Project Title:	Surface Water Management Strategy for Land on Royle Road, Sudden, Rochdale, OL11 3ET Revision 2	**Job Number:**	L0324
		Date:	16/12/2020
Client:	Stechrioco Ltd		
Subject:	Surface Water Management Strategy for a commercial development at Royle Road, Sudden, Rochdale, OL11 3ET		

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1. INTRODUCTION

1.1. Background

This report is an addendum to the existing Flood Risk Assessment for the commercial development for Royle Road, Sudden, Rochdale OL11 3ET. This report describes the amended Surface Water Management Plan (SWMP) for Stechrioco Ltd.

The proposed SWMP uses Sustainable Drainage Systems (SuDS) and is designed to comply with both the local authority's requirements and the national SuDS guidance (e.g., CIRIA's SuDS Manual 2015 and DEFRA's National SuDS Standards). The recommended SuDS features would be capable of being operated and maintained for the lifetime of the proposed development.

The site is located at Sudden, Rochdale, OL11 3ET, (grid reference: SD885115). The proposed development site is shown in Figure 1 (topographic and boundary) and Figure 2 (aerial), with location and grid reference details found in Table 1. The site itself sits at an elevation of 129.3mAOD in the north-east to 120.7mAOD in the south-west and is approximately 0.6km south of the River Roch. The 0.86ha site itself is currently vacant. Development proposals are to construct a commercial development (Figure 3).

1.2. Location of the Scheme

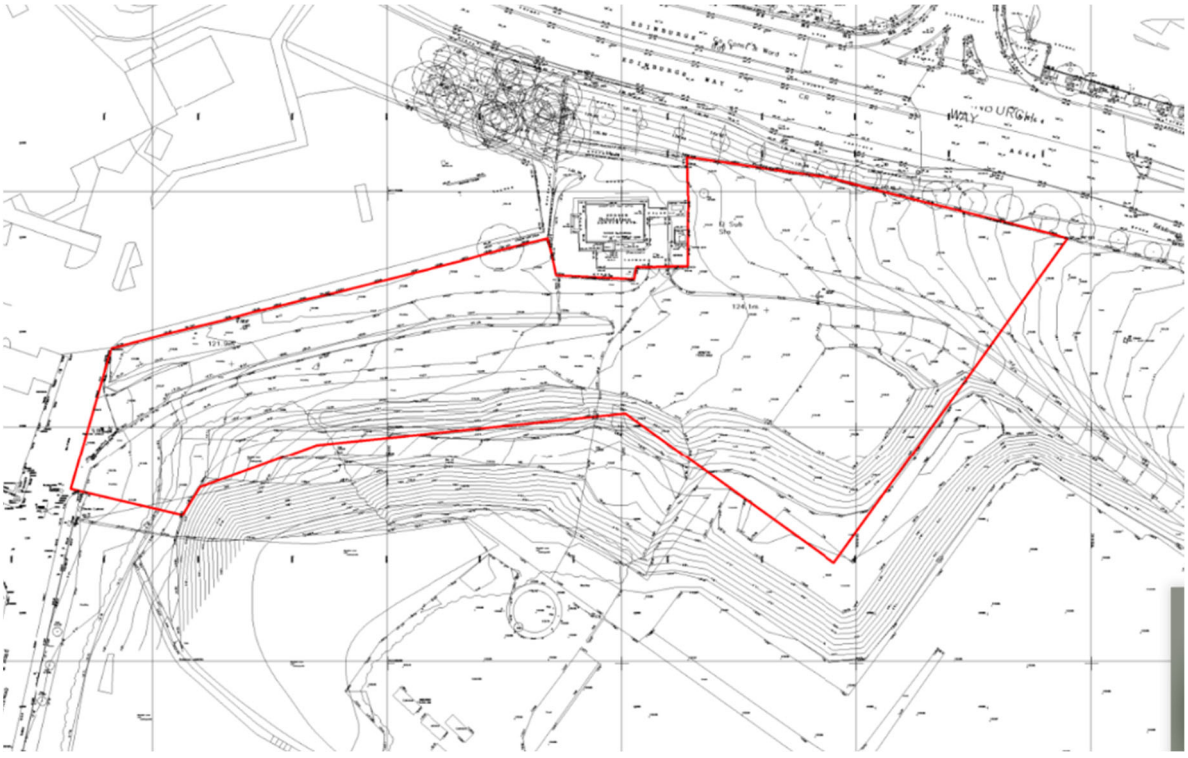

Figure 1: Site Location (Source: Stechrioco Ltd)

Table 1: The Details of the Proposed Development's Location (Source: Streetmap)

OS X (Eastings)	*388576*
OS Y (Northings)	*411536*
Nearest Post Code	*OL11 3ET*
Lat (WGS84)	*N53:36:01 (53.600264)*
Long (WGS84)	*W2:10:27 (-2.174099)*
Lat, Long	*53.600264,-2.174099*
Nat Grid	*SD885115 / SD8857611536*

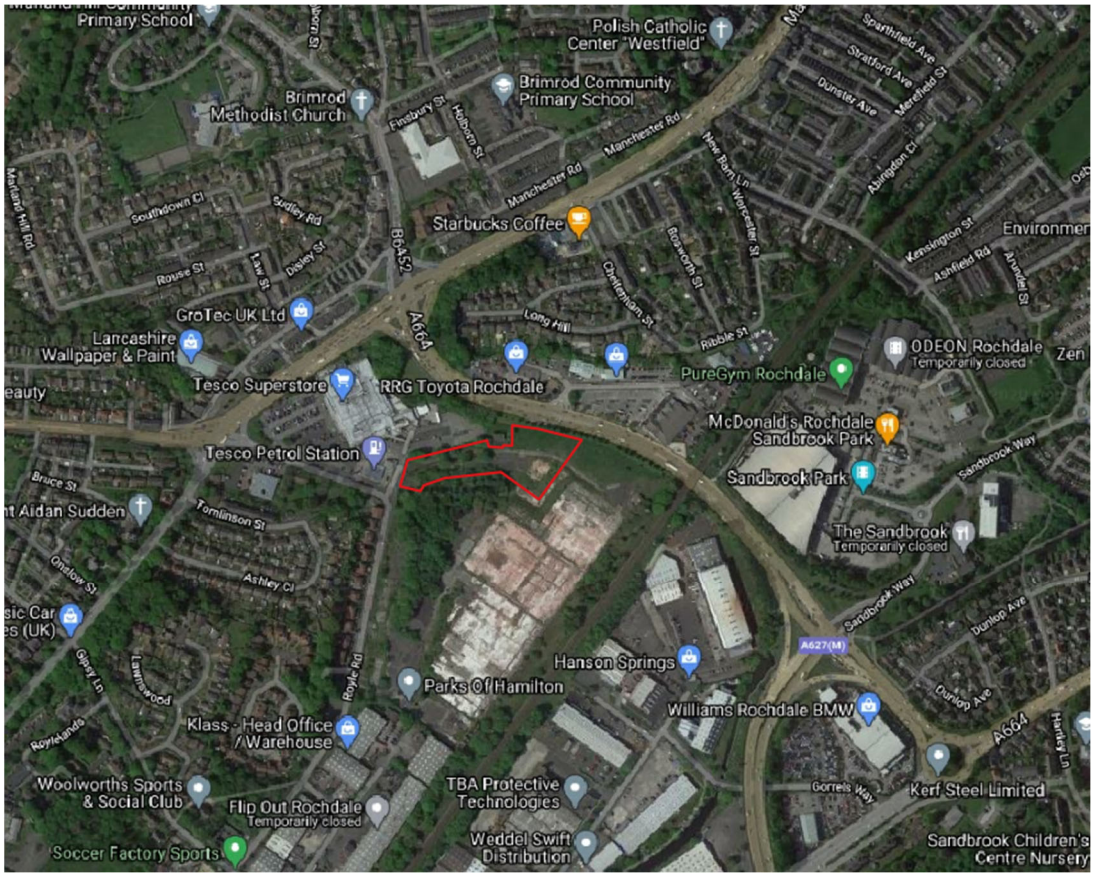

Figure 2: Aerial photograph of the site outlined in red (Source: Bing Maps)

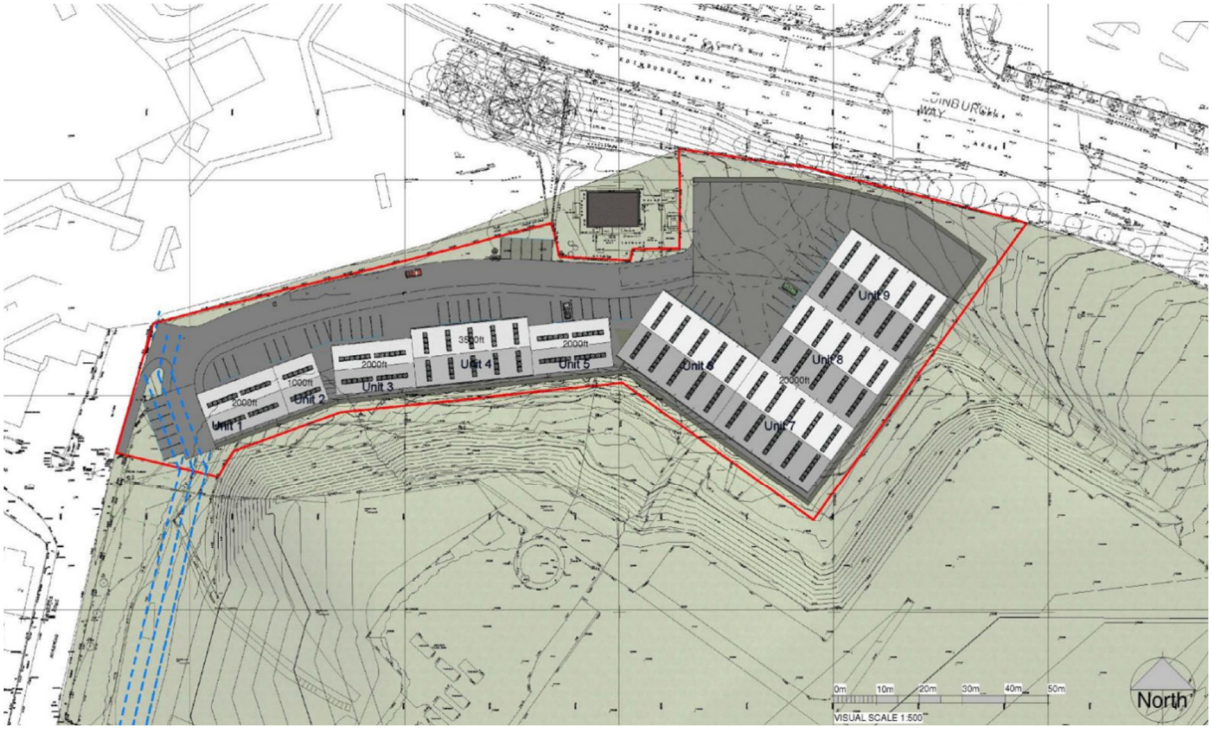

Figure 3: Site's layout (Source: Stechrioco Ltd)

2. SURFACE WATER DRAINAGE STRATEGY

2.1. Overview of SuDS strategy

The Surface Water Management Plan (SWMP) requires the provision of SuDS in order to manage runoff from the development site. It is understood that infiltration is not feasible at this site. The surface water runoff from the development would be managed by an Attenuation Tank. It will be installed beneath and alongside the parking area north of the easternmost proposed building or in the carpark. The full details of which will be submitted at reserved matters.

There is a culvert watercourse running along the eastern boundary of the development site parallel with the road (Figure 4). Its invert Level is 117.590m/AOD according to RSK drawing. The runoff generated by the development will be discharged to this sewer according to the LLFA guidance.

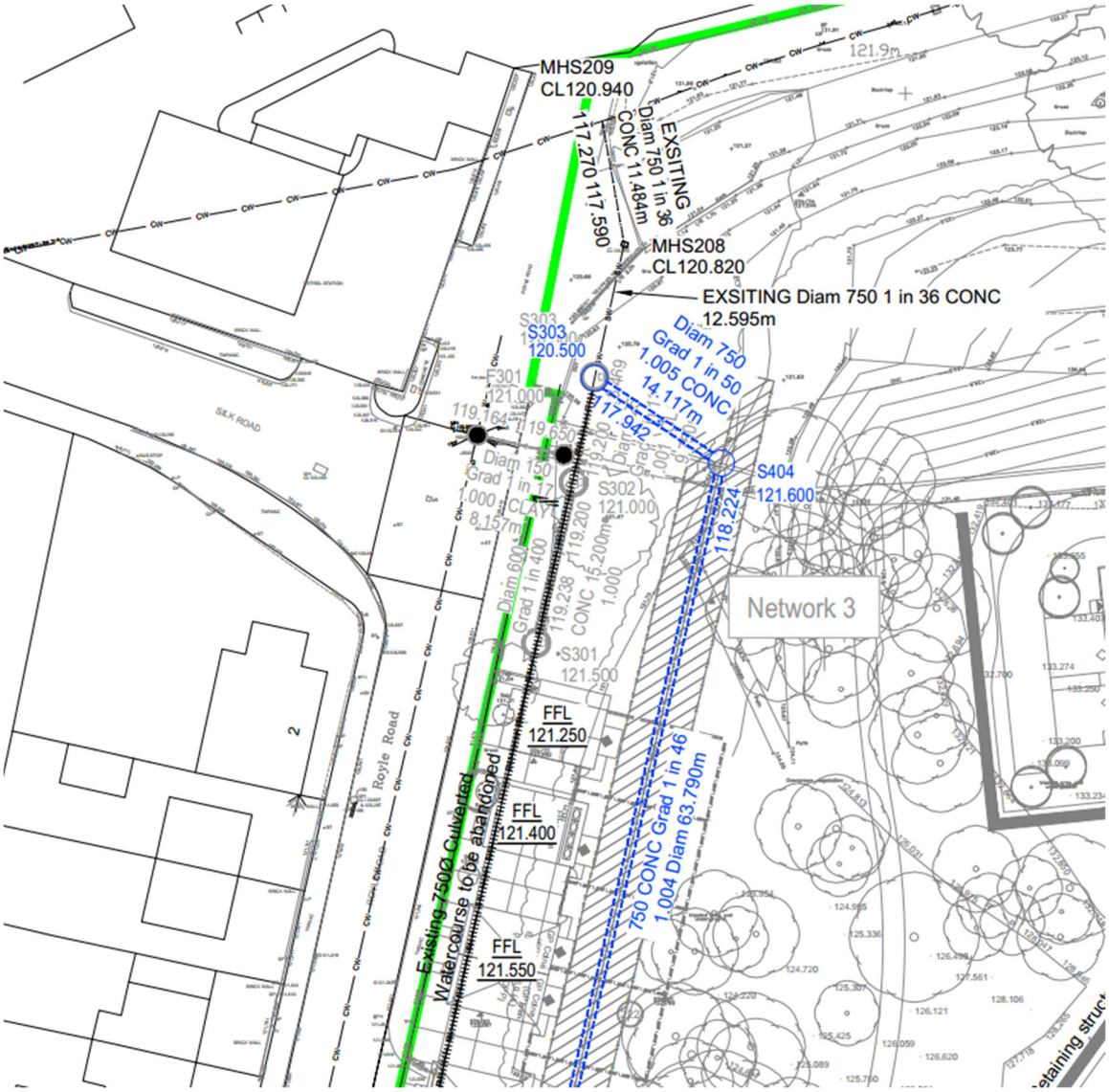

Figure 4: Receptor sewer (Source: Stechrioco Ltd)

The discharge rates for the 2,30 and 100(+40%CC) years Return Period critical rainfall, are indicated in Table 2. Figure 5 display the existing brownfield area, Figure 6 the new development's impermeable area and Figure 7 the greenfield area to become impermeable.

The Rational Method (Q=2.78 C i A, where Q represents the peak discharge rate, 2.78 is a local correction factor, C is the rational runoff coefficient, i the rainfall intensity and A the drainage area) was used to calculate the discharges in agreement with Lead Local Flood Authority guidance.

The maximum discharges have been agreed with the LLFA. Please see appendix A

Table 2: Runoff rates calcs for Qbar, 30 and 100(+40%CC) years RP

Runoff calcs - Rational Method				
Assumption is that Rational method runoff coefficient (C) from tarmac area = 0.9 and from grass area = 0.3				
Total area	0.86ha			
Greenfield area	0.6ha			
Brownfield area (existing and will also be part of development)	0.26ha			
Greenfield area to become impermeable	0.34ha			
	Qbar (YR 2.3 mean annual)	**YR 30**	**YR 100**	**YR 100 + 40%**
Rainfall Intensity (mm/hr)	25	44.2	57.7	80.8
Rational Runoff calculation (2.78CiA) from existing Brownfield area (2.78 x C x rainfall rate x area) (l/s)	16.26	28.75	37.54	52.56
Brownfield area 50% runoff reduction	8.13	14.38	18.77	26.28
Add former greenfield area to become impermeable (l/s) - Rational Runoff method (C=0.3)	7.51	13.27	17.32	24.26
Max permitted future discharge to sewer (l/s)	15.64	27.65	36.09	50.54

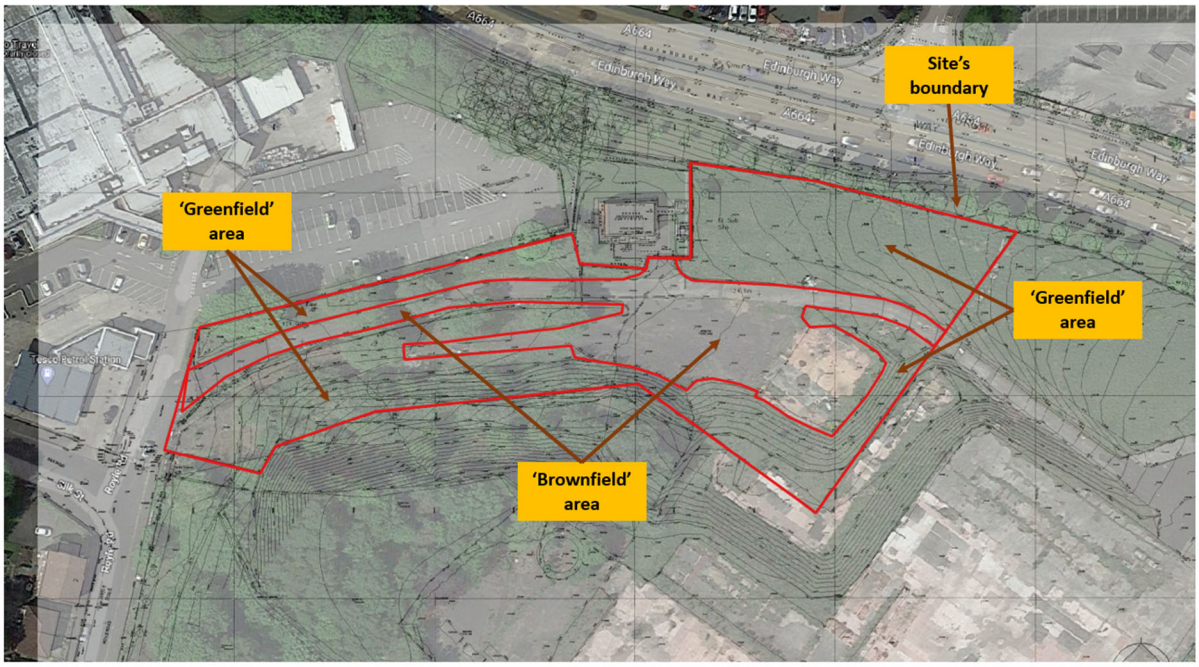

Figure 5: Existing brownfield area

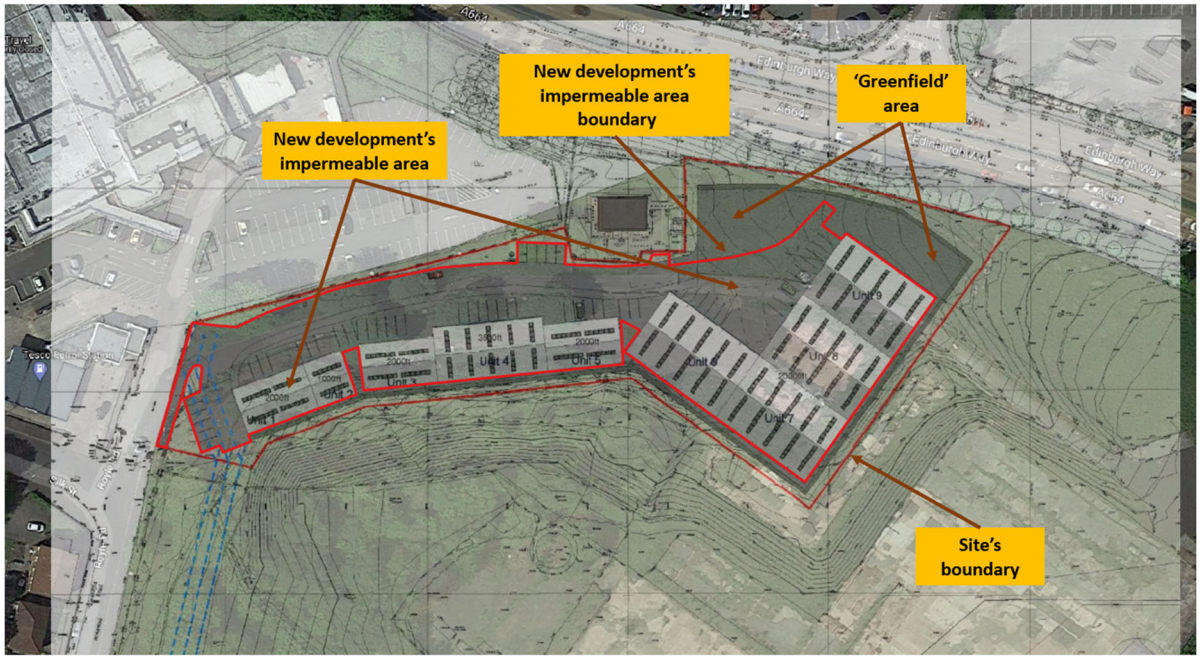

Figure 6: New development's impermeable area

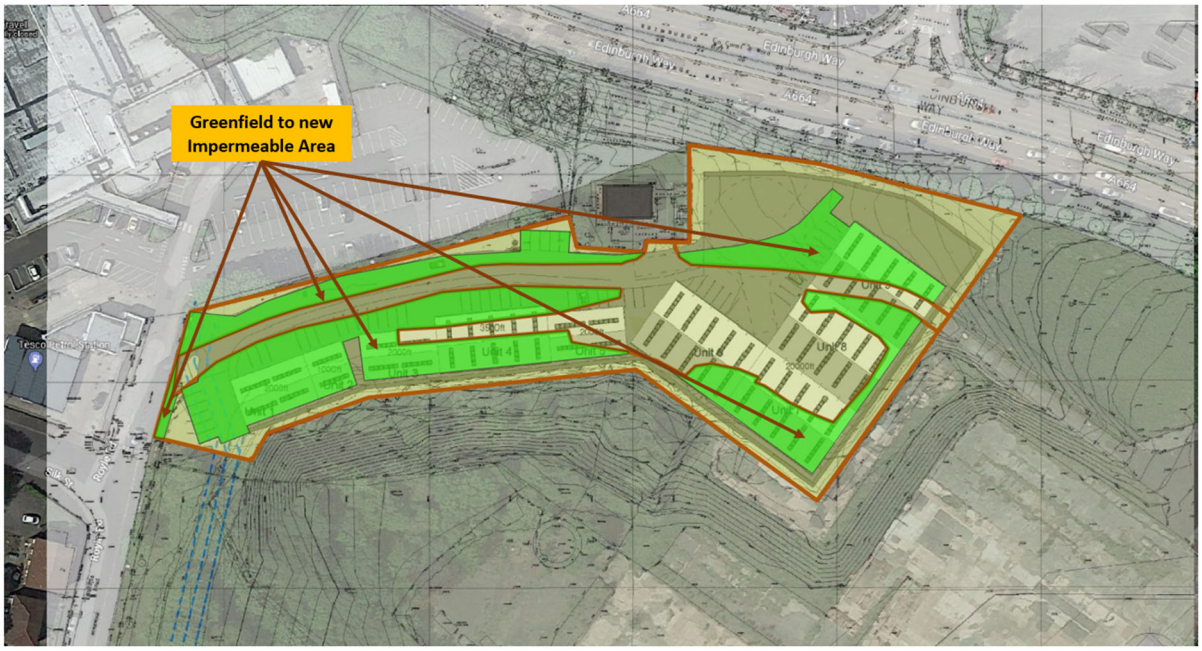

Figure 7:Greenfield area to become impermeable (coloured green)

2.2. Sizing of SuDS features

The impermeable surfaces on the site will be the building roofs and driveways, hardstanding, driveways and the access road comprising of an area of 6,000 m^2 (0.6ha). It is intended that the proposed surface water system will be adopted by United Utilities.

Modelling via Micro Drainage, an industry leading software which allows design and analysis of SuDS features, was carried out to determine the required dimensions of the Tank (original results shown in Appendix).

The following conservative assumptions and design parameters were set within the model:

- Rainfall intensity was obtained through the FSR methodology and increased by 40%, the upper end allowance for climate change over the 100year design life of the proposed commercial/agricultural development, in line with the requirements of the NPPF;
- The required storage in a 1 in 100 year event plus climate change is approximately **188m^3**.
- It will take up to 4 minutes for runoff from all impermeable surfaces to reach the tank;
- A factor of safety of 2.0 has been applied to the design, as recommended by CIRIA C753;
- In Micro Drainage the tank has been designed to manage runoff from the 1:100 year rainstorm with an additional 40% climate change allowance;
- The ground level above the tank is 122mAOD. The tanks invert level is 120mAOD and the soffit is 121.2mAOD. Therefore, the tank has a cover of 0.8mAOD.;
- Three Hydro-Breaks were installed. One for the Qbar discharge rate and the second and third for the 30yr RP and the 100(+40%CC)yr. RP respectively. Their invert levels were 120mAOD, 120.350mAOD and 120.700mAOD respectively.
- According to the topographical survey the connection manhole has an invert of 117.590mAOD and a cover level of 120.20mAOD. This suggest that the difference between the invert of the tank and the invert of the receptor manhole 2.41m. This means the tank can drain via gravity.

Table 3 below includes a summary of the tank specifications, designed for the 1in 100 year event plus 40% climate change allowances critical rainfall which was the 120min Winter storm event.

*Table 3: Summary of tank specifications for the 1 in 100 year plus 40% CC event**

Surface area of the tank (m^2)	Storage volume (m^3)	Maximum volume actually accommodated (m^3)	Dimensions (w x l x h in m)	Maximum water level (m) above the invert
160	192	188.48	5.2 x 30.8 x 1.2	1.178

**Based on a critical 120min winter storm event*

Table 4: Summary of Micro Drainage outputs for attenuation tank design

Design event	Critical Storm duration (min)	Maximum water depth (mm) above normal water level	Maximum discharge rate l/s
2yr	60 Winter	302	15.6
30yr	120 Winter	622	26.3
100yr plus 40% climate change allowance	120 Winter	1,178	48.6

All discharge rates are complying (have a lower value) with the runoff rates presented in Table 2

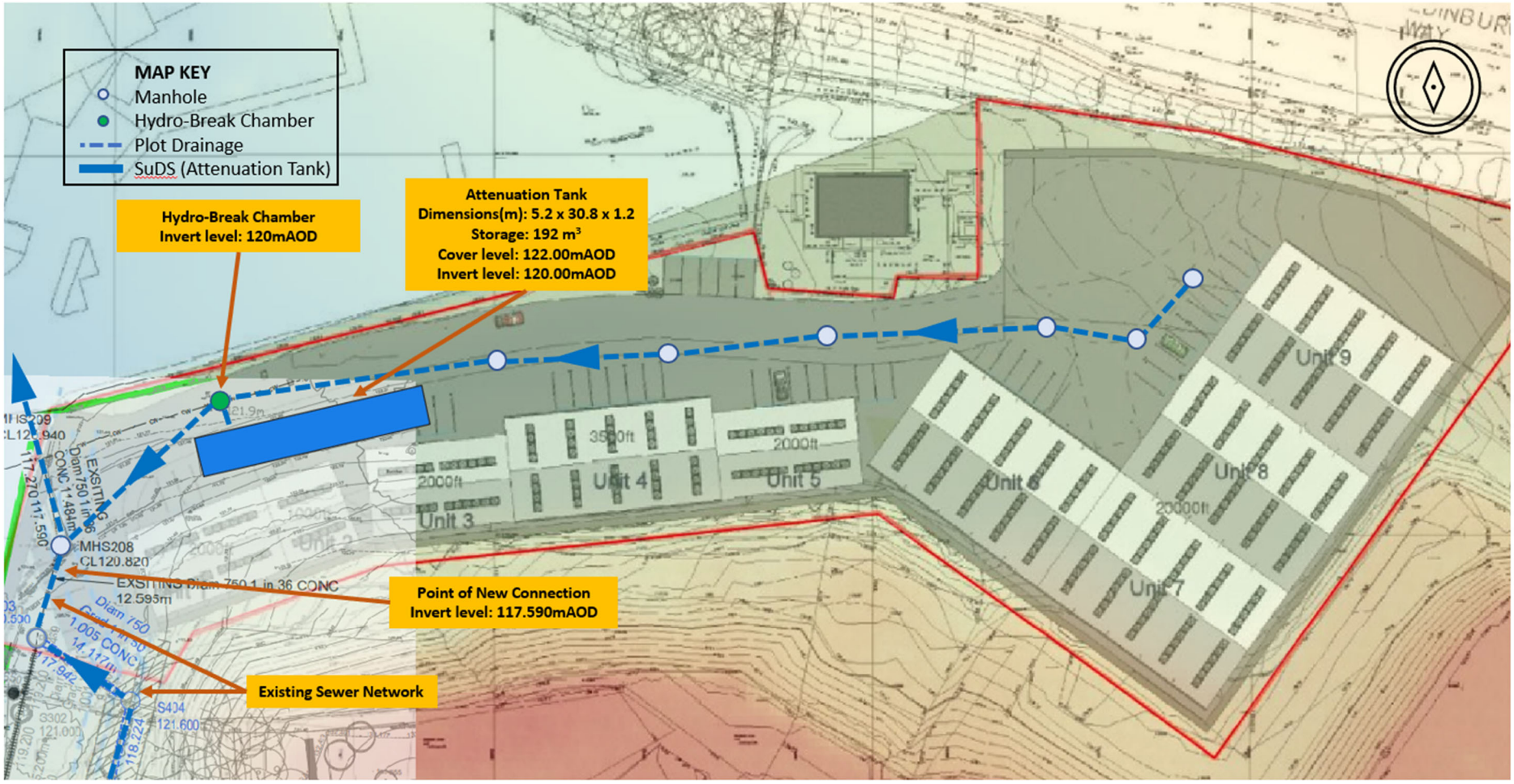

Figure 8: Site layout including SWMP

2.3. Residual risks

Residual risks associated with the SuDS features designed in this report include the risk of storm events of greater magnitude than those considered in this report or from partial blockage of any pipes or flow controls in the systems. The outflow controls have been sized to minimise the risk of blockage as all Hydro-Break outgoing pipes are bigger than 100mm. In addition, it is recommended to include catchpits and other devices to trap silt and other debris, further reducing the risk of blockage.

Structures which manage surface water runoff require little maintenance, however a regular maintenance schedule e.g., after heavy rainfall, should be established by the site owners to reduce the risk of blockage within the drainage system.

Regular inspection and maintenance is required to ensure the effective long-term operation of belowground storage systems. Maintenance responsibility for systems should be placed with a responsible organisation. Table 5 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive, and some actions may not always be required.

Maintenance Plans and schedules should be developed during the design phase and will be specific to the type of tank that is adopted. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

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

Table 5: CIRIA SuDS operation and maintenance schedule for storage attenuation tank

3. SUMMARY AND CONCLUSIONS

A summary of the main conclusions for the addendum is presented below:

- Development proposals are for construction of a commercial development at Royle Road, Sudden, Rochdale, OL11 3ET;
- Soils at the site are shown to be of low permeability. An outline surface water management plan based around attenuation has therefore been designed;
- Allowance is made for climate change by increasing design rainfall by 40%, in line with the NPPF and Environment Agency recommended allowance;
- It is recommended that runoff, during rainfall events of 1:100 years with an additional 40% climate change allowance is attenuated via attenuation tank and then discharged to the culverted watercourse;
- Below are the revised discharges:
  - *Table 6: The amended Surface Water Discharges.*

Design event	Critical Storm duration (min)	Maximum discharge rate l/s
2yr	60 Winter	15.6
30yr	120 Winter	26.3
100yr plus 40% climate change allowance	120 Winter	48.6

- Results showed that the attenuation system would be capable of managing runoff from the impermeable surface area during rainfall events of 1:100 year with an additional 40% climate change allowance;
- Three Hydro-Breaks were installed. One for the Qbar discharge rate and the second and third for the 30yr RP and the 100(+40%CC)yr. RP respectively. Their invert levels were 120mAOD, 120.350mAOD and 120.700mAOD respectively.
- The area of the tank is 160m^2 and has a depth of 1.2m. Its width is 5.2m and its length 30.8m. The volume that could be accommodated is 192m^3 while the maximum volume actually accommodated for the 100yRP+40%CC critical rainfall was estimated to amount to **188.48 m^3**;
- According to the topographical survey the connection manhole has an invert of 117.590mAOD and a cover level of 120.20mAOD. This suggest that the difference between the invert of the tank and the receptor manhole 2.41m. This means the tank can drain via gravity.
- It is recommended that the attenuation system should be checked on an annual basis and after heavy rains.

Prepared By:	Checked By:	Approved By:
Dimitrios Goukos	Charles Townsend	Alan Corner

4. REFERENCES

Author	Date	Title/Description
CIRIA	2015	The SUDS Manual – CIRIA Report C753.
DCLG	Mar 2012	Technical Guidance to the National Planning Policy Framework.
Ministry of Housing, Communities and Local Government.	2019	National Planning Policy Framework.
ELLUC Projects	Nov 2018	FRA - Land at Royle Road, Rochdale - Commercial Ref. Num. 18037A

APPENDIX

Charles Townsend

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: 09 December 2020 09:09
To: Charles Townsend
Subject: RE: New runoff rates for Royale Road L0324

Hello Charles,

I looked at your table – looks okay to me. You can send me your FRA at same time (or before) as you issue to your Client / Planning.

Stephen McCann
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

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Please consider the environment before printing this email.

From: Charles Townsend <ctownsend@hydro-int.com>
Sent: 08 December 2020 18:29
To: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Subject: New runoff rates for Royale Road L0324

Dear Stephen, good to talk to you earlier today and glad all is going well.

As discussed, we are revisiting the Royale Road site for the commercial areas to the north. As discussed we would like to increase the discharge because the original calculation did not include brownfield areas. Please see attached the maps and below a table based on the calculations that you used. Please can you confirm this is acceptable and we will amend the FRA.

Runoff calcs - Rational Method – IoH124				
Assumption is that Rational method runoff coefficient (C) from tarmac area = 0.9 and from grass area = 0.3				
Total area	0.86ha			
Greenfield area	0.6ha			
Brownfield area (existing and will also be part of development)	0.26ha			
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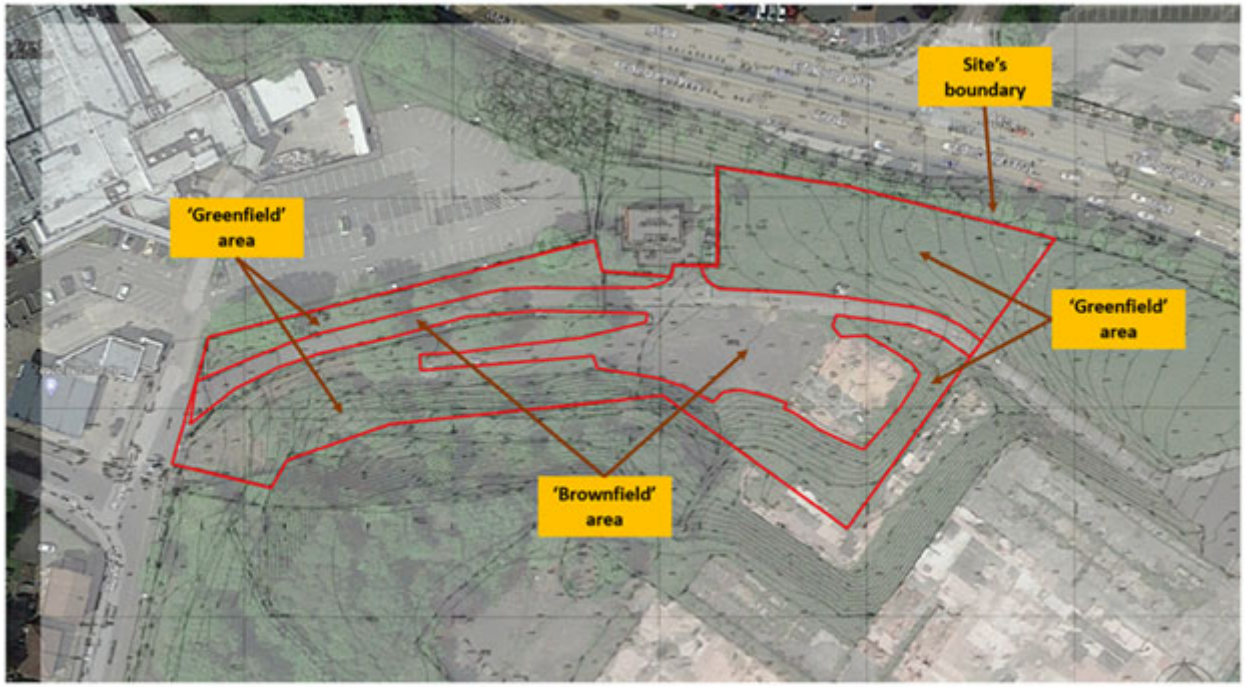

If you have any queries please do not hesitate to contact me.

Kind regards
Charles

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