HIGHWAYS & STREETSCENE
HIGHWAYS STRUCTURES

Flint Street,
Fartown,
Huddersfield
HD1 6LG

APPROVAL IN PRINCIPLE FOR DESIGN OF

The Secura Grand Retaining Wall (wall 3) at Broad Oak Linthwaite

Structure reference:	**TBC**
Date:	**05/10/2023**
Revision:	**0**
Status:	**Draft**
Prepared by:	**Adam Cash**
Checked by:	**Gordon Mackenzie**

DOCUMENT CONTROL

Structure title: Secura Grand Retaining Wall at Broad Oak, Linthwaite

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Document issue record

Issue	Status	Prepared	Date	Checked	Date	Approved	Date
0		AC	05/10/23	GM	05/10/23		

PROJECT DETAILS

Name of project: Broad Oak, Linthwaite

Name of Bridge or Structure: Secura Grand Retaining Wall

Structure reference no: N/A

Summary:

The retaining wall is required to support a cutting at the western boundary of the site at plot 93. The cutting the wall is to retain is within the influence of an existing Public Right of Way and therefore requires AIP.

1. HIGHWAY DETAILS

1.1. Type of highway

1.1.1. Location and OS Map / Grid reference

Location: Kinder Avenue, Cowlersley, Kirklees, West Yorkshire, England, HD4 5XD, United

OS Map: SE 10615 14725

Grid Ref (X, Y): 410615 , 414725

1.2. Permitted traffic speed

N/A

1.3. Existing restrictions

None

2. SITE DETAILS

2.1. Obstacles retained

The retaining wall is required to support a cutting at the western boundary of the site. The wall is to retain an existing Public Right of Way.

Geoman drawing number SK22-5482-01 indicates the site location and AJP Consulting Engineers drawing number BRO-AJP-00-ZZ-DR-C-1460 indicates the location of the wall on the site.

3. PROPOSED STRUCTURE

3.1. Description of structure and design working life

The structure is a Tobermore Secura Grand segmental concrete block retaining wall constructed with C20/25 concrete backfill. The blocks have a split masonry face. The wall has a 120 year design life as per HAPAS Certificate number 15/H230.

The maximum retained height of the wall is 3.60m and is approximated 20m long.

A capping course is to be fitted and fixed in place with epoxy mortar.

The C20/25 concrete backfill is to be installed behind the wall and within the voids in the blocks to create a monolithic structure.

Construction of the wall is to be in accordance with the manufacturer's installation instructions and BBA HAPAS Certificate number 15/H230.

Design details of the wall is shown on Geoman drawing number SK22-5482-01.

3.2. Structural type

Secura Grand mass gravity retaining wall.

3.3. Foundation type

The wall's base course of blocks are to be placed on a C20/25 mass concrete foundation. The foundation should be formed on original, undisturbed firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSITS) with a minimum allowable bearing capacity of 150kN/m^2.

The concrete acts as a levelling pad from which to build the base row of blocks and is not a structural foundation.

3.4. Span arrangements

The maximum retained height of the structure is 3.60m

3.5. Articulation arrangements

The retained height reduces at both ends of the walls to a safe height.

No expansion joints are required in the face as a degree of movement can be accommodated due to their mortarless segmental nature.

No construction joints are required in the concrete levelling pad since is not a structural foundation. The concrete is to act as a levelling pad from which to build the base row of blocks.

3.6. Classes and levels

3.6.1. Consequence class

CC2 (UK NA to BS EN 1990:2002+A1:2005)

3.6.2. Reliability class

RC2 (UK NA to BS EN 1990:2002+A1:2005)

3.6.3. Inspection level

IL2 (UK NA to BS EN 1990:2002+A1:2005)

3.7. Road restraint systems requirements

It is proposed to install a 1.1m post and wire fence at the crest of the wall. The fence posts should be installed into PVC void formers pre-installed through the backfill during construction. The void formers should have a minimum 100mm deep concrete plug and the top and bottom and be infilled with compacted kiln dry sand. Horizontal loads considered in accordance with the National Annex of Eurocode 1 [2014].

As there is a plot on the low side of the wall vehicle impact should not be an issue however the wall will be structurally stable following impact in front due to the modular nature of the facing. Should local damage occur, the wall could be easily repaired in a small section without affecting remainder of structure.

The walls are to be situated in a new housing development subjected to low speeds.

Given the above, the impact and likelihood of damage to the walls is extremely low.

3.8. Proposed arrangements for future maintenance and inspection

3.8.1. Traffic management

None required for inspection. The Public Right of Way closure may be required for future maintenance. This should agreed with Kirklees Council.

3.8.2. Arrangements for future maintenance and inspection of structure. Access arrangements to structure.

The wall can be inspected from above or at the toe of the wall.

3.9. Environment and sustainability

The wall has been designed and specified with sustainability in mind:

- The facing blocks are prefabricated which allows for quicker construction and negates the need for formwork to the front face.
- No steel reinforcement is required in the concrete pad, as it is not required structurally for the design. The concrete is to act as a levelling pad from which to build the base row of blocks.

3.10. Durability. Materials and finishes

For structural elements specify material strengths, exposure classes, finishes etc., and list the relevant codes/standards.

Item	Material	Finish / Location
Segmental facing blocks	Secura Grand segmental facing blocks as per HAPAS Certificate number 15/H230.	Split masonry finish on face of precast concrete Secura Grand blocks. Class XF2 exposure in accordance with BS 8500-1:2015 and as per HAPAS Certificate number 15/H230.
Drainage aggregate	10mm single sized free draining aggregate in accordance with MCDHW Specification for Highways Works, Series 600.	Behind top 2 courses of the wall see Geoman drawing SK22-5482-01 for detail.
Concrete levelling pad	C20/25 concrete levelling pad in accordance with SHW Series 1700.	Formed finished to mass concrete levelling pad shall be F1, unformed to U1. Exposure Class X0 Levelling pad at the base of the wall under the base segmental blocks and concrete backfill.
Concrete Backfill	Mass concrete shall be in accordance with BS EN206:2013+A1:2016 and BS8500-1:2015+A2:2019.	Concrete backfill placed behind the facing blocks.

3.11. Risks and hazards considered for design, execution, maintenance and demolition. Consultation with and/or agreement from Overseeing Organisation

Geoman Ltd. conducted the design of the structure and, as designers, are responsible for fulfilling their obligations as defined in the Construction (Design & Management) Regulations 2015.

Casey Group Ltd is the Principal Contractor

TADW Architects is the Principal Designer

Designers Risks have been identified and are included in the Appendix.

3.12. Estimated cost of proposed structure together with other structural forms considered (including where appropriate proprietary manufactured structure), and the reasons for their rejection (including comparative whole life costs with dates of estimates)

Approximately £20,000. Other solutions were also considered, but were deemed unsuitable due to aesthetics, and costs.

3.13. Proposed arrangements for construction

3.13.1. Construction of structure

N/A

3.13.2. Traffic management

N/A

3.13.3. Service diversions

No existing services in vicinity of proposed work.

There are no plans at present to install services in the verge above the walls.

3.13.4. Interface with existing structures

N/A

3.14. Resilience and security

As the wall is a robust concrete structure there is very little risk of damage from vandals and given the location of the wall (surrounding a residential plot) there's very little exposure to the public.

4. DESIGN CRITERIA

4.1. Actions

4.1.1. Permanent actions

Mass concrete backfill density = 24kN/m^3 in accordance with BS EN 1991 Actions on Structures

4.1.2. Snow, Wind and Thermal actions

Snow loads to BS EN 1991-1-3:2003+A1:2015.

Wind loads to BS EN 1991-1-4:2005+A1:2010.

Thermal actions to BS EN 1991-1-5:2003.

4.1.3. Actions relating to normal traffic under AW regulations and C&U regulations

N/A

4.1.4. Actions relating to General Order traffic under STGO regulations

N/A

4.1.5. Footway or footbridge variable actions

10kPa surcharge on footway which satisfies BS EN 1991-2 and BS8002:2015

4.1.6. Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section

Allowance has been made for loading due to emergency vehicles or construction traffic during infill operations by considering a surcharge load of 10kPa at the crest of the walls

4.1.7. Accidental actions

Accidental impact load from vehicle considered in accordance with BS 6779-4 and Eurocode 1-1.7.

4.1.8. Action during construction

Allowance has been made for unforeseen excavation in front of the walls of 10% of the height up to a maximum of 500mm, in accordance with BS EN 1997-1:2004 Cl. 9.3.2.2.

Construction loads to be in accordance with 4.3, 4.7 and 4.11 of BS EN 1991-1-6:2005 and National Annex.

4.1.9. Any special action not covered above

N/A

4.2. Heavy or high load route requirements and arrangements being made to preserve the route, including any provision for future heavier loads or future widening

N/A

4.3. Proposed minimum headroom provided

N/A

4.4. Authorities consulted and any special conditions required

Kirklees Council

4.5. Standards and documents listed in the Technical Approval Schedule

TAS dated 05/10/23 See appendix A.

Additional relevant DoT standards published since the above edition of the TAS including amendments, are listed as follows:

None

4.6. Proposed departures from standards listed in 4.5

N/A

4.7. Proposed departures from standards concerning methods for dealing with aspects not covered by standards listed in 4.5

N/A

4.8. Proposed safety critical fixings

N/A

5. STRUCTURAL ANALYSIS

5.1. Methods of analysis proposed for superstructure, substructure and foundations

FINE GEO5 PREFAB WALL and SLOPE software to be used for wall analyses to BS EN 1997-1:2004 Eurocode7. This software uses a metre strip analysis.

5.2. Description and diagram of idealised structure to be used for analysis

The most onerous section, as shown on Geoman Ltd. drawing SK22-5482-01, is considered using the design software.

5.3. Assumptions intended for calculation of structural element stiffness

N/A

5.4. Proposed range of soil parameters to be used in the design of earth retaining elements

- The foundation material (in-situ) to be firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSITS) with minimum: $\varphi' = 30°$ $K_a = 0.33$ $K_p = 3.00$ $K_o = 0.50$
- The retained material is to be MADE GROUND or class 1 upfill with a minimum: $\varphi' = 28°$ $K_a = 0.36$ $K_p = 2.77$ $K_o = 0.53$

6. GEOTECHNICAL CONDITIONS

6.1. Acceptance of recommendations of the ground investigation report (references/dates) to be used in the design and reasons for any proposed changes

GRM Phase I Site Appraisal (Desk Study) (P8985, April 2020) includes several window simples and trial pits excavated across the site in the vicinity of the proposed retaining walls. The most relevant log was TP05.

Considering the proposed cut and fill works the logs generally indicate that formation level of the walls will be original competent firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSIT) or weathered rock . A minimum effective angle of internal friction of 30 degrees was assumed for original competent original competent firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSITS) based on the Plasticity Index results 20-24% (NAVFAC 1971) and the minimum SPT value of 10 in GLACIAL DEPOSIT strata. We have assumed the walls retained stratum will be MADE GROUND with a minimum friction angle of 28-degrees.

The Principal Contractor should appoint a local geotechnical specialist to inspect and test the ground at proposed formation level and below to ensure a minimum required safe bearing resistance of 150kPa is achieved. Any soft/loose or unsuitable material (such as made ground, soft clay, loose sand, alluvium or peat/ organics) present at or below formation level must be excavated out down to original, competent firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSIT) and replaced with compacted Class 6F2 granular fill.

6.2. Summary of design for highway structure in the ground investigation report

See Highway Structure Summary Information Sheet attached in Appendix. Design Sulphate Class for the site should be taken as DS-1 and the ACEC Class as AC-1.

6.3. Differential settlement to be allowed for in the design of the structure

10mm over 10m.

6.4. If the ground investigation report is not yet available, state when the results are expected and list the sources of information used to justify the preliminary choice of foundations

N/A

7. CHECK

7.1. Proposed Category and Design Supervision Level

DMRB, BD 2/12, Cl. 3.4.1 indicates Category 1 (Retaining greater than 2m but less than 7m).

7.2. If Category 3, name of proposed Independent Checker

N/A

7.3. Erection proposals or temporary works for which Types S and P Proposals will be required, listing structural parts of the permanent structure affected with reasons

The safe angle of repose of the temporary cut slope is to be determined on site. Battering of the temporary cut slope may be required to create a safe working environment.

8. DRAWINGS AND DOCUMENTS

8.1. List of drawings (including numbers) and documents accompanying the submission

8.1.1. Drawings (See appendix B)

Reference	Title
Geoman drawing SK22-5482-01	Cross-section, plan, & elevation
AJP Consulting Engineers drawing BRO-AJP-00-ZZ-DR-C-1460	PLOTS 93-94 - PROW SECTIONS
911277 101C13 Overall Proposed Site Plan	Overall site plan

8.1.2. Documents (See appendix C)

Reference	Title
SECURA BBA - H230PS1i2	Secura BBA/HAPAS certificate
22-5482 HSSIS	Highway structure summary information sheet

9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

We confirm that details of the temporary works design will be/have [Delete as appropriate] been passed to the permanent works Designer for review. [This statement is applicable to temporary works design AIP only]

Design Team Leader	
Signed	
Name	Adam Cash
Engineering Qualifications	BEng
Name of Organisation	Geoman Ltd.
Date	05/10/23

Check Team Leader	
Signed	
Name	Gordon Mackenzie
Engineering Qualifications	CEng MICE
Name of Organisation	Geoman Ltd.
Date	05/10/23

10. THE ABOVE IS REJECTED/AGREED SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW

Signed	
Name	**Farhad Khatibi**
Position held	**Bridges & Structures Manager**
Engineering Qualifications	**BSc (Hons) Civil Eng, MSc**
TAA	**Kirklees Council**
Date	

For and on behalf of Kirklees Council

APPENDIX A

LIST OF RELEVANT DESIGN DOCUMENTS

Scheme title: Broad Oak, Linthwaite **Struc Ref: TBC**
Structure title: Secura Grand Retaining Wall **Revision 0 05/10/23**

TECHNICAL APPROVAL SCHEDULE (TAS)

Schedule of Documents Relating to Design of Highway Bridges and Structures

(All documents are taken to include revisions current as of November 2021)

The Designer is responsible for ensuring that the standards and references given in the schedule are correct and up to date. **Tick all the documents used (✓)**

Eurocodes and associated UK National Annexes				
Used	**Reference**	**Title**	**Amendment / Corrigenda**	**Notes**
	Eurocode 0	***Basis of structural design***		
✓	BS EN 1990:2002 +A1:2005	Eurocode 0: Basis of structural design	+A1:2005 Incorporating corrigenda December 2008 and April 2010	See CD 350 section 7 for additional guidance.
✓	NA to BS EN 1990:2002 + A1:2005	UK National Annex to Eurocode 0 Basis of structural design	National Amendment No.1	See CD 350 section 7 for additional guidance.
	Eurocode 1	***Actions on structures***		
✓	BS EN 1991-1-1:2002	Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings	Corrigenda December 2004 and March 2009	
✓	NA to BS EN 1991-1-1:2002	UK National Annex to Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings	Corrigenda July 2019	
✓	BS EN 1991-1-3:2003 +A1:2015	Eurocode 1: Actions on structures. General Actions. Snow loads	+A1:2015 Incorporating corrigenda December 2004 and March 2009	
✓	NA to BS EN 1991-1-3:2003+A1:2015	UK National Annex to Eurocode 1: Actions on structures. General Actions. Snow loads	+A2:2018 Incorporating corrigenda June 2007, December 2015 and October 2018	
✓	BS EN 1991-1-4:2005 +A1:2010	Eurocode 1: Actions on structures. General Actions. Wind actions	+A1:2010 Corrigenda July 2009 and January 2010	
✓	NA to BS EN 1991-1-4:2005 + A1:2010	UK National Annex to Eurocode 1: Actions on structures. General Actions. Wind actions	National Amendment No.1	
✓	BS EN 1991-1-5:2003	Eurocode 1: Actions on structures. General Actions. Thermal actions	Corrigenda December 2004 and March 2009	
✓	NA to BS EN 1991-1-5:2003	UK National Annex to Eurocode 1: Actions on structures. General Actions. Thermal actions	-	
✓	BS EN 1991-1-6:2005	Eurocode 1: Actions on structures. General Actions. Actions during execution	Corrigenda July 2008, November 2012 and February 2013	
✓	NA to BS EN 1991-1-6:2005	UK National Annex to Eurocode 1: Actions on structures. General Actions. Actions during execution	-	

Eurocodes and associated UK National Annexes				
Used	**Reference**	**Title**	**Amendment / Corrigenda**	**Notes**
	BS EN 1991-1-7:2006 +A1:2014	Eurocode 1: Actions on structures. General Actions. Accidental actions	+A1: 2014 Corrigendum February 2010	
	NA+A1 to BS EN 1991-1-7:2006+A1:2014	UK National Annex to Eurocode 1: Actions on structures. Part 1-7 : Accidental actions	+A1:2014 Incorporating corrigenda August 2014 and November 2015	See CD 350 for additional guidance.
✓	BS EN 1991-2:2003	Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigenda December 2004 and February 2010	See CD 350 section 7 for additional guidance.
	NA +A1:2020 to BS EN 1991-2:2003	UK National Annex to Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigendum No.1 Amendment June 2020	See CD 350 section 7 for additional guidance.
	Eurocode 2	***Design of concrete structures***		
	BS EN 1992-1-1:2004 + A1:2014	Eurocode 2: Design of concrete structures– Part 1-1: General rules and rules for buildings	Incorporating corrigendum January 2008, November 2010 and January 2014	
	NA + A2:2014 to BS EN 1992-1-1:2004 + A1:2014	UK National Annex to Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings		
✓	BS EN 1992-2:2005	Eurocode 2: Design of concrete structures – Part 2: Concrete bridges – Design and detailing rules	Corrigendum July 2008	
✓	NA to BS EN 1992-2:2005	UK National Annex to Eurocode 2: Design of concrete structure – Part 2: Concrete bridges – Design and detailing rules	-	
	BS EN 1992-3:2006	Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures	-	
	NA to BS EN 1992-3:2006	UK National Annex to Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures	-	
	BS EN 1992-4:2018	Eurocode 2: Design of concrete structures – Part 4: Design of fastenings for use in concrete		
	NA to BS EN 1992-4:2018	UK National Annex to Eurocode 2: Design of concrete structures – Part 4: Design of fastenings for use in concrete		
	Eurocode 3	***Design of steel structures***		
	BS EN 1993-1-1:2005 + A1:2014	Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings	Corrigenda February 2006 and April 2009	
	NA + A1:2014 to BS EN 1993-1-1:2005 + A1:2014	UK National Annex to Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings	-	
	BS EN 1993-1-3:2006	Eurocode 3: Design of steel structures – Part 1-3 General rules – Supplementary rules for cold-formed members and sheeting	Corrigendum November 2009	
	NA to BS EN 1993-1-3:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-3 Supplementary rules for cold-formed members and sheeting	-	

Eurocodes and associated UK National Annexes

Used	Reference	Title	Amendment / Corrigenda	Notes
	BS EN 1993-1-4:2006 + A2:2020	Eurocode 3: Design of steel structures – Part 1-4 General rules – Supplementary rules for stainless steels	+ A1:2015 Amendment No. 1 + A2:2020 Amendment No. 2	Supersedes BS EN 1993-1-4:2006 + A1:2015
	NA+A1:15 to BS EN 1993-1-4:2006+A1:2015	UK National Annex to Eurocode 3: Design of steel structures – Part 1-4 Supplementary rules for stainless steels	+ A1:2015 Amendment No. 1	
	BS EN 1993-1-5:2006+A2:2019	Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	Corrigendum April 2009, +A1:2017 Amendment No. 2, +A2:2019	
	NA+A1:2016 to BS EN 1993-1-5:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	+ A1:2016 Amendment No. 1	
	BS EN 1993-1-6:2007+ A1:2017	Eurocode 3: Design of steel structures – Part 1-6 Strength and stability of shell structures	+ A1:2017 Amendment No. 1	
	BS EN 1993-1-7:2007	Eurocode 3: Design of steel structures – Part 1-7 Plated structures subject to out of plane loading	Corrigendum April 2009	
	BS EN 1993-1-8:2005	Eurocode 3: Design of steel structures – Part 1-8 Design of joints	Corrigenda December 2005, September 2006, July 2009 and August 2010	
	NA to BS EN 1993-1-8:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-8 Design of joints	-	
	BS EN 1993-1-9:2005	Eurocode 3: Design of steel structures – Part 1-9 Fatigue	Corrigenda December 2005, September 2006 and April 2009	
	NA to BS EN 1993-1-9:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-9 Fatigue	-	
	BS EN 1993-1-10:2005	Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through-thickness properties	Corrigenda December 2005, September 2006 and March 2009	
	NA to BS EN 1993-1-10:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through thickness properties	-	
	BS EN 1993-1-11:2006	Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components	Corrigendum April 2009	
	NA to BS EN 1993-1-11:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components	-	
	BS EN 1993-1-12:2007	Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700	Corrigendum April 2009	
	NA to BS EN 1993-1-12:2007	UK National Annex to Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700	-	

Eurocodes and associated UK National Annexes				
Used	**Reference**	**Title**	**Amendment / Corrigenda**	**Notes**
	BS EN 1993-2:2006	Eurocode 3: Design of steel structures – Part 2 Steel bridges	Corrigendum July 2009	
	NA + A1:2012 to BS EN 1993-2:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 2 Steel bridges	+ A1:2012	
	BS EN 1993-5:2007	Eurocode 3: Design of steel structures – Part 5 Piling	Corrigendum May 2009	
	NA + A1:2012 to BS EN 1993-5:2007	UK National Annex to Eurocode 3: Design of steel structures – Part 5 Piling	+ A1:2012	
	Eurocode 4	***Design of composite steel and concrete structures***		
	BS EN 1994-1-1:2004	Eurocode 4: Design of composite steel and concrete structures – Part 1-1 General rules and rules for buildings	Corrigendum April 2009	
	NA to BS EN 1994-1-1:2004	UK National Annex to Eurocode 4: Design of composite steel and concrete structures – Part 1-1 General rules and rules for buildings	-	
	BS EN 1994-2:2005	Eurocode 4: Design of composite steel and concrete structures – Part 2 General rules and rules for bridges	Corrigendum July 2008	
	NA to BS EN 1994-2:2005	UK National Annex to Eurocode 4: Design of composite steel and concrete structures – Part 2 General rules and rules for bridges	-	
	Eurocode 5	***Design of timber structures***		
	BS EN 1995-1-1:2004 + A2:2014	Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings	+ A2:2014 Incorporating corrigendum June 2006	
	NA to BS EN 1995-1-1:2004 + A1:2008	UK National Annex to Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings	+ A1:2014	
	BS EN 1995-2:2004	Eurocode 5: Design of timber structures – Part 2 Bridges	-	
	NA to BS EN 1995-2:2004	UK National Annex to Eurocode 5: Design of timber structures – Part 2 Bridges	-	
	Eurocode 6	***Design of masonry structures***		
	BS EN 1996-1-1:2005+A1:2012	Eurocode 6: Design of masonry structures – Part 1-1 General rules for reinforced and unreinforced masonry structures	+A1:2012 Corrigenda February 2006 and July 2009	
	NA to BS EN 1996-1-1:2005 +A1:2012	UK National Annex to Eurocode 6: Design of masonry structures – Part 1-1 General rules for reinforced and unreinforced masonry structures	+A1:2012	
	BS EN 1996-2:2006	Eurocode 6: Design of masonry structures – Part 2 Design considerations, selection of materials and execution of masonry	Corrigendum September 2009	
	NA to BS EN 1996-2:2006	UK National Annex to Eurocode 6: Design of masonry structures – Part 2 Design considerations, selection of materials and execution of masonry	Corrigendum No.1	
	BS EN 1996-3:2006	Eurocode 6: Design of masonry structures – Part 3 Simplified calculation methods for unreinforced masonry structures	Corrigendum October 2009	

Eurocodes and associated UK National Annexes				
Used	**Reference**	**Title**	**Amendment / Corrigenda**	**Notes**
	NA +A1:2014 to BS EN 1996-3:2006	UK National Annex to Eurocode 6: Design of masonry structures – Part 3 Simplified calculation methods for unreinforced masonry structures	+A1:2014	
	Eurocode 7	***Geotechnical design***		
✓	BS EN 1997-1:2004+A1:2013	Eurocode 7: Geotechnical design – Part 1 General rules	+A1:2013 Corrigendum February 2009	
	NA+A1 to BS EN 1997-1:2004+A1:2013	UK National Annex to Eurocode 7: Geotechnical design – Part 1 General rules	+A1:2013 Incorporating Corrigendum No.1	
✓	BS EN 1997-2:2007	Eurocode 7: Geotechnical design – Part 2 Ground investigation and testing	Corrigendum June 2010	
	NA to BS EN 1997-2:2007	UK National Annex to Eurocode 7: Geotechnical design – Part 2 Ground investigation and testing	-	
	Eurocode 8	***Design of structures for earthquake resistance***		
	BS EN 1998-1:2004 + A1:2013	Eurocode 8: Design of structures for earthquake resistance – Part 1 General rules, seismic actions and rules for buildings	Corrigendum June 2009, January 2011 and March 2013	
	NA to BS EN 1998-1:2004	UK National Annex to Eurocode 8: Design of structures for earthquake resistance – Part 1 General rules, seismic actions and rules for buildings	-	
	BS EN 1998-2:2005+A2:2011	Eurocode 8: Design of structures for earthquake resistance – Part 2 Bridges	Corrigenda February 2010 and February 2012	
	NA to BS EN 1998-2:2005	UK National Annex to Eurocode 8: Design of structures for earthquake resistance – Part 2 Bridges	-	
	BS EN 1998-5:2004	Eurocode 8: Design of structures for earthquake resistance – Part 5 Foundations, retaining structures and geotechnical aspects	-	
	NA to BS EN 1998-5:2004	UK National Annex to Eurocode 8: Design of structures for earthquake resistance – Part 5 Foundations, retaining structures and geotechnical aspects	-	
	Eurocode 9	***Design of aluminium structures***		
	BS EN 1999-1-1:2007 + A2:2013	Eurocode 9: Design of aluminium structures– Part 1-1 General structural rules	+ A2:2013 Incorporating corrigendum March 2014	
	NA to BS EN 1999-1-1:2007 + A1:2009	UK National Annex to Eurocode 9: Design of aluminium structures – Part 1-1 General structural rules	National Amendment No.1 Corrigendum No.1	
	BS EN 1999-1-3:2007 + A1:2011	Eurocode 9: Design of aluminium structures – Part 1-3 Structures susceptible to fatigue	+ A1:2011	
	NA to BS EN 1999-1-3:2007 + A1:2011	UK National Annex to Eurocode 9: Design of aluminium structures – Part 1-3 Structures susceptible to fatigue	+ A1:2011	
	BS EN 1999-1-4:2007 +A1:2011	Eurocode 9: Design of aluminium structures – Part 1-4 Cold formed structural sheeting	+ A1:2011 Corrigendum November 2009	

Scheme title: Broad Oak, Linthwaite **Struc Ref: TBC**
Structure title: Secura Grand Retaining Wall **Revision 0 05/10/23**

Eurocodes and associated UK National Annexes

Used	Reference	Title	Amendment / Corrigenda	Notes
	NA to BS EN 1999-1-4:2007	UK National Annex to Eurocode 9: Design of aluminium structures – Part 1-4 Cold formed structural sheeting	-	

BSI Published Documents

Used	Reference	Title	
For guidance only unless clauses are otherwise specified in CD 350 Appendix A.			
	PD 6687-1:2020	Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3	Supersedes PD 6687-1:2010 See CD 350 clauses 3.6, 4.1, 4.2 and Appendix A for additional guidance. Clause 3.6 in CD 350 refers to clause 2.5 in PD 6687-1, this is now clause 4.5 in PD 6687-1 Clause 4.2 in CD 350 refers to clause 2.22 in PD 6687-1, this is now clause 4.21.4 in PD 6687-1
	PD 6687-2:2008	Recommendations for the design of structures to BS EN 1992-2:2005	See CD 350 clauses 4.1, 4.2 and Appendix A for additional guidance.
✓	PD 6688-1-1:2011	Recommendations for the design of structures to BS EN 1991-1-1	See CD 350 Appendix A for additional guidance.
	PD 6688-1-4:2015	Background paper to the UK National Annex to BS EN 1991-1-4	See CD 350 Appendix A for additional guidance.
	PD 6688-1-7:2009 +A1:2014	Recommendations for the design of structures to BS EN 1991-1-7	See CD350 clause 3.7 and Appendix B for additional guidance.
✓	PD 6688-2:2011	Recommendations for the design of structures to BS EN 1991-2	See CD 350 Appendix A for additional guidance.
	PD 6695-1-9:2008	Recommendations for the design of structures to BS EN 1993-1-9	See CD 350 Appendix A for additional guidance.
	PD 6695-1-10:2009	Recommendations for the design of structures to BS EN 1993-1-10	See CD 350 Appendix A for additional guidance.
	PD 6695-2:2008 + A1:2012 Incorporating Corrigendum No.1	Recommendation for the design of bridges to BS EN 1993	See CD 350 Appendix A for additional guidance.
	PD 6696-2:2007 + A1:2012	Background paper to BS EN 1994-2 and the UK National Annex to BS EN 1994-2	See CD 350 Appendix A for additional guidance.
	PD 6698:2009	Recommendations for the design of structures for earthquake resistance to BS EN 1998	See CD 350 section 7 for additional guidance.
	PD 6702-1:2009+A1:2019	Structural use of aluminium. Recommendations for the design of aluminium structures to BS EN 1999	Amended 31 May 2019
	PD 6703:2009	Structural bearings – Guidance on the use of structural bearings	

BSI Published Documents

Used	Reference	Title	
	PD 6705-2:2020	Structural use of steel and aluminium. Execution of steel bridges conforming to BS EN 1090-2. Guide	Replaces PD 6705-2:2010 + A1:2013
	PD 6705-3:2009	Recommendations on the execution of aluminium structures to BS EN 1090-3	
	PD 6695-1-9:2008	Recommendations for the design of structures to BS EN 1993-1-9	See CD 350 Appendix A for additional guidance.

Execution Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 1090-1:2009+A1:2011	Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment of structural components	
	BS EN 1090-2:2018	Execution of steel structures and aluminium structures. Technical requirements for the execution of steel structures	Supersedes BS EN 1090-2:2008+A1:2011
	BS EN 1090-3:2019	Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures	Supersedes BS EN 1090-3:2008
✓	BS EN 13670:2009 Incorporating corrigenda October 2015 and November 2015	Execution of concrete structures	

Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 206:2013+A2:2021	Concrete – Specification, performance, production and conformity	Supersedes BS EN 206:2013+A1:2016
	BS EN 1317-1:2010	Road Restraint Systems – Part 1 – Terminology and general criteria for test methods	
✓	BS EN 1317-2:2010	Road Restraint Systems – Part 2 – Performance classes, impact test acceptance criteria and test methods for safety barriers.	
	BS EN 1317-3:2010	Road Restraint Systems – Part 3 – Performance classes, impact test acceptance criteria and test methods for crash cushions.	
	DD ENV 1317-4:2002	Road Restraint Systems – Part 4 – Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers.	*Draft BS EN 1317-4 for public comment published in June 2012*
	BS EN 1317-5:2007+A2:2012	Road Restraint Systems – Part 5 - Product requirements and evaluation of conformity for vehicle restraint systems	Incorporating corrigendum August 2012 *Draft prEN 1317-5 for public comment published in December 2013*
	PD CEN/TR 16949:2016	Road Restraint System – Pedestrian restraint system - Pedestrian parapets	*Bsi Published Document / CEN Technical Report published in July 2016* *(This document should not be used. The requirements of BS 7818:1995 apply.)*

Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	Draft prEN 1317-7	Road restraint systems - Part 7: Performance classes, impact test acceptance criteria and test methods for terminals of safety barriers	*Draft prEN 1317-7 for public comment published in June 2012* *(This document should not be used. All terminals should continue to be in accordance with ENV1317-4.)*
	PD CEN/TS 17342:2019	Road restraint systems - Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers	*Replaces* PD CEN/TS 1317-8:2012 *(This document should not be used.)*
	PD CEN/TR 17081:2018	Design of fastenings for use in concrete – Plastic design of fastenings with headed and post-installed fasteners	
	BS EN 1337-1:2000	Structural bearings – Part 1: General Design Rules	
	BS EN 1337-2:2004	Structural bearings – Part 2: Sliding elements	
	BS EN 1337-3:2005	Structural bearings – Part 3: Elastomeric bearings	
	BS EN 1337-4:2004	Structural bearings – Part 4: Roller bearings	Corrigendum No.1 March 2007
	BS EN 1337-5:2005	Structural bearings – Part 5: Pot bearings	
	BS EN 1337-6:2004	Structural bearings – Part 6: Rocker bearings	
	BS EN 1337-7:2004	Structural bearings – Part 7: Spherical and cylindrical PTFE bearings	
	BS EN 1337-8:2007	Structural bearings – Part 8: Guide bearings and restraint bearings	
	BS EN 1337-9:1998	Structural bearings – Part 9: Protection	
	BS EN 1337-10:2003	Structural bearings – Part 10: Inspection and maintenance	Corrigendum No.1 November 2003
	BS EN 1337-11:1998	Structural bearings – Part 11: Transport, Storage and Installation.	
	BS EN 10025-1:2004	Hot rolled products of structural steels Part 1: General technical delivery conditions.	
	BS EN 10025-2:2019	Hot rolled products of structural steels Part 2: Technical delivery conditions for non-alloy structural steels.	Supersedes BS EN 10025-1:2004
	BS EN 10025-3:2019	Hot rolled products of structural steels Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels.	Supersedes BS EN 10025-3:2004
	BS EN 10025-4:2019	Hot rolled products of structural steels Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels.	Supersedes BS EN 10025-4:2004
	BS EN 10025-5:2019	Hot rolled products of structural steels – Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance	Supersedes BS EN 10025-5:2004
	BS EN 10025-6:2019	Hot rolled products of structural steels – Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition.	Supersedes BS EN 10025-6:2004+A1:2009
	BS EN 10080:2005	Steel for the reinforcement of concrete – Weldable reinforcing steel - General	
	BS EN 10210-1:2006	Hot finished structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions	

Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 10210-2:2019	Hot finished structural hollow sections – Part 2: Tolerances, dimensions and sectional properties	Supersedes BS EN 10210-2:2006
	BS EN 10248-1:1996	Hot rolled sheet piling of non alloy steels. Technical delivery conditions	
	BS EN 10248-2:1996	Hot rolled sheet piling of non alloy steels. Tolerances on shape and dimensions	
	BS EN 12063:1999	Execution of special geotechnical work. Sheet pile walls.	
	BS EN 14388:2005	Road traffic noise reducing devices	There is a 2015 version, however the 2015 version is not harmonised.
	BS EN 15050:2007 + A1:2012	Precast concrete products – Bridge elements	See CD 350 clause 3.8.1 for additional guidance.
	BS EN 15258:2008	Precast concrete products - Retaining wall elements	

British Standards

Used	Reference	Title	
	BS 4449:2005 +A3:2016	Steel for the reinforcement of concrete	No longer covers plain round bar. (See BS4482 up to 12mm dia, see BS EN 10025-1 for larger sizes and dowels. See BS EN 13877-3 for dowel bars in concrete pavements.)
	BS 5896:2012	Specification for high tensile steel wire and strand for the prestressing of concrete	
✓	BS 7818:1995	Specification for pedestrian restraint systems in metal	Incorporating Corrigendum No.1 May 2004 and Corrigendum No.2 September 2006 Currently the requirements of BS 7818:1995 are to be used instead of PD CEN/TR 16949:2016
✓	BS 8002:2015	Code of practice for earth retaining structures	
	BS 8004:2015 +A1 2020	Code of practice for foundations	Amendment +A1:2020
	BS 8006-1:2010+A1:2016	Code of practice for strengthened/reinforced soils and other fills	
	BS 8500-1:2015+A2:2019	Concrete – Complementary British Standard to BS EN 206: Method of specifying and guidance for the specifier.	Incorporating Corrigendum No.1 and Corrigendum No.2 June 2020 Amendment +A2:2019
	BS 8500-2:2015+A2:2019	Concrete – Complementary British Standard to BS EN 206 : Specification for constituent materials and concrete.	Amendment +A2:2019

Scheme title: Broad Oak, Linthwaite **Struc Ref: TBC**
Structure title: Secura Grand Retaining Wall **Revision 0 05/10/23**

British Standards

Used	Reference	Title	
	BS 8666:2020	Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete	Supersedes BS 8666:2005

The Manual Contract Document for Highway Works (MCHW)

Used	Reference	Title	
✓	MCHW Volume 1: July 2021	Specification for Highway Works	*Specification compliant with the execution standards must be used. A Departure is necessary for the parts where a compliant revision has not been published.* *Amendments July 2021*
✓	MCHW Volume 2: July 2021	Notes for guidance on the Specification for Highway Works	*Notes for guidance compliant with the execution standards must be used. A Departure is necessary for the parts where a compliant revision has not been published.* *Amendments July 2021*
✓	MCHW Volume 3: February 2017	Highway Construction Details	

The Design Manual for Roads and Bridges (DMRB)

Used	Reference	Title	
	GG 101 Revision 0.1.0	Introduction to the Design Manual for Roads and Bridges	Replaces GG 101 Revision 0
	GG 102 Revision 0	Quality Management Systems for Highway Design	Replaces GD 02/16
	GG 103 Revision 0	Introduction and general requirements for sustainable development and design	
	GG 104 Revision 0	Requirements for Safety Risk Assessment	Replaces GD04/12 and IAN 191/16
	GG 184 Revision 0	Specification for the use of Computer Aided Design	Replaces IAN 184/16
✓	CG 300 Revision 0.1.0	Technical approval of highway structures	Supersedes BD 2/12
	CG 302 Revision 0	As-built, operational and maintenance records for highway structures	Supersedes BD 62/07
	CG 303 Revision 0	Quality assurance scheme for paints and similar protective coatings	Supersedes BD 35/14
	CG 305 Revision 0	Identification marking of highway structures	Supersedes BD 45/93
	CG 501 Revision 2	Design of highway drainage systems	Supersedes HD 33/16, TA 80/99
	CD 127 Revision 1.0.1	Cross-sections and headrooms	Replaces TD 27/05 and TD 70/08
✓	CD 350 Revision 0	The design of highway structures	Supersedes BD 100/16, BA 57/01, BD 57/01 and IAN 124/11

The Design Manual for Roads and Bridges (DMRB)			
Used	**Reference**	**Title**	
	CD 351 Revision 0	The design and appearance of highway structures	Supersedes BA 41/98
	CD 352 Revision 0	Design of road tunnels	Supersedes BD 78/99
	CD 353 Revision 0	Design criteria for footbridges	Supersedes BD 29/17
	CD 354 Revision 1	Design of minor structures	Supersedes BD 94/17
	CD 355 Revision 0	Application of whole-life costs for design and maintenance of highway structures	Replaces BD 36/92 and BA 28/92
	CD 356 Revision 1	Design of highway structures for hydraulic action	Supersedes BA 59/94
	CD 357 Revision 1	Bridge expansion joints	Replaces BD 33/94, BA 26/94, IAN 168/12 and IAN 169/12
	CD 358 Revision 2	Waterproofing and surfacing of concrete bridge decks	Replaces BD 47/99, BA 47/99 and IAN 96/07
	CD 359 Revision 0	Design requirements for permanent soffit formwork	Supersedes BA 36/90 and IAN 131/11
	CD 360 Revision 2	Use of compressive membrane action in bridge decks	Supersedes BD 81/02
	CD 361 Revision 0	Weathering steel for highway structures	Supersedes BD 7/01
	CD 362 Revision 1	Enclosure of bridges	Replaces BD 67/96 and BA 67/96
	CD 363 Revision 0	Design rules for aerodynamic effects on bridges	Replaces BD 49/01
	CD 364 Revision 0	Formation of continuity joints in bridge decks	Replaces BA 82/00
	CD 365 Revision 1	Portal and cantilever signs/signals gantries	Replaces BD 51/14, IAN 193/16, BE 7/04
	CD 366 Revision 0	Design criteria for collision protection beams	Replaces BD 65/14
	CD 367 Revision 0	Treatment of existing structures on highways widening schemes	Replaces BD 95/07
	CD 368 Revision 0	Design of fibre reinforced polymer bridges and highway structures	Replaces BD 90/05
	CD 369 Revision 0	Surface protection for concrete highway structures	Replaces BA 85/04
	CD 371 Revision 0	Strengthening highway structures using fibre-reinforced polymers and externally bonded steel plates	Replaces BD 85/08, BD 84/02
	CD 372 Revision 0	Design of post-installed anchors and reinforcing bar connections in concrete	Supersedes IAN 104/15
	CD 373 Revision 0	Impregnation of reinforced and prestressed concrete highway structures using hydrophobic pore-lining impregnants	Supersedes BD 43/03
	CD 374 Revision 0	The use of recycled aggregates in structural concrete	Supersedes BA 92/07
	CD 375 Revision 1	Design of corrugated steel buried structures	Supersedes BD 12/01
	CD 376 Revision 0	Unreinforced masonry arch bridges	Replaces BD 91/04

The Design Manual for Roads and Bridges (DMRB)			
Used	**Reference**	**Title**	
✓	CD 377 Revision 4	Requirements for road restraint systems	Supersedes TD 19/06
✓	CD 622 Revision 1	Managing geotechnical risk	Replaces HD 22/08, BD 10/97 and HA 120/08
	CS 461 Revision 0	Assessment and upgrading of in-service parapets	Supersedes BA 37/92 and IAN 97/07
	GD 304 Revision 2	Designing health and safety into maintenance	Replaces IAN 69/15
	LA 104 Revision 1	Environmental assessment and monitoring	Supersedes HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10
	LA 106 Revision 1	Cultural heritage assessment	Supersedes HA 208/07, HA 60/92, HA 75/01
	LA 110 Revision 0	Material assets and waste	Supersedes IAN 153/11
	LA 113 Revision 1	Road drainage and the water environment	Supersedes HD 45/09
	LD 119 Revision 0	Roadside environmental mitigation and enhancement	Formerly LA 119, which superseded HA 65/94 and HA 66/95

Interim Advice Notes		
Used	**Reference**	**Title**
✓	IAN 105/08	Implementation of construction (design and management) 2007 and the withdrawal of SD 10 and SD 11

Miscellaneous			
Used	**Reference**	**Title**	
	CIRIA C543	Bridge Detailing Guide	
	CIRIA C686	Safe Access for Maintenance and Repair	
✓	CIRIA C760	Guidance on embedded retaining wall design	
✓	CIRIA C766	Control of cracking caused by restrained deformation in concrete	Supersedes C660

APPENDIX B

DRAWINGS

APPENDIX C

ADDITIONAL INFORMATION

NOTES:

1) All dimensions in mm's unless otherwise specified.

2) BLOCKS:
Block type: Secura Grand

3) INSTALLATION:
Please refer to standard Manufacturer's installation guidelines.

4) REINFORCEMENT:
Fortrac 35T and 55T geogrid. Grids to be installed at a maximum 2 block vertical centres. Grid lengths to be as shown in sections. Intermediate wall heights to utilise grid lengths from the higher sections. Bottom grid must always be placed on the top of the base course of Secura Grand blocks. **During installation the grid must be installed by rolling it perpendicular to the wall and cutting to the required length. The grid must not be rolled out longitudinally along the wall.**

5) BACKFILL TO WALL:
GEOGRID SECTION:
The backfill for the wall shall comprise a selected compacted granular fill material to comply with MCDHW Class 6S. This material is assumed to have the following characteristics: Phi' = 35 degrees, Gamma = 19 kN/m³ and c' = 0 kPa, compacted to in accordance with MCDHW Series 600, Table 6/4.

The Contractor is responsible for the selection of this material to ensure compliance with the geotechnical characteristics specified in 'Series 600' of the Specification for Highway Works, as shown on the relevant drawings and in the design documents/calculations namely:

C20/25 CONCRETE BACKFILL SECTIONS:
There are areas were the required lengths of geogrids cannot be accommodated due to proximity with the site boundary on the retained side. To reduce the construction width at these points C20/25 concrete backfill can be used in lieu of geogrid reinforced granular backfill.

C20/25 concrete to be installed to the width shown on the design sections and as indicated on the wall elevations. The concrete must be pokered into the voids in and behind the blocks to create a monolithic structure.
Concrete backfill must be placed in lifts no higher than 600mm per day.
C20/25 concrete backfill to have a nominal density of 24kN/m³.

5) DRAINAGE
Typically a minimum 150mm diameter rear of wall drain is provided behind segmental retaining walls to discharge any water from the reinforced zone to an approved outlet. However, the Client has advised that there is nowhere to outlet wall drainage on the site. The Client must then accept that there maybe seepage of water through the joints in the Secura Grand facing blocks following intense storms.

A minimum 300mm wide column consisting of free draining 10-20mm aggregate should be installed directly behind the facing blocks as indicated on the sections.

6) FOUNDATION FOR WALLS:
We assume that the formation level of the walls will be within original competent firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSIT) with a minimum safe bearing resistance of 150kPa. **This should be confirmed by the Principal Contractor prior to construction. The Principal Contractor is responsible for ensuring the in-situ soils comply with the geotechnical characteristics as shown on the relevant drawings and in the design calculations.**

Any soft/loose or unsuitable material (such as made ground, loose sand, alluvium or peat/ organics) present at or below formation level must be excavated out down to original competent firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSIT) and replaced with compacted Class 6F2 granular fill.

The Principal Contractor should appoint a local geotechnical specialist to inspect and test the ground at proposed formation level and below to ensure a minimum required safe bearing resistance of 150kPa is achieved.

We suggest in-situ hand shear vane testing and plate load testing at minimum 20m spacings along the length of the wall.

For hand shear vane testing a minimum undrained shear strength of 80kPa would be required.

Plate load tests should be carried out to the incremental method as detailed by BS1377-9 using a minimum 600mm diameter plate loaded to a minimum of 350kPa in 50kPa increments.

Construction of the walls should not commence until the Principal Contractor has confirmation in writing that the proposed formation level is suitable and provides a safe bearing resistance of 150kPa.

7) SITE / IN-SITU SOILS :
Foundation (assumed to be competent firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSIT)): this material is assumed to have the following minimum properties:

φ' = 30°, γ = 19kN/m³ & c' = 0kPa

Retained (assumed to be MADE GROUND or CLASS 1 UPFILL); this material is assumed to have the following minimum properties:

φ' = 28°, γ = 19kN/m³ & c' = 0kPa

The Principal Contractor/ Client's Consulting Engineer must ensure that the upfill placed to raise levels behind the reinforced zone complies with Class 1/ 2C fill and achieves a minimum effective angle of friction of 28-degrees. The upfill should be placed and compacted in an engineered fashion in accordance with SFHW Series 600 Table 6/4.

8) PEDESTRIAN PROTECTION
It is assumed that a maximum 1.8m high fence(designed by others) is to be located on the retained side of the wall. This must be confirmed by the Principal Contractor prior to construction. Fence post foundations should be installed in minimum 0.3mØ, 1.0m long sleeves pre-installed in the wall backfill and then fully infilled with C20/25 concrete. The geogrid may be locally cut in secondary direction to accomodate the post sleeves.
Please advise if a higher fence is proposed as the design will need to be revised.
Please advise us of any additional wind/ impact loads to be considered and we will revise the design.
Banter requirements at the crest and toe of the wall are to be determined by the Principal Designer.

Also refer to the **NOTES ON FENCING IN TEMPORARY CASE.**

9) TEMPORARY EXCAVATIONS
The safe angle of repose of the temporary cut slope is to be determined by the Principal Contractor. This solution is for the permanent works only, and is issued on the basis that a safe system or works is provided for construction. Temporary excavations have the potential to fail rapidly and without warning. Temporary stability and design of any temporary works is outside our scope and should be confirmed by a temporary works designer appointed by the Principal Contractor.

We would recommend that the client considers suitable temporary works, moving the line of the Wall 3 away from the boundary.

The Principal Contractor must consider temporary propping/ sheet piling to create a safe working environment, excavation and construction in short lengths, etc.
Geoman Ltd. is not responsible for temporary stability or design of any temporary works.

10) TYPICAL FRONT FACE ANGLE:
Secura Grand: Face angle = 7°

11) BUILDING/STRUCTURE FOUNDATIONS
It is assumed that any proposed structure/building foundations immediately to the rear of the walls will be placed prior to or alongside construction of the walls to avoid either being destabilised. The building foundations must be designed NOT to rely on the flexible Secura Grand wall and reinforced backfill for any support (including lateral support).

Please advise us if a pilling rig is to be used on the retained side of the walls, as well as its required minimum offset and maximum operational surcharge. If the surcharge on the retained side of the reinforced slope is to exceed 10kN/m² (and/ or a pilling rig is to be used following construction of the walls, the Principal Contractor must inform Geoman Ltd. prior to construction to allow this design to be reviewed.

Some settlement of the wall and retained material will occur following construction. This should be monitored and the installation of surface finishes, fences, etc. delayed until it has ceased.

12) HEAVY CONSTRUCTION TRAFFIC OPERATING CLOSE TO THE WALL
It should be ensured that the face batter is not compromised by the use of heavy compaction plant machinery too close to the front of the wall. If construction plant is to traffic the crest of the wall, a suitable haul road design must be undertaken and be set back an adequate distance from the rear of the wall (designer by others). If construction plant operates on the unprotected retained material, distortion/bulging of the wall may occur.

13) SURCHARGE
A maximum live load of 10kN/m² was assumed to act on the retained side of the walls. Please advise us if the surcharge on the retained side of the wall in the permanent condition is to exceed 10kN/m² - the Client's Consulting Engineer must inform Geoman Ltd.if a more onerous surcharge should be considered prior to construction as this design must be reviewed.

14) STATUTORY APPROVALS
We have assumed that Technical Approval is not required for the proposed walls. This must be confirmed by the Principal Designer prior to construction. Progressing Technical Approval should it be required is outside our scope and is the responsibility of others.

15) TOPOGRAPHY
The topography at the crest and toe of the walls needs to be checked prior to construction and Geoman Ltd. must be informed if it is more onerous than assumed as the design will need to be reviewed.

16) NOTES ON CALCULATIONS/DRAWINGS:
These plans and the accompanying design documentation should be thoroughly checked by the Principal Designer. Any apparent errors, omissions or variations should be reported immediately to Geoman Ltd. Construction of these walls shall not commence unless and until the Client/Principal Designer has considered the Geoman Design Submission Document (GP06 Ref: 22-5482-02) to ensure that there are no errors, omissions or conflict with the scheme design.

FOR APPROVAL

REV 0	ADB	22.06.22
Issue / Revision:	Drawn:	Date:

Designer:

GEOMAN
44 Elmwood Avenue, Belfast, BT9 6AZ 02890 664941 geoman@geoman.co.uk

Project Title:

Broad Oak, Linthwaite

Client: Casey Group Ltd

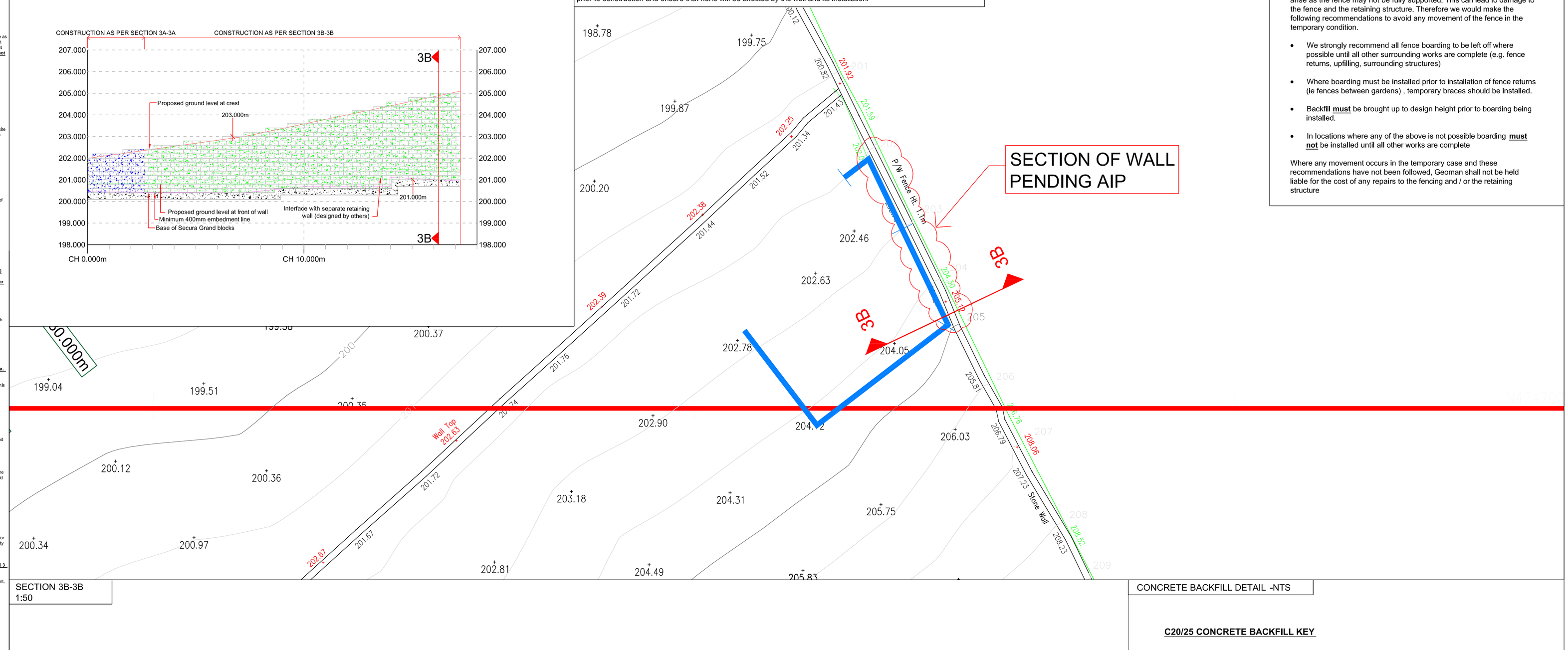
Drawing Title:

SECURA GRAND RETAINING WALL 3
INDICATIVE ELEVATION AND SECTIONS

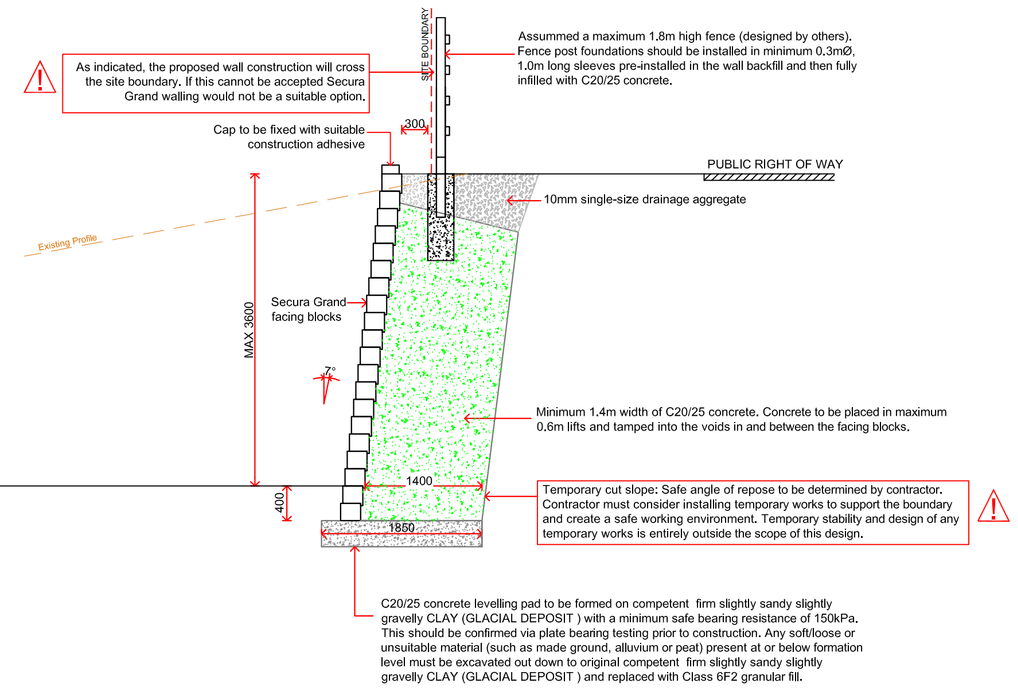
Designed:	ADB		Date:22.06.22	Project No:	22-5482
Drawn:	ADB		Date:22.06.22	Scale:	AS INDICATED
Approved:	GM		Date:23.06.22		
Drawing No:	SK22-5482-01			Revision:	0

ELEVATION WALL 3
SCALE 1:100

INDICATIVE LOCATION OF SECURA GRAND WALL
1:200
All slope geometry, setting out and required offsets to be confirmed by the Principal Contractor and/ or Principal Designer prior to construction. The Principal Contractor and/ or Principal Designer must also confirm the locations of all services prior to construction and ensure that none will be affected by the wall and its installation.



SECTION 3B-3B
1:50



FENCING IN TEMPORARY CASE.

The retaining structure is designed to support a 1.8m close boarded fence in the permanent condition, however in the temporary condition issues can arise as the fence may not be fully supported. This can lead to damage to the fence and the retaining structure. Therefore we would make the following recommendations to avoid any movement of the fence in the temporary condition.

- We strongly recommend all fence boarding to be left off where possible until all other surrounding works are complete (e.g. fence returns, upfilling, surrounding structures)
- Where boarding must be installed prior to installation of fence returns (ie fences between gardens) , temporary braces should be installed.
- Backfill **must** be brought up to design height prior to boarding being installed.
- In locations where any of the above is not possible boarding **must not** be installed until all other works are complete

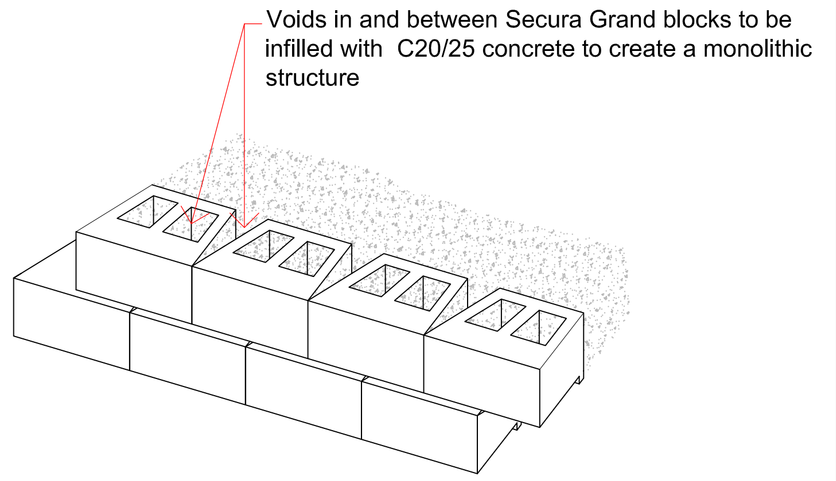
Where any movement occurs in the temporary case and these recommendations have not been followed, Geoman shall not be held liable for the cost of any repairs to the fencing and / or the retaining structure

CONCRETE BACKFILL DETAIL -NTS

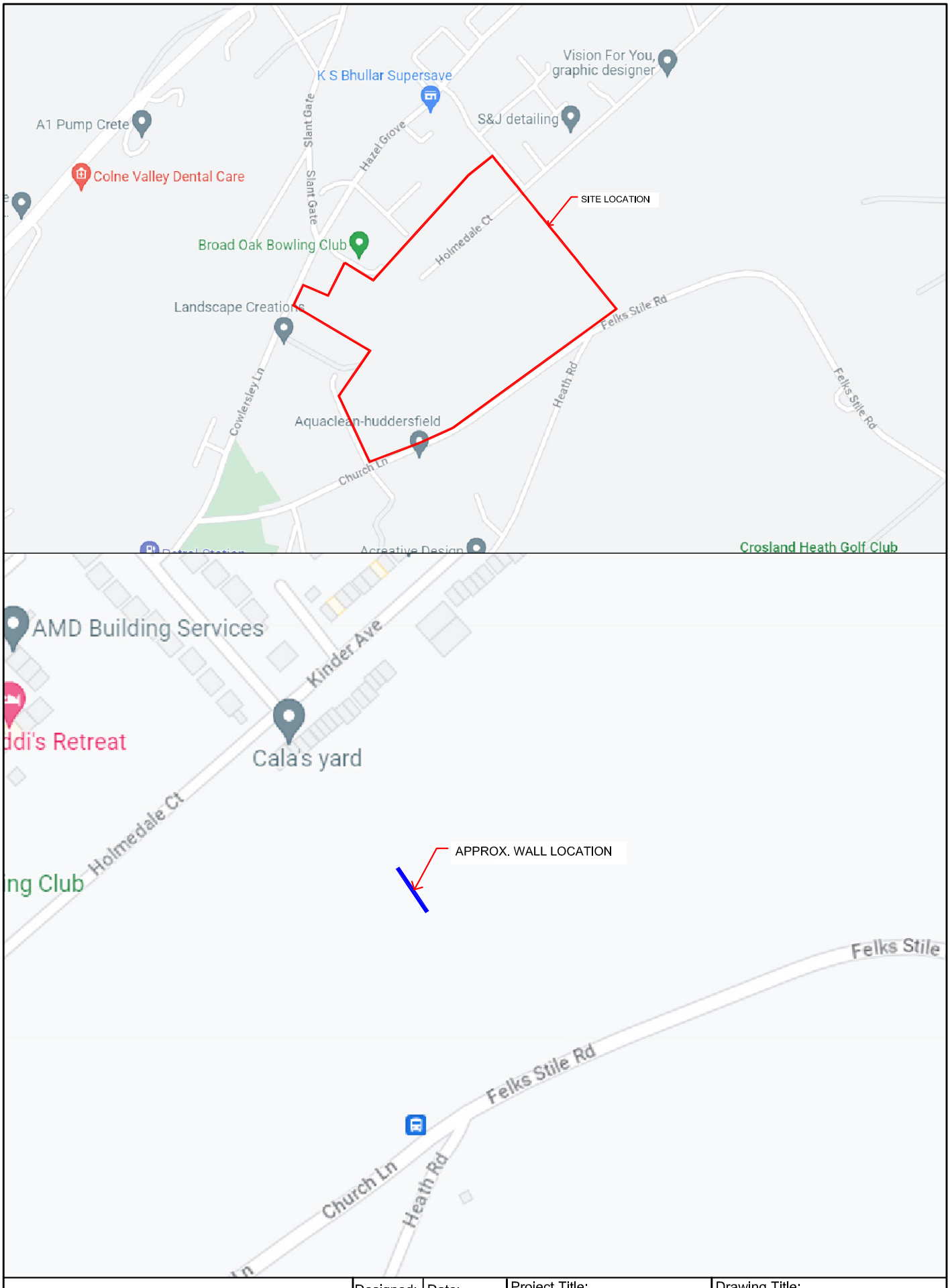
C20/25 CONCRETE BACKFILL KEY

0.7m WIDTH

1.4m WIDTH



C20/25 concrete to be installed to the width shown on the design sections and as indicated on the wall elevations. The concrete must be pokered into the voids in and behind the blocks to create a monolithic structure.
Concrete backfill must be placed in lifts no higher than 600mm per day.
C20/25 concrete backfill to have a nominal density of 24kN/m³.



GEOMAN 44 Elmwood Avenue, Belfast, BT9 6AZ 02890 664941 geoman@geoman.co.uk	Designed:	Date:	Project Title: BROAD OAK LINTHWAITE	Drawing Title: SITE LOCATION PLAN	
	Drawn: AC	Date: 15/10/23	Client: CASEY GROUP LTD.	Scale: NTS	Project No: 22-5482
	Approved:	Date:		Drawing No: SK22-5482-02	Rev: 0

KEY

- Boundary Type A1 -1.8m concrete post and timber panel fence
- Boundary Type A2 -2m concrete post and timber panel fence with 0.3m trellis Applies to plot 1 only
- Boundary Type A3 -1.8m concrete post and timber panel fence with 0.3m trellis Applies to plots 29 and 30 only
- Boundary Type B1 - 1.5m mesh and timber stock fence
- Boundary Type B2 - 0.9m mesh and timber stock fence
- Boundary Type C - 0.9m high dry stone walling
- Boundary Type D -2m stone and timber panel walling
- EV charging point
- Tarmac to driveways
- Feature tarmac to highways
- Paving to properties

Refer to drawings 102-4 for detailed layouts of sub-sections of the site

Refer to drawings 105-6 for details of boundary treatments and bin stores

Where trees are within 5m of the adoptable highway, and at mature height shall overhang the highway, all trees to have a minimum crown height of 2.4m

See Engineer's drawings for details of drainage basin

See Landscape Architect's drawings for details of open space

See Landscape Architect's drawings for details of open space

See Landscape Architect's drawings for details of open space

See Landscape Architect's drawings for details of open space

See dwgs 102 to 104 for setting out coordinates

New tarmac path adjacent to plot 46 to connect to The Lodge at grade (approx 198.700) with no steps, handrails, boundary fencing or gates. See AJP dwg 1530 for typical construction details

NOTE - Plot 46 is a Variant House Type. See dwg 219

New tarmac path at end of new highway to connect to existing adjacent footpath at a point to ensure access at grade (approx 200.560). Existing wall to be locally dismantled to form opening, but otherwise no steps, handrails, boundary fencing or gates to be provided. See AJP dwg 1530 for typical construction details

NOTE - Plot 200 is a Variant House Type. See dwg 200

NOTE - Plots 93-94 are Variant House Types. See dwg 229

NOTE - Plot 93 is a Variant House Type. See dwg 203

74m raidius from cricket wickets

Setting Out Co-ordinates

Note: All setting out co-ordinates for houses taken to outside face of stonework corners

- House Type A Silverdale
- House Type B Malhamdale
- House Type C Stonesdale
- House Type D Bedale
- House Type E Birkdale
- House Type F Fossdale
- House Type G Garsdale
- House Type H Bardale
- House Type J Cotdale

Church Lane Insert

01	**Proposed Site Plan**
101	Scale 1:500 @ A1

Issue	Description	Date	Drawn	Checked
C13	Indicative path levels added	19.5.23	MH	BB
C12	Bin stores moved. Tree note added	8.5.23	MH	BB
C11	Fence type B split into B1 and B2. Streetlighting and street trees added	5.12.22	MH	BB
C10	Fence type A split into A1, A2 and A3	25.11.22	MH	BB
C9	Drawing status changed to Construction	3.10.22	MH	BB
P8	Retaining wall heights added. Boundaries added to plots122-125	23.05.22	MH	BB
P7	Setting out and variant references added	13.05.22	MH	BB
P6	Connecting path notes added	14.04.22	MH	BB
P5	Stepped gardens added, Bin store relocated	3.03.22	MH	BB
P4	Cable run and corner insert added	3.03.22	MH	BB
P3	Plots 93-104 adjusted	2.03.22	MH	BB
P2	Prepared for issue	27.01.22	MH	BB
P1	Issued for comment	19.01.22	MH	BB

Drawing Status
P - Planning | **T** - Tender | **C** - Construction | **R** - As Record

For Construction

tadw | architects

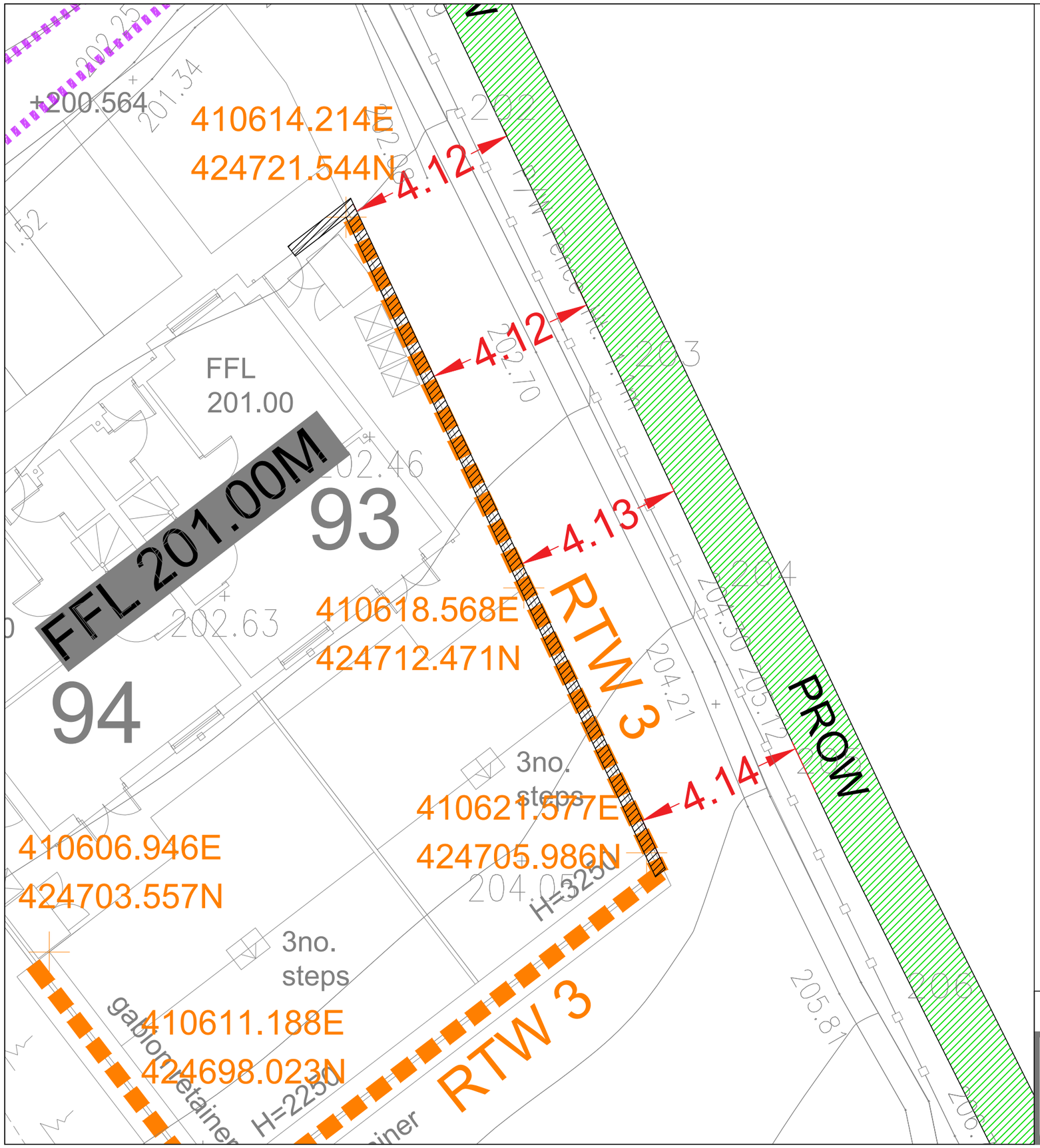
Six St. Petersgate Stockport Cheshire SK1 1HD
Ph 0161 477 6158 Fx 0161 480 8342 mail@tadw.co.uk www.tadw.co.uk

Client	Yorkshire Housing Casey Group
Job	Broadoak Farm Linthwaite
Title	Proposed Site Plan
Scale	1:500 @ A1

Note - Prints from PDF files may not be to scale, check accuracy against scale

50m 20 10 30 1:500

Job Number	Drawing Number	Issue
911277	101	C13



SITE COORDINATES
E 410589
N 414784
POSTCODE HD4 5XD

REV	DATE	DESCRIPTION	BY	APP
C01	26.04.2023	CONSTRUCTION ISSUE	JCM	JCM

PROJECT: BROAD OAK, LINTHWAITE

TITLE: PROW OFFSET DISTANCE

STATUS:	PROJECT No:	DRAWING No:	REV:
S2	219-174	BRO-AJP-00-ZZ-DR-C-1440	C01

SCALE @ A3:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:100	JCM	JCM	JCM	JLS	APRIL 2023

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0151 227 1462 info@ajpltd.co.uk 1 Dale Street, Liverpool, L2 2ET

TAA REF NO	·
GEOTECHNICAL REF NO	·

HIGHWAY STRUCTURE SUMMARY INFORMATION SHEET

STRUCTURE NAME	
Secura Grand retaining wall	
OS GRID REF	CHAINAGE
410615E 414725N	N/A
STRUCTURE TYPE	DESIGN LIFE
Concrete backfill Segmental Block Retaining Wall	120 YEARS
GEOTECHNICAL CATEGORY	DESIGNER'S GEOTECHNICAL ADVISOR
2	Adam Cash

QUANTITIVE GEOTECHNICAL INVESTIGATIONS	GRM Phase I Site Appraisal (Desk Study) (P8985, April 2020)
SOILS/GEOLOGY	Shallow topsoil (0.25m deep) overlying firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSITS) followed by layers of extremely weak weathered MUDSTONE (ROSSENDALE FORMATION).
RELEVANT TRIAL HOLES	TP05

STRATA	CHARACTERISTIC VALUES (EC7)			TYPICAL DEPTHS (BELOW GROUND LEVEL)	FOUNDATION LEVEL	GROUNDWATER LEVEL
	c_u (kPa)	ϕ' (°)	E' (MPa)			
TP05 TOPSOIL	Minimum 80kPa	Minimum 30 degrees		0-0.25mBGL	200.40-201.00mOD	Not encountered
Firm, grey mottled orange, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded, mudstone and sandstone. GLACIAL DEPOSITS				0.25-1.60mBGL		
Extremely weak, dark grey, with weathered brown faces, thinly laminated highly weathered MUDSTONE. Recovered as dense, grey, slightly clayey, sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular, lithorelicts of weak weathered mudstone. WEATHERED ROSSENDALE FORMATION				1.60-2.30mBGL		
Extremely weak to weak, dark grey with weathered brown faces, thinly laminated MUDSTONE. Recovered as a dark grey, sandy gravel of angular mudstone. ROSSENDALE FORMATION				2.30-3.80mBGL		

TAA REF NO	.
GEOTECHNICAL REF NO	.

HIGHWAY STRUCTURE SUMMARY INFORMATION SHEET

PREVIOUS GROUND HISTORY	The site predominantly comprises cropped farmland with dividing hedgerows, trees and drainage ditches, typically sloping down from west to east.
CONTAMINATED GROUND RISK ASSESSMENT REQUIRED	Contamination Assessment carried out as part of the GRM's Site Appraisal Report.
PROTECTION OF STRUCTURE AGAINST CHEMICAL ATTACK	Concrete pad Design Sulphate Class for the site should be taken as DS-1 and the ACEC Class as AC-1

EARTH PRESSURE VALUES				
STRATA	φ'k (°)	K_a	K_p	K_0
In-situ soils (Firm sandy gravelly CLAY)	30	0.33	3.00	0.5
Class 1 upfill	28	0.36	2.76	0.53
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SPREAD FOUNDATIONS

STRUCTURE ELEMENT	FOUNDING STRATUM	FOUNDING LEVEL	FOOTING SIZE	ULS UTILISATION							
				BEARING		SLIDING		OVERTURNING			
				C1	C2	C1	C2	C1	C2		
Base of reinforced earth wall (Section 3B-3B)	Firm CLAY	200.40-201.00mOD	Min 1.850m wide.	68.7 %	85.3 %	83.7 %	83.0 %	64.7%	66.3%	.	.
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										.	.
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.	.	.	.	.	.	.	.	.	.	.	.

TAA REF NO	
GEOTECHNICAL REF NO	

HIGHWAY STRUCTURE SUMMARY INFORMATION SHEET

SETTLEMENT/GROUND MOVEMENTS

STRUCTURE ELEMENT	FOUNDING LEVEL	APPLIED BEARING (SLS) (kPa)	IMMEDIATE SETTLEMENT (mm)	TIME FOR 90%	SETTLEMENT REMAINING AT COMPLETION	CONSERVATIVE PRELIMINARY EST. OF SLS BEARING CAPACITY
Base of reinforced earth wall (Section 3B-3B)	200.40-201.00mOD	167.59Pa	<10mm	6 weeks	<10mm	170kPa

DIFFERENTIAL SETTLEMENT	• Differential settlement to be allowed for between adjacent supports = 10mm • Differential settlement allowed between structure and approach embankment – N/A

PILE DESIGN	COMMENTS
PILE TYPE	N/A
CRITERIA FOR SELECTING PILE TOE LEVEL	N/A
ALLOWANCE FOR NEGATIVE SKIN FRICTION WITHIN DESIGN	N/A
TESTING	N/A

PILE LOADING DATA

LOADCASE	PILE CUT OFF LEVEL	PILING PLATFORM LEVEL	QUANTITY OF PILES	MAX UNFACTORED VERTICAL LOAD (kN)	MAX UNFACTORED TENSION LOAD (kN)	MAX UNFACTORED LATERAL LOAD (kN)
N/A						

PILE DESIGN DATA

LOADING CASE	UNFACTORED LOAD (kN)	PILE LENGTH (m)	DESIGN ACTION (kN)		DESIGN RESISTANCE (kN)		DEGREE OF UTILISATION (%)	
			C1	C2	C1	C2	C1	C2
N/A								

TAA REF NO	·
GEOTECHNICAL REF NO	·

HIGHWAY STRUCTURE SUMMARY INFORMATION SHEET

CHEMICAL ANALYSIS					
TYPE OF TEST	SAMPLE				
	SOIL	SOIL WATER	WATER	OTHER	AIR
SULPHATE/SULPHIDE	-	0.02-0.13g/l	-	-	-
CHLORIDE	-	-	-	-	-
PH	-	6.6-8.2	-	-	-
REDOX	-	-	-	-	-
OTHER	-	-	-	-	-

DESIGN SULPHATE CLASSIFICATION	DS-1
BURIED CONCRETE CLASSIFICATION	ACEC Class AC-1
GEOTECHNICAL SUPERVISION/MONITORING	The Principal Contractor should appoint a local geotechnical specialist to inspect and test the ground at proposed formation level and below to ensure a minimum required safe bearing resistance of 170kPa is achieved. Any soft/loose or unsuitable material (such as made ground, soft clay, loose sand, alluvium or peat/ organics) present at or below formation level must be excavated out down to original, competent firm slightly sandy slightly gravelly CLAY (GLACIAL DEPOSIT) and replaced with compacted Class 6F2 granular fill.
NOTES	N/A