

Civic Centre 1  
High Street  
Huddersfield  
HD1 2NE

## **APPROVAL IN PRINCIPLE FOR DESIGN OF**

**Proposed Private Reinforced Concrete  
Retaining Wall Supporting Gardens for New  
Dwelling on Land adjacent to No.80 Greenhill  
Bank Road, New Mill, HD9 1ER**

**Structure reference: K66980**  
**Date: 8<sup>th</sup> February 2024**  
**Revision: 2**  
**Status: Draft**  
**Prepared by: B. Rahma**  
**Checked by: D. Haigh**

**Scheme title:** Land adj. No.80, Greenhill Bank Road, New Mill  
**Structure title:** Private Reinforced Concrete Retaining Wall above  
Highway

**Structure Ref:**  
K66980  
REV.02: 08/02/2024

## DOCUMENT CONTROL

**Structure title:** Private reinforced concrete retaining wall adjacent to Greenhill Bank Road, New Mill, HD9 1ER

**Structure reference:** K66980

**Date:** 8<sup>th</sup> February 2024

**Revision:** 02

**Status:** Draft

### Document issue record

| Issue | Status | Prepared | Date     | Checked  | Date     | Approved | Date |
|-------|--------|----------|----------|----------|----------|----------|------|
| 01    | Draft  | B. Rahma | 20.12.23 | D. Haigh | 20.12.23 |          |      |
| 02    | Draft  | B. Rahma | 08.02.24 | D. Haigh | 07.02.24 |          |      |
|       |        |          |          |          |          |          |      |
|       |        |          |          |          |          |          |      |

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## PROJECT DETAILS

**Name of project:** Proposed new dwelling on land adjacent to No.80, Greenhill Bank Road, New Mill.

**Name of Bridge or Structure:** Private reinforced concrete retaining wall adjacent to Greenhill Bank Road, New Mill, HD9 1ER

**Structure reference no:** K66980

**Summary:** This AIP is for a private reinforced concrete retaining wall supporting private gardens for a proposed new dwelling on land adjacent to No.80, Greenhill Bank Road, New Mill. The new retaining wall is required to form off road parking areas and a driveway adjacent to the highway.

## 1. HIGHWAY DETAILS

### 1.1. Type of highway

#### 1.1.1. Location and OS Map / Grid reference

**Location:** Unclassified

**OS Map:** SE 160085

**Grid Ref (X, Y):** (416034 , 408353)

### 1.2. Permitted traffic speed

30mph

### 1.3. Existing restrictions

None

## 2. SITE DETAILS

### 2.1. Obstacles crossed

Not Applicable

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### 3. PROPOSED STRUCTURE

#### 3.1. Description of structure and design working life

A reinforced concrete retaining wall to support private gardens above the highway. The retaining wall will be supported on a reinforced concrete footing foundation. There is no vehicle access above the retaining wall.

The proposed reinforced concrete retaining wall is required to level off sloping gardens and will be designed to have a design working life category 5 (120 years) in accordance with. CD 350 The design of highway structures- Table 7.1.

#### 3.2. Structural type

Reinforced concrete retaining wall.

#### 3.3. Foundation type

Reinforced concrete foundations.

#### 3.4. Span arrangements

Adjacent to the highway, the proposed retaining wall will have a maximum retained height of 2.0m high above formation level. The length of wall to be rebuilt will be approximately 8.0m long at each side of the driveway with a 1.5m return at the free end of the retaining wall where it abuts the existing mortar bonded stone retaining wall structure.

#### 3.5. Articulation arrangements

The reinforced concrete retaining wall will only be designed to support the private gardens adjacent to the highway. Adjacent properties and the new proposed dwelling is at a distance where their foundation loadings will not influence the construction of the proposed retaining wall.

The stability of the proposed retaining wall structure by its own self-weight does not rely upon the passive pressures from the earth in front of the retaining wall which could be excavated at a future date.

A 25mm thick polystyrene or cork based compression material is to be installed in the expansion joint along the interfaces with any existing structures.

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### **3.6. Classes and levels**

The classes and levels stated below apply to both the whole structure as well as all individual structural components.

#### **3.6.1. Consequence class**

CC 2

#### **3.6.2. Reliability class**

RC 2

#### **3.6.3. Inspection level**

IL 2

### **3.7. Road restraint systems requirements**

A 1.1m high (min) balustrade will be provided on top of the retaining wall adjacent to the upper ground level to prevent accidental fall from the top of the retaining wall onto the highway below.

### **3.8. Proposals for Water Management**

A 100mm diameter perforated longitudinal drain will discharge any water accumulated behind the wall to a suitable outlet. 75mm diameter weep holes will also be provided through the wall at 2.0m centres.

### **3.9. Proposed arrangements for future maintenance and inspection**

#### **3.9.1. Traffic management**

No traffic management will be required to inspect the wall. During future maintenance of the proposed retaining wall and its balustrade, any required traffic management will be agreed with local Highways Authority prior to any works being undertaken. Localised partial closure of the pavement footpath may be required, and this will be undertaken by using Heras fencing along the boundary of the site. During the construction of the retaining wall, pedestrian access along pavement will be managed by the contractors on site with any temporary tower scaffolding removed overnight to maintain free access to the public.

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

Access to the site will be provided directly from the highway and the new driveway formed as part of the development.

### 3.10. Environment and sustainability

There are no environmental factors which need to be considered in the close proximity to the proposed reconstruction of the retaining wall.

### 3.11. Durability. Materials and finishes

| Item                  | Material                                                                                                                                                                                                          | Finish / Location                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Retaining Wall & Base | Reinforced concrete<br>Grade C40/45 in accordance with BS 8500-1 and BS EN 206-1.                                                                                                                                 | The wall will be faced with natural stonework in a mortar bonded dry stone style and tied using stainless wall ties at 5 No per sqm. The addition of facework is considered to increase the design working life of the reinforced concrete to the required 120 years.<br><br>The steel reinforcement will be detailed in accordance with BS8500-table A.5 to achieve a working life of at least 100 years,<br>Exposure close XD3, with a minimum cover of 65mm. |
| Drainage              | 100mm diameter perforated longitudinal drain behind the heel of the retaining wall base will be encased in free draining material and taken to a suitable outlet together with 75mm PVC weep pipes at 2m centres. | The perforated land drain will be taken to a suitable outlet so that it does not discharge onto the adjacent highway.                                                                                                                                                                                                                                                                                                                                           |
| Waterproofing         | Bituthene 'blackjack' type waterproofing will be provided to the back, top and front face of toe of the retaining wall                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Parapet               | A 1.1m high balustrade (type TBC) will be provided on the top of the retaining wall.                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| Item              | Material                                                     | Finish / Location     |
|-------------------|--------------------------------------------------------------|-----------------------|
| Backfill Material | Class 6N in compliance with specification for highway works. | Backfill to structure |

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

For the coordination of the requirements under CDM Regulations 2015, the principal designers for the project have yet to be appointed.

Some factors to be considered will include, but not be limited to:

- Maintenance of vehicular/pedestrian access during construction
- Working at height
- Stability of the adjacent land and existing structures
- Existing utility services including street lighting pole.
- Manual handling of heavy objects
- Pumping of concrete and lean fill mix: spillages onto the highway.
- Deliveries of materials to site from the highway (if applicable)
- Use of large heavy (and high) plant adjacent to the highway.

### 3.13. 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)

The estimated cost of the proposed structure is excluding/including Statutory Undertakers costs.

excluding Statutory Undertakers costs.

### 3.14. Proposed arrangements for construction

#### 3.14.1. Construction of structure

The site will be secured using Heras type fencing along the highway and above the section of wall to be rebuilt.

Temporary propping will be installed to the existing unaffected retaining structures to prevent their collapse onto the highway during construction of the retaining walls.

Excavations will be undertaken carefully from below the site, gradually reducing the levels as the works proceed.

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The land at the back of the retaining structure will be graded back to a safe angle to facilitate access to build the new retaining wall.

Upon completion of the main retaining wall structure, it will be waterproofed using a Bituthene 'blackjack' type product, the longitudinal drain will be installed, and weep holes cleaned prior to backfilling with proposed free draining hardcore material.

The reinforced concrete wall will be faced in mortar bonded dry stone style walling, which will have a minimum of 5 No. stainless ties per square metre of walling. The wall ties will be drilled, and resin fixed into the face of the mass concrete wall. The dry stone style facing will then be extended above the wall to form the 360mm wide unreinforced masonry parapet.

The upper section of the facing stonework will be built off removable tower scaffolding, thus ensuring that access along the pavement is unrestricted when contractors are not on site.

#### 3.14.2. **Traffic management**

It is likely that traffic management along the public highway will be required during the construction of the new retaining wall.

This shall be agreed with the Kirklees Council's Highways Service prior to the commencement of the works. It is noted that the requirement for 9 weeks (min) notice period required for the implementation of a Temporary Road Closure should this become necessary.

#### 3.14.3. **Service diversions**

Statutory Service plans to be obtained and presence of services to be confirmed before construction of the new retaining wall is started.

#### 3.14.4. **Interface with existing structures**

Where applicable, a 25mm polystyrene or cork based compression joint will to be installed along the interfaces with any existing structures.

### 3.15. **Resilience and security**

The site will be secured using Heras Type fencing to prevent access from the highway. The garden above the retaining structure is private land with no vehicle access above the retaining wall.



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## 4. DESIGN CRITERIA

### 4.1. Actions

#### 4.1.1. Permanent actions

All permanent actions as outlined in BS EN 1991-1-1:2002 and the associated National Annex.

#### 4.1.2. Snow, Wind and Thermal actions

Snow loading not considered (NA to BS EN 1991-1-3 NA.4.1.1).

Thermal – movement joints will be specified where necessary.

Wind loading will not be considered, since the surcharge loads from the highway will far exceed any expected wind loads acting upon the proposed wall.

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

Not Applicable

#### 4.1.4. Actions relating to General Order traffic under STGO regulations

Not Applicable

#### 4.1.5. Footway or footbridge variable actions

5.0 kN/m<sup>2</sup> to BS 8002:2015 Cl 4.4.1.5 (Table 7).

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

Not Applicable.

#### 4.1.7. Accidental actions

There is no vehicle access above the retaining wall.

A 1100mm high balustrade will be provided on top of the retaining wall structure to protect pedestrians falling off the top of the retaining wall.

A line load of 0.34 kN/m will be applied to this balustrade.

#### 4.1.8. Action during construction

Not Applicable. No construction traffic will be allowed above the retaining wall.

The retaining wall is to be backfilled in accordance with the MCHW and surcharge loadings are to be derived based on the requirements of PD 6694-1:2011. Therefore, compaction pressures imposed on the wall during construction do not need to be considered. (PD 6694-1:2011 CL 7.3.3).

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**4.1.9. Any special action not covered above**

None

**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**

Not Applicable

**4.3. Proposed minimum headroom provided**

Not applicable.

**4.4. Authorities consulted and any special conditions required**

Kirklees Council

**4.5. Standards and documents listed in the Technical Approval Schedule**

TAS dated 3<sup>rd</sup> October 2023 - 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**

None

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

The proposed reinforced concrete retaining wall will be a private structure and as such its maintenance liability will solely rest with the adjoining land title holder/s.

**4.8. Proposed safety critical fixings**

None

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## 5. STRUCTURAL ANALYSIS

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

The method of analysis employed is to BS EN 1997-1:2004 incorporating Corrigendum dated February 2009 and UK National Annex incorporating Corrigendum No 1.

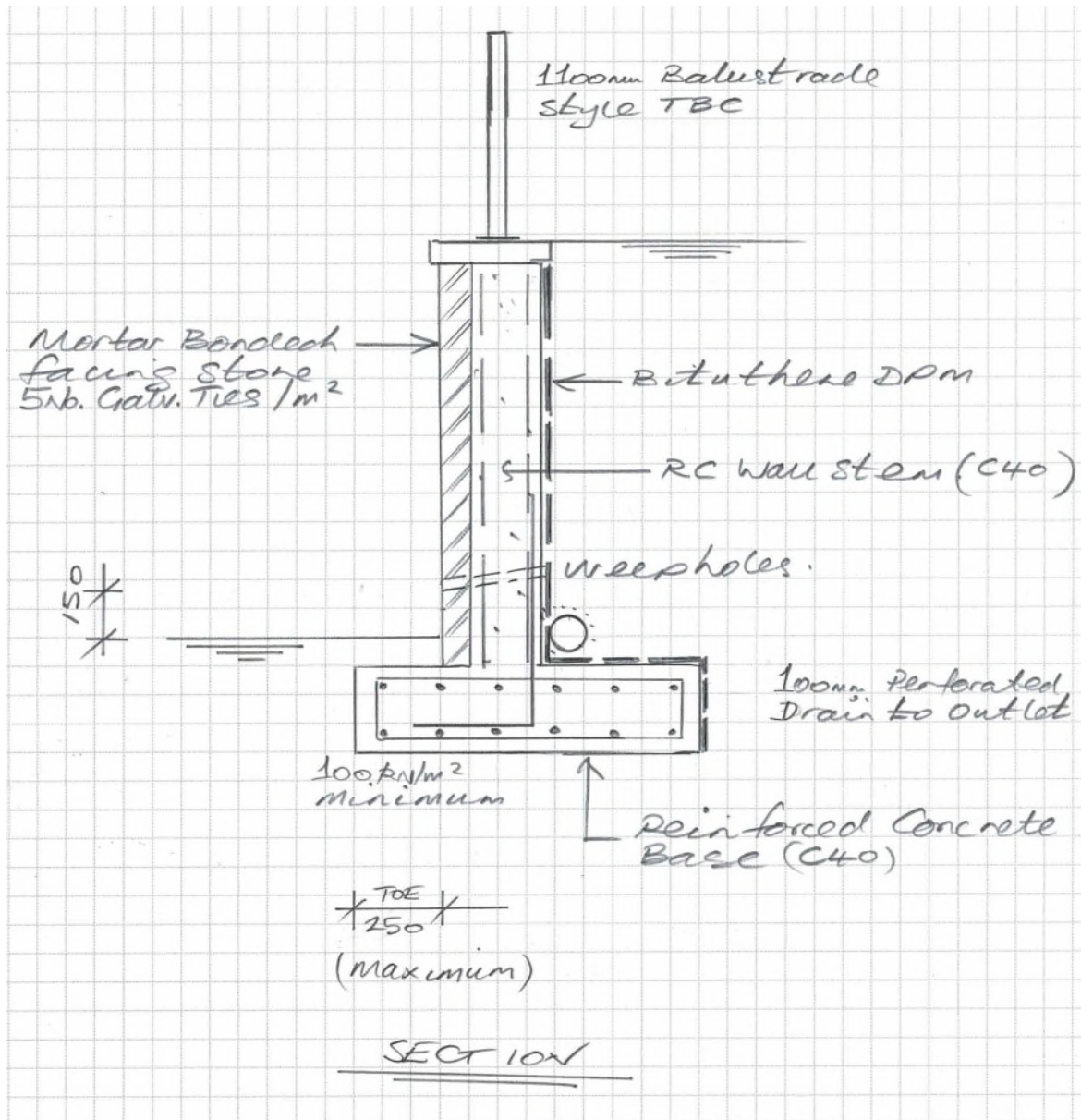
A 5.0kN/m<sup>2</sup> surcharge has been applied at the top of the wall in accordance with Section 4.5.1.5 (Table 7) of BS 8002:2015 Code of Practice for Earth Retaining Structures

The design of mass concrete gravity retaining wall will be in accordance with all applicable Eurocodes, adopting a design life of 120 years.

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



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**5.3. Assumptions intended for calculation of structural element stiffness.**

Weight of backfill behind wall is  $17.0 \text{ kN/m}^3$ .

Surcharge is taken at  $5.0 \text{ kN/m}^2$  above the retaining wall.

Angle of internal friction of sub strata,  $\Phi = 36^\circ$

Angle of internal friction of retained soil,  $\Phi = 36^\circ$

Ground bearing pressure of the bedrock sub strata upon which the wall will be constructed =  $100 \text{ kN/m}^2$ .

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

The retaining will be designed using active pressures, assuming the wall is immobile and with NO passive pressure.

In the global stability conditions, the active pressure,  $K_a$ , has been used.

$$K_a = 0.236$$

$$K_o = 0.764$$

The ground forming the highway (i.e. passive pressure) in front of the retaining wall will not be considered in the stability checks of the wall, to allow for any unplanned excavations which may occur to the highway in the future.

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## 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.**

A phase 2 ground investigation report has been completed by RGS, reference document number C3582/23/E/5443.

This confirms that the underlying sub-strata is weathered bedrock with an allowable ground bearing pressure of 250 kN/m<sup>2</sup>.

However, it is anticipated that softer layers of sand or gravel may be encountered at a shallower depth near the highway so a more conservative ground bearing pressure of 100 kN/m<sup>2</sup> will be considered in the design of the retaining wall.

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

No comments were made regarding the design of the retaining wall within the ground investigation report.

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

The new retaining wall structure only covers a small area, and it will be constructed in sections, therefore it is considered that differential settlement across the base slab will not occur.

**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.**

Not applicable.

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## 7. CHECK

### 7.1. Proposed Category and Design Supervision Level

Category 1

### 7.2. If Category 3, name of proposed Independent Checker

Not Applicable

### 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 earth behind the retaining structure will be graded back to allow safe access during the construction phase. This negates the need for any temporary shoring works required to the face of the excavation.

Temporary propping will be provided to the adjacent retaining structures to prevent their possible collapse during the reconstruction of the defective section of wall.

Temporary 'Heras' type fencing will be used to protect the site boundaries during the construction program.

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## 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                                      |
|-----------------|--------------------------------------------|
| MDL-9591-RW-001 | Reinforced Concrete Retaining Wall Details |
|                 |                                            |
|                 |                                            |
|                 |                                            |
|                 |                                            |
|                 |                                            |
|                 |                                            |

#### 8.1.2. Documents (See appendix C)

| Reference                           | Title                                      |
|-------------------------------------|--------------------------------------------|
| MDL-9591-RW-001<br>(not yet issued) | Structural Calculations for Retaining Wall |
|                                     |                                            |
|                                     |                                            |
|                                     |                                            |
|                                     |                                            |
|                                     |                                            |
|                                     |                                            |



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## 9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

**Design Team Leader**

**Signed**

**Name**

**Engineering Qualifications**

BSc. Civil Engineering

**Name of Organisation**

Marsh Design Limited

**Date**

8<sup>th</sup> February 2024

**Check Team Leader**

**Signed**

**Name**

**Engineering Qualifications**

B. Eng. (Hons) Civil Engineering

**Name of Organisation**

Marsh Design Limited

**Date**

8<sup>th</sup> February 2024

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

**Signed**

**Name**

**Position held**

Bridges & Structures Manager

**Engineering Qualifications**

BSc (Hons) Civil Eng, MSc

**TAA**

Kirklees Council

**Date**

*For and on behalf of Kirklees Council*

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## **APPENDIX A**

### ***LIST OF RELEVANT DESIGN DOCUMENTS***

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