



Drainage Strategy

Charlie Wayman Fields and Miners Welfare
Ground, Chilton Way, Ferryhill, DL17 0H

Presented to: **Callingham Associates**

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Table of Contents

1.0	INTRODUCTION	1
1.1	Appointment.....	1
1.2	Project Understanding.....	1
1.3	Scope of Works	1
1.4	Sources of Information.....	2
1.5	Project Limitations.....	2
2.0	SITE DESCRIPTION	3
3.0	RELEVANT PLANNING POLICY AND GUIDANCE	7
3.1	Introduction	7
3.2	Local Policy	7
3.3	Consultation.....	9
4.0	DRAINAGE STRATEGY	10
4.1	Introduction	10
4.2	Drainage Hierarchy	10
4.3	Surface Water Discharge.....	11
4.4	Attenuation Storage.....	13
4.5	Sustainable Drainage Systems.....	13
4.6	Preferred Drainage Scheme.....	14
4.7	Event Exceedance	15
4.8	Surface Water Treatment.....	16
4.9	Maintenance	16
4.10	Foul Water Discharge	16
4.11	Other Considerations	17
5.0	CONCLUSIONS AND RECOMMENDATIONS.....	18
5.1	Conclusions	18
5.2	Recommendations.....	18

Appendices

APPENDIX A –LIMITATIONS
APPENDIX B –LIDAR PLAN
APPENDIX C –PUBLIC SEWER RECORDS
APPENDIX D –PROPOSED DEVELOPMENT PLAN
APPENDIX E –WESTERN PARCEL RUNOFF AND FLOW CALCULATIONS
APPENDIX F –EASTERN PARCEL RUNOFF AND FLOW CALCULATIONS
APPENDIX G –QUICK STORAGE ESTIMATES
APPENDIX H –WESTERN PARCEL CONCEPT DRAINAGE SKETCH
APPENDIX I –EASTERN PARCEL CONCEPT DRAINAGE SKETCH
APPENDIX J –MAINTENANCE SCHEDULES

1.0 Introduction

1.1 Appointment

- 1.1.1 Delta-Simons Limited (“Delta-Simons”) was instructed by Callingham Associates (the “Client”) to carry out a Drainage Strategy of Charlie Wayman Fields and Miners Welfare Ground, Chilton Way, Ferryhill, DL17 0H (the “Site”).

1.2 Project Understanding

The proposed development is over 1 ha in area and will increase the impermeable area and risk of surface water flooding to downstream receptors. Therefore, a Drainage Strategy with appropriate consideration for Sustainable Drainage Systems (SuDS) in line with CIRIA SuDS (C753) Guidance is required.

- 1.2.1 Durham County Council as Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment.

1.3 Scope of Works

- 1.3.1 The scope of works has been as follows for this Drainage Strategy:

Review existing conditions including sewer plans, British Geological Survey information and topographical information;

Review LLFA drainage policies;

Analyse existing and proposed impermeable areas;

Calculate existing runoff rates (excluding existing drainage system modelling);

Assess method of surface water runoff disposal (soakaway / watercourse / sewer);

Establish surface water discharge rate in consultation with the LLFA / sewerage undertaker;

Estimate required attenuation volume using Microdrainage software;

Advise on suitable forms of SUDS;

Advise on drainage system maintenance measures;

Advise on surface water treatment methods;

Establish method of foul water drainage;

Prepare concept drainage sketch (where development plan is available as dwg. format); and

Prepare outline Drainage Strategy defining the principles of the preferred surface water strategy and where possible the preferred discharge regime.

- 1.3.2 This report takes into account the following national and local policies:

National Planning Policy Framework (NPPF) (2023)¹;

¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1182995/NPPF_Sept_23.pdf

National Planning Practice Guidance (NPPG) (2014)²;
CIRIA Guidance: The SuDS Manual (C753) (2017)³; and
Durham County Council Local Development and Planning Policies.

1.4 Sources of Information

1.4.1 The following sources of information have been reviewed and assessed for the purpose of this FRA:

British Geological Society (BGS) Interactive Map⁴; and
MAGIC Interactive Map⁵.

1.5 Project Limitations

1.5.1 The wider Delta-Simons limitations are contained within Appendix A.

2 <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

3 https://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

4 <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

5 <http://www.magic.gov.uk/>

2.0 Site Description

2.1.1 The aim of this section of the report is to outline key environmental information associated with the baseline environment.

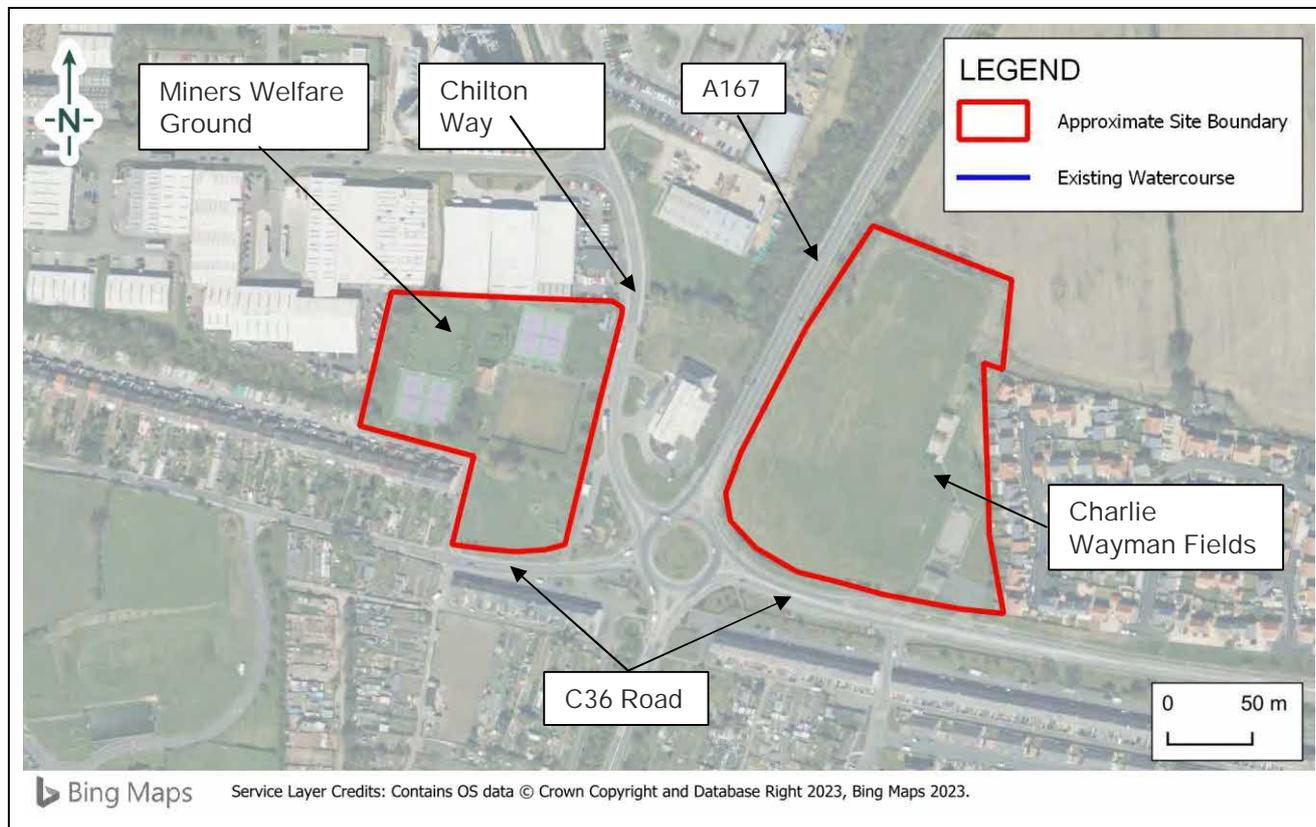


Figure 1: Site Location Plan

Co-ordinates	Centred approximately at an Easting of 428265 and Northing of 530155.	Miners Welfare Ground Area	1.845 ha
		Charlie Wayman Fields Area	2.715 ha
Site Location	The Site is located in north-west Chilton and situated alongside the A167 and is situated approximately 320 m north-east of Elemore Hall School.		
Existing Site Conditions	<p>The existing Site is split into two areas, The Miners Welfare Ground to the west of the A167 and the Charlie Wayman Fields to the east.</p> <p>Miners Welfare Ground</p> <p>Online mapping (including imagery from Google Streetview imagery accessed 11-01-2024) shows that the Miners Welfare Ground comprises recreational grounds that include a Tennis Grounds in the north-east and west, a bowling grounds in the east playground and playing fields in the south-east and a recreation centre located in the centre of the plot overlooking the bowling green. The Miners Welfare Ground is accessed by Chilton Way immediately adjacent to the east of the plot or also via the C36 road to the south.</p>		

	<p>The Miners Welfare Ground is bordered by a commercial / industrial park to the north and west, some minor roads and residential properties to the south and a petrol station to the east.</p> <p>Charlie Wayman Fields</p> <p>The Charlie Wayman Fields comprises mainly greenfield used for sports with a changing facility and a Multi-Use Games Area (MUGA) in the south-east as well as a skatepark in the east. Access to the Charlie Wayman Fields is made via the C36 road immediately to the south of the plot. The Charlie Wayman Fields is bordered by greenfield to the north, residential properties to the east, C36 road to the south with further residential properties beyond, and the A167 to the west with a petrol station beyond.</p> <p>Areas</p> <p>The Miners Welfare Ground measures approximately 18,450 m² area in total and consists of 3561 m² of existing hardstanding with the remaining soft landscaped area comprising 14,889 m².</p> <p>The Charlie Wayman Fields measures approximately 27,150 m² area in total and consists of 1,865 m² of existing hardstanding, with the remaining soft landscaped areas comprising 25,285 m².</p> <p>Areas were calculated using DWG Format files provided to by the Client.</p>
<p>Topography</p>	<p>Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1 m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM).</p> <p>Miners Welfare Ground</p> <p>A review of LiDAR ground elevation data shows that the Miners Welfare Ground slopes from approximately 124.5 m AOD in the north-west down to approximately 118 m AOD in the south.</p> <p>Charlie Wayman Fields</p> <p>LiDAR ground elevation data shows that the Charlie Wayman Fields slopes from approximately 121 m AOD in the east down to approximately 118 m AOD in the south-east. A LiDAR extract is included in Appendix B.</p>
<p>Hydrology</p>	<p>The nearest watercourse is a land drain which is located approximately 250 m south of the Miners Welfare Ground. The drain appears to capture runoff from the adjacent fields and drains in a north-eastern to southern direction down the natural topography of the area and away from the Site. The land drain is an Ordinary Watercourse and the responsibility of the adjacent riparian owner to maintain.</p> <p>There are no other nearby watercourses.</p>
<p>Geology</p>	<p>Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that both the Miners Welfare Ground and the Charlie Wayman Fields of the Site are underlain by superficial deposits of Till generally comprising Devensian Diamicton. The superficial deposits are identified as being underlain by bedrock deposits of the Raisby Formation –which are described as comprising dolostone.</p> <p>The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a Site-specific basis.</p>

	<p>The closest historical BGS borehole record (BGS Ref: NZ23SE339) was dug in 1996 and is located 10 m north of the Miners Welfare Ground (NGR 428162, 53025). The borehole record indicates the following generalised sequence:</p> <p style="padding-left: 40px;">Stony Topsoil from ground level to 0.3 meters below ground level (m bgl);</p> <p style="padding-left: 40px;">Stiff sandy gravelly clay from 0.3 m bgl to 0.75 m bgl;</p> <p style="padding-left: 40px;">Glacial Till from 0.75 m bgl to 4.2 m bgl; and</p> <p style="padding-left: 40px;">Weather Limestone from 4.2 m bgl to 4.65 m bgl.</p>
<p>Hydrogeology</p>	<p>BGS borehole record (BGS Ref: NZ23SE339) recorded the 5 m borehole was dry upon excavation.</p> <p>According to the EA's Aquifer Designation data, obtained from MAGIC Map's online mapping, accessed 11-01-2024, the Till superficial deposits are classified as a Secondary (Undifferentiated) aquifer.</p> <p>Secondary Undifferentiated Aquifers are assigned in 'cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and principal aquifer in different locations due to the variable characteristics of the rock type'.</p> <p>The underlying Raisby Formation bedrock deposit is described as a Principal Aquifer.</p> <p>Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.</p> <p>The EA's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping, accessed 11-01-2024, indicates that the Site is not located within a Groundwater Source Protection Zone.</p> <p>The Soilsmap mapping obtained from MAGIC Map's online mapping [accessed 11-01-2024] shows the Site to be located in 'Slowly permeable seasonally wet acid loamy and clayey soils'.</p>
<p>Local Drainage</p>	<p>Public sewer records have been obtained from Northumbrian Water and are included in Appendix C.</p> <p>Miners Welfare Ground</p> <p>The public sewer records show that there is a 450 mm diameter surface water sewer located 5 m to the west of the Miners Welfare Ground. The sewer drains down the western boundary before changing direction to flow to the east and within the southern boundary of the Miners Welfare Ground. The sewer discharges into a 900 mm diameter surface water sewer that then then drains to the south-west and away from the Site.</p> <p>A 750 mm diameter surface water sewer is located approximately 10 m to the east of the Miners Welfare Ground and drains in a north-east to south-west direction down Chilton Way. The 750 mm surface water sewer discharges into the aforementioned 900 mm diameter surface water sewer in the south of the Site.</p> <p>A 225 mm foul sewer is located alongside the western boundary of the Miners Welfare Ground that drains in a southerly direction and away from the Site.</p> <p>An additional 225 mm foul sewer is located approximately 10 m to the east of the Miners Welfare Ground within Chilton Way which discharges into the aforementioned 225 mm foul sewer 35 m south-east of the plot.</p>

	<p>Charlie Wayman Fields</p> <p>A 225 mm diameter public surface water sewer is located approximately 25 m to the east of the Charlie Wayman Fields separated by residential dwellings, serving the residential zone.</p> <p>The sewer drains in a north to south direction and then changes direction to drain in an eastward's direction into a tank. It is unclear what onwards connection the tanks drains into, if at all. Further consultation with Northumbrian Water or a CCTV Survey would be needed to confirm.</p> <p>Two 150 mm diameter foul sewers are located within the residential area 25 m to the east of the Site. Both sewers drain in an eastwards direction and away from the Site.</p> <p>It should be noted that the public sewer plans do not detail any sewers located with C36 road immediately to the south of the Charlie Wayman Fields. However, a review of online imagery, accessed 11-01-2024, indicates that there is drainage infrastructure (drains and what is likely to be manholes) located along the extent of the C36 road.</p> <p>Historical online mapping indicates that the C36 road was built between 2001-2006 which may indicate that the public sewer records have not been updated to reflect the construction of the road network comprising the C36 Road and any likely subsequent drainage infrastructure. It is highly likely a surface water sewer is serving the road network and drains down the natural topography in a north-west to south-east direction and away from the Site. A survey would need to be undertaken to confirm its presence.</p>
<p>Proposed Site Conditions</p>	<p>The proposed development is for the redevelopment of both the Miners Welfare Ground and the Charlie Wayman Fields. The Miners Welfare Ground is proposed to incorporate a new skate park within the southern extents, a tennis court in the north-east and a carparking area comprising a Grasscrete (porous surfacing) along the north-east boundary of the Site. The existing pavilion on the Miners Welfare Ground is also proposed to be refurbished.</p> <p>The Charlie Wayman Fields proposed development comprises the removal of changing facilities and the introduction of a Clubhouse with associated parking access around the periphery. As well as this the skatepark has been proposed to be replaced by a 5 a side mini football pitch with a pathway connecting with the new clubhouse. Other minor amendments are proposed such as moving of the football pitches slightly to the north-west.</p> <p>Proposed development plans are included in Appendix D.</p> <p>Change in Hardstanding</p> <p>The Miners Welfare Ground will introduce a total of 1382 m² of hardstanding in the form of the skatepark, extension of the tennis court and parking areas.</p> <p>The Charlie Wayman Fields will introduce a total of 1,111 m² in the form of the redevelopment of the existing changing facilities into the clubhouse, the introduction of additional parking and the 5 a side mini football pitch. It should be noted that as the Charlie Wayman Fields is redeveloping over large areas of existing hardstanding, the overall hardstanding of the proposed development within the Charlie Wayman Fields is 2980 m².</p> <p>Areas were calculated using DWG Format files provided to by the Client.</p>

3.0 Relevant Planning Policy and Guidance

3.1 Introduction

3.1.1 The aim of this section of the report is to discuss the main aspects of the local and national planning policies that are relevant to any proposed development on the Site and relevant guidance and legislation.

3.2 Local Policy

3.2.1 The County Durham Plan was adopted on the 21 October 2020 and contains policies relating to drainage which are as follows:

Policy 35

Water Management

Flood Risk and Sustainable Drainage Systems

All development proposals will be required to consider the effect of the proposed development on flood risk, both on-site and off-site, commensurate with the scale and impact of the development and taking into account the predicted impacts of climate change for the lifetime of the proposal. This includes completion of a Flood Risk Assessment (FRA) where appropriate. Development will not be permitted unless:

- a) in the functional floodplain (flood zone 3b), as identified in the Strategic FRA, it is water compatible or essential infrastructure;*
- b) in flood zones 2 and 3a it passes the Sequential Test, and if necessary the Exceptions Test, as required by national policy; and*
- c) it can be proven through a FRA that the development, including the access, will be safe, without increasing or exacerbating flood risk elsewhere, any residual risk can be safely managed and where possible will reduce flood risk overall(124).*

Regarding Surface Water Flood Risk:

- d) for major developments(125) the management of water must be an intrinsic part of the overall development;*
- e) on all new development there is no net increase in surface water runoff for the lifetime of the development. Where greenfield sites are to be developed, the runoff rates must not (126) exceed and where possible should reduce the existing greenfield runoff rates. On previously developed land, as close as practicable to a greenfield rate must be achieved. In exceptional cases where the developer can satisfactorily demonstrate that greenfield run-off rates are unachievable, a betterment rate (which should be a minimum of 50% of the existing site run-off rate) will be agreed with the council(127). Surface water run-off must be managed at source wherever possible and disposed of in the following order:*

- 1. to an infiltration or soak away system.*
- 2. to a watercourse open or closed.*
- 3. to a surface water sewer.*
- 4. to a combined sewer.*

Disposal to combined sewers should be the last resort once all other methods have been clearly explored and evidenced;

f) *part of the development site is set aside for surface water management and uses measures that do not increase flood risk elsewhere. These measures will supplement green infrastructure networks, thereby contributing to mitigation of climate change, water quality and flooding as an alternative to, or complementary to, hard engineering;*

g) *where sites may be susceptible to over land flood flows (as shown in the Strategic Flood Risk Assessment) or lie within a Surface Water Risk Area (as shown in the Surface Water Management Plan) then developers must put adequate protection in place;*

h) *the development incorporates a Sustainable Drainage System (SuDS) to manage surface water drainage. Where SuDS are provided arrangements must be put in place for their whole life management and maintenance. Where appropriate' SuDS should contribute to the provision of Green Infrastructure and biodiversity net gains; and*

i) *all new development with culverts running through the site must seek to de-culvert watercourses for flood risk management and environmental benefit, unless it can be clearly demonstrated that this is not practical.*

Where improvement works are required to ensure that the drainage infrastructure has sufficient capacity to support proposed new development, developer contributions will be required in accordance with Policy 25 (Developer Contributions).

Water Quality

The quantity and quality of surface and groundwater bodies shall be protected and where possible enhanced. All commercial, industrial and major residential development must demonstrate control of the quality of surface water runoff during construction and for the lifetime of the development. New development will be required to incorporate appropriate water pollution control measures.

Development adjacent to, over or in a watercourse should consider opportunities to improve the river environment and water quality.

Development which could adversely affect the quality or quantity of surface or groundwater, flow of groundwater or ability to abstract water will not be permitted unless it can be demonstrated that no adverse impact would occur or mitigation could be put in place to minimise this impact

Policy 36

Water Infrastructure

Disposal of Foul Water

In the consideration of development proposals, the hierarchy of drainage options that must be considered and discounted for foul water are (in the following order):

- 1. connection to the public sewer;*
- 2. package sewage treatment plant (which can be offered to the Sewerage Undertaker for adoption (128); and*
- 3. septic tank (which must drain into an appropriate soak away and not discharge directly into a watercourse).*

Applications involving the use of non-mains methods of drainage (including Septic Tanks/Cess Pits) will not be permitted in areas where public sewerage exists.

Sewage and Wastewater Infrastructure

Proposals for new or extensions/improvements to existing water treatment, waste water, sludge or sewage treatment works will be permitted, unless the adverse impact of development outweighs the need for greater capacity and other benefits.

Flood Defence Infrastructure

Proposals for additional flood defences will be permitted only where it can be demonstrated that the proposal represents the most sustainable response to a particular threat and demonstrates long term maintenance can be achieved.

Proposals which seek to mitigate flooding, create natural flood plains or seek to enhance and/or expand flood plains in appropriate locations will be permitted."

- 3.2.2 Durham County Council released the "Sustainable Drainage Systems (SuDS) Adoption Guide"⁶ in 2016 which contained guidance for the production of an outline drainage strategy within the Durham County Council administrative area. The following requirement was used and referenced within the report.
- 3.2.3 Requirement 11:
- 3.2.4 Proposals for SuDS must demonstrate how the frequency, rate and volume of runoff from the development will be managed to achieve a Greenfield (QBar) rate.
- 3.2.5 On previously developed land, as close as practicable to a greenfield rate must be achieved, in exceptional cases where the developer can satisfactorily demonstrate that greenfield run-off rates are unachievable, a betterment rate will be agreed with DCC.
- 3.2.6 Flow rate and storage volume calculations should be presented in a manner that is acceptable to DCC.

3.3 Consultation

LLFA

- 3.3.1 A consultation request was submitted to the LLFA in December 2023. A response is still awaited.

Utility Provider

- 3.3.2 Public sewer records have been obtained from Northumbrian Water and are included in Appendix C.

Internal Drainage Board

- 3.3.3 The Site is not located within an Internal Drainage Board (IDB) District.

⁶ <https://www.durham.gov.uk/media/9133/Sustainable-Drainage-System-Adoption-Guidance-2016/pdf/SustainableDrainageSystemAdoptionGuidance2016.pdf?m=636735630462400000>

4.0 Drainage Strategy

4.1 Introduction

- 4.1.1 The Site currently consists of two separate plots. The Miners Welfare Ground which comprises recreational grounds that include tennis grounds in the north-east and west, a bowling ground in the east, playground and playing fields in the south-east and a recreation centre in the centre of the grounds overlooking the bowling green. The Charlie Wayman Fields comprises mainly greenfield used for sports with a changing facility and a Multi-Use Games Area (MUGA) in the south-east as well as a skatepark in the east.
- 4.1.2 The existing grounds are predominantly greenfield with the developed areas understood to be draining at an unrestricted rates.
- 4.1.3 Given that both the Miners Welfare Ground and the Charlie Wayman Fields are separated by third-party land, their hardstanding, discharge and attenuation requirements have been considered separately.
- 4.1.4 The proposed development of the Miners Welfare Ground will introduce 1382 m² of hardstanding in the form of the new skate park, tennis court and carparking area.
- 4.1.5 The proposed development of the Charlie Wayman Fields will introduce 1,111 m² of hardstanding in the form of the new 5 a side football pitch, the clubhouse and associated parking and access. However, as the Charlie Wayman Fields intends to redevelop over existing brownfield land, the drainage strategy will aim to attenuate and restrict runoff for all areas redeveloped including any extra hardstanding which comprises a total 2980 m².
- 4.1.6 The increase in hardstanding area will result in an increase in surface water runoff rates and volumes. In order to ensure the proposed development will not increase flood risk elsewhere, surface water discharge from the Site will be controlled.

4.2 Drainage Hierarchy

- 4.2.1 The recommended surface water drainage hierarchy (Paragraph 080 of the NPPG: Flood Risk and Coastal Change) is to utilise soakaway systems or infiltration as the preferred option, followed by discharging to an appropriate watercourse. If this is not feasible, the final option is to discharge to an existing public sewer.

Surface Water Discharge to Soakaway

- 4.2.2 The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces). As described above the Site is underlain by 'Slowly permeable seasonally wet acid loamy and clayey soils' and superficial deposits of Devensian Diamicton which is considered to be a Secondary Undifferentiated Aquifer.
- 4.2.3 BGS borehole record (BGS Ref: NZ23SE339) identified Glacial Till from 0.75 m bgl to 4.2 m bgl which may inhibit infiltration rates. It should be noted that the borehole recorded ground conditions 10 m north of the Miners Welfare Ground and is unlikely to represent the underlying conditions for the entirety of both grounds.
- 4.2.4 It can be concluded that soakaways may not be suitable for the discharge of surface water runoff.
- 4.2.5 However, Infiltration tests should still be undertaken in accordance with the BRE365 specification to determine the suitability of soakaways. Soakaways should be located a minimum of 5 m from habitable dwellings. In the absence of infiltration testing, an alternative discharge method will be proposed until receipt of said testing.

Surface Water Discharge to Watercourse

- 4.2.6 Soakaways will be utilised where possible. If soakaways are proven not to be suitable, a connection to watercourse is the next consideration.
- 4.2.7 The nearest watercourse is the land drain located approximately 250 m south of the Miners Welfare Ground. However, the land drain is separated by third party, urbanised land. Therefore, discharge to the land drain is not feasible.

Surface Water Discharge to Sewer

Miners Welfare Ground

- 4.2.8 Where disposal of surface water via soakaway or to a watercourse is not possible, a connection to the public sewer system is the final consideration. There is a 900 mm diameter public surface water sewer located in the south of the Miners Welfare Ground. A connection to this sewer appears to be a feasible option. In addition to this, there is also the 750 mm diameter surface water sewer located approximately 10 m to the east of the Miners Welfare Ground within Chilton Way that could also be utilised.

Charlie Wayman Fields

- 4.2.9 As mentioned in the 'Local Drainage' section above, there appears to be a surface water sewer or combined sewer located directly to the south of the Charlie Wayman Fields within the C36 Road. A survey would have to be undertaken to confirm the existence of the drain and the potential invert levels to assess if a gravity fed discharge is feasible. However, the presence of drains and what appears to be manholes within the C36 Road, suggests there is a sewer located within the road network that the Charlie Wayman Fields could discharge into. Discharge into the public sewers would have to be agreed with Northumbrian Water.
- 4.2.10 Failing this a connection into the 225 mm surface water approximately 25 m to the east of the Charlie Wayman Fields serving the residential zone is unlikely to be feasible. From what information is available, it appears as though this drainage run and the tank which is displayed is part of a carefully designed system attenuating specifically the residential dwellings present there. A drainage survey would be required to confirm the above. Any new connections would have to be in agreement with Northumbrian Water.

4.3 Surface Water Discharge

Miners Welfare Ground

- 4.3.1 The existing greenfield runoff rates have been estimated using the Institute of Hydrology Report No. 124 method, provided within Appendix E and Table 1 below. The existing 1 in 1 year greenfield rate for the proposed Miners Welfare Ground of 0.138 ha of development Site is 0.5 l/s.

Table 1: Greenfield Runoff Rates

Return Period (Years)	Runoff Rate (l/s) Miners Welfare Ground
1 in 1	0.5
QBAR	0.6
1 in 30	1.1
1 in 100	1.3

- 4.3.2 According to the Durham County Council's "Sustainable Drainage Systems (SuDS) Adoption Guide" "rates must not (126) exceed and where possible should reduce the existing greenfield runoff rates". As a result, the proposed overall discharge rate of the Miners Welfare Ground will be 0.7 l/s, which is the lowest practical discharge rate a HydroBrake can attain whilst supporting enough flow to assist the device to remain self-cleansing.

Charlie Wayman Fields

- 4.3.3 The existing brownfield runoff rates have been estimated using the Modified Rational Method ($2.78 \times I \times A_p$, whereby I is rainfall intensity, A_p is impermeable drainage area), provided as Table 2 below. The existing 1 in 1 year event brownfield rate for the proposed 0.298 ha hardstanding development for the Miners Welfare Ground is 16.8 l/s.

Table 2 - Brownfield Runoff Rates

Return Period (Years)	Runoff Rate (l/s)
1 in 1	16.8
1 in 2	20.5
1 in 10	30.6
1 in 30	39.6
1 in 100	52.3

- 4.3.4 The existing runoff rates have also been estimated using the Institute of Hydrology Report No. 124 method to identify greenfield rates, provided as Table 3 below and included as Appendix F. The existing 1 in 1 year event greenfield runoff rate for the 0.298 ha development Site is 1.1 l/s.

Table 3: Greenfield Runoff Rates

Return Period (Years)	Runoff Rate (l/s)
1 in 1	1.1
QBAR	1.3
1 in 30	2.3
1 in 100	2.7

- 4.3.5 As identified within Durham County Council's "Sustainable Drainage Systems (SuDS) Adoption Guide" Requirement 11: Proposals for SuDS must demonstrate how the frequency, rate and volume of runoff from the development will be managed to achieve a Greenfield (QBar) rate" as "On previously developed land, as close as practicable to a greenfield rate must be achieved".
- 4.3.6 As a result of the above, it is proposed to discharge the Charlie Wayman Fields to 1.3 l/s in line with QBAR which provides 93.66% percentage betterment in comparison to the existing 1 in 2 year brownfield runoff rate of 20.5 l/s.

4.4

4.4 Attenuation Storage

Miners Welfare Ground

- 4.4.1 In order to achieve a discharge rate of 0.7 l/s, attenuation storage will be required. Storage estimates have been provided using Flow (Causeway) and are included in Table 4 below and within Appendix G. The storage estimates are based on a flow rate of 0.7 l/s, storage within a tank or pond structure, an impermeable drainage area of each of the respective plots with a HydroBrake flow control has been presented below.

Table 4: Attenuation Storage Volume Requirements

Storm Event	Attenuation Volume (m ³) Miners Welfare Ground
1 in 30 year	42 - 61
1 in 100 year plus 45% CC	89 - 126

- 4.4.2 The attenuation volumes are provided for indicative purposes only and should be verified at the detailed design stage.

Charlie Wayman Fields

- 4.4.3 In order to achieve a discharge rate of 1.3 l/s, attenuation storage will be required. Storage estimates have been provided using Flow (Causeway) and are included in Table 5 below and within Appendix G. The storage estimates are based on a flow rate of 1.3 l/s, storage within a tank or pond structure, an impermeable drainage area of each of the respective plots with a HydroBrake flow control has been presented below.

Table 5: Attenuation Storage Volume Requirements

Storm Event	Attenuation Volume (m ³) Charlie Wayman Fields
1 in 30 year	94 - 136
1 in 100 year plus 45% CC	203 - 277

- 4.4.4 The attenuation volumes are provided for indicative purposes only and should be verified at the detailed design stage.

4.5 Sustainable Drainage Systems

- 4.5.1 Attenuation storage should be provided in the form of Sustainable Drainage Systems (SuDS) where practical. The following SuDS options have been considered:

Soakaways

- 4.5.2 As described above, the use of soakaways should be determined by carrying out infiltration tests in accordance with the BRE 365 specification.

Swales, Detention Basins and Ponds

- 4.5.3 Sufficient space is available on Site to utilise a pond, basin or swale as an above ground attenuation feature. However, an open surface water attenuation feature such as a pond, basin or a swale in a recreational area presents a safety risk. As well as this, the Site focuses on multiple ball-based sports, this presents additional hazards which may impact more vulnerable or younger Site users in the incident that a ball entered the open surface water attenuation feature, that may be considered an unnecessary risk for the Site. As a result, an open surface water attenuation has not been considered practical at this time. However sufficient space is available in both Plots if safety concerns were considered.

Rainwater Harvesting

- 4.5.4 The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the tanks were not full. However, rainwater harvesting techniques could be incorporated within the final design.

Green Roofs

- 4.5.5 Green roofs are not identified on development plans. Given the nature of the proposed development, the significant additional cost involved in installing and maintaining green roofs and the additional works required to allow for the additional loading on the building, green roofs are not considered a practical option. The benefits achieved through installing a green roof would be disproportionate to the significant ongoing maintenance and construction costs involved.

Porous/Permeable Paving

- 4.5.6 Porous paving comprising Grasscrete has been proposed to be incorporated within the proposed parking areas of the Miners Welfare Ground pathways. There is also the potential porous paving could be incorporated in the walkways throughout both Plots and the Charlie Wayman Fields proposed carparks. Porous paving would be provided within the sub-grade material prior to controlled release to the receiving system. The amount of storage offered by permeable paving is subject to sub-grade depth and Site gradient. The use of permeable paving should be considered further at the detailed design stage.

Underground Attenuation Tanks

- 4.5.7 Storage could be provided within underground attenuation tanks or within oversized pipes. Sufficient space for an underground tank is provided underneath the parking areas within both plots or underneath the access pathways that would be suitable for a gravity fed discharge.

4.6 Preferred Drainage Scheme

Miners Welfare Ground

- 4.6.1 A drainage sketch has been included as Appendix H. Soakaways will be used where practical. Where soakaways are not feasible, surface water runoff generated by plot will be discharged to the 900 mm diameter surface water sewer in the south of the Site.
- 4.6.2 The northern area of the Site comprising the tennis court and the proposed carpark comprising grasscrete could also be provided with a separate tank to attenuate for the tennis court which both could discharge into the 750 mm surface water sewer located 10 m to the east of the Miners Welfare Ground. This method could be undertaken should the proposed sewer runs connecting the northern extent of the Site down to the southern extent prove to impractical. The attenuation tank could be downsized in the south to accommodate the introduction of an additional tank in the north. However, it is assumed that all the Miners Welfare Ground discharges into the same sewer in the south of the Miners Welfare Ground at this stage. This is to be reviewed at the Detailed Design Stage. The overall discharge from this plot will be limited to a rate of 0.7 l/s.

- 4.6.3 Surface water runoff up to the 1 in 100 year plus 45% climate change allowance event will be attenuated on Site. Flow (Causeway) Calculations, included as Appendix E, have indicated that a total attenuation volume of 98.51 m³ will be required to achieve the discharge rate.
- 4.6.4 The proposed development plan has designated areas for Grasscrete (porous surfacing) which has indicated a total area of 411 m² to be utilised for porous paving, which at a 0.3 m depth and 30% porosity can provide a total of 36.99 m³ of attenuation. There is the potential to provide more attenuation of permeable paving within the proposed walkways throughout the plot, however this has not been considered further at this stage.
- 4.6.5 As a result, 61.52 m³ of attenuation remains to be attenuated and shall be stored within below the walkways / skate park within geocellular crates prior to the discharge into the 900 mm surface water sewer. The tank will occupy an area of 81.07 m² and be 0.8 m deep and comprise a 95% porosity which provides the remaining attenuation.
- 4.6.6 It should be noted that there is also ample space for above ground attenuation which the Site could utilise providing the safety measures of such a feature has been undertaken at the detailed design stage. However, this concept drainage strategy has been designed to demonstrate that the Site has more than enough space to restrict runoff rates via attenuation and can be adaptable to other attenuation methods should they be required at a later stage.

Charlie Wayman Fields

- 4.6.7 A drainage sketch has been included as Appendix I. Soakaways will be used where practical. If soakaways are proven not to be feasible, surface water runoff generated by the plot will be discharged to the surface water sewer understood to be located within the C36 Road to the south of the Site upon confirmation of its existence. The connection should be agreed with Northumbrian Water. The overall discharge from this plot will be limited to a rate of 1.3 l/s matching greenfield QBAR Rates.
- 4.6.8 Surface water runoff up to the 1 in 100 year plus 45% climate change allowance event will be attenuated on Site. Flow (Causeway) Calculations, included as Appendix F, have indicated that a total attenuation volume of 212.96 m³ will be required to achieve the discharge rate.
- 4.6.9 The proposed development has no designated areas for porous paving in the Charlie Wayman Fields, however a conservative estimate of the walkway around the proposed clubhouse and 50% of the carparking available has indicated approximately 387 m² of pathway and parking could be utilised for porous paving. The potential paving at a 0.3 m depth and 30% porosity could provide a total of 34.83 m³ of attenuation. There is the potential to provide more attenuation of permeable paving within the proposed walkways throughout the plot, however this has not been considered further at this stage.
- 4.6.10 As a result, 178.13 m³ of attenuation remains to be attenuated and shall be stored within below the parking areas within geocellular crates prior to the discharge into the potential surface water sewer, assuming infiltration rates for the Site is proven to be unsuccessful. The tank will occupy an area of 234.38 m² and be 0.8 m deep and comprise a 95% porosity which provides the remaining attenuation.
- 4.6.11 It should be noted that there is also ample space for above ground attenuation which the Site could utilise providing the safety measures of such a feature has been undertaken at the detailed design stage. However, this concept drainage strategy has been designed to demonstrate that the Site has more than enough space to restrict runoff rates back down to greenfield rates via attenuation which can also be adapted to other attenuation methods should they be required at a later stage.

4.7 Event Exceedance

- 4.7.1 Storage will be provided for the 1 in 100 year plus 45 % CC event. Storm events in excess of the 1 in 100 year plus 45 % CC event should be permitted to produce temporary shallow depth flooding within the car park, access road and soft landscaped areas. Finished floor levels will be set at a minimum of 150 mm above surrounding ground levels ensuring exceedance flooding will not affect the buildings.

4.8 Surface Water Treatment

4.8.1 In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), residential roofs have a 'very low' pollution hazard level, with low traffic roads classified as having a 'low' pollution hazard level. Table 6 below shows the pollution hazard indices for each land use.

Table 6: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs (typically commercial/industrial roofs)	Low	0.3	0.2**	0.05
Low Trafficked Roads / Non Residential Parking	Low	0.5	0.4	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' –Table 26.2

* Indices values range from 0-1.

** up to 0.8 where there is potential for metals to leach from the roof

4.8.2 Where practical, runoff from roofs and roads will be directed to porous paving. Table 7 below demonstrates that porous paving provides sufficient treatment for both Plots.

Table 7: SuDS Mitigation Indices

Type of SuDS	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' –Table 26.3

4.8.3 It can be concluded that the inclusion of a porous paving will provide sufficient treatment. Where attenuation is provided in a below ground system (tank storage), treatment will need to be provided by a suitably sized separator.

4.9 Maintenance

4.9.1 Maintenance of communal drainage features such as porous paving or an attenuation tank will be the responsibility of the Site owner. Maintenance of shared surface water drainage systems can be arranged through appointment of a Site management company.

4.9.2 Maintenance schedules for an attenuation tank and permeable paving are included in Appendix J. Maintenance of the separator will be as per the manufacturer's guidance.

4.10 Foul Water Discharge

Miners Welfare Ground

4.10.1 Foul flows should be discharged to the 225 mm foul sewer is located approximately 10 m to the east of the Miners Welfare Ground within Chilton Way. A survey of the cover and invert levels of the sewer should be undertaken to confirm a gravity connection can be made. Any new connection should be agreed with Northumbria Water.

Charlie Wayman Fields

4.10.2 Foul flows should be discharged to any potential foul sewer located within the C36 Road to the south of the Site. However, in the absence of any foul or combined sewer located in the C36 Road, connection into the either of the two 150 mm diameter foul sewers are located within the residential area 25 m to the east of the Site. As the sewers are located at lower elevations, a gravity fed discharge should be achievable.

4.11 Other Considerations

4.11.1 Any soakaways should be situated 5 m away from any built development; and

4.11.2 A 3 m clearance should be maintained either side of any public sewers

5.0 Conclusions and Recommendations

5.1 Conclusions

- 5.1.1 The proposed development is for the redevelopment of both the Miners Welfare Ground and the Charlie Wayman Fields. The Miners Welfare Ground is proposed to incorporate a new skate park within the southern extent, a new tennis court in the north-east and a carparking area consisting of grasscrete (porous surfacing) along the north-east boundary of the Site. The existing pavilion on the Miners Welfare Ground is also proposed to be refurbished.
- 5.1.2 The Charlie Wayman Fields proposed development comprises the removal of the changing facilities and the introduction of a Clubhouse with associated parking and access around the periphery. As well as this, the skatepark has been proposed to be replaced by a 5 a side mini football pitch with a pathway connecting to the clubhouse. Other minor amendments are proposed such as the moving of the football pitches slightly to the north-west.
- 5.1.3 The proposed development will introduce impermeable drainage area in the form of buildings, courts and access. This will result in an increase in surface water runoff, if unmitigated. In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, flow control will be used, and attenuation provided on Site to accommodate storm events up to and including the 1 in 100 year plus 45 % climate change event.

Miners Welfare Ground

- 5.1.4 All methods of surface water discharge have been assessed. Where soakaways are not feasible, discharge of surface water to a surface water sewer in the south of the Miners Welfare Ground at a rate of 0.7 l/s appears to be the most practical option subject to agreement with Northumbrian Water.
- 5.1.5 Attenuation storage will be required on Site in order to restrict surface water discharge to 0.7 l/s. Attenuation can be provided within a combination of grasscrete porous paving and attenuation tanks prior to discharge.
- 5.1.6 Foul flows should be discharged to the 225 mm foul sewer located approximately 10 m to the east of the Miners Welfare Ground within Chilton Way subject to survey.

Charlie Wayman Fields

- 5.1.7 All methods of surface water discharge have been assessed. Where soakaways are not feasible, discharge of surface water to the likely surface water sewer located in the C36 Road to the south of the Charlie Wayman Fields at a rate of 1.3 l/s appears to be the most practical option subject to agreement with Northumbrian Water.
- 5.1.8 Attenuation storage will be required on Site in order to restrict surface water discharge to 1.3 l/s. Attenuation can be provided within a combination of potential porous paving and attenuation tanks prior to discharge.
- 5.1.9 Foul flows should be discharged to any potential foul sewer located within the C36 Road to the south of the Site. However, in the absence of any foul or combined sewer located in the C36 Road, connection into the either of the two 150 mm diameter foul sewers are located within the residential area 25 m to the east of the Site. As the sewers are located at lower elevations, a gravity fed discharge should be achievable.

5.2 Recommendations

Drainage Strategy

Undertake BRE 365 infiltration testing to determine the suitability of infiltration techniques;

Verify the attenuation volumes included in this report when undertaking detailed drainage design;

Make provision for sustainable drainage features in the lower southern extents of each plot of the Site;

Survey the public surface water and foul sewers within the C36 Road to determine invert levels and the requirement for a pumped solution.

Other

5 meter easements should be maintained nearby any built development if incorporating soakaways; and

A 3 m clearance should be maintained either side of any public sewers.

Appendix A – Limitations

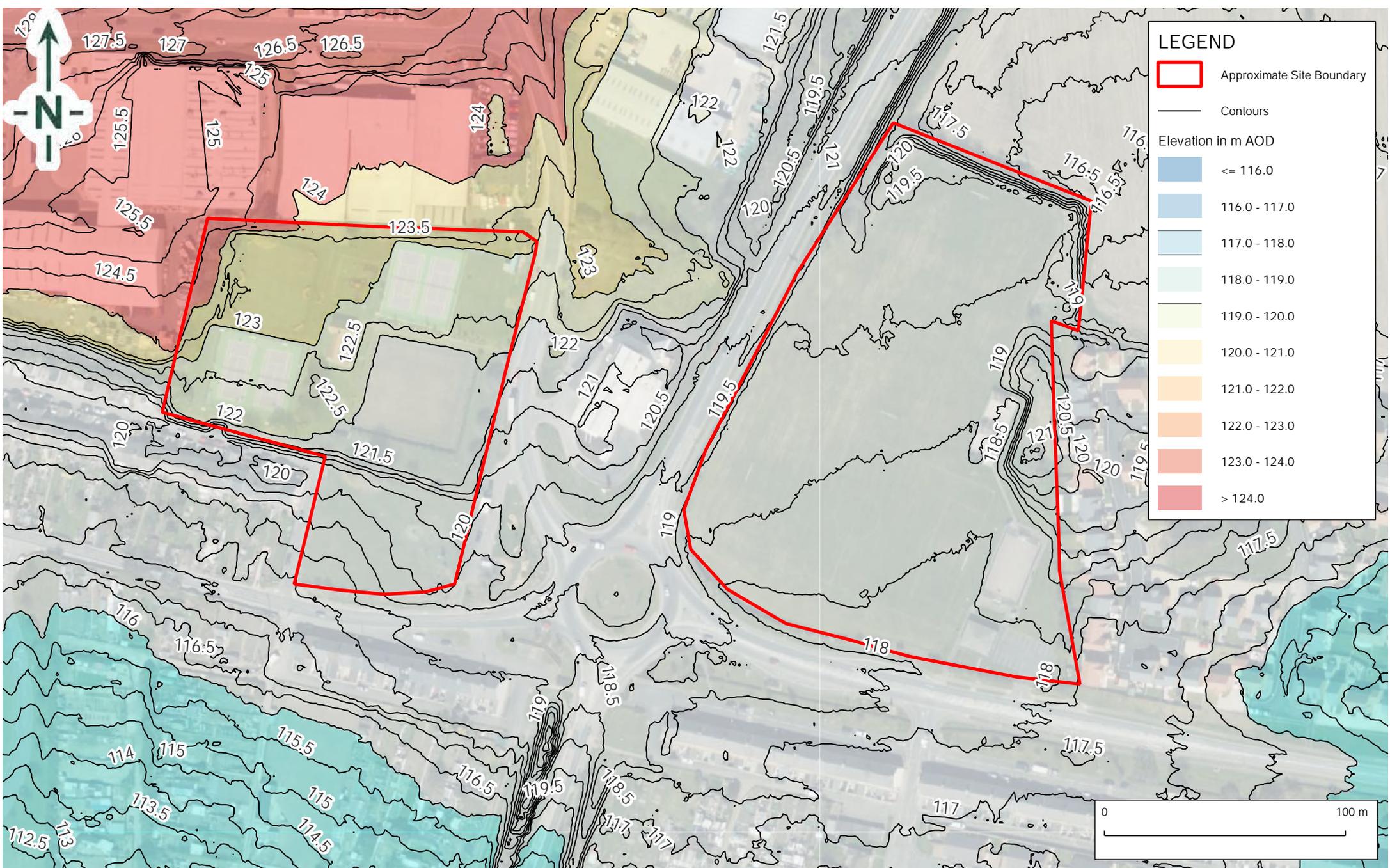
Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

Appendix B – LiDAR Plan



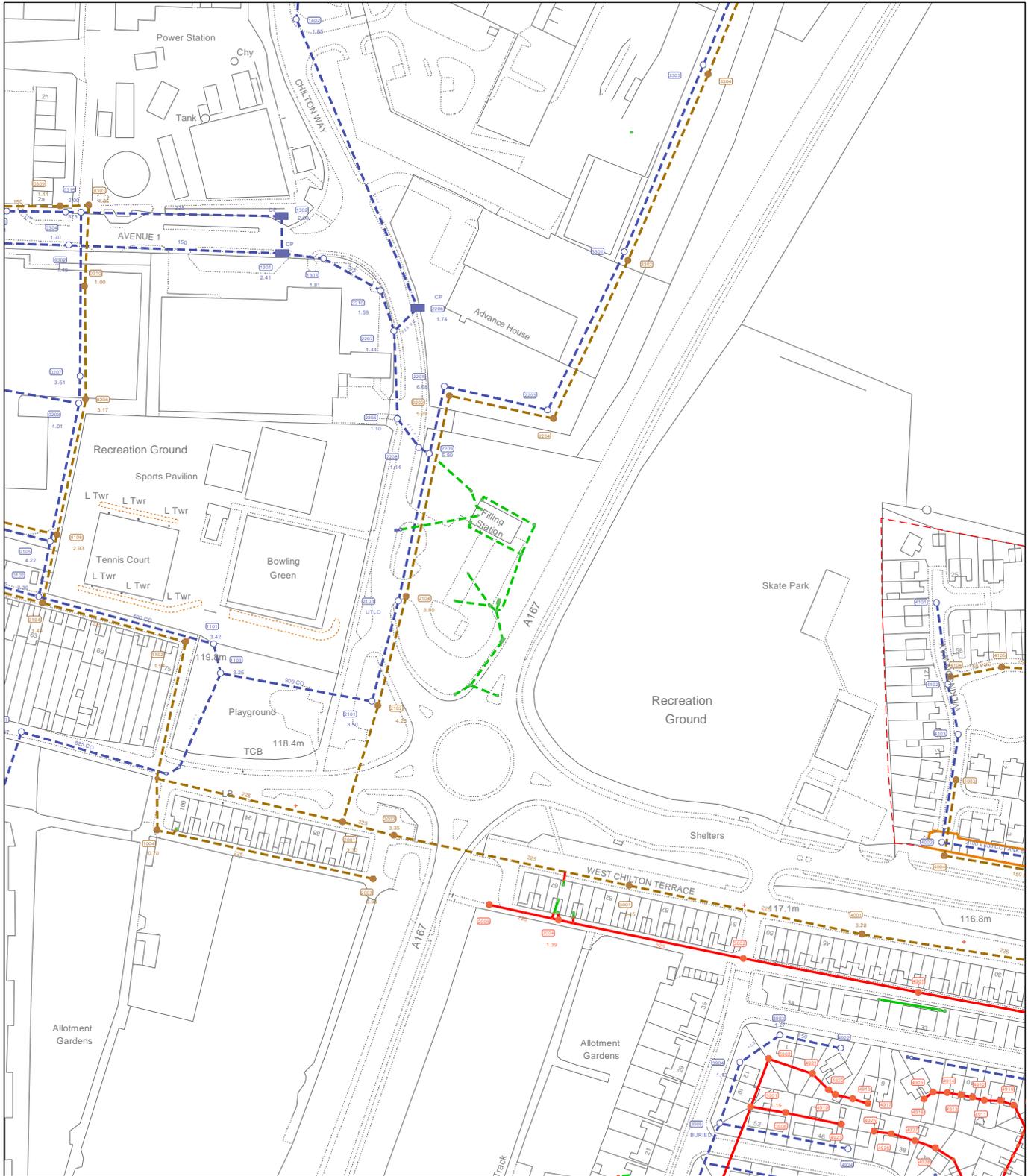
Service Layer Credits: Contains OS data © Crown Copyright and Database Right 2023, Bing Maps 2023. Contains Environment Agency information © Environment Agency and/or database right 2023. All rights reserved.



TITLE:
 LiDAR Plan
 Charlie Wayman Fields and Miners Welfare Ground, Chilton Way, Ferryhill, DL17 0HJ

DRAWN BY: AR	SCALE (@A4): 1:2,000	PROJECT NO: 100372.588457
CHECKED BY: AR	REVISION: -	FIGURE NO: B
DATE: 21 December 2023		

Appendix C – Public Sewer Records



NWL Responsibility		Private/Non NWL		Proposed		Annotations		Symbols	
Combined Foul	— (Red)	Combined Foul	— (Green)	Combined Foul	— (Red)	Direction of flow	→	Chambers	●
Surface	— (Blue)	Surface	— (Green)	Surface	— (Red)	Backdrop	— (Black)	Inlet/Outlet	⌋
Treated Eff	— (Blue)	Treated Eff	— (Green)	Surface	— (Red)	Abandoned	— (Black)	Treatment Works	■
Untreated Eff	— (Red)	Trade Eff	— (Yellow)	Surface	— (Red)	Rising Main	— (Black)	Termination Node	▶
Overflow	— (Red)	Watercourse	— (Blue)	Surface	— (Red)			Air Valve	◆
								Property Connection	●
								Capped End	⌋
								Unknown End	●
								Lamp Hole	■
								Hatchbox	●
								Dual Usage Chamber	⊙
								Balancing Pond	■
								Attribute Change	— (Black)
								Rodding Eye	▲



User : WYNN1

Date : 21/12/2023

Title : .

Centre Point : 428276,530166

Map Sheet : NZ2830SW

The material contained on this plot has been reproduced from an Ordnance Survey map with permission of the controller of H.M.S.O. Crown Copyright Reserved. Licence No. AC0000851702. The information shown on this plan should be regarded as approximate and is intended for guidance only. No Liability of any kind whatsoever is accepted by Northumbrian Water, its servants or agents for any omission. The actual position of any water mains or sewers shown on the plan must be established by taking trial holes in all cases. In the case of water mains Northumbrian Water must be given two working days notice of their intention to excavate trial holes. With effect from 1 October 2011, private lateral drains and sewers automatically transferred to Northumbrian Water under a scheme made by the Secretary of State pursuant to section 105A Water Industry Act 1991. These former private drains and sewers together with existing private connections may not be shown but their presence should be anticipated. WARNING...Where indicated on the plan there could be abandoned asbestos cement materials or shards of pipe. If excavating in the vicinity of these abandoned asbestos cement materials, the appropriate Health & Safety precautions should be taken. Northumbrian Water accepts no liability in respect of claims, costs, losses or other liabilities which arise as the result of the presence of the pipes or any failure to take adequate precautions. Emergency Telephone Number: 0345 717 1100

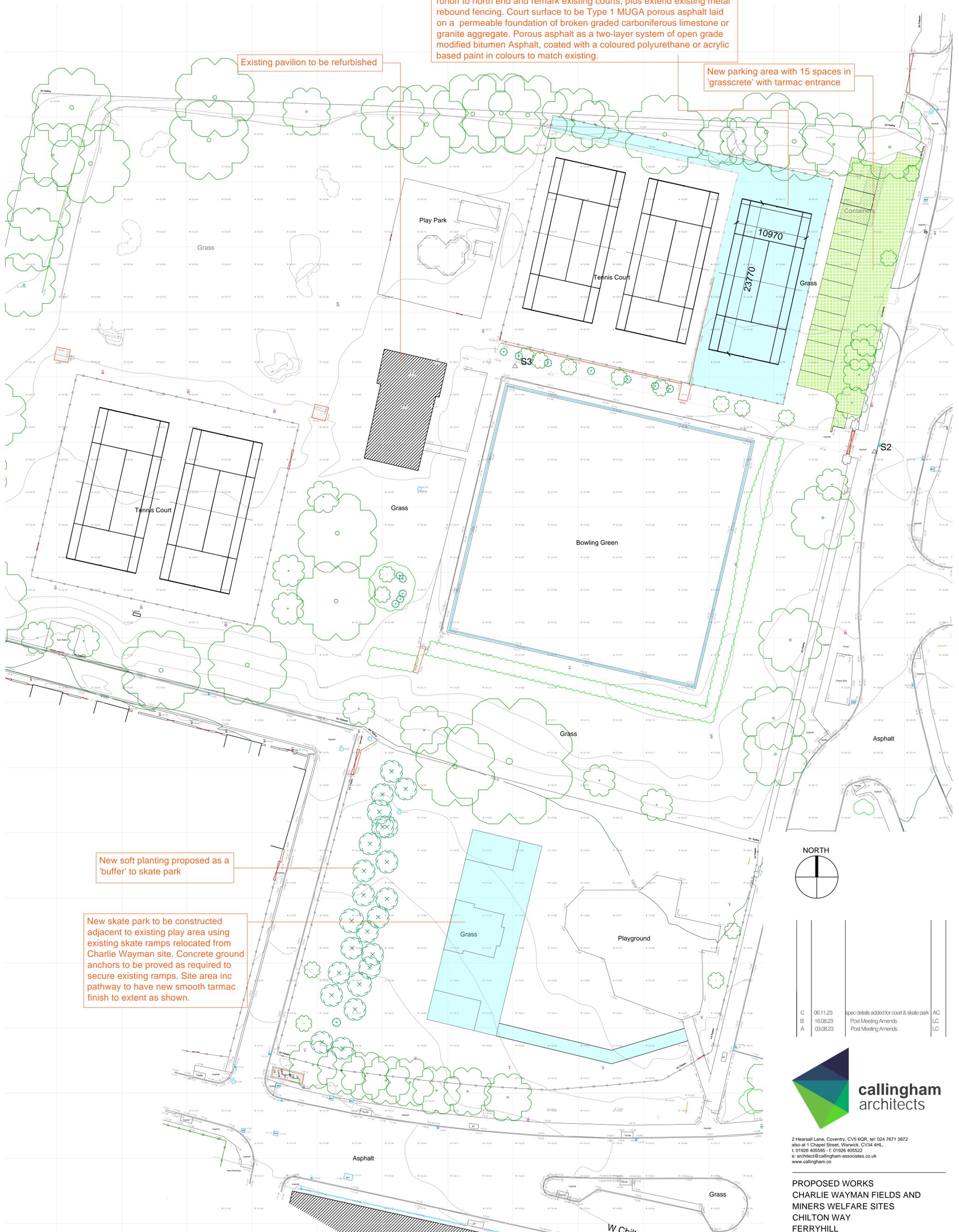


Appendix D – Proposed Development Plan

New third tennis court extension to existing courts including extension of runoff to north end and remark existing courts, plus extend existing metal rebound fencing. Court surface to be Type 1 MUGA porous asphalt laid on a permeable foundation of broken graded carboniferous limestone or granite aggregate. Porous asphalt as a two-layer system of open grade modified bitumen Asphalt, coated with a coloured polyurethane or acrylic based paint in colours to match existing.

Existing pavilion to be refurbished

New parking area with 15 spaces in 'grasscrete' with tarmac entrance



New soft planting proposed as a 'buffer' to skate park

New skate park to be constructed adjacent to existing play area using existing skate ramps relocated from Charlie Wayman site. Concrete ground anchors to be provided as required to secure existing ramps. Site area inc pathway to have new smooth tarmac finish to extent as shown.



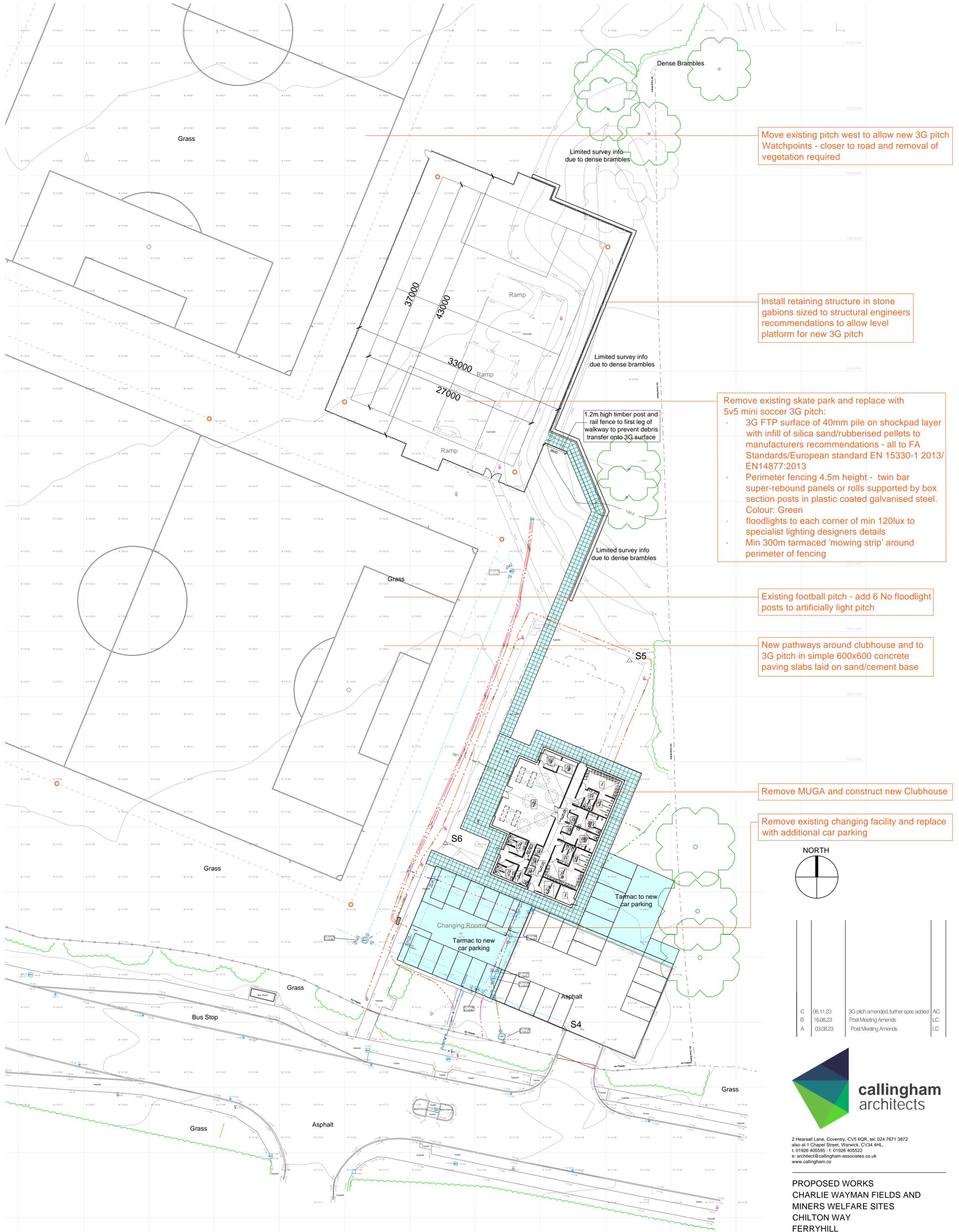
C	06.11.23	spec details added for court & skate park	AC
B	16.08.23	Post Meeting Amends	LC
A	03.08.23	Post Meeting Amends	LC



2 Hearsall Lane, Coventry, CV5 6QR, tel: 024 7671 3872
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 e: architect@callingham-associates.co.uk
 www.callingham.co

PROPOSED WORKS
 CHARLIE WAYMAN FIELDS AND
 MINERS WELFARE SITES
 CHILTON WAY
 FERRYHILL
 DL17 0HJ

PROPOSED MINERS WELFARE SITE
 scale: 1:1250@A1 date: 09.08.23 drawn by: LC
 drg: **1329.04C** checked by: xx



Move existing pitch west to allow new 3G pitch
Watchpoints - closer to road and removal of vegetation required

Install retaining structure in stone gabions sized to structural engineers recommendations to allow level platform for new 3G pitch

Remove existing skate park and replace with 5v5 mini soccer 3G pitch:

- 3G FTP surface of 40mm pile on shockpad layer with infill of silica sand/rubberised pellets to manufacturers recommendations - all to FA Standards/European standard EN 15330-1 2013/EN14877:2013
- Perimeter fencing 4.5m height - twin bar super-rebound panels or rolls supported by box section posts in plastic coated galvanised steel. Colour: Green
- floodlights to each corner of min 120lux to specialist lighting designers details
- Min 300m tarmaced 'mowing strip' around perimeter of fencing

Existing football pitch - add 6 No floodlight posts to artificially light pitch

New pathways around clubhouse and to 3G pitch in simple 600x600 concrete paving slabs laid on sand/cement base

Remove MUGA and construct new Clubhouse

Remove existing changing facility and replace with additional car parking



C	06.11.23	3G pitch amended, further spec added	AC
B	16.08.23	Post Meeting Amends	LC
A	03.08.23	Post Meeting Amends	LC

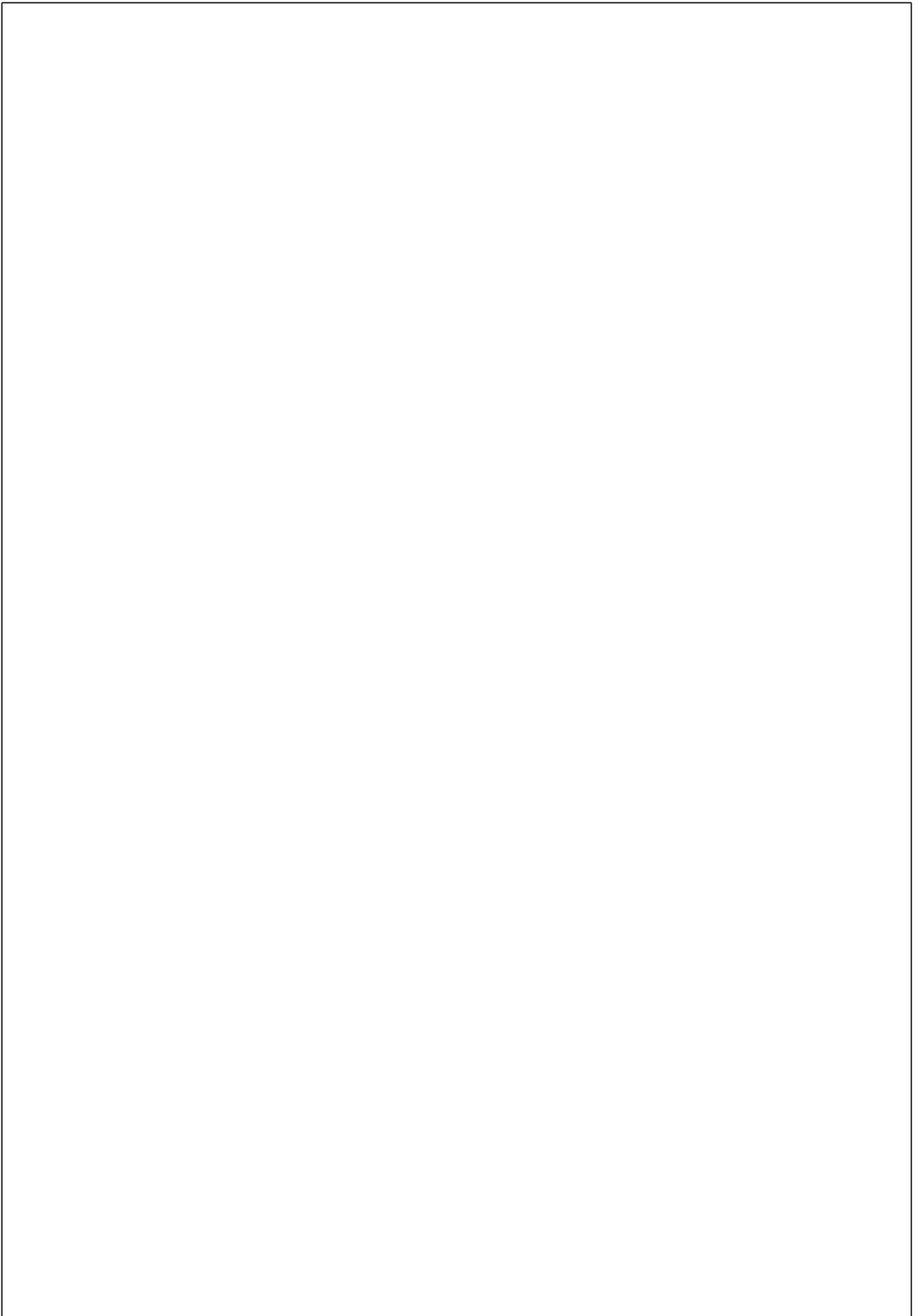


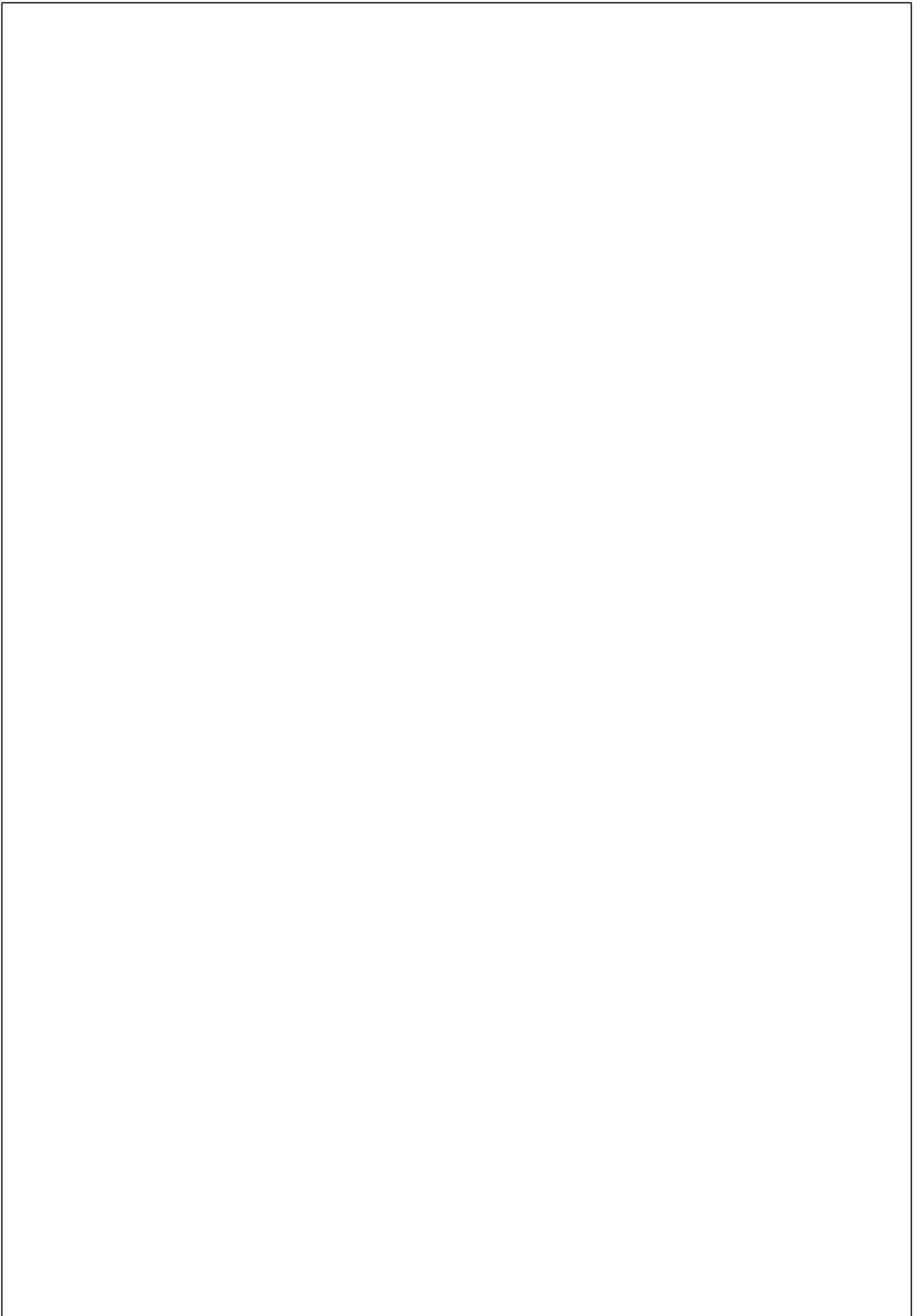
2 Hearsall Lane, Coventry, CV5 6QR, tel: 024 7671 3872
also at 1 Chapel Street, Warwick, CV34 4HL,
t: 01926 405595 - f: 01926 405522
e: architect@callingham-associates.co.uk
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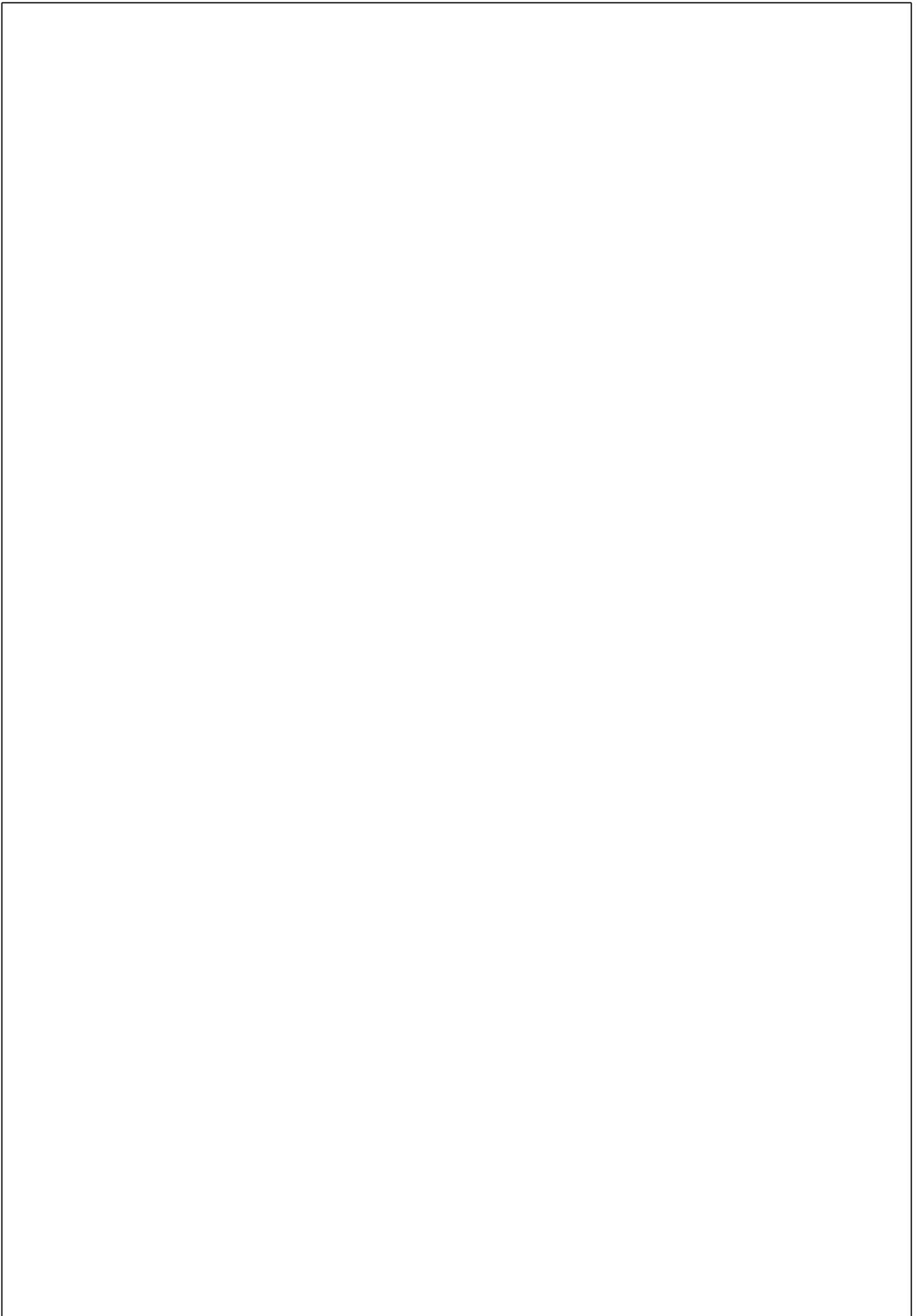
PROPOSED WORKS
CHARLIE WAYMAN FIELDS AND
MINERS WELFARE SITES
CHILTON WAY
FERRYHILL
DL17 0HJ

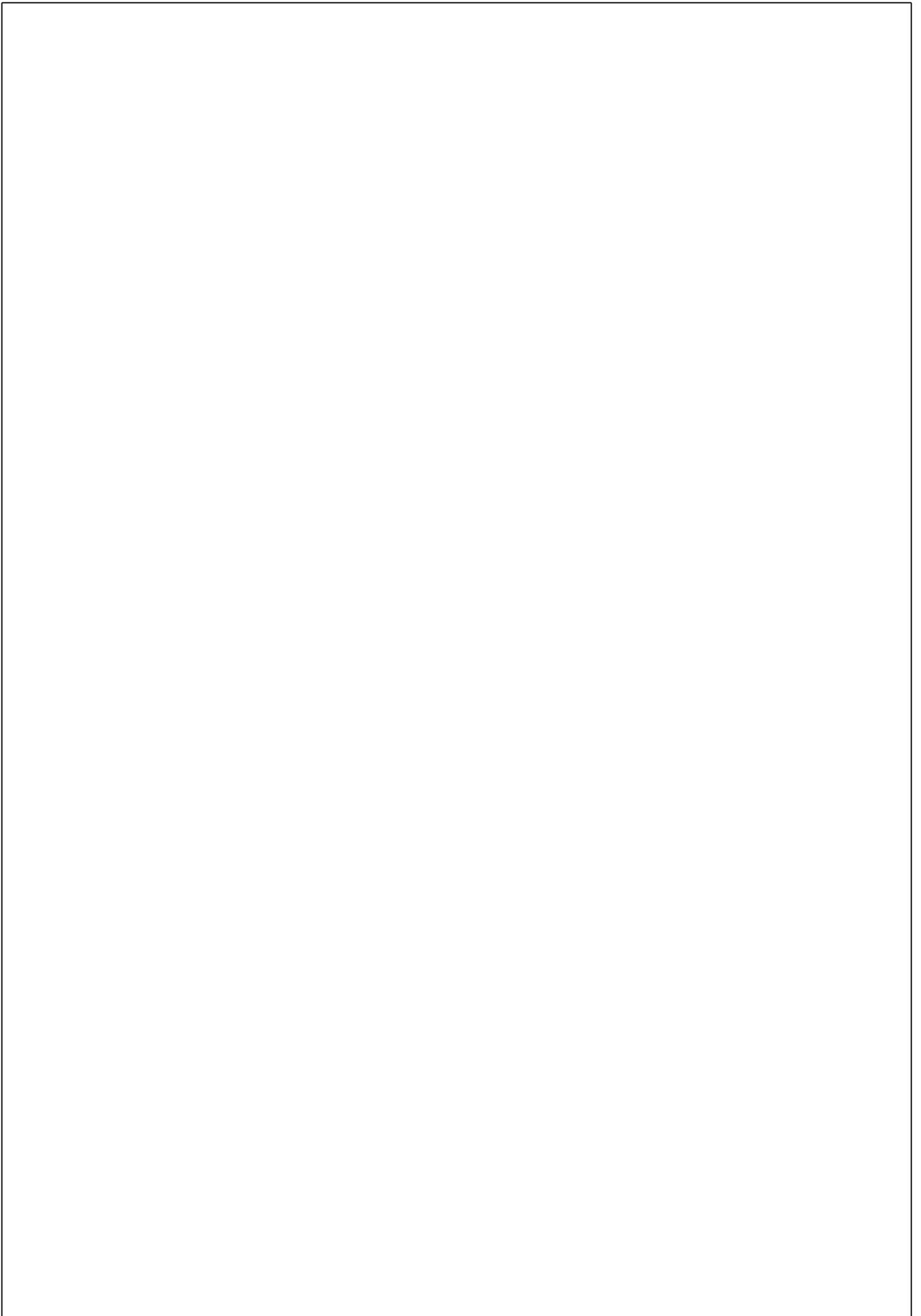
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scale:1:1250@A1 date: 09.08.23 drawn by: LC
drg: **1329.05C** checked by: xx

Appendix E –Western Parcel Runoff and Flow Calculations

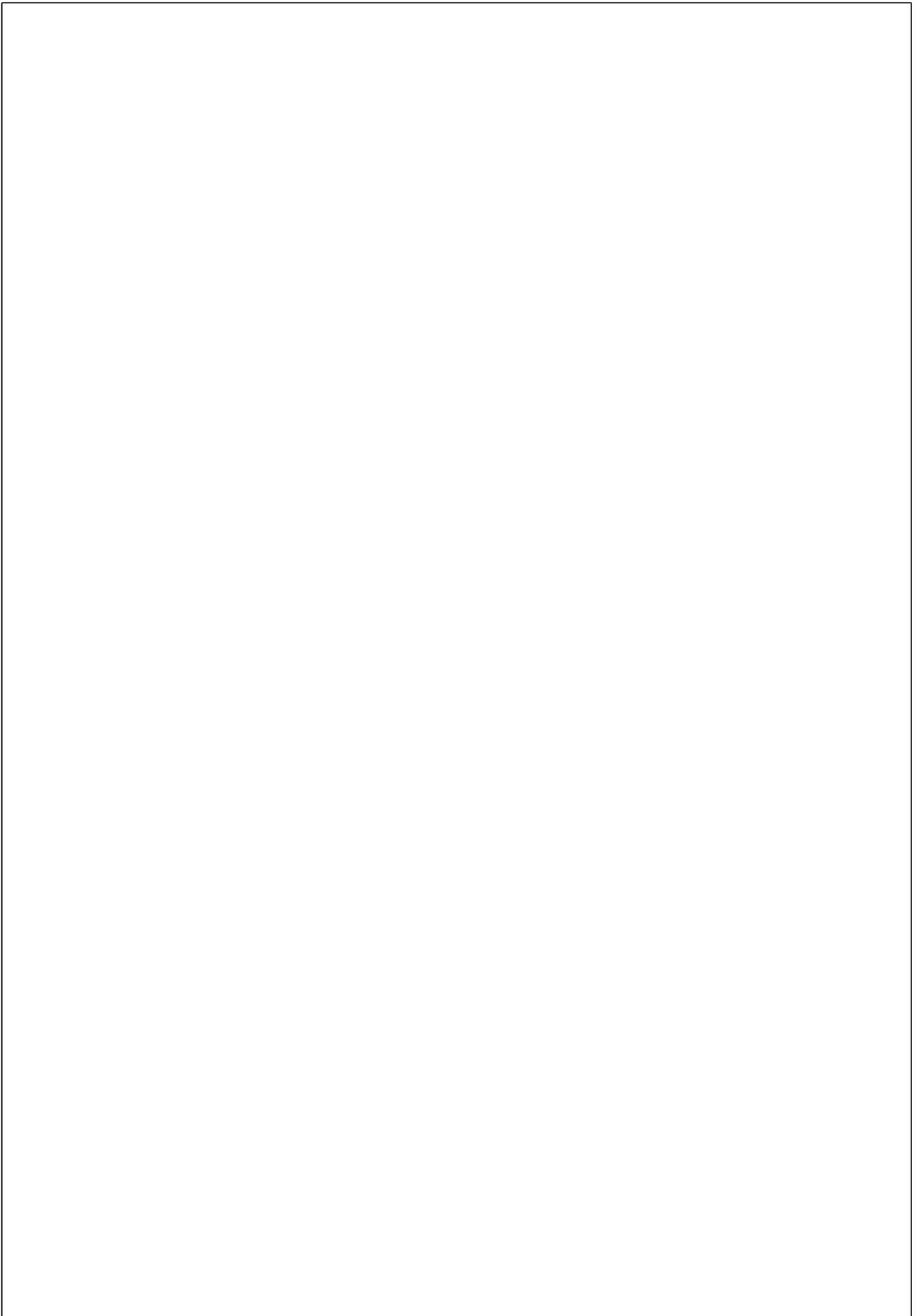


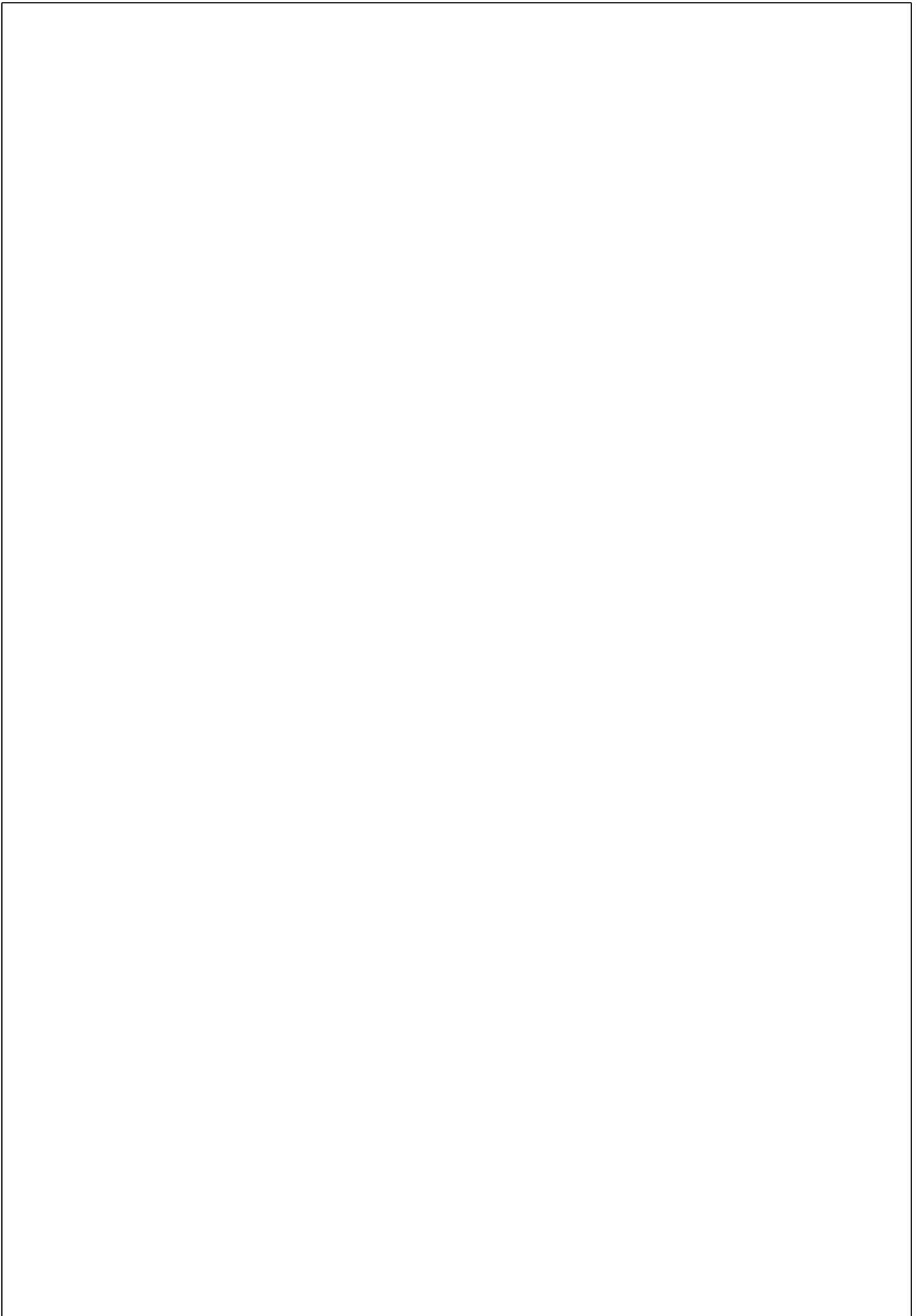


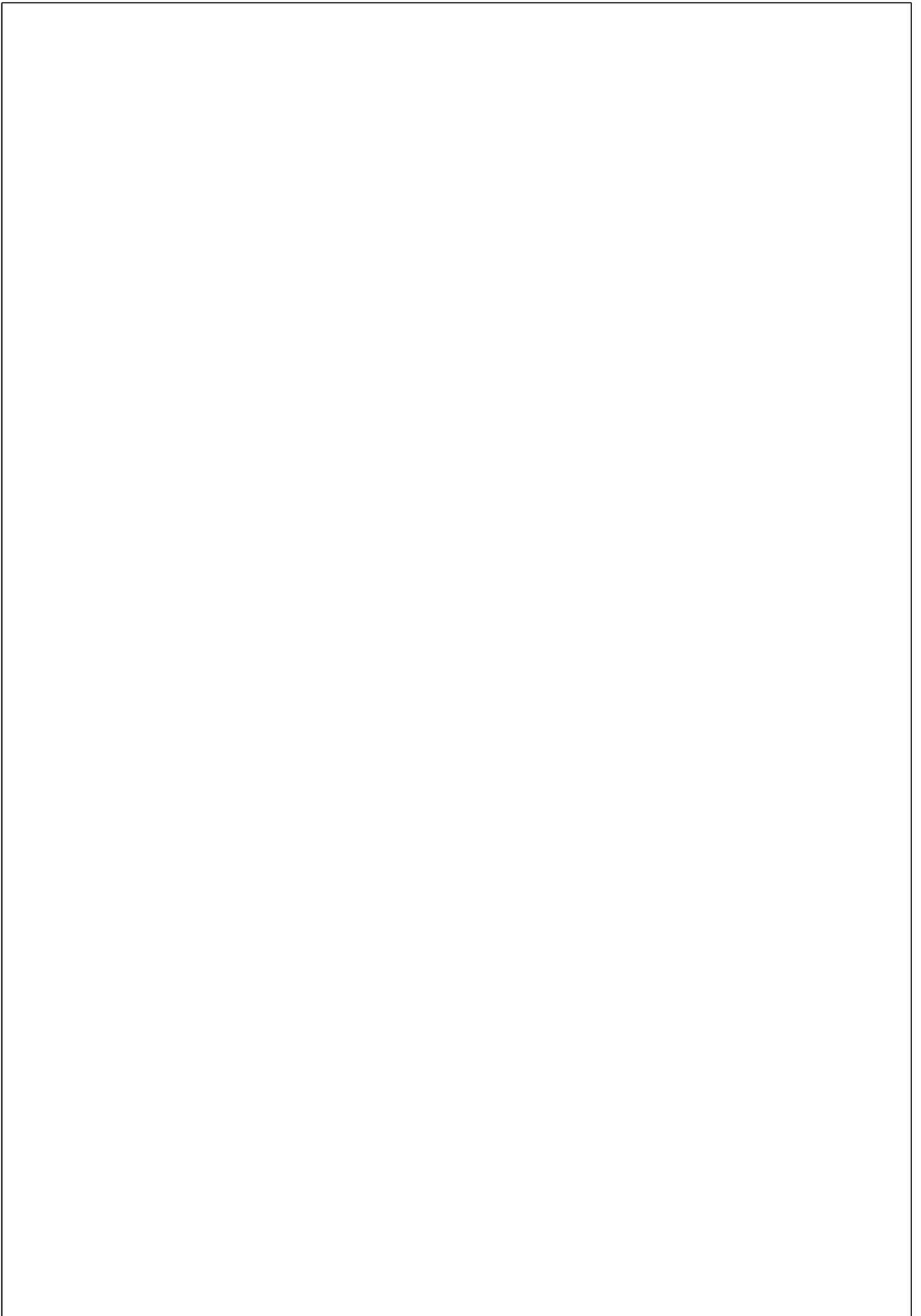


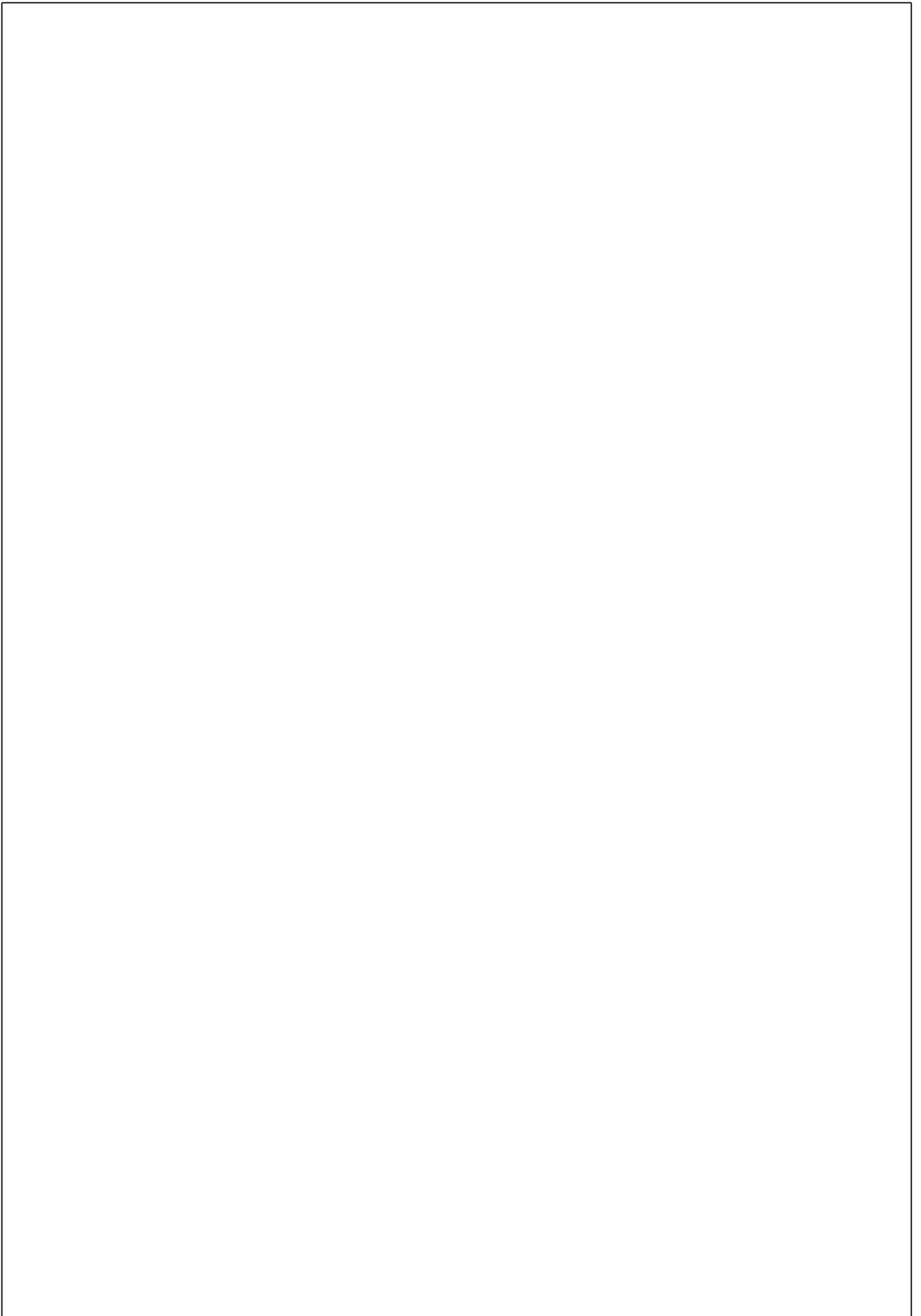


Appendix F – Eastern Parcel Runoff and Flow Calculations









Appendix G – Quick Storage Estimates

Miners Welfare Grounds - Quick Storage Estimates

1 in 30 Years

Storage Estimate

Return Period (years)	<input type="text" value="30"/>		<input type="button" value="OK"/>
Climate Change (%)	<input type="text" value="0"/>		<input type="button" value="Cancel"/>
Impermeable Area (ha)	<input type="text" value="0.138"/>	<input type="button" value="Update"/>	
Peak Discharge (l/s)	<input type="text" value="0.700"/>		
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	<input type="text"/>	<input type="button" value="Calc"/>	
Required Storage (m ²)	<input type="button" value="Calc"/>		
from	<input type="text" value="42"/>		
to	<input type="text" value="61"/>		
With infiltration (m ²)			
from	<input type="text"/>		
to	<input type="text"/>		

1 in 100 years + 45 % CC (Design Event)

Storage Estimate

Return Period (years)	<input type="text" value="100"/>		<input type="button" value="OK"/>
Climate Change (%)	<input type="text" value="45"/>		<input type="button" value="Cancel"/>
Impermeable Area (ha)	<input type="text" value="0.138"/>	<input type="button" value="Update"/>	
Peak Discharge (l/s)	<input type="text" value="0.700"/>		
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	<input type="text"/>	<input type="button" value="Calc"/>	
Required Storage (m ²)	<input type="button" value="Calc"/>		
from	<input type="text" value="89"/>		
to	<input type="text" value="126"/>		
With infiltration (m ²)			
from	<input type="text"/>		
to	<input type="text"/>		

Charlie Wayman Fields Quick Storage Estimates

1 in 30

Storage Estimate

Return Period (years)	<input type="text" value="30"/>		<input type="button" value="OK"/>
Climate Change (%)	<input type="text" value="0"/>		<input type="button" value="Cancel"/>
Impermeable Area (ha)	<input type="text" value="0.298"/>	<input type="button" value="Update"/>	
Peak Discharge (l/s)	<input type="text" value="1.300"/>		
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	<input type="text"/>	<input type="button" value="Calc"/>	
Required Storage (m ³)	<input type="button" value="Calc"/>		
from	<input type="text" value="94"/>		
to	<input type="text" value="136"/>		
With infiltration (m ³)			
from	<input type="text"/>		
to	<input type="text"/>		

1 in 100 + 45% CC (Design Event)

Storage Estimate

Return Period (years)	<input type="text" value="100"/>		<input type="button" value="OK"/>
Climate Change (%)	<input type="text" value="45"/>		<input type="button" value="Cancel"/>
Impermeable Area (ha)	<input type="text" value="0.298"/>	<input type="button" value="Update"/>	
Peak Discharge (l/s)	<input type="text" value="1.300"/>		
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	<input type="text"/>	<input type="button" value="Calc"/>	
Required Storage (m ³)	<input type="button" value="Calc"/>		
from	<input type="text" value="203"/>		
to	<input type="text" value="277"/>		
With infiltration (m ³)			
from	<input type="text"/>		
to	<input type="text"/>		

Appendix H – Western Parcel Concept Drainage Sketch



Grasscrete to occupy the 411 m² designated area at a 0.3 m depth and 30% porosity providing 36.99 m³ of attenuation.

An additional attenuation tank could be located below the grasscrete in the north to attenuate the tennis court. It could discharge into the Sewer 10 m to the east of this location to split the drainage of the Western Plot. However it is assumed to all of the Western Plot discharges into the same location at this stage. This is to be reviewed at the Detailed Design Stage.

Geocellular Tank covering a 81.07 m² area, 0.8 m depth and 95% porosity providing the remaining 61.52 m³ of attenuation required. A separator is located before the surface water enters the tank to provide water quality benefits.

HydroBrake(s) Restricting outfall of the Western Plot discharge rate to 0.7 l/s for all events up to and including the 1 in 100 + 45% climate change scenario

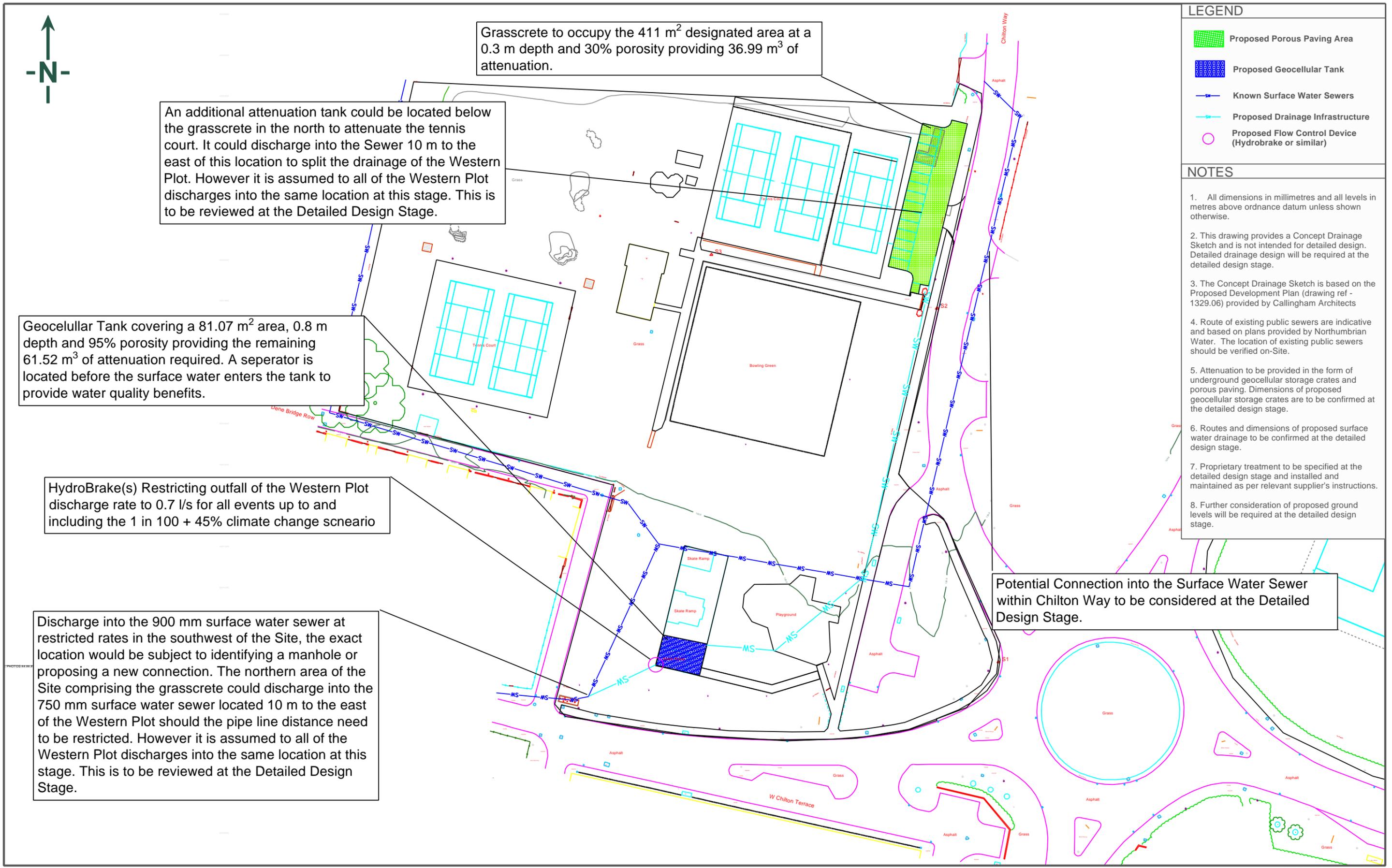
Discharge into the 900 mm surface water sewer at restricted rates in the southwest of the Site, the exact location would be subject to identifying a manhole or proposing a new connection. The northern area of the Site comprising the grasscrete could discharge into the 750 mm surface water sewer located 10 m to the east of the Western Plot should the pipe line distance need to be restricted. However it is assumed to all of the Western Plot discharges into the same location at this stage. This is to be reviewed at the Detailed Design Stage.

Potential Connection into the Surface Water Sewer within Chilton Way to be considered at the Detailed Design Stage.

LEGEND

-  Proposed Porous Paving Area
-  Proposed Geocellular Tank
-  Known Surface Water Sewers
-  Proposed Drainage Infrastructure
-  Proposed Flow Control Device (Hydrobrake or similar)

- NOTES**
1. All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.
 2. This drawing provides a Concept Drainage Sketch and is not intended for detailed design. Detailed drainage design will be required at the detailed design stage.
 3. The Concept Drainage Sketch is based on the Proposed Development Plan (drawing ref - 1329.06) provided by Callingham Architects
 4. Route of existing public sewers are indicative and based on plans provided by Northumbrian Water. The location of existing public sewers should be verified on-site.
 5. Attenuation to be provided in the form of underground geocellular storage crates and porous paving. Dimensions of proposed geocellular storage crates are to be confirmed at the detailed design stage.
 6. Routes and dimensions of proposed surface water drainage to be confirmed at the detailed design stage.
 7. Proprietary treatment to be specified at the detailed design stage and installed and maintained as per relevant supplier's instructions.
 8. Further consideration of proposed ground levels will be required at the detailed design stage.



Site Plan Provided by Client

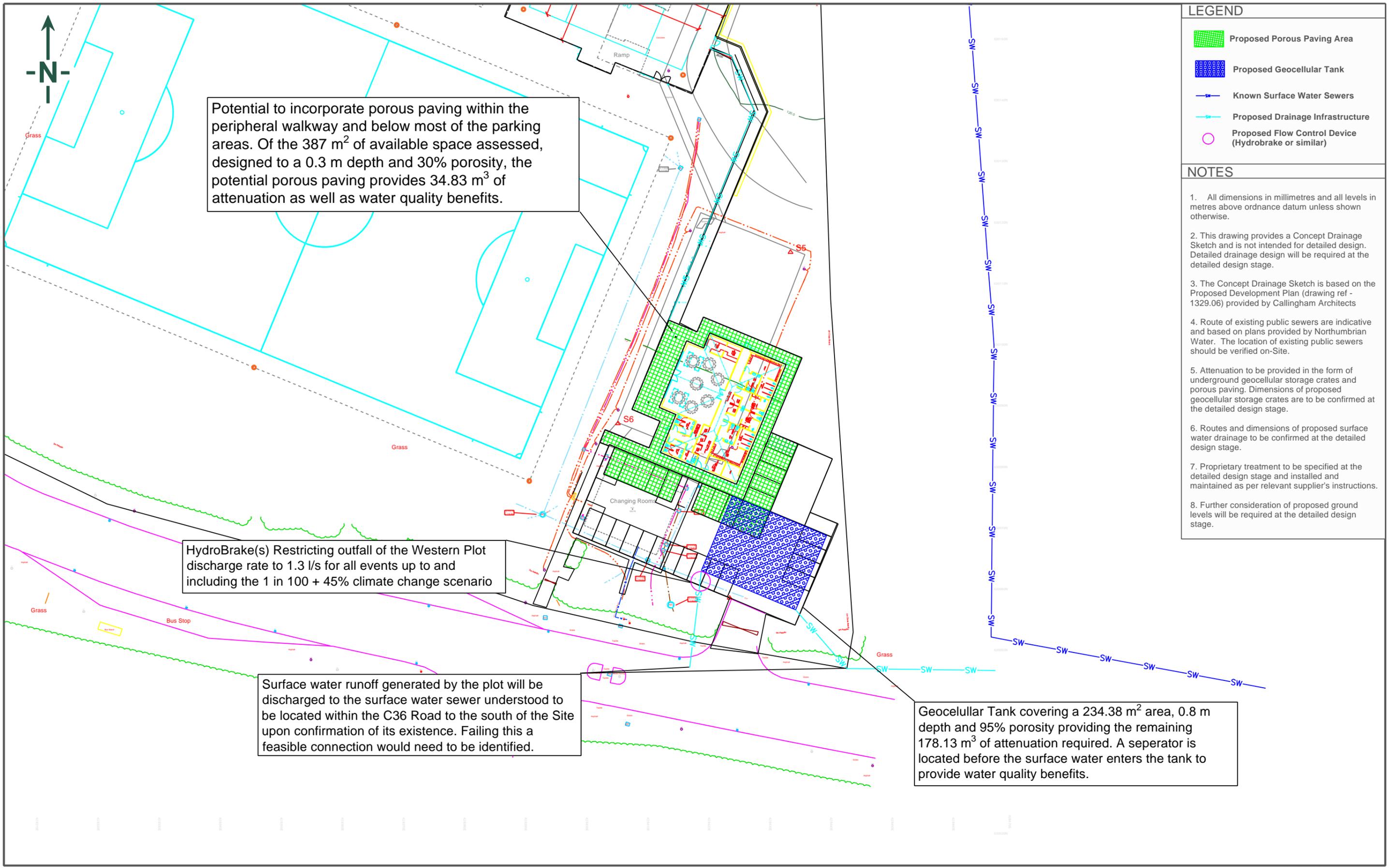


TITLE:
Concept Drainage Sketch - Miners Welfare Ground
 Charlie Wayman Fields and Miners Welfare Ground, Chilton Way, Ferryhill, DL17 0HJ

DRAWN BY: AR	SCALE: Not to Scale
CHECKED BY: LA	REVISION: 1
DATE: 11-01-2024	

PROEJCT NO:
100372.588457
 APPENDIX:
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Appendix I – Eastern Parcel Concept Drainage Sketch



Potential to incorporate porous paving within the peripheral walkway and below most of the parking areas. Of the 387 m² of available space assessed, designed to a 0.3 m depth and 30% porosity, the potential porous paving provides 34.83 m³ of attenuation as well as water quality benefits.

HydroBrake(s) Restricting outfall of the Western Plot discharge rate to 1.3 l/s for all events up to and including the 1 in 100 + 45% climate change scenario

Surface water runoff generated by the plot will be discharged to the surface water sewer understood to be located within the C36 Road to the south of the Site upon confirmation of its existence. Failing this a feasible connection would need to be identified.

Geocellular Tank covering a 234.38 m² area, 0.8 m depth and 95% porosity providing the remaining 178.13 m³ of attenuation required. A separator is located before the surface water enters the tank to provide water quality benefits.

LEGEND

-  Proposed Porous Paving Area
-  Proposed Geocellular Tank
-  Known Surface Water Sewers
-  Proposed Drainage Infrastructure
-  Proposed Flow Control Device (Hydrobrake or similar)

NOTES

1. All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.
2. This drawing provides a Concept Drainage Sketch and is not intended for detailed design. Detailed drainage design will be required at the detailed design stage.
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4. Route of existing public sewers are indicative and based on plans provided by Northumbrian Water. The location of existing public sewers should be verified on-Site.
5. Attenuation to be provided in the form of underground geocellular storage crates and porous paving. Dimensions of proposed geocellular storage crates are to be confirmed at the detailed design stage.
6. Routes and dimensions of proposed surface water drainage to be confirmed at the detailed design stage.
7. Proprietary treatment to be specified at the detailed design stage and installed and maintained as per relevant supplier's instructions.
8. Further consideration of proposed ground levels will be required at the detailed design stage.

Site Plan Provided by Client



TITLE:
Concept Drainage Sketch - Charlie Wayman Fields
 Charlie Wayman Fields and Miners Welfare Ground, Chilton Way, Ferryhill, DL17 0HJ

DRAWN BY: AR	SCALE: Not to Scale
CHECKED BY: LA	REVISION: 1
DATE: 11-01-2024	

PROJECT NO:
100372.588457
 APPENDIX:
I

Appendix J – Maintenance Schedules

Attenuation Storage Tank Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Ref. Table 21.3, CIRIA C753 'The SuDS Manual'

Permeable Paving Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on Site-specific observations of clogging or manufacturer's recommendations –pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and move contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required –once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and / or weed growth –if required, take remedial action	Three-monthly, 48hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Ref. Table 20.15, CIRIA C753 'The SuDS Manual'