



# Alma Park Primary School, Levenshulme

## Drainage Strategy

November 2024



| Project Information |                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Project:            | Alma Park Primary School, Levenshulme                                                                                               |
| Report Title:       | Drainage Strategy                                                                                                                   |
| Client:             | Alma Park Primary School                                                                                                            |
| Instruction:        | The instruction to undertake this Drainage Strategy was received from Daniel Markwart of Studio OL3 acting on behalf of the Client. |
| File Ref:           | 15818-Drainage Strategy-02                                                                                                          |

| Approval Record |                                       |
|-----------------|---------------------------------------|
| Author:         | Ryan Moore BSc (Hons)                 |
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| Approver:       | Aled Williams BSc (Hons) MCIWEM C.WEM |

| Document History |            |                                               |
|------------------|------------|-----------------------------------------------|
| Revision         | Date       | Comment                                       |
| 01               | 27/04/2024 | First issue                                   |
| 02               | 27/11/2024 | Second issue- Updated following LLFA comments |
|                  |            |                                               |

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This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

## Contents

|                                                |   |
|------------------------------------------------|---|
| Introduction .....                             | 1 |
| Existing Conditions .....                      | 1 |
| Development Proposals .....                    | 2 |
| Planning Policy .....                          | 3 |
| Consultation .....                             | 3 |
| Surface Water Management .....                 | 4 |
| Drainage System Blockage Risk Assessment ..... | 6 |
| Conclusions .....                              | 8 |
| Recommendations.....                           | 8 |

## Appendices

|            |                                         |
|------------|-----------------------------------------|
| Appendix A | Location Plan and Aerial Image          |
| Appendix B | Topographical Information               |
| Appendix C | BGS Borehole Location Plan and Record   |
| Appendix D | UU Sewer Plan and Correspondence        |
| Appendix E | Existing and Proposed Development Plans |
| Appendix F | Greenfield Runoff Estimates             |
| Appendix G | Attenuation Storage Estimate            |
| Appendix H | Concept Drainage Sketch                 |
| Appendix I | Hydro-Brake® Brochure Extract           |
| Appendix J | Concept Designer's Risk Assessment      |

## Introduction

Waterco has been commissioned to undertake a Drainage Strategy in relation to a proposed multi-use games area (MUGA) at Alma Park Primary School, Errwood Road, Burnage, Levenshulme, M19 2PF.

Manchester City 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.

## Existing Conditions

The site covers an area of approximately 520m<sup>2</sup> and is located at National Grid Reference (NGR): 387373, 393815. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery, accessed November 2024) shows that the site comprises amenity / play space in the grounds of Alma Park Primary School.

The site is bordered by Alma Park Primary School to the north, a railway line to the east, a pedestrian footpath and communal open space to the south, and the grounds of Alma Park Primary School to the west. Access to the site is provided from Alma Primary School which in turn is accessed off Errwood Road.

## Local Topography

An Existing Block Plan identifying the site topography has been provided by Studio OL3. The Existing Block Plan shows that the site is relatively flat with levels ranging from 55.31 metres Above Ordnance Datum (m AOD) in the north-east to 55.11m AOD in the east.

Topographic levels to m AOD have also been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). The LiDAR data generally corroborates with the topographical survey.

Topographical data is provided as Appendix B.

## Ground Conditions

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by superficial deposits of Devensian Till, generally comprising of Diamicton. The superficial deposits are identified as being underlain by the Collyhurst Sandstone Formation.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

The closest historical BGS borehole record (BGS reference: SJ89SE18) is located 115m west of the site (NGR: 387247, 393814) and is included together with a borehole location plan in Appendix C. The borehole record

(off Errwood Road) identifies:

- Soil from ground level to 0.61 metres below ground level (m.bgl).
- Hard, blue clay from 0.61m.bgl to 6.71m.bgl.
- Dark, loamy sand from 6.71m.bgl to 8.99m.bgl.

According to the EA's Aquifer Designation data, obtained from MAGIC's online mapping [accessed November 2024], the Devensian Till is classified as a Secondary Undifferentiated Aquifer. 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 non-aquifer in different locations due to the variable characteristics of the rock type*'.

The underlying Collyhurst Sandstone Formation is described as a Principal Aquifer. 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*'.

The EA's 'Source Protection Zones' data, obtained from MAGIC's online mapping [accessed November 2024], indicates that the site is not located within a Groundwater Source Protection Zone.

The Cranfield University 'Soilscapes' map [accessed November 2024] indicates that the site is underlain by '*slowly permeable seasonally wet loamy and clayey soils*'.

## Local Drainage

Public sewer records have been obtained from United Utilities (UU) and are included in Appendix D. The UU sewer records identify a 700mm public combined sewer approximately 35m south of the site. The 700mm public combined sewer flows west and orientates north crossing the wider Alma Park Primary School site (approximately 95m west of the site) becoming 600mm in diameter. No cover or invert levels for the public combined sewer crossing the Alma Park Primary School are provided on the UU sewer plans.

There is no information on how surface water from the primary school is currently drained. However, in absence of a nearby watercourse and based on the underlying ground conditions (clay), it is assumed that surface water from the school currently drains to the public combined sewer crossing the wider Alma Park Primary School site.

## Development Proposals

The proposed development comprises the construction of 3no. MUGA pitches with an associated access footpath. Proposed development plans are included in Appendix E.

The proposed MUGA pitches and associated access footpath cover an area of approximately 520m<sup>2</sup>. All measurements have been taken from a PDF copy of the 'Part Site Plan as Proposed and Block Plan as

Proposed (Rev P-02)' and are approximate only.

## Planning Policy

The Manchester City Council Core Strategy (adopted July 2012) contains the following policies relating to drainage:

### **'Policy EN 8 – Adaptation to Climate Change:**

*All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:*

- *Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rain water permeability.*

### **Policy EN 14 – Flood Risk:**

- *All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required.*

### **Policy EN 17 – Water Quality:**

*With reference to the Manchester-Salford-Trafford SFRA and other relevant documents:*

- *Development should minimise surface water run-off from development and associated roads, and maximise the use of appropriate sustainable drainage systems, to minimise groundwater contamination, and to avoid pollutants reaching watercourses'.*

## Consultation

A pre-development enquiry was submitted to United Utilities (UU) in February 2024. In their response (Appendix D), UU have stated that:

### Surface Water

*All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.*

*Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.*

*This is outlined as follows, in order of priority:*

- 1. into the ground (infiltration);*
- 2. to a surface waterbody;*
- 3. to a surface water sewer or highway drain;*
- 4. to a combined sewer.*

*For guidance, The North West SuDS Pro-Forma provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted. The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area). The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.*

*Should the above be exhausted and a connection to the combined sewer is required I can confirm we would have no objections to a connection to the public 600dia combined sewer running through your site with a maximum pass forward flow rate of 5 l/s.'*

A consultation request was also submitted to the LLFA in February 2024. A response is currently awaited.

## Surface Water Management

The site is not formally drained and is therefore considered to be 100% permeable. The proposed development will introduce 520m<sup>2</sup> of formally drained area in the form of the MUGA pitches and an associated footpath.

The introduction of formally drained 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.

The existing greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. A summary of the greenfield runoff rates for a range of events is provided as Appendix F. The existing 1 in 1 year greenfield runoff rate for the 520m<sup>2</sup> site is 0.36 l/s.

A discharge rate of 1 l/s is proposed for this site to ensure the drainage system is self-cleansing.

## Discharge Method

Paragraph 056 of the NPPG: Flood Risk and Coastal Change sets out the following hierarchy of drainage options: into the ground (infiltration); to a surface water body; to a surface water sewer, highway drain or another drainage system; to a combined sewer.

## Infiltration

The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces).

As described above, the site is underlain by superficial deposits of Devensian Till comprising Diamicton. Given the impermeable nature of the underlying superficial deposits, it can be concluded that infiltration techniques are unlikely to be suitable for the disposal of surface water runoff.

## Watercourse

As infiltration techniques are not considered feasible, a connection to watercourse is the next consideration. The nearest watercourse is Fallowfield Brook which is located approximately 500m east of the site. The site is separated from Fallowfield Brook by third party, urbanised land, including a railway line. Therefore, discharge to watercourse is not considered to be feasible.

## Sewer

As disposal of surface water to watercourse is not possible, a connection to the public sewer system is the final consideration. There is a 600mm public combined sewer located approximately 95m west of the site crossing the wider Alma Park Primary School Site.

UU have stated that: *'Should the above be exhausted and a connection to the combined sewer is required I can confirm we would have no objections to a connection to the public 600dia combined sewer running through your site with a maximum pass forward flow rate of 5 l/s.'*

Therefore, it is proposed to discharge surface water to the 600mm public combined sewer at a limited discharge rate of 1 l/s. Where possible, a connection to the 600mm public combined sewer will be made via the existing surface / combined drainage system serving the adjacent school. This will avoid making a new connection to the public combined sewer and will minimise the length of pipework required.

A survey of the drainage system serving the adjacent school buildings should be undertaken as to establish invert levels. The site is slightly elevated above the adjacent school buildings and as such a gravity connection should be achievable.

It is noted that a public surface water sewer is located in Errwood Road immediately west of the school site. The surface water sewer is shown to drain into the public combined sewer system. As such, there are no surface water sewers in this area which provide an alternative discharge point.

## Attenuation Storage

In order to achieve a limited discharge rate of 1 l/s, attenuation storage will be required. An attenuation storage estimated has been undertaken using MicroDrainage software and is included in Appendix G. An estimated storage volume of 37m<sup>3</sup> will be required to accommodate the 1 in 100 year plus 45% Climate Change (CC) event. The storage estimate is based on a contributing drainage area of 520m<sup>2</sup>, storage within the pitch sub-grade, a void ratio of 30% (applicable to stone sub-grade) and a discharge rate of 1 l/s.

Attenuation storage will be provided within the stone sub-grade of the MUGA pitches. Based on a level sub-grade and a pitch area of 490m<sup>2</sup> (site area excluding the footpath north of the MUGA pitches) a sub-grade

depth of 250mm will be required to accommodate the 1 in 100 year plus 45% CC event. Perforated pipes will be laid within the sub-grade to encourage water towards the flow control chamber.

### Concept Surface Water Drainage Scheme

As infiltration techniques are unlikely to be feasible due to the underlying clay geology, surface water runoff will be discharged into the existing surface water drainage system that currently serves the school at a limited rate of 1 l/s. The drainage system serving the school is assumed to drain into the 600mm public combined sewer located approximately 95m west of the site.

Surface water runoff up to the 1 in 100 year plus 45% climate change allowance event will be attenuated on site. A total attenuation volume of 37m<sup>3</sup> will be required to achieve a discharge rate of 1 l/s and will be provided within the stone sub-grade of the MUGA pitches.

A Concept Drainage Sketch is included in Appendix H.

### Exceedance Event

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 will be permitted to produce temporary shallow depth flooding on the surface of the proposed MUGA pitches.

### Drainage System Blockage Risk Assessment

LLFA comments received following submission of the planning application, request an assessment of blockage risk associated with the proposed drainage system and limiting flows to 1 l/s.

As detailed above, surface water will filter through the stone sub-grade of the pitch which will limit the amount of sediment that is passed through to the flow control chamber (Hydro-Brake). Larger sediment/debris would not pass through the pitch surface and as such would not reach the Hydro-brake chamber. In addition to this, a sump will be designed into the flow control chamber for ease of sediment capture and removal.

A Hydro-Brake Optimum will be used, which is a self-activating vortex flow control with no moving parts and no power requirement. Further details on the Hydro-Brake are included within Appendix I. The Hydro-Brake Flow Control Series brochure by Hydro International states that: *'Minimal maintenance- with up to 20% larger outlet clearances compared to other vortex devices, there is significantly less risk of blockage with a Hydro-Brake® Optimum.'*

Therefore, the risk of drainage system blockage is considered to be very low.

### Surface Water Treatment

The pollution hazard associated with the artificial pitches is considered to be very low. Rainwater will filtrate through the sub-grade material prior to entering the flow control chamber via a series of collection drains (perforated pipework). No additional surface water treatment is deemed necessary for the proposed MUGA pitches.

## Maintenance

Monthly inspection of the flow control chamber will be required to check for silt accumulation. Maintenance will be the responsibility of the site owner. The maintenance of the artificial sports pitches will be as per the manufacture's guidelines.

## Conclusions

The proposed development is for the construction of multi-use games area (MUGA) pitches with an associated footpath.

The proposed development will include formally drained area in the form of the MUGA pitches. This will result in an increase in surface water runoff. 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.

All surface water discharge methods have been assessed. Infiltration techniques are not considered to be feasible given the impermeable nature of the underlying clay. There are no watercourses in the vicinity of the site and as such a connection to the public combined sewer is proposed. Where possible, a connection to the 600mm public combined sewer 95m west of the site will be made via the existing surface / combined drainage system serving the adjacent school. This will avoid making a new connection to the public combined sewer and will minimise the length of pipework required. Discharge will be made at a limited rate of 1 l/s.

Surface water runoff up to the 1 in 100 year plus 45% climate change allowance event will be attenuated on site. A total attenuation volume of 37m<sup>3</sup> will be required to achieve a discharge rate of 1 l/s and will be provided within the stone sub-grade of the proposed MUGA pitches. Perforated pipes will be laid within the sub-grade to encourage water towards the flow control chamber.

A Concept Designer's Risk Assessment (cDRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The cDRA has been included in Appendix J.

## Recommendations

1. Submit this Drainage Strategy to the Planning Authority in support of the Planning Application.
2. Survey the exiting drainage system serving the adjacent school building to establish invert levels.

## **Appendix A    Location Plan and Aerial Image**



Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

**LEGEND**

- Site Boundary
- Land Under Client's Ownership
- Watercourses
- Waterbodies

CLIENT:

**waterco**  
www.waterco.co.uk

SCHEME:

Alma Park School, Levenshulme

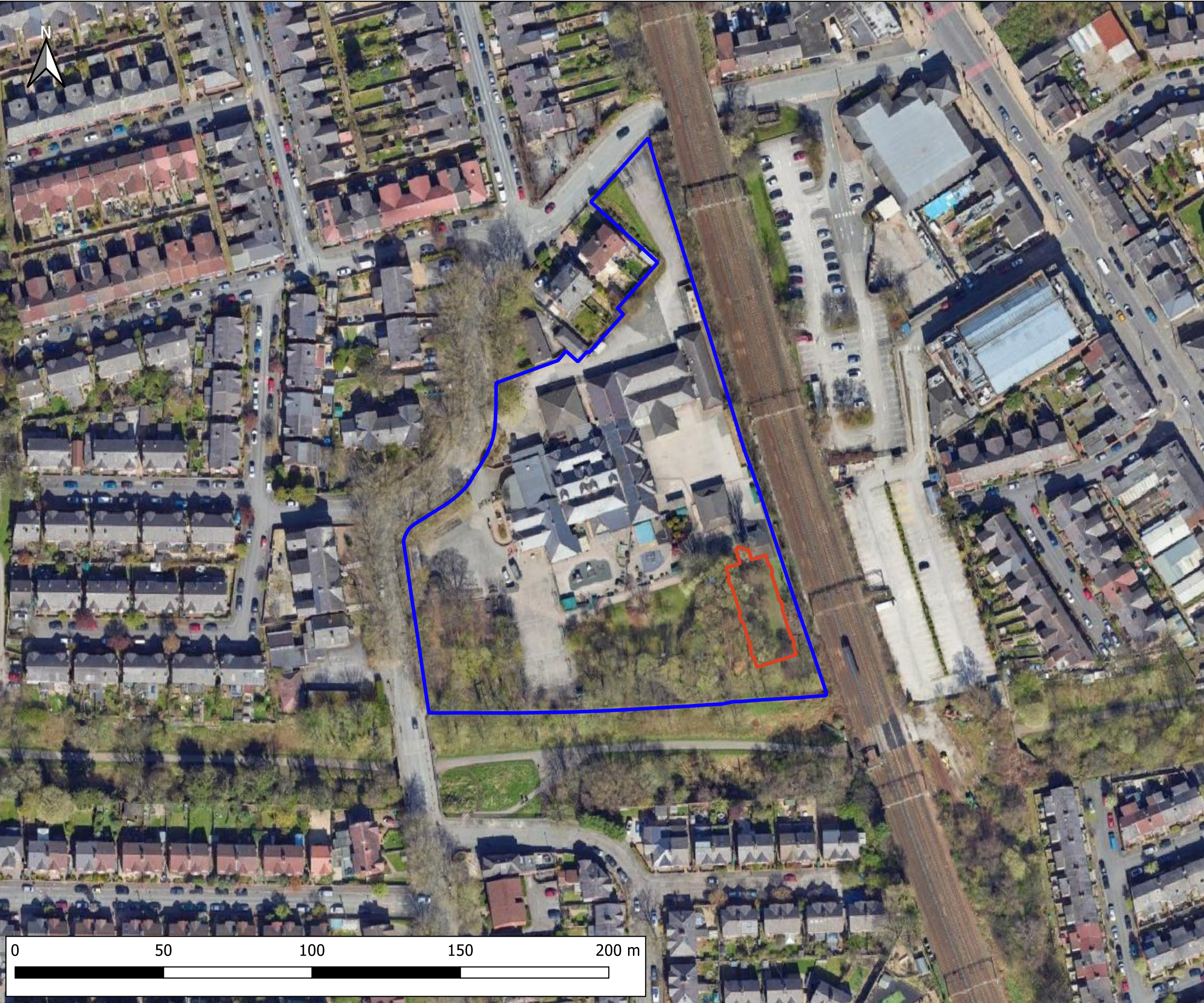
PLOT TITLE:

Location Plan

|              |  |            |  |
|--------------|--|------------|--|
| PLOT STATUS: |  | DATE:      |  |
| FINAL        |  | 02-04-2024 |  |

|        |          |           |                   |
|--------|----------|-----------|-------------------|
| DRAWN: | CHECKED: | APPROVED: | PLOT SCALE AT A3: |
| RM     | JR       | AW        | 1:1250            |

|                     |           |
|---------------------|-----------|
| PLOT NAME:          | REVISION: |
| 15818_Location_Plan | -         |



Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

**LEGEND**

- Site Boundary
- Land Under Client's Ownership



CLIENT:



SCHEME:

Alma Park School, Levenshulme

PLOT TITLE:

Aerial Plan

PLOT STATUS:

FINAL

DATE:

02-04-2024

DRAWN:

RM

CHECKED:

JR

APPROVED:

AW

PLOT SCALE AT A3:

1:1250

PLOT NAME:

15818\_Aerial\_Plan

REVISION:

-

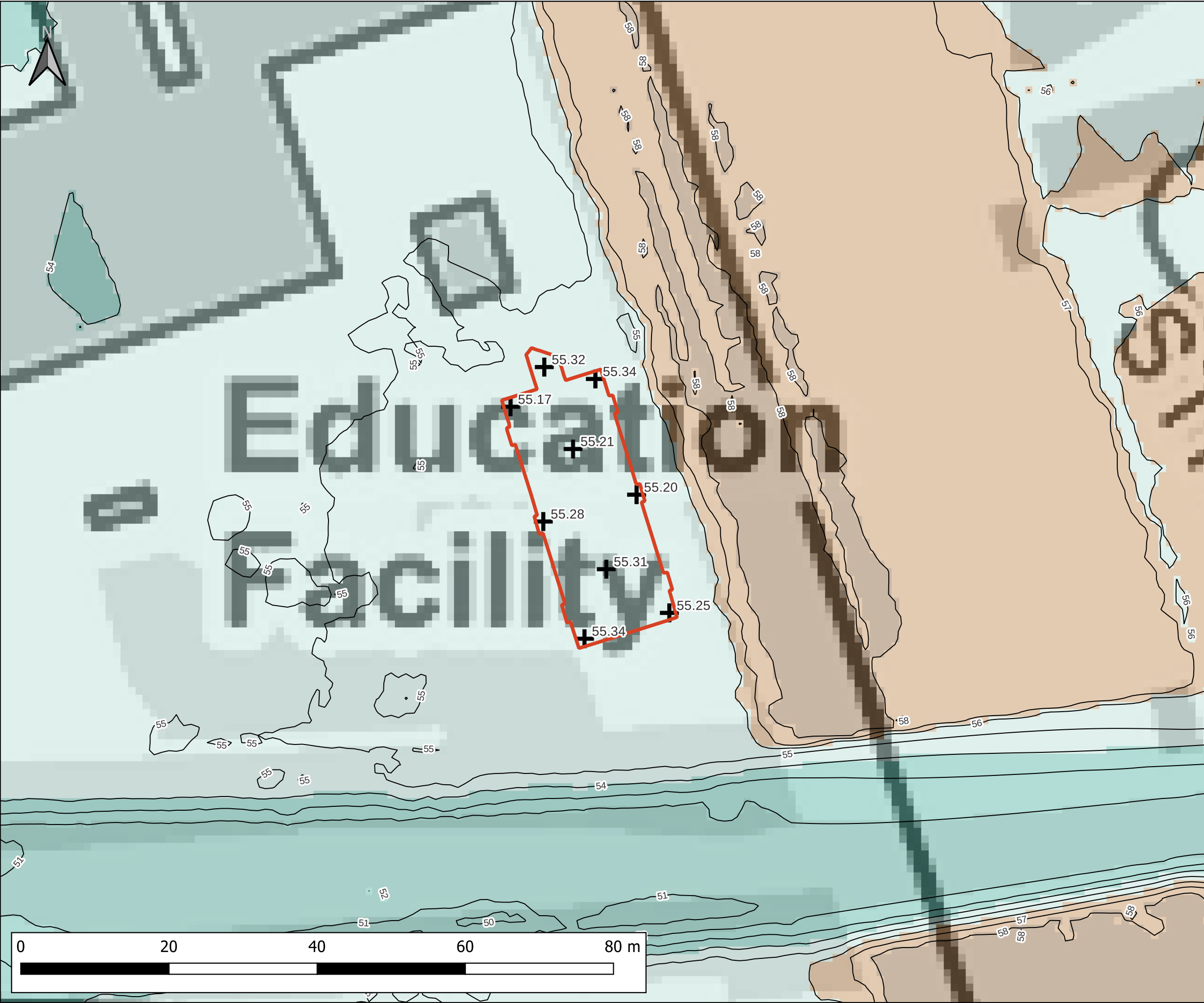
**Appendix B    Topographical Information**

The site plan illustrates the layout of Alma Park Primary School and its immediate surroundings. The school building is a large, grey-shaded structure with a central entrance labeled 'MAIN ENTRANCE'. To the north of the building is a 'PLAYGROUND' and a 'SCHOOL PARKING' area. To the east is another 'SCHOOL PARKING' area and a 'PLAYGROUND'. To the south are several 'PLAYGROUND' areas and a 'SOFT LANDSCAPING' area. A 'Cycle Way' runs along the bottom edge of the site. The school is bordered by 'ALMA ROAD' to the north and 'Ward Bay' to the west. A 'Subway (dis)' line runs along the east side of the school. A 'Store' is located to the northeast. The plan also shows various residential streets with house numbers (e.g., 18, 2, 10, 12, 14, 16, 20, 22, 28, 34, 36, 42, 44, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100) and other landmarks like 'El Sub Sta' and 'S Gaptry'.

N

A simple line drawing of a north arrow, consisting of a vertical line with a triangular arrowhead pointing upwards.

Unit 7 Whitegate Business Centre, Jardine Way, Oldham, OL9 9JT  
Email - [design@studio-ol3.co.uk](mailto:design@studio-ol3.co.uk) Web - [www.studio-ol3.co.uk](http://www.studio-ol3.co.uk)



Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

**LEGEND**

Site Boundary

Site Levels (m AOD)

Ground Elevations (m AOD)

<= 52

52 - 54

54 - 56

56 - 58

58 - 60

> 60



CLIENT:



**waterco**  
www.waterco.co.uk

SCHEME:

Alma Park School, Levenshulme

PLOT TITLE:

LiDAR Plan  
1m Resolution  
Data from Environment Agency

PLOT STATUS:

FINAL

DATE:

02-04-2024

DRAWN:

RM

CHECKED:

JR

APPROVED:

AW

PLOT SCALE AT A3:

1:500

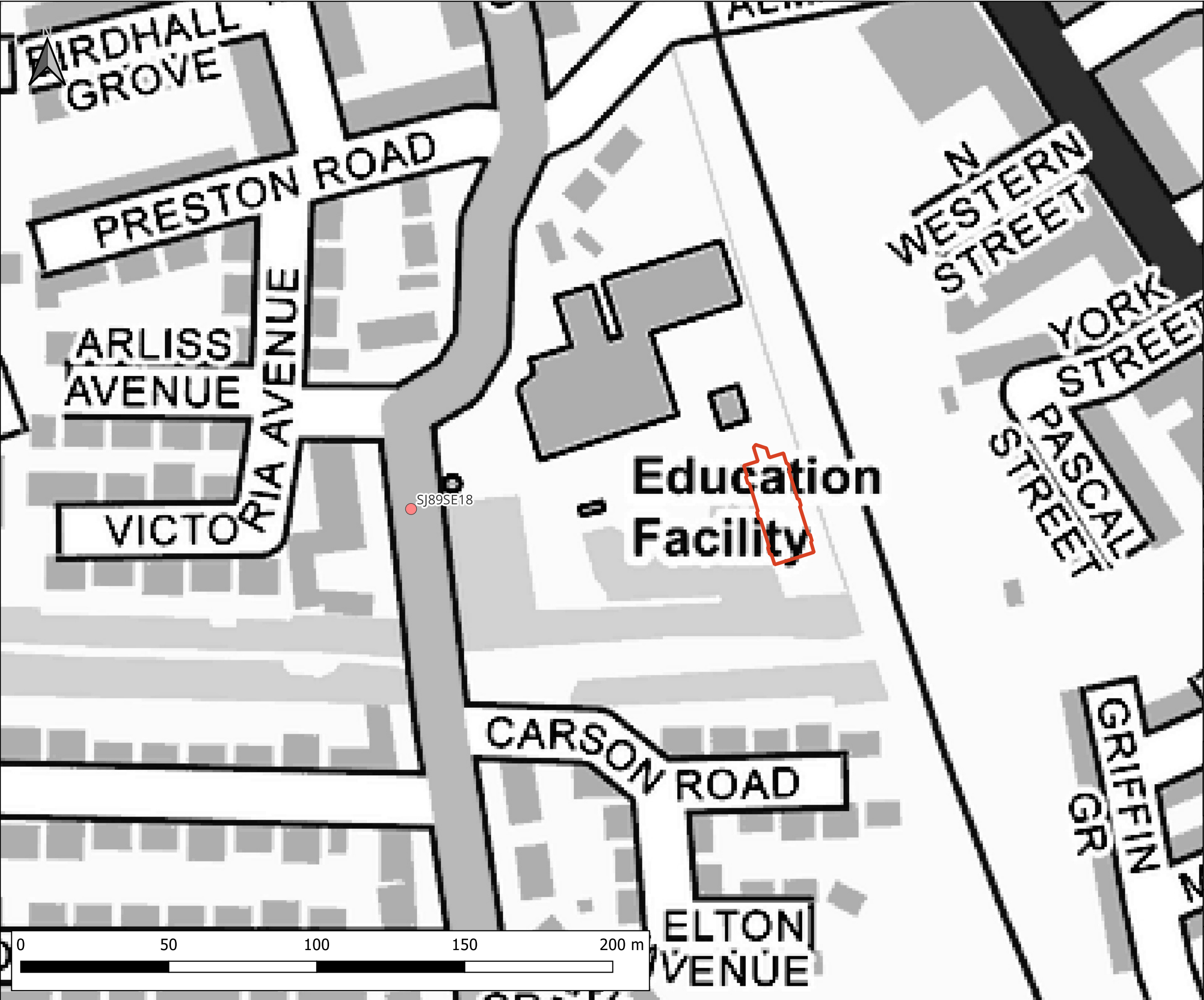
PLOT NAME:

15818\_LiDAR\_Plan

REVISION:

-

## **Appendix C    BGS Borehole Location Plan and Record**



Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

**LEGEND**

- Site Boundary
- BGS Borehole Location

CLIENT:

**waterco**  
www.waterco.co.uk

SCHEME:

Alma Park School, Levenshulme

PLOT TITLE:

Historical BGS Borehole Location Plan  
Data from British Geological Survey (BGS)

|              |  |            |  |
|--------------|--|------------|--|
| PLOT STATUS: |  | DATE:      |  |
| FINAL        |  | 02-04-2024 |  |

|        |          |           |                   |
|--------|----------|-----------|-------------------|
| DRAWN: | CHECKED: | APPROVED: | PLOT SCALE AT A3: |
| RM     | JR       | AW        | 1:1250            |

|                                  |           |
|----------------------------------|-----------|
| PLOT NAME:                       | REVISION: |
| 15818_BGS_Borehole_Location_Plan | -         |

G.S.M. Nos. 15-19

**GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.**

**SJ89SE**

County Lancs. on standard and -it maps

Manholes  along Marshall Road +  
~~BORE-SHAFT~~ Errwood Road Sewer, Levenshulme, Manchester 6-in. Map 111 NE GSM

Surface level Separately O.D. stated One-inch Map 85 + 98.

Communicated 8<sup>th</sup> June 1932 by City Engineer's Office, Manchester Corporation

Date of sinking 1931-2 Borer —

Specimens

| Description.                                                                                                    | THICKNESS. |         | DEPTH. |              |
|-----------------------------------------------------------------------------------------------------------------|------------|---------|--------|--------------|
|                                                                                                                 | Feet.      | Inches. | Feet.  | Inches.      |
| <u>Manhole 1.</u><br><u>N. end of Marshall Road, 168 ft. above O.D.</u>                                         |            |         |        | <u>metre</u> |
| <u>No. 15</u><br><b>15</b><br>Setts                                                                             | -          | 9       | -      | 9 0.23       |
| Soil                                                                                                            | 1          | 3       | 2      | - 0.61       |
| Yellow clay                                                                                                     | 2          | 3       | 4      | 3 1.30       |
| Hard blue clay                                                                                                  | 13         | 9       | 18     | - 5.49       |
| Red sandstone                                                                                                   | 9          | -       | 27     | - 8.23       |
| <u>Manhole 2.</u> <u>Midway down Marshall Road, 172½ ft. above O.D.</u>                                         |            |         |        |              |
| <u>No. 16</u><br><b>16</b><br>Setts + filling                                                                   | 1          | 6       | 1      | 6 0.46       |
| Yellow clay                                                                                                     | 2          | 6       | 4      | - 1.22       |
| Hard blue clay                                                                                                  | 13         | -       | 17     | - 5.18       |
| Red sandstone                                                                                                   | -          | -       | -      | -            |
| <u>Manhole 3.</u> <u>South end of Marshall Road 174½ ft. O.D.</u>                                               |            |         |        |              |
| <u>No. 17</u><br><b>17</b><br>Setts + filling                                                                   | 1          | 3       | 1      | 3 0.38       |
| Yellow clay                                                                                                     | 2          | 9       | 4      | - 1.22       |
| Hard blue clay                                                                                                  | 9          | 6       | 13     | 6 4.16       |
| Ballast                                                                                                         | 1          | 6       | 15     | - 4.57       |
| Fine dry sand + pebbles.                                                                                        | 13         | 6       | 28     | 6 8.69       |
| <u>Manhole 4.</u> <u>off Errwood Road 177 ft. O.D.</u>                                                          |            |         |        |              |
| <b>18</b><br>Soil                                                                                               | 2          | -       | 2      | - 0.61       |
| Hard blue clay                                                                                                  | 20         | -       | 22     | - 6.71       |
| Dark loamy sand.                                                                                                | 7          | 6       | 29     | 6 8.99       |
| <u>Manhole 5.</u> <u>South corner Errwood Road + railway.</u><br><u>158 ft. O.D. at base of 18 ft. cutting.</u> |            |         |        |              |
| <u>No. 19</u><br><b>19</b><br><u>Hard brown clay to depth of 7½ below floor of cutting.</u>                     |            |         |        |              |

(B12268) Wt 13119-0014 5000 9/27 Gp. 160 O.A.

SJ89/178A-E

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

Mandholes  
BORE-SHAFT along Marshall Road -  
Errwood Road Sewer, Levenshulme, Manchester

County Lancs.  
6-in. Map 111 NE<sup>E</sup>

GSM

Surface level Separately O.D. stated One-inch Map 8<sup>5</sup>+98  
Communicated 8<sup>th</sup> June 1932 by City Engineer's Office, Manchester Corporation.  
Date of sinking 1931-2 Borer —

Specimens

| Description.                                                                                                                                                                                                               | THICKNESS. |         | DEPTH. |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------|--------|---------|
|                                                                                                                                                                                                                            | Feet.      | Inches. | Feet.  | Inches. |
| <u>Mandhole 1.</u><br><u>A</u> <u>N. end of Marshall Road. 168 ft. above O.D.</u><br><u>No. 15</u><br><u>SJ 8725 9415</u>                                                                                                  |            |         |        |         |
| Setts                                                                                                                                                                                                                      | -          | 9       | -      | 9       |
| Soil                                                                                                                                                                                                                       | 1          | 3       | 2      | -       |
| Yellow clay                                                                                                                                                                                                                | 2          | 3       | 4      | 3       |
| Hard blue clay                                                                                                                                                                                                             | 13         | 9       | 18     | -       |
| Red sandstone                                                                                                                                                                                                              | 9          | -       | 27     | -       |
| <u>Mandhole 2.</u> <u>Midway down Marshall Road. 172 ft. above O.D.</u><br><u>No. 16</u><br><u>B</u> <u>SJ 8726 9405</u>                                                                                                   |            |         |        |         |
| Setts + filling                                                                                                                                                                                                            | 1          | 6       | 1      | 6       |
| Yellow clay                                                                                                                                                                                                                | 2          | 6       | 4      | -       |
| Hard blue clay                                                                                                                                                                                                             | 13         | -       | 17     | -       |
| Red sandstone.                                                                                                                                                                                                             | -          | -       | -      | -       |
| <u>Mandhole 3.</u> <u>South end of Marshall Road 174 ft. O.D.</u><br><u>No. 17</u><br><u>C</u> <u>SJ 8730 9395</u>                                                                                                         |            |         |        |         |
| Setts + filling                                                                                                                                                                                                            | 1          | 3       | 1      | 3       |
| Yellow clay                                                                                                                                                                                                                | 2          | 9       | 4      | -       |
| Hard blue clay                                                                                                                                                                                                             | 9          | 6       | 13     | 6       |
| Ballast                                                                                                                                                                                                                    | 1          | 6       | 15     | -       |
| Fine dry sand + pebbles.                                                                                                                                                                                                   | 13         | 6       | 28     | 6       |
| <u>Mandhole 4.</u> <u>Off Errwood Road 177 ft. O.D.</u><br><u>No. 18</u><br><u>D</u> <u>SJ 8725 9386</u>                                                                                                                   |            |         |        |         |
| Soil                                                                                                                                                                                                                       | 2          | -       | 2      | -       |
| Hard blue clay                                                                                                                                                                                                             | 20         | -       | 22     | -       |
| Dark loamy sand.                                                                                                                                                                                                           | 7          | 6       | 29     | 6       |
| <u>Mandhole 5.</u> <u>South corner Errwood Road + railway. 158 ft. O.D. at base of 13 ft. cutting.</u><br><u>No. 19</u><br><u>E</u> <u>SJ 8725 9376</u><br><u>Hard brown clay to depth of 7 ft. below foot of cutting.</u> |            |         |        |         |



381

Comes 11 NE / 15-19

## **Appendix D    UU Sewer Plan and Correspondence**

Waterco

Waterco  
lon parcwr,  
ruthin, denbighshire  
LL15 1nj

FAO:

**How to contact us:**

**United Utilities Water Limited  
Property Searches  
Haweswater House  
Lingley Mere Business Park  
Great Sankey  
Warrington  
WA5 3LP**

**Telephone: 0370 7510101**

**E-mail: [propertysearches@uuplc.co.uk](mailto:propertysearches@uuplc.co.uk)**

**Your Ref: 15818  
Our Ref: UUPS-ORD-549491  
Date: 19/02/2024**

**Dear Sirs**

**Location: 15818-Alma Park School Levenshulme**

I acknowledge with thanks your request dated 15/02/2024 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



Karen McCormack  
Property Searches Manager

## **TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS**

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

### **TERMS AND CONDITIONS:**

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



## Ryan Moore

---

**From:** seweradoptions@uuplc.co.uk  
**Sent:** 21 February 2024 14:56  
**To:** Jessica Roberts  
**Subject:** RE: 15818: Ref - 05327311 - Pre Developer Enquiry - Alma Park Primary School

**Caution:** This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Good Afternoon Jessica,

Thank you for your confirming the pitches are not soil, please see below.

### **UU REF 05327311 – WW PDE – Alma Park Primary School, Errwood Road, Manchester**

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

### **Surface Water**

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

*Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.*

This is outlined as follows, in order of priority:

- 1. into the ground (infiltration);**
- 2. to a surface waterbody;**
- 3. to a surface water sewer or highway drain;**
- 4. to a combined sewer.**

For guidance, The [North West SuDS Pro-Forma](#) provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Should the above be exhausted and a connection to the combined sewer is required I can confirm we would have no objections to a connection to the public 600dia combined sewer running through your site with a maximum pass forward flow rate of 5 l/s.

Please do contact me should you wish to discuss any further details or processes

Regards

Anthony



**Anthony Laithwaite**

Ww Engineer  
Developer Services & Metering  
Customer Services

**M:** 07880 298897  
unitedutilities.com

----- Original Message -----

**From:** seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]

**Sent:** 21/02/2024 13:54

**To:** jessica.roberts@waterco.co.uk

**Subject:** RE: 15818: Ref - 05327311 - Pre Developer Enquiry - Alma Park Primary School

Good Afternoon

Your enquiry has been logged and sent to our engineer Anthony Laithwaite. His contact number is 07880298897. Our service Level agreement is to respond to you on or before 6 March 2024.

Many thanks



**Jayne Guest**

Customer Advisor Advanced  
Developer Services & Metering  
Customer Services  
Tel: 0345 072 6067  
unitedutilities.com

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[developers/](#) or you can email us at  
[WastewaterDeveloperServices@uuplc.co.uk](mailto:WastewaterDeveloperServices@uuplc.co.uk)

----- Original Message -----

**From:** Jessica Roberts [jessica.roberts@waterco.co.uk]

**Sent:** 21/02/2024 13:40

**To:** seweradoptions@uuplc.co.uk

**Subject:** 15818: Ref - 05327311 - Pre Developer Enquiry - Alma Park Primary School

**UU REF 05327311 – WW PDE – Alma Park Primary School, Errwood Road, Manchester**

Good morning Anthony,

Many thanks for your prompt response in relation to the development located at the above address.

The sports pitch will be constructed with synthetic material with a sub-grade build up similar to that of a hardstanding yard. As such, the pitch will need a formal drainage system and won't be a grassed field. We therefore don't consider that the drainage will constitute land drainage.

Therefore, please can you provide us with an updated response based on the following approach:

We propose to attenuate surface water flows up to the 1 in 100 year + CC within the MOT sub-grade layer of the pitch. Water in the sub-grade would be collected by carrier drains to a flow control chamber which will limit flows to the 1 in 1 year greenfield runoff rate before discharging to the public sewer (in lieu of any alternative options for surface water disposal).

Please see attached pitch specification and sewer plan for your reference.

If you require anything further to process my request, then please don't hesitate to contact me.

Kind regards,

**Jessica Roberts** BSc (Hons) MCIWEM  
Senior Environmental Consultant

☎ 01244 734982

✉ jessica.roberts@waterco.co.uk

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---

**From:** seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>  
**Sent:** Friday, February 16, 2024 2:13 PM  
**To:** Jessica Roberts <jessica.roberts@waterco.co.uk>  
**Subject:** RE: Ref - 05327311 - Pre Developer Enquiry - Alma Park Primary School

**Caution:** This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Good Afternoon Jessica,

Thank you for your WW PDE, please see below:

**UU REF 05327311 – WW PDE – Alma Park Primary School, Errwood Road, Manchester**

I note your proposal is for sports pitches, please note United Utilities does not accept any form of land drainage to communicate with any public sewer and therefore you will need to look for an alternative method of surface water disposal.

Please contact me on my mobile should you wish to discuss.

Regards

Anthony



**Anthony Laithwaite**

Ww Engineer  
Developer Services & Metering  
Customer Services

**M:** 07880 298897  
unitedutilities.com

----- Original Message -----

**From:** [seweradoptions@uuplc.co.uk](mailto:seweradoptions@uuplc.co.uk) [seweradoptions@uuplc.co.uk]

**Sent:** 16/02/2024 14:10

**To:** [jessica.roberts@waterco.co.uk](mailto:jessica.roberts@waterco.co.uk)

**Subject:** Ref - 05327311 - Pre Developer Enquiry - Alma Park Primary School

Dear Jessica

**PRE DEVELOPMENT APPLICATION AT: Alma Park Primary School – UU Ref 05327311**

Please accept this email as receipt of your application received on 15 February 2024 for the above development. This has now been logged on our system and the job reference is 05327311 we would ask that you quote this reference in all future correspondence.

I have reviewed your application (and attachments) and can confirm this is suitable to be passed to Anthony Laithwaite for technical assessment. You will receive their response on or before 29 February 2024.

Kind regards



**Jayne Guest**

Customer Advisor Advanced  
Developer Services & Metering  
Customer Services  
Tel: 0345 072 6067  
unitedutilities.com

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click on the orange live chat box on our webpage  
and one of our advisors will be ready to chat to you  
and help you with your  
enquiry [https://www.unitedutilities.com/builders-  
developers/](https://www.unitedutilities.com/builders-developers/) or you can email us at

----- Original Message -----

**From:** Jessica Roberts [jessica.roberts@waterco.co.uk]

**Sent:** 15/02/2024 12:42

**To:** [wastewaterdeveloperservices@uuplc.co.uk](mailto:wastewaterdeveloperservices@uuplc.co.uk)

**Subject:** 15818-Pre Developer Enquiry

**Proposed development at Alma Park Primary School, Errwood Road, Levenshulme, Manchester, M19 2PF.**

Dear Sir/Madam,

We are currently preparing a Drainage Strategy for a site located at the above address, please can you provide us with your pre-developer advice (see completed form attached).

Development proposals are for 3no. MUGA pitches which are to be located on a parcel of existing school land which is currently laid to grass.

The site is underlain by Diamicton (likely clayey and as such the site is unlikely to be suitable for infiltration techniques. Therefore, we propose to utilise permeable surfacing, with storm water storage within the MOT layer before discharging to a flow control chamber onto the public sewer.

Please could you advise if this would be acceptable and if you have any discharge rate requirements. Furthermore, please can you advise if you have any further surface water drainage requirements.

If you have any questions or require any further information to process my request, please don't hesitate to contact me.

Kind Regards,

**Jessica Roberts** BSc (Hons) MCIWEM  
Senior Environmental Consultant

— 01244 734982  
— jessica.roberts@waterco.co.uk

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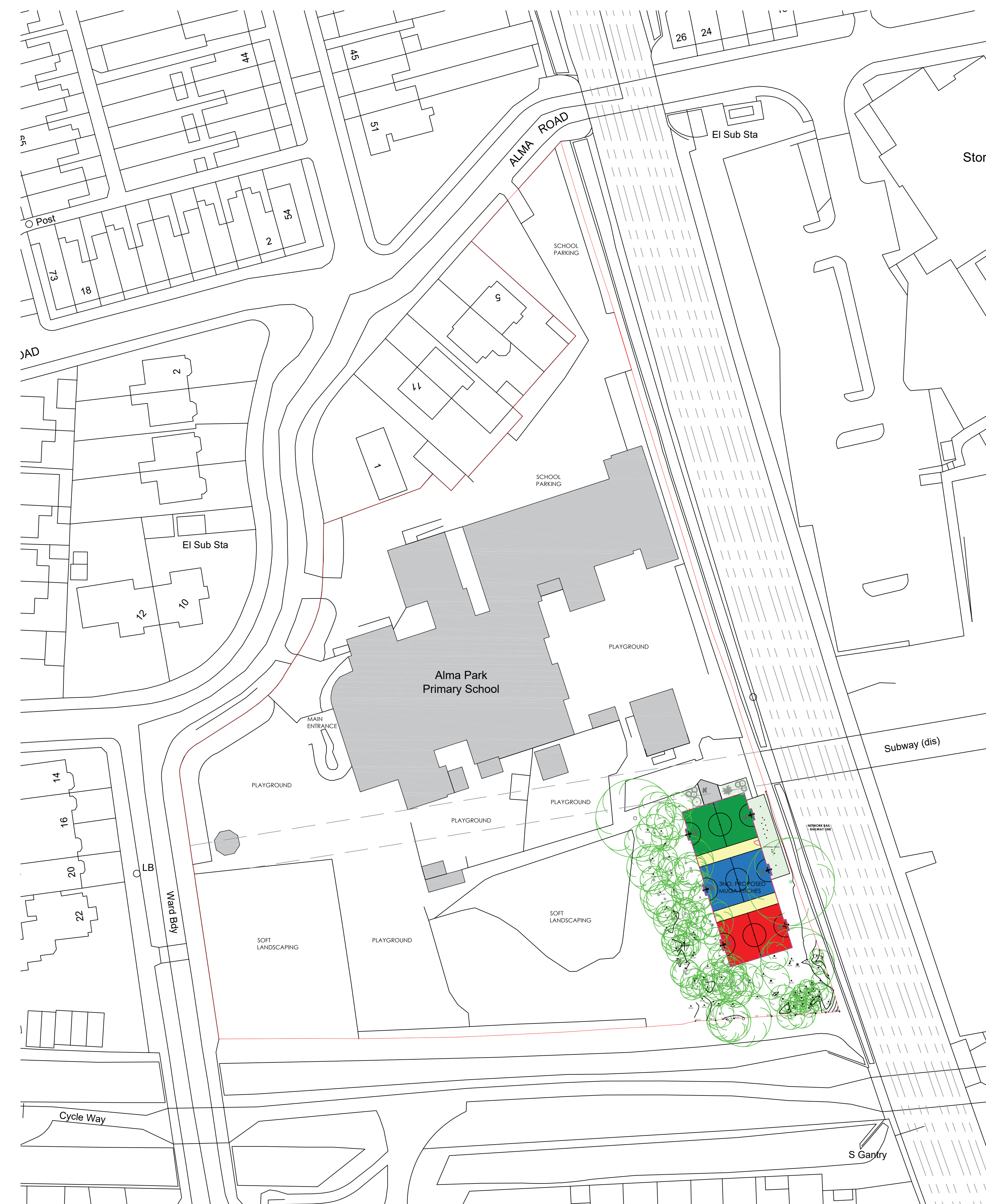
United Utilities Group PLC, Haweswater House, Lingley Mere  
Business Park, Lingley Green Avenue, Great Sankey,  
Warrington, WA5 3LP  
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**Appendix E    Existing and Proposed Development Plans**

PART SITE PLAN AS PROPOSED  
Scale - 1:100



BLOCK PLAN AS PROPOSED  
Scale - 1:500

### KEY

- 30m, 14m long x 10m wide MUGA pitches to be installed with multiple Macadam finish. The pitches will run off grass to be provided between pitches. 3m tall ball stop fencing to be installed to perimeter of proposed MUGA pitches to provide protection to adjacent Network Rail line from play equipment used within MUGA.
- Denotes proposed min. 3m tall ball stop fencing to perimeter of 30, proposed MUGA pitches / courts.
- Denotes proposed crunch and run football to be installed to provide pedestrian access between existing playground and MUGA pitches.
- Indicates location of proposed soft landscaping to provide natural boundary between existing playground and MUGA pitches and will provide improved visual aspect.
- Denotes existing soft play / artificial grass areas which is to be retained.

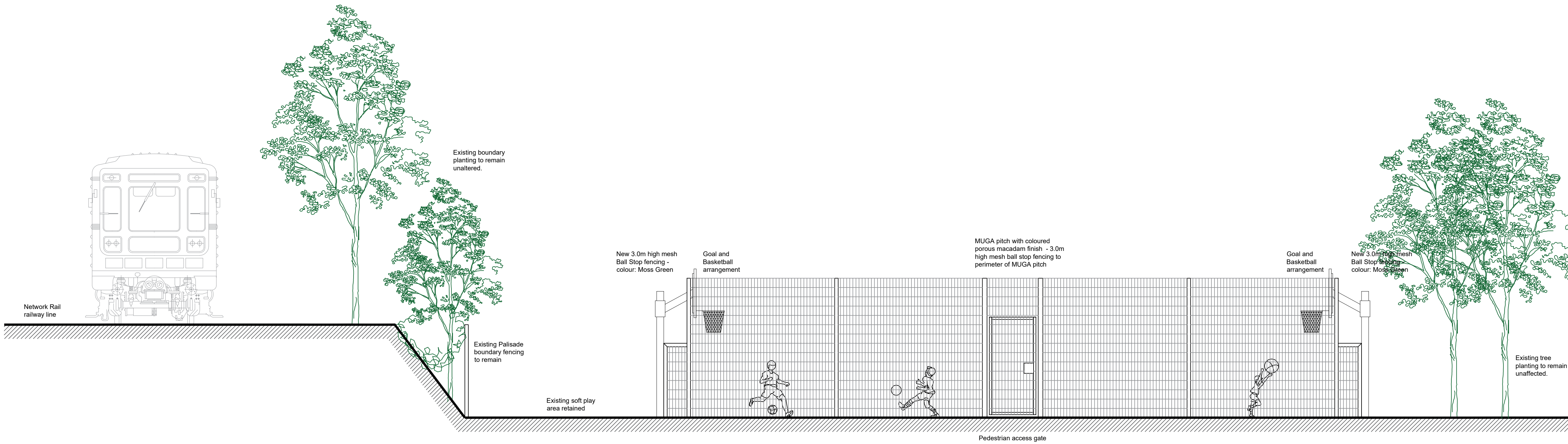
| No. | Date | Description | Issued by |
|-----|------|-------------|-----------|
|-----|------|-------------|-----------|

ALMA PARK PRIMARY SCHOOL,  
ERRWOOD ROAD, LEVENSHULME,  
MANCHESTER, M19 2PF

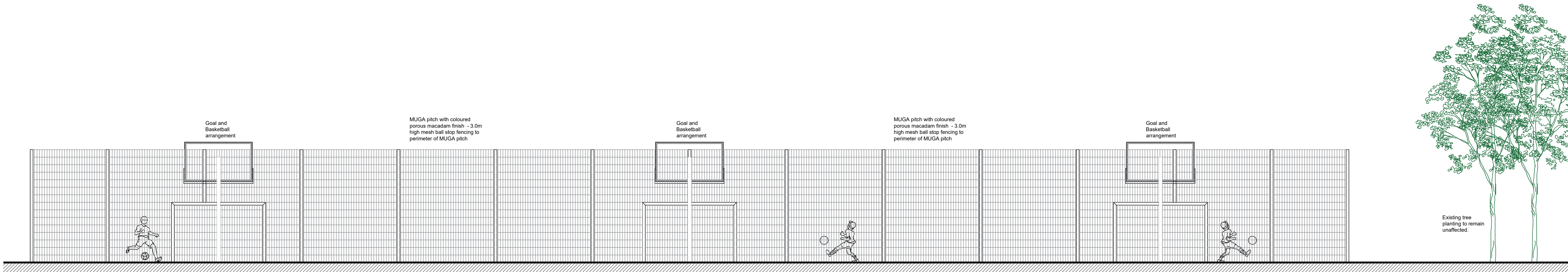
## PROPOSED MUGA PITCHES

PART SITE PLAN AS PROPOSED AND  
BLOCK PLAN AS PROPOSED

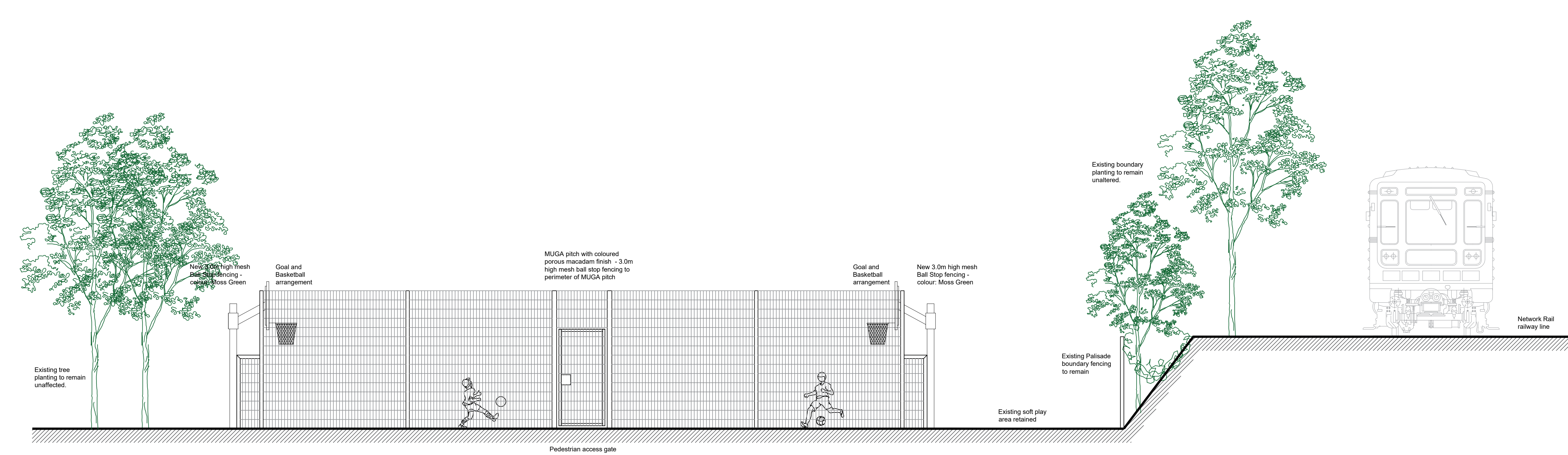
Project number 320-01  
 Date 03.01.2024  
 Drawn by DM  
 Checked by OL3 Scale @ A0 AS NOTED



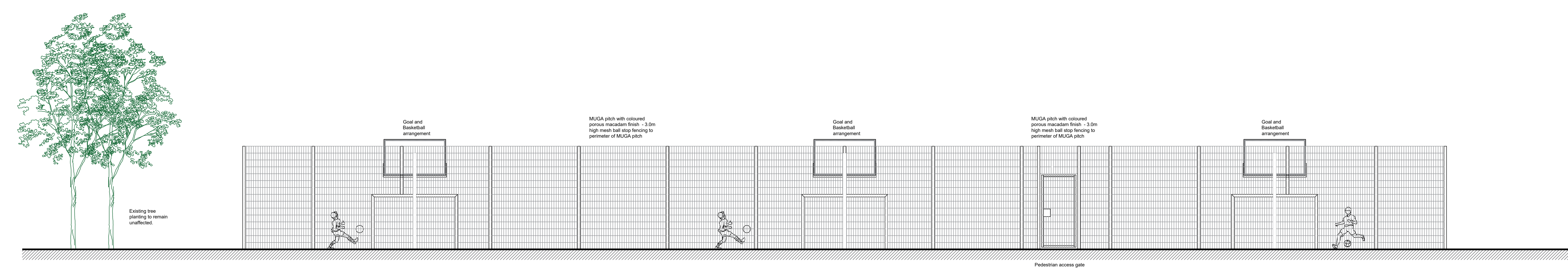
ELEVATION A - AS PROPOSED  
Scale - 1:50



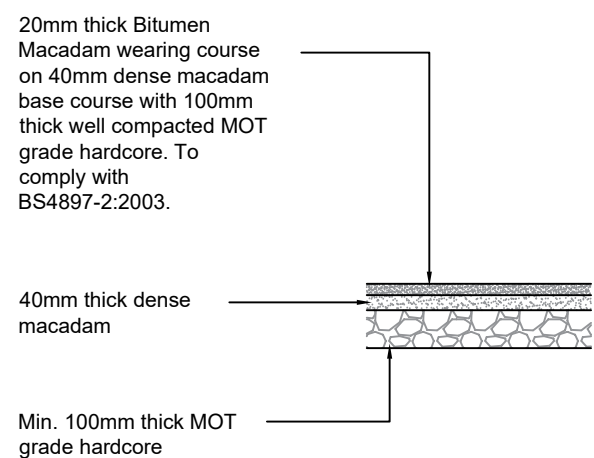
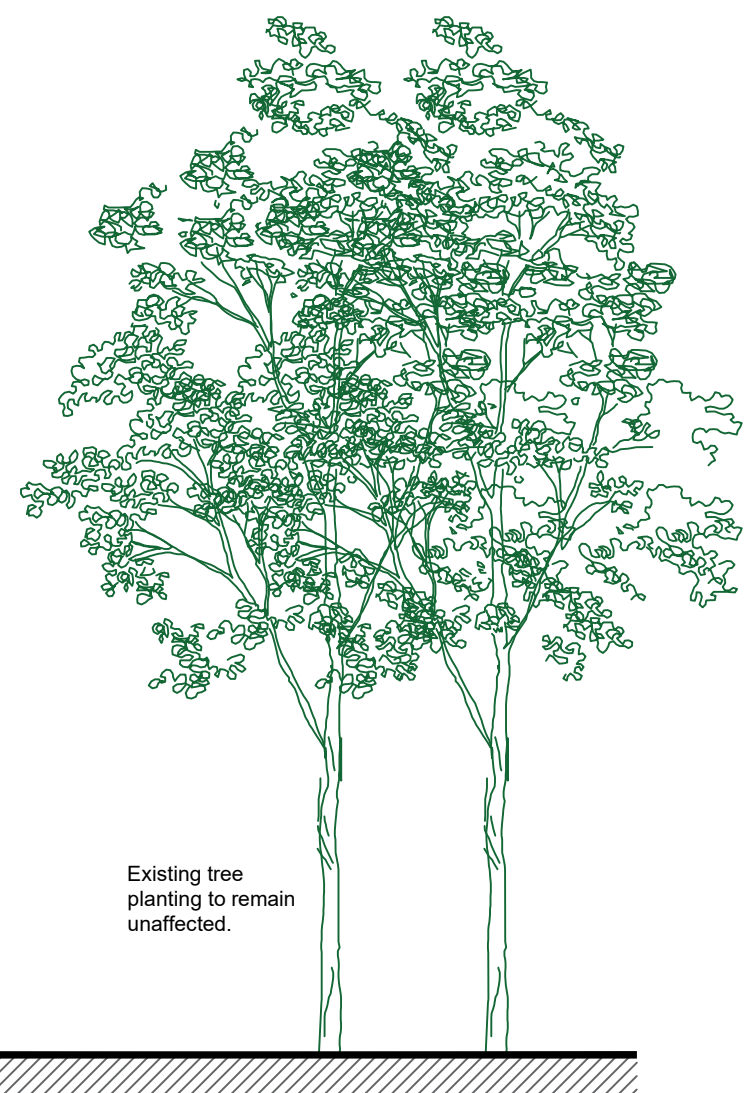
ELEVATION B - AS PROPOSED  
Scale - 1:50



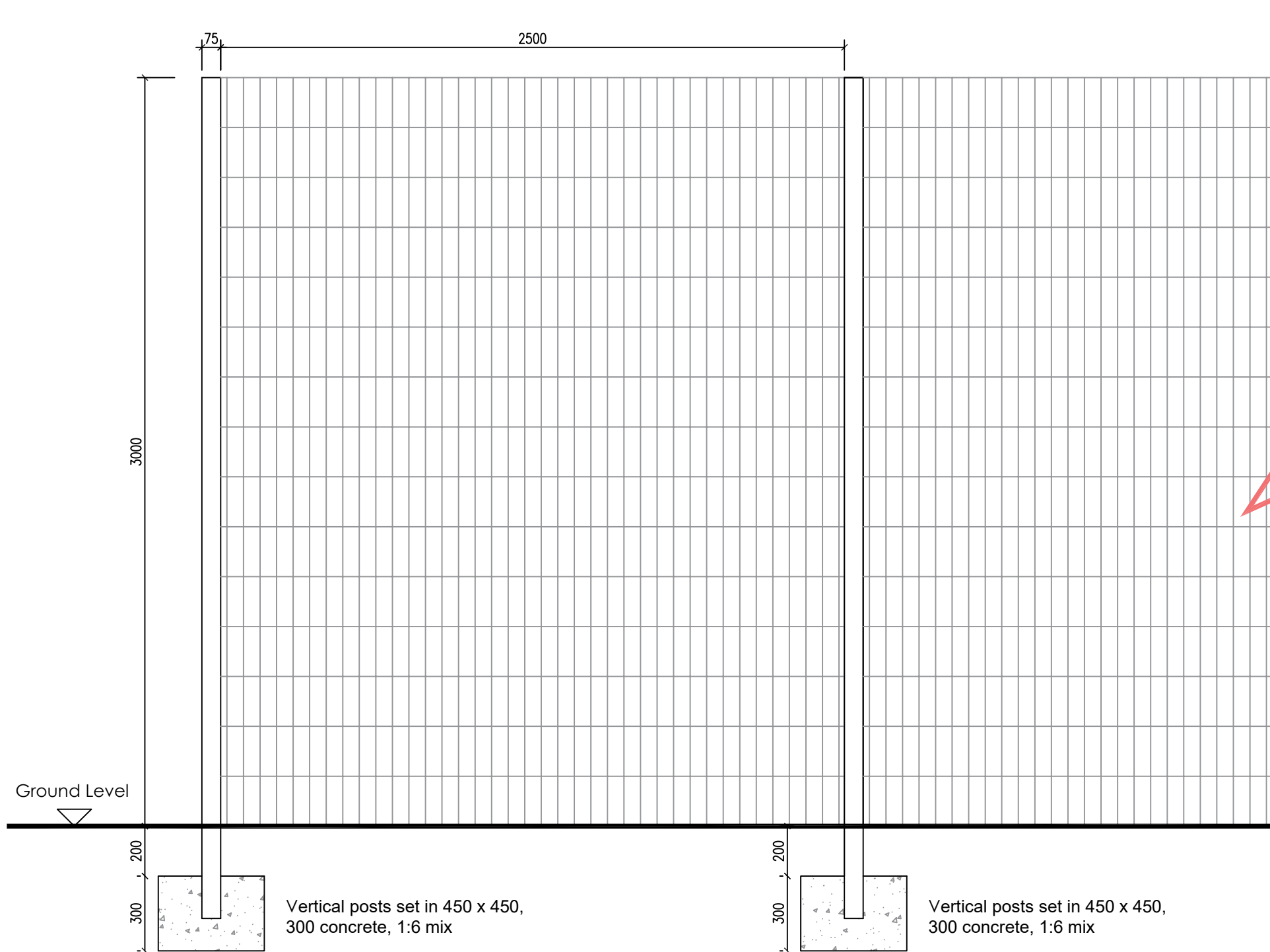
ELEVATION C - AS PROPOSED  
Scale - 1:50



ELEVATION D - AS PROPOSED  
Scale - 1:50



PROPOSED TYPICAL MACADAM BUILD UP DETAIL  
Scale - 1:20



PROPOSED TYPICAL 3.0M TALL BALL STOP FENCING ELEVATION  
Scale - 1:20

Specification

3.0m tall Ball Stop Fencing

Bottom 1.2m of mesh paneling which is exposed to most impact to be reinforced with rigid double horizontal wire at 66.3mm centres. Above 1.2m, 200mm x 50mm double wire provides containing boundary.  
3.0m high fence with 80 by 40mm post sections. Vertical infill section size of 6mm (wire size) and horizontal section size of twin 8mm wire diameter. Post centres 2.5 metres.  
Powder coated in RAL 6005 - Moss Green.  
Posts to have smooth pitch side appearance with use of discreet clamp fixing bars that attach directly to the mesh.  
Conforms to British Standard BS 1722 Part 14:2016  
Fence panel size of 3.03m height x 2.52m width.  
Supply of panels and posts inclusive of required fixings

No. Date Description Issued by

ALMA PARK PRIMARY SCHOOL,  
ERRWOOD ROAD, LEVENSHULME,  
MANCHESTER, M19 2PF

PROPOSED MUGA PITCHES

MUGA PITCH ELEVATIONS AS  
PROPOSED & TYPICAL DETAILS AS  
PROPOSED

Project number 328-01  
Date 03.01.2024  
Drawn by DM  
Checked by OL3 Scale @ A0 AS NOTED

P-03

STUDIO OL3  
ARCHITECTURAL DESIGN

Unit 7 Whitegate Business Centre, Jardine Way, Oldham, OL9 9JT  
Email - design@studio-ol3.co.uk Web - www.studio-ol3.co.uk

## **Appendix F    Greenfield Runoff Estimates**

| DOCUMENT VERIFICATION RECORD |                                       |
|------------------------------|---------------------------------------|
| <b>Project:</b>              | Alma Park Primary School, Levenshulme |
| <b>Client:</b>               | Alma Park Primary School              |
| <b>Report Title:</b>         | 15818-Drainage Strategy-01            |
| <b>Date:</b>                 | 3 <sup>rd</sup> of April 2024         |

| DOCUMENT REVIEW & APPROVAL |                                       |
|----------------------------|---------------------------------------|
| <b>Author:</b>             | Ryan Moore BSc (Hons)                 |
| <b>Checker:</b>            | Jessica Roberts BSc (Hons) MCIWEM     |
| <b>Approver:</b>           | Aled Williams BSc (Hons) MCIWEM C.WEM |

| ReFH2 RUNOFF RATES*   |                          |
|-----------------------|--------------------------|
| Return Period (Years) | As-rural Peak Flow (l/s) |
| 1                     | 0.36                     |
| 2                     | 0.41                     |
| 5                     | 0.6                      |
| 10                    | 0.73                     |
| 30                    | 0.95                     |
| 50                    | 1.06                     |
| 75                    | 1.15                     |
| 100                   | 1.22                     |
| 200                   | 1.41                     |
| 1000                  | 1.93                     |

\*Runoff Rates printed from the ReFH Flood Modelling software package

## **Appendix G    Attenuation Storage Estimate**

| Waterco Ltd                                                                                              |               |                     |                        |                   |                     |                                                                  | Page 1                                                                              |
|----------------------------------------------------------------------------------------------------------|---------------|---------------------|------------------------|-------------------|---------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Eden Court<br>Lon Parcwr Business Park<br>Denbighshire LL15 1NJ                                          |               |                     |                        |                   |                     | 15818<br>Attenuation Storage Estimates<br>1 in 100 Year + 45% CC |  |
| Date 27/03/2024<br>File 15818-Attenuation Stora...                                                       |               |                     |                        |                   |                     | Digned by RM<br>Checked by AW                                    |                                                                                     |
| XP Solutions                                                                                             |               |                     |                        |                   |                     | Source Control 2020.1.3                                          |                                                                                     |
| <p><u>Summary of Results for 100 year Return Period (+45%)</u></p> <p>Half Drain Time : 310 minutes.</p> |               |                     |                        |                   |                     |                                                                  |                                                                                     |
| Storm Event                                                                                              | Max Level (m) | Max Depth (m)       | Max Infiltration (l/s) | Max Control (l/s) | Max E Outflow (l/s) | Max Volume (m³)                                                  | Status                                                                              |
| 15 min Summer                                                                                            | 9.867         | 0.117               | 0.0                    | 1.0               | 1.0                 | 17.1                                                             | Flood Risk                                                                          |
| 30 min Summer                                                                                            | 9.907         | 0.157               | 0.0                    | 1.0               | 1.0                 | 23.1                                                             | Flood Risk                                                                          |
| 60 min Summer                                                                                            | 9.949         | 0.199               | 0.0                    | 1.0               | 1.0                 | 29.2                                                             | Flood Risk                                                                          |
| 120 min Summer                                                                                           | 9.977         | 0.227               | 0.0                    | 1.0               | 1.0                 | 33.3                                                             | Flood Risk                                                                          |
| 180 min Summer                                                                                           | 9.988         | 0.238               | 0.0                    | 1.0               | 1.0                 | 35.0                                                             | Flood Risk                                                                          |
| 240 min Summer                                                                                           | 9.992         | 0.242               | 0.0                    | 1.0               | 1.0                 | 35.5                                                             | Flood Risk                                                                          |
| 360 min Summer                                                                                           | 9.991         | 0.241               | 0.0                    | 1.0               | 1.0                 | 35.4                                                             | Flood Risk                                                                          |
| 480 min Summer                                                                                           | 9.988         | 0.238               | 0.0                    | 1.0               | 1.0                 | 35.0                                                             | Flood Risk                                                                          |
| 600 min Summer                                                                                           | 9.984         | 0.234               | 0.0                    | 1.0               | 1.0                 | 34.4                                                             | Flood Risk                                                                          |
| 720 min Summer                                                                                           | 9.979         | 0.229               | 0.0                    | 1.0               | 1.0                 | 33.7                                                             | Flood Risk                                                                          |
| 960 min Summer                                                                                           | 9.968         | 0.218               | 0.0                    | 1.0               | 1.0                 | 32.0                                                             | Flood Risk                                                                          |
| 1440 min Summer                                                                                          | 9.943         | 0.193               | 0.0                    | 1.0               | 1.0                 | 28.4                                                             | Flood Risk                                                                          |
| 2160 min Summer                                                                                          | 9.904         | 0.154               | 0.0                    | 1.0               | 1.0                 | 22.6                                                             | Flood Risk                                                                          |
| 2880 min Summer                                                                                          | 9.871         | 0.121               | 0.0                    | 1.0               | 1.0                 | 17.8                                                             | Flood Risk                                                                          |
| 4320 min Summer                                                                                          | 9.829         | 0.079               | 0.0                    | 1.0               | 1.0                 | 11.6                                                             | Flood Risk                                                                          |
| 5760 min Summer                                                                                          | 9.812         | 0.062               | 0.0                    | 0.9               | 0.9                 | 9.1                                                              | Flood Risk                                                                          |
| 7200 min Summer                                                                                          | 9.803         | 0.053               | 0.0                    | 0.8               | 0.8                 | 7.8                                                              | Flood Risk                                                                          |
| 8640 min Summer                                                                                          | 9.798         | 0.048               | 0.0                    | 0.7               | 0.7                 | 7.0                                                              | Flood Risk                                                                          |
| Storm Event                                                                                              | Rain (mm/hr)  | Flooded Volume (m³) | Discharge Volume (m³)  | Time-Peak (mins)  |                     |                                                                  |                                                                                     |
| 15 min Summer                                                                                            | 154.619       | 0.0                 | 17.6                   | 16                |                     |                                                                  |                                                                                     |
| 30 min Summer                                                                                            | 102.466       | 0.0                 | 24.1                   | 31                |                     |                                                                  |                                                                                     |
| 60 min Summer                                                                                            | 64.984        | 0.0                 | 31.2                   | 62                |                     |                                                                  |                                                                                     |
| 120 min Summer                                                                                           | 38.805        | 0.0                 | 37.7                   | 120               |                     |                                                                  |                                                                                     |
| 180 min Summer                                                                                           | 28.524        | 0.0                 | 41.8                   | 180               |                     |                                                                  |                                                                                     |
| 240 min Summer                                                                                           | 22.864        | 0.0                 | 44.8                   | 240               |                     |                                                                  |                                                                                     |
| 360 min Summer                                                                                           | 16.666        | 0.0                 | 49.1                   | 302               |                     |                                                                  |                                                                                     |
| 480 min Summer                                                                                           | 13.294        | 0.0                 | 52.3                   | 362               |                     |                                                                  |                                                                                     |
| 600 min Summer                                                                                           | 11.148        | 0.0                 | 54.9                   | 428               |                     |                                                                  |                                                                                     |
| 720 min Summer                                                                                           | 9.651         | 0.0                 | 57.0                   | 496               |                     |                                                                  |                                                                                     |
| 960 min Summer                                                                                           | 7.684         | 0.0                 | 60.5                   | 634               |                     |                                                                  |                                                                                     |
| 1440 min Summer                                                                                          | 5.572         | 0.0                 | 65.6                   | 908               |                     |                                                                  |                                                                                     |
| 2160 min Summer                                                                                          | 4.043         | 0.0                 | 71.0                   | 1296              |                     |                                                                  |                                                                                     |
| 2880 min Summer                                                                                          | 3.224         | 0.0                 | 75.0                   | 1648              |                     |                                                                  |                                                                                     |
| 4320 min Summer                                                                                          | 2.352         | 0.0                 | 81.1                   | 2332              |                     |                                                                  |                                                                                     |
| 5760 min Summer                                                                                          | 1.887         | 0.0                 | 85.9                   | 3000              |                     |                                                                  |                                                                                     |
| 7200 min Summer                                                                                          | 1.598         | 0.0                 | 89.9                   | 3680              |                     |                                                                  |                                                                                     |
| 8640 min Summer                                                                                          | 1.398         | 0.0                 | 93.4                   | 4416              |                     |                                                                  |                                                                                     |
| ©1982-2020 Innovyze                                                                                      |               |                     |                        |                   |                     |                                                                  |                                                                                     |

|                                                      |               |                               |                        |                                                                                     |                     |                 |            |
|------------------------------------------------------|---------------|-------------------------------|------------------------|-------------------------------------------------------------------------------------|---------------------|-----------------|------------|
| Waterco Ltd                                          |               | Page 2                        |                        |                                                                                     |                     |                 |            |
| Eden Court                                           |               | 15818                         |                        |  |                     |                 |            |
| Lon Parcwr Business Park                             |               | Attenuation Storage Estimates |                        |                                                                                     |                     |                 |            |
| Denbighshire LL15 1NJ                                |               | 1 in 100 Year + 45% CC        |                        |                                                                                     |                     |                 |            |
| Date 27/03/2024                                      |               | Designed by RM                |                        |                                                                                     |                     |                 |            |
| File 15818-Attenuation Stora...                      |               | Checked by AW                 |                        |                                                                                     |                     |                 |            |
| XP Solutions                                         |               | Source Control 2020.1.3       |                        |                                                                                     |                     |                 |            |
| Summary of Results for 100 year Return Period (+45%) |               |                               |                        |                                                                                     |                     |                 |            |
| Storm Event                                          | Max Level (m) | Max Depth (m)                 | Max Infiltration (l/s) | Max Control (l/s)                                                                   | Max Σ Outflow (l/s) | Max Volume (m³) | Status     |
| 10080 min Summer                                     | 9.794         | 0.044                         | 0.0                    | 0.7                                                                                 | 0.7                 | 6.4             | Flood Risk |
| 15 min Winter                                        | 9.867         | 0.117                         | 0.0                    | 1.0                                                                                 | 1.0                 | 17.1            | Flood Risk |
| 30 min Winter                                        | 9.907         | 0.157                         | 0.0                    | 1.0                                                                                 | 1.0                 | 23.1            | Flood Risk |
| 60 min Winter                                        | 9.948         | 0.198                         | 0.0                    | 1.0                                                                                 | 1.0                 | 29.1            | Flood Risk |
| 120 min Winter                                       | 9.977         | 0.227                         | 0.0                    | 1.0                                                                                 | 1.0                 | 33.3            | Flood Risk |
| 180 min Winter                                       | 9.988         | 0.238                         | 0.0                    | 1.0                                                                                 | 1.0                 | 35.0            | Flood Risk |
| 240 min Winter                                       | 9.992         | 0.242                         | 0.0                    | 1.0                                                                                 | 1.0                 | 35.6            | Flood Risk |
| 360 min Winter                                       | 9.990         | 0.240                         | 0.0                    | 1.0                                                                                 | 1.0                 | 35.3            | Flood Risk |
| 480 min Winter                                       | 9.985         | 0.235                         | 0.0                    | 1.0                                                                                 | 1.0                 | 34.5            | Flood Risk |
| 600 min Winter                                       | 9.979         | 0.229                         | 0.0                    | 1.0                                                                                 | 1.0                 | 33.6            | Flood Risk |
| 720 min Winter                                       | 9.971         | 0.221                         | 0.0                    | 1.0                                                                                 | 1.0                 | 32.5            | Flood Risk |
| 960 min Winter                                       | 9.954         | 0.204                         | 0.0                    | 1.0                                                                                 | 1.0                 | 30.0            | Flood Risk |
| 1440 min Winter                                      | 9.914         | 0.164                         | 0.0                    | 1.0                                                                                 | 1.0                 | 24.0            | Flood Risk |
| 2160 min Winter                                      | 9.859         | 0.109                         | 0.0                    | 1.0                                                                                 | 1.0                 | 16.0            | Flood Risk |
| 2880 min Winter                                      | 9.824         | 0.074                         | 0.0                    | 1.0                                                                                 | 1.0                 | 10.9            | Flood Risk |
| 4320 min Winter                                      | 9.803         | 0.053                         | 0.0                    | 0.8                                                                                 | 0.8                 | 7.7             | Flood Risk |
| 5760 min Winter                                      | 9.793         | 0.043                         | 0.0                    | 0.7                                                                                 | 0.7                 | 6.3             | Flood Risk |
| 7200 min Winter                                      | 9.788         | 0.038                         | 0.0                    | 0.6                                                                                 | 0.6                 | 5.5             | Flood Risk |
| 8640 min Winter                                      | 9.784         | 0.034                         | 0.0                    | 0.5                                                                                 | 0.5                 | 5.0             | Flood Risk |
| Storm Event                                          | Rain (mm/hr)  | Flooded Volume (m³)           | Discharge Volume (m³)  | Time-Peak (mins)                                                                    |                     |                 |            |
| 10080 min Summer                                     | 1.251         | 0.0                           | 96.5                   | 5144                                                                                |                     |                 |            |
| 15 min Winter                                        | 154.619       | 0.0                           | 17.6                   | 16                                                                                  |                     |                 |            |
| 30 min Winter                                        | 102.466       | 0.0                           | 24.1                   | 31                                                                                  |                     |                 |            |
| 60 min Winter                                        | 64.984        | 0.0                           | 31.2                   | 60                                                                                  |                     |                 |            |
| 120 min Winter                                       | 38.805        | 0.0                           | 37.7                   | 118                                                                                 |                     |                 |            |
| 180 min Winter                                       | 28.524        | 0.0                           | 41.8                   | 176                                                                                 |                     |                 |            |
| 240 min Winter                                       | 22.864        | 0.0                           | 44.8                   | 230                                                                                 |                     |                 |            |
| 360 min Winter                                       | 16.666        | 0.0                           | 49.1                   | 332                                                                                 |                     |                 |            |
| 480 min Winter                                       | 13.294        | 0.0                           | 52.3                   | 376                                                                                 |                     |                 |            |
| 600 min Winter                                       | 11.148        | 0.0                           | 54.9                   | 452                                                                                 |                     |                 |            |
| 720 min Winter                                       | 9.651         | 0.0                           | 57.0                   | 528                                                                                 |                     |                 |            |
| 960 min Winter                                       | 7.684         | 0.0                           | 60.5                   | 682                                                                                 |                     |                 |            |
| 1440 min Winter                                      | 5.572         | 0.0                           | 65.6                   | 966                                                                                 |                     |                 |            |
| 2160 min Winter                                      | 4.043         | 0.0                           | 71.0                   | 1320                                                                                |                     |                 |            |
| 2880 min Winter                                      | 3.224         | 0.0                           | 75.1                   | 1616                                                                                |                     |                 |            |
| 4320 min Winter                                      | 2.352         | 0.0                           | 81.2                   | 2292                                                                                |                     |                 |            |
| 5760 min Winter                                      | 1.887         | 0.0                           | 85.9                   | 2992                                                                                |                     |                 |            |
| 7200 min Winter                                      | 1.598         | 0.0                           | 90.0                   | 3680                                                                                |                     |                 |            |
| 8640 min Winter                                      | 1.398         | 0.0                           | 93.5                   | 4480                                                                                |                     |                 |            |
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|                                                                 |                     |                     |                                                                  |                             |                           |                       |                                                                                     |
|-----------------------------------------------------------------|---------------------|---------------------|------------------------------------------------------------------|-----------------------------|---------------------------|-----------------------|-------------------------------------------------------------------------------------|
| Waterco Ltd                                                     |                     |                     |                                                                  |                             |                           |                       | Page 3                                                                              |
| Eden Court<br>Lon Parcwr Business Park<br>Denbighshire LL15 1NJ |                     |                     | 15818<br>Attenuation Storage Estimates<br>1 in 100 Year + 45% CC |                             |                           |                       |  |
| Date 27/03/2024<br>File 15818-Attenuation Stora...              |                     |                     | Designed by RM<br>Checked by AW                                  |                             |                           |                       |                                                                                     |
| XP Solutions                                                    |                     |                     | Source Control 2020.1.3                                          |                             |                           |                       |                                                                                     |
| <u>Summary of Results for 100 year Return Period (+45%)</u>     |                     |                     |                                                                  |                             |                           |                       |                                                                                     |
| Storm<br>Event                                                  | Max<br>Level<br>(m) | Max<br>Depth<br>(m) | Max<br>Infiltration<br>(l/s)                                     | Max<br>Control<br>(l/s)     | Max<br>Σ Outflow<br>(l/s) | Max<br>Volume<br>(m³) | Status                                                                              |
| 10080 min Winter                                                | 9.781               | 0.031               | 0.0                                                              | 0.4                         | 0.4                       | 4.6                   | Flood Risk                                                                          |
| Storm<br>Event                                                  |                     | Rain<br>(mm/hr)     | Flooded<br>Volume<br>(m³)                                        | Discharge<br>Volume<br>(m³) | Time-Peak<br>(mins)       |                       |                                                                                     |
| 10080 min Winter                                                |                     | 1.251               | 0.0                                                              | 96.6                        | 5144                      |                       |                                                                                     |
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|                                 |                               |                                                                                     |
|---------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| Waterco Ltd                     |                               | Page 4                                                                              |
| Eden Court                      | 15818                         |  |
| Lon Parcwr Business Park        | Attenuation Storage Estimates |                                                                                     |
| Denbighshire LL15 1NJ           | 1 in 100 Year + 45% CC        |                                                                                     |
| Date 27/03/2024                 | Designed by RM                |                                                                                     |
| File 15818-Attenuation Stora... | Checked by AW                 |                                                                                     |
| XP Solutions                    |                               | Source Control 2020.1.3                                                             |

Rainfall Details

|                                               |       |
|-----------------------------------------------|-------|
| Rainfall Model                                | FEH   |
| Return Period (years)                         | 100   |
| FEH Rainfall Version                          | 2013  |
| Site Location GB 387373 393815 SJ 87373 93815 |       |
| Data Type                                     | Point |
| Summer Storms                                 | Yes   |
| Winter Storms                                 | Yes   |
| Cv (Summer)                                   | 1.000 |
| Cv (Winter)                                   | 1.000 |
| Shortest Storm (mins)                         | 15    |
| Longest Storm (mins)                          | 10080 |
| Climate Change %                              | +45   |

Time Area Diagram

Total Area (ha) 0.052

| Time (mins) | Area     |
|-------------|----------|
| From:       | To: (ha) |
| 0           | 1 0.052  |

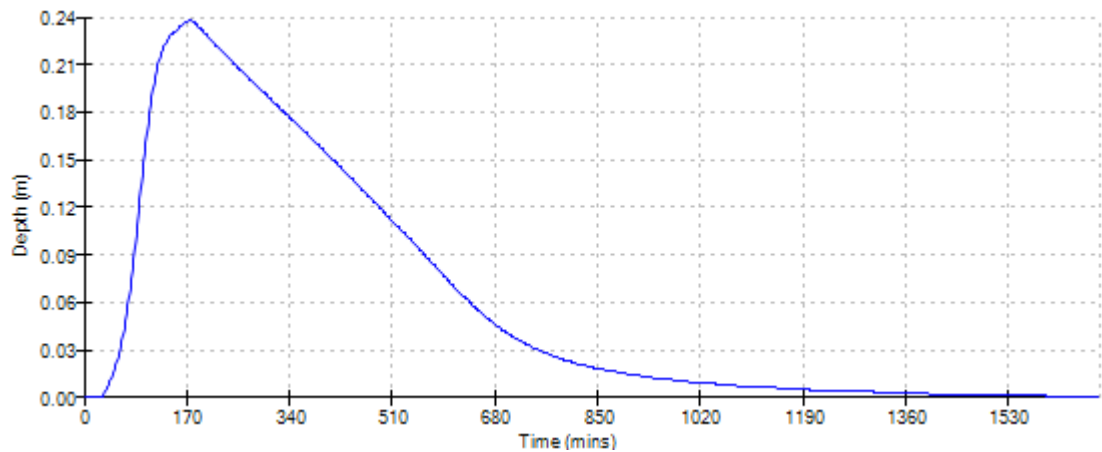
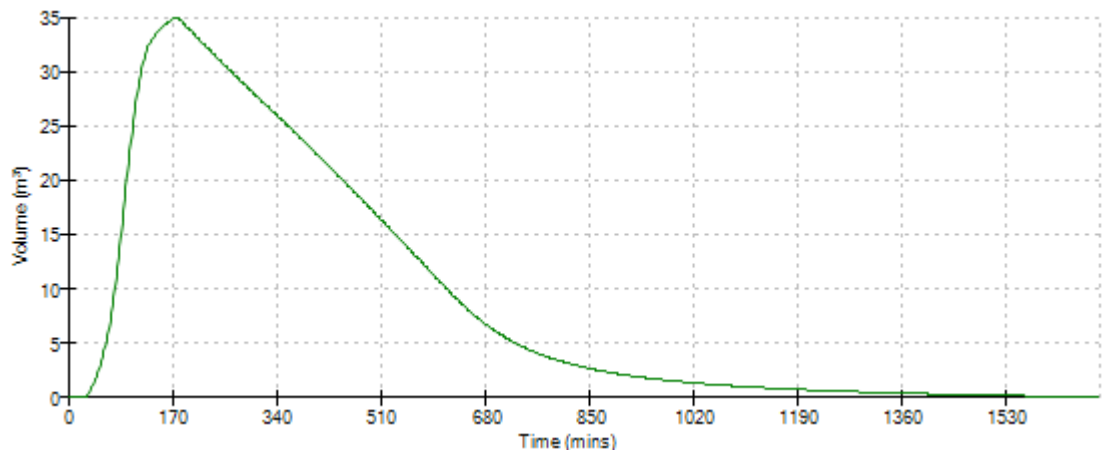
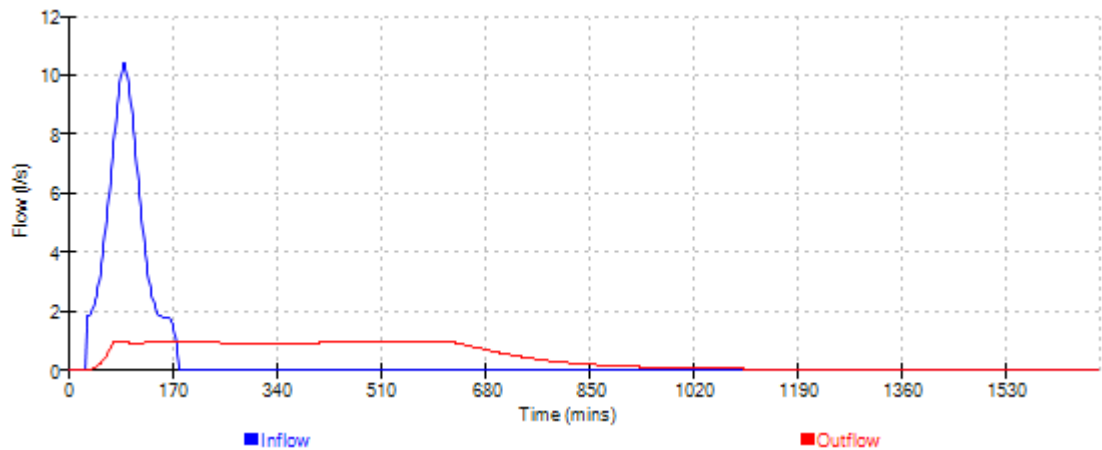
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                               |                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| Waterco Ltd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                               | Page 5                                                                              |
| Eden Court                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15818                         |  |
| Lon Parcwr Business Park                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Attenuation Storage Estimates |                                                                                     |
| Denbighshire LL15 1NJ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1 in 100 Year + 45% CC        |                                                                                     |
| Date 27/03/2024                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Designed by RM                |                                                                                     |
| File 15818-Attenuation Stora...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Checked by AW                 |                                                                                     |
| XP Solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | Source Control 2020.1.3                                                             |
| <div>Model Details</div> <div>Storage is Online Cover Level (m) 10.000</div> <div>Porous Car Park Structure</div> <div>Infiltration Coefficient Base (m/hr) 0.00000<br/>Membrane Percolation (mm/hr) 1000<br/>Max Percolation (l/s) 136.1<br/>Safety Factor 2.0<br/>Porosity 0.30<br/>Invert Level (m) 9.750<br/>Width (m) 14.0<br/>Length (m) 35.0<br/>Slope (1:X) 100000.0<br/>Depression Storage (mm) 5<br/>Evaporation (mm/day) 3<br/>Membrane Depth (m) 0</div> <div>Hydro-Brake® Optimum Outflow Control</div> <div>Unit Reference MD-SHE-0057-1000-0250-1000<br/>Design Head (m) 0.250<br/>Design Flow (l/s) 1.0<br/>Flush-Flo™ Calculated<br/>Objective Minimise upstream storage<br/>Application Surface<br/>Sump Available Yes<br/>Diameter (mm) 57<br/>Invert Level (m) 9.745<br/>Minimum Outlet Pipe Diameter (mm) 75<br/>Suggested Manhole Diameter (mm) 1200</div> <div>Control PointsHead (m)Flow (l/s)</div> <div>Design Point (Calculated) 0.250 1.0<br/>Flush-Flo™ 0.080 1.0<br/>Kick-Flo® 0.184 0.9<br/>Mean Flow over Head Range - 0.8</div> <div>The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated</div> <div>Depth (m)Flow (l/s)Depth (m)Flow (l/s)Depth (m)Flow (l/s)</div> <div>0.100 1.00.500 1.41.200 2.0<br/>0.200 0.90.600 1.51.400 2.2<br/>0.300 1.10.800 1.71.600 2.3<br/>0.400 1.21.000 1.91.800 2.4</div> <div>©1982-2020 Innovyze</div> |                               |                                                                                     |

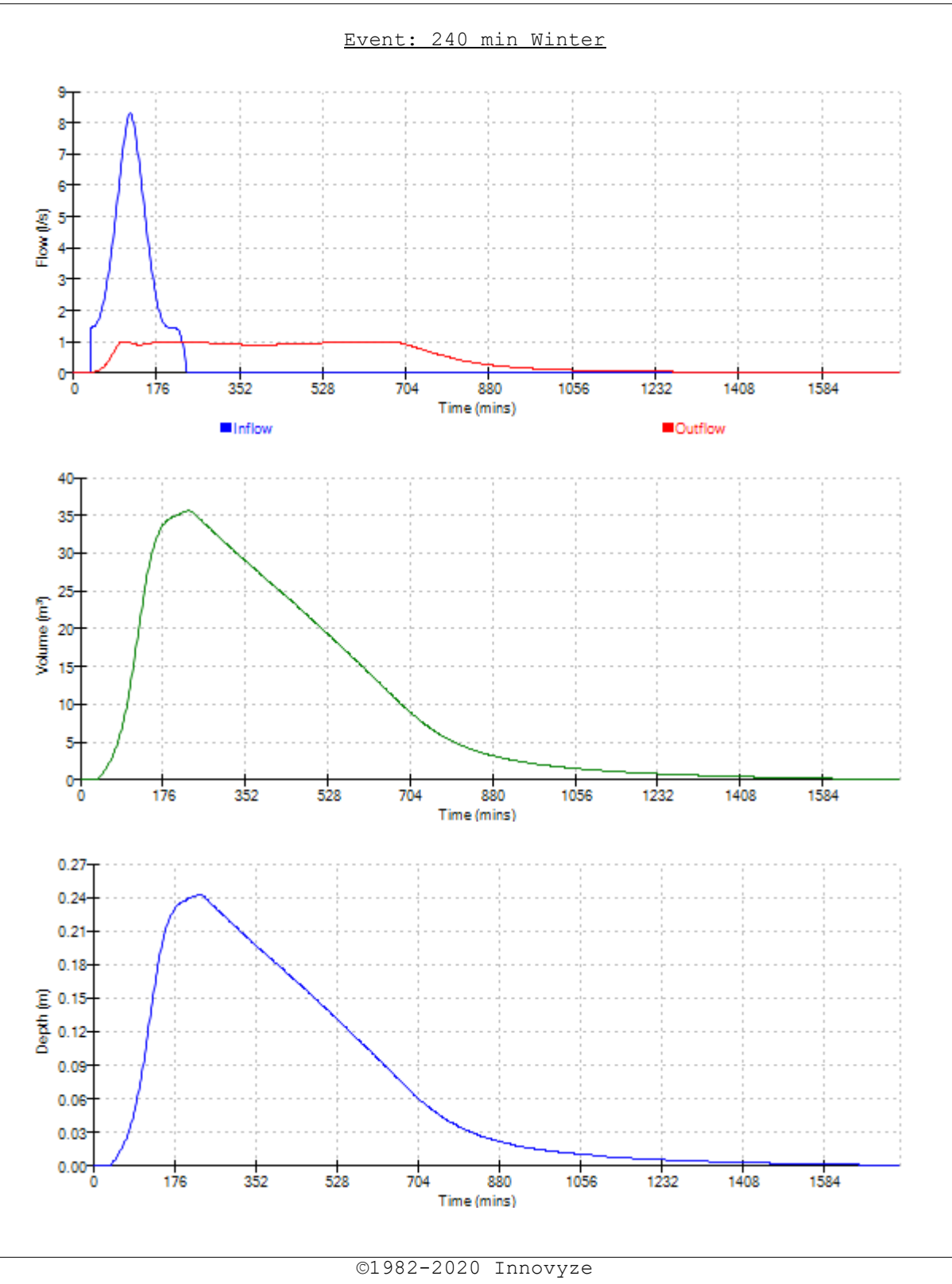
| Waterco Ltd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | Page 6                                                                              |            |            |            |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------|------------|------------|------------|------------|-----------|------------|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|
| Eden Court                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 15818                         |  |            |            |            |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| Lon Parcwr Business Park                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Attenuation Storage Estimates |                                                                                     |            |            |            |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| Denbighshire LL15 1NJ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1 in 100 Year + 45% CC        |                                                                                     |            |            |            |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| Date 27/03/2024                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Designed by RM                |                                                                                     |            |            |            |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| File 15818-Attenuation Stora...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Checked by AW                 |                                                                                     |            |            |            |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| XP Solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Source Control 2020.1.3       |                                                                                     |            |            |            |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| <p style="text-align: center;"><u>Hydro-Brake® Optimum Outflow Control</u></p> <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>2.000</td><td>2.6</td><td>4.000</td><td>3.6</td><td>7.000</td><td>4.7</td></tr><tr><td>2.200</td><td>2.7</td><td>4.500</td><td>3.8</td><td>7.500</td><td>4.9</td></tr><tr><td>2.400</td><td>2.8</td><td>5.000</td><td>4.0</td><td>8.000</td><td>5.1</td></tr><tr><td>2.600</td><td>2.9</td><td>5.500</td><td>4.2</td><td>8.500</td><td>5.2</td></tr><tr><td>3.000</td><td>3.1</td><td>6.000</td><td>4.4</td><td>9.000</td><td>5.4</td></tr><tr><td>3.500</td><td>3.3</td><td>6.500</td><td>4.6</td><td>9.500</td><td>5.5</td></tr></table> |                               |                                                                                     | Depth (m)  | Flow (l/s) | Depth (m)  | Flow (l/s) | Depth (m) | Flow (l/s) | 2.000 | 2.6 | 4.000 | 3.6 | 7.000 | 4.7 | 2.200 | 2.7 | 4.500 | 3.8 | 7.500 | 4.9 | 2.400 | 2.8 | 5.000 | 4.0 | 8.000 | 5.1 | 2.600 | 2.9 | 5.500 | 4.2 | 8.500 | 5.2 | 3.000 | 3.1 | 6.000 | 4.4 | 9.000 | 5.4 | 3.500 | 3.3 | 6.500 | 4.6 | 9.500 | 5.5 |
| Depth (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Flow (l/s)                    | Depth (m)                                                                           | Flow (l/s) | Depth (m)  | Flow (l/s) |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| 2.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2.6                           | 4.000                                                                               | 3.6        | 7.000      | 4.7        |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| 2.200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2.7                           | 4.500                                                                               | 3.8        | 7.500      | 4.9        |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| 2.400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2.8                           | 5.000                                                                               | 4.0        | 8.000      | 5.1        |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| 2.600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2.9                           | 5.500                                                                               | 4.2        | 8.500      | 5.2        |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| 3.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3.1                           | 6.000                                                                               | 4.4        | 9.000      | 5.4        |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
| 3.500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3.3                           | 6.500                                                                               | 4.6        | 9.500      | 5.5        |            |           |            |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |       |     |
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|                                 |                               |                                                                                     |
|---------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| Waterco Ltd                     |                               | Page 7                                                                              |
| Eden Court                      | 15818                         |  |
| Lon Parcwr Business Park        | Attenuation Storage Estimates |                                                                                     |
| Denbighshire LL15 1NJ           | 1 in 100 Year + 45% CC        |                                                                                     |
| Date 27/03/2024                 | Designed by RM                |                                                                                     |
| File 15818-Attenuation Stora... | Checked by AW                 |                                                                                     |
| XP Solutions                    | Source Control 2020.1.3       |                                                                                     |

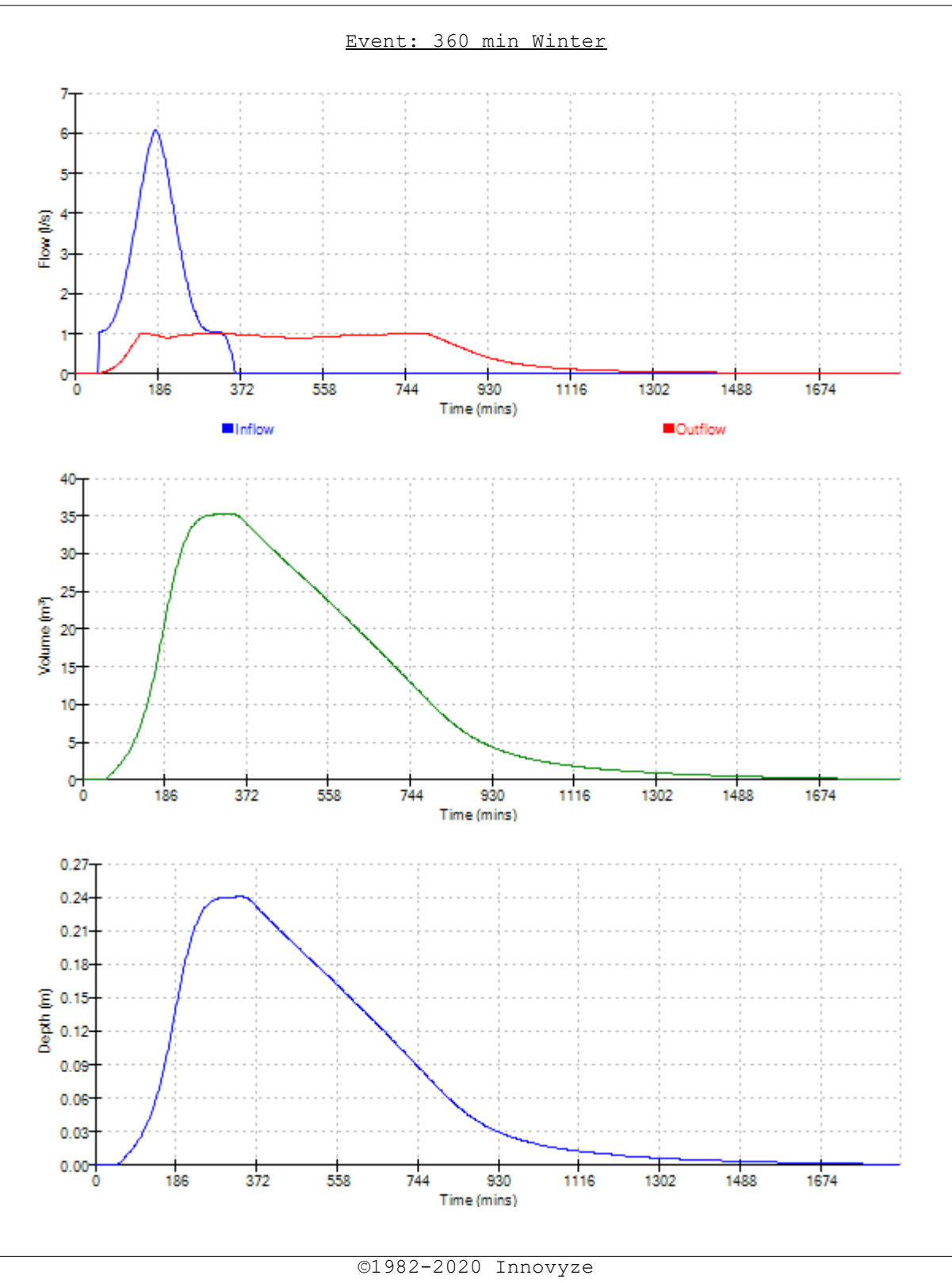
Event: 180 min Winter



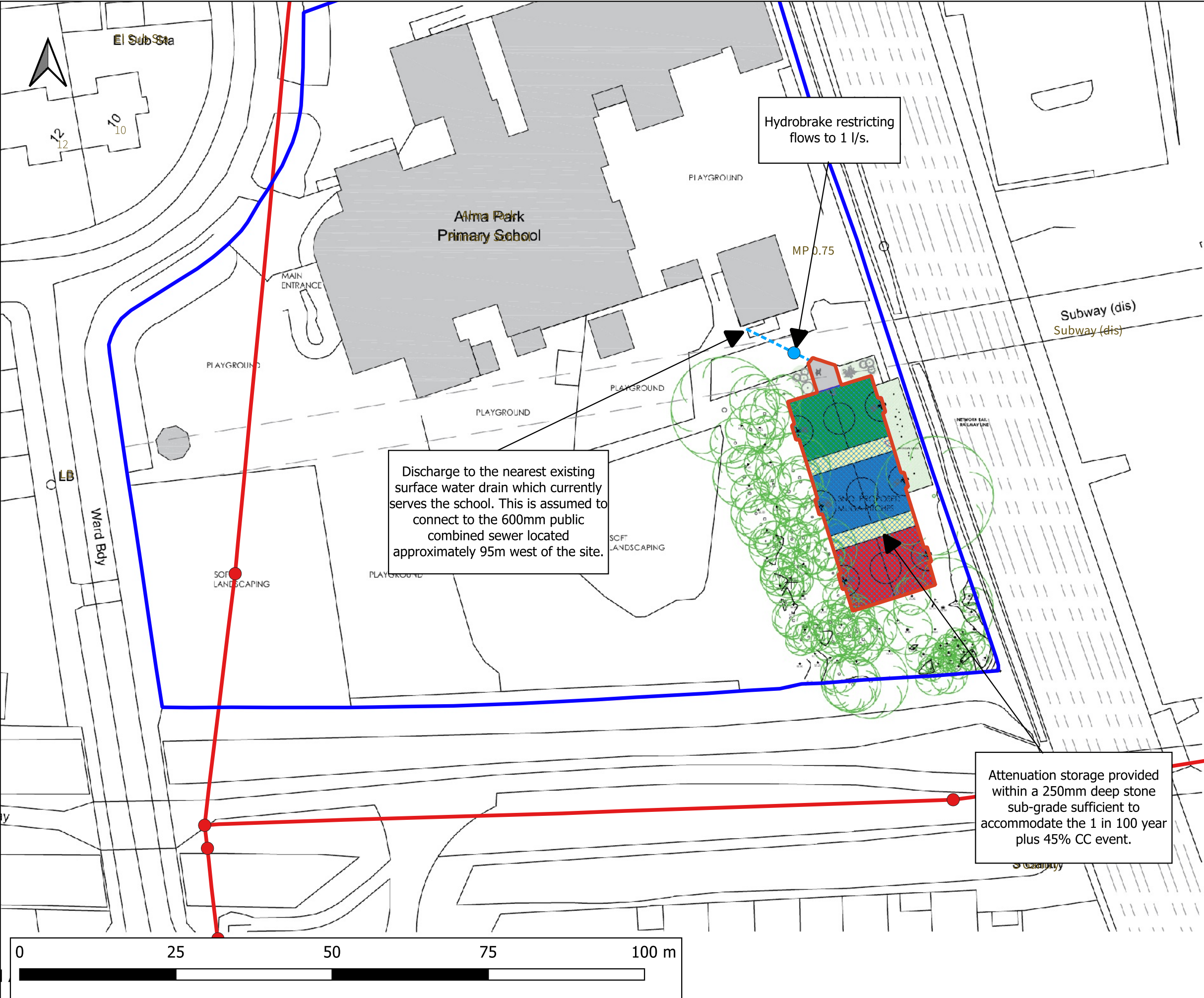
|                                                                 |                                                         |                                                                                     |
|-----------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Waterco Ltd                                                     |                                                         | Page 8                                                                              |
| Eden Court<br>Lon Parcwr Business Park<br>Denbighshire LL15 1NJ | 15818                                                   |  |
|                                                                 | Attenuation Storage Estimates<br>1 in 100 Year + 45% CC |                                                                                     |
| Date 27/03/2024                                                 | Designed by RM                                          |                                                                                     |
| File 15818-Attenuation Stora...                                 | Checked by AW                                           |                                                                                     |
| XP Solutions                                                    | Source Control 2020.1.3                                 |                                                                                     |



|                                                                 |                                                         |                                                                                     |
|-----------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Waterco Ltd                                                     |                                                         | Page 9                                                                              |
| Eden Court<br>Lon Parcwr Business Park<br>Denbighshire LL15 1NJ | 15818                                                   |  |
|                                                                 | Attenuation Storage Estimates<br>1 in 100 Year + 45% CC |                                                                                     |
| Date 27/03/2024                                                 | Designed by RM                                          |                                                                                     |
| File 15818-Attenuation Stora...                                 | Checked by AW                                           |                                                                                     |
| XP Solutions                                                    | Source Control 2020.1.3                                 |                                                                                     |



## Appendix H Concept Drainage Sketch



Notes:  
1) This sketch has not been subject to formal checks or approvals. Its validity and use must therefore be limited to discussion and information purposes only.  
2) Unless otherwise noted the risks associated with this proposal are not considered to be extra ordinary and within the remit of an experienced and competent contractor.  
3) All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.  
4) This drawing is an amendment of the 'Part Site Plan as Proposed and Block Plan as Proposed' (Rev P-02) by 'Studio OL3'. This drawing provides a concept only and is not intended for detailed design.

LEGEND

- Site Boundary
- Land Under Client's Ownership
- Proposed Sub-grade
- Proposed Surface Water Drain
- Proposed Flow Control Chamber
- Existing Public Combined Sewer
- Existing Public Combined Manhole

|                               |          |                                                                                                            |                     |
|-------------------------------|----------|------------------------------------------------------------------------------------------------------------|---------------------|
| CLIENT:                       |          |                       |                     |
|                               |          | <br>www.waterco.co.uk |                     |
| SCHEME:                       |          | Alma Park School, Levenshulme                                                                              |                     |
| PLOT TITLE:                   |          | Concept Drainage Sketch                                                                                    |                     |
| PLOT STATUS:                  |          | SKETCH                                                                                                     | DATE:<br>03-04-2024 |
| DRAWN:                        | CHECKED: | APPROVED:                                                                                                  | PLOT SCALE AT A3:   |
| RM                            | JR       | AW                                                                                                         | 1:600               |
| PLOT NAME:                    |          |                                                                                                            | REVISION:           |
| 15818_Concept_Drainage_Sketch |          |                                                                                                            | -                   |

## **Appendix I     Hydro-Brake® Brochure Extract**

# Hydro-Brake® Optimum

The Hydro-Brake® Optimum is Hydro International's flagship passive flow control device and the most advanced vortex flow control available.

Hydro-Brake® Optimum is the only vortex flow control for which the head and discharge relationship can be fine-tuned to optimise your design. Designers can size a Hydro-Brake® Optimum to achieve the perfect hydraulic performance curve and engineer the best possible passive flow control performance.



Surface water management and SuDS



Combined drainage systems and CSOs



Watercourse flood prevention



Sewer network optimisation



Wastewater treatment plants



- ✓ No external energy source.
- ✓ No moving parts.
- ✓ Future-proof.
- ✓ Large outlet clearances prevent blockages.

## There is No Equivalent

Hydro-Brake® Optimum dispenses with the need to choose from a range of sizes and types and instead offers built-in flexibility to size each unit for absolute fit. Each Hydro-Brake® Optimum is individually-sized, so you achieve performance without compromise for every project.

## Maximise Storage Savings

The increased hydraulic efficiency of the Hydro-Brake® Optimum means you can reduce on-site storage by up to 15% than if an alternative vortex control is used. With reduced storage, you can lower construction and excavation costs as well as saving project time and overall land-use.

## Best Value for Every Project

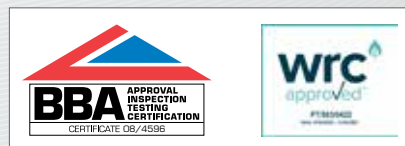
Selecting the superior performance of Hydro-Brake® Optimum does not mean a higher cost for your project. On the contrary, because your upstream storage can be fine-tuned to achieve the smallest volumes, construction, excavation and material costs are reduced.

## Easy to Install

Hydro-Brake® Optimum comes with a range of installation options and accessories to make construction and installation as simple as possible.

## Setting the Standard

The Hydro-Brake® Optimum is the culmination of more than 40 years of research and development by Hydro International, and the company continues to take an international lead in vortex technology and expertise. Hydro-Brake® Optimum is the only vortex flow control to be independently certified by BBA and WRc for the control of stormwater or combined flows.



## Minimal Maintenance

With up to 20% larger outlet clearances compared to other vortex devices, there is significantly less risk of blockage with a Hydro-Brake® Optimum. With no power source or moving parts, it offers minimal, predictable maintenance.

## Future-Proofed

Standard, Hydraulically Efficient, Hydro-Brake® Optimum units are supplied with an adjustable inlet, allowing post-installation flow adjustments without the need to replace the whole device.

## Flow Control Chamber

A Hydro-Brake® Optimum flow control can be supplied prefitted in a precast reinforced concrete chamber. Custom options including high level emergency bypass, rodding pipe and removable units are also available.

## Case Studies



### Tight Fit for New Homes

Engineers challenged to solve a “tight fit” surface water management challenge on a West Yorkshire housing development used the Hydro-Brake® Optimum Design Tool to calculate a solution that optimised the limited pipe storage area. Using conventional flow control devices would have required more back up storage than would fit in the space available, but by using Hydro-Brake® Optimum flood protection measures, challenging discharge limits were met for a 1 in 100 year storm.



### ‘Optimum’ Savings for Developer with 21st Century Drainage

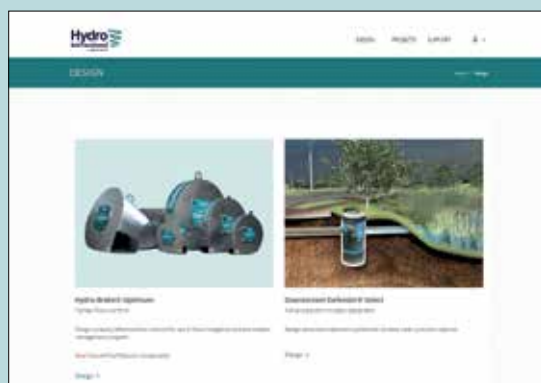
The first phase of Edinburgh City Council's 21st Century Homes project, the Gracemount development showcases sustainable construction. A major feature of the drainage solution is Hydro International's high performance Hydro-Brake Optimum® to control surface water which saved the developers over 30% in storage construction costs.

*Photo courtesy of Edinburgh City Council*

## Hydro-Brake® Optimum Selection Criteria

|                  |                                                   |                                            |                                   |
|------------------|---------------------------------------------------|--------------------------------------------|-----------------------------------|
| Suitability:     | Most sites, from very low to very high flow rates |                                            |                                   |
| Flow Range (l/s) | Head Range (m)                                    | Ability to match greenfield discharge rate | On-site water storage requirement |
| 0.7 – 550 *      | 0.4 – 4.0                                         | Very good                                  | Low                               |
| Moving Parts?    | External Power?                                   | Risk of blockage?                          |                                   |
| No               | No                                                | Very low                                   |                                   |

\* lower flows may be possible (contact Hydro International to discuss)



## Explore the Options with our Online Design Tool

Our online design tool is a sizing engine that gives you the flexibility to compare flow control design options, output detailed design drawings and hydraulic data and import the results into commercially-available hydraulic modelling software.

The tool also has the option to design and customise our latest stormwater treatment separator, the Downstream Defender® Select.

[hydro-int.design](https://hydro-int.design)

## **Appendix J     Concept Designer's Risk Assessment**

**Project:** Alma Park Primary School, Levenshulme  
**Client:** Alma Park Primary School  
**Report Reference:** 15818-Drainage Strategy-01

**Project No:** 15818

**Prepared by:** Ryan Moore BSc (Hons) **Date:** 02/04/2024  
**Checked by:** Jessica Roberts BSc (Hons) MCIWEM **Date:** 02/02/2024  
**Reviewed by:** Aled Williams BSc (Hons) MCIWEM C.WEM **Date:** 03/04/2024

## Requirement:

The Construction (Design and Management) Regulations 2015 (CDM 2015) place an obligation on the Designer to take all reasonable steps to provide, with the design, sufficient information about the design, construction or maintenance of the structure, to adequately assist the client, other designers and contractors to comply with their duties under CDM. The Designer has undertaken this assessment to identify any extra-ordinary risks, or those that would not be expected on this particular project by an experienced and competent Contractor. The aim is to avoid needless paperwork and bureaucracy and ensure the assessment is project specific, relevant and proportionate to the risk.

## DRA Summary

Each of the following risk areas has been considered using the question below. Is a risk present which is considered to be **extra-ordinary or unexpected** in this instance?

If **YES** - A detailed risk assessment is required at design stage

If **UNKNOWN** - Insufficient information has been provided at concept design stage and the risks are unknown. Further consideration must be given at design stage(s)

If **NO** - No further action is required.

| Hazard Ref. | Risk Areas                                     | YES, UNKNOWN or NO | Comments                                                     |
|-------------|------------------------------------------------|--------------------|--------------------------------------------------------------|
| 1           | Ground Conditions                              | Unknown            | To be considered at detailed design stage.                   |
| 2           | Hazardous Environment                          | Unknown            | To be considered at detailed design stage.                   |
| 3           | Existing Working Environment                   | Yes                | Existing school.                                             |
| 4           | Existing Services                              | Unknown            | Site located within the grounds of Alma Park Primary School. |
| 5           | Proximity to Other Structure(s)                | Yes                | Site adjacent to raised railway line embankment              |
| 6           | Near Waterbody / flood risk                    | No                 |                                                              |
| 7           | Proximity to Other Activities                  | Yes                | Site located within the grounds of Alma Park Primary School. |
| 8           | Sequence of Construction                       | Unknown            | To be considered at detailed design stage.                   |
| 9           | Access                                         | Unknown            | To be considered at detailed design stage.                   |
| 10          | Interfaces                                     | Unknown            | To be considered at detailed design stage.                   |
| 11          | Confined Space Working                         | Unknown            | To be considered at detailed design stage.                   |
| 12          | Maintenance Considerations                     | Unknown            | To be considered at detailed design stage.                   |
| 13          | Working at Height                              | Unknown            | To be considered at detailed design stage.                   |
| 14          | Steep Slopes                                   | No                 |                                                              |
| 15          | Demolition / Refurbishment / Repair            | Unknown            | To be considered at detailed design stage.                   |
| 16          | Welfare                                        | Unknown            | To be considered at detailed design stage.                   |
| 17          | Occupational Health                            | Unknown            | To be considered at detailed design stage.                   |
| 18          | Environmental Issues                           | Unknown            | To be considered at detailed design stage.                   |
| 19          | Other Significant Hazards not Identified Above | Unknown            | To be considered at detailed design stage.                   |
| 20          | Residual Risk to Future Users                  | Unknown            | To be considered at detailed design stage.                   |