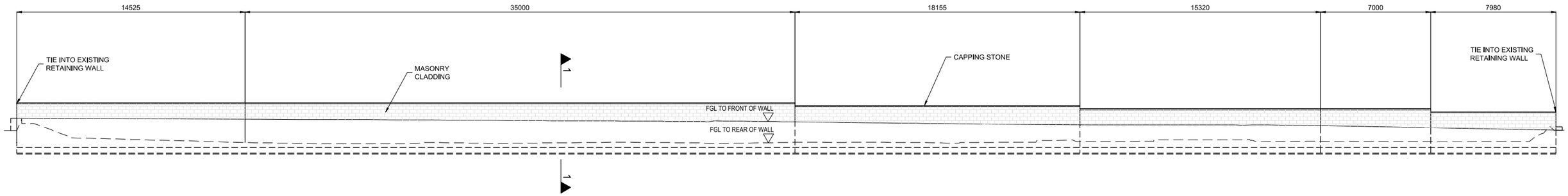

DEVELOPED ELEVATION A-A

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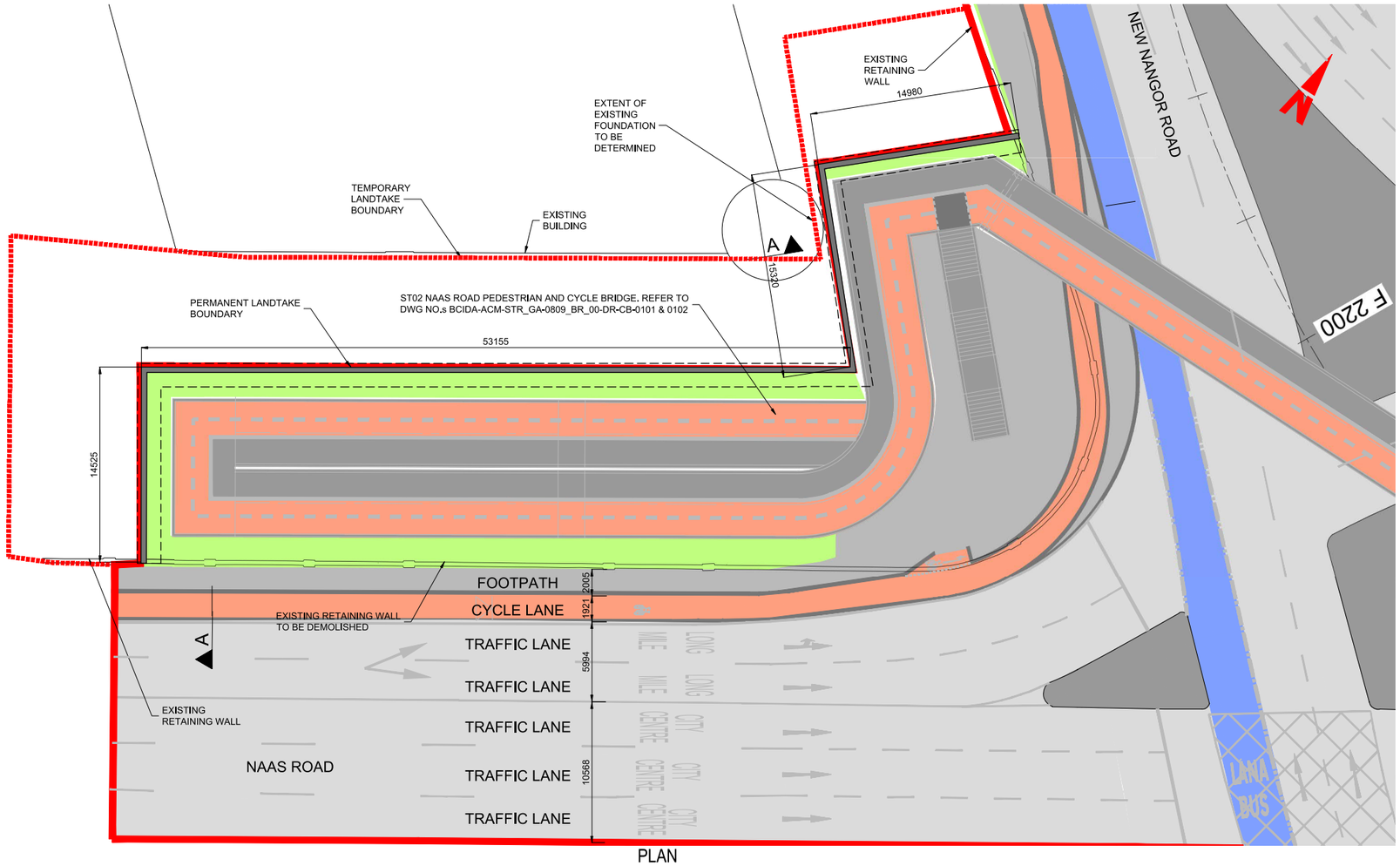
1:250 @ A3



PLAN

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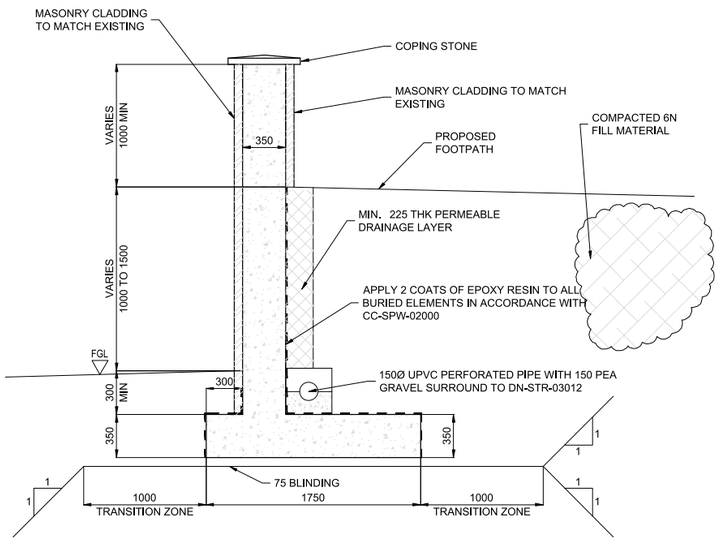

SECTION 1-1

1:25 @ A1
1:50 @ A3

Project Ireland 2040
Building Ireland's Future

Rev	Date	Drn	Chk'd	App'd	Description
L01.1	03/02/22	DH	AD	CA	ISSUE FOR PEER REVIEW

Client: NTA — Údarás Náisiúnta Iompair, National Transport Authority
Engineering Designer: AECOM, MOTT MACDONALD

Date	Scale	Drawn	Checked	Approved
03/02/22	AS SHOWN @ A1, AS SHOWN @ A3			

Project Code	Originator Code	QMS Code
BCIDA	ACM	

Programme Title: **BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS**

Drawing Title: TALLAGHT/CLONDALKIN TO CITY CENTRE SCHEME
RW05 NAAS ROAD RETAINING WALL NO.2
GENERAL ARRANGEMENT

Drawing File Name	Sheet Number	Status	Rev
BCIDA-ACM-STR_GA-0809_RW_00-DR-CB-0111	1 of 1		L01.1

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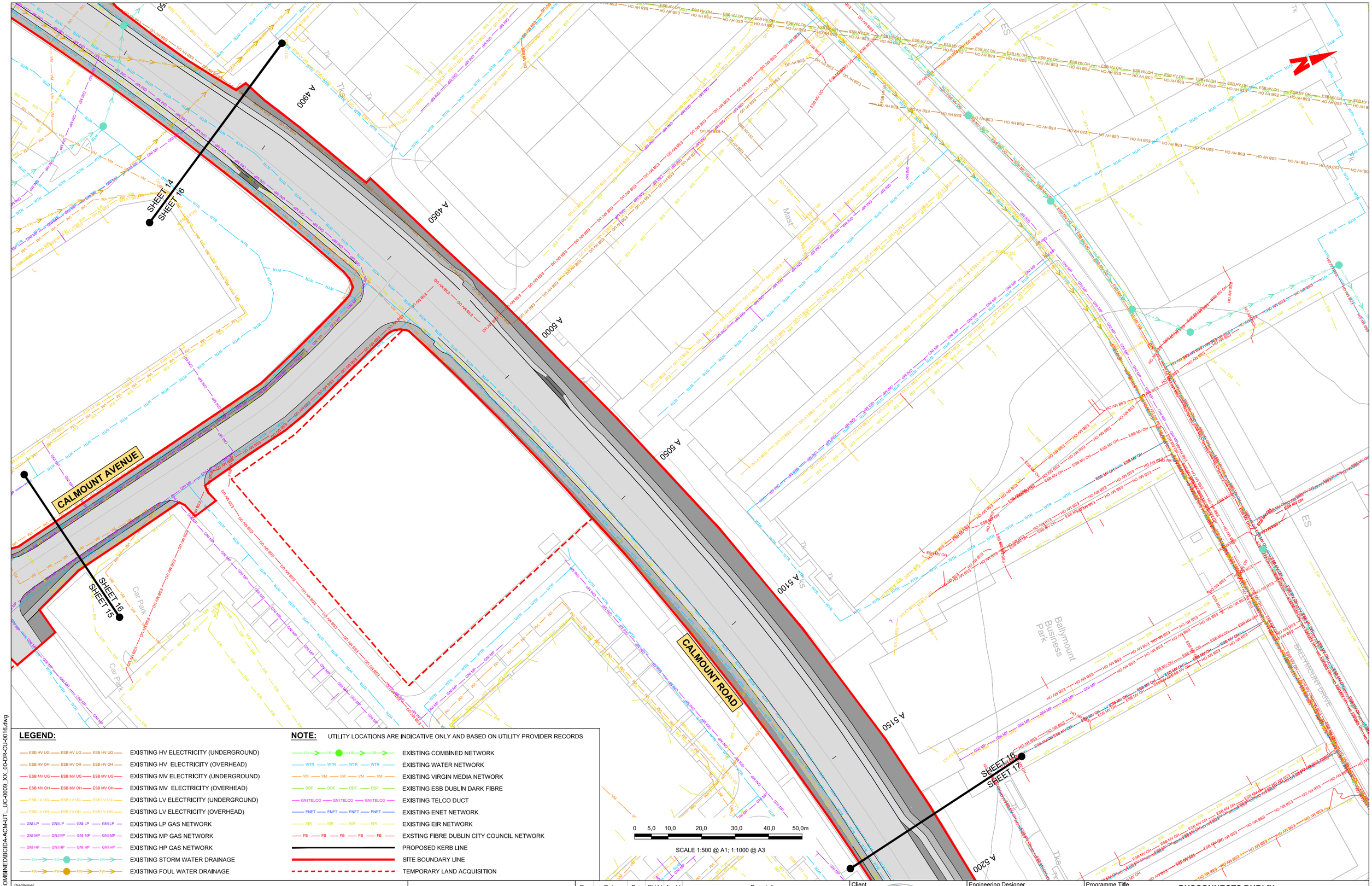
Appendix C Utility Drawings



LEGEND:

ESB HV UG	EXISTING HV ELECTRICITY (UNDERGROUND)
ESB HV OH	EXISTING HV ELECTRICITY (OVERHEAD)
ESB MV UG	EXISTING MV ELECTRICITY (UNDERGROUND)
ESB MV OH	EXISTING MV ELECTRICITY (OVERHEAD)
ESB LV UG	EXISTING LV ELECTRICITY (UNDERGROUND)
ESB LV OH	EXISTING LV ELECTRICITY (OVERHEAD)
GNI LP	EXISTING LP GAS NETWORK
GNI MP	EXISTING MP GAS NETWORK
GNI HP	EXISTING HP GAS NETWORK
SW	EXISTING STORM WATER DRAINAGE
FW	EXISTING FOUL WATER DRAINAGE
CB	EXISTING COMBINED NETWORK
WTR	EXISTING WATER NETWORK
VM	EXISTING VIRGIN MEDIA NETWORK
DDF	EXISTING ESB DUBLIN DARK FIBRE
GNI TELCO	EXISTING TELCO DUCT
ENET	EXISTING ENET NETWORK
EIR	EXISTING EIR NETWORK
FB	EXSTING FIBRE DUBLIN CITY COUNCIL NETWORK
	PROPOSED KERB LINE
	SITE BOUNDARY LINE
	TEMPORARY LAND ACQUISITION

NOTE: UTILITY LOCATIONS ARE INDICATIVE ONLY AND BASED ON UTILITY PROVIDER RECORDS

Project Ireland 2040 Building Ireland's Future

Rev	Date	Drn	Chk'd	App'd	Description
L02	30/04/21	PZ	AD	JS	ISSUED FOR PEER REVIEW
L01	23/10/20	PZ	AD	JS	STAGE A - PEER REVIEW

Client: NTA Údarás Náisiúnta Iompair / National Transport Authority

Engineering Designer: AECOM / MOTT MACDONALD

Date	Scale	Drawn	Checked	Approved
30/04/21	1:500 @ A1, 1:1000 @ A3	P.ZAJAC	A.DUGGAN	J.SEYMOUR

Project Code	Originator Code	QMS Code
BCIDA	ACM	

Programme Title: **BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS**

Drawing Title: CBC09 TALLAGHT/CLONDALKIN TO CITY CENTRE COMBINED EXISTING UTILITIES RECORDS SHEET 16

Drawing File Name	Sheet Number	Status	Rev
BCIDA-ACM-UTL_UC-0009_XX_00-DR-CU-0016	16 of 44	S3	L02

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0 5.0 10.0 20.0 30.0 40.0 50.0m

SCALE 1:500 @ A1; 1:1000 @ A3

SHEET 15
SHEET 17

SHEET 16
SHEET 17

SHEET 17
SHEET 18

CALMOUNT ROAD

GREENHILLS ROAD

C 600
C 660
C 700
C 750
C 800
C 850
C 900
C 914

A 5200
A 5250
A 5300
A 5350
A 5400
A 5450

Car Park
ESB
TK
Ballymount Court Business Centre

LEGEND:

- EXISTING HV ELECTRICITY (UNDERGROUND) — ESB HV UG
- EXISTING HV ELECTRICITY (OVERHEAD) — ESB HV OH
- EXISTING MV ELECTRICITY (UNDERGROUND) — ESB MV UG
- EXISTING MV ELECTRICITY (OVERHEAD) — ESB MV OH
- EXISTING LV ELECTRICITY (UNDERGROUND) — ESB LV UG
- EXISTING LV ELECTRICITY (OVERHEAD) — ESB LV OH
- EXISTING LP GAS NETWORK — GNI LP
- EXISTING MP GAS NETWORK — GNI MP
- EXISTING HP GAS NETWORK — GNI HP
- EXISTING STORM WATER DRAINAGE — SW
- EXISTING FOUL WATER DRAINAGE — FW

NOTE:

UTILITY LOCATIONS ARE INDICATIVE ONLY AND BASED ON UTILITY PROVIDER RECORDS

- EXISTING COMBINED NETWORK — CB
- EXISTING WATER NETWORK — WTR
- EXISTING VIRGIN MEDIA NETWORK — VM
- EXISTING ESB DUBLIN DARK FIBRE — DDF
- EXISTING TELCO DUCT — GNI TELCO
- EXISTING ENET NETWORK — ENET
- EXISTING EIR NETWORK — EIR
- EXSTING FIBRE DUBLIN CITY COUNCIL NETWORK — FB
- PROPOSED KERB LINE
- SITE BOUNDARY LINE
- TEMPORARY LAND ACQUISITION

Project Ireland 2040 Building Ireland's Future

Rev	Date	Drn	Chk'd	App'd	Description
L02	30/04/21	PZ	AD	JS	ISSUED FOR PEER REVIEW
L01	23/10/20	PZ	AD	JS	STAGE A - PEER REVIEW

Client: NTA — Údarás Náisiúnta Iompair, National Transport Authority

Engineering Designer: AECOM / MOTT MACDONALD

Date	Scale	Drawn	Checked	Approved
30/04/21	1:500 @ A1, 1:1000 @ A3	P.ZAJAC	A.DUGGAN	J.SEYMOUR

Project Code	Originator Code	QMS Code
BCIDA	ACM	

Programme Title: BUSCONNECTS DUBLIN
CORE BUS CORRIDORS INFRASTRUCTURE WORKS

Drawing Title: CBC09
TALLAGHT/CLONDALKIN TO CITY CENTRE
COMBINED EXISTING UTILITIES RECORDS
SHEET 17

Drawing File Name	Sheet Number	Status	Rev
BCIDA-ACM-UTL_UC-0009_XX_00-DR-CU-0017	17 of 44	S3	L02

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LEGEND:

ESB HV UG / ESB HV UG / ESB HV UG	EXISTING HV ELECTRICITY (UNDERGROUND)
ESB HV OH / ESB HV OH / ESB HV OH	EXISTING HV ELECTRICITY (OVERHEAD)
ESB MV UG / ESB MV UG / ESB MV UG	EXISTING MV ELECTRICITY (UNDERGROUND)
ESB MV OH / ESB MV OH / ESB MV OH	EXISTING MV ELECTRICITY (OVERHEAD)
ESB LV UG / ESB LV UG / ESB LV UG	EXISTING LV ELECTRICITY (UNDERGROUND)
ESB LV OH / ESB LV OH / ESB LV OH	EXISTING LV ELECTRICITY (OVERHEAD)
GNI LP / GNI LP / GNI LP / GNI LP	EXISTING LP GAS NETWORK
GNI MP / GNI MP / GNI MP / GNI MP	EXISTING MP GAS NETWORK
GNI HP / GNI HP / GNI HP / GNI HP	EXISTING HP GAS NETWORK
SW / SW / SW / SW	EXISTING STORM WATER DRAINAGE
FW / FW / FW / FW	EXISTING FOUL WATER DRAINAGE

NOTE: UTILITY LOCATIONS ARE INDICATIVE ONLY AND BASED ON UTILITY PROVIDER RECORDS

CB / CB / CB / CB	EXISTING COMBINED NETWORK
WTR / WTR / WTR / WTR	EXISTING WATER NETWORK
VM / VM / VM / VM / VM	EXISTING VIRGIN MEDIA NETWORK
DDF / DDF / DDF / DDF	EXISTING ESB DUBLIN DARK FIBRE
GNI TELCO / GNI TELCO / GNI TELCO	EXISTING TELCO DUCT
ENET / ENET / ENET / ENET	EXISTING ENET NETWORK
EIR / EIR / EIR / EIR	EXISTING EIR NETWORK
FB / FB / FB / FB / FB	EXSTING FIBRE DUBLIN CITY COUNCIL NETWORK
	PROPOSED KERB LINE
	SITE BOUNDARY LINE
	TEMPORARY LAND ACQUISITION

0 5.0 10.0 20.0 30.0 40.0 50.0m

SCALE 1:500 @ A1; 1:1000 @ A3

SLIEVEBLOOM ROAD
LONG MILE ROAD
DRIMNAGH ROAD
BALFE ROAD
WALKINSTOWN ROAD
BRANDON ROAD
SLIEVEBLOOM PARK
A 6650
A 6700
A 6750
A 6800
A 6850
A 6900
A 6950
A 7000
SHEET 21
SHEET 22
SHEET 23
Clubhouse
Bank
Car Park
20A-20D

Project Ireland 2040 Building Ireland's Future

Rev	Date	Drn	Chk'd	App'd	Description
L02	30/04/21	PZ	AD	JS	ISSUED FOR PEER REVIEW
L01	23/10/20	PZ	AD	JS	STAGE A - PEER REVIEW

Client: NTA Údarás Náisiúnta Iompair / National Transport Authority

Engineering Designer: AECOM / MOTT MACDONALD

Date	Scale	Drawn	Checked	Approved
30/04/21	1:500 @ A1, 1:1000 @ A3	P.ZAJAC	A.DUGGAN	J.SEYMOUR

Project Code	Originator Code	QMS Code
BCIDA	ACM	

Programme Title: **BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS**

Drawing Title: CBC09 TALLAGHT/CLONDALKIN TO CITY CENTRE COMBINED EXISTING UTILITIES RECORDS SHEET 22

Drawing File Name	Sheet Number	Status	Rev
BCIDA-ACM-UTL_UC-0009_XX_00-DR-CU-0022	22 of 44	S3	L02

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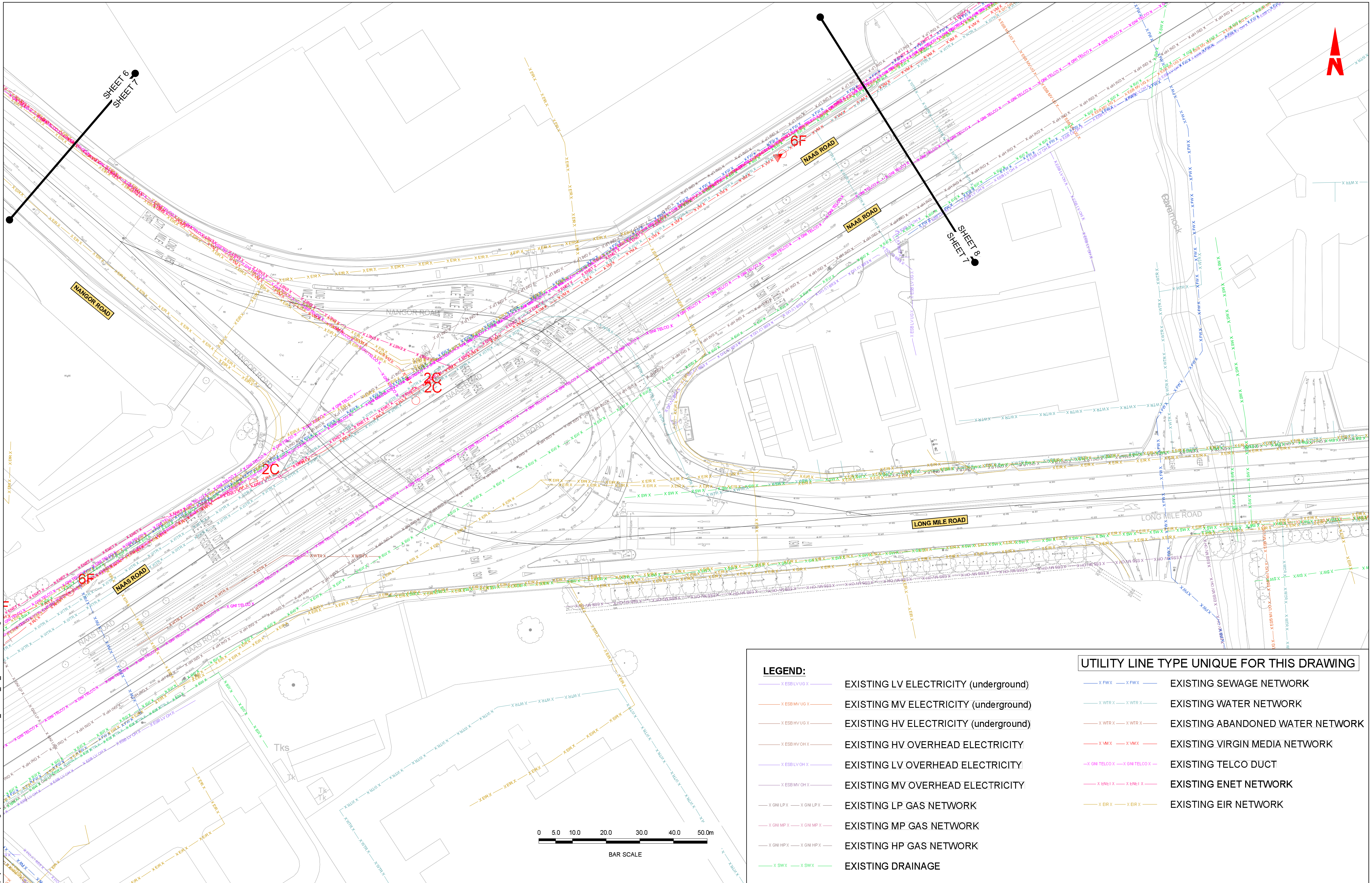

LEGEND:

X ESB LV UG X	EXISTING LV ELECTRICITY (underground)
X ESB MV UG X	EXISTING MV ELECTRICITY (underground)
X ESB HV UG X	EXISTING HV ELECTRICITY (underground)
X ESB HV OH X	EXISTING HV OVERHEAD ELECTRICITY
X ESB LV OH X	EXISTING LV OVERHEAD ELECTRICITY
X ESB MV OH X	EXISTING MV OVERHEAD ELECTRICITY
X GNI LP X	EXISTING LP GAS NETWORK
X GNI MP X	EXISTING MP GAS NETWORK
X GNI HP X	EXISTING HP GAS NETWORK
X SWX X	EXISTING DRAINAGE

UTILITY LINE TYPE UNIQUE FOR THIS DRAWING

X FWX X	EXISTING SEWAGE NETWORK
X WTR X	EXISTING WATER NETWORK
X WTR X	EXISTING ABANDONED WATER NETWORK
X VMX X	EXISTING VIRGIN MEDIA NETWORK
X GNI TELCO X	EXISTING TELCO DUCT
X ENET X	EXISTING ENET NETWORK
X EIR X	EXISTING EIR NETWORK

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b. This drawing is to be used for the design element identified in the titlebox. Other information shown is to be considered indicative only. The drawing is to be read in conjunction with all other relevant design drawings.

c. O.S. data used for plans are printed under © Ordnance Survey Ireland Government of Ireland. All rights reserved. Licence Number 2020/OSi_NMA_180 National Transport Authority. All elevations are in metres and relate to OSi Geoid Model (OSGM15) Malin Head. All Co-ordinates are in Irish Transverse Mercator Grid (ITM) as defined by OSi active local GPS station.

d. Information concerning the position of apparatus shown on this drawing is based on drawings supplied by the utility owners and/or the utility works contractor, whilst every care has been taken in the preparation of this drawing, positions should be taken as approximate and are intended for general guidance only and no representation is made by the NTA as to the accuracy, completeness, sufficiency or otherwise of this drawing and the position of the apparatus.The information contained herein does not purport to be comprehensive or final as the apparatus is subject to being altered and/or superceded. Recipients should not rely on this information. Any liabilities are hereby expressly disclaimed.

e. The information contained herein has been provided by the NTA but does not purport to be comprehensive or final. Recipients should not rely on the information. Neither the NTA nor any of its directors, officers, employees, agents, stakeholders or advisers make any representation or warranty as to, or accept any liability or responsibility in relation to, the adequacy, accuracy, reasonableness or completeness of the information provided as part of this document or any matter on which the information is based (including but not limited to loss or damage arising as a result of reliance by recipients on the information or any part of it). Any liabilities are hereby expressly disclaimed.

Project Ireland 2040
Building Ireland's Future

Rev	Date	Drn	Chk'd	App'd	Description
L01	18/08/20				ISSUED FOR DESIGN FIX 3

Client: NTA Údarás Náisiúnta Iompair National Transport Authority

Engineering Designer: AECOM / MOTT MACDONALD

Programme Title: BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS

Drawing Title: CBC08 TALLAGHT/CLONDALKIN TO CITY CENTRE COMBINED EXISTING UTILITIES

Date	Scale	Drawn	Checked	Approved
18/08/20	1:500 @ A1 1:1000 @ A3			

Project Code	Originator Code	QMS Code	Drawing File Name	Sheet Number	Status	Rev
BCIDA	ACM		BCIDA-ACM-UTL_UC-0008_XX_00-DR-CU-0007	7 of 12	S3	L01

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Appendix D Designers Risk Assessment

BusConnects Package A – CBC0809 Tallaght/Clondalkin to City Centre
CBC0809-RW01 Calmount Road Retaining Wall No.1
Designers Risk Assessment

Project Number:	60599126	**Revision**						
Client:	National Transport Authority	**Rev**	01	02	03	04	05	06	07
Designer:	AECOM	**Date**	26/03/21						
Contractor:	Not applicable	**Client**	✓						
Prepared by:	Rionach Murphy	**Designer**	✓						
Checked by:	Arthur Costello	**Main Contractor**	-						
Approved by:	Niamh Rodgers	**Sub-Contractors**	-						
		Other	-						

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
1	Live Carriageways	Site is immediately adjacent to Calmount Road. The road will be live during majority of construction.	High	Traffic management to be implemented to ensure that safe working strips are provided to work areas.	Live traffic with traffic management zones	Medium	Traffic Management controls to be implemented on site during construction works. Contractor is to ensure that appropriate PPE is worn at all times and that all staff are aware of the risks of working near a live road.
2	Access and egress to the site area	Access and egress to the central supports is via Calmount Road.	High	Traffic management to be implemented to ensure that safe access and egress is achieved		Low	The contractor is to ensure that suitable traffic management is implemented on site which includes appropriately designed and identified access points for site vehicles.
3	Site security	Unauthorised access by members of the public to the works areas	High	Suitable hoarding/fencing to be erected to prevent unauthorised access to the works areas		Low	Contractor to ensure that fencing is erected and maintained throughout the construction works.

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
5	Underground services	Potential for unknown and/or undocumented services in the vicinity of the proposed structure.	Medium	Desk top study of available utility information carried out and all known services in the vicinity of the proposed structure have been shown on detailed design drawings.		Low	Full CAT scan site survey to be carried out prior to construction commencing. Any services identified should be located by hand excavation, marked and protected or re-routed before commencement of works
6	Substances hazardous to health	Risk of chemical exposure from construction materials such as waterproofing and silane	High	Project Specific Specifications have been prepared to identify a number of likely substances to be used in the construction which are hazardous to health		Medium	Contractor to refer to project specification for further information. All substances to be applied in line with manufacturers recommendations
7	Slope/ground stability	Risk of embankment failure during construction	High	Embankments have been designed to ensure stability during temporary construction stages as well as the final construction. The depth of embankments has been limited where possible to reduce the risk of collapse.		Low	Stability of constructed embankments to be checked on a regular basis, surcharging with heavy plant to be avoided on embankments, if movement of heavy plant on embankments is required the embankment should be monitored.
8	Excavation adjacent to a live road	Excavations required to construct the wall run the risk of undermining and vibrating the foundations of the live road adjacent to the Wall	High				The contractor is to be aware of the risk of undermining the existing road foundations. The contractor is to ensure that vibration levels from excavation are limited and that safe working limits are developed prior to works.
9	Manual handling	Injury to staff, possible back injury and/or crushing toes, caused by manual handling, lifting tools and equipment, moving materials, and/or hand digging.	High	Consideration of method of construction has been made during detailed design. Elements have been sized such that they can be easily fabricated and transported.		Low	Contractor to develop method statements and ensure manual handling training is undertaken prior to manual handling activities. Only trained personnel to use tools. Only use the appropriate tool for each activity. Specialised equipment or mechanical hoist equipment to be used where appropriate.

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
10	Power tools	Risk of clothing becoming entangled in moving parts; possibility of eye injuries from dust or other airborne fragments, when using power tools. Also, risk of wrist and/or hand injuries, due to power tools jamming or binding. Hand/Arm Vibration Syndrome (HAVS) from over use of power tools	High	Consideration has been made during the design to reduce the requirements for power tools.		Low	The contractor is to ensure safe systems of work are in place and followed at all times. Protective PPE including eye protection and safety footwear (laced) provided and all staff must have received manual handling training. Inspect all tools before use for damage/wear, do not use if damaged. Hydraulic tools to be used in accordance with manufacturer's procedures and safety procedures and serviced to the manufacturer's specification
11	Night-time Working	Reduced visibility and fatigue caused by night time working poses the risk of slips, trips, falls and unsafe working practices being incorporated.	High	Site personnel should receive the required safety induction training. Appropriate signage should be erected to make site personnel aware of the potential hazards across the site.		Low	The contractor must ensure that all site personnel wear the required PPE at all times when on site. It is also the contractor's responsibility to ensure site personnel are not overworked and remain vigilant.
12	Demolition of structures	Demolition of existing retaining wall	High	Detailed demolition plan to be prepared prior to demolition. Lane closures and traffic management to be implemented during demolition.		Medium	Contractor is to develop a detailed method statement and risk assessment for all demolition works. Safe working limits are to be established and any damages that occur to the existing road must be repaired.

BusConnects Package A – CBC0809 Tallaght/Clondalkin to City Centre
CBC0809-RW02 Calmount Road Retaining Wall No.2
Designers Risk Assessment

Project Number:	60599126	**Revision**						
Client:	National Transport Authority	**Rev**	01	02	03	04	05	06	07
Designer:	AECOM	**Date**	26/03/21						
Contractor:	Not applicable	**Client**	✓						
Prepared by:	Rionach Murphy	**Designer**	✓						
Checked by:	Arthur Costello	**Main Contractor**	-						
Approved by:	Niamh Rodgers	**Sub-Contractors**	-						
		Other	-						

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
1	Live Carriageways	Site is immediately adjacent to Calmount Road. The road will be live during majority of construction.	High	Traffic management to be implemented to ensure that safe working strips are provided to work areas.	Live traffic with traffic management zones	Medium	Traffic Management controls to be implemented on site during construction works. Contractor is to ensure that appropriate PPE is worn at all times and that all staff are aware of the risks of working near a live road.
2	Access and egress to the site area	Access and egress to the central supports is via Calmount Road.	High	Traffic management to be implemented to ensure that safe access and egress is achieved		Low	The contractor is to ensure that suitable traffic management is implemented on site which includes appropriately designed and identified access points for site vehicles.
3	Site security	Unauthorised access by members of the public to the works areas	High	Suitable hoarding/fencing to be erected to prevent unauthorised access to the works areas		Low	Contractor to ensure that fencing is erected and maintained throughout the construction works.

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
5	Underground services	Potential for unknown and/or undocumented services in the vicinity of the proposed structure.	Medium	Desk top study of available utility information carried out and all known services in the vicinity of the proposed structure have been shown on detailed design drawings.		Low	Full CAT scan site survey to be carried out prior to construction commencing. Any services identified should be located by hand excavation, marked and protected or re-routed before commencement of works
6	Substances hazardous to health	Risk of chemical exposure from construction materials such as waterproofing and silane	High	Project Specific Specifications have been prepared to identify a number of likely substances to be used in the construction which are hazardous to health		Medium	Contractor to refer to project specification for further information. All substances to be applied in line with manufacturers recommendations
7	Slope/ground stability	Risk of embankment failure during construction	High	Embankments have been designed to ensure stability during temporary construction stages as well as the final construction. The depth of embankments has been limited where possible to reduce the risk of collapse.		Low	Stability of constructed embankments to be checked on a regular basis, surcharging with heavy plant to be avoided on embankments, if movement of heavy plant on embankments is required the embankment should be monitored.
8	Excavation adjacent to a live road	Excavations required to construct the wall run the risk of undermining and vibrating the foundations of the live road adjacent to the Wall	High				The contractor is to be aware of the risk of undermining the existing road foundations. The contractor is to ensure that vibration levels from excavation are limited and that safe working limits are developed prior to works.
9	Manual handling	Injury to staff, possible back injury and/or crushing toes, caused by manual handling, lifting tools and equipment, moving materials, and/or hand digging.	High	Consideration of method of construction has been made during detailed design. Elements have been sized such that they can be easily fabricated and transported.		Low	Contractor to develop method statements and ensure manual handling training is undertaken prior to manual handling activities. Only trained personnel to use tools. Only use the appropriate tool for each activity. Specialised equipment or mechanical hoist equipment to be used where appropriate.

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
10	Power tools	Risk of clothing becoming entangled in moving parts; possibility of eye injuries from dust or other airborne fragments, when using power tools. Also, risk of wrist and/or hand injuries, due to power tools jamming or binding. Hand/Arm Vibration Syndrome (HAVS) from over use of power tools	High	Consideration has been made during the design to reduce the requirements for power tools.		Low	The contractor is to ensure safe systems of work are in place and followed at all times. Protective PPE including eye protection and safety footwear (laced) provided and all staff must have received manual handling training. Inspect all tools before use for damage/wear, do not use if damaged. Hydraulic tools to be used in accordance with manufacturer's procedures and safety procedures and serviced to the manufacturer's specification
11	Night-time Working	Reduced visibility and fatigue caused by night time working poses the risk of slips, trips, falls and unsafe working practices being incorporated.	High	Site personnel should receive the required safety induction training. Appropriate signage should be erected to make site personnel aware of the potential hazards across the site.		Low	The contractor must ensure that all site personnel wear the required PPE at all times when on site. It is also the contractor's responsibility to ensure site personnel are not overworked and remain vigilant.
12	Demolition of structures	Demolition of existing retaining wall	High	Detailed demolition plan to be prepared prior to demolition. Lane closures and traffic management to be implemented during demolition.		Medium	Contractor is to develop a detailed method statement and risk assessment for all demolition works. Safe working limits are to be established and any damages that occur to the existing road must be repaired.

BusConnects Package A – CBC0809 Tallaght/Clondalkin to City Centre
CBC0809-RW03 Long Mile Road Retaining Wall
Designers Risk Assessment

Project Number:	60599126	**Revision**						
Client:	National Transport Authority	**Rev**	01	02	03	04	05	06	07
Designer:	AECOM	**Date**	26/03/21						
Contractor:	Not applicable	**Client**	✓						
Prepared by:	Rionach Murphy	**Designer**	✓						
Checked by:	Arthur Costello	**Main Contractor**	-						
Approved by:	Niamh Rodgers	**Sub-Contractors**	-						
		Other	-						

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
1	Live Carriageways	Site is immediately adjacent to the Long Mile Road. The road will be live during majority of construction.	High	Traffic management to be implemented to ensure that safe working strips are provided to work areas.	Live traffic with traffic management zones	Medium	Traffic Management controls to be implemented on site during construction works. Contractor is to ensure that appropriate PPE is worn at all times and that all staff are aware of the risks of working near a live road.
2	Access and egress to the site area	Access and egress is via the Long Mile Road and Slievebloom Park.	High	Traffic management to be implemented to ensure that safe access and egress is achieved		Low	The contractor is to ensure that suitable traffic management is implemented on site which includes appropriately designed and identified access points for site vehicles.
3	Site security	Unauthorised access by members of the public to the works areas	High	Suitable hoarding/fencing to be erected to prevent unauthorised access to the works areas		Low	Contractor to ensure that fencing is erected and maintained throughout the construction works.
5	Underground services	Potential for unknown and/or undocumented services in the vicinity of the proposed structure.	Medium	Desk top study of available utility information carried out and all known services in the vicinity of the proposed structure have been shown on detailed design drawings.		Low	Full CAT scan site survey to be carried out prior to construction commencing. Any services identified should be located by hand excavation, marked and protected or re-routed before commencement of works

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
6	Substances hazardous to health	Risk of chemical exposure from construction materials such as waterproofing and silane	High	Project Specific Specifications have been prepared to identify a number of likely substances to be used in the construction which are hazardous to health		Medium	Contractor to refer to project specification for further information. All substances to be applied in line with manufacturers recommendations
7	Slope/ground stability	Risk of embankment failure during construction	High	Embankments have been designed to ensure stability during temporary construction stages as well as the final construction. The depth of embankments has been limited where possible to reduce the risk of collapse.		Low	Stability of constructed embankments to be checked on a regular basis, surcharging with heavy plant to be avoided on embankments, if movement of heavy plant on embankments is required the embankment should be monitored.
8	Excavation adjacent to a live road	Excavations required to construct the wall run the risk of undermining and vibrating the foundations of the live road adjacent to the Wall	High				The contractor is to be aware of the risk of undermining the existing Naas Road road foundations. The contractor is to ensure that vibration levels from excavation are limited and that safe working limits are developed prior to works.
9	Manual handling	Injury to staff, possible back injury and/or crushing toes, caused by manual handling, lifting tools and equipment, moving materials, and/or hand digging.	High	Consideration of method of construction has been made during detailed design. Elements have been sized such that they can be easily fabricated and transported.		Low	Contractor to develop method statements and ensure manual handling training is undertaken prior to manual handling activities. Only trained personnel to use tools. Only use the appropriate tool for each activity. Specialised equipment or mechanical hoist equipment to be used where appropriate.

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
10	Power tools	Risk of clothing becoming entangled in moving parts; possibility of eye injuries from dust or other airborne fragments, when using power tools. Also, risk of wrist and/or hand injuries, due to power tools jamming or binding. Hand/Arm Vibration Syndrome (HAVS) from over use of power tools	High	Consideration has been made during the design to reduce the requirements for power tools.		Low	The contractor is to ensure safe systems of work are in place and followed at all times. Protective PPE including eye protection and safety footwear (laced) provided and all staff must have received manual handling training. Inspect all tools before use for damage/wear, do not use if damaged. Hydraulic tools to be used in accordance with manufacturer's procedures and safety procedures and serviced to the manufacturer's specification
11	Night-time Working	Reduced visibility and fatigue caused by night time working poses the risk of slips, trips, falls and unsafe working practices being incorporated.	High	Site personnel should receive the required safety induction training. Appropriate signage should be erected to make site personnel aware of the potential hazards across the site.		Low	The contractor must ensure that all site personnel wear the required PPE at all times when on site. It is also the contractor's responsibility to ensure site personnel are not overworked and remain vigilant.
12	Demolition of structures	Demolition of existing retaining wall	High	Detailed demolition plan to be prepared prior to demolition. Lane closures and traffic management to be implemented during demolition.		Medium	Contractor is to develop a detailed method statement and risk assessment for all demolition works. Safe working limits are to be established and any damages that occur to the existing road must be repaired.

BusConnects Package A – CBC08 Tallaght/Clondalkin to City Centre
CBC0809-RW04 Naas Road Retaining Wall No.1
Designers Risk Assessment

Project Number:	60599126	**Revision**						
Client:	National Transport Authority	**Rev**	01	02	03	04	05	06	07
Designer:	AECOM	**Date**	26/03/21						
Contractor:	Not applicable	**Client**	✓						
Prepared by:	Rionach Murphy	**Designer**	✓						
Checked by:	Arthur Costello	**Main Contractor**	-						
Approved by:	Niamh Rodgers	**Sub-Contractors**	-						
		Other	-						

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
1	Live Carriageways	Site is immediately adjacent to the Naas Road. The road will be live during majority of construction.	High	Traffic management to be implemented to ensure that safe working strips are provided to work areas.	Live traffic with traffic management zones	Medium	Traffic Management controls to be implemented on site during construction works. Contractor is to ensure that appropriate PPE is worn at all times and that all staff are aware of the risks of working near a live road.
2	Access and egress to the site area	Access and egress to the central supports is via the Naas Road.	High	Traffic management to be implemented to ensure that safe access and egress is achieved		Low	The contractor is to ensure that suitable traffic management is implemented on site which includes appropriately designed and identified access points for site vehicles.
3	Site security	Unauthorised access by members of the public to the works areas	High	Suitable hoarding/fencing to be erected to prevent unauthorised access to the works areas		Low	Contractor to ensure that fencing is erected and maintained throughout the construction works.
5	Underground services	Potential for unknown and/or undocumented services in the vicinity of the proposed structure.	Medium	Desk top study of available utility information carried out and all known services in the vicinity of the proposed structure have been shown on detailed design drawings.		Low	Full CAT scan site survey to be carried out prior to construction commencing. Any services identified should be located by hand excavation, marked and protected or re-routed before commencement of works

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
6	Substances hazardous to health	Risk of chemical exposure from construction materials such as waterproofing and silane	High	Project Specific Specifications have been prepared to identify a number of likely substances to be used in the construction which are hazardous to health		Medium	Contractor to refer to project specification for further information. All substances to be applied in line with manufacturers recommendations
7	Slope/ground stability	Risk of embankment failure during construction	High	Embankments have been designed to ensure stability during temporary construction stages as well as the final construction. The depth of embankments has been limited where possible to reduce the risk of collapse.		Low	Stability of constructed embankments to be checked on a regular basis, surcharging with heavy plant to be avoided on embankments, if movement of heavy plant on embankments is required the embankment should be monitored.
8	Excavation adjacent to a live road	Excavations required to construct the wall run the risk of undermining and vibrating the foundations of the live road adjacent to the Wall	High				The contractor is to be aware of the risk of undermining the existing Naas Road road foundations. The contractor is to ensure that vibration levels from excavation are limited and that safe working limits are developed prior to works.
9	Manual handling	Injury to staff, possible back injury and/or crushing toes, caused by manual handling, lifting tools and equipment, moving materials, and/or hand digging.	High	Consideration of method of construction has been made during detailed design. Elements have been sized such that they can be easily fabricated and transported.		Low	Contractor to develop method statements and ensure manual handling training is undertaken prior to manual handling activities. Only trained personnel to use tools. Only use the appropriate tool for each activity. Specialised equipment or mechanical hoist equipment to be used where appropriate.

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
10	Power tools	Risk of clothing becoming entangled in moving parts; possibility of eye injuries from dust or other airborne fragments, when using power tools. Also, risk of wrist and/or hand injuries, due to power tools jamming or binding. Hand/Arm Vibration Syndrome (HAVS) from over use of power tools	High	Consideration has been made during the design to reduce the requirements for power tools.		Low	The contractor is to ensure safe systems of work are in place and followed at all times. Protective PPE including eye protection and safety footwear (laced) provided and all staff must have received manual handling training. Inspect all tools before use for damage/wear, do not use if damaged. Hydraulic tools to be used in accordance with manufacturer's procedures and safety procedures and serviced to the manufacturer's specification
11	Night-time Working	Reduced visibility and fatigue caused by night time working poses the risk of slips, trips, falls and unsafe working practices being incorporated.	High	Site personnel should receive the required safety induction training. Appropriate signage should be erected to make site personnel aware of the potential hazards across the site.		Low	The contractor must ensure that all site personnel wear the required PPE at all times when on site. It is also the contractor's responsibility to ensure site personnel are not overworked and remain vigilant.
12	Demolition of structures	Demolition of existing retaining wall	High	Detailed demolition plan to be prepared prior to demolition. Lane closures and traffic management to be implemented during demolition.		Medium	Contractor is to develop a detailed method statement and risk assessment for all demolition works. Safe working limits are to be established and any damages that occur to the existing road must be repaired.

BusConnects Package A – CBC08 Tallaght/Clondalkin to City Centre
CBC0809-RW05 Naas Road Retaining Wall No.2
Designers Risk Assessment

Project Number:	60599126	**Revision**						
Client:	National Transport Authority	**Rev**	01	02	03	04	05	06	07
Designer:	AECOM	**Date**	26/03/21						
Contractor:	Not applicable	**Client**	✓						
Prepared by:	Rionach Murphy	**Designer**	✓						
Checked by:	Arthur Costello	**Main Contractor**	-						
Approved by:	Niamh Rodgers	**Sub-Contractors**	-						
		Other	-						

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
1	Live Carriageways	Site is immediately adjacent to the Naas Road. The road will be live during majority of construction.	High	Traffic management to be implemented to ensure that safe working strips are provided to work areas.	Live traffic with traffic management zones	Medium	Traffic Management controls to be implemented on site during construction works. Contractor is to ensure that appropriate PPE is worn at all times and that all staff are aware of the risks of working near a live road.
2	Access and egress to the site area	Access and egress to the central supports is via the Naas Road.	High	Traffic management to be implemented to ensure that safe access and egress is achieved		Low	The contractor is to ensure that suitable traffic management is implemented on site which includes appropriately designed and identified access points for site vehicles.
3	Site security	Unauthorised access by members of the public to the works areas	High	Suitable hoarding/fencing to be erected to prevent unauthorised access to the works areas		Low	Contractor to ensure that fencing is erected and maintained throughout the construction works.
5	Underground services	Potential for unknown and/or undocumented services in the vicinity of the proposed structure.	Medium	Desk top study of available utility information carried out and all known services in the vicinity of the proposed structure have been shown on detailed design drawings.		Low	Full CAT scan site survey to be carried out prior to construction commencing. Any services identified should be located by hand excavation, marked and protected or re-routed before commencement of works

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
6	Substances hazardous to health	Risk of chemical exposure from construction materials such as waterproofing and silane	High	Project Specific Specifications have been prepared to identify a number of likely substances to be used in the construction which are hazardous to health		Medium	Contractor to refer to project specification for further information. All substances to be applied in line with manufacturers recommendations
7	Slope/ground stability	Risk of embankment failure during construction	High	Embankments have been designed to ensure stability during temporary construction stages as well as the final construction. The depth of embankments has been limited where possible to reduce the risk of collapse.		Low	Stability of constructed embankments to be checked on a regular basis, surcharging with heavy plant to be avoided on embankments, if movement of heavy plant on embankments is required the embankment should be monitored.
8	Excavation adjacent to a live road	Excavations required to construct the wall run the risk of undermining and vibrating the foundations of the live road adjacent to the Wall	High				The contractor is to be aware of the risk of undermining the existing Naas Road road foundations. The contractor is to ensure that vibration levels from excavation are limited and that safe working limits are developed prior to works.
9	Manual handling	Injury to staff, possible back injury and/or crushing toes, caused by manual handling, lifting tools and equipment, moving materials, and/or hand digging.	High	Consideration of method of construction has been made during detailed design. Elements have been sized such that they can be easily fabricated and transported.		Low	Contractor to develop method statements and ensure manual handling training is undertaken prior to manual handling activities. Only trained personnel to use tools. Only use the appropriate tool for each activity. Specialised equipment or mechanical hoist equipment to be used where appropriate.

Ref.	Feature, element, process or work activity	Constraints and significant hazards identified	Risk Rating before Intervention	Designers interventions to eliminate or reduce hazards	Significant residual hazards remaining	Residual Risk Rating	Information to be provided to enable project partners to manage hazards
10	Power tools	Risk of clothing becoming entangled in moving parts; possibility of eye injuries from dust or other airborne fragments, when using power tools. Also, risk of wrist and/or hand injuries, due to power tools jamming or binding. Hand/Arm Vibration Syndrome (HAVS) from over use of power tools	High	Consideration has been made during the design to reduce the requirements for power tools.		Low	The contractor is to ensure safe systems of work are in place and followed at all times. Protective PPE including eye protection and safety footwear (laced) provided and all staff must have received manual handling training. Inspect all tools before use for damage/wear, do not use if damaged. Hydraulic tools to be used in accordance with manufacturer's procedures and safety procedures and serviced to the manufacturer's specification
11	Night-time Working	Reduced visibility and fatigue caused by night time working poses the risk of slips, trips, falls and unsafe working practices being incorporated.	High	Site personnel should receive the required safety induction training. Appropriate signage should be erected to make site personnel aware of the potential hazards across the site.		Low	The contractor must ensure that all site personnel wear the required PPE at all times when on site. It is also the contractor's responsibility to ensure site personnel are not overworked and remain vigilant.
12	Demolition of structures	Demolition of existing retaining wall	High	Detailed demolition plan to be prepared prior to demolition. Lane closures and traffic management to be implemented during demolition.		Medium	Contractor is to develop a detailed method statement and risk assessment for all demolition works. Safe working limits are to be established and any damages that occur to the existing road must be repaired.