

The background is a vibrant red field with several abstract geometric shapes. In the top left, there's a green quarter-circle and a blue semi-circle. In the top right, there's a blue semi-circle with a white circle inside, and a dark blue horizontal bar. In the bottom left, there's a blue semi-circle with a white circle inside, and a dark blue semi-circle below it. In the bottom right, there's a large green semi-circle and a red semi-circle with a white outline. The text is positioned in the upper left quadrant of the red field.

Appendix J
Structures Preliminary
Design Report

**Preliminary Design Report-
Consultation**

STA-1b

Categories 1, 2 & 3

Scheme Name

Name and Location – BusConnects Route 7 Liffey Valley to City Centre, Dublin

Structure(s)

Name and nature of the Structure(s) – Route 7 Retaining Structures

Structures Options Report

Reference - R07-RW010, R07-RW011

Revision - L02

Date - 23rd June 2022

Submitted by

Signed  _____

Name John McElhinney

Position Structural Discipline Lead (Team Leader)

Organisation Jacobs Engineering

Date 23/06/2022

Structures Section confirmation of consultation

Signed _____

Name _____

Position _____

Date _____

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1. Introduction

1.1 Brief

Jacobs have been appointed by the National Transport Authority (NTA) to undertake the Engineering Design Services for the Planning Stage through to the end of the Statutory Process of the BusConnects Radial Core Bus Corridors Infrastructure Upgrade Programme (the Programme). The Project has been split in four packages with Jacobs undertaking Package B.

This report outlines the Preliminary Design for the retaining structures on Core Bus Corridor (CBC) 07 Liffey Valley to City Centre. The other routes undertaken by Jacobs shall be covered in separate reports. The scope of this report extends only to structures considered within Dublin County Council (DCC) maintenance boundary.

1.2 Background

The National Transport Authority (NTA) published the Transport Strategy for the Greater Dublin Area, 2016 – 2035 at the beginning of 2016. The strategy identifies a “Core Bus Network”, representing the most important bus routes within the Greater Dublin area, generally characterised by high passenger volumes, frequent services, and significant trip attractors along the routes. The identified core network comprises sixteen radial bus corridors, three orbital bus corridors and six regional bus corridors.

The Strategy states that it is intended to provide continuous bus priority, as far as is practicable, along the core bus routes. This will result in a more efficient and reliable bus service with lower journey times, increasing the attractiveness of public transport in these areas and facilitating a shift to more sustainable modes of transport. The Liffey Valley to City Centre Core Bus Corridor is identified as part of the Core Bus Network.

In March 2018, BusConnects Dublin was launched as part of major investment programme, including Metrolink and the Dublin Area Rapid Transport (DART) Expansion Programme, to improve public transport in Dublin, as part of the National Development Plan 2018-2027. The Liffey Valley to City Centre CBC serves the area to the west of Dublin city, creating an improved public transportation link for areas along the corridor.



Figure 1.2: BusConnects Dublin Radial CBC Network

1.3 Previous Studies

The first non-statutory public consultation on the BusConnects CBCs took place on a phased basis between November 2018 and May 2019. The second round of public consultations occurred between March 2020 and April 2020. A third round of public consultations then followed between November 2020 and December 2020.

Consultation with the principal project stakeholders (i.e Dublin City Council, Transport Infrastructure Ireland, Utility companies and the National Transport Authority) has also taken place.

A desktop study was undertaken to identify the existing structures within the project extents, with site inspections undertaken where information was limited.

2. Site & Function

2.1 Site Location

Along Liffey Valley to City Centre Core Bus Corridor there are 2 locations within the management area of Dublin County Council identified in the previous stage which require retaining structures to accommodate the proposed widened cross section.

Refer to Appendix A - BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1001 for details.

See Table 2.1 below for walls considered within the scope of this scheme.

Wall Reference	Retained Height (m)	Chainage Start	Chainage End	Definition
R7-RW010	3	B 3+840	B 3+910	Sarsfield Road north side of mainline along the Longmeadow Park (MAP 16, Appendix A).
R7-RW011	2.5	B 3+920	B 4+180	Sarsfield Road north side of mainline along the Longmeadow Park (MAP 16, Appendix A).

Table 2.1: Summary of walls within the scope of this report

2.2 Function of Site and Obstacles Crossed

The retaining walls are needed to maintain the required ground level in the areas affected by the proposed new elements of the bus corridor, where the height difference is too high to be maintained with an embankment.

2.3 Choice of location

Walls are located where geometric constraints do not allow for traditional earthworks batters to be contained within the site boundaries.

2.3.1 R07-RW010

R7-RW010 is located on the north side of the Sarsfield Road R833, along the Longmeadows Park Lands. The proposed widening encroaches on an existing retaining wall which also forms part of the boundary partition separating the highway from the golf course.

2.3.2 R07-RW011

R7-RW011 is located on the north side of the Sarsfield Road R833, along the Longmeadows Park Lands. The proposed widening encroaches on an existing retaining wall which also forms part of the boundary partition separating the highway from the golf course.

2.4 Site Description and Topography

2.4.1 R07-RW010

The existing wall appears to consist of a mass gravity wall, with approx. 2.0m retained height. To accommodate the widening required at this location, any new wall would have retained height varying from 2.0m to 3.0m. The length of the affected part of the existing wall is approx. 80m. The alignment of the wall is constrained by a new attenuation pond proposed to the east of the junction with St Laurence's Road required to offset the removal of

permeable surface in the development of this route. Access requirements for maintenance of the wall and access to the pond requires the proposed wall to be offset from the edge of the pond by 2m.



Figure 2.4.3: Photo of wall location R07-RW010

2.4.2 R07-RW011

The existing wall comprises of concrete gravity walls with a maximum retained height of 2.5m. Rendered finish shows signs of deterioration with localized debonding of render along the length of the wall. The western end of the wall forms part of the access to the golf course located to the north of the wall. The eastern end of the wall supports a green space that appears unused. Land take at the west end of the proposed wall is therefore unlikely to be a major constraint.



Figure 2.4.4: Photo of wall location R07-RW011

2.5 Vertical and Horizontal Alignments

Refer to the road design drawings for the proposed vertical and horizontal road alignments along the scheme.

2.6 Cross Sectional Dimensions

Not applicable for retaining structures.

2.7 Existing Underground and Overground Services

Clashes with existing utilities are potential hazards which would have major impacts on the construction and buildability of the route. Any clashes would need mitigating measures to prevent disruption to the services they provide. The affected services would require diversion prior to and during construction works. Depending on the size of the asset these mitigation works could range broadly in cost and complexity, significantly impacting the construction programmes at each location.

At locations where utilities run parallel to a proposed wall the level of the foundation should be constructed such that no loading is transferred into the assets. This could require additional reductions in foundation level, greater than that needed solely for structural purposes. Cover to existing utilities should be confirmed in detail design and the levels of foundations adjusted accordingly. Consequently, a conservative approach has been adopted when estimating land takes at location identified for protection against clashing with utilities assets. Where there is a direct clash with a buried assets and diversion is not practical, the proposed solution should accommodate these assets.

A schedule of identified clashes can be seen in Table 2.7.

Wall Reference	Underground Services	Overground Services
R7-RW010	<p><u>Electricity</u> Proximity to 2no. medium voltage asset – 1 No. to be diverted to run alongside footway, 1 No. to be diverted westwards (see drawing BCIDB-JAC-UTL_UE-0007_XX_00-DR-CU-0016)</p> <p><u>Water</u> None Identified</p> <p><u>Gas</u> None Identified</p> <p><u>Data</u> None Identified</p>	Overhead ESB – to be diverted to run alongside footway (see drawing BCIDB-JAC-UTL_UE-0007_XX_00-DR-CU-0016)
R7-RW011	<p><u>Electricity</u> Clash with LV asset – to be retained (see drawing BCIDB-JAC-UTL_UE-0007_XX_00-DR-CU-0016)</p> <p><u>Water</u> None Identified</p> <p><u>Gas</u> None Identified</p> <p><u>Data</u> None Identified</p>	Overhead ESB – to be diverted to run alongside footway (see drawing BCIDB-JAC-UTL_UE-0007_XX_00-DR-CU-0016)
Utilities list does not include domestic / privately owned services and supplies for street furniture		

Table 2.7: Summary of existing services

2.8 Geotechnical Summary

A geotechnical desktop study of the area has been undertaken using publicly available information and Ground Investigation reports available through the Geological Survey of Ireland.

Refer to Section 7 for details of the ground conditions at each retaining wall location.

2.9 Hydrology and Hydraulic Summary

Construction of the retaining walls on this scheme is not expected to have any significant impact on the local hydrogeology.

2.10 Archaeological Summary

There is no impact envisaged from these structures.

2.11 Environmental Summary

An Environmental Impact Assessment (EIA) is currently being prepared for the scheme on behalf of the Employer. Outcomes from this EIA will be reviewed and incorporated once determined.

3. Structure & Aesthetics

3.1 General Description of Recommended Structure and Design Working Life

A preferred option for each wall has been recommended based on the evaluation of the site-specific constraints.

Wall Reference	Preferred Wall Solution
R07-RW010	Precast Reinforced Concrete Cantilever Wall
R07-RW011	Precast Reinforced Concrete Cantilever Wall

Table 3.1: Summary of preferred options

3.1.1 R07-RW010 & R07-RW011

Precast concrete retaining wall is the preferred option at this location as it can best limit disruption to local residents through its comparatively short construction time. Finishes to the wall can also be catered to the wishes of the individual properties, further reducing local disruption. This solution reduces the hazards exposed to the operatives constructing the wall as off-site fabrication reduces the time and complexity of work in the excavation, required section need only be quickly lifted into position and connected.

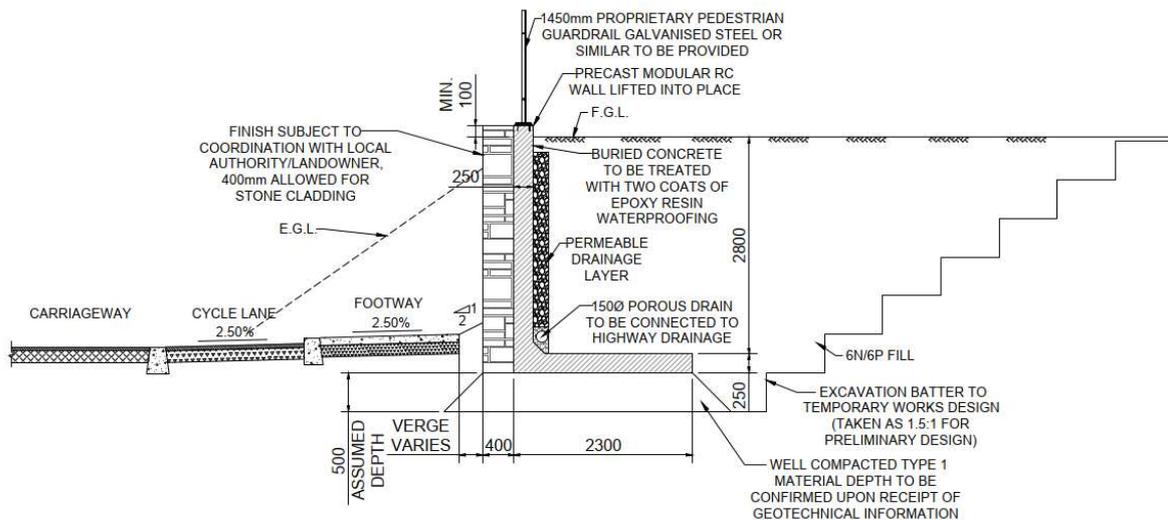


Figure 3.1.2: R07-RW010 & R07-RW011 Typical Cross-Sections

3.2 Aesthetic Considerations

For each of the locations the proposed solution should take into consideration the visual impact on the environment. There are no contractually specified finishes for walls however care should be taken to match existing finishes, in both the immediate locality and on the route in general. Thought should be given to use of feature finishes to break up plain vistas and to improve the visual appearance at locations which present a large exposed front face to the public.

3.2.1 R07-RW010 & R07-RW011

The golf course gateway at the east end of the structure will need to be set back and reconstructed. There are no identified heritage issues associated with this location and therefore there is no requirement to recreate the existing arrangement. Finishes to the wall can be catered to the wishes of the individual properties. This location should not be considered independently and the interaction with wall R7-RW011 should be coordinated to provide continuity along this section of the route.

3.3 Proposals for the Recommended Structure

3.3.1 Proposed Category

The retained height of all the walls is smaller than 5m, hence the walls are classified as Category 1 structures in accordance with DN-STR-03001.

3.3.2 Span Arrangement

Not applicable.

3.3.3 Minimum Headroom Provided

Not applicable.

3.3.4 Approaches including run-on arrangements

Not applicable.

3.3.5 Foundation Type

Shallow foundations are proposed placed directly atop a suitably prepared layer of compacted unbound fill.

In conjunction with the provision of the compacted material for the foundation layer, the wall base was sized to limit the bearing pressures to 150kN/m². Further GI is recommended to determine suitability of the proposed foundation solution.

3.3.6 Substructure

Not applicable.

3.3.7 Superstructure

Not applicable.

3.3.8 Articulation Arrangement

Nominal 20mm vertical movement joints will be used between sections of wall to allow for natural expansion and contraction of the concrete.

3.3.9 Vehicle Restraint System

No VRS system is proposed to any of the retaining walls.

3.3.10 Drainage

A permeable drainage layer will be provided behind the in-situ concrete retaining walls in accordance with CC-SPW-00500 and will provide positive outfall from one end to the other of the structure and will connect to the mainline road drainage.

3.3.11 Durability

The structure will comprise reinforced concrete, which is highly durable material with a working design life of 120 years (Working Life Category 5). Concrete specification and cover to reinforcement will be in accordance with TII publication DN-STR-03012 (Design for Durability).

3.3.12 Sustainability

Recycled GGBS will be used in the design and construction of some of the concrete elements of the structure leading to a more sustainable structure overall.

3.3.13 Inspection and Maintenance

The proposed structures are of reinforced concrete construction and are expected to have minimal maintenance and inspection requirements.

4. Safety

4.1 Traffic Management during construction

To be developed at a further stage of the design.

4.2 Safety during construction

The Designer will take account of the General Principles of Prevention, as specified in the Schedule 3 of the Safety, Health and Welfare at Work Act 2005, liaise with the Project Supervisor appointed by the Client for the Design Process and the Project Supervisor appointed for the Construction Stage and carry out all other duties as required by Clause 15 of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013).

4.3 Safety in use

Suitable edge protection will be provided on top of wall for pedestrian safety / safety of inspection and maintenance personnel.

4.4 Lighting

There are no lighting requirements for these structures.

5. Design Assessment Criteria

5.1 Actions

5.1.1 Permanent Actions

Permanent actions in accordance with IS EN 1991-1-1:2002 and the associated National Annex.

5.1.2 Snow, Wind and Thermal Actions

Snow actions are not considered in the design of the retaining walls. Snow load is ignored in accordance with NA to IS EN 1990:2002.

Wind actions shall be in accordance with IS EN 1991-1-4 and the associated National Annex.

Thermal actions will be assessed in accordance with IS EN 1991-1-5 and the associated National Annex.

5.1.3 Actions Relating to Normal Traffic

The application of traffic loads and distribution through the soil will be applied to the retaining walls in accordance with PD 6694-1:2011 (*Recommendations for the design of structures subject to traffic loading to BS EN 1997-1:2004*).

5.1.4 Actions Relating to Abnormal Traffic

Not applicable.

5.1.5 Footway or Footbridge Live Loading

Not applicable.

5.1.6 Provision for Exceptional Abnormal Loads

Abnormal loads not considered, subject to TAA confirmation

5.1.7 Accidental Actions

Not applicable.

5.1.8 Actions during Constructions

Not applicable.

5.1.9 Any Special Loading not Covered Above

A transient surcharge load will be applied to the ground behind the walls. The following non-concurrent loads have been considered in the design depending on the slope of the ground level behind the wall following BS8002:2015:

- 10 kPa Construction Surcharge (ground profile level behind the wall)
- 10 kPa Design Surcharge for slopes $\beta \leq 1V:6H$
- 5.0 kPa Design Surcharge for slopes $1V:6H < \beta \leq 1V:3H$
- 2.5 kPa Design Surcharge for slopes $\beta > 1V:3H$

5.2 Authorities consulted and any special conditions required

Principal project stakeholders have been consulted:

- Dublin City Council;
- Transport Infrastructure Ireland;
- National Transport Authority.

The following utilities companies were consulted with on a scheme wide basis:

- ESB;
- GNI;
- Irish Water;
- Eir;
- Virgin Media.

5.3 Proposed Departures from Standards

These are no proposed departures from standards for these structures

5.4 Proposed methods of dealing with aspects not covered in standards

Not applicable.

6. Ground Conditions

6.1 Geotechnical Classification

Retaining walls for this scheme are considered Geotechnical Classification 2.

6.2 Ground Conditions

Ground conditions at each structure location have been assessed using publicly available information including geological maps, hydrogeological information, publicly available ground investigations and historic mapping. The assumed local geology is described for each wall location below.

6.2.1 R07-RW0010 & RW07-RW011

The ground conditions at this location are assumed to comprise Till derived from limestones (Dublin Boulder Clay) overlying bedrock geology of dark limestones and shale of the Lucan Formation. The site of R07-RW011 is recorded to have “urban” deposits, which are assumed to be made ground overlying Glacial Till deposits. Total thickness of superficial deposits are unconfirmed, publicly available borehole information indicate a minimum thickness of 20m.

Publicly available GI reports (Figure 6-1, GSI External Report Refs: [720](#), [976](#), [1048](#)) indicated the natural superficial geology of the area is generally described as firm to very stiff clay with gravel strata also recorded within boreholes to the north of the proposed structure. Significant thickness of made ground, up to 13m in thickness, have been recorded approx. 70m to 250m north – northeast of the proposed structures in historic GI reports (GSI External Report Ref: 720, 1048). Made ground was also recorded at thicknesses of between 1.1m and 1.4m in GSI External Report Ref 976 which is located adjacent to the Sarsfield Road at the eastern end of R07-RW011. No information is provided to indicate the strength or consistency of the made ground material.

Due to this variability in the thickness and lack of strength data for made ground in this area it is recommended that ground investigation is undertaken at the wall location to confirm the founding strata and suitability of the proposed foundation solution.

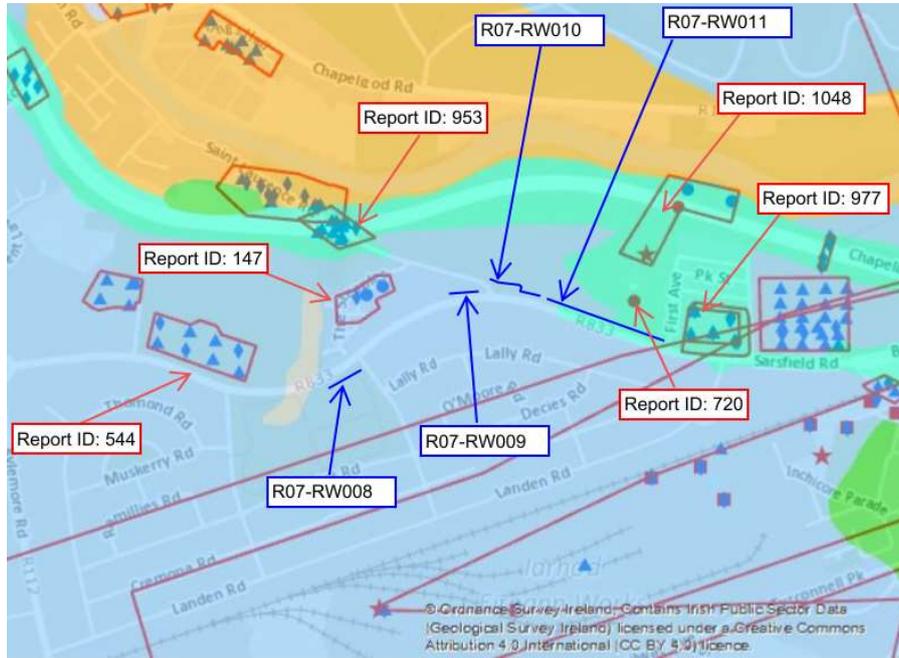


Figure 6-1 Extract from GSI website showing location of available historical GI reports for R07-RW008 – R07-RW011.

7. Drawings and Documents

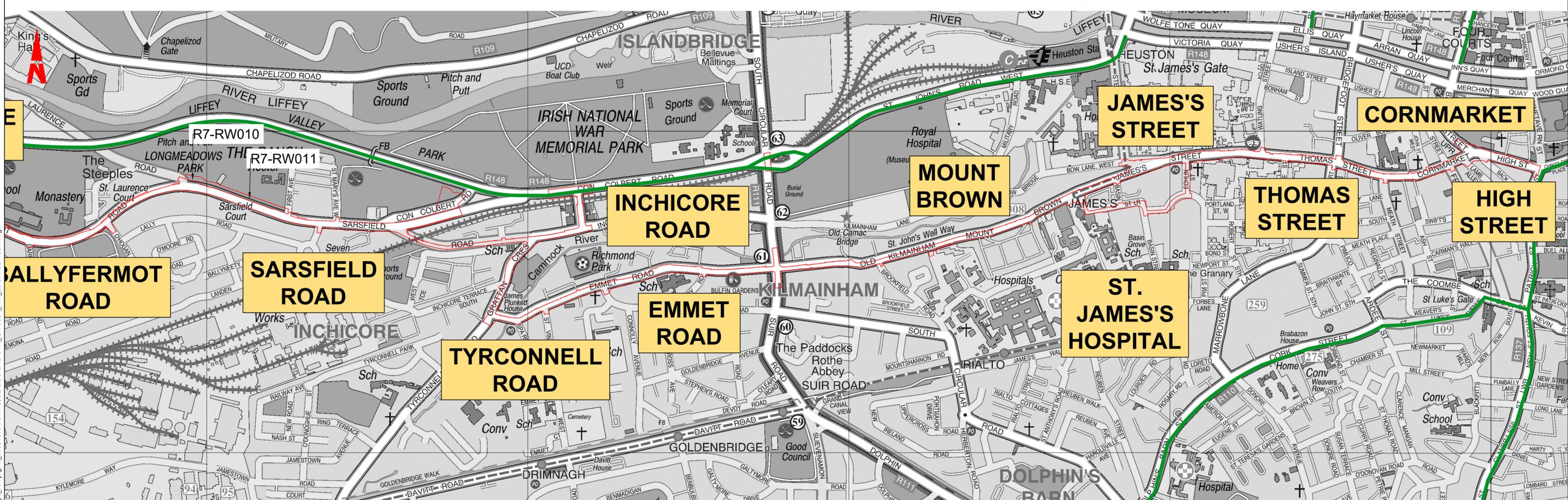
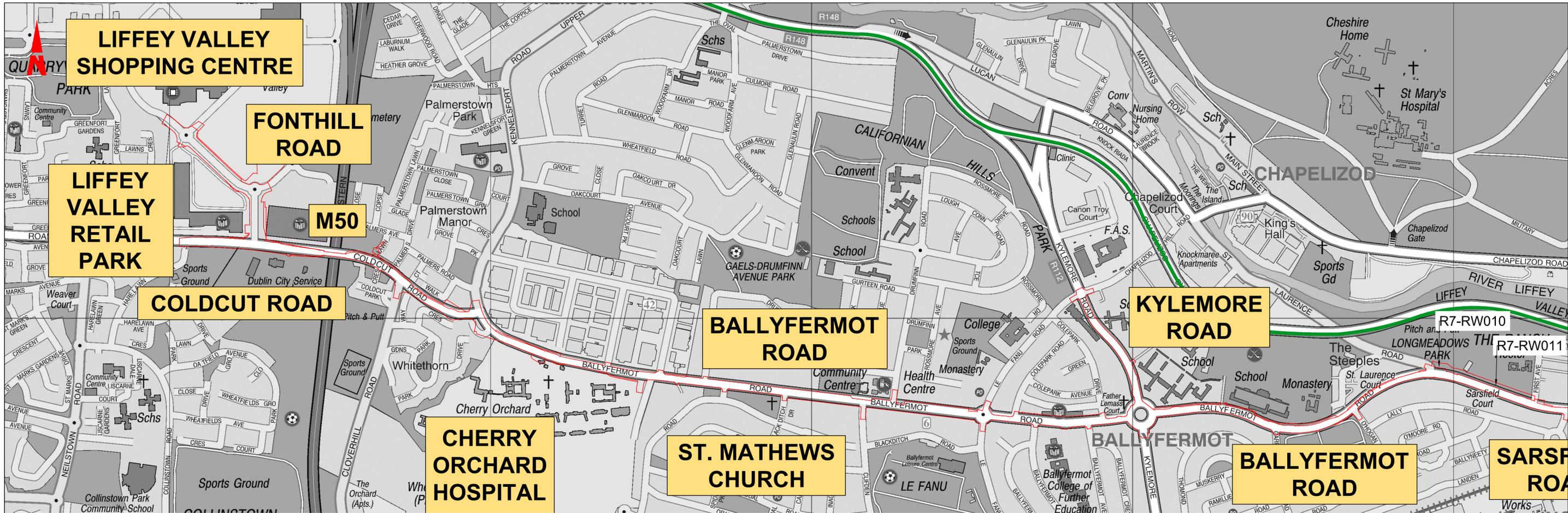
7.1 List of All Documents Accompanying the Submission

Drawing Reference	Drawing Title	Revision
BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1001	Site Location Plan	L01
BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1101	General Arrangement R7-RW010	L01
BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1102	General Arrangement R7-RW011	L01

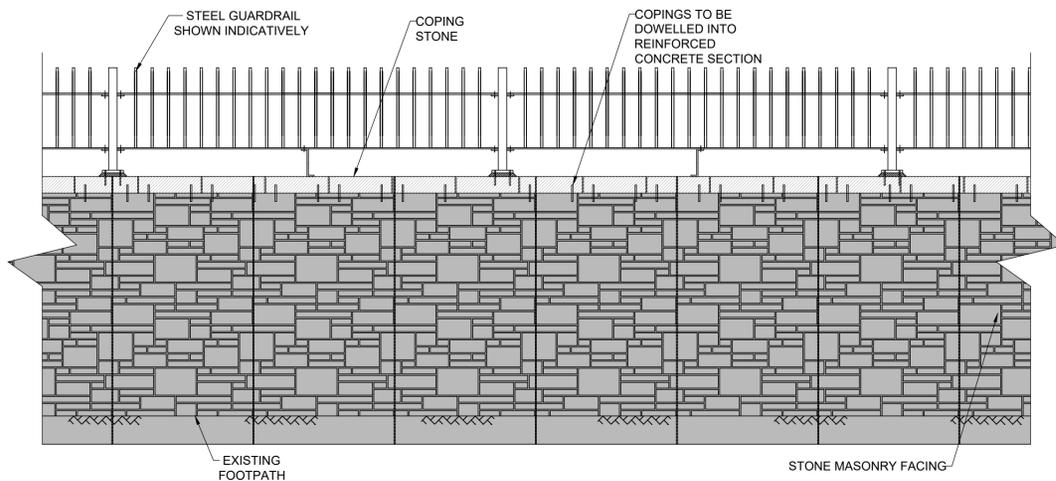
Table 8.1.1: List of accompanying drawings

Relevant documents are included as appendices to this report.

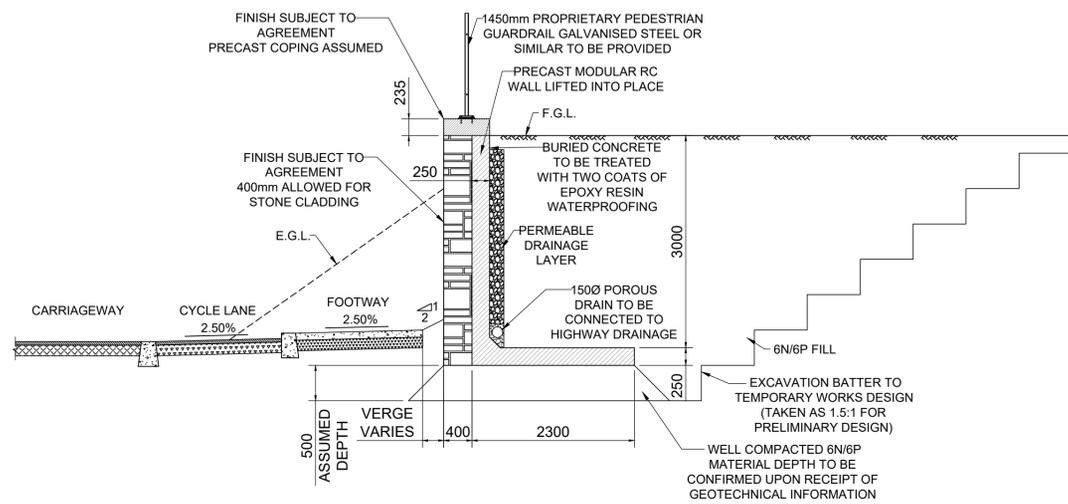
Appendix A. Drawings



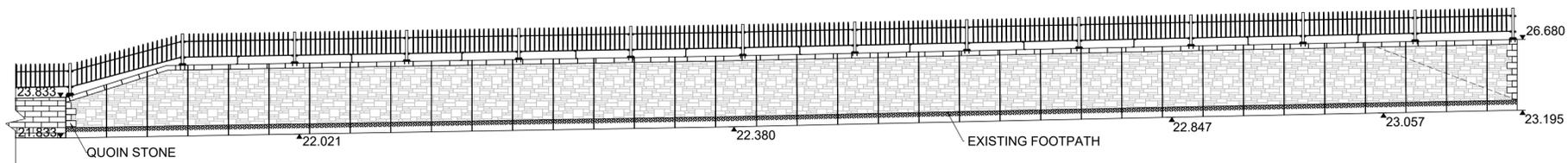
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Rev	Date	Drn	Chk'd	App'd	Description																
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<p>Date</p> <p>06/05/2022</p> <p>Scale as shown @ A1 as shown @ A3</p>						<p>Drawn</p> <p>AS</p>		<p>Checked</p> <p>RG</p>		<p>Approved</p> <p>JM</p>											
<p>Project Code</p> <p>BCIDB</p>						<p>Originator Code</p> <p>JAC</p>		<p>QMS Code</p>		<p>Drawing File Name</p> <p>BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1001</p>											
<p>Sheet Number</p> <p>01 of 1</p>						<p>Status</p> <p>A</p>		<p>Rev</p> <p>L01</p>		<p>DO NOT SCALE USE FIGURED DIMENSIONS ONLY</p>											



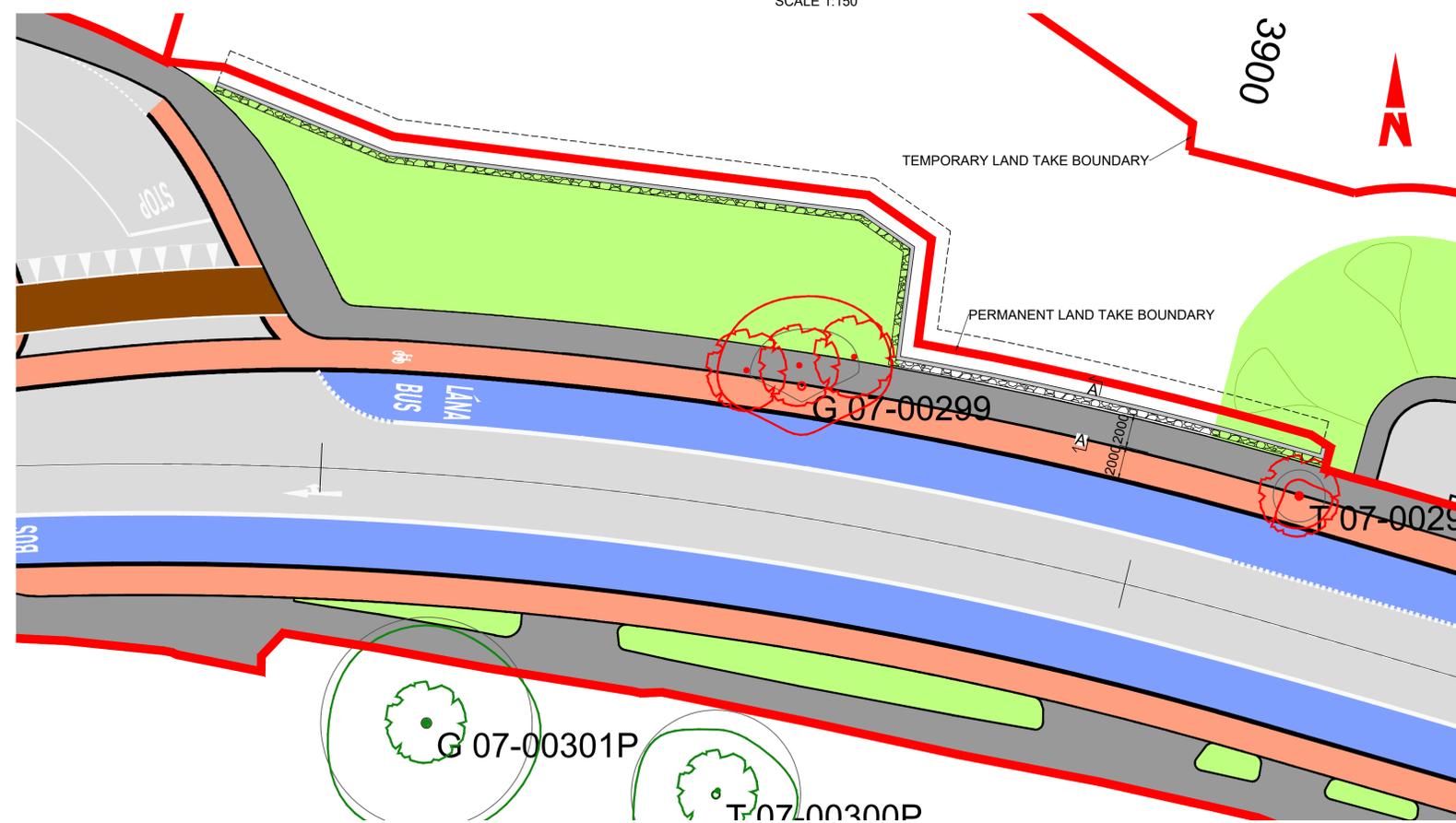
TYPICAL ELEVATION
SCALE 1:50



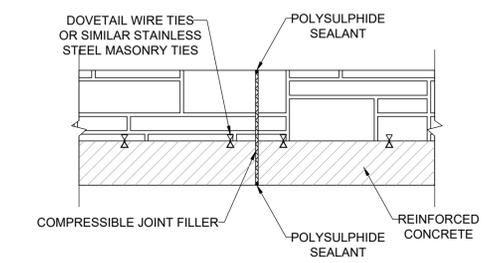
TYPICAL CROSS-SECTION A-A
SCALE 1:50



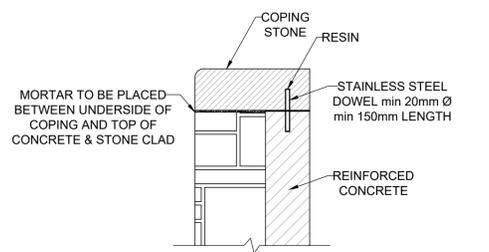
ELEVATION
SCALE 1:150



PLAN ON RETAINING WALL
SCALE 1:200



TYPICAL CROSS SECTION THROUGH
WALL JOINT
SCALE 1:20



CROSS SECTION THROUGH COPING
STONE TIE IN
SCALE 1:20

- NOTES:
- ALL DIMENSIONS ARE SHOWN IN MILLIMETRES UNLESS NOTED OTHERWISE.
 - ALL LEVELS ARE SHOWN IN METRES ABOVE ORDINANCE DATUM USING GEIOD OSFM02.
 - FINISHES:
 - BURIED UNFORMED SURFACES -U1
 - BURIED FORMED SURFACES -F1
 - EXPOSED UNFORMED SURFACES (EXCLUDING AREA TO BE WATERPROOFED) -U3
 - ALL OTHER EXPOSED FORMED SURFACES -F4
 - MATERIALS:
 - LOCATION: RETAINING WALLS CONCRETE GRADE: -C32/40 (50% GGBS)
 - NON-STRUCTURAL CONCRETE: CONCRETE FOR BLINDING CONCRETE GRADE: -S2
 - BURIED CONCRETE SURFACES SHALL BE TREATED WITH TWO COATS OF EPOXY RESIN WATERPROOFING PAINT IN ACCORDANCE WITH TII CC-SPW-01700.
 - ALL EXPOSED CONCRETE SHALL BE IMPREGNATED WITH A HYDROPHOBIC PORE LINER IN ACCORDANCE WITH THE TII CC-SPW-01700.
 - EXTERNAL CONCRETE EDGES ARE TO BE CHAMFERED 25x25 UNLESS NOTED OTHERWISE.
 - STONE MASONRY FACING TO BE ANCHORED TO RETAINING WALL USING DOVETAIL WIRE TIES OR SIMILAR STAINLESS STEEL MASONRY TIES.
 - LOCALISED SOFT SPOTS, IF PRESENT, TO BE EXCAVATED AND REPLACED WITH 6N2.
 - FINAL LEVELS TO BE CONFIRMED IN THE DETAILED DESIGN.

C:\pwworking\jacobs_uk_highways_ssa\legintl_as034573\ud0147883\BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1101.dwg

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Rev	Date	Drn	Chk'd	App'd	Description
L01	06/05/22	AS	RG	JM	ISSUE FOR PHASE 4: PLANNING

Client: **NTA**
 Údarás Náisiúnta Iompair
 National Transport Authority

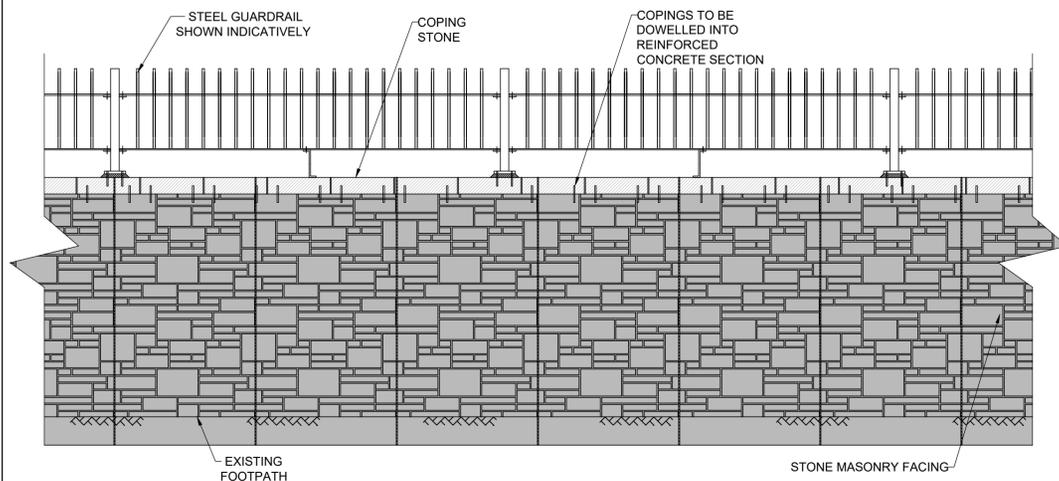
Engineering Designer: **Jacobs**

Date: 06/05/2022
 Scale: as shown @ A1 as shown @ A3
 Drawn: AS
 Checked: RG
 Approved: JM

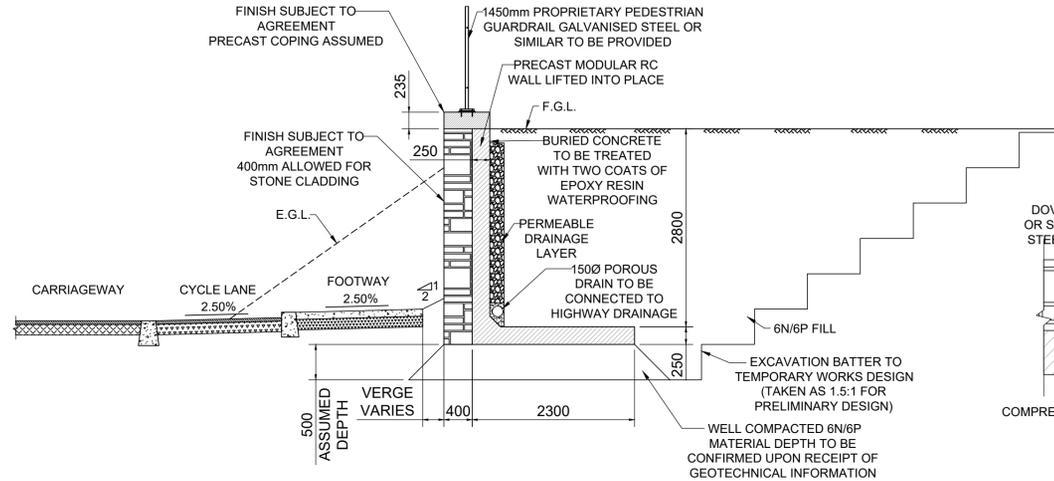
Project Code: BCIDB
 Originator Code: JAC
 QMS Code:

Programme Title BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS			
Drawing Title LIFFEY VALLEY TO CITY CENTRE SCHEME GENERAL ARRANGEMENT R7-RW010			
Drawing File Name BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1101	Sheet Number 01 of 1	Status A	Rev L01

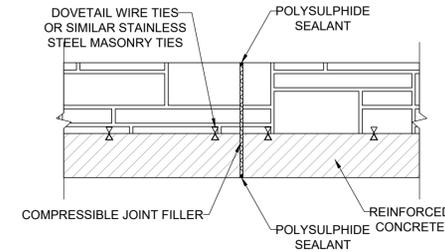
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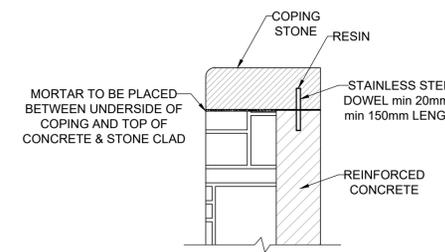
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SCALE 1:50



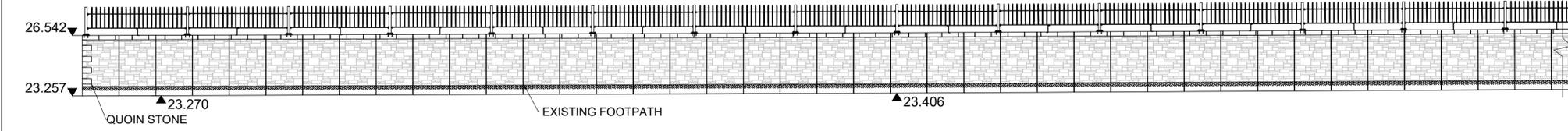
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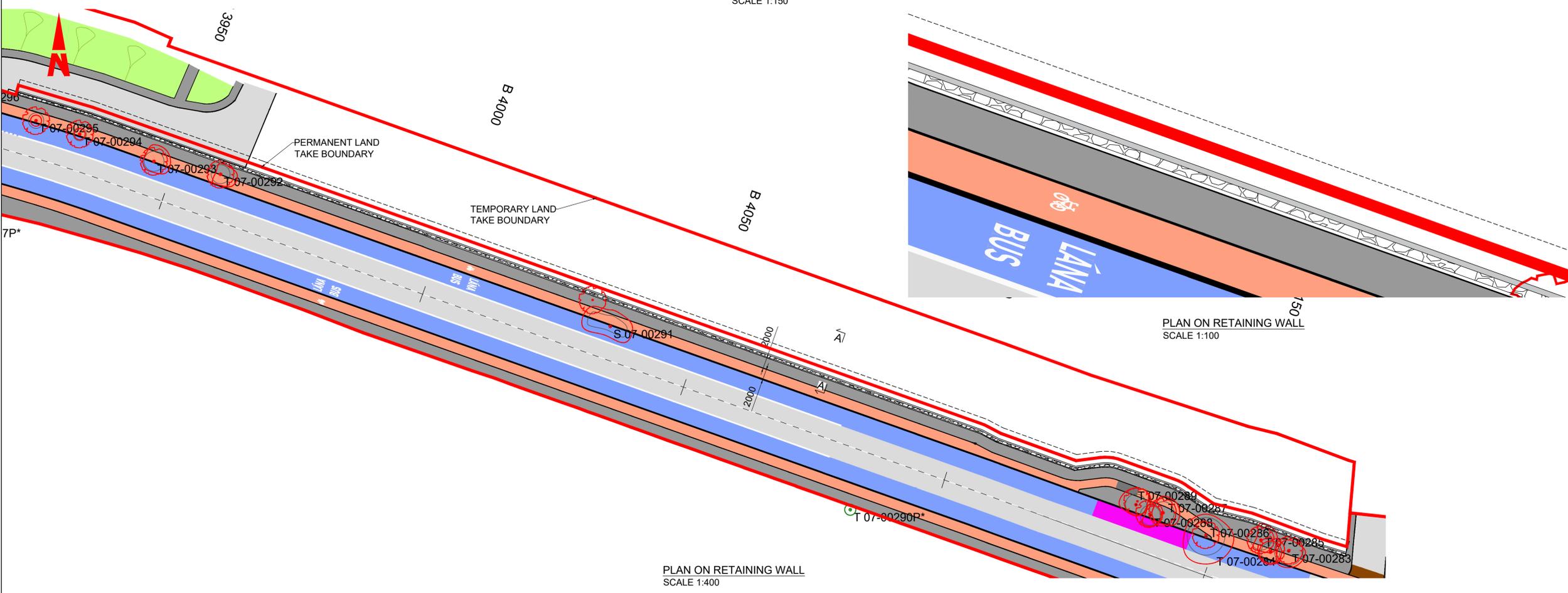
TYPICAL CROSS SECTION THROUGH WALL JOINT
SCALE 1:20



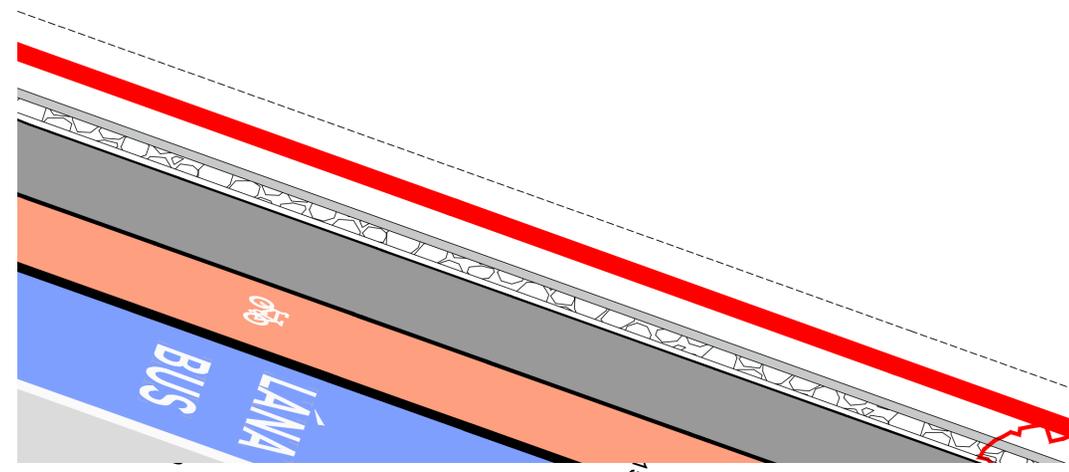
CROSS SECTION THROUGH COPING STONE TIE IN
SCALE 1:20



ELEVATION
SCALE 1:150



PLAN ON RETAINING WALL
SCALE 1:400



PLAN ON RETAINING WALL
SCALE 1:100

- NOTES:
- ALL DIMENSIONS ARE SHOWN IN MILLIMETRES UNLESS NOTED OTHERWISE.
 - ALL LEVELS ARE SHOWN IN METRES ABOVE ORDINANCE DATUM USING GEOID OSFM02.
 - FINISHES:
 - BURIED UNFORMED SURFACES -U1
 - BURIED FORMED SURFACES -F1
 - EXPOSED UNFORMED SURFACES (EXCLUDING AREA TO BE WATERPROOFED) -U3
 - ALL OTHER EXPOSED FORMED SURFACES -F4
 - MATERIALS:
 - LOCATION: RETAINING WALLS CONCRETE GRADE: -C32/40 (50% GGBS)
 - NON-STRUCTURAL CONCRETE: CONCRETE FOR BLINDING CONCRETE GRADE: -ST2
 - BURIED CONCRETE SURFACES SHALL BE TREATED WITH TWO COATS OF EPOXY RESIN WATERPROOFING PAINT IN ACCORDANCE WITH TI CC-SPW-01700.
 - ALL EXPOSED CONCRETE SHALL BE IMPREGNATED WITH A HYDROPHOBIC PORE LINER IN ACCORDANCE WITH THE TI CC-SPW-01700.
 - EXTERNAL CONCRETE ARISES TO BE CHAMFERED 25x25 UNLESS NOTED OTHERWISE.
 - STONE MASONRY FACING TO BE ANCHORED TO RETAINING WALL USING DOVETAIL WIRE TIES OR SIMILAR STAINLESS STEEL MASONRY TIES.
 - LOCALISED SOFT SPOTS, IF PRESENT, TO BE EXCAVATED AND REPLACED WITH 6N2.
 - FINAL LEVELS TO BE CONFIRMED IN THE DETAILED DESIGN.

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 National Transport Authority

Engineering Designer: **Jacobs**

Date: 06/05/2022
 Project Code: BCIDB
 Originator Code: JAC
 QMS Code:

Drawn: AS
 Checked: RG
 Approved: JM

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

Drawing Title: **LIFFEY VALLEY TO CITY CENTRE SCHEME**
 GENERAL ARRANGEMENT
 R7-RW011

Drawing File Name: BCIDB-JAC-STR_GA-0007_RW_00-DR-CB-1102
 Sheet Number: 01 of 1
 Status: A
 Rev: L01

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Appendix B. Geotechnical Risk Register

Geotechnical Risk Register

In accordance with TII Managing Geotechnical Risk DN-ERW-03083 [1], a Geotechnical Risk Register has been produced for the proposed structures in order to identify potential hazards, the probability of the hazard occurring, its impact, risk rating and methods for their mitigations. At this stage, potential hazards affecting the design and construction of retaining structures greater than 1.5m in height have been identified.

Risk is a function of probability that a hazard may occur and its potential impact. The Risk Register reflects the current level of understanding of the geotechnical aspects of the scheme and will be subject to revision as the project progresses when further information becomes available.

The risk rating used in the Risk Register follows the principle: Risk Rating (RR) = Probability (P) x Impact (I)

Table 1 – Risk Evaluation and Risk Matrix

PROBABILITY (P)		x	IMPACT (I)		=	RISK (R)					
			TIME or COST			Impact					
Very Likely	5		Very High	5			5	4	3	2	1
Likely	4		High	4		5	25	20	15	10	5
Probable	3		Medium	3		4	20	16	12	8	4
Unlikely	2		Low	2		3	15	12	9	6	3
Negligible	1		Very Low	1		2	10	8	6	4	2
						1	5	4	3	2	1

As a general guide, risk ratings that are 4 or less are considered trivial, risk ratings between 5 and 8 are considered tolerable/ manageable. Risk ratings above 9 are potentially significant and mitigation will be required to reduce this risk for the design.

The scoring system outlined in Table 1 is adopted in the preliminary Geotechnical Risk Register for the retaining structures.

The Geotechnical Risk Register is arranged as follows:

- Description of Hazard and Risk Exposure - provides a brief description of the hazard and the potential implications to the scheme;
- Current appreciation of the Risk identified – provides a brief description of the current appreciation based on available information;
- Potential Mitigation of Risk - identifies measures that may reduce the likelihood of occurrence and/or reduce the impact of the hazard;
- Risk Owner – Identifies the party responsible for management of the risk going forward.

Risk ratings are determined both pre and post implementation of mitigation measures.



BusConnects Dublin Core Bus Corridor Infrastructure Works – Package B

Liffey Valley to City Centre CBC Scheme - Geotechnical Risk Register

Structure R07-RW008

Retained Height 1.0m

Approx. Chainage B3+495 - B3+555



Risk	Current Appreciation	Unmitigated Assessment		Potential Mitigation	Residual Assessment		Risk Owner
		Likelihood	Impact		Likelihood	Impact	
Naturally occurring soft ground at foundation	No indication for the presence significant soft ground at foundation.	2	3	Carry out ground investigation at structure location prior to construction. Excavate and replace localised areas of soft ground at foundation level if encountered.	2	1	Designer / Contractor
Deep Made Ground at Formation	Quarries/gravel pit recorded on historic mapping to north and south of existing road alignment. Not recorded immediately under the location of the proposed structure. Buildings located to the south of the proposed structure location.	3	3	Carry out ground investigation at structure location prior to construction. Excavate and replace areas of localised, deep made ground, if encountered.	3	1	Designer / Contractor
High Groundwater encountered in excavations	Historic ground investigation indicates potential for shallow groundwater table - groundwater strikes recorded at approx. 1m.	4	2	Installation of groundwater monitoring standpipes in advance of works. Contractor to be prepared for groundwater inflow into excavation.	4	1	Designer / Contractor
Contaminated Soils encountered in excavations	No indication of contamination.	2	2	Carry out environmental testing on soil samples prior to excavation.	2	1	Contractor
Relict foundations or other man-made structures encountered in excavations	Existing wall, fence and associated foundations to be removed. Historic quarry buildings indicated on historic mapping recorded to south of proposed structure location.	2	2	If identified, relict structures to be excavated prior to construction of foundation.	2	1	Contractor
Unstable existing structures affect the proposed works	No major instability of existing structures evident. Existing structures are to be replaced.	2	2	If instability of existing structure identified, cause of instability to be investigated to inform design. Instability of existing structures to be considered in design of temporary works.	2	1	Contractor
Existing unstable slopes affect the proposed works	No evidence of instability in existing low height earthworks.	2	2	Any instability in existing earthworks to be noted prior to demolition of existing retaining structures. Instability to be considered in design of temporary works	2	1	Contractor
The proposed works cause instability in existing earthworks	Proposed work to retain existing earthworks	1	2	Stability analysis of retained slope to be undertaken.	1	1	Designer



BusConnects Dublin Core Bus Corridor Infrastructure Works – Package B

Liffey Valley to City Centre CBC Scheme - Geotechnical Risk Register

Structure R07-RW009; R07-RW-010; R07-RW011



Retained Height 1.0m; 3.0m; 2.5m

Approx. Chainage B3+800 - B3+820; B3+840 - B3+910; B3+920 - B4+180

Risk	Current Appreciation	Unmitigated Assessment		Potential Mitigation	Residual Assessment		Risk Owner
		Likelihood	Impact		Likelihood	Impact	
Naturally occurring soft ground at foundation	No indication for the presence significant soft ground at foundation.	2	3	Carry out ground investigation at structure location prior to construction. Excavate and replace localised areas of soft ground at foundation level if encountered.	2	1	Designer / Contractor
Deep Made Ground at Formation	Deep Made Ground (up to 13m thickness) recorded in Historic GI approx. 70m - 160m to north of proposed structure R07-RW011 and approx. 220m - 250m east and north east of proposed structure R07-RW010. No indication on historic mapping of source of deep made ground.	3	3	Carry out ground investigation at structure location prior to construction. Excavate and replace areas of localised, deep made ground, if encountered.	2	1	Designer / Contractor
High Groundwater encountered in excavations	Historic ground investigation indicates potential for shallow groundwater table - groundwater strikes recorded at approx. 1.5m bgl.	4	2	Installation of groundwater monitoring standpipes in advance of works. Contractor to be prepared for groundwater inflow into excavation.	4	1	Designer / Contractor
Contaminated Soils encountered in excavations	No indication of source contamination on historic mapping. Deep made ground of unknown source recorded in historic GI to north/ east of proposed structures.	2	3	Carry out environmental testing on soil samples prior to excavation.	2	1	Contractor
Relict foundations or other man-made structures encountered in excavations	Existing retaining walls and foundations to be removed. No other relict foundations or man-made structures anticipated.	2	2	None.	2	2	Contractor
Unstable existing structures affect the proposed works	Deterioration of render identified on existing wall at location of proposed R07-RW011.	3	2	If instability of existing structure identified, cause of instability to be investigated to inform design. Instability of existing structures to be considered in design of temporary works.	2	1	Contractor
Existing unstable slopes affect the proposed works	No evidence of instability in existing earthworks.	2	2	Any instability in existing earthworks to be noted prior to demolition of existing retaining structures and considered in design of proposed structure. Instability to be considered in design of temporary works.	2	1	Contractor
The proposed works cause instability in existing earthworks	Proposed work to retain existing earthworks	1	2	Stability analysis of retained earthworks to be undertaken.	1	1	Designer

Structure **R07-RW013**

Retained Height **1.0m**

Approx. Chainage **B0+295 - B0+395**



Risk	Current Appreciation	Unmitigated Assessment		Potential Mitigation	Residual Assessment		Risk Owner
		Likelihood	Impact		Likelihood	Impact	
Naturally occurring soft ground at foundation	No indication for the presence significant soft ground at foundation.	2	3	Carry out ground investigation at structure location prior to construction. Excavate and replace localised areas of soft ground at foundation level if encountered.	2	1	Designer / Contractor
Deep Made Ground at Formation	No indication of the presence of deep made ground at foundation. Made ground associated with existing earthworks.	2	3	Carry out ground investigation at structure location prior to construction. Excavate and replace areas of localised, deep made ground, if encountered.	2	1	Designer / Contractor
High Groundwater encountered in excavations	No indication of high groundwater levels.	2	2	Installation of groundwater monitoring standpipes in advance of works. Contractor to be prepared for groundwater inflow into excavation.	4	1	Designer / Contractor
Contaminated Soils encountered in excavations	No indication of contamination.	2	2	Carry out environmental testing on soil samples prior to excavation.	2	1	Contractor
Relict foundations or other man-made structures encountered in excavations	No indication of potential relict man-made structures.	2	1	None.	2	1	Contractor
Unstable existing structures affect the proposed works	No existing structures	1	1	None.	1	1	Contractor
Existing unstable slopes affect the proposed works	Existing earthworks are heavily vegetated - no indication of instability in existing earthworks.	2	2	Any instability in existing earthworks to be noted prior to demolition of existing retaining structures. Instability to be considered in design of temporary works	2	1	Contractor
The proposed works cause instability in existing earthworks	Proposed work to retain existing earthworks	2	2	Stability analysis of retained slope to be undertaken.	2	1	Designer