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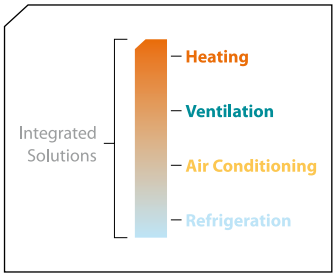
User Guide – Altherma LT Split

For your new Daikin Altherma low temperature heat pump



Your new Daikin Altherma heat pump

In this manual you will find information and guidelines that will allow you to run your Daikin Altherma heat pump system in the most energy efficient and cost effective way.

We hope you enjoy a warm and comfortable winter season!

System overview

The heart of your new central heating system is a highly efficient Daikin Altherma air source heat pump. The heat pump heats the water which flows around your central heating and separately heats the hot water when required in your hot water cylinder. The central heating is usually controlled from a Daikin controller or programmable room thermostat which switches the heat pump on and off at preset times, sending warm water through the central heating. Most radiators have thermostats (TRV's) fitted to control the individual room temperatures.

Outdoor unit

Hot water cylinder

Hydrobox

Daikin Altherma controller

Your heating system in detail and getting the most from it

Outdoor unit

Outside is the heat pump. This extracts heat from the air, even below 0°C and uses this heat to heat the water passing through the central heating and hot water cylinder.

The outdoor unit pulls in air from the rear, extracts the heat in the air, and blows the cooled air out the front. This is done automatically, and there is no need to set or adjust it.

If the rear of the outdoor unit gets clogged up with leaves or debris, the efficiency of your heating system can be reduced, this should be checked regularly and cleaned with a soft brush. Similarly, don't block the front of the unit up by leaning anything against it.

Hydrobox

The hydrobox is located indoors. This distributes hot water around the central heating and to the cylinder. The Daikin Altherma controller communicates with the hydrobox for efficient use.

Cylinder

Hot water is stored in the cylinder. To ensure low running costs the cylinder is normally set to heat to 48°C. Your system is set up to heat the water in the cylinder at the time when it is cheapest. If you have Economy 7 this will be during off-peak periods. If not, it will be during the day when the air temperature is higher. Once a week the water in the cylinder is heated to at least 60°C to ensure the cylinder remains free from bacteria.

Hot water preparation in detail

Your system is set up to heat the water in the cylinder at the time when it is cheapest. If you have Economy 7 this will be during off-peak periods. If not, it will be during the day when the air temperature is higher.

Programmable room thermostat

You may have a room thermostat installed in your property. It would be located in the hall or within certain rooms. It controls when the house is heated, and to what temperature.

It is likely the thermostat has been set to heat the house to 21°C in the early morning, lunchtime and evening, with a cooler 18°C at other times from Monday to Friday. At weekends, it is set to 21°C from early morning until late evening, with 18°C over night.

Heat emitters: radiators

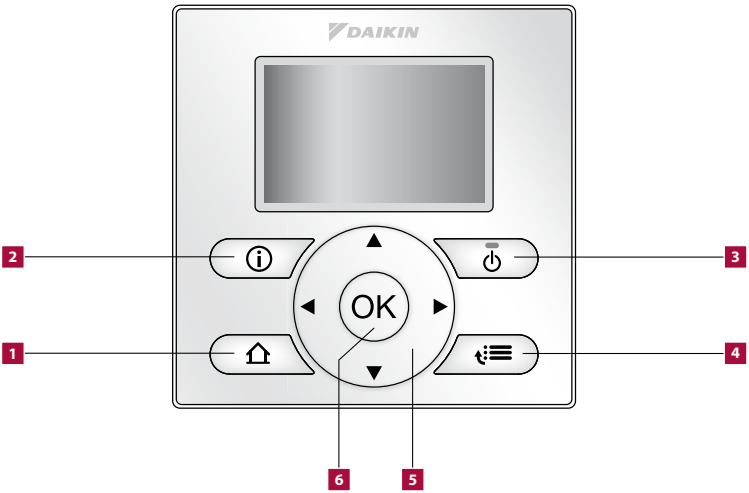
Most radiators are fitted with Thermostatic Radiator Valves (TRV's) as shown in the picture which ensures rooms will not become too warm.

Temperatures are represented by numbers or roman numerals I, II, III, IIII. The higher the number, the warmer the room temperature. Each valve should be set according to the temperature you wish to achieve.

Underfloor heating (UFH) and/or fan coil units (FCU)

If UFH is installed you may see a manifold in your airing cupboard or similar with pipes going into the floor. This will heat your floors, which in turn heat your home. If FCU are installed you will see them on your walls. FCU operate in a similar way to radiators, but a fan in the unit pushes heat into the space around it.

Your Daikin Altherma remote controller



1. **Home pages**
   - Switches between home pages for room temperature, tank temperature and leaving water temperature (when on the home pages)
   - Goes to the home page (when you are in the menu structure)
2. **Error information**
   - If an error occurs with your Daikin Altherma heat pump unit the information is displayed here
3. **On/off**
   - Turns on or off one of the controls (room temperature, tank temperature and leaving water temperature), depending on which home screen is shown on the display
4. **Menu/back**
   - Opens menu page when on the home page or goes back a level when you are within the menu structure
5. **Navigation buttons**
   - Navigates through the menu structure, selects and changes settings
6. **OK/enter button**
   - Confirms a selection
   - Goes to the next step when in programming mode
   - Enters a sub-menu when in the menu structure

Useful functions on your Daikin Altherma controller

Raising the hot water temperature

Storing water at higher temperatures is wasteful, because heat loss from the cylinder will be increased and the heat pump running costs will increase.

However, should you find the hot water is not hot enough, it can be increased by going to the domestic hot water home page. Press ⌂ until you reach the domestic hot water home page (display will show 'tank' in top right corner). You will see either a temperature setting e.g. 60°C ▲▼ or 🧍 symbol on the screen.

Use the ▲ button to increase the volume of hot water in the tank.

Note: You need to ensure the domestic hot water function is 'ON' to be able to adjust the settings. Press ⏻ if you do not see a green light above the ⏻ symbol.

Additional hot water other than pre-set times (boost function)

If you run out of hot water you can go into booster mode. Press ⌂ until you reach the domestic hot water home page.

Now press ▶ until you reach 💪 to activate domestic hot water booster mode.

Note: Increased use of boost function will affect overall efficiency of the system.

Note: If you see the ☁ symbol, this means the domestic hot water is based on weather compensation, thus cannot be changed from the home menu.

Maximising your energy savings

To increase the efficiency of the central heating system, your heat pump will automatically vary the temperature of the water going through your central heating. The colder the temperature gets outside, the warmer the circulating water through your central heating.

When in the automatic (weather compensation) mode, if you feel the house is too warm or not warm enough you can adjust the central heating temperature up or down. Press ⌂ until you reach the room temperature home page. Use the ▲ or ▼ button to increase the room temperature.

Note: You need to ensure the room temperature function is 'ON' to be able to adjust the settings. Press ⏻ if you do not see a green light above the ⏻ symbol.

Activating the schedule timer

To activate the schedule timer press ⌂ until you reach the room temperature home page (display will show 'room' in top right corner). Use the ◀ or ▶ to move between heating modes. When you reach the 🕒 symbol you are in scheduled mode. The next scheduled timer function is shown at the bottom of the screen, for example wed 17:00 ↑

Heating modes: 🕒 = Scheduled mode
☀ = Comfort daytime mode (20°C)
☾ = Eco nighttime mode (18°C)

Note: ↑ = At the next scheduled action, desired temperature will increase
→ = At the next scheduled action, desired temperature will not change
↓ = At the next scheduled action, desired temperature will decrease

Setting the clock

If for any reason you require to re-set the clock,

1. Press ⌂ to go to any home page
2. Press ☰ to enter the menu function and press OK when 'set time / date' is highlighted
3. Press ▼ until you reach the 'time' setting. Press OK
4. Press to adjust the hour ▲ or ▼ and then ◀ or ▶ to move across to adjust the minutes. Now Press ▲ or ▼ to adjust the minutes
5. Press OK to confirm and save the new time and press ⌂ to return to the home page

Changing the central heating timer settings

If you wish to set the central heating to heat at times other than those already set, you need to adjust the settings on the controller:

1. Press ⌂ to go to the home page
2. Press ☰ to enter the menu function
3. Press ▼ until 'user settings' is highlighted, press OK
4. Press ▼ until 'set schedules' is highlighted, press OK
5. When 'room temp.' is highlighted, press OK
6. When 'set heating schedule' is highlighted, press OK
7. If you wish to change an existing schedule choose the name of the schedule you wish to change and press OK, OR if you want to start a new schedule, choose 'empty' and press OK
8. 'Mon' will be highlighted, this is the schedule for Monday. Press ▶ to enter the schedule for the selected day, or ▲ or ▼ to select another day

Continued overleaf...

Changing the central heating timer settings

Continued...

9. Press ▲ or ▼ to change the hour time of the schedule and press ▶ to change minutes. Press ▶ to set type of schedule. You can either set a room temperature or choose 'eco' (18°C) or 'comfort' (20°C) modes. Press ▲ or ▼ to switch between modes or to adjust temperatures
10. Press ▶ to move to the next schedule for the day. Repeat step 9 for the next timer schedule
11. When you have set all schedules for the day, press (OK)
12. You are able to copy the schedule set for Monday, to other days in the week. Press ▼ until 'copy day' is highlighted. Press (OK)
13. 'No' will be highlighted under 'Tue'. If the same schedule is required for Tuesday, press ▲ until 'yes' appears. Press ▶ to move to Wednesday. Repeat this step until you have copied the schedule for the days you require. Press (OK) to confirm and return to the schedule timer screen
14. If you would like a different schedule, for example on the weekend, press ◀ until the days on the left-hand side are highlighted
15. Press ▲ or ▼ until the day you wish to adjust is highlighted. Press ▲ to enter schedule timer adjustment screen and adjust timer schedules as described in step 9
16. When all schedules are set, press (OK) and press ▼ until 'same schedule' is reached, press (OK)
17. Save the schedule timer under either 'user defined 1, 2 or 3'. Press ▲ or ▼ to move between the user schedules 1, 2 or 3. Press (OK) to confirm
18. You can edit the name of the schedule. Press ▲ or ▼ to adjust the first letter and ▶ to adjust the next letters. Press (OK) to confirm
19. Press ⌂ to return to the home screen

Changing the central heating timer settings

Continued...

20. Press ☰ to enter menu and press ▼ until 'select schedules' is highlighted and press OK
21. When 'room temperature' is highlighted press OK
22. When 'heating' is highlighted, press OK
23. Press ▼ until the name of the schedule you have changed is highlighted and press OK

Your checklist for diagnosing possible faults

If the radiator is too cold check that the radiator TRV is set to a high enough level.
A room may become warm enough without the radiator being more than lukewarm.

Is the programmable thermostat set too low?
Check that the temperature on the programmable thermostat is set high enough to start the heat pump.

Is the mains power switched off?
Check that the heating switches are switched ON, including the switch located next to the outdoor unit.

In the event you have checked the points opposite, and the system still fails to operate normally, you can manually reset the system by turning off the power, waiting 60 seconds then turning it back on.

If the system still does not operate as normal, check the display on the controller for a fault code (typically a number and a letter for example 7H) and contact your housing association, making reference to the displayed code.

www.daikin.co.uk
For full user instructions, please refer to the Daikin Altherma operation manual.

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MCS HP0006

Visit **www.microgenerationcertification.org**
for a list of the latest MCS certified Daikin heat pumps

Carbon
Balanced Paper

FSC

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25 June 2020

Dear Pauline

Hopeman Service Station, Forsyth Street
Level 1 Flood Risk Statement

Please find attached a Level 1 Flood Risk Statement for your site in Hopeman, Moray. The flood risk statement is supported by SEPA flood maps and GIS analysis.

An overland flow analysis and review of the SEPA flood maps highlighted that there was a risk of pluvial flow from Gallow Hill accumulating south of the site within an existing ditch but not within the site. In 2018, a swale and attenuation basin was constructed to collect surface water from potential developments around the south of Hopeman including the proposed site at Hopeman Service Station. The swale is designed to intercept flows from the hill and will improve drainage around the site reducing the pluvial flood risk. This existing drainage infrastructure is designed to protect the site against a 1 in 200 year RP overland flow from Gallow Hill.

The assessment of flooding from all sources concluded there was no risk of flooding from fluvial, coastal or groundwater sources.

Yours sincerely
for EnviroCentre Ltd

(issued electronically)

John Phillips
Senior Consultant

Martin Nichols
Principal Consultant

Enc: Hopeman Service Station: Level 1 Flood Risk Statement
Hopeman, Moray Attenuation Design Support: 368688/EO/001
CC:

HOPEMAN SERVICE STATION: LEVEL 1 FLOOD RISK STATEMENT

Site Location and Development Description

The site is located in the village of Hopeman, Moray. The proposed development is to be located on the land of the Hopeman Service Station on Forsyth Road. The representative National Grid Reference (NGR) of the site is NJ 14749 69255. The development site has an area of approximately 0.3ha. The location plan is presented in Figure 0.1. The proposed development is for the construction of a retail unit, a light industrial unit and two blocks of flats comprising of eight units in total.

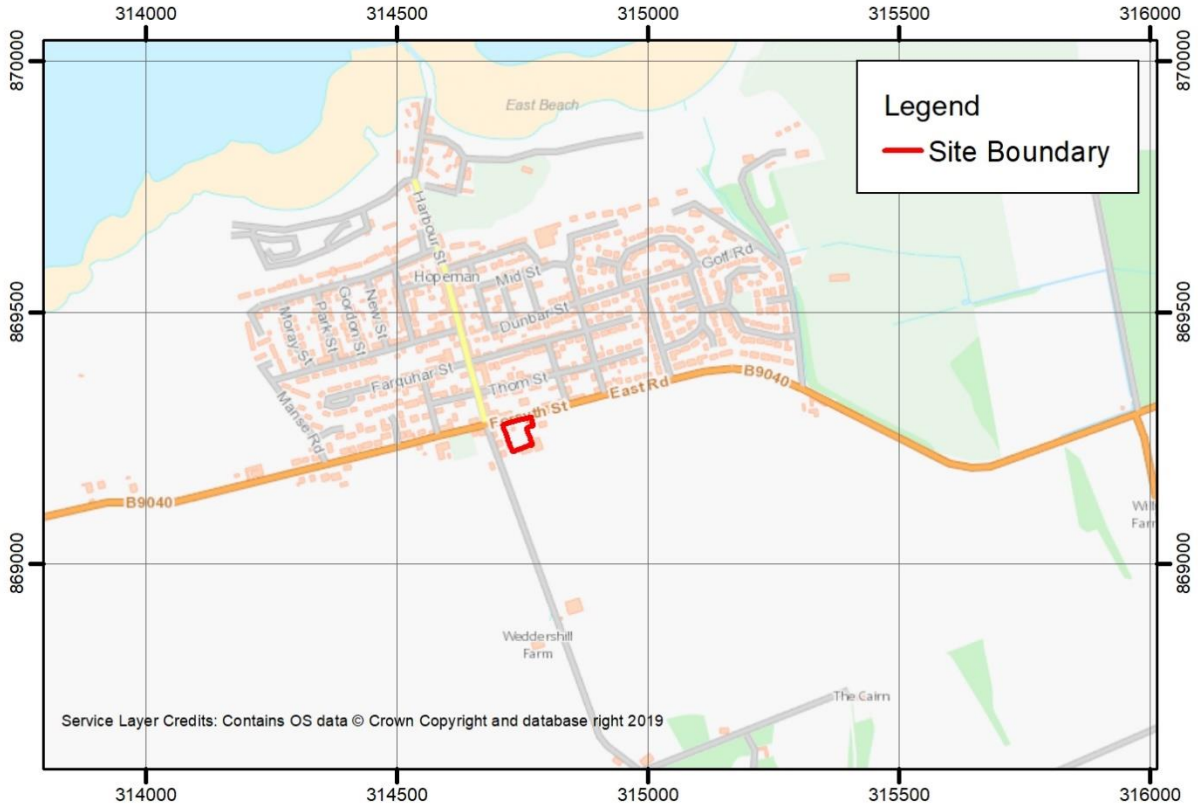

Figure 0.1: Site location

Development Drainage

In 2018, a swale and attenuation basin was constructed to the south of the site (Planning Reference 17/00894/APP). The supporting documentation for the design of the drainage is provided in the enclosed Hopeman, Moray Attenuation Design Support (368688/EO/001).

The contributing catchment to inform the design of this swale and attenuation basin included the proposed development site. The scheme was designed to attenuate the runoff generated in a 1 in 200 year RP + 20% climate change event from the fields to the south of site. The basin releases the flows into the receiving ditch downstream of the site at less than the 1 in 2 year RP greenfield runoff rate.

Surface water runoff from the Hopeman Service Station development site will be collected in an underground drainage network. This network will discharge into the existing swale located to the south of the site. The swale in turn discharges to the existing attenuation basin. Further discussion on the drainage of the site is provided in the drainage impact assessment (10045/CIVIL/R001).

Site Topography and Hydrology

The topography of the site and surrounds has been assessed using the LiDAR DTM data from the Scottish Remote Sensing Portal (https://remotesensingdata.gov.scot/). The DTM data, which includes part of Gallow Hill, is from the LiDAR Phase 1 survey, which was collected between March 2011 and May 2012, prior to the 2018 construction of the swale and attenuation basin.

Within the site the topography is relatively flat, with a maximum elevation of approximately 28mAOD in the south-west corner of the site and a minimum elevation of approximately 27mAOD in the north-east corner of the site. The direction of slope within the site is therefore from the south-west towards the north-east corner onto Forsyth Road. The ground elevation for the site and surrounding area is presented in Figure 0.2.

To the south of the site is Gallow Hill which has a maximum elevation of approximately 70mAOD, sloping down towards the site. Between the foot of Gallow hill and the site is a small ditch. The ditch flows in a east-north-east direction. A cross section of the ditch from Gallow Hill to the site is presented in Figure 0.3. As noted previously, since the collection of data for the DTM used in this assessment a swale has been constructed to the south of the existing ditch.

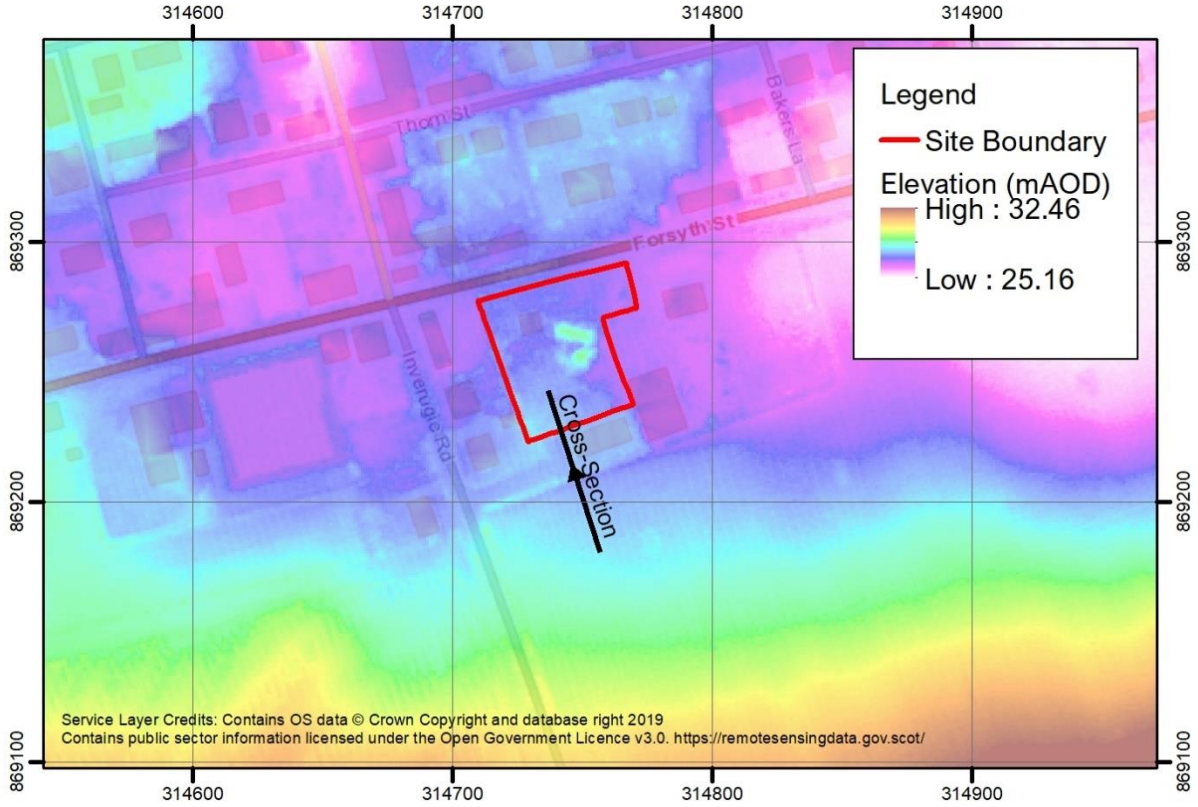

Figure 0.2: Ground elevation excluding the Swale

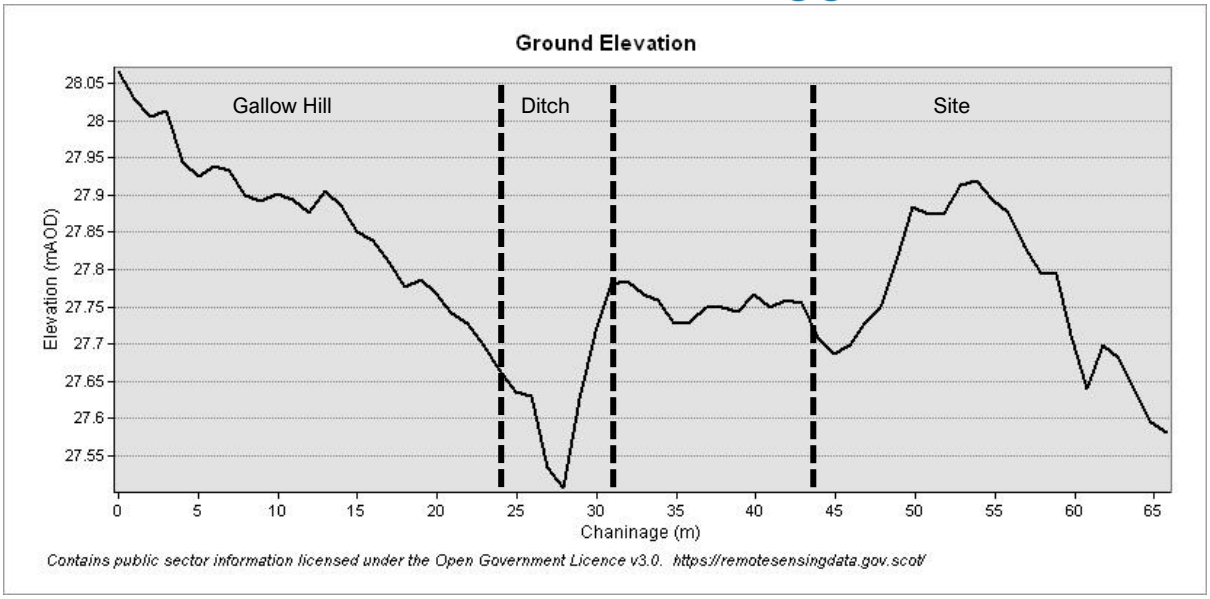

Figure 0.3: Cross-section profile of the ground level from south to north

SEPA Flood Maps

SEPA flood maps have been used to support this assessment. The SEPA flood maps consider three probabilities of flood occurrence, high likelihood (1 in 10 year RP); medium likelihood (1 in 200 year RP); and, low likelihood (1 in 1000 year RP).

Table 0.1: SEPA flood map assessment for all flooding sources

Flooding Source	Description
Coastal	SEPA flood maps do not indicate coastal flood risk within the vicinity of the site.
Fluvial	SEPA flood maps do not indicate fluvial flood risk within the vicinity of the site.
Groundwater	SEPA flood maps do not indicate groundwater flood risk within the vicinity of the site.
Pluvial	SEPA flood maps do not indicate pluvial flood risk within the site. The maps do show high pluvial flood risk to the south of the site. The maps show multiple small ponding locations around the south of the site. It is likely that flow from Gallow hill is collecting in the ditch and depressions in the ground elevation model, creating small disperse ponding. The SEPA flood maps do not include the new swale constructed in 2018, which has improved the drainage in the area.

Overland Flow Analysis

Overland flow analysis has been undertaken using the 3D analyst extension in ArcGIS, with the input LiDAR DTM dataset which does not include the swale or attenuation basin. The results are presented in Figure 0.4, and highlight overland flow is likely to accumulate on Gallow hill and flow towards the

site. Due to the steep nature of the hill the runoff from the hill is diffuse in nature and is not confined to a clearly defined flow path or channel. At the foot of the hill the existing ditch collects this runoff from the hill, and protect the site from inundation. The 2018 construction of a swale will have enhanced the collection and conveyance of flow from the foot of Gallow Hill, away from the site towards the associated attenuation basin.

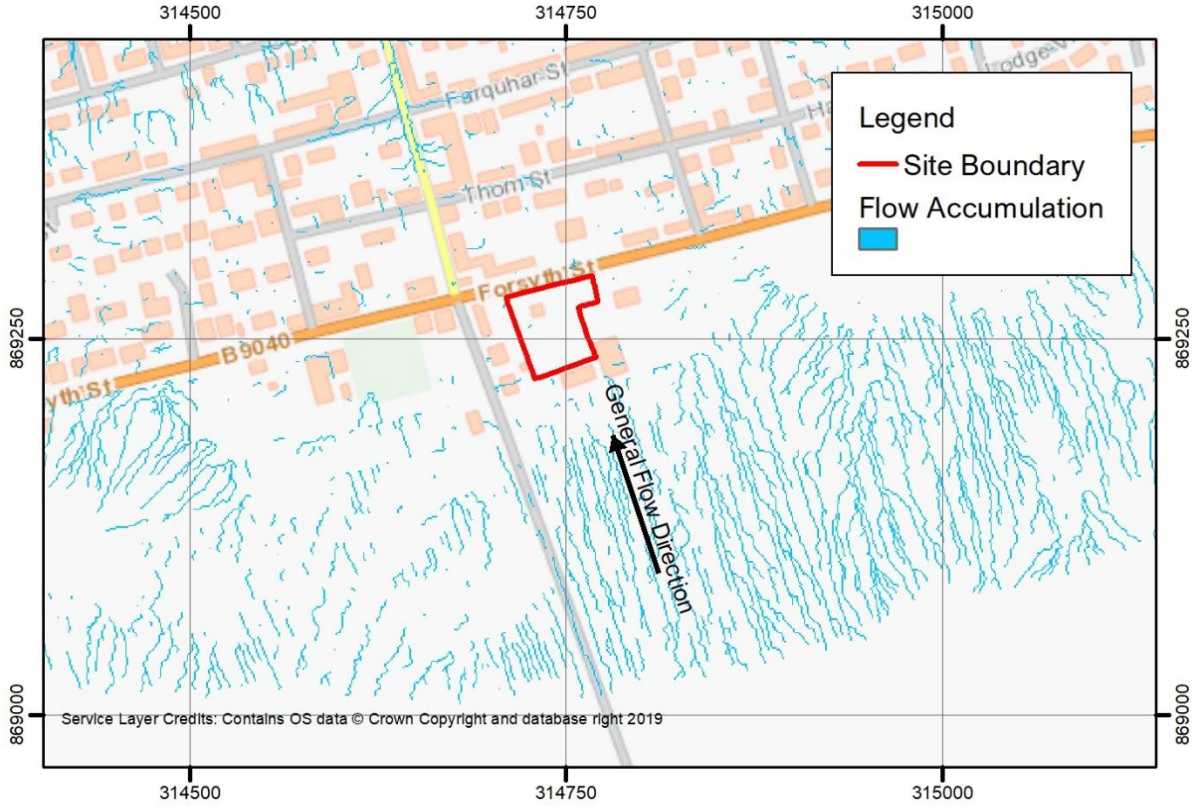

Figure 0.4: Overland flow analysis and general flow direction towards the site

Assessment of Flood Risk from All Sources

Flooding Source	Description	Mitigation
Coastal	The site has an elevation of approximately 27mAOD and is located 610m from the coast. The site is not at risk of coastal flooding.	No mitigation required
Fluvial	There is no significant watercourse within the vicinity of the site. SEPA flood maps do not indicate that the site is at risk of fluvial flooding. Therefore it is considered that the site is not at risk of fluvial flooding.	No mitigation required
Groundwater	SEPA flood maps do not indicate any groundwater flood risk within the vicinity of the	No mitigation required

Flooding Source	Description	Mitigation
	site. The nearest low probability of groundwater flooding is to the north-east, approximately 2.6km from the site. It is considered that the site is not at risk from groundwater flooding.	
Pluvial	The site is located at the bottom of Gallow Hill. Overland flow analysis shows that there is a risk that overland flow will discharge down the hill towards the site and accumulate in the ditch to the south of the site. This agrees with the SEPA flood map which shows a risk of ponding south of the site. A review of local topography, including a cross-sectional ground prolife, shows the site is protected by higher elevation ground between the ditch and the site. In 2018, a swale was constructed at the foot of Gallow Hill. The swale is designed to improve drainage from Gallow Hill. It intercepts runoff from the hill and conveys it to the associated attenuation basin. The construction of the swale and attenuation basin has further reduced pluvial flood risk around the site. Neither the SEPA flood maps nor the overland flow analysis show the site is at risk of flooding.	The proposed development surface water drainage network will collect flow from within the site. The receiving water for this surface water will be the existing swale. This swale will direct flow to the associated attenuation basin. The basin will then release the flow into the receiving ditch at less than the 1 in 2 year RP greenfield runoff rate. The swale also intercepts flows from Gallow Hill. Which reduces the risk of ponding around to the site. This scheme has been designed to protect the site against the 1 in 200 year RP event.

Conclusion

This assessment has shown that there is no likely risk of flooding from coastal, fluvial, groundwater or pluvial sources to the development site. Mitigation is not required to protect against flooding from coastal, fluvial and groundwater sources. The proposed and existing mitigation for pluvial flooding will protect the site against any potential pluvial flooding originating from Gallow hill to the south, the development drainage scheme has been designed to protect the site for events up to and including a 1 in 200 year RP.

HOPEMAN, MORAY ATTENUATION DESIGN SUPPORT: 368688/EO/001

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22 May 2017

Dear Alasdair

Hopeman, Moray
Drainage Improvement Design Support

Please find attached our detailed designs for the proposed drainage improvement scheme at Hopeman, Moray.

The proposed scheme will attenuate the runoff generated in a 1 in 200 year + 20% climate change event from the fields to the south of Hopeman, and release the flows into the current receiving ditch downstream of the site at less than the 1 in 2 year greenfield runoff rate.

The proposed scheme is designed to intercept and attenuate runoff from the fields to the south of Hopeman.

Yours sincerely
for EnviroCentre Ltd

(issued electronically)

Emer Owens
Senior Civil Engineer

Jennifer MacDonald
Senior Environmental Consultant

Enc: Hopeman Attenuation Calculations
Appendix A: Field Drain Drawings
Appendix B: Catchments
Appendix C: Catchment Descriptors
Appendix D: Greenfield Runoff Rates (ReFH2)
Appendix E: Greenfield Runoff Rates (IH124)

HOPEMAN ATTENUATION CALCULATIONS

Introduction

Terms of Reference

1. EnviroCentre Ltd has been commissioned by Springfield Properties PLC to design a drainage improvement scheme for a site immediately to the south of Hopeman, Moray. The site is shown in Appendix B with the centre of the catchment located at grid reference NJ 14960 68983. EnviroCentre Ltd has previously examined runoff volumes for the site (Ref: 368688/JMD/001).

Scope of Report

2. There are existing flooding issues caused by runoff from the fields to the south of Hopeman. In response to this, Springfield Properties installed a field drain running parallel to Forsyth Street/East Road in order to route runoff into the existing ditch which extends along the western edge of the golf course. The design drawings for the existing field drain are provided in Appendix A.

3. Following two storm events in 2014, Moray Council commissioned JBA Consulting to undertake an appraisal of the field drain and its conveyance capacity. JBA have determined that the field drain does not have sufficient capacity to convey the 1 in 2 year runoff volume (JBA Consulting, 2016). Springfield Properties Ltd therefore intends to install further drainage improvement features to cope with the volume of runoff generated in storm events up to the 0.5% Annual Exceedance Probability (AEP), or 1 in 200 year return period event, plus an additional 20% to allow for future climate change.

4. Springfield Properties has developed an outline drainage improvement design whereby an attenuation basin will be incorporated into the existing drainage design. The attenuation basin will be located next to the shallowest section of ditch and will be used to store the runoff exceeding the capacity of the existing field drain, up to the 0.5% AEP + 20% climate change runoff volume. The attenuation basin will be tied into the field drain at its eastern and western extents to ensure that all runoff from the site is routed through the basin.

5. The purpose of this report is to provide the detailed designs for the drainage improvement features (including supporting calculations) required for the site, to cope with the volume of runoff generated in storm events with magnitudes up to 0.5% AEP + 20% climate change.

6. The proposed layout of the scheme is provided in drawing 368688-001.

Hydrology

Catchment Delineation

7. The catchment of the existing field drain was delineated using OS Terrain 50 contours and is shown in Appendix B. In order to be conservative, the catchment has been extended to the boundary of the western fields. The catchment of the entire site has an area of approximately 67ha. This catchment area has been used for the hydrological calculations of the attenuation basin detailed below.

8. An access road currently extends north westwards through the site. In recent extreme rainfall events, this access road has been the preferential flow route for runoff from the western fields. The western fields comprise 42% of the site catchment area (28ha). The western field catchment is also shown in Appendix B and has been used for the hydrological calculations of the conveyance swale detailed below.

Greenfield Runoff Rates

9. The catchment characteristics used in the calculations were derived from the catchment of the receiving ditch to the north east of the site using the Flood Estimation Handbook (FEH) web service (CEH, 2015). The Standard Annual Average Rainfall (SAAR) for the site is 612mm. The BFI HOST value of 0.89 was considered to be unrepresentative of the site given the underlying glacial till drift geology (BGS, n.d.), and therefore this was adjusted based on gauged data for a nearby gauging station (7007 Black Burn at Monaughty). This provided a revised BFI HOST value of 0.66. A summary of the catchment descriptors obtained from the FEH web service is provided in Appendix C.

10. Greenfield runoff rates for the site were calculated using two alternative flow estimation methods in order to determine the standard of protection currently provided by the field drain and determine the appropriate volume of additional storage required to mitigate overland flood risk up to a 0.5% AEP + 20% climate change event.

11. The Institute of Hydrology Report 124 (Marshall & Bayliss, 1994) method was used to estimate the 0.5% AEP greenfield runoff rate for the site and produced a 0.5% AEP + 20% climate change greenfield runoff rate of 0.47m^3/s for the catchment of the field drain. The suggested SOIL factor of 0.15 for the site (derived from Winter Rainfall Acceptance Potential (WRAP) map) was considered to be too low based on the soil type (Humus-iron Podzols) and underlying superficial geology of the site (Glacial Till). The SOIL factor was therefore increased to 0.35 which is considered to better represent the site conditions.

12. The REFH2 Method (WHS, 2015) was also run for comparison. A critical storm duration of 6 hours was derived iteratively for the site and provided a 0.5% AEP greenfield runoff rate of 0.37m^3/s.

Table 1 Greenfield Runoff Rates

Flood Event	Western Fields Catchment		Entire Site Catchment	
	IH124 Method (m^3/s)	ReFH2 Method (m^3/s)	IH124 Method (m^3/s)	ReFH2 Method (m^3/s)
50% AEP	0.06	0.04	0.13	0.10
0.5% AEP	0.17	0.15	0.39	0.37
0.5% AEP + 20% Climate Change	0.21	0.19	0.47	0.44

13. In order to be conservative the higher flow estimates derived using the IH124 Method has been adopted in this study. The 0.5% AEP greenfield runoff rate including an additional 20% climate change allowance for the site is therefore assumed to be 0.47m^3/s. Supporting calculations are provided in Appendices D and E.

Existing Drainage Scheme

14. The capacity of the existing drainage system on site was studied, and is detailed in the EnviroCentre Ltd letter report (Ref 368688/JMD/001) dated 2 November 2016.

15. The result of the study found that the existing field drain has sufficient capacity to convey approximately 0.062m^3/s, but that the outflow from the site is restricted by the current culvert under East Road. Based on information provided by Springfield Properties PLC, the culvert under East Road is estimated to convey 0.016m^3/s and this is therefore considered to be the maximum outflow rate for the site. This is significantly less than the calculated 1 in 2 year greenfield runoff rate of 0.13m^3/s.

Flow Attenuation Requirements

16. In order to prevent overland flows from the fields to the south of Hopeman from affecting Forsyth Street/East Road and the properties beyond, it is proposed that the drainage improvement features will be designed to store runoff which exceeds the current maximum outflow rate for the site, up to the 0.5% AEP + 20% climate change storm event.

17. The volume of attenuation required was calculated based on the volume of runoff generated within the site minus the volume of outflow from site, over the critical storm duration of six hours.

18. The volume of runoff generated within the site over the 0.5% AEP + 20% climate change storm duration was calculated to be 10,152m^3 based on a flow rate of 0.47m^3/s over the course of a six hour storm.

19. The volume of water leaving the site through the culvert under East Road has been calculated based on the maximum flow rate for the culvert (0.016m^3/s) over the course of a six hour storm duration. The outflow from the site is calculated to be 346m^3/s.

20. A required attenuation volume of approximately 9,800m^3 has therefore been calculated for the site based on the difference between the calculated runoff and controlled outflow volumes.

Attenuation Design

Outflow

21. The current culvert at the north east boundary of the site will remain as the only outflow from the site and therefore a flow of 0.016m^3/s has been used as the outflow rate from the drainage system.

Swale

22. The 0.5% AEP + 20% climate change runoff from the western field has been estimated at 0.21m^3/s (Table 1). The capacity of the section of field drain located within the western field has been estimated at 0.10m^3/s based on a gradient of 1 in 200 and a Ks value of 0.6mm (as used in Springfield Properties PLC calculations) in order to be conservative. The current field drain is therefore considered to have insufficient capacity to convey flows from the western fields to the attenuation basin which will be located within the eastern field.

23. In order to adequately convey the flow exceeding the capacity of the current field drain (0.11m^3/s), additional conveyance capacity will need to be provided. A swale, stretching from the western field boundary to the attenuation basin (as shown on drawing 368688-001), will be installed to provide this additional conveyance capacity.

24. The Conveyance Estimation System (Wallingford Software, 2008) has been used to design a swale with appropriate dimensions in order to provide the required attenuation capacity up to the 0.5% AEP + 20% climate change runoff rate. The proposed swale should be at least 0.5m deep with 1 in 3 side slopes. This will provide an overall top width of 3.5m. In a 0.5% AEP + 20% climate change storm event the depth of runoff through the swale will be approximately 0.3m.

25. A new culvert will be required under the existing access road between the fields. A required culvert diameter of 350mm has been estimated using the standard pipe tables (HR Wallingford, 2006) based on a 1 in 200 gradient and a Ks value of 0.6mm.

Attenuation Basin

26. As per the EnviroCentre letter report (REF 368688/JMD/001), the attenuation basin will be located in the north eastern corner of the site as this is where overland flows from the majority of the site will naturally pond (as shown in drawing 368688-002). The attenuation basin will be designed according to best practice Sustainable Drainage Systems (SuDS) guidance (Woods Ballard et al., 2015).

27. The proposed attenuation basin is to be 1.5m deep, and a total of 37m x 300m. Baffle walls are included to follow best practice guidance. Further details can be found on the engineering drawings in accompanying drawings 368688-002 to 368688-004.

28. The 1.5m depth includes a 600mm freeboard allowance. In a 0.5% AEP storm event, the design water level in the attenuation basin will be 24.65mAOD (depth of 0.9m). All storage within the attenuation basin, including the 600mm freeboard allowance will be provided below current ground levels. Due to the depth of the basin, a geotextile liner will be used in order to prevent ingress of groundwater during times when the groundwater table is high. This will ensure that the 'active' capacity of the basin is not reduced by groundwater ingress.

Shallow Landscaped Bund

29. The drainage improvement system has been designed so as not to rely solely on the attenuation basin in order to contain runoff within the site during extreme storm events. A shallow landscaped bund (at least 500mm high) will be installed along the northern boundary of the site (as shown on drawing 368688-001). This will provide an additional level of protection and will further prevent overland flows draining northwards off site during storm events which exceed the 0.5% AEP + 20% climate change design criteria.

30. The shallow bund will also extend southwards along eastern boundaries of both the western and eastern fields in order to direct any overland flows away from the access roads and ensure that all flows generated within the within the catchment to the south of Hopeman are attenuated as part of the drainage improvement scheme.

Construction

31. The floor of the SuDS attenuation basin will have a shallow fall towards the outlet to ensure basin is completely drained following storm events and minimise risk of erosion. The sides and base of the basin should be lined with a geotextile to increase stability and prevent ingress of groundwater.

32. In order to ensure that the attenuation basin operates as planned, a low bund (at least 500mm high) should be installed to the east of the attenuation basin running parallel to the existing field drain, in order to direct any overland flow from the strip of land east of the site, westwards into the attenuation basin.

33. A shallow landscaped bund should be installed immediately to the north of the field drain running parallel to it, in order to prevent any runoff exceeding the capacity of the existing field drain from flowing northwards off the site and bypassing the attenuation basin. The bund should be at least 500mm in height with side slopes no steeper than 1 in 3. Material excavated to create the attenuation basin would be used for this purpose.

34. Side slopes of the SuDS attenuation basin should not usually exceed 1 in 3; there should be appropriate access to the SuDS basin for maintenance activities such as grass cutting.

35. The pre-treatment swale acts to remove as much of the suspended solids and fine silts from the runoff as possible prior to entering the SuDS basin. The inlet channel should be stabilised using rip rap.

36. Immediately following construction, the base and side slopes should be stabilised with a dense, water tolerant grass. Some additional vegetation can stabilise slopes and prevent erosion. Fencing is not generally desirable however inlet and outlet pipes should not be accessible by small children.

37. Detailed drawings of the attenuation basin are provided in drawings 368688-002 to 368688-004.

Maintenance

38. Regular inspection and maintenance is important for the effective operation of attenuation basins. The areas in and around attenuation basins can be managed as “meadow”, unless additional management

is required for landscaping purposes. Inspection and maintenance will be undertaken by the landowners. The proposed maintenance schedule is outlined in Table 2.

Table 2 Maintenance Schedule

Monthly maintenance	Half Yearly	As Required
Litter & debris removal	Grass cutting (spring and autumn)	Re-seed areas of poor vegetation growth.
Manage vegetation		Prune & trim trees
Inspect outlets and inlets from blockages.		Remove sediment from pre-treatment swale (when 50% full)
Inspect banksides, structures and pipework for damage.		Repair of any damages or blockages. Rehabilitation of any surfaces as required.

Flood Risk

39. The proposed scheme has been designed to mitigate the current risk to the properties located along Forsyth Street/East Road as a result of overland flows from the fields to the south of Hopeman, for storm events with magnitudes up to the 0.5% AEP + 20% climate change level.

40. Due to concerns that increasing the outflow rate from the site may result in increased flood risk from the receiving ditch to the north east of the site, the current proposals have assumed that the culvert under East Road will not be upgraded as part of the proposed scheme. There will therefore be no increase in flood risk from the receiving ditch as a result of the proposals.

References

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HR Wallingford (2006). *Tables for the hydraulic design of pipes, sewers and channels* (Vol. II). London: Thomas Telford.

Marshall, D., & Bayliss, A. (1994). *Report No. 124; Flood estimation for small catchments*. Wallingford: Institute of Hydrology.

Wallingford Software (2008). Conveyance Estimation System. Wallingford: Wallingford Software Ltd.

WHS (2015). ReFH2 (Software). Retrieved from http://www.hydrosolutions.co.uk/products.asp?categoryID=4671

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APPENDIX A: FIELD DRAIN DRAWINGS

HAVERS

Sub Sta

EAST ROAD

BM 26.48m

EAST ROAD B 9040 B 9040

Headwall

Extend 150mm pipe to ditch
and form headwall at outlet

Existing 150mm diam pipe

BM 24.68m

WELL

Station

Sheildaig

BM 27.45m

27.5m

27.3m

26.3m

27.1m

Cala-Na-Sithe

Library

Viewfield

FORSYTH STREET

27.4m

Millseat
House

Bowling
Green

Club

Pav

Car Park

INVERUGIE ROAD

Balmellie

WELL

REV	DESCRIPTION	DATE

Springfield

SPRINGFIELD PROPERTIES PLC
ALEXANDER FLEMING HOUSE
8 SOUTHFIELD DRIVE
ELGIN
IV30 6GR

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E-MAIL info@springfield.co.uk

PROJECT
Hopeman
Proposed Storm Drainage

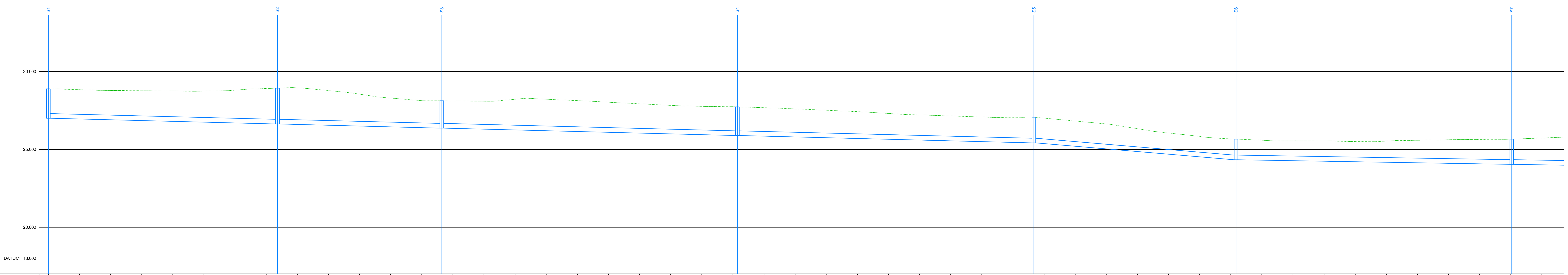
LOCATION
Hopeman

CLIENT
Springfield Properties Plc

DESCRIPTION
Proposed Storm Drainage

DRAWN	DATE	SCALE
R. Vitols	Mar 16	1:750

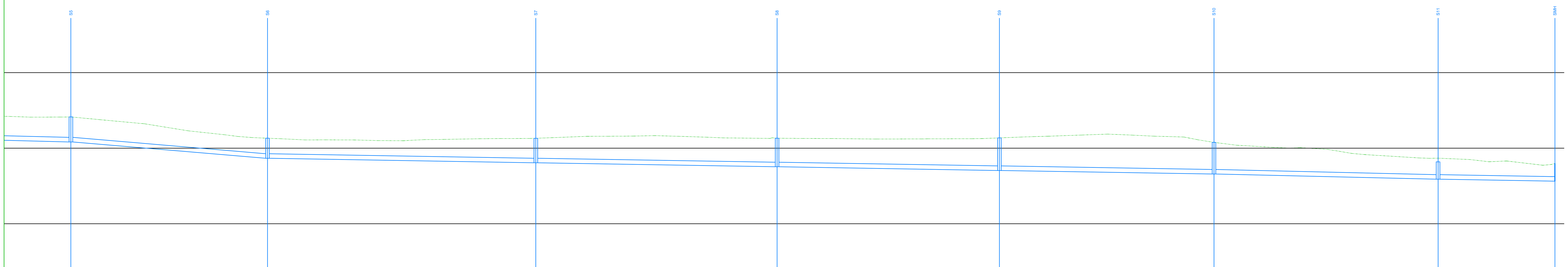
DWG No	CHECKED
ENG/600	BM



GROUND LEVEL	28.888	28.833	28.785	28.769	28.750	28.743	28.805	28.910	28.950	28.778	28.550	28.297	28.131	28.113	28.092	28.220	28.221	28.132	28.028	27.929	27.826	27.766	27.741	27.678	27.601	27.517	27.426	27.308	27.213	27.147	27.079	27.060	27.009	26.821	26.637	26.328	26.054	25.828	25.676	25.589	25.552	25.545	25.504	25.532	25.583	25.621	25.641	25.658	25.731

	S1	S2	S3	S4	S5	S6	S7
STORMWATER COVER LEVEL	28.888	28.936	28.123	27.732	27.069	25.661	25.660
STORMWATER INVERT	27.000	26.632 26.632	26.368 26.368	25.893 25.893	25.416 25.416	24.418 24.418	24.123 24.123

	S1–S2	S2–S3	S3–S4	S4–S5	S5–S6	S6–S7
STORMWATER DETAILS	Pipe 1.000 Dia 300 Circular PLASTIC 1 in 200	Pipe 1.001 Dia 300 Circular PLASTIC 1 in 200	Pipe 1.002 Dia 300 Circular PLASTIC 1 in 200	Pipe 1.003 Dia 300 Circular PLASTIC 1 in 200	Pipe 1.004 Dia 300 Circular PLASTIC 1 in 65	Pipe 1.005 Dia 300 Circular PLASTIC 1 in 300
STORMWATER LENGTHS	73.610	52.836	94.989	95.303	64.954	88.630



27.079	27.060	27.009	26.821	26.637	26.328	26.054	25.828	25.676	25.589	25.552	25.545	25.504	25.532	25.583	25.621	25.641	25.658	25.731	25.789	25.800	25.831	25.773	25.703	25.667	25.664	25.646	25.637	25.614	25.612	25.621	25.628	25.656	25.734	25.797	25.869	25.927	25.843	25.767	25.527	25.245	25.105	25.014	24.945	24.654	24.507	24.384	24.327	24.225	24.146	23.945

S5	S6	S7	S8	S9	S10	S11	SMH
27.069	25.661	25.660	25.663	25.683	25.386	24.100	23.991
25.416 25.416	24.418 24.418	24.123 24.123	23.858 23.858	23.613 23.613	23.377 23.377	23.130 23.130	23.000

S5–S6	S6–S7	S7–S8	S8–S9	S9–S10	S10–S11	S11–SMH
Pipe 1.004 Dia 300 Circular PLASTIC 1 in 65	Pipe 1.005 Dia 300 Circular PLASTIC 1 in 300	Pipe 1.006 Dia 300 Circular PLASTIC 1 in 300	Pipe 1.007 Dia 300 Circular PLASTIC 1 in 300	Pipe 1.008 Dia 300 Circular PLASTIC 1 in 300	Pipe 1.009 Dia 300 Circular PLASTIC 1 in 300	Pipe 1.010 Dia 300 Circular PLASTIC 1 in 320
64.954	88.630	79.693	73.443	70.885	74.025	38.602

REV	DESCRIPTION	DATE

Springfield

SPRINGFIELD PROPERTIES PLC
ALEXANDER FLEMING HOUSE
8 SOUTHFIELD DRIVE
ELGIN
IV30 6GR

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E-MAIL info@springfield.co.uk

IMPORTANT NOTES FOR CLIENTS / CONTRACTORS

NO WORKS ARE TO COMMENCE ON SITE UNTIL ALL RELEVANT APPROVALS HAVE BEEN OBTAINED. ANY DEVIATIONS TO THE APPROVED PLANS HAVE TO BE REPORTED TO THIS OFFICE. CONTRACTORS TO CHECK ALL DIMENSIONS ON SITE PRIOR TO COMMENCEMENT OF WORK.
GIVEN DIMENSIONS ONLY TO BE USED *DO NOT SCALE*

PROJECT
Hopeman
Proposed Storm Drainage

LOCATION
Hopeman

CLIENT
Springfield Properties Plc

DESCRIPTION
Proposed Strom Drainage
Long Sections

DRAWN	DATE	SCALE
R. Vitols	Feb 16	1:200

DWG No	CHECKED
ENG/650 Rev 1	BM

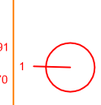
MANHOLE SCHEDULE

Sheet 1 of 2

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams Inv-soff	Manhole Size	Types: Manhole	Types: Cover
S1 E. 314562.616 N. 869145.580	28.888 1.588		0 1.000 0 1.001	27.000 26.632	300 300	1200	B	675
S2 E. 314634.802 N. 869159.991	28.936 2.004		1 1.000 0 1.001	26.632 26.368	300 300	1200	B	675
S3 E. 314686.678 N. 869170.017	28.123 1.455		1 1.001 0 1.002	26.368 25.893	300 300	1200	B	675
S4 E. 314776.367 N. 869201.300	27.732 1.539		1 1.002 0 1.003	25.893 25.893	300 300	1200	B	675
S5 E. 314866.476 N. 869232.333	27.069 1.353		1 1.003 0 1.004	25.416 25.416	300 300	1200	B	675
S6 E. 314884.396 N. 869294.765	25.661 1.027		1 1.004 0 1.005	24.334 24.334	300 300	1200	E	675

MANHOLE SCHEDULE

Sheet 2 of 2

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams Inv-soff	Manhole Size	Types: Manhole	Types: Cover
S7 E. 314970.361 N. 869316.337	25.660 1.322		1 1.005 0 1.006	24.038 24.038	300 300	1200	B	675
S8 E. 315047.627 N. 869335.855	25.663 1.590		1 1.006 0 1.007	23.773 23.773	300 300	1200	B	675
S9 E. 315119.486 N. 869351.027	25.683 1.855		1 1.007 0 1.008	23.528 23.528	300 300	1200	B	675
S10 E. 315188.696 N. 869366.344	25.386 1.794		1 1.008 0 1.009	23.292 23.292	300 300	1200	B	675
S11 E. 315259.095 N. 869343.463	24.100 0.850		1 1.009 0 1.010	22.950 22.950	300 300	1200	E	675
SMH E. 315297.684 N. 869342.456	23.991 0.870		1 1.010	22.821	300 150	PIPE	OUTFALL	N/A

REV	DESCRIPTION	DATE

Springfield

SPRINGFIELD PROPERTIES PLC
ALEXANDER FLEMING HOUSE
8 SOUTHFIELD DRIVE
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PROJECT
Hopeman
Proposed Storm Drainage

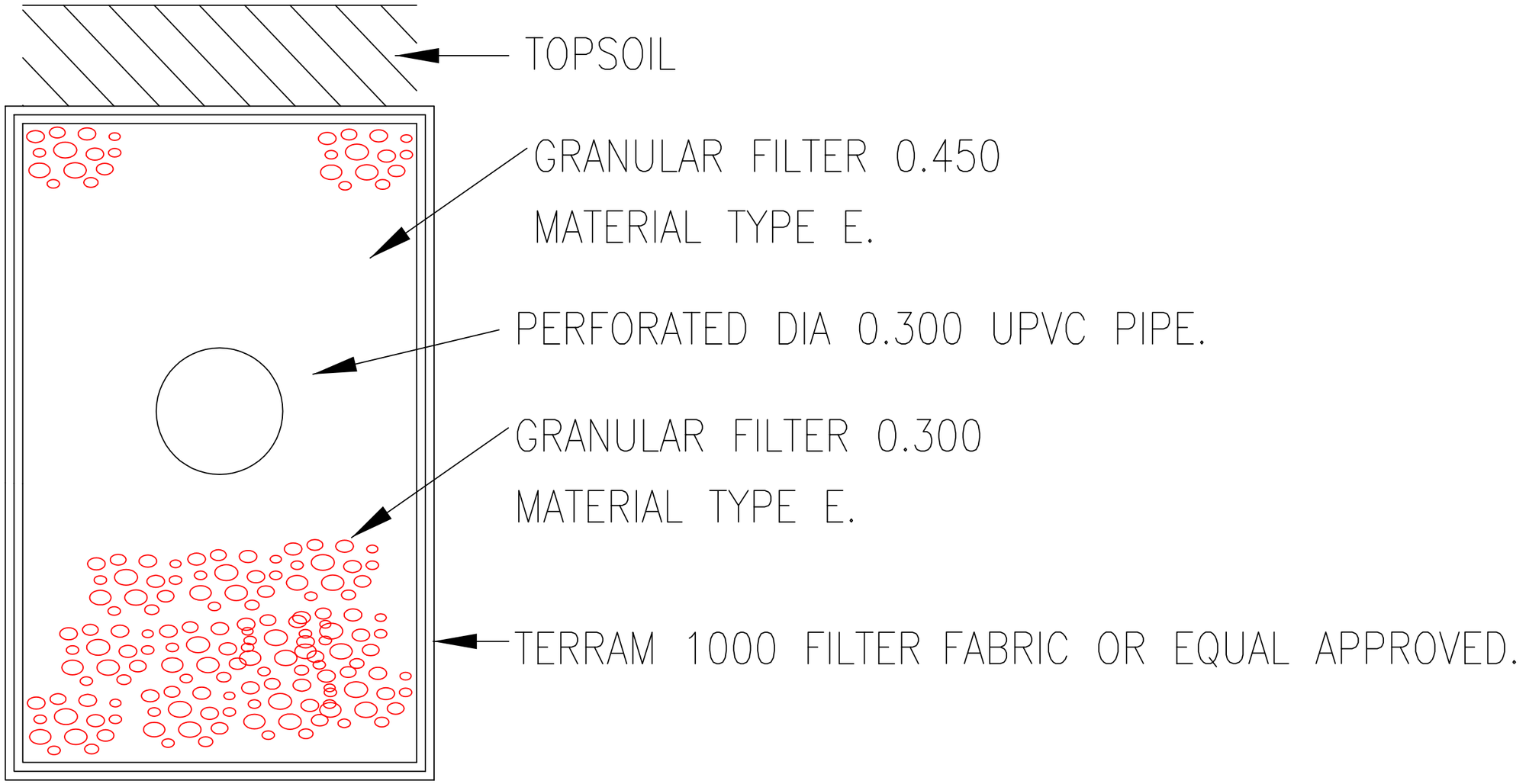
LOCATION
Hopeman

CLIENT
Springfield Properties Plc

DESCRIPTION
Manhole Schedule

DRAWN	DATE	SCALE
R. Vitols	Feb 16	NTS

DWG No	CHECKED
ENG/660	BM



Typical Filter Drain

REV	DESCRIPTION	DATE

SPRINGFIELD PROPERTIES PLC
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8 SOUTHFIELD DRIVE
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PROJECT
Hopeman
Proposed Storm Drainage

LOCATION
Hopeman

CLIENT
Springfield Properties Plc

DESCRIPTION
Drainage Detail

DRAWN	DATE	SCALE
R. Vitols	Feb 16	NTS

DWG No	CHECKED
ENG/661	BM

APPENDIX B: CATCHMENTS

Legend

- Site Catchment
- Western Fields Catchment
- Culvert
- Field Drain
- 5m Contours

Do not scale this map

Client
Springfield Properties Ltd

Project
Land at Hopeman, Moray

Title
Field Drain Catchment

Status
Final

Drawing No.
368688 - 005

Revision

Scale
1:7,500

A3

Date
08 Dec 2016

Drawn	Checked	Approved
JMC	NG	NG

ENVIRO Centre
Craighall Business Park, Eagle Street, Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

APPENDIX C: CATCHMENT DESCRIPTORS

Catchment	NJ 15100 69800
AREA	0.5175
ALTBAR	32
ASPBAR	356
ASPVAR	0.78
BFIHOST	0.889
DPLBAR	0.75
DPSBAR	33
FARL	1
FPEXT	0.0531
FPDBAR	0.208
FPLOC	0.729
LDP	1.4
PROPWET	0.42
RMED-1H	8.7
RMED-1D	33.7
RMED-2D	42.5
SAAR	612
SAAR4170	742
SPRHOST	15.15
URBCONC1990	0.429
URBEXT1990	0.0121
URBLOC1990	0.137
URBCONC2000	0.412
URBEXT2000	0.0614
URBLOC2000	0.38
C	-0.013
D1	0.41687
D2	0.35361
D3	0.2421
E	0.25
F	2.26671
C(1 km)	-0.013
D1(1 km)	0.418
D2(1 km)	0.352
D3(1 km)	0.244
E(1 km)	0.25
F(1 km)	2.262

APPENDIX D: GREENFIELD RUNOFF RATES (REFH2)

UK Design Flood Estimation

Generated on Wednesday, November 02, 2016 4:14:11 PM by JPrice
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

Site details Checksum: 8B63-41E2

Site name: Hopeman 368688

Easting: 315100

Northing: 869800

Country: Scotland

Catchment Area (km²): 0.62 [0.52]*

Using plot scale calculations: Yes

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH 2013 (mm):	22.72	Total runoff (ML):	2.12
Total Rainfall (mm):	22.11	Total flow (ML):	4.98
Peak Rainfall (mm):	2.81	Peak flow (m³/s):	0.09

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	06:10:00 [09:00:00]	Yes
Timestep (hh:mm:ss)	00:10:00 [01:00:00]	Yes
SCF (Seasonal correction factor)	0.99	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Summer	n/a

Loss model parameters

Name	Value	User-defined?
Cini (mm)	81.64	No
Cmax (mm)	598.65	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	5.12	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.02	No
BL (hr)	26.57	No
BR	1.35	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0.06]	Yes
Urbext 2000	0 [0.06]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.1319	0.0000	0.0180	0.0000	0.0208	0.0208
00:10:00	0.1476	0.0000	0.0202	0.0000	0.0207	0.0207
00:20:00	0.1656	0.0000	0.0227	0.0000	0.0206	0.0206
00:30:00	0.1861	0.0000	0.0256	0.0001	0.0204	0.0205
00:40:00	0.2096	0.0000	0.0288	0.0001	0.0203	0.0204
00:50:00	0.2367	0.0000	0.0327	0.0002	0.0202	0.0204
01:00:00	0.2679	0.0000	0.0371	0.0003	0.0201	0.0203
01:10:00	0.3041	0.0000	0.0422	0.0004	0.0199	0.0203
01:20:00	0.3465	0.0000	0.0483	0.0005	0.0198	0.0204
01:30:00	0.3963	0.0000	0.0555	0.0007	0.0197	0.0204
01:40:00	0.4554	0.0000	0.0641	0.0009	0.0196	0.0205
01:50:00	0.5264	0.0000	0.0745	0.0012	0.0195	0.0207
02:00:00	0.6127	0.0000	0.0873	0.0015	0.0194	0.0209
02:10:00	0.7197	0.0000	0.1034	0.0019	0.0192	0.0211
02:20:00	0.8561	0.0000	0.1241	0.0023	0.0191	0.0215
02:30:00	1.0375	0.0000	0.1520	0.0028	0.019	0.0219
02:40:00	1.2983	0.0000	0.1928	0.0034	0.019	0.0224
02:50:00	1.7540	0.0000	0.2649	0.0042	0.0189	0.023
03:00:00	2.8083	0.0000	0.4348	0.0051	0.0188	0.0239
03:10:00	1.7540	0.0000	0.2783	0.0062	0.0187	0.0249
03:20:00	1.2983	0.0000	0.2093	0.0076	0.0187	0.0263
03:30:00	1.0375	0.0000	0.1693	0.0092	0.0186	0.0278
03:40:00	0.8561	0.0000	0.1410	0.0109	0.0186	0.0295
03:50:00	0.7197	0.0000	0.1195	0.0127	0.0186	0.0313
04:00:00	0.6127	0.0000	0.1024	0.0146	0.0186	0.0332
04:10:00	0.5264	0.0000	0.0885	0.0166	0.0186	0.0352
04:20:00	0.4554	0.0000	0.0769	0.0187	0.0186	0.0373
04:30:00	0.3963	0.0000	0.0672	0.0208	0.0187	0.0395
04:40:00	0.3465	0.0000	0.0590	0.0230	0.0187	0.0417
04:50:00	0.3041	0.0000	0.0519	0.0252	0.0188	0.044
05:00:00	0.2679	0.0000	0.0459	0.0275	0.0189	0.0464
05:10:00	0.2367	0.0000	0.0406	0.0297	0.019	0.0488
05:20:00	0.2096	0.0000	0.0361	0.0321	0.0192	0.0512
05:30:00	0.1861	0.0000	0.0321	0.0344	0.0193	0.0537
05:40:00	0.1656	0.0000	0.0286	0.0367	0.0195	0.0562

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
05:50:00	0.1476	0.0000	0.0255	0.0390	0.0197	0.0587
06:00:00	0.1319	0.0000	0.0228	0.0413	0.0199	0.0612
06:10:00	0.0000	0.0000	0.0000	0.0435	0.0202	0.0637
06:20:00	0.0000	0.0000	0.0000	0.0458	0.0204	0.0662
06:30:00	0.0000	0.0000	0.0000	0.0480	0.0207	0.0686
06:40:00	0.0000	0.0000	0.0000	0.0501	0.021	0.0711
06:50:00	0.0000	0.0000	0.0000	0.0522	0.0213	0.0734
07:00:00	0.0000	0.0000	0.0000	0.0542	0.0216	0.0758
07:10:00	0.0000	0.0000	0.0000	0.0561	0.0219	0.078
07:20:00	0.0000	0.0000	0.0000	0.0579	0.0223	0.0802
07:30:00	0.0000	0.0000	0.0000	0.0597	0.0226	0.0823
07:40:00	0.0000	0.0000	0.0000	0.0612	0.023	0.0842
07:50:00	0.0000	0.0000	0.0000	0.0627	0.0234	0.086
08:00:00	0.0000	0.0000	0.0000	0.0639	0.0237	0.0876
08:10:00	0.0000	0.0000	0.0000	0.0648	0.0241	0.0889
08:20:00	0.0000	0.0000	0.0000	0.0653	0.0245	0.0898
08:30:00	0.0000	0.0000	0.0000	0.0654	0.0249	0.0903
08:40:00	0.0000	0.0000	0.0000	0.0653	0.0253	0.0906
08:50:00	0.0000	0.0000	0.0000	0.0649	0.0257	0.0906
09:00:00	0.0000	0.0000	0.0000	0.0644	0.0261	0.0905
09:10:00	0.0000	0.0000	0.0000	0.0638	0.0265	0.0903
09:20:00	0.0000	0.0000	0.0000	0.0631	0.0268	0.0899
09:30:00	0.0000	0.0000	0.0000	0.0622	0.0272	0.0894
09:40:00	0.0000	0.0000	0.0000	0.0613	0.0276	0.0888
09:50:00	0.0000	0.0000	0.0000	0.0602	0.0279	0.0881
10:00:00	0.0000	0.0000	0.0000	0.0591	0.0282	0.0874
10:10:00	0.0000	0.0000	0.0000	0.0580	0.0285	0.0865
10:20:00	0.0000	0.0000	0.0000	0.0568	0.0288	0.0856
10:30:00	0.0000	0.0000	0.0000	0.0555	0.0291	0.0847
10:40:00	0.0000	0.0000	0.0000	0.0542	0.0294	0.0837
10:50:00	0.0000	0.0000	0.0000	0.0529	0.0297	0.0826
11:00:00	0.0000	0.0000	0.0000	0.0516	0.0299	0.0815
11:10:00	0.0000	0.0000	0.0000	0.0502	0.0302	0.0804
11:20:00	0.0000	0.0000	0.0000	0.0488	0.0304	0.0792
11:30:00	0.0000	0.0000	0.0000	0.0474	0.0306	0.0781
11:40:00	0.0000	0.0000	0.0000	0.0461	0.0308	0.0769

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
11:50:00	0.0000	0.0000	0.0000	0.0447	0.031	0.0757
12:00:00	0.0000	0.0000	0.0000	0.0434	0.0312	0.0745
12:10:00	0.0000	0.0000	0.0000	0.0420	0.0314	0.0734
12:20:00	0.0000	0.0000	0.0000	0.0407	0.0315	0.0722
12:30:00	0.0000	0.0000	0.0000	0.0394	0.0316	0.0711
12:40:00	0.0000	0.0000	0.0000	0.0381	0.0318	0.0699
12:50:00	0.0000	0.0000	0.0000	0.0369	0.0319	0.0688
13:00:00	0.0000	0.0000	0.0000	0.0357	0.032	0.0677
13:10:00	0.0000	0.0000	0.0000	0.0345	0.0321	0.0666
13:20:00	0.0000	0.0000	0.0000	0.0334	0.0322	0.0656
13:30:00	0.0000	0.0000	0.0000	0.0324	0.0323	0.0647
13:40:00	0.0000	0.0000	0.0000	0.0315	0.0323	0.0638
13:50:00	0.0000	0.0000	0.0000	0.0306	0.0324	0.063
14:00:00	0.0000	0.0000	0.0000	0.0298	0.0324	0.0622
14:10:00	0.0000	0.0000	0.0000	0.0289	0.0325	0.0614
14:20:00	0.0000	0.0000	0.0000	0.0282	0.0325	0.0607
14:30:00	0.0000	0.0000	0.0000	0.0274	0.0325	0.0599
14:40:00	0.0000	0.0000	0.0000	0.0266	0.0326	0.0592
14:50:00	0.0000	0.0000	0.0000	0.0259	0.0326	0.0585
15:00:00	0.0000	0.0000	0.0000	0.0252	0.0326	0.0578
15:10:00	0.0000	0.0000	0.0000	0.0245	0.0326	0.0571
15:20:00	0.0000	0.0000	0.0000	0.0238	0.0326	0.0564
15:30:00	0.0000	0.0000	0.0000	0.0231	0.0326	0.0557
15:40:00	0.0000	0.0000	0.0000	0.0225	0.0326	0.0551
15:50:00	0.0000	0.0000	0.0000	0.0218	0.0326	0.0544
16:00:00	0.0000	0.0000	0.0000	0.0212	0.0325	0.0537
16:10:00	0.0000	0.0000	0.0000	0.0205	0.0325	0.053
16:20:00	0.0000	0.0000	0.0000	0.0199	0.0325	0.0524
16:30:00	0.0000	0.0000	0.0000	0.0193	0.0324	0.0517
16:40:00	0.0000	0.0000	0.0000	0.0186	0.0324	0.051
16:50:00	0.0000	0.0000	0.0000	0.0180	0.0324	0.0503
17:00:00	0.0000	0.0000	0.0000	0.0173	0.0323	0.0496
17:10:00	0.0000	0.0000	0.0000	0.0167	0.0322	0.049
17:20:00	0.0000	0.0000	0.0000	0.0161	0.0322	0.0483
17:30:00	0.0000	0.0000	0.0000	0.0154	0.0321	0.0476
17:40:00	0.0000	0.0000	0.0000	0.0148	0.032	0.0468

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:50:00	0.0000	0.0000	0.0000	0.0142	0.032	0.0461
18:00:00	0.0000	0.0000	0.0000	0.0135	0.0319	0.0454
18:10:00	0.0000	0.0000	0.0000	0.0129	0.0318	0.0447
18:20:00	0.0000	0.0000	0.0000	0.0123	0.0317	0.044
18:30:00	0.0000	0.0000	0.0000	0.0116	0.0316	0.0432
18:40:00	0.0000	0.0000	0.0000	0.0110	0.0315	0.0425
18:50:00	0.0000	0.0000	0.0000	0.0104	0.0314	0.0418
19:00:00	0.0000	0.0000	0.0000	0.0098	0.0313	0.041
19:10:00	0.0000	0.0000	0.0000	0.0091	0.0312	0.0403
19:20:00	0.0000	0.0000	0.0000	0.0085	0.031	0.0396
19:30:00	0.0000	0.0000	0.0000	0.0079	0.0309	0.0388
19:40:00	0.0000	0.0000	0.0000	0.0073	0.0308	0.0381
19:50:00	0.0000	0.0000	0.0000	0.0067	0.0307	0.0374
20:00:00	0.0000	0.0000	0.0000	0.0062	0.0305	0.0367
20:10:00	0.0000	0.0000	0.0000	0.0056	0.0304	0.036
20:20:00	0.0000	0.0000	0.0000	0.0050	0.0302	0.0353
20:30:00	0.0000	0.0000	0.0000	0.0045	0.0301	0.0346
20:40:00	0.0000	0.0000	0.0000	0.0040	0.0299	0.0339
20:50:00	0.0000	0.0000	0.0000	0.0034	0.0298	0.0332
21:00:00	0.0000	0.0000	0.0000	0.0030	0.0296	0.0326
21:10:00	0.0000	0.0000	0.0000	0.0025	0.0294	0.0319
21:20:00	0.0000	0.0000	0.0000	0.0021	0.0293	0.0314
21:30:00	0.0000	0.0000	0.0000	0.0017	0.0291	0.0308
21:40:00	0.0000	0.0000	0.0000	0.0014	0.0289	0.0304
21:50:00	0.0000	0.0000	0.0000	0.0012	0.0288	0.03
22:00:00	0.0000	0.0000	0.0000	0.0010	0.0286	0.0296
22:10:00	0.0000	0.0000	0.0000	0.0008	0.0284	0.0292
22:20:00	0.0000	0.0000	0.0000	0.0007	0.0283	0.0289
22:30:00	0.0000	0.0000	0.0000	0.0005	0.0281	0.0286
22:40:00	0.0000	0.0000	0.0000	0.0004	0.0279	0.0283
22:50:00	0.0000	0.0000	0.0000	0.0003	0.0277	0.0281
23:00:00	0.0000	0.0000	0.0000	0.0003	0.0276	0.0278
23:10:00	0.0000	0.0000	0.0000	0.0002	0.0274	0.0276
23:20:00	0.0000	0.0000	0.0000	0.0001	0.0272	0.0274
23:30:00	0.0000	0.0000	0.0000	0.0001	0.0271	0.0272
23:40:00	0.0000	0.0000	0.0000	0.0001	0.0269	0.027

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
23:50:00	0.0000	0.0000	0.0000	0.0000	0.0267	0.0268
24:00:00	0.0000	0.0000	0.0000	0.0000	0.0266	0.0266
24:10:00	0.0000	0.0000	0.0000	0.0000	0.0264	0.0264
24:20:00	0.0000	0.0000	0.0000	0.0000	0.0262	0.0262
24:30:00	0.0000	0.0000	0.0000	0.0000	0.0261	0.0261
24:40:00	0.0000	0.0000	0.0000	0.0000	0.0259	0.0259
24:50:00	0.0000	0.0000	0.0000	0.0000	0.0257	0.0257
25:00:00	0.0000	0.0000	0.0000	0.0000	0.0256	0.0256
25:10:00	0.0000	0.0000	0.0000	0.0000	0.0254	0.0254
25:20:00	0.0000	0.0000	0.0000	0.0000	0.0253	0.0253
25:30:00	0.0000	0.0000	0.0000	0.0000	0.0251	0.0251
25:40:00	0.0000	0.0000	0.0000	0.0000	0.025	0.025
25:50:00	0.0000	0.0000	0.0000	0.0000	0.0248	0.0248
26:00:00	0.0000	0.0000	0.0000	0.0000	0.0246	0.0246
26:10:00	0.0000	0.0000	0.0000	0.0000	0.0245	0.0245
26:20:00	0.0000	0.0000	0.0000	0.0000	0.0243	0.0243
26:30:00	0.0000	0.0000	0.0000	0.0000	0.0242	0.0242
26:40:00	0.0000	0.0000	0.0000	0.0000	0.024	0.024
26:50:00	0.0000	0.0000	0.0000	0.0000	0.0239	0.0239
27:00:00	0.0000	0.0000	0.0000	0.0000	0.0237	0.0237
27:10:00	0.0000	0.0000	0.0000	0.0000	0.0236	0.0236
27:20:00	0.0000	0.0000	0.0000	0.0000	0.0234	0.0234
27:30:00	0.0000	0.0000	0.0000	0.0000	0.0233	0.0233
27:40:00	0.0000	0.0000	0.0000	0.0000	0.0231	0.0231
27:50:00	0.0000	0.0000	0.0000	0.0000	0.023	0.023
28:00:00	0.0000	0.0000	0.0000	0.0000	0.0229	0.0229
28:10:00	0.0000	0.0000	0.0000	0.0000	0.0227	0.0227
28:20:00	0.0000	0.0000	0.0000	0.0000	0.0226	0.0226
28:30:00	0.0000	0.0000	0.0000	0.0000	0.0224	0.0224
28:40:00	0.0000	0.0000	0.0000	0.0000	0.0223	0.0223
28:50:00	0.0000	0.0000	0.0000	0.0000	0.0221	0.0221
29:00:00	0.0000	0.0000	0.0000	0.0000	0.022	0.022
29:10:00	0.0000	0.0000	0.0000	0.0000	0.0219	0.0219
29:20:00	0.0000	0.0000	0.0000	0.0000	0.0217	0.0217
29:30:00	0.0000	0.0000	0.0000	0.0000	0.0216	0.0216
29:40:00	0.0000	0.0000	0.0000	0.0000	0.0215	0.0215

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
29:50:00	0.0000	0.0000	0.0000	0.0000	0.0213	0.0213
30:00:00	0.0000	0.0000	0.0000	0.0000	0.0212	0.0212
30:10:00	0.0000	0.0000	0.0000	0.0000	0.0211	0.0211
30:20:00	0.0000	0.0000	0.0000	0.0000	0.0209	0.0209

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km²)	0.62 [0.52]	**Yes**
ALTBAR	32	No
ASPBAR	356	No
ASPVAR	0.78	No
BFIHOST	0.66 [0.89]	**Yes**
DPLBAR (km)	0.75	No
DPSBAR (mkm-¹)	33	No
FARL	1	No
LDP	1.4	No
PROPWET (mm)	0.49 [0.42]	**Yes**
RMED1H	8.7	No
RMED1D	33.7	No
RMED2D	42.5	No
SAAR (mm)	612	No
SAAR4170 (mm)	742	No
SPRHOST	15.15	No
Urbext2000	0 [0.06]	**Yes**
Urbext1990	0.01	No
URBCONC	0.41	No
URBLOC	0.38	No
Urban Area (km²)	0 [0.06]	**Yes**
DDF parameter C	-0.01	No
DDF parameter D1	0.42	No
DDF parameter D2	0.35	No
DDF parameter D3	0.24	No
DDF parameter E	0.25	No
DDF parameter F	2.27	No
DDF parameter C (1km grid value)	-0.01	No
DDF parameter D1 (1km grid value)	0.42	No
DDF parameter D2 (1km grid value)	0.35	No
DDF parameter D3 (1km grid value)	0.24	No
DDF parameter E (1km grid value)	0.25	No
DDF parameter F (1km grid value)	2.26	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Wednesday, November 02, 2016 4:13:49 PM by JPrice
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

Site details Checksum: 8B63-41E2

Site name: Hopeman 368688

Easting: 315100

Northing: 869800

Country: Scotland

Catchment Area (km²): 0.62 [0.52]*

Using plot scale calculations: Yes

Site description: None

Model run: 200 year

Summary of results

Rainfall - FEH 2013 (mm):	75.50	Total runoff (ML):	9.01
Total Rainfall (mm):	73.49	Total flow (ML):	21.14
Peak Rainfall (mm):	9.33	Peak flow (m³/s):	0.34

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	06:10:00 [09:00:00]	Yes
Timestep (hh:mm:ss)	00:10:00 [01:00:00]	Yes
SCF (Seasonal correction factor)	0.99	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Summer	n/a

Loss model parameters

Name	Value	User-defined?
Cini (mm)	81.64	No
Cmax (mm)	598.65	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	5.12	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.02	No
BL (hr)	26.57	No
BR	1.35	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0.06]	Yes
Urbext 2000	0 [0.06]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.4382	0.0000	0.0599	0.0000	0.0208	0.0208
00:10:00	0.4907	0.0000	0.0675	0.0000	0.0207	0.0207
00:20:00	0.5504	0.0000	0.0762	0.0001	0.0206	0.0207
00:30:00	0.6186	0.0000	0.0862	0.0002	0.0204	0.0206
00:40:00	0.6967	0.0000	0.0979	0.0004	0.0203	0.0207
00:50:00	0.7866	0.0000	0.1115	0.0006	0.0202	0.0208
01:00:00	0.8904	0.0000	0.1274	0.0009	0.0201	0.021
01:10:00	1.0108	0.0000	0.1462	0.0013	0.02	0.0213
01:20:00	1.1516	0.0000	0.1687	0.0018	0.0198	0.0217
01:30:00	1.3171	0.0000	0.1957	0.0024	0.0197	0.0222
01:40:00	1.5136	0.0000	0.2284	0.0032	0.0196	0.0228
01:50:00	1.7493	0.0000	0.2688	0.0041	0.0195	0.0236
02:00:00	2.0362	0.0000	0.3193	0.0051	0.0195	0.0246
02:10:00	2.3918	0.0000	0.3839	0.0064	0.0194	0.0258
02:20:00	2.8452	0.0000	0.4691	0.0080	0.0193	0.0273
02:30:00	3.4481	0.0000	0.5866	0.0098	0.0193	0.0291
02:40:00	4.3150	0.0000	0.7621	0.0120	0.0193	0.0312
02:50:00	5.8294	0.0000	1.0789	0.0147	0.0192	0.0339
03:00:00	9.3335	0.0000	1.8457	0.0180	0.0193	0.0373
03:10:00	5.8294	0.0000	1.2266	0.0224	0.0193	0.0417
03:20:00	4.3150	0.0000	0.9445	0.0279	0.0194	0.0473
03:30:00	3.4481	0.0000	0.7771	0.0342	0.0195	0.0537
03:40:00	2.8452	0.0000	0.6562	0.0410	0.0197	0.0608
03:50:00	2.3918	0.0000	0.5621	0.0484	0.02	0.0684
04:00:00	2.0362	0.0000	0.4860	0.0562	0.0203	0.0765
04:10:00	1.7493	0.0000	0.4231	0.0644	0.0207	0.0851
04:20:00	1.5136	0.0000	0.3702	0.0729	0.0211	0.094
04:30:00	1.3171	0.0000	0.3253	0.0817	0.0217	0.103
04:40:00	1.1516	0.0000	0.2868	0.0907	0.0222	0.113
04:50:00	1.0108	0.0000	0.2535	0.1000	0.0229	0.123
05:00:00	0.8904	0.0000	0.2247	0.1094	0.0236	0.133
05:10:00	0.7866	0.0000	0.1996	0.1191	0.0245	0.144
05:20:00	0.6967	0.0000	0.1777	0.1288	0.0253	0.154
05:30:00	0.6186	0.0000	0.1585	0.1386	0.0263	0.165
05:40:00	0.5504	0.0000	0.1415	0.1484	0.0274	0.176

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
05:50:00	0.4907	0.0000	0.1266	0.1582	0.0285	0.187
06:00:00	0.4382	0.0000	0.1134	0.1680	0.0297	0.198
06:10:00	0.0000	0.0000	0.0000	0.1778	0.0309	0.209
06:20:00	0.0000	0.0000	0.0000	0.1875	0.0323	0.22
06:30:00	0.0000	0.0000	0.0000	0.1970	0.0337	0.231
06:40:00	0.0000	0.0000	0.0000	0.2063	0.0352	0.241
06:50:00	0.0000	0.0000	0.0000	0.2154	0.0367	0.252
07:00:00	0.0000	0.0000	0.0000	0.2243	0.0384	0.263
07:10:00	0.0000	0.0000	0.0000	0.2328	0.0401	0.273
07:20:00	0.0000	0.0000	0.0000	0.2411	0.0418	0.283
07:30:00	0.0000	0.0000	0.0000	0.2489	0.0436	0.292
07:40:00	0.0000	0.0000	0.0000	0.2561	0.0455	0.302
07:50:00	0.0000	0.0000	0.0000	0.2628	0.0474	0.31
08:00:00	0.0000	0.0000	0.0000	0.2686	0.0493	0.318
08:10:00	0.0000	0.0000	0.0000	0.2733	0.0513	0.325
08:20:00	0.0000	0.0000	0.0000	0.2761	0.0533	0.329
08:30:00	0.0000	0.0000	0.0000	0.2774	0.0553	0.333
08:40:00	0.0000	0.0000	0.0000	0.2775	0.0572	0.335
08:50:00	0.0000	0.0000	0.0000	0.2767	0.0592	0.336
09:00:00	0.0000	0.0000	0.0000	0.2751	0.0612	0.336
09:10:00	0.0000	0.0000	0.0000	0.2729	0.0631	0.336
09:20:00	0.0000	0.0000	0.0000	0.2702	0.065	0.335
09:30:00	0.0000	0.0000	0.0000	0.2669	0.0668	0.334
09:40:00	0.0000	0.0000	0.0000	0.2632	0.0687	0.332
09:50:00	0.0000	0.0000	0.0000	0.2591	0.0704	0.33
10:00:00	0.0000	0.0000	0.0000	0.2547	0.0722	0.327
10:10:00	0.0000	0.0000	0.0000	0.2500	0.0738	0.324
10:20:00	0.0000	0.0000	0.0000	0.2450	0.0754	0.32
10:30:00	0.0000	0.0000	0.0000	0.2398	0.077	0.317
10:40:00	0.0000	0.0000	0.0000	0.2344	0.0785	0.313
10:50:00	0.0000	0.0000	0.0000	0.2289	0.08	0.309
11:00:00	0.0000	0.0000	0.0000	0.2232	0.0814	0.305
11:10:00	0.0000	0.0000	0.0000	0.2174	0.0827	0.3
11:20:00	0.0000	0.0000	0.0000	0.2115	0.084	0.296
11:30:00	0.0000	0.0000	0.0000	0.2056	0.0853	0.291
11:40:00	0.0000	0.0000	0.0000	0.1997	0.0864	0.286

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
11:50:00	0.0000	0.0000	0.0000	0.1939	0.0875	0.281
12:00:00	0.0000	0.0000	0.0000	0.1881	0.0886	0.277
12:10:00	0.0000	0.0000	0.0000	0.1824	0.0896	0.272
12:20:00	0.0000	0.0000	0.0000	0.1767	0.0906	0.267
12:30:00	0.0000	0.0000	0.0000	0.1711	0.0915	0.263
12:40:00	0.0000	0.0000	0.0000	0.1656	0.0923	0.258
12:50:00	0.0000	0.0000	0.0000	0.1602	0.0931	0.253
13:00:00	0.0000	0.0000	0.0000	0.1549	0.0938	0.249
13:10:00	0.0000	0.0000	0.0000	0.1499	0.0945	0.244
13:20:00	0.0000	0.0000	0.0000	0.1451	0.0952	0.24
13:30:00	0.0000	0.0000	0.0000	0.1407	0.0958	0.236
13:40:00	0.0000	0.0000	0.0000	0.1365	0.0964	0.233
13:50:00	0.0000	0.0000	0.0000	0.1326	0.0969	0.23
14:00:00	0.0000	0.0000	0.0000	0.1289	0.0974	0.226
14:10:00	0.0000	0.0000	0.0000	0.1253	0.0979	0.223
14:20:00	0.0000	0.0000	0.0000	0.1219	0.0983	0.22
14:30:00	0.0000	0.0000	0.0000	0.1186	0.0987	0.217
14:40:00	0.0000	0.0000	0.0000	0.1153	0.099	0.214
14:50:00	0.0000	0.0000	0.0000	0.1122	0.0994	0.212
15:00:00	0.0000	0.0000	0.0000	0.1091	0.0997	0.209
15:10:00	0.0000	0.0000	0.0000	0.1061	0.1	0.206
15:20:00	0.0000	0.0000	0.0000	0.1031	0.1	0.203
15:30:00	0.0000	0.0000	0.0000	0.1002	0.1	0.201
15:40:00	0.0000	0.0000	0.0000	0.0974	0.101	0.198
15:50:00	0.0000	0.0000	0.0000	0.0946	0.101	0.195
16:00:00	0.0000	0.0000	0.0000	0.0918	0.101	0.193
16:10:00	0.0000	0.0000	0.0000	0.0891	0.101	0.19
16:20:00	0.0000	0.0000	0.0000	0.0863	0.101	0.188
16:30:00	0.0000	0.0000	0.0000	0.0837	0.101	0.185
16:40:00	0.0000	0.0000	0.0000	0.0810	0.101	0.182
16:50:00	0.0000	0.0000	0.0000	0.0783	0.101	0.18
17:00:00	0.0000	0.0000	0.0000	0.0756	0.101	0.177
17:10:00	0.0000	0.0000	0.0000	0.0729	0.101	0.174
17:20:00	0.0000	0.0000	0.0000	0.0702	0.101	0.172
17:30:00	0.0000	0.0000	0.0000	0.0675	0.101	0.169
17:40:00	0.0000	0.0000	0.0000	0.0648	0.101	0.166

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:50:00	0.0000	0.0000	0.0000	0.0621	0.101	0.163
18:00:00	0.0000	0.0000	0.0000	0.0594	0.101	0.16
18:10:00	0.0000	0.0000	0.0000	0.0567	0.101	0.158
18:20:00	0.0000	0.0000	0.0000	0.0541	0.101	0.155
18:30:00	0.0000	0.0000	0.0000	0.0514	0.101	0.152
18:40:00	0.0000	0.0000	0.0000	0.0487	0.1	0.149
18:50:00	0.0000	0.0000	0.0000	0.0460	0.1	0.146
19:00:00	0.0000	0.0000	0.0000	0.0434	0.0999	0.143
19:10:00	0.0000	0.0000	0.0000	0.0407	0.0996	0.14
19:20:00	0.0000	0.0000	0.0000	0.0381	0.0993	0.137
19:30:00	0.0000	0.0000	0.0000	0.0355	0.099	0.135
19:40:00	0.0000	0.0000	0.0000	0.0329	0.0987	0.132
19:50:00	0.0000	0.0000	0.0000	0.0304	0.0983	0.129
20:00:00	0.0000	0.0000	0.0000	0.0279	0.0979	0.126
20:10:00	0.0000	0.0000	0.0000	0.0254	0.0975	0.123
20:20:00	0.0000	0.0000	0.0000	0.0230	0.0971	0.12
20:30:00	0.0000	0.0000	0.0000	0.0206	0.0967	0.117
20:40:00	0.0000	0.0000	0.0000	0.0183	0.0963	0.115
20:50:00	0.0000	0.0000	0.0000	0.0160	0.0958	0.112
21:00:00	0.0000	0.0000	0.0000	0.0139	0.0953	0.109
21:10:00	0.0000	0.0000	0.0000	0.0118	0.0949	0.107
21:20:00	0.0000	0.0000	0.0000	0.0099	0.0944	0.104
21:30:00	0.0000	0.0000	0.0000	0.0082	0.0938	0.102
21:40:00	0.0000	0.0000	0.0000	0.0069	0.0933	0.1
21:50:00	0.0000	0.0000	0.0000	0.0057	0.0928	0.0985
22:00:00	0.0000	0.0000	0.0000	0.0048	0.0923	0.097
22:10:00	0.0000	0.0000	0.0000	0.0039	0.0917	0.0956
22:20:00	0.0000	0.0000	0.0000	0.0032	0.0912	0.0944
22:30:00	0.0000	0.0000	0.0000	0.0026	0.0906	0.0932
22:40:00	0.0000	0.0000	0.0000	0.0021	0.0901	0.0922
22:50:00	0.0000	0.0000	0.0000	0.0017	0.0895	0.0912
23:00:00	0.0000	0.0000	0.0000	0.0013	0.089	0.0903
23:10:00	0.0000	0.0000	0.0000	0.0010	0.0884	0.0894
23:20:00	0.0000	0.0000	0.0000	0.0007	0.0879	0.0886
23:30:00	0.0000	0.0000	0.0000	0.0005	0.0873	0.0879
23:40:00	0.0000	0.0000	0.0000	0.0004	0.0868	0.0872

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
23:50:00	0.0000	0.0000	0.0000	0.0002	0.0863	0.0865
24:00:00	0.0000	0.0000	0.0000	0.0001	0.0857	0.0859
24:10:00	0.0000	0.0000	0.0000	0.0001	0.0852	0.0853
24:20:00	0.0000	0.0000	0.0000	0.0000	0.0847	0.0847
24:30:00	0.0000	0.0000	0.0000	0.0000	0.0841	0.0841
24:40:00	0.0000	0.0000	0.0000	0.0000	0.0836	0.0836
24:50:00	0.0000	0.0000	0.0000	0.0000	0.0831	0.0831
25:00:00	0.0000	0.0000	0.0000	0.0000	0.0826	0.0826
25:10:00	0.0000	0.0000	0.0000	0.0000	0.082	0.082
25:20:00	0.0000	0.0000	0.0000	0.0000	0.0815	0.0815
25:30:00	0.0000	0.0000	0.0000	0.0000	0.081	0.081
25:40:00	0.0000	0.0000	0.0000	0.0000	0.0805	0.0805
25:50:00	0.0000	0.0000	0.0000	0.0000	0.08	0.08
26:00:00	0.0000	0.0000	0.0000	0.0000	0.0795	0.0795
26:10:00	0.0000	0.0000	0.0000	0.0000	0.079	0.079
26:20:00	0.0000	0.0000	0.0000	0.0000	0.0785	0.0785
26:30:00	0.0000	0.0000	0.0000	0.0000	0.078	0.078
26:40:00	0.0000	0.0000	0.0000	0.0000	0.0775	0.0775
26:50:00	0.0000	0.0000	0.0000	0.0000	0.0771	0.0771
27:00:00	0.0000	0.0000	0.0000	0.0000	0.0766	0.0766
27:10:00	0.0000	0.0000	0.0000	0.0000	0.0761	0.0761
27:20:00	0.0000	0.0000	0.0000	0.0000	0.0756	0.0756
27:30:00	0.0000	0.0000	0.0000	0.0000	0.0751	0.0751
27:40:00	0.0000	0.0000	0.0000	0.0000	0.0747	0.0747
27:50:00	0.0000	0.0000	0.0000	0.0000	0.0742	0.0742
28:00:00	0.0000	0.0000	0.0000	0.0000	0.0737	0.0737
28:10:00	0.0000	0.0000	0.0000	0.0000	0.0733	0.0733
28:20:00	0.0000	0.0000	0.0000	0.0000	0.0728	0.0728
28:30:00	0.0000	0.0000	0.0000	0.0000	0.0724	0.0724
28:40:00	0.0000	0.0000	0.0000	0.0000	0.0719	0.0719
28:50:00	0.0000	0.0000	0.0000	0.0000	0.0715	0.0715
29:00:00	0.0000	0.0000	0.0000	0.0000	0.071	0.071
29:10:00	0.0000	0.0000	0.0000	0.0000	0.0706	0.0706
29:20:00	0.0000	0.0000	0.0000	0.0000	0.0701	0.0701
29:30:00	0.0000	0.0000	0.0000	0.0000	0.0697	0.0697
29:40:00	0.0000	0.0000	0.0000	0.0000	0.0693	0.0693

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
29:50:00	0.0000	0.0000	0.0000	0.0000	0.0688	0.0688
30:00:00	0.0000	0.0000	0.0000	0.0000	0.0684	0.0684
30:10:00	0.0000	0.0000	0.0000	0.0000	0.068	0.068
30:20:00	0.0000	0.0000	0.0000	0.0000	0.0675	0.0675
30:30:00	0.0000	0.0000	0.0000	0.0000	0.0671	0.0671
30:40:00	0.0000	0.0000	0.0000	0.0000	0.0667	0.0667
30:50:00	0.0000	0.0000	0.0000	0.0000	0.0663	0.0663
31:00:00	0.0000	0.0000	0.0000	0.0000	0.0659	0.0659
31:10:00	0.0000	0.0000	0.0000	0.0000	0.0655	0.0655
31:20:00	0.0000	0.0000	0.0000	0.0000	0.0651	0.0651
31:30:00	0.0000	0.0000	0.0000	0.0000	0.0646	0.0646
31:40:00	0.0000	0.0000	0.0000	0.0000	0.0642	0.0642
31:50:00	0.0000	0.0000	0.0000	0.0000	0.0638	0.0638
32:00:00	0.0000	0.0000	0.0000	0.0000	0.0634	0.0634
32:10:00	0.0000	0.0000	0.0000	0.0000	0.063	0.063
32:20:00	0.0000	0.0000	0.0000	0.0000	0.0626	0.0626
32:30:00	0.0000	0.0000	0.0000	0.0000	0.0623	0.0623
32:40:00	0.0000	0.0000	0.0000	0.0000	0.0619	0.0619
32:50:00	0.0000	0.0000	0.0000	0.0000	0.0615	0.0615
33:00:00	0.0000	0.0000	0.0000	0.0000	0.0611	0.0611
33:10:00	0.0000	0.0000	0.0000	0.0000	0.0607	0.0607
33:20:00	0.0000	0.0000	0.0000	0.0000	0.0603	0.0603
33:30:00	0.0000	0.0000	0.0000	0.0000	0.06	0.06
33:40:00	0.0000	0.0000	0.0000	0.0000	0.0596	0.0596
33:50:00	0.0000	0.0000	0.0000	0.0000	0.0592	0.0592
34:00:00	0.0000	0.0000	0.0000	0.0000	0.0588	0.0588
34:10:00	0.0000	0.0000	0.0000	0.0000	0.0585	0.0585
34:20:00	0.0000	0.0000	0.0000	0.0000	0.0581	0.0581
34:30:00	0.0000	0.0000	0.0000	0.0000	0.0577	0.0577
34:40:00	0.0000	0.0000	0.0000	0.0000	0.0574	0.0574
34:50:00	0.0000	0.0000	0.0000	0.0000	0.057	0.057
35:00:00	0.0000	0.0000	0.0000	0.0000	0.0567	0.0567
35:10:00	0.0000	0.0000	0.0000	0.0000	0.0563	0.0563
35:20:00	0.0000	0.0000	0.0000	0.0000	0.056	0.056
35:30:00	0.0000	0.0000	0.0000	0.0000	0.0556	0.0556
35:40:00	0.0000	0.0000	0.0000	0.0000	0.0553	0.0553

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:50:00	0.0000	0.0000	0.0000	0.0000	0.0549	0.0549
36:00:00	0.0000	0.0000	0.0000	0.0000	0.0546	0.0546
36:10:00	0.0000	0.0000	0.0000	0.0000	0.0542	0.0542
36:20:00	0.0000	0.0000	0.0000	0.0000	0.0539	0.0539
36:30:00	0.0000	0.0000	0.0000	0.0000	0.0536	0.0536
36:40:00	0.0000	0.0000	0.0000	0.0000	0.0532	0.0532
36:50:00	0.0000	0.0000	0.0000	0.0000	0.0529	0.0529
37:00:00	0.0000	0.0000	0.0000	0.0000	0.0526	0.0526
37:10:00	0.0000	0.0000	0.0000	0.0000	0.0522	0.0522
37:20:00	0.0000	0.0000	0.0000	0.0000	0.0519	0.0519
37:30:00	0.0000	0.0000	0.0000	0.0000	0.0516	0.0516
37:40:00	0.0000	0.0000	0.0000	0.0000	0.0513	0.0513
37:50:00	0.0000	0.0000	0.0000	0.0000	0.0509	0.0509
38:00:00	0.0000	0.0000	0.0000	0.0000	0.0506	0.0506
38:10:00	0.0000	0.0000	0.0000	0.0000	0.0503	0.0503
38:20:00	0.0000	0.0000	0.0000	0.0000	0.05	0.05
38:30:00	0.0000	0.0000	0.0000	0.0000	0.0497	0.0497
38:40:00	0.0000	0.0000	0.0000	0.0000	0.0494	0.0494
38:50:00	0.0000	0.0000	0.0000	0.0000	0.0491	0.0491
39:00:00	0.0000	0.0000	0.0000	0.0000	0.0487	0.0487
39:10:00	0.0000	0.0000	0.0000	0.0000	0.0484	0.0484
39:20:00	0.0000	0.0000	0.0000	0.0000	0.0481	0.0481
39:30:00	0.0000	0.0000	0.0000	0.0000	0.0478	0.0478
39:40:00	0.0000	0.0000	0.0000	0.0000	0.0475	0.0475
39:50:00	0.0000	0.0000	0.0000	0.0000	0.0472	0.0472
40:00:00	0.0000	0.0000	0.0000	0.0000	0.0469	0.0469
40:10:00	0.0000	0.0000	0.0000	0.0000	0.0467	0.0467
40:20:00	0.0000	0.0000	0.0000	0.0000	0.0464	0.0464
40:30:00	0.0000	0.0000	0.0000	0.0000	0.0461	0.0461
40:40:00	0.0000	0.0000	0.0000	0.0000	0.0458	0.0458
40:50:00	0.0000	0.0000	0.0000	0.0000	0.0455	0.0455
41:00:00	0.0000	0.0000	0.0000	0.0000	0.0452	0.0452
41:10:00	0.0000	0.0000	0.0000	0.0000	0.0449	0.0449
41:20:00	0.0000	0.0000	0.0000	0.0000	0.0446	0.0446
41:30:00	0.0000	0.0000	0.0000	0.0000	0.0444	0.0444
41:40:00	0.0000	0.0000	0.0000	0.0000	0.0441	0.0441

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
41:50:00	0.0000	0.0000	0.0000	0.0000	0.0438	0.0438
42:00:00	0.0000	0.0000	0.0000	0.0000	0.0435	0.0435
42:10:00	0.0000	0.0000	0.0000	0.0000	0.0433	0.0433
42:20:00	0.0000	0.0000	0.0000	0.0000	0.043	0.043
42:30:00	0.0000	0.0000	0.0000	0.0000	0.0427	0.0427
42:40:00	0.0000	0.0000	0.0000	0.0000	0.0425	0.0425
42:50:00	0.0000	0.0000	0.0000	0.0000	0.0422	0.0422
43:00:00	0.0000	0.0000	0.0000	0.0000	0.0419	0.0419
43:10:00	0.0000	0.0000	0.0000	0.0000	0.0417	0.0417
43:20:00	0.0000	0.0000	0.0000	0.0000	0.0414	0.0414
43:30:00	0.0000	0.0000	0.0000	0.0000	0.0412	0.0412
43:40:00	0.0000	0.0000	0.0000	0.0000	0.0409	0.0409
43:50:00	0.0000	0.0000	0.0000	0.0000	0.0406	0.0406
44:00:00	0.0000	0.0000	0.0000	0.0000	0.0404	0.0404
44:10:00	0.0000	0.0000	0.0000	0.0000	0.0401	0.0401
44:20:00	0.0000	0.0000	0.0000	0.0000	0.0399	0.0399
44:30:00	0.0000	0.0000	0.0000	0.0000	0.0396	0.0396
44:40:00	0.0000	0.0000	0.0000	0.0000	0.0394	0.0394
44:50:00	0.0000	0.0000	0.0000	0.0000	0.0391	0.0391
45:00:00	0.0000	0.0000	0.0000	0.0000	0.0389	0.0389
45:10:00	0.0000	0.0000	0.0000	0.0000	0.0387	0.0387
45:20:00	0.0000	0.0000	0.0000	0.0000	0.0384	0.0384
45:30:00	0.0000	0.0000	0.0000	0.0000	0.0382	0.0382
45:40:00	0.0000	0.0000	0.0000	0.0000	0.0379	0.0379
45:50:00	0.0000	0.0000	0.0000	0.0000	0.0377	0.0377
46:00:00	0.0000	0.0000	0.0000	0.0000	0.0375	0.0375
46:10:00	0.0000	0.0000	0.0000	0.0000	0.0372	0.0372
46:20:00	0.0000	0.0000	0.0000	0.0000	0.037	0.037
46:30:00	0.0000	0.0000	0.0000	0.0000	0.0368	0.0368
46:40:00	0.0000	0.0000	0.0000	0.0000	0.0365	0.0365
46:50:00	0.0000	0.0000	0.0000	0.0000	0.0363	0.0363
47:00:00	0.0000	0.0000	0.0000	0.0000	0.0361	0.0361
47:10:00	0.0000	0.0000	0.0000	0.0000	0.0358	0.0358
47:20:00	0.0000	0.0000	0.0000	0.0000	0.0356	0.0356
47:30:00	0.0000	0.0000	0.0000	0.0000	0.0354	0.0354
47:40:00	0.0000	0.0000	0.0000	0.0000	0.0352	0.0352

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
47:50:00	0.0000	0.0000	0.0000	0.0000	0.035	0.035
48:00:00	0.0000	0.0000	0.0000	0.0000	0.0347	0.0347
48:10:00	0.0000	0.0000	0.0000	0.0000	0.0345	0.0345
48:20:00	0.0000	0.0000	0.0000	0.0000	0.0343	0.0343
48:30:00	0.0000	0.0000	0.0000	0.0000	0.0341	0.0341
48:40:00	0.0000	0.0000	0.0000	0.0000	0.0339	0.0339
48:50:00	0.0000	0.0000	0.0000	0.0000	0.0337	0.0337
49:00:00	0.0000	0.0000	0.0000	0.0000	0.0335	0.0335
49:10:00	0.0000	0.0000	0.0000	0.0000	0.0332	0.0332
49:20:00	0.0000	0.0000	0.0000	0.0000	0.033	0.033
49:30:00	0.0000	0.0000	0.0000	0.0000	0.0328	0.0328
49:40:00	0.0000	0.0000	0.0000	0.0000	0.0326	0.0326
49:50:00	0.0000	0.0000	0.0000	0.0000	0.0324	0.0324
50:00:00	0.0000	0.0000	0.0000	0.0000	0.0322	0.0322
50:10:00	0.0000	0.0000	0.0000	0.0000	0.032	0.032
50:20:00	0.0000	0.0000	0.0000	0.0000	0.0318	0.0318
50:30:00	0.0000	0.0000	0.0000	0.0000	0.0316	0.0316
50:40:00	0.0000	0.0000	0.0000	0.0000	0.0314	0.0314
50:50:00	0.0000	0.0000	0.0000	0.0000	0.0312	0.0312
51:00:00	0.0000	0.0000	0.0000	0.0000	0.031	0.031
51:10:00	0.0000	0.0000	0.0000	0.0000	0.0308	0.0308
51:20:00	0.0000	0.0000	0.0000	0.0000	0.0306	0.0306
51:30:00	0.0000	0.0000	0.0000	0.0000	0.0305	0.0305
51:40:00	0.0000	0.0000	0.0000	0.0000	0.0303	0.0303
51:50:00	0.0000	0.0000	0.0000	0.0000	0.0301	0.0301
52:00:00	0.0000	0.0000	0.0000	0.0000	0.0299	0.0299
52:10:00	0.0000	0.0000	0.0000	0.0000	0.0297	0.0297
52:20:00	0.0000	0.0000	0.0000	0.0000	0.0295	0.0295
52:30:00	0.0000	0.0000	0.0000	0.0000	0.0293	0.0293
52:40:00	0.0000	0.0000	0.0000	0.0000	0.0291	0.0291
52:50:00	0.0000	0.0000	0.0000	0.0000	0.029	0.029
53:00:00	0.0000	0.0000	0.0000	0.0000	0.0288	0.0288
53:10:00	0.0000	0.0000	0.0000	0.0000	0.0286	0.0286
53:20:00	0.0000	0.0000	0.0000	0.0000	0.0284	0.0284
53:30:00	0.0000	0.0000	0.0000	0.0000	0.0282	0.0282
53:40:00	0.0000	0.0000	0.0000	0.0000	0.0281	0.0281

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:50:00	0.0000	0.0000	0.0000	0.0000	0.0279	0.0279
54:00:00	0.0000	0.0000	0.0000	0.0000	0.0277	0.0277
54:10:00	0.0000	0.0000	0.0000	0.0000	0.0275	0.0275
54:20:00	0.0000	0.0000	0.0000	0.0000	0.0274	0.0274
54:30:00	0.0000	0.0000	0.0000	0.0000	0.0272	0.0272
54:40:00	0.0000	0.0000	0.0000	0.0000	0.027	0.027
54:50:00	0.0000	0.0000	0.0000	0.0000	0.0269	0.0269
55:00:00	0.0000	0.0000	0.0000	0.0000	0.0267	0.0267
55:10:00	0.0000	0.0000	0.0000	0.0000	0.0265	0.0265
55:20:00	0.0000	0.0000	0.0000	0.0000	0.0264	0.0264
55:30:00	0.0000	0.0000	0.0000	0.0000	0.0262	0.0262
55:40:00	0.0000	0.0000	0.0000	0.0000	0.026	0.026
55:50:00	0.0000	0.0000	0.0000	0.0000	0.0259	0.0259
56:00:00	0.0000	0.0000	0.0000	0.0000	0.0257	0.0257
56:10:00	0.0000	0.0000	0.0000	0.0000	0.0255	0.0255
56:20:00	0.0000	0.0000	0.0000	0.0000	0.0254	0.0254
56:30:00	0.0000	0.0000	0.0000	0.0000	0.0252	0.0252
56:40:00	0.0000	0.0000	0.0000	0.0000	0.0251	0.0251
56:50:00	0.0000	0.0000	0.0000	0.0000	0.0249	0.0249
57:00:00	0.0000	0.0000	0.0000	0.0000	0.0248	0.0248
57:10:00	0.0000	0.0000	0.0000	0.0000	0.0246	0.0246
57:20:00	0.0000	0.0000	0.0000	0.0000	0.0245	0.0245
57:30:00	0.0000	0.0000	0.0000	0.0000	0.0243	0.0243
57:40:00	0.0000	0.0000	0.0000	0.0000	0.0241	0.0241
57:50:00	0.0000	0.0000	0.0000	0.0000	0.024	0.024
58:00:00	0.0000	0.0000	0.0000	0.0000	0.0238	0.0238
58:10:00	0.0000	0.0000	0.0000	0.0000	0.0237	0.0237
58:20:00	0.0000	0.0000	0.0000	0.0000	0.0235	0.0235
58:30:00	0.0000	0.0000	0.0000	0.0000	0.0234	0.0234
58:40:00	0.0000	0.0000	0.0000	0.0000	0.0233	0.0233
58:50:00	0.0000	0.0000	0.0000	0.0000	0.0231	0.0231
59:00:00	0.0000	0.0000	0.0000	0.0000	0.023	0.023
59:10:00	0.0000	0.0000	0.0000	0.0000	0.0228	0.0228
59:20:00	0.0000	0.0000	0.0000	0.0000	0.0227	0.0227
59:30:00	0.0000	0.0000	0.0000	0.0000	0.0225	0.0225
59:40:00	0.0000	0.0000	0.0000	0.0000	0.0224	0.0224

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
59:50:00	0.0000	0.0000	0.0000	0.0000	0.0223	0.0223
60:00:00	0.0000	0.0000	0.0000	0.0000	0.0221	0.0221
60:10:00	0.0000	0.0000	0.0000	0.0000	0.022	0.022
60:20:00	0.0000	0.0000	0.0000	0.0000	0.0218	0.0218
60:30:00	0.0000	0.0000	0.0000	0.0000	0.0217	0.0217
60:40:00	0.0000	0.0000	0.0000	0.0000	0.0216	0.0216
60:50:00	0.0000	0.0000	0.0000	0.0000	0.0214	0.0214
61:00:00	0.0000	0.0000	0.0000	0.0000	0.0213	0.0213
61:10:00	0.0000	0.0000	0.0000	0.0000	0.0212	0.0212
61:20:00	0.0000	0.0000	0.0000	0.0000	0.021	0.021

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km²)	0.62 [0.52]	**Yes**
ALTBAR	32	No
ASPBAR	356	No
ASPVAR	0.78	No
BFIHOST	0.66 [0.89]	**Yes**
DPLBAR (km)	0.75	No
DPSBAR (mkm-¹)	33	No
FARL	1	No
LDP	1.4	No
PROPWET (mm)	0.49 [0.42]	**Yes**
RMED1H	8.7	No
RMED1D	33.7	No
RMED2D	42.5	No
SAAR (mm)	612	No
SAAR4170 (mm)	742	No
SPRHOST	15.15	No
Urbext2000	0 [0.06]	**Yes**
Urbext1990	0.01	No
URBCONC	0.41	No
URBLOC	0.38	No
Urban Area (km²)	0 [0.06]	**Yes**
DDF parameter C	-0.01	No
DDF parameter D1	0.42	No
DDF parameter D2	0.35	No
DDF parameter D3	0.24	No
DDF parameter E	0.25	No
DDF parameter F	2.27	No
DDF parameter C (1km grid value)	-0.01	No
DDF parameter D1 (1km grid value)	0.42	No
DDF parameter D2 (1km grid value)	0.35	No
DDF parameter D3 (1km grid value)	0.24	No
DDF parameter E (1km grid value)	0.25	No
DDF parameter F (1km grid value)	2.26	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

APPENDIX E: GREENFIELD RUNOFF RATES (IH124)

Institute of Hydrology Report No.124 - Flood Estimation for Small Catchments (IH124)

Flow Calculation

User Defined
Calculated

Project No.	368688
Project Title	Hopeman
Version No.	1

Calculation by:	JMC	**Date:**	01/10/2016
Checked by:	KIMD	**Date:**	02/11/2016

	Return Period (years)	Flow (m^3/s)	Flow (l/s)	Flow (Ml/d)
Flow Summary:	2	0.12	119	10.25
	5	0.16	158	13.66
	10	0.19	191	16.51
	25	0.24	238	20.60
	50	0.28	279	24.13
	100	0.33	327	28.23
	200	0.37	369	31.88
	200+cc	0.44	443	38.25

Development size	Method
0 - 50 ha	The Institute of Hydrology Report 124 *Flood estimation for small catchments* (Marshall & Bayliss, 1994) is to be used to determine peak greenfield runoff rates for QBAR. Where developments are smaller than 50 ha, the analysis for determining greenfield discharge rate should use 50 ha in the formula but linearly interpolate the flow rate value based on the ratio of the size of the development to 50 ha. FSSR 14 (IH, 1993) regional growth curve factors should be used to calculate greenfield peak flow rates for 1-, 30- and 100-year return periods.
50-200 ha	IH Report 124 should be used to calculate greenfield peak flow rates. Regional growth factors to be applied.
Above 200 ha	IH Report 124 can be used for catchments that are much larger than 200 ha. However, for schemes of this size it is recommended that the Flood Estimation Handbook (FEH) (IH, 1999) should be applied. Both the statistical approach and the unit hydrograph approach should be used to calculate peak flow rates. However, where FEH is not considered appropriate for the calculation of greenfield runoff for the development site, for whatever reasons, IH 124 should be used.

OS Grid Ref: NJ 14942 69173

AREA: 62 Ha (0.62 km^2) — Catchment area.

SAAR: 612 mm — From FEH CD-ROM / literature.
NB If catchment not defined in FEH, assume SAAR from neighbouring FEH-defined catchments

SOIL: 0.35

SOIL = 0.15 x (WRAP1) + 0.30 x (WRAP2) + 0.40 x (WRAP3) + 0.45 x (WRAP4) + 0.50 x (WRAP5)
(See Winter Rain Acceptance Potential Map)

WRAP Class	1	2	3	4	5
Factor	0.15	0.3	0.4	0.45	0.5
Fraction	0	0.5	0.5	0	0

$QBAR_{rural}$

$QBAR_{rural}$: 0.13 m^3/s

$QBAR = 0.00108*AREA^{0.89}*SAAR^{1.17}*SOIL^{2.17}$ (IH124 7.1)

if site is <50ha — Area Reduction: 1.24 (ratio of size of site to 50ha)
$QBAR_{rural\ (adjusted)}$: 0.13 m^3/s — Applicable if area is < 50 ha

$QBAR_{urban}$

CWI: 83.56 — Catchment Wetness Index

SAAR	<835	>=835
CWI	=0.1745*SAAR-23.238	=0.0024*SAAR+120.5

CIND: 24.24 — Catchment Index — CIND = 102.4*SOIL+0.28*(CWI-125) (IH124 7.2)

NC: 0.77 — Rainfall Continentality Factor
NC = 0.92-0.00024*SAAR (for 500≤SAAR≤1100mm)
NC = 0.74-0.000082*SAAR (for 1100≤SAAR≤3000mm) (IH124 7.3)

NC	0.77312
	0.689816

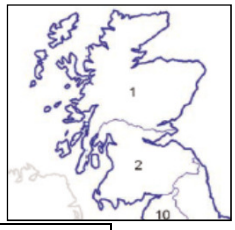
URBAN: 0 — Fraction of catchment under urban land use

$QBAR_{urban}/QBAR_{rural}$: 1.00 — $QBAR_{urban}/QBAR_{rural} = [1+URBAN]^{2NC}*[1+URBAN\{(21/CIND)-0.3\}]$ (IH124 7.4)

$QBAR_{urban}$: 0.13 m^3/s

For conservative design, choose higher of $QBAR_{urban}$ and $QBAR_{rural}$
QBAR: 0.13 m^3/s

Hydrometric Area: 1 — See map opposite for hydrometric areas within Scotland



Growth Curve Factors

Region	Hydrometric Area	Return Period 2	5	10	25	50	100	200	500
N Scotland	1	0.9	1.2	1.45	1.81	2.12	2.48	2.8	3.25
S Scotland	2	0.91	1.11	1.42	1.81	2.17	2.63	3	3.45
	$Q_{return\ period}$ (m^3/s)	0.12	0.16	0.19	0.24	0.28	0.33	0.37	0.43

(Growth factors and hydrometric areas taken from CIRIA SUDS Manual C697)

Planning Support Statement

Hopeman Development – May 2020

Author: Victoria Mungall – Springfield Real Estate Management

on behalf of Co-Operative Society for Moray Council

Planning Reference No: - 20/00474/APP

Contents:

1.0 Introduction & Proposal

1.1 This statement sets out the background, provides an overview of the site and corresponding proposals alongside a review of relevant development plan policy (Moray Council LDP 2015 and the 2020 emerging LDP) as well as other material planning considerations. The Town and Country Planning (Scotland) Act 1997, as amended by the Planning (Scotland) Act 2006 which requires all planning applications to be determined in accordance with adopted Development Plan policies unless material considerations indicate otherwise.

1.2 This statement demonstrates that we have assessed the proposals against the current (2015) and emerging (2020) development plan(s) and considered relevant material considerations including the Council's Supplementary Guidance regarding Affordable Housing, Climate Change, Urban Design (and Quality Audits) alongside the relevant Development polices for Industry/ Business.

1.3 The site although not specifically identified for housing within the Local Development Plan, does benefit from being identified within the LDP for development (Business Use). In Summary this statement is in support of our client's proposal to demolish a previous service station/ car garage which has fallen into a state of disrepair, clear the site and construct a retail unit, a small light industrial business starter unit and 2no blocks of residential cottage style flats (Cawdor).

1.4 Located on a 'brownfield' site, it is dilapidated and in a severe state of disrepair, readily suitable for redevelopment. Situated on the main B9040 through Hopeman spanning from Lossiemouth westerly towards Burghead it detracts significantly on Eastern approach into Hopeman. The area has a number of local amenities including Hopeman Primary School, Hopeman Stores, and Post Office (Premier), Cost cutters, a general store, hairdressers and beauty salon, a butcher shop, a chemist, a fish & chip shop and recreational facilities. There is currently no supermarket provision.

1.5 We propose a high-quality, place-making focused development of homes suitable for the location and site, a small retail and business element which would provide employment - supporting local economy growth, providing space for a small local business/ businesses to grow as well as reducing the need for local residents to commute into Elgin or the larger town centres to access a supermarket facility. We conclude that the proposals accord with development plan policies and other material considerations and as such should be approved in line with the LDP and deliver much needed new affordable housing for the area, bring employment opportunities, improve the character and approach into Hopeman, improve pedestrian and cycle ways and reduce travel thus providing a greener, more accessible place.

1.6 The site is identified within the LDP as designated for Business Use, but it is clear that the site is not being utilised for business use and will without substantial investment, deteriorate further over time. We propose high-quality, cottage style flats 1 and 3/4 storey, (amended elevations have been submitted with this statement, following review of planning and objection commentary) suitable for the location and site as well as a light industrial business starter unit to ensure the business element of the site remains.

1.7 The planning application and this statement is accompanied by a number of supporting documents, including:

- Amended Drawings following consultation
- Drainage Impact Assessment
- Retail Statement
- Flood Risk Assessment
- Transport Statement
- Bat Survey

2.0 Site Information

2.1 Site Description

2.1.1 The Site extending to 0.67ha, is currently a brownfield site located South of Forsyth Street (B9040) The Northern edge of the boundary is bound by this road which is the main route through the town from Lossiemouth in the East towards Burghhead.

2.1.2 Adjacent to the site, on the opposite side of Forsyth street, it is lined with residential property, this is mixed with single storey terraced standstone cottage dwellings which have undergone refurbishment and now bore painted white render fronts, with upgraded slate roofing alongside detached bungalows with a more modern palette and a large detached sandstone dwelling, which consists of slate roofing and timber windows and doors. 2.1.3 Part of the Eastern boundary from Forsyth Street to within 1/3 of the site is bound by a block work wall (bearing no historical significance), which leads to the edge of an existing industrial unit, changing to kerbing which leads towards the rear of the site.

2.1.4 Beyond the eastern boundary line, is a business premises, currently occupied by Tulloch of Cummings, this building looks almost residential in appearance, and is more modern than the sandstone residential properties on the opposite side of Forsyth Street.

2.1.5 The Western Edge is bound by a sandstone wall leading to an existing traditional stone front house, this runs approximately ¾ of the way towards the back of the site, with hedge planting along the remainder of the boundary. It is proposed that both shall remain untouched.

2.1.6 Bounding the South edge of the site is a telephone exchange, which is in poor condition with spalling render, decaying metal doors and dilapidated brickwork. Further south lies gently undulating farmland, with scattered farm buildings.

EXISTING SITE IMAGES

View on approach along the B9040 heading West towards Burghead

Looking inwards to the proposed site from the North West corner

Residential Properties adjacent to the proposed site entrance

View along lane off of Inverugie Road towards the old telephone exchange

2.2 Planning History of the Site

89/00952/ADV	October 1989	Advertising consent to erect free standing pole	Granted
95/00498/FUL	July 1995	Extension to garage to add spare parts store	Granted
16/01799/APP	January 2017	Application to extend existing garage building	Granted (Never Constructed)

2.2.1 3 historical applications can be found on the Moray Council planning pages, from 1989 – 2017. The first was an application for signage to be erected directly off of Forsyth Street to highlight as a garage/ car sales for passing trade. It was inevitable a large volume of traffic would be attracted to the site, however established structured parking was never created.

2.2.2 The second application in July 1995 was an application to extend the garage to create a parts store, details/ drawings were not available on the Moray Council website, but it is apparent from visiting the site a small store was constructed on the western gable of the existing garage building.

2.2.3 In 2017 a further application was made with the intention of extending the garage to double the footprint in size. Although approved, this was never constructed. At some stage (unknown) a temporary unit has been added, this adjoins the garage and it is apparent it has been in-situ for a significant period of time.

2.3 Current Use of Site

2.3.1 Currently a brownfield site, it was obvious on visiting that although once a thriving car garage and car sales location, the site has fallen into a serious state of disrepair. There is no operational business currently on the site, and it has not been operational for some time. It is understood that the previous owner had been using the garage facility for personal use having taken up employment elsewhere. Historically, the site also had facility as a working filling station, there is a clear point of entry and exit from Forsyth Street and a small central island still apparent as to where the pumps would have been located previously. The nature of the business on the site historically would have undoubtedly attracted a high volume of traffic, both for access to the filling station and those arriving to deposit vehicles for repair at the garage. Entry and exit points do not constitute formal junctions and would certainly not comply with today's roads safety standards. It is believed although not known for certain that the bus stop adjacent to the site (concealed within a lane) would have been erected sometime after the garage business was established on the site.

2.3.2 There is a palisade fence which houses a small enclosed yard area, this was previously used as a storage area for a gardening services business, and this is no longer occupied now lying dormant.

2.3.3 The driving factor behind the proposals for a mixed use development is that historical precedents exploring the above suggests the site requires careful consideration regarding the success of business use only upon the site largely due to a more rural setting, and although contrary to plans set out in the current and evolving Moray Council LDP, mixed use is something that should be considered when assessing our client's application to allow the regeneration of a prominent site regenerating the area, injecting a new sense of purpose.

3.0 Supporting Design Statement

3.1 Site Layout & Design

3.1.1 SUMMARY OF PROPOSAL

This statement is submitted to Moray Council in support of our planning application proposals for Business, Retail and Residential development on a site as described above. The application seeks detailed planning permission for the erection of:

- 2 no blocks of cottage flats, comprising of 8 dwellings
- 372sqm Retail Unit
- 111sqm Light industrial business starter
- Associated Parking and Infrastructure
- Landscaping
- Improved Pedestrian and Cycleways

3.1.2 CONTEXT AND MASS

Located close to the centre of Hopeman, the site is an ideal location for local residents to reach the site easily on foot or bicycle, which our proposals address by creating a new crossing point on Forsyth Street allowing the site to become accessible safely with the previous footpath stopping abruptly on the western edge. As the main vehicular route through the town, used well by both local residents commuting largely towards Lossiemouth, Elgin and Burghead, it is also a highly popular costal route for tourists.

The Business Unit proposed is single storey build with designated parking to the front ensuring the business element under the sites designation is the most prominent on the Eastern approach. Proposed materials are in keeping with the larger unit immediately behind on the adjoining site and it is proposed the metal cladding will conform to a grey pallet to compliment the use of grey Caithness stone on the main elevation of the retail unit and the residential.

The proposed retail element has been positioned directly off of Forsyth Street with parking easily accessible via a newly compliant formal junction from Forsyth Street. The retail element proposed is single storey, with the massing of the residential units located at the back of the site (Southern Edge) to remain sympathetic to the streetscape along Forsyth Street. They have also been positioned to ensure no overshadowing to the existing residential property on the Western boundary. The entrance to the retail unit has been situated on the North East side, this allows it to be closest to the proposed new crossing point on Forsyth Street and to allow bicycle hoops to be carefully positioned on the wider section of the footpath.

The proposed residential units are known as ‘Cawdor’ and are 1 ¾ stories, this is to ensure the proposed massing is in keeping with the existing residential style(s) within Hopeman. Living and Kitchen areas are at the front of the blocks to ensure maximum North light, and to offer views out towards Forsyth Street and towards the newly landscaped areas at the front. Bedrooms have been located to the rear to give

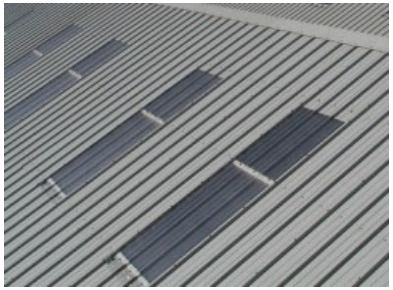
maximum privacy and views from 1st floor beyond the telephone exchange to the undulating farmland in the south. Bathrooms have been positioned within the East and West gables further privacy is offered by applying obscure glazing.

3.1.3 MATERIALITY

BUSINESS (INDUSTRIAL UNIT):

It is proposed to use a contemporary external materials and finishes palette. This would include the use of a high-quality metal cladding system (Kingspan or Equivalent). The main elements light grey in colour with doors, framing, flashings in a darker grey to compliment the use of stone on the Forsyth street elevation of the retail unit and in keeping with the stained grey timber/ Caithness stone proposed for the residential units at the rear of the site.

External Walls – 80mm Composite insulate metal panel (goosewing grey) Metal roof trims and flashings (graphite grey)
Roofing - 80mm Composite Insulated metal roof panels (goosewing grey) Metal roof trims and flashings (graphite grey)
Windows/ Rooflights – Double glazed units
Insulated Sectional Overhead Doors – Metal (meets secure by design criteria) RAL 7024 Graphite Grey
Personnel Doors – Metal (meets secure by design criteria) RAL 7024 Graphite Grey



RETAIL:
It is proposed to use a contemporary external materials and finishes palette. This would include the use of high-quality Kingspan metal standing seam roof tiles, modern K-Rend roughcast render wall finishes with larch timber cladding and Caithness stone cladding a contemporary but complimentary detail on the Forsyth street elevation to relate to the adjacent stone used on facing residential properties. The Service Yard to the rear would be enclosed using a high quality powder coated metal post with timber infill system to ensure

External Walls Type 1 – Smooth K-Rend White Render
External Walls Type 2 - 145x23mm 'NORDIC SPRUCE' VERTICAL SHIPLAP TIMBER EXTERNAL CLADDING BOARD
External Walls Type 3 – Caithness Stone Cladding Panel (grey)
Roofing – Metal Kingspan standing seam roof panels (grey)
Windows - Powder coated aluminium finish – Ral 7043 Traffic Grey
Doors – Powder coated aluminium finish – Ral 7043 Traffic Grey




RESIDENTIAL:
It is proposed to use a contemporary external materials and finishes palette. This would include the use of high-quality concrete smooth grey roof tiles, modern K-Rend roughcast render wall finishes with larch timber cladding and elements of Caithness stone. Sensitive boundary treatments would be provided to give a modern aesthetic character and aid place making.

External Walls – Smooth White Render/ Timber cladding/ Caithness Stone
Roofing – Marley Edgemere Grey with Teracotta Ridge
Windows – Timber Stained Grey
Doors – Timber stained Grey

Front Elevation 1:100


Side Elevation 1:100


3.1.4 ROADS & PARKING

A new junction is proposed, formed off of Forsyth Street to the left of the proposed retail unit leading into the site. A new layby is also proposed directly in front of the retail unit which prevents large commercial vehicles entering or turning within the proposed site, all retail deliveries would arrive into the layby, to be offloaded and taken into the store through the back of house entrance (refer to Drawing L-106 Proposed Elevations). It has been considered however that refuse vehicles will have to enter the site to reach the residential bin store, and a Swept Path analysis has been prepared in support of this application. (Refer to 10054-C-40). The service yard for the retail element is accessible only on foot via the service lane running upside the western edge or via rear doors through back of house.

Residential, Retail and Business premise Parking has been kept distinctly separate, with residential park situated closest to the flats and clear of all retail & business proposed spaces. There are designated parking bays allocated for business use, they are accessible directly from Forsyth Street and are located to the front of the industrial unit. A further 12 bays have been designated for residential parking only, positioned immediately in front of the residential blocks, it is intended bay no's would be allocated and appropriate signage installed to highlight spaces are for residential use only. In addition there are 21 spaces provided for retail, under Moray Council parking guidelines, this falls short by 2 spaces, this has also been considered however and given the rural location and following discussions with the Co-op it is evident from precedents within the retail statement, carpark areas are unexpected to ever require full capacity. It is also expected that with improved pedestrian and cycle ways both within and immediately outside the boundary this will greatly reduce parking need. 2 Spaces have been allocated as disabled, with a space identified for electrical vehicle charging. Initial proposals had shown parking bays allocated within the proposed loading bay, these have subsequently been removed and reallocated to the rear. (Refer to L-0003B Proposed Site Plan). Proposals align with guidance set out in the Moray Council 2015 LDP as noted below;

"On all streets a minimum of 75% of car parking must be provided to the side or rear and behind the building line with a maximum of 25% car parking within the front curtilage or on street,"

Cycle Bays are to be provided to the left of the proposed entrance into the retail unit, with 2 additional cycle storage areas highlighted immediately outside both residential units.

3.1.5 IMPROVED PEDESTRIAN AND CYCLEWAYS

New connections would be created with the existing road and path network to allow for the provision of a walkable neighbourhood, which is safe and well integrated into the surrounding area. A crossing is proposed to the left of the proposed junction over Forsyth Street allowing pedestrians and cyclists a safe route of passage with the majority of those on foot/ cycle to be approaching from the North where the majority of residential properties lie. A second crossing point as indicated on the proposed site plan is located within the newly formed junction allowing both pedestrian and cyclists a safe point of crossing to approach the proposed retail element, or to safely pass through the site to the third proposed crossing leading towards the proposed residential units.

Additional street lighting would be proposed in line with legislation and consultation with Moray Council's Roads and Transport team. Specifically to ensure the newly formed junction is well lit, as well as the relocation of existing street lighting which is currently located where the

new junction is to be formed. The carpark would include additional street lighting along with feature bollard lighting to highlight pedestrian routes and promote wayfinding. A BT box located in front of the retail unit where the existing footpath disconnects would remain in its current location. Cycle hoops are proposed for both the retail and residential to promote greener travel, and to reduce the volume of traffic visiting the site.

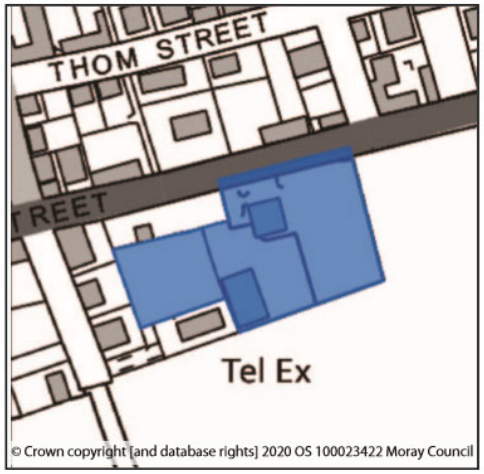
3.1.6 DRAINAGE AND SUDS

A fully detailed DIA has been prepared and will be submitted in support of this submission (Document Ref 10045/Civil/R001) It is intended that Roads, Parking and Roof (Surface Treatment) will be treated by means of an existing offsite swale and detention basin, This was constructed 200m west of the site as part of a Springfield Homes development further treatment is proposed by use of porous paving which will be added as a feature within the parking areas. Full details are provided within the DIA. Foul connections will be made into the existing Scottish Water network.

3.1.7 LANDSCAPING

Areas of landscaping are proposed principally fronting the north elevations of the residential units, this is to provide screening from the car parking area and to conceal the roadside bin stores necessary for refuse collection. The strip of landscaping will create a distinct boundary between residential and retail/ business and will consist of semi mature trees with shrub and bulb planting beneath. . Appropriate hedgerow and tree planting would be retained along the East and Western boundary edges of the site, ensuring undisturbed privacy to neighbouring plots.

I1 Forsyth Street Existing Business Area



- Flood Risk Assessment (FRA) required.
- Drainage Impact Assessment (DIA) required.
- Noise Impact Assessment (NIA) may be required depending on use.
- Existing roadside verge along site frontage must be retained for future footway/cycleway provision.

Extract from Moray Council LDP 2015 highlighting area designation

3.2 Proposed Industrial

Scottish Planning Policy requires development plans to designate sites that meet the diverse needs of different types and sizes of business in a way that is flexible enough to accommodate changing circumstances. The top priority of the Community Planning Partnerships 10 year plan, Moray 2026 is “a growing, diverse and sustainable economy.” (Moray Council LDP 2020). The introduction of a modern new, light industrial unit which has the adaptability to be easily reconfigured internally to potentially accommodate 2 small businesses, has been designed with a small start-up business in mind.

In rural areas the Council would wish to support economic development and sustain employment in rural areas. The policy seeks to support rural business proposals that fit into the environment and can be adequately serviced. Locational need is where it is necessary for a proposed development to be located at or in close vicinity of the development site; necessary in this context means more than convenience. (Moray Council LDP 2020 - DP5 Business & Industry.

Given that the site is earmarked for Business use, it is not expected that this element will be contentious.

3.3 Proposed Retail

3.3.1 It is important to note that a full detailed Retail Statement has been prepared and will be submitted in support of this application. This report was prepared by:

North Plan Development
2nd Floor Tay House
Glasgow
G2 4JR

The proposed retail element is a single storey building comprising of 372sqm, along with associated landscaping, parking and improved pedestrian routes. A service yard is to be located at the rear, however it is important to note that the yard would be accessible by foot only, with all deliveries received within a proposed loading bay at the front of the store, this would remove the need for any delivery vehicles to have to enter or exit the site.

3.3.2 The Moray LDP 2015 sets out a vision that places an emphasis on supporting Scottish Government’s aims of promoting sustainable economic growth, promoting a generous housing land supply, along with a low carbon economy and emphasis on design and place making. Its spatial strategy directs the main growth towards the area’s largest settlements. It places implementation of its priorities via a series of primary policies, these are reviewed hereafter. The site sits within the settlement of Hopeman, as identified in the adopted LDP. Whilst part of the site

is affected by Policy I1, which supports business and industrial uses, the front part of the application site, over which the Co-op store is proposed, appears to be 'white land' and so that part is not affected by Policy I1.

"Small shops that are intended to primarily serve the convenience needs of a local neighbourhood within a settlement boundary will be supported. Depending on scale, proposals may be required to demonstrate that they will not have an unacceptable adverse impact on the vitality and viability of the network of town centres (Table 6), by a Retail Impact Assessment or Retail Statement. Within a neighbourhood one unit of up to 400m² designed to meet the day to day convenience needs of the neighbourhood will be supported. DP7 retail and town centres" (Moray Council LDP 2020)

3.4 Proposed Residential

3.4.1 The site proposals are considered to provide an opportunity for much-needed and wholly affordable housing which could support local facilities and amenities. The site is not identified for housing in the Local Development Plan however recognising Scottish Government's pledge to deliver 50,000 affordable homes over the next 5 years, the Local Housing Strategy's priority for the delivery of traditional affordable housing for rent and the need for these in rural locations we would request that this proposal is attributed significant weight to allow for an acceptable departure from the LDP in this instance. It has been agreed with Moray Council via email exchange on that a commuted sum would be paid in support of the application.

The SHIP states that "a commuted payment will be sought from developers where … the planning proposals would require multi tenure/multi use provision under one communal roof structure e.g. a block of flats or mixed residential/commercial buildings.

* Policy H9 is not applicable as the number of units proposed does not meet the current threshold of 10 units.

3.4.2 SPP suggests that in 'rural areas, and increasingly in urban areas, innovative and flexible approaches will be required to deliver affordable houses in suitable numbers.' In looking at exceptional cases for rural areas planning authorities can allocate land for affordable housing which would generally not receive planning permission if it were for market housing only. PAN 2/2010, presents as a further option the promotion of sites 'specifically for affordable housing to meet requirements identified in the Housing Need and Demand Assessment (HNDA) and Local Housing Strategy (LHS). This approach is most likely to be appropriate for small scale sites within or adjoining existing villages to provide for locally arising needs.' In the absence of such a policy approach, other proactive alternatives to promote affordable housing to come forwards, such as a more flexible approach on delivering sites like this, should be encouraged.

"Housing Land Requirement / Housing Supply Targets Scottish Planning Policy requires local development plans to take a longer term approach to housing land. The Scottish Government has ambitious targets for the provision of 50,000 new affordable homes through the "More Homes Scotland" initiative. An "effective" supply of land for housing is a key aspect of delivering this ambition and meeting wider housing need and demand." (Moray Council LDP 2020)

3.4.3 Policy E9 Settlement Boundaries states that ‘boundaries are drawn around each of the towns, villages and rural communities representing the limit to which these settlements can expand during the Local Development Plan period’. It further states that ‘development proposals immediately out with the boundaries of these settlements will not be acceptable, unless the proposal is a designated “LONG” term development site which is being released for development under the terms of Policy H2.

3.4.3 The settlement boundaries are defined on the proposals maps for the purpose of guiding development to the towns and villages sustainably, preventing ribbon development and maintaining a clear distinction between the built up area and the countryside. The Forsyth Road development is within the settlement boundary, so it is therefore not going against the limitations set out within the LDP. Development of this site would not unduly impact on Hopeman’s countryside hinterland and in doing so would not represent an erosion of its character or setting.

3.4.4 The selected Cawdor style has been proposed to allow for fully accessible flatted properties to cater for a wide variety of potential residents from first time buyers, small families, to pensioners. The introduction of housing with a retail element in such close proximity supports residents within this site, but also within the new homes which have been approved for construction to the west and those within existing residential areas towards the North.

4.0 Key Planning Requirements

4.1 Sustainability & Energy Efficiency

4.1.1 The materials used within construction will be locally sourced where possible, tendering for the project will be restricted to locally based contractors.

BUSINESS/ INDUSTRIAL:
The business starter unit(s) have been designed to be unheated, however, composite insulated panels are being utilized, ready for tenants to line out should they wish to. This forward thinking creates a superior comfort to the units, minimising the need for heating within the buildings.

The unit(s) have extensive roof lights to maximising daylight. The buildings will make use of energy efficient fittings, with LED energy efficient lighting specified by the M&E consultants. External lighting to the building will have three settings to be ‘on’, ‘off’ or ‘auto’, as required and to lower electricity consumption. The unit(s) are to remain unheated and any heating system would be to the tenant’s specification at a later stage.

The units will be naturally ventilated through the sectional overhead doors and pass door to the front of each unit. The WCs will be mechanically ventilated.

RETAIL:
The retail unit has been designed to allow natural light and ventilation internally without the need for mechanical extraction. Walls floor and roof are specified to better the values set out within the Scottish Building Standards.

HOUSING:
The residential units have been designed with a focus on sustainability, carbon reduction and customer energy saving through highly efficient building fabric specification, technology and renewable energy sources. The houses have been orientated to take best advantage of passive solar gain with maximum North and South light throughout the day. The design ensures, all dwellings will be fitted with triple glazed high performance timber windows. Narrow plan forms allow for good natural daylighting

The houses incorporate enhanced day lighting using large windows and natural ventilation as considered potentially greater value and more user friendly than technologically driven techniques.

The houses are also to have good air tightness, and the floors, walls and roof are well insulated. Bettering the requirements set out within the Scottish Building Standards.

4.2 Active Travel

A transport survey is being undertaken as part of this application for Planning. This report will cover items relating to public transport, cycling and driving. The site as a whole provides ample parking which is clearly defined and designated to each specific element.

PUBLIC TRANSPORT

Situated on the B9040 which acts as he main through route within Hopeman, there are a number of bus stops located along Forsyth Street with one immediately adjacent to the proposed site. A frequent bus service along this route makes the site easily accessible by use of public transport. Introducing a safer pedestrian crossing point on Forsyth Street ensures the adjacent bus stop is utilised.

CAR CHARGING POINTS

An electric car charging point is proposed and located to the rear of the site to promote the use of electric cars. These charging points will be fed by a landlords electricity supply, under current legislation and on approval by the Scottish Energy Trust. It is proposed that the charge point available will be a fast charge point, and the bay will be easily identifiable with signage and demarcation.

CYCLING

Cycle racking has been incorporated to encourage cycling to work and business premises this is detailed within the transport statement which has been prepared to accompany this design statement.

The promotion of cycling is intended to reduce CO2 emissions and promote healthy lifestyle and wellbeing. The site makes best use of this by incorporating cycle bays in close proximity to the retail entrance and by incorporating 2 no cycle stores in close proximity to the entrances on the rear of the residential blocks.

4.3 Resource Efficiency

WATER

The small unit(s) proposed use is for WCs and wash hand basins meaning water consumption is low. Within the retail unit again it is expected a maximum of 6-7 staff with a minimal staffroom/ tea prep area proposed. Residential units will allow for the collection of rainwater to be harvested for use in landscaped/ garden areas.

The surface water drainage and rainwater run-off from the units is dealt with by means of an offsite SUDS system, full details can be found in the accompanying DIA as noted above. Porous paviours will be used within the car park area to provide and additional level of treatment if required. The drainage has been designed holistically for the site by the engineers, creating a comprehensive solution that will be agreeable to Scottish Water.

WASTE

Business:

The nature of the tenants would suggest that the majority of waste will be light industrial and should be within lease agreements that this must be disposed of responsibly and appropriately, and should be included within individual tenancy agreements.

Retail:

Waste will be stored within the secure service area at the rear of the store. The co-op have a detailed waste management strategy to promote recycling. Waste is collected from the store under private arrangements.

Residential:

Bin Stores have been located in close proximity to the residential blocks, and will comprise of secure lockable units. A further bin store has been provided on the edge of the residential parking area to allow ease of collection by the local authority on designated days.

4.4 Climate Change Adaption

Designed Building Flexibility

The proposed starter unit has been designed with the intention of promoting small scale business and start-up companies. The unit is perfectly suited to accommodate a small business but has been designed in a way that internal division is possible to split the unit and accommodate 2 smaller businesses. The retail unit will be constructed as a 'shell' and will be leased on a long term arrangement, the space could be refurbished to accommodate other business use if the retail element was unsuccessful.

Flood Prevention

As above – Drainage & SUDS

Low maintenance Build Materials

Robust and low maintenance building materials have been specified with the intention of reducing maintenance needs as well as any impact and pollution from carrying out maintenance works.

4.0 Conclusion

Now within a serious state of disrepair, with no past or current interest to redevelop with the exception of our client, there is a risk that without the gaining of consent to do so the site will become dormant and fall further into a state of dilapidation having a detrimental effect on the charm and character that is Hopeman. Once a former filling station/ garage, with potential to extend and adapt, sadly these proposals never came to fruition.

It is highlighted very clearly in the Moray Council LDP 2015 alongside the evolving 2020 LDP this site is designated for Business Use only. However, the proposals set out in this report are intended to offer a mixed use development that we feel has been carefully considered, one that we feel has the best chance of success given that precedent shows this area is unlikely to thrive if developed solely for business use. The proposed residential element is not significant with only 8 dwellings proposed, but one which we feel will bring a renewed sense of community and place to the area. The retail element is a small footprint and should not be viewed as a large scale commercial entity, but a far smaller retail outlet, which will offer residents an accessible option by foot or cycle preventing unnecessary travel to the larger surrounding towns.

Our client's intention is to work with Moray Council and the local residents to ensure that any approved proposal enhances the area not solely by regeneration of the site, but also by making significant contribution to the upgrade of areas out with the site boundary to ensure a safe, secure and accessible environment improving both pedestrian and cycle links.





Proposed Mixed Use Development, Forsyth Street, Hopeman

Transport Statement

July 2020

ECS Transport Planning Limited
Centrum Offices, 38 Queen Street, Glasgow, G1 3DX
www.ECSTransportPlanning.com

TRANSPORT PLANNING LIMITED

Client Name:	Springfield Real Estate Management Ltd
Document Reference:	01
Project Number:	20044

Issue	Date	Prepared by	Checked by	Approved by
01	10.07.20	Steven Scott	Michael Summers	Michael Summers

Comments

Comments

Content

Figures

Tables

Appendices

1. Introduction

1.1. ECS Transport Planning Limited (ECS) has been commissioned by Springfield Real Estate Management Ltd to produce a Transport Statement (TS) in support of a proposed mixed-use development with associated parking on the Hopeman Service Station site adjacent to the B9040 Forsyth Street, Hopeman.

1.2. The proposals seek permission to demolish the existing service station and garage and construct a small food retail convenience store, a light industrial / commercial starter unit and 2 no. blocks of residential dwellings containing a total of 8 cottage flats with associated access, servicing and parking facilities.

1.3. This report examines the key transportation issues and access opportunities associated with all modes of travel from development on the site, and documents the potential to improve the walking, cycling and public transport connections in the area, where necessary.

1.4. The findings of this study are based on a review of the comments provided by Moray Council's Transport Planning Department (MC) within a consultation response to the planning application, consideration of representations by the public, a site visit, existing traffic observations and has been produced in accordance with the Scottish Executive (Government) document 'Transport Assessment Guidance' (2012), where appropriate. Consideration has also been given to the requirements of local and national government transport planning polices, including 'Designing Streets'.

1.5. The subsequent chapters of this report are structured as follows:-

- Development Proposals;
- Local & National Transport Policy;
- Sustainable Accessibility;
- Existing & Future Traffic; and
- Summary & Conclusions.

2. Development Proposals

Existing Site & Surrounding Area

2.1. Hopeman is a seaside village in Moray, on the coast of the Moray Firth, founded in 1805 to house and re-employ people displaced during the Highland Clearances. According to the 2011 census, Hopeman has a population of 1,724 residents within circa 701 dwellings.

2.2. The site extends 0.67ha and currently hosts a service station and garage which has fallen into a state of disrepair in its current condition. The site is considered to currently be dilapidated and detrimental to the character of Hopeman.

2.3. This site, which is brownfield in nature, is bounded to the north by the B0940 Forsyth Street, to the east by Tulloch of Cummings, to the south by a telephone exchange and agricultural land and to the west by residential properties between the site and Inverugie Road. The location of the site, in a local context, is highlighted in red within *Figure 1* below:-

Figure 1: Site Location

Based upon the Crdnance Survey's (1:1250) Map of 2020 with permission of the controller of Her Majesty's Stationery Cffice, Crown copyright reserved. ECS Transport Planning Ltd Centrum Cffices, 38 Queen Street, Glasgow, G1 3DX. License No: 100055056

2.4. The area has a number of local amenities including Hopeman Primary School, Hopeman Stores, and Post Office (Premier), Costcutters, a general store, hairdressers and beauty salon, a butcher shop, a chemist, a fish & chip shop and recreational facilities.

2.5. The site is identified within the Local Development Plan as designated for Business Use, but it is clear that the site is not being utilised for business use and will, without substantial investment, deteriorate further over time. The site is well located in terms of access to arterial routes and public transport services to key areas of employment, such as, Elgin.

2.6. *Figures 2 & 3* below present the site in its current form. *Figure 2* displays a view of the site frontage looking south from Forsyth Street, with *Figure 3* illustrating the existing access arrangements.

Figure 2: View of Site from Forsyth Street

Figure 3: Existing Access Arrangements

Proposed Residential Development

Development & Access Overview

2.7. The proposals involve the demolition of the existing service station and garage onsite, and construction of a retail unit, a small light industrial unit and 2no blocks of residential cottage style flats. The development content will comprise of the following:-

- 372msq Gross Floor Area (GFA) Food Retail (Convenience Store);
- 112msq GFA Light Industrial / Business Use (Starter Business); and
- 8 cottage flats split equally between two blocks.

2.8. The site frontage will be reconfigured, with the access arrangement condensed and footway on the southern side of the carriageway reinstated. The large existing egress at the western side of the site will be removed and a new standard priority junction introduced to replace the eastern access. A new delivery / loading layby will be created on the southern side of Forsyth Street to the west of the enhanced site access with the footway routing around the rear. In additional to the proposed delivery bay, 4 new car parking spaces will be introduced on the northern western boundary at the rear of the footway accessible via dropped kerb.

2.9. The site access junction will provide a route to the central area of the site with parking located either side. The internal road will be introduced in a T-Shaped arrangement to support larger vehicle turning manoeuvres. The minor section of the internal T-Shaped arrangement will operate as a parking courtyard and will host parking facilities either side.

2.10. The light industrial unit will be positioned to the east of the access junction directly south of the 4 proposed site frontage parking spaces and east of the site spine road. The convenience retail store will be located on the northern boundary of the site, to the south of the proposed delivery loading bay. To the south of the access roads and parking facilities, the cottage flats will sit on the southern boundary side by side.

2.11. Pedestrian access to the site will be provided from the northern boundary via Forsyth Street. A new dropped kerb crossing with tactile paving will be introduced between the enhanced site access junction and the proposed frontage car parking spaces. Access to the light industrial unit will be via an entrance on the northern elevation which will front the footway, as will access to the retail unit with entrance directly south of the delivery bay.

2.12. A zebra crossing will be introduced within the private internal spine road to support pedestrians crossing the minor arm of the junction. Access to the residential cottage flats will be introduced via a footway between the retail building and the parking bays on the western side of the site spine road. Another zebra crossing will be introduced over the parking court providing access to a surfaced area around the perimeter of both flatted buildings.

2.13. The proposed site layout is illustrated on Drawing L-003 Rev B contained within *Appendix A*.

Development Parking Provision

2.14. The proposed development will provide a total of 37 car parking spaces, which will consist of 4 frontage access spaces from Forsyth Street in support of the light industrial unit, 12 bays for the residential dwellings located either side of the internal parking court and 21 spaces for the convenience retail store positioned adjacent to the main spine road. The provision for the convenience store will include 2 disabled bays and one electric charging station.

2.15. As requested within MC's consultation response, parking provision for the residential element of the site has been introduced in accordance with Moray Council's Parking Standards as 1.5 spaces per flat which equates to a total of 12 spaces. Given the provision also accounts for visitor use, the spaces will not be allocated which ensures more efficient use of parking spaces.

2.16. Furthermore, the ratio of 3 spaces per 100msq GFA has also been applied to the light industrial use. However, given that some of the residential parking will be vacant during key retail demand periods, it is not considered necessary to apply the full food retail parking requirement to the site given the potential for shared use. The proposed retail element will provide a total of 21 spaces which is two short of the recommended 23 space provision. Co-Op, who are likely to be the tenant of the proposed unit, are comfortable that the proposed provision is sufficient to accommodate demand based on knowledge of operations at similar sized stores in areas with comparable characteristics. Given the remote location of the store, the proposed unit includes a larger storage area than would be standard, as such, applying the full parking ratio to this area is onerous.

2.17. Cycle parking will be provided in accordance with Moray Council's Parking Standards, with 3 Sheffield Cycle Stands introduced at the rear of the retail building which will support a total of 6 bicycles at any time.

The provision is in excess of the minimum requirements for both the retail and industrial elements of the site as set out in MC's guidance.

2.18. Cycle parking for the residential element of the site will be provided in a secure sheltered facility at the rear of the buildings adjacent to the bin stores.

Service & Refuse Vehicle Access

2.19. Servicing, for the retail store, will be undertaken from a dedicated layby on the southern side of the Forsyth Street carriageway adjacent to the unit. A traffic regulation Order will be promoted to restrict parking within the area. The dimension of the bay is more than adequate to support a standard 10m rigid delivery vehicle at a width of 3m and length of 18m. Servicing, if required, for the light industrial unit is envisaged to be undertaken by a small panel van.

2.20. Refuse collection will be undertaken internally for all three land uses. The refuse vehicle will enter the site in a forward gear route south on the spine road and turn right into the parking court. Once the bins have been collected the vehicle will reverse into the T-Shaped turning head arrangement and exit the site in a forward gear.

2.21. Drawing 20044_002, contained within *Appendix B,* demonstrates a service vehicle entering and exiting the proposed loading layby on Forsyth Street. Drawing 20044_001, also contained within Appendix B, demonstrates a refuse vehicle can be safely accommodated within the proposals, allowing vehicles to enter and exit the site in a forward gear, with Drawing 10045_401 illustrating fire tender access to the site.

3. Local & National Transport Policy

3.1. The planning system is used to make decisions about the future development and use of land in our towns, cities and countryside. It considers where development should happen and how development affects its surroundings. The system balances different interests, including transport, to make sure that land is used and developed in a way that creates high quality, sustainable places.

3.2. To inform this process, National and Local Government have developed a series of policy documents / statements and guidance in terms of transportation. As most forms of transport are fundamental to modern life, whether moving people to school, work, shopping or recreation, the integration of transport and land use is a key element to support economic growth, as well as, social inclusion. In reducing Scotland's carbon footprint, the promotion of public transport is seen as key for new developments with walking and cycling taking an important role.

3.3. The following provides an overview of the current national / central and local government policies and guidelines, which the development proposals and site will be reviewed against within this report.

National / Central Government Transport Planning Policy

The Government's White Paper

3.4. The White Paper 'The Future of Transport: A Network for 2030, Executive Summary, Paragraph 6' states that:-

"We need a transport network that can meet the challenges of a growing economy and the increasing demand for travel, but can also achieve our environmental objectives. This means coherent transport networks with:-

- *the road network providing a more reliable and free-flowing service for both personal travel and freight, with people able to make informed choices about how and when they travel;*
- *the rail network providing a fast, reliable and efficient service, particularly for interurban journeys and commuting into large urban areas;*
- *bus services that are reliable, flexible, convenient and tailored to local needs;*
- *making walking and cycling a real alternative for local trips; and*
- *ports and airports providing improved international and domestic links."*

Scottish White Paper

3.5. The Scottish White Paper, 'Scotland's Transport Future, Section 2: Objectives' outlines new objectives for achieving an integrated and sustainable transport system in Scotland:-

"Our objectives are to:-

- *promote economic growth by building, enhancing, managing and maintaining transport services, infrastructure and networks to maximise their efficiency;*
- *promote social inclusion by connecting remote and disadvantaged communities and increasing the accessibility of the transport network;*

- *protect our environment and improve health by building and investing in public transport and other types of efficient and sustainable transport which minimise emissions and consumption of resources and energy;*
- *improve safety of journeys by reducing accidents and enhancing the personal safety of pedestrians, drivers, passengers and staff;*
- *improve integration by making journey planning and ticketing easier and working to ensure smooth connection between different forms of transport".*

Scottish Planning Policy

3.6. National policy for transport is detailed in Scottish Planning Policy (SPP). The relevant aim of planning policy is to support and accommodate new investment and development in locations accessible by a range of means of transport which seek to minimise the impact on existing transport networks and the environment.

Planning Advice Note 75: Planning for Transport

3.7. Planning Advice Note (PAN) 75 accompanies SPP and provides a good practice guide for planning authorities and developers in relation to carrying out policy development, proposal assessment and project delivery. The aim of the document focuses on how planning and transport can be managed; the role of different bodies / professions in the planning process and provides reference to other sources of information.

3.8. Respectively, paragraphs 7 and 24 of the document state the following in terms of transport:

"The intention is for new developments to be user focused and for the transport element to promote genuine choice, so that each mode contributes its full potential and people can move easily between different modes. Consideration should be given to freight logistics as well as person travel."

"Development plan policy should encourage development of significant travel generating proposals at locations which are key nodes on the public transport network that have a potential for higher density development and a potential for mixed use development with an emphasis on high quality design and innovation. These locations should encourage modal shift of people and freight by providing good linkages to rail, walking and cycling networks and with vehicular considerations, including parking, having a less significant role. Mixed use development, for example the inclusion of local shops and services within larger housing developments can encourage multi-purpose trips and reduce overall distances travelled by car by bringing together related land uses."

3.9. Furthermore, maximum travel distances for walking and cycling, as well as, establishing how far people would be prepared to walk to access public transport are contained within PAN 75. From paragraph B13, the document states the following:-

"Accessibility to public transport services:

- *For accessibility of housing to public transport the recommended guidelines are less than 400m to bus services and up to 800m to rail services."*

"Accessibility to local facilities by walking and cycling:

- *A maximum threshold of 1,600m for walking is broadly in line with observed travel behaviour."*

Designing Streets

3.10. This document is the first policy statement in Scotland for street design and sits alongside Designing Places, setting out government aspirations for design and the role of the planning system in delivering these. Together, they are the Scottish Government's two key policy statements on design and place making. Both documents are national planning policy and are supported by a range of design-based Planning Advice Notes (PANs). Designing Streets updates and replaces PAN 76 New Residential Streets (which is now withdrawn) and, in doing so, marks a distinct shift, raising the importance of street design issues.

3.11. The key policies from Designing Streets that should be considered are as follows:

- *"Street design must consider place before movement.*
- *Street design guidance, as set out in this document, can be a material consideration in determining planning applications and appeals.*
- *Street design should meet the six qualities of successful places, as set out in Designing Places.*
- *Street design should be based on balanced decision-making and must adopt a multidisciplinary collaborative approach.*
- *Street design should run planning permission and Road Construction Consent (RCC) processes in parallel."*

Scottish Executive Development Department: Transport Assessment Guidance (TAG)

3.12. The above document was published in 2012 and seeks to provide a best practice guide to help identify and deal with the likely impacts of development proposals in-terms of transport. As with SPP, this guidance focuses on the overall accessibility of the development. Detailed below are the key aims of a Transport Assessment.

- Reducing the need to travel, especially by private vehicle;
- Reducing environmental impact of development;
- Encouraging accessibility of development / location; and
- Promotion of measures that influence sustainable travel behaviour.

3.13. TAG provides recommendations for pedestrians, cyclists and public transport accessibility in relation to new development, defining mechanisms for identifying the location and measures.

3.14. Paragraph 2.9 of the document states that:

"Accessibility analysis and location considerations will lead the process of assessment. Person trips will form the platform for all numerical and computational work with numbers associated with car and non-car modes being appropriately addressed in accordance with current policy."

"In many cases, vehicle impacts will still be important and, in terms of the principals involved in the analytical process, will generally follow the well-established IHT procedures…"

Let's Get Scotland Walking - The National Walking Strategy

3.15. Let's Get Scotland Walking is a strategy to increase the number of Scots who are physically active and build on Scotland's outstanding opportunities for walking both in urban and rural areas. The foreword of the document states:

"There are many benefits from getting Scotland walking, including: more people will use active travel more often and will walk more for pleasure and for recreation; children will have safer routes to school and local facilities; older people will feel more connected with their communities; employers will have a healthier and more productive workforce; Scotland will reduce its use of carbon; and local economies will benefit from increased footfall."

3.16. The vision and aims of the document are as follows:

"A Scotland where everyone benefits from walking as part of their everyday journeys, enjoys walking in the outdoors and where places are well designed to encourage walking."

3 Strategic Aims are:

- *Create a culture of walking where everyone walks more often as part of their everyday travel and for recreation and well-being*
- *Better quality walking environments with attractive, well designed and managed built and natural spaces for everyone*
- *Enable easy, convenient and safe independent mobility for everyone*

Cycling Action Plan for Scotland

3.17. The actions in this document aim to increase cycling across Scotland, supporting both new and experienced cyclists. It outlines a framework for delivering the vision, setting out what the Scottish Government will do, what they expect others to do and what outcomes they expect that action will achieve.

3.18. The Scottish Government's purpose is to focus government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth. This first ever Cycling Action Plan for Scotland (CAPS) sets out how cycling, within the wider context of walking and active travel, contributes to this purpose, particularly through improving health, reducing congestion, reducing carbon emissions and providing a good transport alternative to persuade people out of cars.

3.19. Currently 1% of all journeys by Scottish residents are made by bicycle (Scottish Household Survey Travel Diary, 2008), and the Scottish Government would like to see this increased tenfold to 10% by 2020. Although this is an ambitious vision, the Scottish Government believe it is achievable. Around half the short journeys made (under 2 miles) are made by car; many of these could be switched to bike. This Action Plan aims to provide a framework to help create an environment which is attractive, accessible and safe for cycling.

Local Transport Planning Policy

Local Transport Strategy

3.20. Transport is an important part of the economy in Moray, particularly given its rural and peripheral nature. Developing a transport system that supports economic development, sustainable development, equality, social inclusion and health improvement principles will be a major challenge. A further challenge is safeguarding the quality of life for the citizens of Moray by finding new ways to maintain and increase sustainable economic development, without causing undue traffic growth, congestion and environmental damage.

3.21. The general need for reduction in levels of road traffic in parts of Scotland is not being challenged in the LTS, and there is general agreement that wherever possible efforts should be made to encourage the use of modes of transport other than the private car. The Council is currently pursuing various initiatives which would at least make a small contribution to this objective. These include Safer Routes to School, Rural Transport Initiatives and the preparation of Access and Cycling Strategies. Nevertheless, it must be acknowledged that the character of Moray, which is dictated by its rural location and the particular constraints which apply to public transport, means that some measures which might be successful in other parts of Scotland would be wholly inappropriate in this area. Therefore, it is not considered that setting targets to reduce traffic volumes on non-trunk roads is appropriate in Moray.

3.22. The purpose of the LTS is to set out a framework for taking forward transport policy and infrastructure within Moray nut can be summarised as follows:

VISION

3.23. Excellent connections and accessibility are achieved for Moray through a safe, integrated, reliable and affordable transport system that is inclusive and supports economic development and the needs of local communities whilst safeguarding the environment.

OBJECTIVES

Introduction

3.24. The following objectives have been developed, as a result of the consultation process. These have been split into two categories, comprising of Key Objectives and Sub-Objectives.

Key Objectives

3.25. The Key Objectives provide a framework for progress at a local level and provide a basis for the LTS.

- K1: Support and enable economic development through a sustainable transport infrastructure;
- K2: Promote safer, inclusive and affordable travel for all;
- K3: Maintain and improve the existing transport infrastructure to enable an effective and reliable transport network;
- K4: Improve accessibility to jobs, services and facilities;
- K5: Increase sustainable travel choices to promote travel behaviour change and reduce the need for car use and the environmental impact associated with transport and health;
- K6: Promote integration across different modes, policies and land-use planning.

Sub-Objectives

- S1: Support the improvement of connections (road, rail, sea and air) to the rest of Scotland, the UK and Europe;
- S2: Develop solutions to traffic safety and capacity problems within Moray and work with the Scottish Government, developers and others to minimise predicted problems;
- S3: Support good quality and affordable public transport systems and where appropriate provide and maintain a network of socially desirable bus services to supplement the commercial network;
- S4: Review the role of Moray harbours;
- S5: Ensure adequate car parking provision to meet the need of communities;
- S6: Support improvements to passenger and freight rail services;
- S7: Work with others to reduce additional transport costs related to Moray's location in Scotland, the UK and Europe;
- S8: Encourage less car dependent forms of transport and where appropriate encourage road traffic reduction, walking, cycling and other active travel initiatives;
- S9: Work with others to improve transport infrastructure related to recreation and tourism;
- S10: Support access to the countryside and well being initiatives.

Delivery and monitoring

3.26. Like many other authorities, the success of the Local Transport Strategy will be constrained by competing demands on budgets. Annual budget and implementation reports will continue to be brought forward for Committee approval. Details of the approved budgets and plans will be made available on the Councils website.

3.27. Data collection and monitoring will continue. This will include aspects such as existing key performance indicators including road condition monitoring, lighting repairs and road accidents.

Summary

3.28. Both Local and National Government policy highlight the need to consider sustainable transportation modes when considering the likely impacts of development sites.

3.29. The promotion and connection to public transport is seen as key to providing an access strategy for new development, with walking and cycling taking an important role. The policies all highlight transport sustainability in terms of social inclusion, environmental impact, successful integration and safety.

3.30. In addition, the Scottish Government document "Transport Assessment Guidance" supports the need for consideration of a sustainable approach to transportation planning.

4. Sustainable Accessibility

4.1. The following provides an overview of the likely travel demand for sustainable modes of travel created by the proposed development. The predicted uplift in walking, cycling and public transport trips is assessed in line with the existing provision and facilities in the surrounding area, with improvements to enhance accessibility by each mode considered, where necessary.

4.2. There are various measures of accessibility and methods of calculation. Determining the accessibility of a site generally requires calculating the travel time by different modes; i.e. walking, cycling, public transport and private car. From 'Transport Assessment Guidance' Journey times of up to 20-30 mins are appropriate for walking and 30-40 mins for cycling.

4.3. In line with PAN 75, when assessing a development site, it is good practice to consider travel distances for walking and cycling, as well as, establishing how far people would be prepared to walk to access public transport. The suggested walking distances to public transport interchanges and local facilities are as follows:-

- 400m to bus services;
- 800m to rail services; and,
- 1,600m to local facilities / amenities.

4.4. It should be noted that the distances detailed above are recommended acceptable walking distances from a development site to surrounding facilities, however, theses distances are often exceeded in rural locations.

Multi-Modal / People Trip Assessment

4.5. It is stated within 'Transport Assessment Guidance' that *"Accessibility analysis and location considerations will lead the process of assessment. Person trips will form the platform for all numerical and computational work with numbers associated with car and non-car modes being appropriately addressed in accordance with current policy."*

4.6. In accordance with 'Transport Assessment Guidance', a person trip assessment has been undertaken to determine the likely multi-modal characteristics of the residential element of the proposed site. To appreciate the future travel characteristics of the development site, reference has been made to Scottish Census 2011 website (http://www.scotlandscensus.gov.uk), which defines 'Method of Travel to Work or Study' for the local area that applies to the location of the proposed development site. A summary of the corresponding mode share statistics are shown in *Table 1* overleaf, with the full 2011 National Census outputs detailed within *Appendix C*.

4.7. To assess the level of person trips, the corresponding weekday AM and PM proposed development peak hour (two-way) traffic generation, as indicated in *Table 5*, was applied to the percentage modal split for 'car drivers' (i.e. 49.62%). The remaining mode related trips were proportioned in line with the traffic generation, as indicated in *Table 2* overleaf.

Table 1: 2011 National Census 'Method of Travel to Work or Study Statistics

Mode	Census Output	Modal Split
Underground	2	0.19%
Train	43	4.13%
Bus	150	14.42%
Taxi	9	0.87%
Car or Van	516	**49.62%**
Passenger	82	7.88%
Motorcycle, Scooter or Moped	5	0.48%
Bicycle	18	1.73%
On Foot	172	16.54%
Other	43	4.13%
Total People	**1040**	100%

Table 2: Proposed Residential Development Modal Split and Mode Share (Two-Way)

Mode of Travel	Modal Split	AM Peak	PM Peak
Underground	0.19%	0	0
Train	4.13%	0	0
Bus / Coach	14.42%	2	1
Taxi / Minicab	0.87%	0	0
Driver Car / Van	**49.62%**	**6**	**4**
Passenger Car / Van	7.88%	1	1
Motorcycle / scooter	0.48%	0	0
Bicycle	1.73%	0	0
Walking	16.54%	2	1
Other	4.13%	0	0
Total	100%	**11**	**7**

Minor discrepancies are associated with rounding

4.8. The census information indicates that approximately 9% of adults work from home in and around the Hopeman area which has not been accounted for in the above calculations ensuring the assessment of each mode is robust. Clearly, those working from home would not impact on the commuter peak periods which would limit the impact on the existing transport infrastructure.

4.9. To determine the likely future travel choice associated with the retail unit, reference has been made to the industry standard Trip Rate Information and Computer System (TRICS) database. This database collates survey data for various development types and, based on the available information, 'Suburban' and 'Edge

of Town' has been used to assess the travel demand associated with the retail element of the site. The multi-modal travel information extracted from this database is contained within *Appendix C* with the resulting multi-modal / people trip generation (two-way) detailed in *Table 3* below.

Table 3: Proposed Retail Development Person Trip Generation (Two-Way)

Mode	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	Total Trip Rate	Total Trips	Total Trip Rate	Total Trips
Walk	18.354	68	21.347	79
Cycle	0.630	2	1.260	5
Public Transport	0.748	3	2.599	10

4.10. The light industrial proposals on site are of a size that is not comparable with any survey sites within the TRICS database, as a result, any movements to / from this facility during peak periods are considered to be insignificant and negligible on the network.

4.11. Furthermore, there has been no consideration take of the extant consent secured on the site and the associated generation that would be removed from the network with the change of land use.

4.12. The following paragraphs provide an overview of the existing walking, cycling and public transport opportunities, in line with the hierarchy of travel modes set out in SPP, demonstrating that the proposed development site is ideally located to be accessible by a range of travel modes, regardless of any additional facilities introduced as a part of the proposals.

Sustainable Travel Opportunities

Walking

Existing

4.13. At present, pedestrian facilities along the site frontage on the southern side of the Forsyth Street carriageway are intermittent and in a poor state of repair. However, there is a continuous footway present on the northern side of the carriageway which is in good condition, of a standard width and benefits from street lighting.

4.14. The footway on the northern side of the carriageway provides a connection to facilities on both sides of Harbour Street with dropped kerbs available to support crossing at regular intervals. Harbour Street is the main street through the centre of the village and provides a link to local amenities and the surrounding residential streets.

4.15. As would be expected within an established built-up village, the footways are interconnecting and penetrate the surrounding residential streets in a grid type arrangement.

4.16. *Figures 4 & 5* overleaf present the footway infrastructure adjacent to the site. *Figure 4* displays a view of the footways on Forsyth Street looking east, with *Figure 5* illustrating the facilities looking west.

Figure 4: View of facilities on Forsyth Street looking east

Figure 5: Facilities on Forsyth Street looking west

Proposed

4.17. From *Tables 2 & 3*, the proposed mixed use development could generate up to 70 and 80 (two-way) trips on foot during the AM and PM peak periods, respectively. However, it is expected that the level of walking trips could be increased given the walk-in catchment and the general accessibility to the village as a whole.

4.18. It is expected that the main pedestrian desire lines will be to the north of the development site, given the location of the village and majority of residential properties.

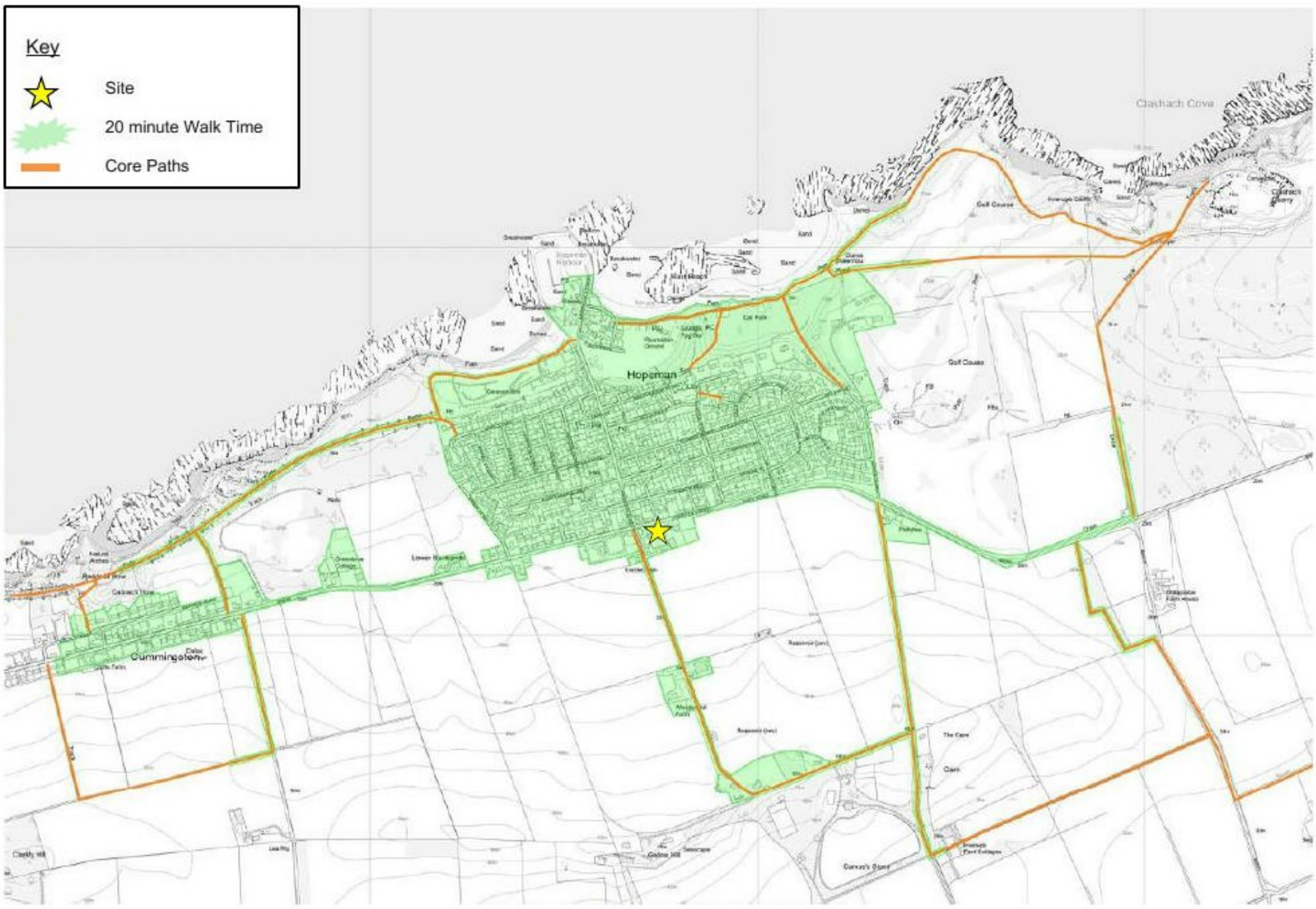
4.19. As part of the development proposals, the footway will be reinstated and upgraded along the site frontage with access provided direct to the retail and industrial unit entrances. Existing lighting columns will be relocated to assist with the introduction of the site access junction and the delivery layby. A zebra crossing will be introduced over the private internal access road to provide pedestrians with a safe crossing point over the minor access.

4.20. In addition to the crossing over the internal access, a new external crossing with be introduced over the B9040 Forsyth Street to the east of the proposed access junction. The crossing point will consist of dropped kerbs with tactile paving supporting access to the public transport facilities on the opposite side of the carriageway and also linking the site with the village.

4.21. Internally, residents of the cottage flats will be directed south via a footpath between the retail unit and the main spine road. A zebra crossing will be introduced to provide residents with support over the parking court aisle and a connection with the entrance to the dwellings.

4.22. From 'Transport Assessment Guidance' journey times of 20 – 30 minutes (circa. 1,600m – 2,500m based on an average walking speed of 1.4m/s) are considered to be appropriate for walking. These figures are broadly in line with the guidance set out in PAN75 which indicates a maximum walking catchment of 1,600m for local facilities and amenities. *Figure 6* presents a 20 minute (1,600m) walking isochrone in relation to the proposed development indicating that residential settlements and bus stops are available in the local area.

Figure 6: Walking Isochrones



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4.23. The site is an excellent example of the 'walkable neighbourhoods' aspiration outlined in Designing Streets where residents can work, live and shop within the local area without the need to utilise a private car.

4.24. It is expected that the inclusion of external footway connections with Forsyth Street and introduction of a new crossing facility over the site access junction and Forysth Street as part of the development will promote journeys on foot from the site and accommodate the expected uplift in pedestrian activity. It is therefore considered that the pedestrian generation calculated within the multimodal assessment will be exceeded, thereby reducing reliance on private car use for local trips.

Safe Routes to Schools

4.25. In line with Transport Planning Policy, Transport Statements / Assessments produced in support of residential developments should consider the safest route for young children travelling on foot or by bicycle to the nearest places of education. It is likely that children residing at the development site will be educated at Hopeman Primary School to the northeast of the site.

4.26. Hopeman Primary School is located on the east side of the village and has approximately 250 registered pupils. The catchment area includes Hopeman and nearby villages of Duffus and Cummingston.

4.27. As highlighted, the development will introduce a new crossing facility on Forsyth Street supporting access to the existing footway on the northern side of the carriageway. Approximately 170m east of the site, the footway on the northern carriageway of Forsyth Street connects with the footway on the western side of School Road. Pedestrians will require to cross minor junctions to reach School Road, but dropped kerb crossing facilities are present at both locations. The footway on School Road routes north terminating at a crossing point on Mid Street which connects the site to the Hopeman School gate. The route is less and 450m in length and well within the recommended walking distance of 1,600m to local facilities as outlined within PAN75.

Cycle Infrastructure

Existing

4.28. The residential nature of the surrounding road network is conducive to cycling with low vehicle speeds, generally 30mph speed restrictions, and low volumes of traffic.

4.29. Circa 4km south of the development site, National Cycle Route 1, Dover to the Shetland Islands, NCR1, intersects the B9013 south of Bank of Roseisle. The route provides access to the centre of Elgin in the east and Forres, Nairn and Inverness in the west. This cycle network runs along a combination of off-road and on-road routes, including the A96 Trunk Road.

4.30. The local Moray core path network also operates as shared cycle paths / footpaths. As previously described, there are several on and off-road core path / cycle routes within the village. Forsyth Street, along the development frontage, is detailed as a promoted path for cyclists. The paths connect the village with Burghead in the west and Lossiemouth in the east.

4.31. *Figure 6*, walking isochrones, indicates areas that can be reached within a 1,600m catchment of the development site, which equates to less than an 8 minute cycle time, indicating that cycling would be an attractive mode of travel for staff / customers accessing the site from the local residential areas. In addition, Lossiemouth and Elgin are within a circa 10km catchment of the development site, which equates to a cycle time of between 30 – 40 minutes which will be attractive to many of the residents accessing local employment centres.

Proposed

4.32. Results from the multi-modal assessment indicate that the development is likely to increase the number of cycling trips on the local road network by 2 movements during the AM peak period and 5 movements during the PM commuter peak. However, with the introduction of connections to cycling facilities and the promotion of a Travel Pack it is considered that cycling will be more attractive to residents than the multi-modal assessment suggests. The key cycle destinations from the residential site will be to education, amenities or public transport facilities for multi-modal travel.

4.33. Cycle parking for the retail unit will be provided in the form of three Sheffield Cycle Stands at the rear of the building which exceeds the minimum requirements detailed within Moray Council's Parking Standards. It is envisaged that these facilities will also support any demand from the small light industrial unit.

4.34. Secure and covered cycle parking for the residential element of the site will be provided at the rear of the buildings adjacent to the bin stores.

4.35. Based on the existing cycle opportunities, connections to cycle routes in the area and nature of the local road network, it is considered that the anticipated demand for cycling can be adequately accommodated.

Public Transport

Existing

4.36. The site is ideally located to access public transport facilities within the local area with bus services within easy reach of the site. Bus stops are located on Forsyth Street directly adjacent to the site frontage and benefit from shelters and timetable information.

4.37. At present, Stagecoach Service 32 services operates in the immediate locale of the development site. Details of bus provision available at the stop surrounding the site is summarised within *Table 4* below.

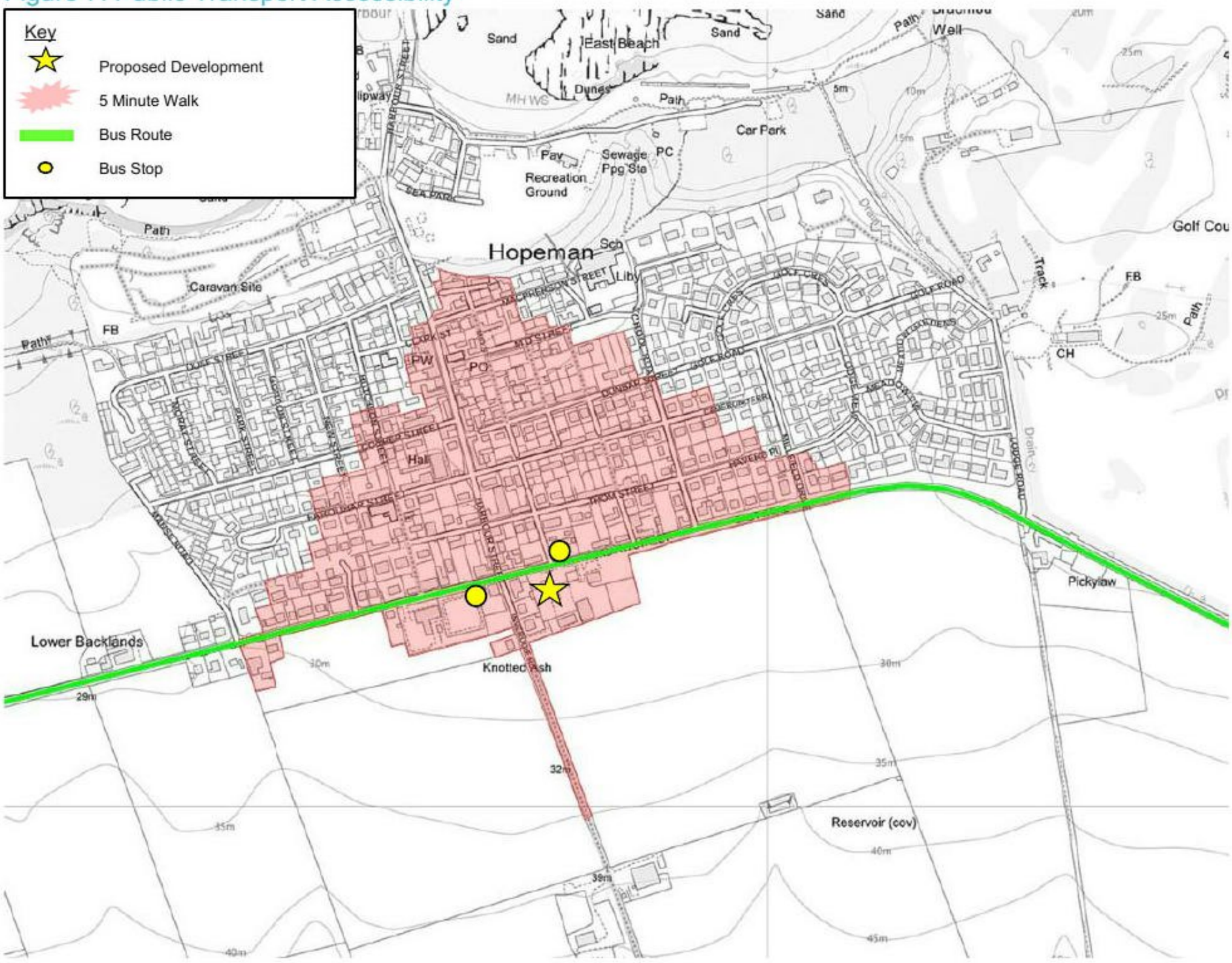
Table 4: Existing Bus Services

Operator	Service	Route	Frequency (mins)					
			Monday-Friday		Saturday		Sunday	
			Day	Night	Day	Night	Day	Night
Stagecoach	32	Elgin – Burghead	60	60	60	60	-	-

4.38. *Table 4* indicates that there is a regular service between Burghead and Elgin routing through Hopeman along Forsyth Street and past the front of the development site. As such, the services adjacent to the site provide an excellent service throughout the day and at evening during both the weekday and on a Saturday.

4.39. *Figure 7* indicates the location of public transport infrastructure in the vicinity of the site and the local bus routes.

Figure 7: Public Transport Accessibility



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Proposed

4.40. It is expected that there will be a regular demand for travelling by public transport to / from the development site during various times throughout the day, however, the largest demand will be associated with employment based trips. As a result, this public transport review focuses on the peak commuting periods, with up to 5 and 11 (two-way) trips estimated to be generated during the AM and PM peaks, respectively.

4.41. Given the location of the bus stops, and the residential settlements / employment centres accessible via these services, it is considered that the additional patronage generated by the development proposals can be easily accommodated by the existing provision.

4.42. It is considered that the available public transport within the area ensures that the development is located in an accessible area and will provide residents and staff with an alternative option to the private car, with timetables accommodating commuter travel.

Travel Plan Framework (Employment)

4.43. It is expected that a full travel plan will form a condition of any consent to ensure that relevant information reflective of Care Concerns specific operation and working conditions can inform the plan. The following provides a framework for a travel plan which will provide the basis for a full travel plan which will be completed in conjunction with MC.

4.44. In line with Transport Assessment Guidance, Travel Plans should first be introduced within the TS. However, a Travel Plan cannot be fully developed until the development is operational, therefore, the Travel Plan Framework below will be used to establish the requirements of the future Travel Plan for the employment element of the development.

4.45. The framework detailed below is not intended to represent a Travel Plan, but is intended to allow consideration of what may be required and is aimed primarily at staff travelling to the development site.

4.46. The Department of Transport (DoT) 'A guide on travel plans for developers' states:

'A travel plan is a strategy for managing all travel and transport within an organisation. It seeks to improve access to a site or development by sustainable models of transport. A travel plan contains both physical and behavioural measures to increase travel choices and reduce reliance on single-occupancy car travel'

4.47. The aim of travel plans, as outlined by Central Government Guidelines, is to address potential means of reducing reliance on staff single-occupancy car use and encouraging the use of alternative forms of travel.

4.48. A Travel Plan involves the development of a set of mechanisms, initiatives and targets that together enable organisations to reduce the impact of travel.

Objectives

4.49. There are a number of objectives, both at national and local level, that the implementation of the Travel Plan is intended to help fulfil:

- Influence travel behaviour;
- Generate fewer single-occupancy car trips than would otherwise be the case by encouraging a modal shift in travel to the site;
- Reduce the need for unnecessary journeys;
- Reduction in overall mileage;
- Help improve the health of staff; and,
- Accommodating those journeys that need to be made by car.

Targets

4.50. The objectives given above provide the framework for the Travel Plan measures. Where applicable, targets can be included to help achieve the objectives and there are two main types that are applicable. The most easily demonstrated is a commitment to deliver the package of measures set out in the plan. These measures include initiatives to promote increases in the use of walking, cycling, car-sharing and public transport use.

4.51. The second form of target is aspirational and related to proportional changes in the travel modes used to access the site. Aspirational targets are not generally set in advance of the development opening as the modal split of staff for the retail development is not known. Results of a staff travel survey (normally

undertaken within 6 months of the development opening) would provide information on the prevailing travel choices of employees and a basis for the setting of aspirational targets in a later revision of the Travel Plan.

4.52. The Travel Plan will be implemented by the end users, who will work in conjunction with MC and other interested parties in its continuing progression and be responsible for managing and implementing.

Initiatives

4.53. In order to ensure that the opportunities for modal shift can be realised there are a number of measures that will be considered and encouraged by the occupier(s) of the development:

- Provision of travel information - e.g. bus timetable information on staff notice boards;
- Measures to promote walking / cycling - washing and changing facilities, bicycle users group, information on walk / cycle routes; and,
- Car sharing - Promote a staff car sharing scheme as a means of reducing single occupancy car trips.

4.54. Travel Plans are primarily focussed on staff and therefore the majority of measures proposed within a plan are intended to encourage staff to use more sustainable modes of transport when travelling to the development.

Monitoring & Review

4.55. An objective of the Travel Plan is that there will be an on-going improvement process including periodic monitoring, where necessary.

Residential Travel Pack

4.56. Changes in travel behaviour can be further influenced through a Travel Plan, which involves the development of a set of mechanisms, initiatives and targets that will ultimately help to reduce the impact of travel.

4.57. The aim of travel plans, as outlined by Central Government guidelines, is to address potential means of reducing reliance on single-occupancy car use and encouraging the use of alternative forms of transport thus helping to reduce the impact of travel.

4.58. The value of school and workplace travel plans is now widely accepted and the majority of local authorities recognise the influence they can have on ensuring efficient travel planning in such environments. As it is now widely recognised that residents also benefit from an environment, which offers a wide range of public transport facilities and where intrusion by traffic is minimised, this concept is now being extended to residential developments, where it has become a vital tool in delivering sustainable communities.

4.59. Although a Travel Plan cannot be fully developed until the proposals are fully operational, a framework document can be used to establish the requirements of the Plan. The focus of this Residential Travel Plan is to help deliver a sustainable community and provide informed transport choices for residents.

4.60. There are a number of objectives, both at national and local level, that the implementation of the travel plan is intended to help fulfil:

- Influence travel behaviour of residents;
- Reduce the need for unnecessary journeys;
- Reduction in overall mileage;

- Help improve the health and wellbeing of residents;
- Accommodating those journeys that need to be made by car.

4.61. In order to ensure that the opportunities for modal shift can be realised there are a number of measures that will be considered and encouraged by the developer, such as:

- Information on the 'on and off road' pedestrian network routes for residents, and include any maps;
- Information on the local cycle network routes to residents, which will include any maps; and
- Provide up-to-date public transport information including timetables and bus company contact information.

4.62. One such method of providing residents with the above information is through issue of a Welcome Pack, however, the preparation of such a package is ultimately the responsibility of the builder. It is hoped that making residents more aware of local public transport facilities by such measures will encourage a modal shift from the private car to more sustainable forms of transport.

4.63. The provision of a residential travel planning leaflet would require to be in line with Moray Council's expectations and this should provide details of sustainable accessibility, in terms of walking, cycling and public transport.

4.64. The leaflet should cover a range of users and function and include the following information:

- School children travelling to / from school (primary and secondary);
- Disabled and elderly access;
- Leisure routes in the vicinity of the site;
- Access to the town centre; and
- Access to local amenities, including convenience stores and shops.

Sustainable Travel Summary

4.65. In accordance with local and national transport policy, an assessment of the development proposals has been undertaken for all sustainable modes of travel. This indicates that the current walking and cycling provision in the area is sufficient to accommodate the expected future demand from the site.

4.66. As part of the internal site design, connections to the existing footway networks are provided which link with existing public transport facilities enhancing connectivity with the surrounding area. A new crossing will be introduced on Forsyth Street to link the site with the wider residential area and public transport facilities on the opposite site of the carriageway. Finally, a travel plan will be developed for the employment elements of the site to encourage staff to travel by sustainable mode and a residential travel pack will be distributed to residents upon occupation of each property to highlight sustainable travel options and encourage a shift in mode choice.

4.67. The site is accessible to a range of sustainable modes of transport, integrates well with the surrounding residential area and is compliant with the principles of Designing Streets thereby ensuring that the site is compliant with the national and local policies highlighted within *Chapter 3*.

5. Vehicular Accessibility

5.1. The following presents a review of the surrounding road network and details how the likely level of private car use will be generated.

Surrounding Road Network

5.2. This section of the report describes the most likely routes vehicles will travel to the development site from residential settlements and from the site to places of education, work and recreation. The following provides an overview of the key route corridors.

Existing

5.3. *Figure 1*, Site Location, identifies the site, surrounding road network and its environs. The site is ideally located to access strategic transport links, such as, the B9040, B9012, B9013 and the A96(T).

5.4. The site is bound to the north by the B9040 Forsyth Street. Forsyth Street is a single carriageway road circa 6.5m in width operating in an east-west direction along the southern extent of the village. Subject to a 30mph speed restriction within the built-up area of Hopeman, the route hosts residential road characteristics, such as, frontage access, on-street parking and is a bus route, despite being of local distributor standard. Beyond the limits of the village the speed limit increases to national speed restriction and connects the village with Burghead in the west with Lossiemouth in the east.

5.5. The village of Hopeman has been developed around a traditional grid style road network with serval of the interconnecting road forming priority junctions with the B9040 on the northern side of the carriageway. The main street in Hopeman, Harbour Street, forms a cross-road priority junction with the B9040 Forsyth Street and Inverugie Road circa 30m west of the site.

5.6. Harbour Street, also a single carriageway road, penetrates the centre of the village and hosts many of the villages' local amenities and recreational facilities whilst also providing a link to the Harbour in the north.

5.7. The B9040 forms a priority junction with the B9013 St Aethans Road to the south of Burghead circa 2.5km west of the site. The B9013 is a single carriageway distributor road linking Burghead in the north with the A96 Trunk Road in the south. The A96 is the main arterial route in the area and provides the village with a link to Inverness in the west and Aberdeen in the east, via Elgin.

5.8. Alternative routes are available to the centre of Elgin, namely the B9012, which is also a single carriageway road subject to a 60mph speed restriction. The B9012 forms a priority junction with the B9040 less than 1,250m east of the site and routes through the village of Duffus before connecting with Morriston Road.

5.9. The road network surrounding the site provides directly links to the centre of the village and easy access to key distributor road providing links to the trunk road network and the main surrounding employment centres.

Proposed

5.10. As described within *Chapter 2*, the current access arrangement to the site with Forsyth Street on the northern boundary will be reconfigured and a single priority junction introduced to replace the former access / egress layout. The proposed / replacement junction will be introduced as a standard priority junction towards the eastern area of the site with standard Designing Street visibility splays provided.

5.11. The priority junction will support a single carriageway spine road which will connect to a parking courtyard in the south west of the site via a priority junction. The main internal spine road will terminate in a T-Shaped turning head.

5.12. Reconfiguration of the site access will permit the introduction of 4 dropped kerb parking spaces at the rear of the footway on the eastern side of the proposed priority junction and a new delivery layby on the western side of the junction. The delivery / loading bay will be subject to a Traffic Regulation Order to restrict public parking and control delivery times.

5.13. Parking for the site will be provided internal either side of the access spine road and both sides of the parking aisle within the courtyard.

5.14. The proposed access arrangement including visibility splays is presented on Drawing 20044_003 contained within *Appendix A*.

5.15. There have been various local representations submitted to Moray Council commenting on the means of access to the site and the nature of the adjacent road network. The standard of Forsyth Street and the volume of through traffic on the route are mentioned within many of the representations.

5.16. A food store should be located on a primary route, such as, Forsyth Street, to ensure pass-by traffic can easily access the site without the need to significantly divert through residential streets. Furthermore, the background traffic on Forsyth Street is not, in road design terms, significant.

5.17. As previously mentioned, the site has an extant land use which benefits direct from Forsyth Street which ensures that the means of access is committed in planning terms. It is understood that a residential development is currently under construction to the west of the site which benefits from direct access from Forsyth Street, thereby further demonstrating direct access from Forsyth Street is appropriate

Development Traffic

5.18. The industry standard TRICS database has been utilised to determine an appropriate vehicle trip rate for the retail and residential elements of the proposals as presented in *Tables 5 & 6* below and overleaf. A copy of the TRICS output is contained within *Appendix C*. As detailed within *Chapter 4*, there are no similar light industrial / business type developments of a comparable size on the database, therefore, it is considered that any generation, particularly during the commuter peak periods associated with this element of the proposals with be negligible.

5.19. It is estimated that the site will generate in the region of 69 and 77 (two-way) vehicle movements during the weekday AM and PM peak hours, respectively, which are expected to coincide with the peak background traffic periods.

Table 5: Residential Development Traffic Generation

8 Residential Units	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Trip Rate	0.210	0.481	0.691	0.259	0.185	0.444
Traffic Generation	2	4	6	2	2	4

Table 6: Residential Development Traffic Generation

372msq Food Retail	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Trip Rate	8.665	8.350	17.015	10.240	9.413	19.653
Traffic Generation	32	31	63	38	35	73

5.20. As highlighted within the tables *above*, two-way traffic generation associated with the development site is estimated to be marginally over 1 two-way vehicle movement every minute, on average, during the peak periods.

5.21. In addition, the site previously operated as a service station / garage which generated vehicle traffic at peak times. As the service station / garage will be removed to accommodate the mixed-use development the traffic associated with this use is considered 'committed' on the road network which would considerably reduce the nett increase of traffic on the road network as a result of the development proposals.

5.22. On the basis, MC confirmed within the consultation response, by the request for a Transport Statement, that a full assessment and detailed capacity analysis was not necessary.

Accident Review

5.23. When considering an appropriate access arrangement, consideration is given to the adjacent route network. As part of the consideration process, a review of Crashmap.com was undertaken to determine whether there were any safety issues surrounding the site. The review highlighted that there has only been one collision reported in the past 5 years on the B9040. The accident took place circa 400m east of the site and involved 3 vehicles. There were two slight injuries associated with the collision, which is considered to be caused by driver error.

5.24. The above review confirms that there are no safety issues with the current network arrangement in the vicinity of the site. Furthermore, the development proposals will rationalise the access points on the site, effectively improving road safety.

Construction Traffic Management Plan

5.25. Generally, the chosen haulage route is the shortest available to the strategic road network and focuses on trunk / distributor standard roads which are suitable to accommodate construction traffic vehicles. At this stage the specific construction route is unknown, but all routes to / from the A96 will be considered in due course.

5.26. Immediately upon commencement of the construction, all deliveries, operatives and visitors to the construction site will report to the site office. This will be communicated to all works contractors at their pre-start meeting. They will be informed by site staff of emergency procedures, assembly points, First Aid, site rules, etc.

5.27. Manned traffic management procedures will be adopted when very large loads are delivered to site. This is only for exceptional items and these movements will only occur occasionally and will be minimised, where possible.

5.28. Construction vehicles will be managed by the Project Manager overseeing direction of the project and by the Site Supervisor responsible for on-site activities. Contact details for both the Project Manager and Site Supervisor shall be provided to MC prior to works commencing and made visible on the site security hoarding.

5.29. Security hoarding around access points will be periodically inspected for damage by the site manager and remedial maintenance will be carried out if necessary.

5.30. Large vehicle deliveries will be coordinated directly between the project team and the supplier. Deliveries to the site by vehicles in excess of 3.5 tonnes will only be carried out between the hours of 09:00 and 17:00 Monday to Friday, and 08:00 to 13:00 on Saturday, however will be coordinated to avoid conflict with school opening and closing time periods.

5.31. All subcontractors will stipulate to the site manager their vehicle size, times for deliveries, access route and site access arrangement prior to delivery.

5.32. Deliveries will be restricted to site working hours as set out above or otherwise agreed with MC to reduce disruption to local residents and businesses.

5.33. Banksman will be provided for all HGV movements into and out of the site to minimise the potential impact on the public highway.

5.34. Wheel washing facilities are to be provided. These will be located on the egress of the site on an area of hard standing concrete. Jet washing wheels will be carried out by a traffic marshal or contracted labour.

5.35. The developer will ensure that the roads and footways surrounding the site are swept on a daily basis. This process is to ensure that any debris or dirt from the construction vehicles avoids getting transferred around the road network.

5.36. The owner will take reasonable steps to minimise noise and supress dust, dirt and debris generated by the scheme, working to the relevant British Standards and best working practices.

5.37. The main contractor and sub-contractors will subscribe to the “Considerate Contractors Scheme” and adhere to the guidelines set out by the scheme.

Vehicular Accessibility Summary

5.38. In summary, the nature of the surrounding road network is considered sufficient to accommodate the likely traffic demands associated with the development proposals, as a result, it is considered that the development site and proposals are in line with current transport planning policy.

6. Summary & Conclusions

Summary

6.1. ECS Transport Planning Limited has been commissioned by Springfield Real Estate Management Ltd to produce a Transport Statement in support of a proposed mixed-use development with associated parking on the Hopeman Service Station site adjacent to the B9040 Forsyth Street, Hopeman.

6.2. The proposals seek permission to demolish the existing service station and garage, and construct a small food retail convenience store, a light industrial / commercial starter unit and 2 no. blocks of residential dwellings containing a total of 8 cottage flats with associated access, servicing and parking facilities.

6.3. This report examines the key transportation issues and access opportunities associated with all modes of travel from development on the site, and documents the potential to improve the walking, cycling and public transport connections in the area, where necessary.

6.4. The findings of this study are based on a review the comments provided by Moray Council's Transport Planning Department (MC) within a consultation response to the planning application, a site visit, existing traffic observations and has been produced in accordance with the Scottish Executive (Government) document 'Transport Assessment Guidance' (2012), where appropriate. Consideration has also been given to the requirements of local and national government transport planning polices, including 'Designing Streets'.

6.5. The development content will comprise of the following:-

- 372msq Gross Floor Area (GFA) Food Retail (Convenience Store);
- 112msq GFA Light Industrial / Business Use (Starter Business); and
- 8 cottage flats split equally between two blocks.

6.6. The site frontage will be reconfigured, with the access arrangement condensed and footway on the southern side of the carriageway reinstated. The large existing egress at the western side of the site will be removed and a new standard priority junction introduced to replace the eastern access. A new delivery / loading layby will be created on the southern side of Forsyth Street to the west of the enhanced site access with the footway routing around the rear. In additional to the proposed delivery bay, 4 new car parking spaces will be introduced on the northern western boundary at the rear of the footway accessible via dropped kerb.

6.7. The site access junction will provide a route to the central area of the site with parking located either side. The internal road will be introduced in T-Shaped arrangement to support larger vehicle turning manoeuvres. The minor section of the internal T-Shaped arrangement will operate as a parking courtyard and will host parking facilities either side.

6.8. The light industrial unit will be positioned to the east of the access junction directly south of the 4 proposed site frontage parking spaces and east of the site spine road. The convenience retail store will be located on the northern boundary of the site, to the south of the proposed delivery loading bay. To the south of the access roads and parking facilities, the cottage flats will sit on the southern boundary side by side.

6.9. Pedestrian access to the site will be provided from the northern boundary via Forsyth Street. A new dropped kerb crossing with tactile paving will be introduced between the enhanced site access junction and the proposed frontage car parking spaces. Access to the light industrial unit will be via an entrance on the

northern elevation which will front the footway, as will access to the retail unit with entrance directly south of the delivery bay.

6.10. A zebra crossing will be introduced within the private internal spine road to support pedestrians crossing the minor arm of the junction. Access to the residential cottage flats will be introduced via a footway between the retail building and the parking bays on the western side of the site spine road. Another zebra crossing will be introduced over the parking court providing access to a surfaced area around the perimeter of both flatted buildings.

6.11. A people trip assessment of the development proposals has been undertaken for all modes of travel which confirms that the walking, cycling and public transport provision in the area is excellent and sufficient to accommodate the expected future demand. The development will be designed to link to the existing transport infrastructure and encourages access by all modes.

6.12. The nature of the surrounding road network is considered sufficient to accommodate the likely traffic demands associated with the development proposals, as a result, it is considered that the development site and proposals are in line with current transport planning policy.

Conclusions

6.13. This Transport Statement demonstrates that the development site will be accessible by sustainable modes of travel and integrate effectively with the existing transport network. In addition, the site can be accessed safely from the adjacent road network by private vehicles without compromising the safety or efficiency of existing road users, therefore, in transportation terms, this Transport Statement demonstrates that the proposed development satisfies all policy requirements.

APPENDICES

Forsyth Street, Hopeman
Project Number: 20044
Document Reference: 01

A. Site Layout

Forsyth Street, Hopeman
Project Number: 20044
Document Reference: 01

A1

N

PLANNING

1
35
33
37
FORSYTH STREET
INVERUGIE ROAD
Existing Bus Shelter
New Crossing Point
Existing lighting column
Relocated lighting column position
Existing lighting column relocated
18000
3000
DELIVERY / LOADING
BT
Secure gate
4000 SQFT RETAIL UNIT
1200 SQFT UNIT
4 PARKING BAYS (UNIT)
EXISTING WALL
21 PARKING BAYS (RETAIL UNIT)
CYCLE HOOPS
12 PARKING BAYS (RESIDENTIAL)
EV CHARGE POINT
SERVICE YARD 50m²
BIN
BIN
BIN
4x4.5m PLANT AREA
BIN STORE (FLATS)
CYCLE STORE
CYCLE STORE

LEGEND:

- SITE BOUNDARY. AREA: 2693m² / 0.67 ACRES
- TARMAC ROADS.
- TARMAC FOOTPATHS.
- BLOCK PAVIORS.
- CONCRETE SLAB.
- STONE CHIPPINGS.
- GRASSED AREAS.
- PAVING SLABS.
- PEDESTRIAN ACCESS TO RETAIL/ RESIDENTIAL.
- PEDESTRIAN ACCESS TO RESIDENTIAL ONLY.
- SERVICE YARD / DELIVERY ACCESS.

SCALE 1:200
0 10m

Rev.	Date	Remarks	By	Ch.
B	03.07.2020	Amendments to suit topo.	BRL	-
A	30.06.2020	Scheme revised for Planning.	BRL	-

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED SITE PLAN

Scale	Date	Drawn by	Checked by
1:200	24.02.2020	BRL	VM

Drawing no. L-003
Rev B

Based upon the Ordnance Survey's (1:1250) Map of 2017 with permission of the controller of Her Majesty's Stationery Office, Crown copyright reserved. ECS Transport Planning Ltd, 38, Queen Street, Glasgow, G1 3DX. License No: AL 100055056.

Notes:-

Visibility Splay 2.4m x 43m

REV	DATE	AMENDMENTS	DRAWN	CHK	APP

ECS Transport Planning Ltd
Centrum Offices
38 Queen Street
Glasgow
G1 3DX

TRANSPORT PLANNING LIMITED

Telephone: 0844 443 0934
Email: info@ecstransport.co.uk

Client

SPRINGFIELD REAL ESTATE MANAGEMENT LTD

Project

PROPOSED MIXED USE DEVELOPMENT, FORSYTH STREET, HOPEMAN

Title

INDICATIVE ACCESS ARRANGEMENT

Team	Drawn	Checked	Approved
-	SS	MS	MS

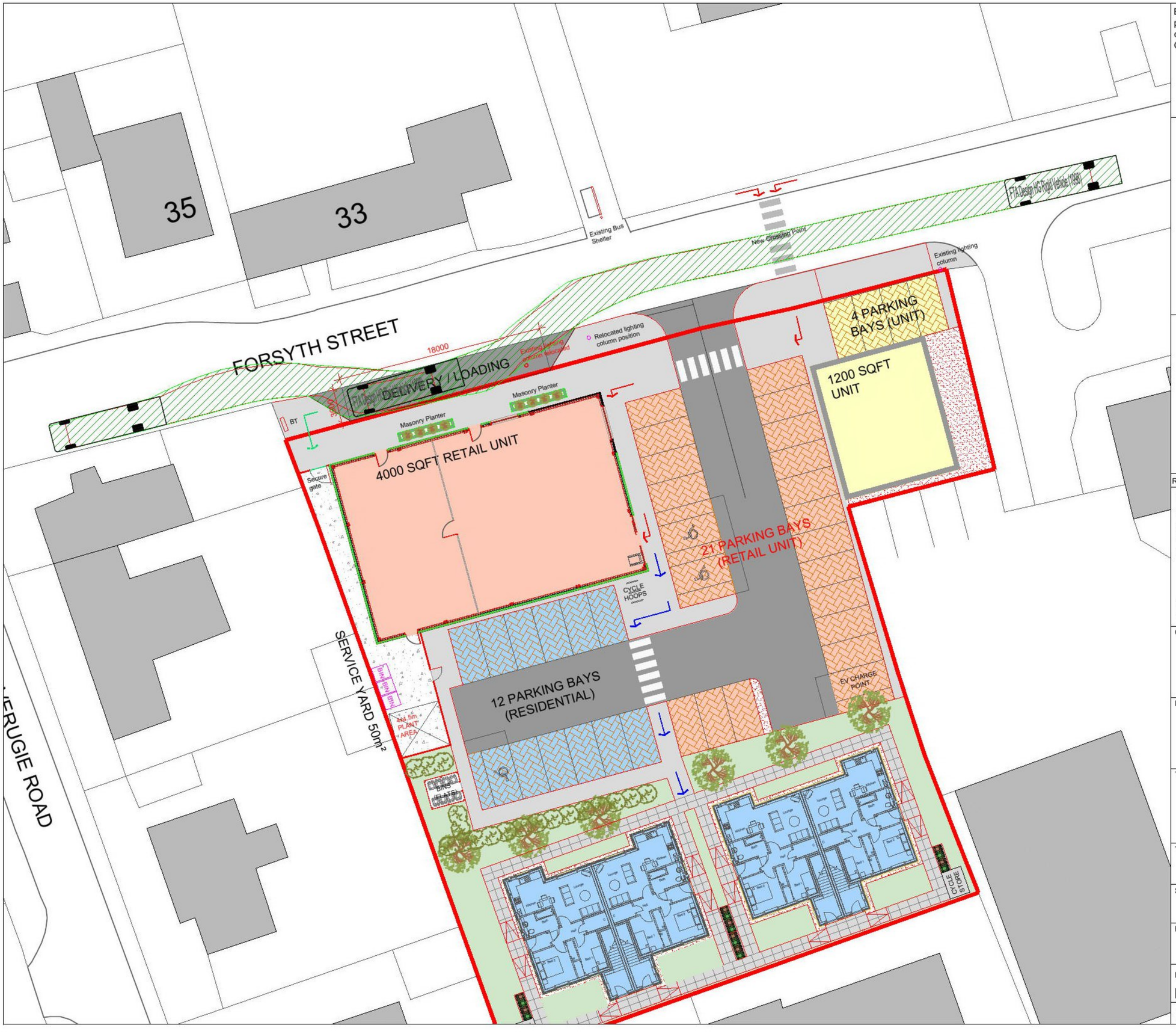
Scale @ A3	Date
1:500	10.07.20

Project No.	Drawing No.	Rev
20044	20044_003	-

Purpose of Issue

☐ Preliminary ☐ For Tender ☐ For Construction
☐ _____ ☑ For Information ☐ For Approval ☐ As Built

B. Vehicle Swept Paths



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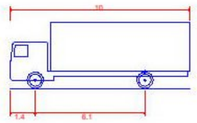

FTA Design HG Rigid Vehicle (1998)	
Overall Length	10.000m
Overall Width	2.500m
Overall Body Height	3.645m
Min Body Ground Clearance	0.440m
Track Width	2.470m
Lock to lock time	3.00s
Kerb to Kerb Turning Radius	11.000m

REV	DATE	AMENDMENTS	DRAWN	CHK	APP

ECS Transport Planning Ltd
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Client

SPRINGFIELD REAL ESTATE MANAGEMENT LTD

Project

PROPOSED MIXED USE DEVELOPMENT, FORSYTH STREET, HOPEMAN

Title

SERVICE VEHICLE SWEPT PATHS

Team	Drawn	Checked	Approved
-	SS	MS	MS

Scale @ A3	Date
N.T.S	10.07.20

Project No.	Drawing No.	Rev
20044	20044_002	-

Purpose of Issue

- ☐ Preliminary
- ☐ For Tender
- ☐ For Construction
- ☐ _____
- ☑ For Information
- ☐ For Approval
- ☐ As Built

33

YTH STREET

Existing Bus Shelter

New Crossing Point

Existing lighting column

4 PARKING BAYS (UNIT)

1200 SQFT UNIT

18000

DELIVERY / LOADING

Existing lighting column relocated

Relocated lighting column position

3000

BT

Masonry Planter

Masonry Planter

4000 SQFT RETAIL UNIT

Secure gate

21 PARKING BAYS (RETAIL UNIT)

CYCLE HOOPS

SERVICE YARD 50m²

BIN BIN BIN

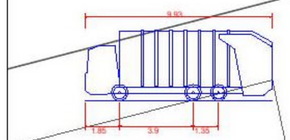
4x4.5m PLANT AREA

12 PARKING BAYS (RESIDENTIAL)

EV CHARGE POINT

BINS (FLATS)

Kitchen Lounge Kitchen Lounge Bath Hall



Vulture 2225 (with Mercedes Econic 2628LL 6x4 chassis)

Overall Length	9.930m
Overall Width	2.490m
Overall Body Height	3.749m
Min Body Ground Clearance	0.302m
Track Width	2.490m
Lock to lock time	4.00s
Wall to Wall Turning Radius	9.100m

REV	DATE	AMENDMENTS	DRAWN	CHK	APP

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Client

SPRINGFIELD REAL ESTATE MANAGEMENT LTD

Project

PROPOSED MIXED USE DEVELOPMENT, FORSYTH STREET, HOPEMAN

Title

REFUSE VEHICLE SWEPT PATHS

Team	Drawn	Checked	Approved
-	SS	MS	MS

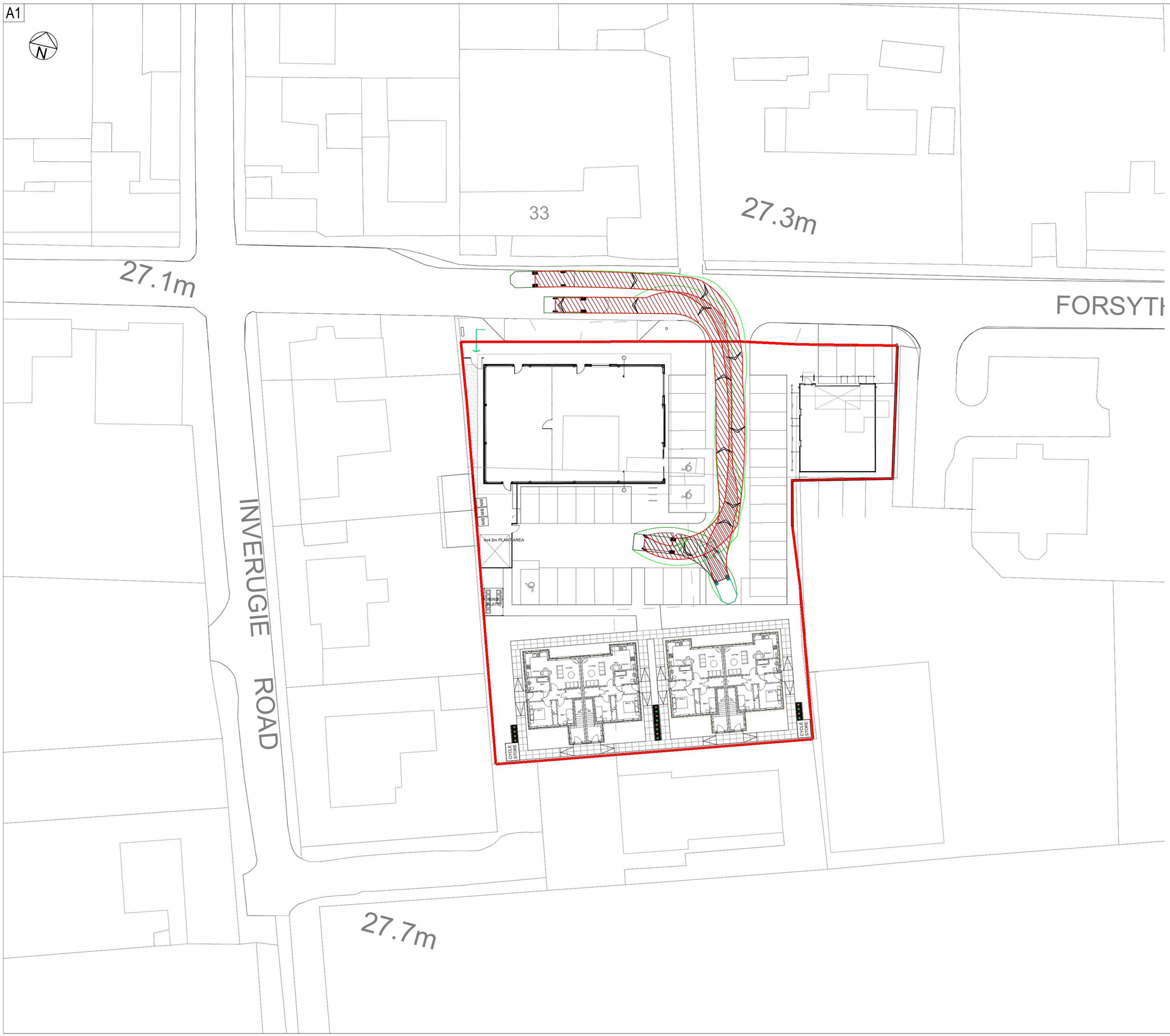
Scale @ A3	Date
N.T.S	10.07.20

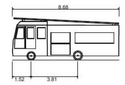
Project No.	Drawing No.	Rev
20044	20044_001	-

Purpose of Issue

- ☐ Preliminary
- ☐ For Tender
- ☐ For Construction
- ☐ _____
- ☑ For Information
- ☐ For Approval
- ☐ As Built

A1





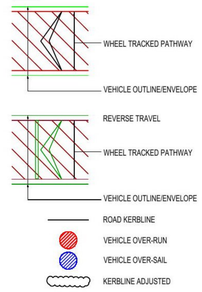
DB32 Fire Appliance

Overall Length	8.680m
Overall Width	2.180m
Overall Body Height	3.452m
Min Body Ground Clearance	0.337m
Max Track Width	2.121m
Lock to lock time	6.00s
Kerb to Kerb Turning Radius	7.910m

NOTES:

1. SITE MEASUREMENTS OR VEHICLE TRACKING SHOULD BE ASSESSED ON A LARGE SCALE ENGINEERING TOPOGRAPHICAL SURVEY OR ARCHITECTS PRECISION LAYOUTS TO VERIFY THAT ADEQUATE CLEARANCES CAN BE ACHIEVED.

LEGEND



PLANNING

Rev.	Date	Remarks	By	Ch.

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT AND FLATS
FORSYTH STREET
HOPEMAN

Drawing
VEHICLE SWEPT PATH

Scale	Date	Drawn by	Checked by
1:250	08.07.20	PD	

Drawing no.
10045-C-401

Rev

C. Census / TRICS / Multi-Modal

C11

Scotland's Census 2011 - National Records of ScotlandTable QS702SC - Method of travel to work or study (1)All people aged 4 and over who are studying or aged 16 to 74 in employment in the week before the census
Datazone 2011 by Transport to place of work or study by Term-time Address (Indicator) and In education or employment
Counting: Person

Filters:
Default Summation Person
Term-time Address Resident
In education or emp In education or employment - Part time students

Transport to place of work or study	All people	Work or study mainly at or from	Underground, metro, light rail or	Train	Bus, minibus or coach	Taxi or minicab	Driving a car or van	Passenger in a car or van	Motorcycle, scooter or moped	Bicycle	On foot	Other
Datazone 2011												
S01011143	630	56	2	24	80	3	279	36	3	10	103	34
S01011144	518	52	0	19	70	6	237	46	2	8	69	9

(1) Excludes some 4 and 5 year olds (a total of 11,867 in Scotland) who were reported as being in full-time education but for whom no information on their place of study or method of travel to study was provided.

	1148	108	2	43	150	9	516	82	5	18	172	43
		9.41%										
	1040		0.19%	4.13%	14.42%	0.87%	49.62%	7.88%	0.48%	1.73%	16.54%	4.13%

20044 Forsyth Street, Hopeman

Hopeman - All people aged 4 and over who are studying or aged 16 to 74 in employment in the week before the census

Total People	Works or studies mainly at or from home	Not currently working or studying	Underground, tube, metro or light rail	Train	Bus, minibus or coach	Taxi or minicab	Driving a car or van	Passenger in a car or van	Motorcycle, scooter or moped	Bicycle	On foot	Other	TOTAL
1148	108		2	43	150	9	516	82	5	18	172	43	1040
			0.19%	4.13%	14.42%	0.87%	49.62%	7.88%	0.48%	1.73%	16.54%	4.13%	100.00%

Residential Vehicle Trips Only

	IN	OUT	TOTAL
AM	2	4	6
PM	2	1	4

Residential People Trips Only

	IN	OUT	TOTAL
AM	3	8	11
PM	4	3	7

		Underground	Train	Bus	Taxi	Car Driver	Passenger	M/cycle	Bicycle	Foot	Other	Total
AM	IN	0	0	0	0	2	0	0	0	1	0	**3**
	OUT	0	0	1	0	4	1	0	0	1	0	**8**
	TOTAL	**0**	**0**	**2**	**0**	**6**	**1**	**0**	**0**	**2**	**0**	**11**
PM	IN	0	0	1	0	2	0	0	0	1	0	**4**
	OUT	0	0	0	0	1	0	0	0	0	0	**3**
	TOTAL	**0**	**0**	**1**	**0**	**4**	**1**	**0**	**0**	**1**	**0**	**7**

Calculation Reference: AJDT-654801-200709-0719

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED

VEHICLES

Selected regions and areas:

04	EAST ANGLIA	
	SF SUFFOLK	1 days
05	EAST MIDLANDS	
	LN LINCOLNSHIRE	1 days
07	YORKSHIRE & NORTH LINCOLNSHIRE	
	NY NORTH YORKSHIRE	1 days
08	NORTH WEST	
	CH CHESHIRE	2 days
11	SCOTLAND	
	AG ANGUS	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter:	No of Dwellings
Actual Range	7 to 24 (units:)
Range Selected by User	5 to 25 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range All Surveys Included

Bedrooms per Dwelling Range All Surveys Included

Percentage of dwellings privately owned All Surveys Included

Public Transport Provision
Selection by: Included in all surveys

Date Range 01/01/12 to 25/09/19

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	4 days
Wednesday	1 days
Thursday	1 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	6 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Suburban Area (PPS6 Out of Centre)	6

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	6

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:
C3 6 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 1 mile:
5,001 to 10,000 1 days
10,001 to 15,000 1 days
15,001 to 20,000 3 days
20,001 to 25,000 1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:
25,001 to 50,000 1 days
50,001 to 75,000 2 days
75,001 to 100,000 2 days
100,001 to 125,000 1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:
0.6 to 1.0 3 days
1.1 to 1.5 3 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:
Yes 1 days
No 5 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:
No PTAL Present 6 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 AG-03-A-01 BUNGALOWS/DET. ANGUS
KEPTIE ROAD
ARBROATH

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 7
Survey date: TUESDAY 22/05/12 Survey Type: MANUAL

2 CH-03-A-08 DETACHED CHESHIRE
WHITCHURCH ROAD
CHESTER
BOUGHTON HEATH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 11
Survey date: TUESDAY 22/05/12 Survey Type: MANUAL

3 CH-03-A-11 TOWN HOUSES CHESHIRE
LONDON ROAD
NORTHWICH
LEFTWICH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 24
Survey date: THURSDAY 05/06/19 Survey Type: MANUAL

4 LN-03-A-03 SEMI DETACHED LINCOLNSHIRE
ROCKERY LANE
LINCOLN
BOULTHAM
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 22
Survey date: TUESDAY 18/09/12 Survey Type: MANUAL

5 NY-03-A-13 TERRACED HOUSES NORTH YORKSHIRE
CATTERICK ROAD
CATTERICK GARRISON
OLD HOSPITAL COMPOUND
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 10
Survey date: WEDNESDAY 10/05/17 Survey Type: MANUAL

6 SF-03-A-04 DETACHED & BUNGALOWS SUFFOLK
NORWICH ON DRIVE
LOWESTOFT

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 7
Survey date: TUESDAY 23/10/12 Survey Type: MANUAL

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

VEHICLES

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	6	14	0.071	6	14	0.398	6	14	0.469
08:00 - 09:00	6	14	0.210	6	14	0.481	6	14	0.691
09:00 - 10:00	6	14	0.198	6	14	0.222	6	14	0.420
10:00 - 11:00	6	14	0.123	6	14	0.123	6	14	0.246
11:00 - 12:00	6	14	0.136	6	14	0.123	6	14	0.259
12:00 - 13:00	6	14	0.185	6	14	0.160	6	14	0.345
13:00 - 14:00	6	14	0.148	6	14	0.210	6	14	0.358
14:00 - 15:00	6	14	0.198	6	14	0.247	6	14	0.445
15:00 - 16:00	6	14	0.222	6	14	0.173	6	14	0.395
16:00 - 17:00	6	14	0.259	6	14	0.185	6	14	0.444
17:00 - 18:00	6	14	0.259	6	14	0.136	6	14	0.395
18:00 - 19:00	6	14	0.148	6	14	0.074	6	14	0.222
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.160			2.529			4.689

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	7 - 24 (units:)
Survey date date range:	01/01/12 - 25/09/19
Number of weekdays (Monday-Friday):	6
Number of Saturdays	0
Number of Sundays:	0
Surveys automatically removed from selection	0
Surveys manually removed from selection	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are shown. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

Calculation Reference: AJDT-654801-200709-0735

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 01 - RETAIL
Category : O - CONVENIENCE STORE

MULTI-MODAL VEHICLES

Selected regions and areas:

03	SOUTH WEST	
	WL WILTSHIRE	1 days
04	EAST ANGLIA	
	NF NORFOLK	1 days
07	YORKSHIRE & NORTH LINCOLNSHIRE	
	NY NORTH YORKSHIRE	1 days
	SY SOUTH YORKSHIRE	1 days
	WY WEST YORKSHIRE	1 days
09	NORTH	
	DH DURHAM	1 days
	TW TYNE & WEAR	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: Gross floor area
Actual Range: 292 to 539 (units: sqm)
Range Selected by User: 70 to 1300 (units: sqm)

Parking Spaces Range: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/12 to 07/04/17

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	3 days
Friday	4 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	7 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Suburban Area (PPS6 Out of Centre)	5
Neighbourhood Centre (PPS6 Local Centre)	2

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	6
High Street	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:
C1 7 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 1 mile:
5,001 to 10,000 2 days
10,001 to 15,000 2 days
15,001 to 20,000 2 days
25,001 to 50,000 1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:
5,001 to 25,000 1 days
25,001 to 50,000 1 days
100,001 to 125,000 1 days
125,001 to 250,000 4 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:
0.6 to 1.0 4 days
1.1 to 1.5 3 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Petrol filling station:
Included in the survey count 0 days
Excluded from count or no filling station 7 days

This data displays the number of surveys within the selected set that include petrol filling station activity, and the number of surveys that do not

Travel Plan:
No 7 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans

PTAL Rating:
No PTAL Present 7 days

This data displays the number of selected surveys with PTAL Ratings

LIST OF SITES relevant to selection parameters

1 DH-01-O-01 SAINSBURY'S LOCAL DURHAM
132 STATION LANE
HARTLEPOOL
SEATON CAREW
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Gross floor area: 469 sqm
Survey date: MONDAY 26/11/12 Survey Type: MANUAL

2 NF-01-O-01 TESCO EXPRESS NORFOLK
DEREHAM ROAD
NORWICH

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Gross floor area: 298 sqm
Survey date: FRIDAY 26/10/12 Survey Type: MANUAL

3 NY-01-O-03 CO-OPERATIVE NORTH YORKSHIRE
FOREST ROAD
NORTHALLERTON

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Gross floor area: 303 sqm
Survey date: MONDAY 19/09/16 Survey Type: MANUAL

4 SY-01-O-02 SAINSBURY'S LOCAL SOUTH YORKSHIRE
ECCLESALL ROAD
SHEFFIELD

Neighbourhood Centre (PPS6 Local Centre)
High Street
Total Gross floor area: 306 sqm
Survey date: FRIDAY 14/12/12 Survey Type: MANUAL

5 TW-01-O-02 CO-OPERATIVE TYNE & WEAR
ETHEL TERRACE
SUNDERLAND
CASTLETOWN
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Gross floor area: 330 sqm
Survey date: FRIDAY 07/04/17 Survey Type: MANUAL

6 WL-01-O-01 ONE STOP WILTSHIRE
THE CIRCLE
SWINDON

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Gross floor area: 292 sqm
Survey date: FRIDAY 23/09/16 Survey Type: MANUAL

7 WY-01-O-02 CO-OPERATIVE WEST YORKSHIRE
AINSTY ROAD
WETHERBY

Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total Gross floor area: 539 sqm
Survey date: MONDAY 26/09/16 Survey Type: MANUAL

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 01 - RETAIL/O - CONVENIENCE STORE

MULTI-MODAL VEHICLES

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00	3	381	4.203	3	381	4.028	3	381	8.231
07:00 - 08:00	7	363	7.759	7	363	7.247	7	363	15.006
08:00 - 09:00	7	363	8.665	7	363	8.350	7	363	17.015
09:00 - 10:00	7	363	6.341	7	363	5.711	7	363	12.052
10:00 - 11:00	7	363	6.144	7	363	6.065	7	363	12.209
11:00 - 12:00	7	363	5.317	7	363	5.553	7	363	10.870
12:00 - 13:00	7	363	7.995	7	363	7.404	7	363	15.399
13:00 - 14:00	7	363	5.790	7	363	5.632	7	363	11.422
14:00 - 15:00	7	363	6.735	7	363	6.617	7	363	13.352
15:00 - 16:00	7	363	7.562	7	363	7.838	7	363	15.400
16:00 - 17:00	7	363	9.059	7	363	8.074	7	363	17.133
17:00 - 18:00	7	363	10.240	7	363	9.413	7	363	19.653
18:00 - 19:00	**7**	**363**	**11.422**	**7**	**363**	**11.934**	**7**	**363**	**23.356**
19:00 - 20:00	7	363	8.153	7	363	9.137	7	363	17.290
20:00 - 21:00	6	375	3.738	6	375	5.296	6	375	9.034
21:00 - 22:00	6	375	2.804	6	375	3.249	6	375	6.053
22:00 - 23:00	1	469	1.919	1	469	2.559	1	469	4.478
23:00 - 24:00									
Total Rates:			113.846			114.107			227.953

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	292 - 539 (units: sqm)
Survey date date range:	01/01/12 - 07/04/17
Number of weekdays (Monday-Friday):	7
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are shown. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 01 - RETAIL/O - CONVENIENCE STORE

MULTI-MODAL CYCLISTS

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00	3	381	0.438	3	381	0.350	3	381	0.788
07:00 - 08:00	7	363	0.433	7	363	0.394	7	363	0.827
08:00 - 09:00	7	363	0.315	7	363	0.315	7	363	0.630
09:00 - 10:00	7	363	0.197	7	363	0.158	7	363	0.355
10:00 - 11:00	7	363	0.118	7	363	0.079	7	363	0.197
11:00 - 12:00	7	363	0.158	7	363	0.158	7	363	0.316
12:00 - 13:00	7	363	0.315	7	363	0.276	7	363	0.591
13:00 - 14:00	7	363	0.118	7	363	0.197	7	363	0.315
14:00 - 15:00	7	363	0.315	7	363	0.315	7	363	0.630
15:00 - 16:00	7	363	0.433	7	363	0.473	7	363	0.906
16:00 - 17:00	**7**	**363**	**0.709**	7	363	0.512	7	363	1.221
17:00 - 18:00	7	363	0.630	**7**	**363**	**0.630**	7	363	1.260
18:00 - 19:00	7	363	0.709	7	363	0.591	**7**	**363**	**1.300**
19:00 - 20:00	7	363	0.433	7	363	0.354	7	363	0.787
20:00 - 21:00	6	375	0.089	6	375	0.267	6	375	0.356
21:00 - 22:00	6	375	0.134	6	375	0.134	6	375	0.268
22:00 - 23:00	1	469	0.000	1	469	0.000	1	469	0.000
23:00 - 24:00									
Total Rates:			5.544			5.203			10.747

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 01 - RETAIL/O - CONVENIENCE STORE

MULTI-MODAL PEDESTRIANS

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00	3	381	3.415	3	381	3.327	3	381	6.742
07:00 - 08:00	7	363	7.168	7	363	6.144	7	363	13.312
08:00 - 09:00	7	363	9.492	7	363	8.862	7	363	18.354
09:00 - 10:00	7	363	7.680	7	363	6.656	7	363	14.336
10:00 - 11:00	7	363	7.168	7	363	6.932	7	363	14.100
11:00 - 12:00	7	363	7.917	7	363	7.562	7	363	15.479
12:00 - 13:00	7	363	8.232	7	363	7.956	7	363	16.188
13:00 - 14:00	7	363	9.137	7	363	9.571	7	363	18.708
14:00 - 15:00	7	363	8.822	7	363	9.098	7	363	17.920
15:00 - 16:00	**7**	**363**	**12.288**	7	363	11.579	**7**	**363**	**23.867**
16:00 - 17:00	7	363	9.965	7	363	10.358	7	363	20.323
17:00 - 18:00	7	363	10.752	7	363	10.595	7	363	21.347
18:00 - 19:00	7	363	11.737	**7**	**363**	**11.776**	7	363	23.513
19:00 - 20:00	7	363	10.004	7	363	11.461	7	363	21.465
20:00 - 21:00	6	375	7.299	6	375	7.655	6	375	14.954
21:00 - 22:00	6	375	6.231	6	375	7.076	6	375	13.307
22:00 - 23:00	1	469	0.000	1	469	0.000	1	469	0.000
23:00 - 24:00									
Total Rates:			137.307			136.608			273.915

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 01 - RETAIL/O - CONVENIENCE STORE

MULTI-MODAL PUBLIC TRANSPORT USERS

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00	3	381	0.000	3	381	0.000	3	381	0.000
07:00 - 08:00	7	363	0.197	7	363	0.079	7	363	0.276
08:00 - 09:00	7	363	0.394	7	363	0.354	7	363	0.748
09:00 - 10:00	7	363	0.315	7	363	0.236	7	363	0.551
10:00 - 11:00	7	363	0.630	7	363	0.670	7	363	1.300
11:00 - 12:00	7	363	0.354	7	363	0.315	7	363	0.669
12:00 - 13:00	7	363	0.315	7	363	0.551	7	363	0.866
13:00 - 14:00	7	363	0.236	7	363	0.197	7	363	0.433
14:00 - 15:00	7	363	0.591	7	363	0.433	7	363	1.024
15:00 - 16:00	7	363	0.315	7	363	0.315	7	363	0.630
16:00 - 17:00	7	363	0.236	7	363	0.158	7	363	0.394
17:00 - 18:00	**7**	**363**	**1.260**	**7**	**363**	**1.339**	**7**	**363**	**2.599**
18:00 - 19:00	7	363	0.709	7	363	0.591	7	363	1.300
19:00 - 20:00	7	363	0.158	7	363	0.197	7	363	0.355
20:00 - 21:00	6	375	0.089	6	375	0.089	6	375	0.178
21:00 - 22:00	6	375	0.045	6	375	0.045	6	375	0.090
22:00 - 23:00	1	469	0.000	1	469	0.000	1	469	0.000
23:00 - 24:00									
Total Rates:			5.844			5.569			11.413

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 01 - RETAIL/O - CONVENIENCE STORE

MULTI-MODAL TOTAL PEOPLE

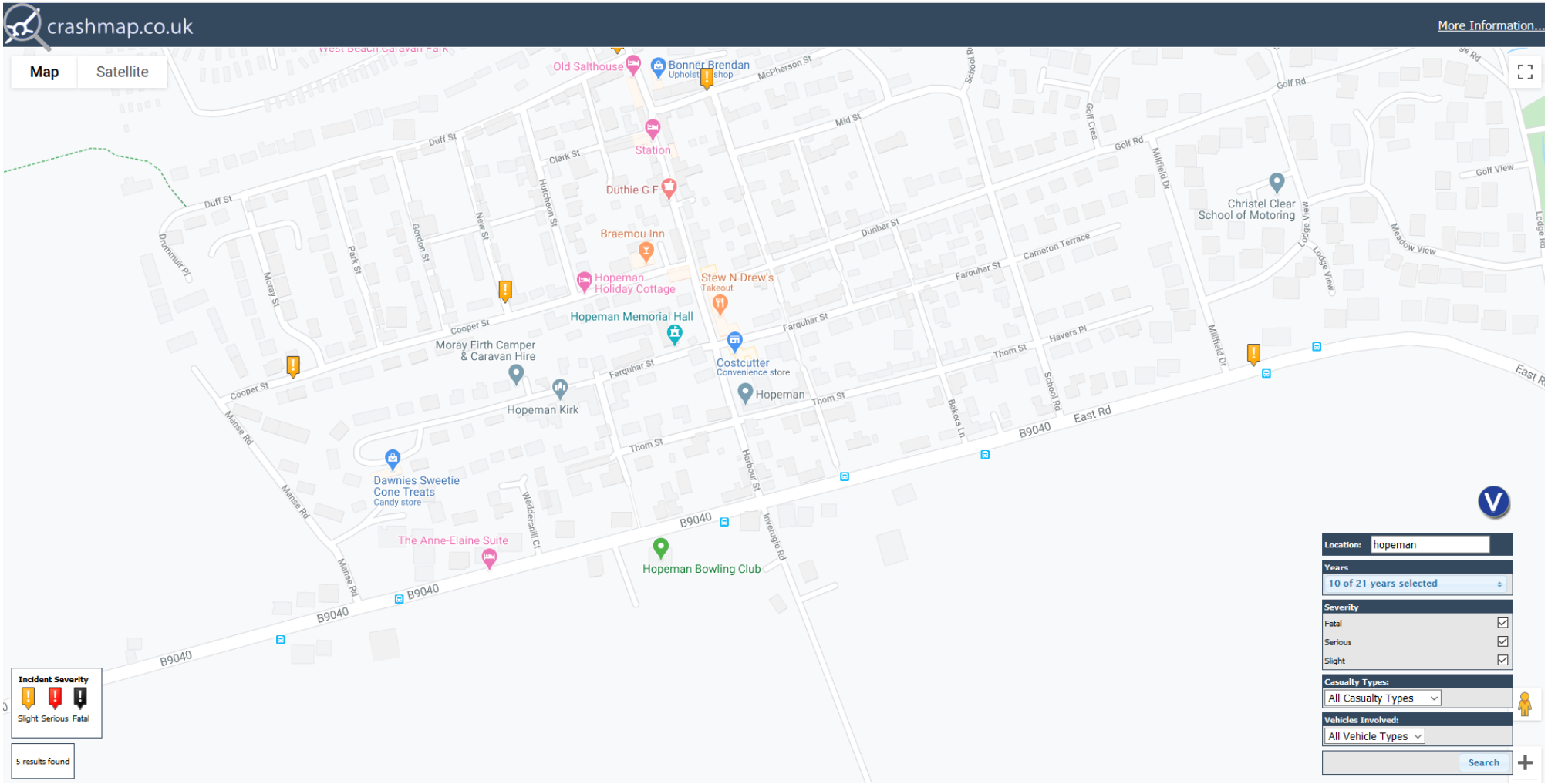
Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00	3	381	8.406	3	381	7.968	3	381	16.374
07:00 - 08:00	7	363	16.857	7	363	15.163	7	363	32.020
08:00 - 09:00	7	363	20.520	7	363	19.575	7	363	40.095
09:00 - 10:00	7	363	15.794	7	363	13.864	7	363	29.658
10:00 - 11:00	7	363	14.927	7	363	14.376	7	363	29.303
11:00 - 12:00	7	363	14.691	7	363	14.533	7	363	29.224
12:00 - 13:00	7	363	17.881	7	363	17.093	7	363	34.974
13:00 - 14:00	7	363	16.266	7	363	16.660	7	363	32.926
14:00 - 15:00	7	363	17.290	7	363	17.290	7	363	34.580
15:00 - 16:00	7	363	22.450	7	363	22.135	7	363	44.585
16:00 - 17:00	7	363	22.686	7	363	21.583	7	363	44.269
17:00 - 18:00	7	363	25.167	7	363	24.262	7	363	49.429
18:00 - 19:00	**7**	**363**	**28.082**	**7**	**363**	**28.279**	**7**	**363**	**56.361**
19:00 - 20:00	7	363	20.835	7	363	23.119	7	363	43.954
20:00 - 21:00	6	375	12.639	6	375	14.953	6	375	27.592
21:00 - 22:00	6	375	10.191	6	375	11.660	6	375	21.851
22:00 - 23:00	1	469	2.772	1	469	3.625	1	469	6.397
23:00 - 24:00									
Total Rates:			287.454			286.138			573.592

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*


crashmap.co.uk
More Information...
Map
Satellite
Old Salthouse
Bonner Brendan
Upholstery shop
McPherson St
Station
Duthie G F
Braemou Inn
Hopeman Holiday Cottage
Stew N Drew's
Takeout
Hopeman Memorial Hall
Moray Firth Camper & Caravan Hire
Costcutter
Convenience store
Hopeman
Hopeman Kirk
Dawnies Sweetie Cone Treats
Candy store
The Anne-Elaine Suite
Hopeman Bowling Club
Christel Clear School of Motoring
Duff St
Clark St
Mid St
Golf Rd
Golf Cres
Golf View
Millfield Dr
Lodge View
Meadow View
Dunbar St
Cameron Terrace
Farquhar St
Havers Pl
Thom St
Cooper St
Moray St
Park St
Gordon St
New St
Hutcheon St
Drummuir Pl
Manse Rd
Weddershill Ct
Harbour St
Invergyle Rd
Baker's Ln
School Rd
East Rd
B9040
Incident Severity
Slight Serious Fatal
5 results found
Location: hopeman
Years
10 of 21 years selected
Severity
Fatal
Serious
Slight
Casualty Types:
All Casualty Types
Vehicles Involved:
All Vehicle Types
Search

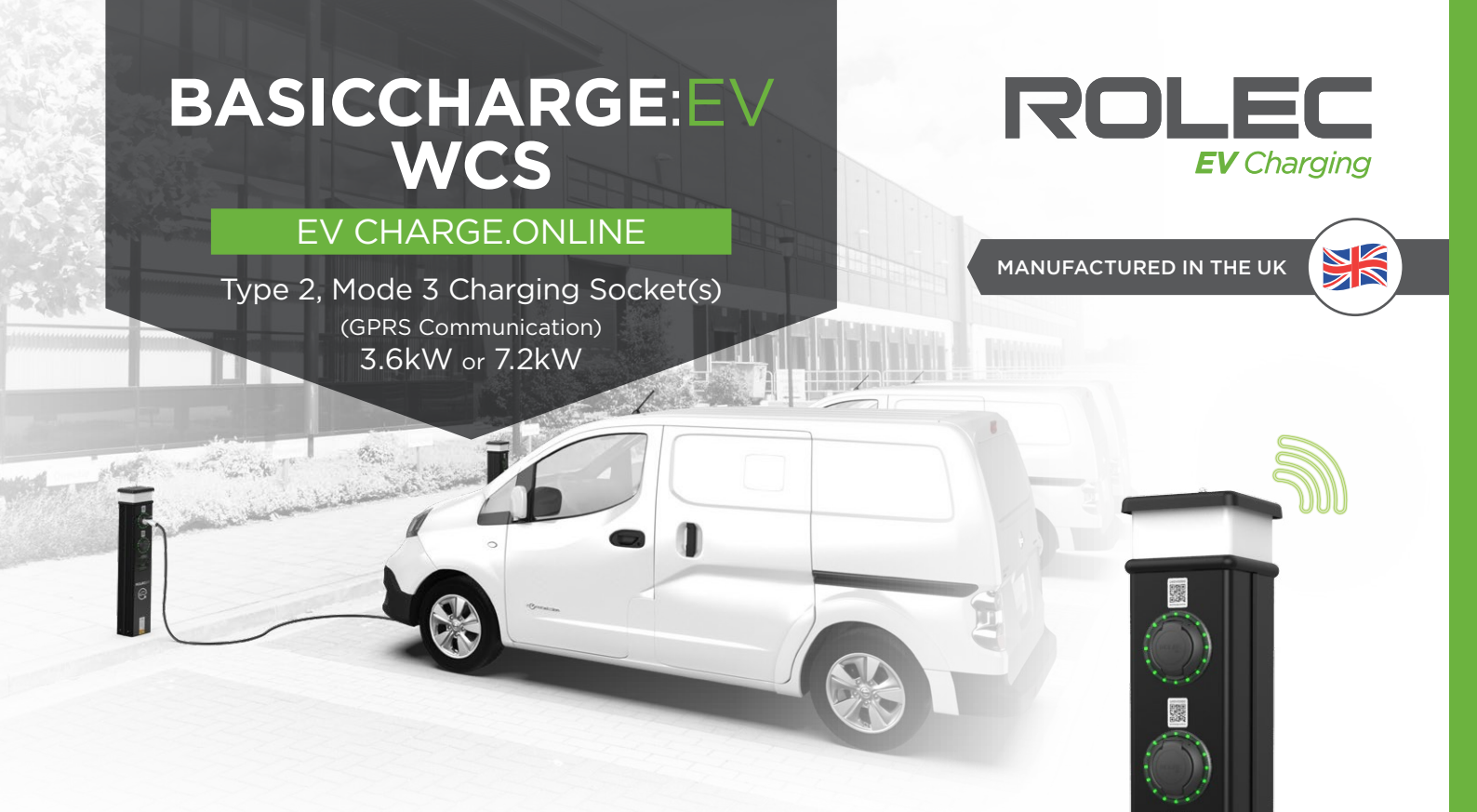
BASICCHARGE:EV WCS

EV CHARGE.ONLINE

Type 2, Mode 3 Charging Socket(s)
(GPRS Communication)
3.6kW or 7.2kW

ROLEC EV Charging

MANUFACTURED IN THE UK



The BASICCHARGE:EV CHARGE.ONLINE pedestal replicates Rolec's world-leading Classic utility pedestal, which provides a simple and effortless EV charging experience for all users.

This versatile, future-proof pedestal allows free-to-use charging and/or a simple pay-to-charge solution via the EV driver's smartphone.

Available in either 1way or 2way versions, providing Mode 3 fast charging in 3.6kW or 7.2kW speeds, this unit features a GPRS antenna communication connection.

Unit shown: BASICCHARGE:EV
EV CHARGE.ONLINE
2way Socket (Type 2) Charging Pedestal

PRODUCT FEATURES

- Mode 3 (IEC 61851-1) fast charging
- Available in 1way / 2way & 3.6kW (16A) / 7.2kW (32A) versions
- Type 2 (IEC 62196) charging socket(s) c/w security hatchlock(s)
- Photocell controlled LED amenity lighting head
- Surface or root mountable
- Built-in AC overload and fault current protection
- Built-in DC sensitive protection
- Built-in LED charging status indicator socket halo(s)
- Built-in class 1 **MID** compliant kWh meter(s)
- EV driver Pay-to-Charge smartphone integration
- OLEV Grant Fundable under the Workplace Charging Scheme
- Easy to install & maintain
- IP rated
- UV stabilised
- Corrosion resistant

EV CHARGE.ONLINE **PAY-TO-CHARGE** PAYMENT PARTNERS/ASSOCIATES

worldpay VISA mastercard

See the EV CHARGE.ONLINE Overview for details

GPRS Connectivity

Grant Fundable

EV Driver Multi-Device Access

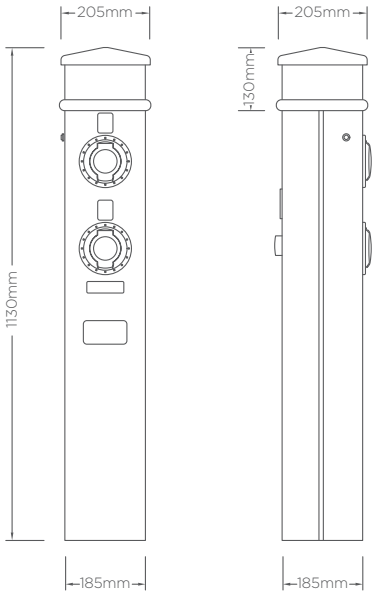
Branding & Colour Options Available

LED Amenity Lighting

IP Rated & UV Stabilised

SPECIFICATIONS

Product Code	EVGM0210	EVGM0211	EVGM0220	EVGM0221
Charging Socket(s)	1x Type 2 (IEC 62196)		2x Type 2 (IEC 62196)	
Rated Output	3.6kW	7.2kW	3.6kW	7.2kW
Rated Current	16A	32A	16A	32A
Charge Protocol	Mode 3			
Input Voltage	230V AC/50Hz (Single Phase)			
AC Overload Protection	1x 20A	1x 40A	2x 20A	2x 40A
AC Fault Protection	30mA			
DC Fault Protection	6mA			
Cable Terminals	3 x 35mm			
Communications	GPRS (Recommended signal strength of 14 CSQ or above)			
Standby Consumption	Approx 0.3kW per day			
Certifications & Compliances CE	EV Charging Compliance – EN 61851-1:2001, EN 61851-21:2002, EN 61851-22:2002 Wiring Regulations – BS 7671 EMC Compliance – EN 61000-6-3:2007, EN 61000-6-2:2005 Safety Compliance (LVD) – 2014/35/EU Environmental Protection – Enclosure IP65, Socket IP54 (BS EN 60529:1992+A2:2013)			
Dimensions	205mm x 1130mm x 205mm (W x H x D)			
Pedestal Material	High impact resistant aluminium composite outer shell			
Internal Chassis	Heavy duty, hot dipped galvanised steel			
Operating Temperature	-30°C to +50°C			
Standard Body Colour	Black (Other colours available upon request)			



EV CHARGE.ONLINE

- Built-in modem and GPRS signal antenna
- Built-in roaming Sim card connects directly to the strongest signal
- Smart charging control via the EV Charge.Online mobile app*
- EV Charge.Online Back Office management system*

EV CHARGE.ONLINE **PAY-TO-CHARGE** PARTNERS/ASSOCIATES

worldpay VISA mastercard

OPTIONS & ACCESSORIES

- Load Manager system (electrical distribution management)
- Corporate branding (colours, logo badge, etc.)
- Galvanised steel ground mounting base
- Protection barriers
- Charge point signage
- EV charging cables (Type 1 to Type 2 or Type 2 to Type 2)

*Full App functionality dependent on chosen data management plan, please refer to the EVCharge.Online Overview Sheet for more information

Head office contact:
t: +44 (0) 1205 724754
f: +44 (0) 1205 724876
rolec@rolecserv.co.uk

Rolec Services Ltd
Ralphs Lane, Frampton West
Boston, Lincolnshire
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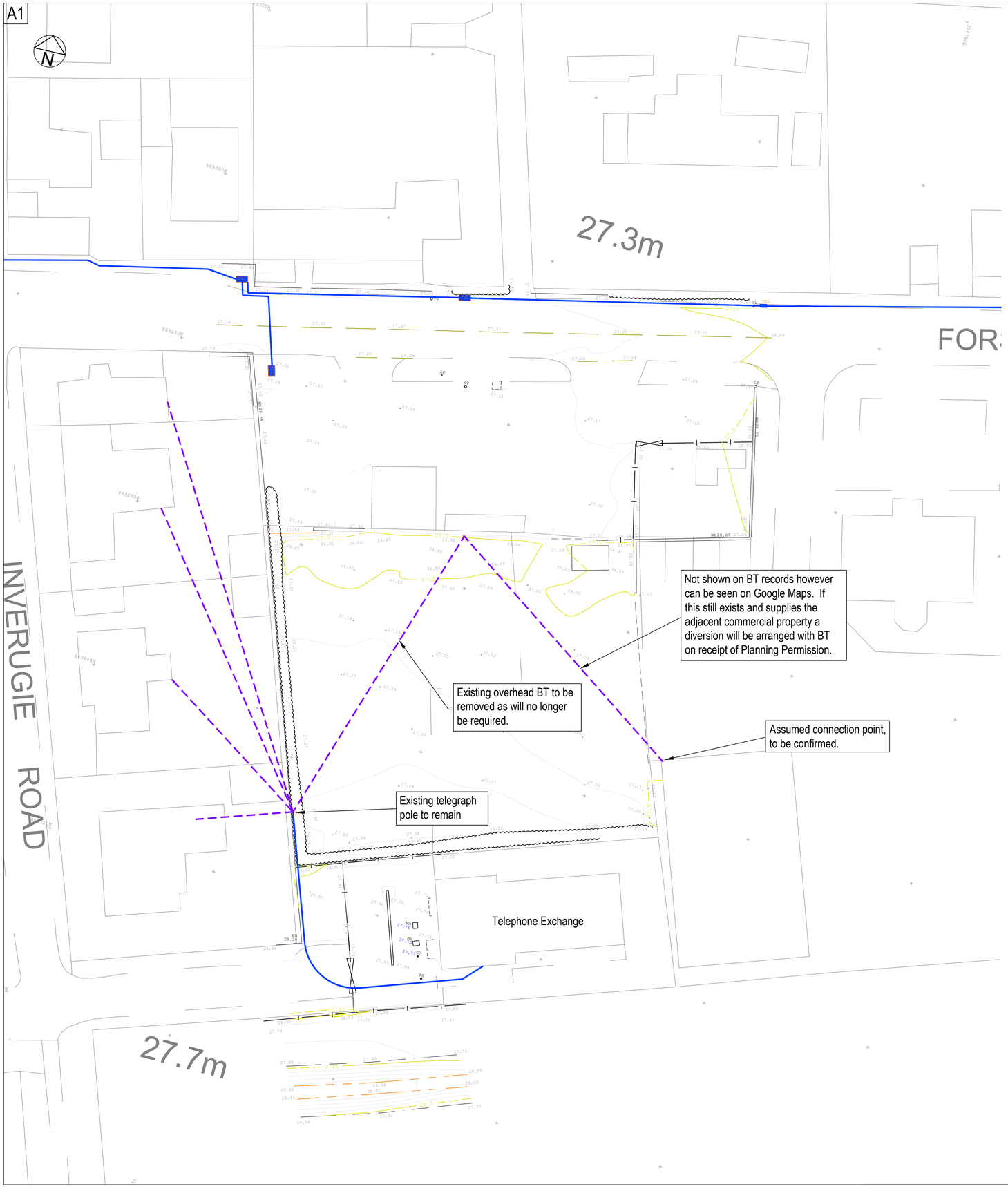
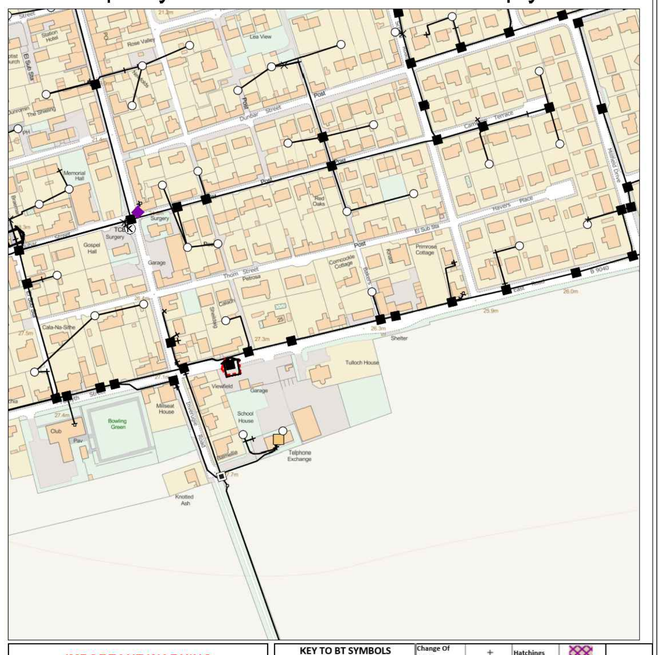
A1



Legend

- Existing Overhead BT
- Existing Underground BT
- Existing BT Junction Box

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED (Office hours: Monday - Friday 08.00 to 17.00)

www.openreach.co.uk/cbyd

KEY TO BT SYMBOLS

	Planned	Live
PCP		
Pole		
Box		
Manhole		
Cabinet		

Change Of State	+	Hatchings	
Split Coupling		Built	
Duct Tee		Planned	
Building		Inferred	
Kiosk	K	Duct	

Other proposed plant is shown using dashed lines. BT Symbols not listed above may be disregarded. Existing BT Plant may not be recorded. Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	In Place	Pending Remove	Not In Use
Power Cable				
Power Duct				N/A

BT Ref : SYX101852
Map Reference : (centre) NJ1479369316
Easting/Northing : (centre) 314793,869316
Issued : 24/09/2018 10:18:54

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

PLANNING

Rev.	Date	Remarks	By	Ch.

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT AND FLATS
FORSYTH STREET
HOPEMAN

Drawing
EXISTING BT APPARATUS

Scale	Date	Drawn by	Checked by
1:250	20.08.20	PD	

Drawing no.
10045-C-501

Rev

Response to Transportation Comments
Date Comments Received: 11th August 2020
Planning Ref: 20/00474/APP

This Response has been prepared in response to the comments received from Moray Council in regards to the above application for proposed retail, residential and light industrial on land located of Forsyth Street Hopeman. Comments received are in black, responses are noted in Green.

1.0 Parking

1.1 Food Retail Unit (371 sqm) = 6 per 100sqm = 22 Standard spaces (of which 2 Rapid EV charging spaces required), 2 PTW Spaces, 3 Disabled Spaces, 3 cycle spaces.
The actual available retail space is 232sqm (BoH = 139sqm). In reference to the current available parking standards legislation set by Moray Council, Appendix 2 notes "a **maximum** of 6spaces/100m2 of GFA" it does not differentiate between standard or disabled bays. Our current proposals are calculated at 5.66/100m2 of GFA. As a precedent, the approved planning application for a Co-op store in Lhandbryde, (15/02252/APP) was approved on the basis 190sqm (retail space) 94sqm (BoH) = Total 17 spaces which was inclusive of disabled bays.

Please refer to the updated site plan (Revision E) which includes 22 Bays for retail inclusive of 2no PTW spaces, 2 disabled (1 highlighted as residential but can be changed) and 3 Cycle spaces. We also note there were no EV charge points installed at this location, it is therefore difficult to understand why 2 are required on what is considered a small development (not major).

In addition to the above, please refer to the Transport Statement (Section 2.16) which notes:

"However, given that some of the residential parking will be vacant during key retail demand periods, it is not considered necessary to apply the full food retail parking requirement to the site given the potential for shared use.

Co-op who are the likely tenant of the proposed unit, are comfortable that the proposed provision is sufficient to accommodate demand based on knowledge of operations at similar sized stores in areas with compatible characteristics. Given the remote location of the store, the proposed unit includes a larger storage area than would be standard, as such applying the full parking ratio to this area is onerous.

It is also hoped that consideration will be given to the improved pedestrian and cycle routes carefully designed to promote green travel. Close proximity to the adjacent bus stop and the fact the site is located on a main bus route through Hopeman should also be considered. As each application is assessed individually we trust through the above response and any subsequent discussions provide a suitable outcome on the required level of parking.

1.2 Light Industrial Unit (111 sqm) = 4 per 100sqm = 4 spaces.
Correct No as per site plan.

1.3 8no 2 Bed Flats =3 per flat (+1 per 4 flats for visitor parking) = 16 standard spaces and 2 visitor spaces (EV provision required for a minimum of 1 space per flat), 1 secure cycle store per flat.
Correct No as per updated site plan. 16 + 2 visitor

1.4 No details for the proposed siting of EV charging points and cable access have been submitted. Details required.
We have undertaken several surveys for the site at significant expense, in order to provide a fully detailed design strategy for EV charge points, we would require input from a suitably qualified engineer. This is unreasonable to expect the client to incur such expense without securing planning. There is no reason why this could not be conditioned.

Whilst we can provide a generic brochure (attached on email response to Lisa McDonald 31/08), this is not necessarily what will be installed and is dependent on changing legislation, grant availability and other external factors. As with all developments, the feed for the EV charge points would be as per the Scottish Energy Trust Scotland guidelines – whereby the Landlord would pay for the energy supply for a min of 12 months. Charge posts will be located centrally at the front of the spaces, and these will most likely be fed from a meter within the communal stairs within the residential elements, however as noted above, routes would be agreed at detailed design to offer a cost effective solution.

1.5 Swept paths for key (difficult) parking spaces have not been provided.
All parking spaces and courts have been designed to the required guidelines.
However please indicate exactly which spaces this is required for to enable us to further assess. Visibility splays from the junction have been demonstrated, and spaces set back adequately from the proposed junction. Please refer to Appendix A of the transport statement.

2.0 Deliveries/ Servicing

2.1 Commercial/Retail development should provide all loading and other servicing to be carried out on site. Frontage layby servicing should only be considered acceptable where there is no other viable alternative. This site is of an adequate size to accommodate dedicated servicing for the retail unit within the site.
As indicated within the supporting Transport Statement, the Co-Op store will only require one large vehicle delivery per day which will be parked within the lay-by for a maximum of 30mins on average. In addition there will be 4 short stay deliveries from small vehicles of under 10 minutes duration. Accommodating the service vehicle within the site would require a larger turning facility and internal loading area as a minimum which will have a detrimental impact on the site layout and development potential. Forsyth Street has on-street parking along the full length which limits visibility at junctions and there has been no issue with accidents (see attached accident data).

Compromising the development potential of a site for a vehicle movement which occurs once a day would not be consistent with good land use planning principles and would result in a layout being dictated by a low frequency large vehicle movement which is not consistent with the principles of Designing Streets.

Convenience stores are often served by lay-by arrangement or direct street front loading bays which are consistent with the proposals at Hopeman. Indeed, the Co-Op store at St Andrew's Road, Lhanbryde has a very similar arrangement with a lay-by on the store frontage which is within the car park access visibility splay and was supported by MC. The co-op would be more than happy to ensure the layby is fully utilised by others and would be happy for this to be conditioned as was the case at the Lhanbryde store. Furthermore, the Lhanbryde example also has a bus stop on the opposite side from the store which would again be within the visibility splay.

There are numerous examples of service lay-by's and loading bays at convenience stores throughout Scotland which result in a temporary reduction in visibility splay at access junctions which are considered acceptable given the temporary nature of the restriction. Indeed, many of the existing junctions on Forsyth Street experience a similar restriction to visibility given the lack of controlled on-street parking along the route and it should be noted that there are no recognised accident concerns based on current data.

The applicant is prepared to promote a Traffic Regulation Order to ensure that the lay-by is used for loading only. Furthermore, the applicant and convenience store operator would be agreeable to a planning condition requiring a delivery management strategy to be submitted and approved by MC to ensure that delivery times are out with busy periods on Forsyth Street and safe delivery protocol is followed at all times.

Further to the above having carefully considered the site layout, it would seem more problematic if a delivery vehicle were to enter the site, and position to drop deliveries to within the service yard area and potentially block in residents. On rubbish collection days, this could provide further issue if you have 2 larger vehicles trying to enter or turn within the site at the same time.

2.2 No vehicular swept paths have been provided for Refuse Collection Vehicles (RCV's) to demonstrate that the proposals are feasible and safe. Swept paths for a fire tender which were submitted on Drawing 10045-C-401 are not acceptable.
Please refer to Appendix B of TS. We are unsure as to why the drawing demonstrating adequate turning provision for a fire appliance is not acceptable? Please also find attached MacLeod Jordan drawing, 1002, providing evidence of a working swept path for refuse vehicle.

2.3 Large vehicles parking in the layby would obscure visibility for vehicles exiting the car park which is a road safety issue. A Stage 1/2 Road Safety Audit is required for the proposal.
A stage 1 / 2 road safety audit would be undertaken at the detailed design stage and would accompany the RCC design package for the access junction and delivery lay-by.

Forsyth Street has on-street parking along the full length which limits visibility at junctions and there has been no issue with accidents (see attached accident data). The loading bay would only be occupied for 30mins per day which is not excessive and the time can be controlled to quieter times of the day.

3.0 Site Layout

3.1 No visibility splay details have been provided for the site access onto the B9040.)Visibility splay required 2.4m x 70m in both directions). The potential for larger vans and service vehicles to block visibility splay is not acceptable.
See Appendix A of TS.

3.2 Residential bins are shown located within the curtilage of the flatted units. A bin store is also shown to the northwest of the flats Access to the bin store for refuse collection is obstructed by the 'Plant Area' this arrangement is not considered viable. Revised Proposals for bin storage and collection are required.
Please refer to updated site plan showing repositioning of bin storage. It is proposed to have a centrally located bin store/collection point at the front of the residential properties. We are currently awaiting a response from Moray Council Environmental & Commercial Services on their preference for individual or communal bins for this development.

3.3 There is only 0.5m offset between the parking bays and the entrance to the retail unit. This will require customers to use the disabled bay hatched area to access the store and some disabled customers will have to go around the rear of the parking space to enter the store. Disabled users accessing vehicles may temporarily block access to the store whilst entering and exiting vehicles, this arrangement is unacceptable. Revised proposals required to ensure access will not be obstructed and disabled parking us useable. EV provision also needs to provide for disabled parking/access.
Please refer to updated site plan – Revision E

3.4 Residents of the cottage flats have no traffic free route from their properties to the footways along the frontage of the site and all users will have to walk through a busy retail car park. This is a safety issue.
Please refer to updated site plan (Revision E), a pedestrian route is proposed from Forsyth street to the residential elements alongside the Eastern edge of the site. This offers a traffic free unobstructed pathway.

4.0 Connectivity

4.1 No details have been submitted which identify where customers would come from, and the routes they would use to access the site, or comparisons of the pre and post development trips and movements to identify where the most appropriate crossing points should be provided and whether a crossing island may be necessary.
See Chapter 4 of the TS. Please also note diagrammatic arrows shown on site plan which clearly indicate pedestrian routes. The siting of crossing point(s) have been located by taking pedestrian routes into consideration. Taking into account all previous comments, the site has now been amended to provide a fully pedestrianised route from Forsyth street to the residential elements with no further crossing points.

4.2 No assessment of existing accident data for the B9040 has been submitted. See attached accident information. Accident reviews are required to consider the previous 5 years. We have included 10 years as there are no accidents at the site frontage in this period indicating that there is no road safety issue near to the site. One minor accident located near to Mill field Drive which is not relevant to the site proposals.

5.0 Infrastructure

5.1 The existing (and proposed) street lighting has not been shown.
This is not required for planning and should be agreed at RCC stage. It is not acceptable to expect the applicant to take on costs for a fully detailed lighting design layout at this stage.

5.2 Existing telecoms infrastructure which would require to be relocated has not been shown.
Please refer to attached sketch proposal (Dwg 10045-C-501). Again this is a detailed element, however it is expected that all overhead BT cabling will be removed as part of the demolition works and all new development will be served via underground ducts. This would require consultation with BT and input from a suitably qualified engineer.

5.3 A Street Engineering Review (SER) is required for the proposed development.
A small cul de sac is all that can be provided given the site boundary etc. It is felt that this is extremely unnecessary.

Proposed mixed-use development

Forsyth Street
Hopeman
IV30 5ST

Planning Noise Assessment

On behalf of

Springfield Real Estate Management Limited

Project Reference: 89408 | Revision: 01 | Date: 28th August 2020
Revised 22nd October 2020

T: 01252 519881
W: noisesolutions.co.uk
E: hello@noisesolutions.co.uk
Noise Solutions Ltd, Unit 5, Oriel Court, Omega Park, Alton, GU34 2YT Reg no. 3483481

Document Information

Project Name	:	**Mixed-use development, Forsyth Street, Hopeman**
Project Reference	:	**89408**
Report Title	:	**Planning Noise Assessment Report**
Doc Reference	:	**89408/PNA**
Date	:	**28th August 2020**

	Name	Qualifications	Initials	Date
Prepared by:	Nigel Chandler	BSc(Hons), MIOA	NAC	28th August 2020
Reviewed and approved by:	Jon Stump	BSc(Hons), MIOA	JS	28th August 2020
For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved
01	22 Oct 2020	Clarification of details following feedback from local authority	NAC	JS

Reg no. 3483481 Trading office Unit 5, Oriel Court, Omega Park, Alton, Hampshire, GU34 2YT

Contents

Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Springfield Real Estate Management Limited to undertake a planning-stage noise assessment for a proposed mixed-use development to the south of Forsyth Street, Hopeman. The development comprises two residential buildings, a 4000 sq ft retail unit and a 1200 sq ft light industrial Starter unit.

1.2. This report presents the results of an environmental noise survey, the applicable policies and guidance, and a noise impact assessment demonstrating the suitability of the site for the proposed residential development.

1.3. Guidance is provided on plant noise emissions from the proposed retail store, and an assessment is made of noise from delivery activities.

1.4. An outline assessment is made of noise from the light industrial unit.

1.5. To assist with the understanding of this report a brief glossary of acoustic terms can be found in **Appendix A**. A more in-depth glossary of acoustic terms can be assessed at the following web address http://www.acoustic-glossary.co.uk/.

2.0 Site layout and development proposals

2.1. The site is located to the south of the Forsyth Street, Hopeman, to the east of its junction with Inverugie Road.

2.2. The proposed development comprises eight flats within two two-storey buildings at the south of the site, and a 4000 sq ft retail store and 1200 sq ft industrial unit at the north, flanking the access road. The middle of the site is occupied by retail and residential car parking.

2.3. The retail unit is to be within a single-storey detached building with a monopitch roof. The customer entrance will be on the east elevation, with service doors on the north and south elevations. Plant serving the store will be located in a service yard to the south of the store, at the western edge of the site. A delivery bay for the retail store will be located on the Forsyth Street frontage adjacent to the store building and thereby reducing the haul distance for trolleys and cages to a minimum.

2.4. The light industrial Starter unit is to be within a single storey detached building with a roller shutter door and a parking bay in front.

2.5. **Appendix B** contains an aerial photograph showing the site and surrounding area, with an overlay of the proposed development. A site plan and elevations of each building are shown in **Appendix C**.

3.0 Noise policy

Scottish Planning Policy, PAN and TAN

3.1. PAN 1/2011 provides guidance and advice in relation to noise and Scottish planning policy.

3.2. Technical Advice Note – Assessment of noise published by the Scottish Government sets out a methodology of assessing the impact of a new noise source on noise sensitive residential property. The change in noise level, $L_{Aeq,T}$ before and after the development is operational is assigned a Magnitude according to the following:

Table 1 Assigning Magnitudes of noise impact

Magnitude	Change in noise level, $L_{Aeq,T}$ dB (After – Before)
Major	≥5
Moderate	3 to 4.9
Minor	1 to 2.3
Negligible	0.1 to 0.9
No change	0

Moray Council

3.3. James, Harris, Senior Environmental Health Officer at Moray Council, has advised[1] that:

> *I would anticipate the noise consultant to consider the application in particular with respect to BS 4142:2014 and consider all significant noise aspects, including the use and times of operation of the delivery area. Other relevant guidance that may be considered is the consideration of the application against internal noise rating (NR) curves whereby, in the absence of tonality, NR 25 within a living apartment with window ajar would be appropriate during daytime hours (0700-2300 hours) to protect the existing residential amenity, and NR 20 in a bedroom during night time (2300 to 0700 hours).BS 8233: 2014 contains further comment on noise rating curves.*

[1] Letter refernce 20/01712/PLANEH, 20/03686/GCOMP dated 27 May 2020

4.0 Acoustic Standards and Guidance

Institute of Acoustics Professional Practice Guidance

4.1. The Institute of Acoustics published a guidance document for new residential development in May 2017, in conjunction with the ANC and the Chartered Institute of Environmental Health, "*to provide practitioners with guidance on a recommended approach to the management of noise …*". While that document was prepared with the English planning system in mind, it does provide appropriate guidance for all residential use.

4.2. The document advocates a two-stage process for consideration of noise affecting new residential developments. Stage 1 is an initial risk assessment of the proposed development site, based on the ambient noise levels in the area. Stage 2 recommends consideration of four main elements:

- demonstration of a "good acoustic design process"
- observation of internal noise guidelines
- an assessment of noise affecting external amenity areas
- consideration of other relevant issues

4.3. The initial risk assessment considers the indicative daytime and night-time equivalent continuous noise levels which indicates an "increasing risk of adverse effect" with increasing noise levels[2].

4.4. For Stage 2, the ProPG document recommends that the guidance in BS 8233:2014 is followed.

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.

4.5. This Standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999[3]). These guideline noise levels are shown in Table 2, below:

[2] Figure 1, IoA ProPG for New Residential Development, May 2017
[3] World Health Organisation Guidelines for Community Noise, 1999

Table 2 BS 8233:2014 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

4.6. BS 8233:2014 advises that: *"regular individual noise events…can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values."* While the current edition of the standard gives no specific guidance on internal night-time L_{Amax} sound levels, the previous edition[4] recommended that:

> *For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{AMax}.*

4.7. The standard also provides advice in relation to design criteria for external noise. It states that:

> *"for traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.*
>
> *In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*
>
> *…*
>
> *In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."*

[4] BS 8233:1999 Sound insulation and noise reduction for buildings – Code of practice

BS 4142:2014 Methods for Rating and Measuring Industrial and Commercial Sound

4.8. British Standard (BS) 4142:2014 describes a method for rating and assessing sound of an industrial or commercial nature, which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

4.9. The industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes, upon which sound is incident.

4.10. The procedure contained in BS 4142 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15-minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.11. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

4.12. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

4.13. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

4.14. The background sound level should be established in terms of the LA90 noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that: "A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

4.15. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

> *a) Typically, the greater this difference, the greater the magnitude of the impact.*
>
> *b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
>
> *Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*
>
> *The standard goes on to note that: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

4.16. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

> *"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

4.17. BS 4142 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

5.0 Environmental sound levels

Environmental sound survey

5.1. An unattended environmental sound pressure level survey was undertaken between 12:30 hours on Friday 21st August and 12:30 hours on Monday 24th August 2020. Measurements were made on Forsyth Street, at position L1 as shown in **Appendix B**.

5.2. Full details of the surveys are provided in **Appendix D** with a history graph of the unattended measurements.

5.3. The relevant results of the survey have been summarised in Table 3 below.

Table 3 Summary of survey results

Measurement location	Measurement period	Range of recorded sound pressure levels (dB)			
		$L_{Aeq(15mins)}$	$L_{AFmax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Forsyth Street (L1)	Daytime (07.00 – 23.00 hours)	53 - 69	76 - 96	47 - 73	32 - 56
	Night-time (23.00 – 07.00 hours)	32 - 65	40 - 86	32 - 69	28 - 46

5.4. The data presented above are the free-field levels recorded from the meter.

5.5. Table 4 below presents the incident free field noise levels at L1 in terms of daytime and night-time levels measured during the monitoring period.

Table 4 Daytime and night-time sound pressure levels (free field levels)

Period	Parameter	Sound pressure level, dB
21 Aug 2020 daytime*	$L_{Aeq,T}$	65
21-22 Aug 2020 night-time	$L_{Aeq,8hours}$	56
22 Aug 2020 daytime	$L_{Aeq,\ 16\ hours}$	65
22-23 Aug 2020 night-time	$L_{Aeq,\ 8\ hours}$	56
23 Aug 2020 daytime	$L_{Aeq,\ 16\ hours}$	64
23-24 Aug 2020 night-time	$L_{Aeq,\ 8\ hours}$	56
24 Aug 2020 daytime*	$L_{Aeq,T}$	66
Overall daytime	**$L_{Aeq,\ 16\ hours}$**	**65**
Overall night-time	**$L_{Aeq,\ 8\ hours}$**	**56**

not complete 16 hour measurements.

5.6. Measured octave band sound pressure levels corresponding to the overall values above are given in Table 5.

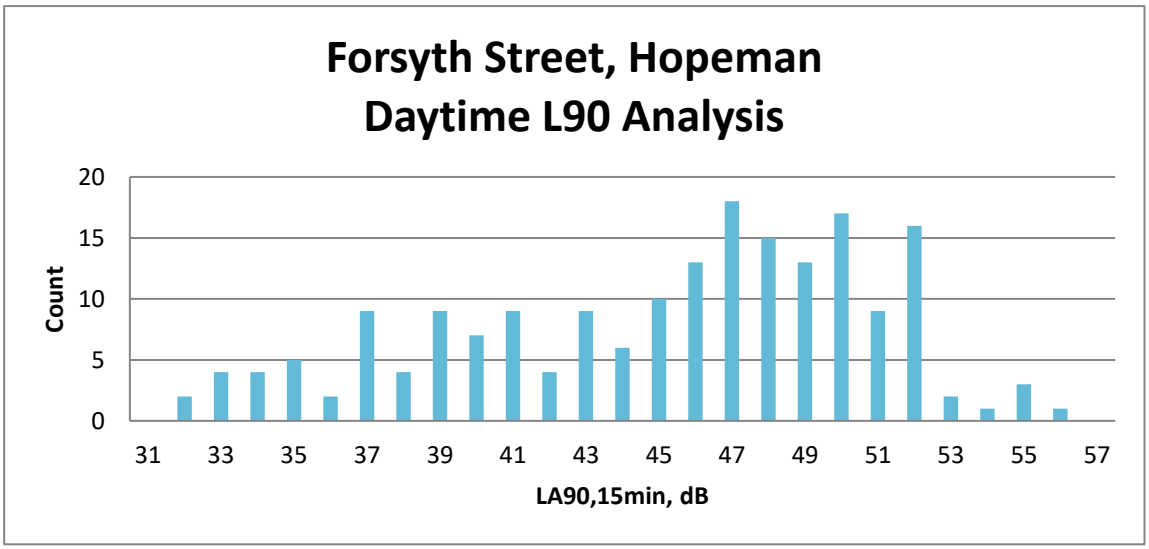
Table 5 Measured octave band sound pressure levels at the measurement location

Period	Incident sound pressure levels (dB) at Octave Band Centre Frequencies (Hz)								
	63	125	250	500	1000	2000	4000	8000	dB(A)
Daytime $L_{eq, 16\ hours}$	65	62	60	59	63	57	50	44	65
Night-time $L_{eq, 8\ hours}$	56	50	49	49	54	50	43	33	57

Background sound levels

5.7. Background ($L_{A90\ 15min}$) sound levels have been analysed to determine representative values, as required by BS 4142:2014. Data has been analysed for the full daytime and night-time periods and for the likely weekday delivery hours (07.00 to 20.00 hours) and Sunday delivery hours (08.00 to 18.00 hours).

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



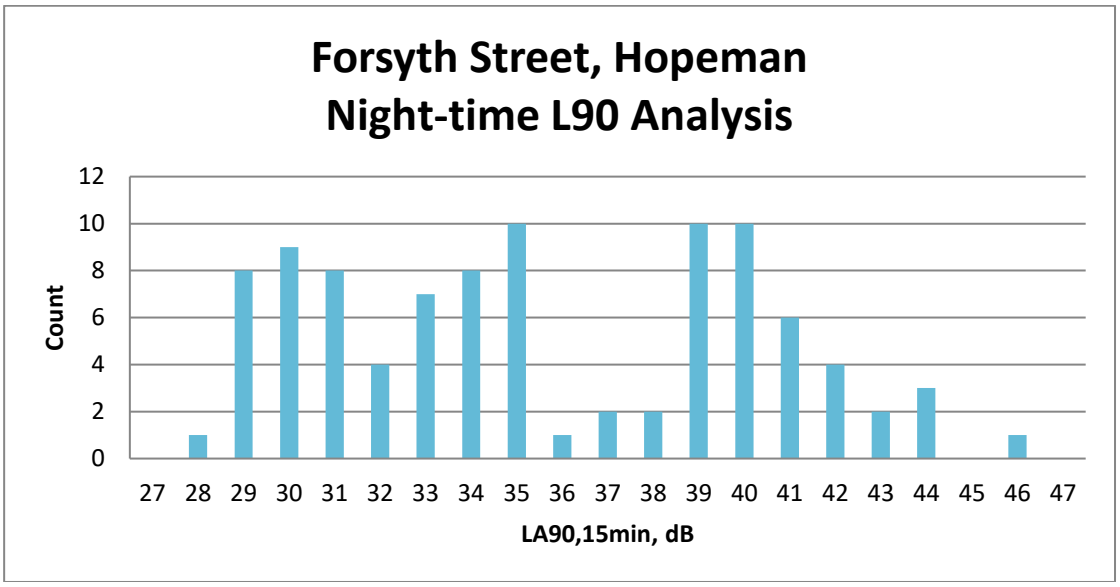
5.8. Additional statistical analysis has been undertaken. As shown in Table 6, the mean, median, and modal values have been calculated:

Table 6 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
Mean	45
Mode	47
Median	46

5.9. From reviewing the above histogram, 37dB has been selected to be representative for the background sound level in this area.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



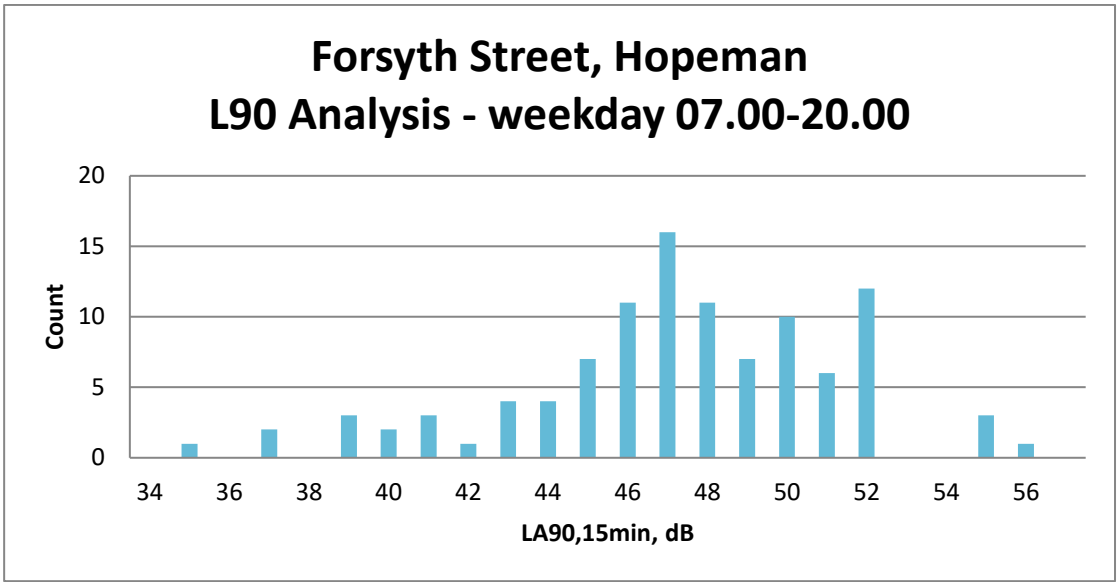
5.10. Additional statistical analysis has been undertaken. As shown in Table 7, the mean, median, and modal values have been calculated:

Table 7 Statistical analysis of $L_{A90,15min}$ levels during the Night-time period

dB, L_{A90} night-time period	
Mean	36
Mode	35
Median	35

5.11. From reviewing the above histogram, 30dB has been selected to be representative of the night-time background sound level in this area.

Figure 3 Histogram of L_{A90} background sound pressure levels, weekdays 07.00 – 20.00 hours



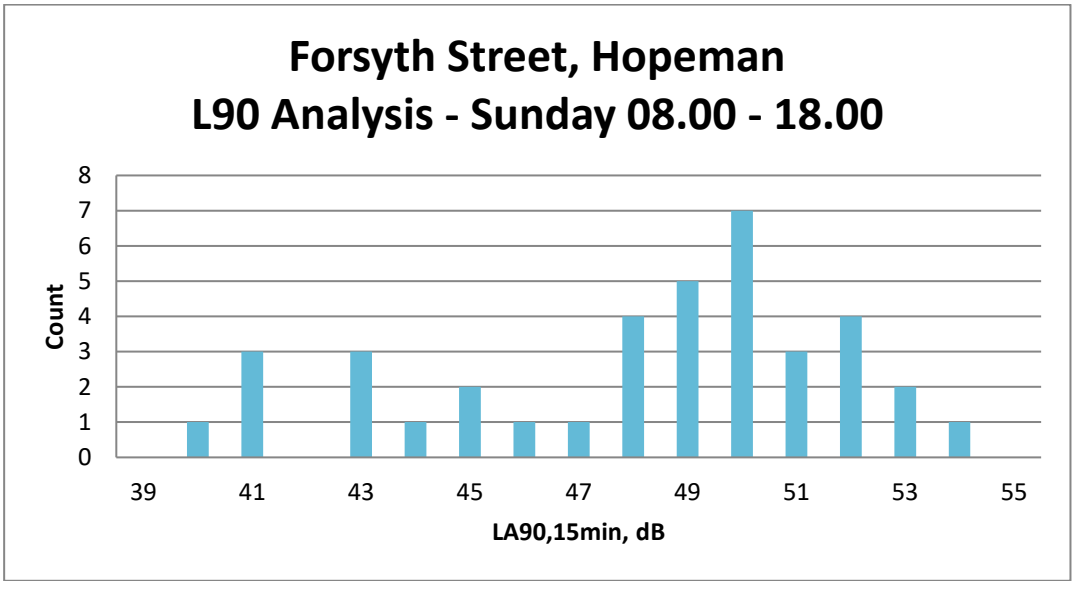
5.12. Additional statistical analysis has been undertaken. As shown in Table 8, the mean, median, and modal values have been calculated:

Table 8 Statistical analysis of $L_{A90,15min}$ levels during likely weekday delivery hours

dB, L_{A90} Sunday 07.00-20.00 hours	
Mean	47
Mode	47
Median	47

5.13. From reviewing the above histogram, 43dB has been selected to be representative of the night-time background sound level in this area.

Figure 4 Histogram of L_{A90} background sound pressure levels, Sunday 08.00 – 18.00 hours



5.14. Additional statistical analysis has been undertaken. As shown in Table 9, the mean, median, and modal values have been calculated:

Table 9 Statistical analysis of $L_{A90,15min}$ levels during likely Sunday delivery hours

dB, L_{A90} Sunday 08.00-18.00 hours	
Mean	48
Mode	50
Median	49

5.15. From reviewing the above histogram, 43dB has been selected to be representative of the night-time background sound level in this area.

5.16. Therefore, the following values are considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 37dB L_{A90} during the daytime period; and
- 30dB L_{A90} during the night-time period
- 43 dB L_{A90} between 07.00 and 20.00 hours Monday to Saturday
- 43 dB L_{A90} between 08.00 and 18.00 hours on Sunday

6.0 Residential noise assessment

Incident sound levels used in assessment

6.1. The measurement position was approximately 1m from the edge of the carriageway. The nearest façades of the proposed houses are significantly further from the road and it is therefore appropriate to apply a correction for the relative distances. In the case of the south façade it is also appropriate to make corrections for acoustic screening provided by the houses. A distance correction of 9dB, and a screening correction of 5dB for the south façade, is considered appropriate.

6.2. Octave band incident sound pressure levels for the residential façades have been calculated based on the measured data and the distance and screening corrections noted above. The data used in the assessment is given in Table 10.

Table 10 Predicted incident octave band sound pressure levels at residential façades

Façade	Period	Incident sound pressure levels (dB) at Octave Band Centre Frequencies (Hz)								
		63	125	250	500	1000	2000	4000	8000	dB(A)
North	Daytime $L_{eq,\ 16\ hours}$	56	53	51	50	54	48	41	35	56
	Night-time $L_{eq,\ 8\ hours}$	47	41	40	40	45	41	34	24	48
South	Daytime $L_{eq,\ 16\ hours}$	51	48	46	45	49	43	36	30	51
	Night-time $L_{eq,\ 8\ hours}$	42	36	35	35	40	36	29	19	43

Initial risk assessment

6.3. As noted in Table 10, the daytime incident noise levels are predicted to be between 56dB $L_{Aeq,16hr}$ on the north façade and 51dB $L_{Aeq,16hr}$ on the south façade, while night-time levels are in the range 48 dB $L_{Aeq,8hr}$ to 43 dB $L_{Aeq,8hr}$ at the same locations.

6.4. The noise levels at the residential façades are therefore are within the "low" ranges of noise levels in Figure 1 of the IoA ProPG document.

6.5. The ProPG document notes that:

> *At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS[5] which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.*

Building fabric assessment

6.6. In order to assess the suitability of the site for the proposed dwellings it is important to predict the internal noise levels within habitable rooms.

6.7. BS 8233:2014 indicates that typically an open window provides a sound reduction of approximately 15 dBA (i.e. the internal reverberant sound level is 15 dBA lower than the external incident sound level). The external noise levels across the site are such that the internal noise levels with open windows would be marginally higher than those recommended in Table 2, and therefore ventilation should not normally be provided by opening the windows.

6.8. The composite acoustic performance required of any portion of the building envelope will depend on its location relative to the principal noise sources around the site and the nature of the spaces behind it (noise criteria, size, room finishes etc.).

[5] Acoustic Design Statement (i.e. this report)

6.9. The variation in incident noise levels on the different façades, along with differences in internal layouts and size of glazed areas, implies that a number of different sound insulation performance levels may be required in order for a specific internal ambient noise level to be reached. Logistically, this could result in increased costs for the development due to bespoke solutions, effects on programme and increase of errors during construction.

6.10. Therefore, it is not practical to specify a large number of different external building fabric constructions and this is also not supported by national policy on noise.

6.11. The detailed calculation methodology described in BS 8233:2014 has been used in the assessment. Table 11 below presents the input data used to predict the resultant internal noise level in the habitable rooms. These calculations are based on the room dimensions shown on the project drawings referenced in **Appendix C**.

Table 11 Source data for the noise break-in assessment

Kitchen / living room	
Room Volume (m^3)	62
Room Type	Kitchen/living room
Room Furnishings	Curtains, sofa, part-timber floor finish
Area of window (m^2)	3.4
Area of external wall (m^2)	26
Bedroom	
Room Volume (m^3)	23
Room Type	Bedroom
Room Furnishings	Curtains, bed, timber floor finish
Area of window (m^2)	1.4
Area of external wall (m^2)	14

6.12. Based on the information above, and the noise spectrum data shown in Table 10, the resulting internal sound levels may be calculated. The results of the assessment are shown in Table 12. These predictions are based on the following typical glazing and ventilator constructions:

- Standard (e.g. 4/16/4 thermal double glazing) to all habitable rooms;
- Standard non-acoustic trickle ventilators to all habitable rooms;
- Traditional brick-block cavity walls with slate/tile roof and plasterboard ceiling under roof joists.

6.13. The minimum airborne sound insulation performance of each of these constructions is as set out in Table 13.

Table 12 Predicted internal sound pressure levels (closed windows)

Façade	Room type	Period/ Parameter	Internal sound level, dB	Criterion, dB	Excess, dB
North	Kitchen-living room	Daytime $L_{Aeq\ 16hr}$	24	35	-9
South	Bedrooms	Daytime $L_{Aeq\ 16hr}$	21	35	-14
		Night-time $L_{Aeq\ 8hr}$	12	30	-18

6.14. The minimum sound insulation values for the various building envelope constructions considered are as shown in Table 13.

Table 13 Proposed building envelope specifications

Envelope Specification	External building fabric element	Construction element	Sound reduction indices or Normalised Level Difference (for ventilators) dB at Octave band Centre Frequencies (Hz)				
			125	250	500	1k	2k
Standard glazing	Glazing configuration, glass mm/airgap mm/glass mm	4mm glass, 16 mm airgap, 4 mm glass	24	23	30	33	33
Non-acoustic trickle ventilator			32	32	31	33	31
Brick/block cavity wall			41	45	45	54	58

6.15. It should be noted that glazing configurations and other constructions described above are for guidance and costings purposes only. It will be the responsibility of the manufacturer to provide evidence of compliance with the required octave band sound reduction performances.

External noise levels

6.16. Gardens are to be provided to the south of the residential building, and are therefore screened from Forsyth Street. Daytime ambient noise levels would therefore be around 48dB $L_{Aeq\ 16hour}$, as noted in Table 10 for the south façade. Noise levels in the garden would therefore be below the guidance values in BS 8233:2014.

Conclusion

6.17. The assessment has demonstrated that, taking into consideration the provision of reasonable practicable measures (i.e. the provision of good quality thermal double glazing and non-acoustic trickle ventilators) adverse effects of noise can be minimised for the development proposals.

7.0 Retail store plant noise guidance

Nearest noise sensitive receptor

7.1. The nearest noise-sensitive receptor to the proposed plant area is the house immediately to the west of the site, on Inverugie Road (shown as Receptor R1 in **Appendix B**). This is approximately 14m from the plant area and may be screened from some or all of the plant by the boundary fence. For the purposes of this initial guidance assessment, however, it is assumed that the fence will provide no significant acoustic screening.

Proposed plant noise criteria

7.2. It is considered appropriate that the cumulative plant noise rating level of proposed plant should be controlled to a level that does not exceed the representative L_{A90} background sound level at the nearest residential property. This would result in, at worst, a 'low impact' according to BS 4142:2014 (depending on the context) and therefore avoid any adverse impact.

7.3. The cumulative noise level for the proposed plant at the nearest residential windows should not therefore exceed the limits shown in the table below:

Table 14 Proposed plant noise emissions level limits at noise sensitive residential receptors

Period	Cumulative plant rating noise level, dB(A)	Resulting internal NR level
Daytime (07.00 – 23.00 hours)	37	17
Night-time (23.00 – 07.00 hours)	30	10

7.4. Plant details are to be finalised. Plant noise spectrum data is therefore not available at present. For typical plant of the type used in stores of this kind, the NR level at 10m is (numerically) around 5 dB lower than the dBA value at 10m. The predicted resulting internal NR levels also include a 15dB reduction for a partially opened window, as described in BS 8233:2014.

Outline guidance - AC and refrigeration plant noise limits

7.5. Taking account of the distance between the plant and the nearest noise sensitive receptors, noise levels from the proposed refrigeration and AC plant should not exceed the following limits in order to demonstrate compliance with the criteria detailed in Table 14:

Table 15 Guidance on maximum AC and refrigeration plant noise emission limits

Plant	Period	Maximum plant noise emission level (L_{Aeq})
AC units (each, based on two operating)	Daytime (07.00 – 23.00 hours)	53dB at 1m*
	Night-time (23.00 – 07.00 hours)	-
Refrigeration plant (total)	Daytime (07.00 – 23.00 hours)	30dB at 10m
	Night-time (23.00 – 07.00 hours)	30dB at 10m

**Limits based on typical split AC units; refer to NSL for limits for VRF/VRV units*

7.6. The above limits are likely to be met with typical plant used at a store of this size.

8.0 Retail store delivery noise assessment

Deliveries

8.1. For stores of this type, main warehouse deliveries are typically made by vehicles no bigger than 12m rigid lorries. Each delivery will take no longer than one hour to complete, the deliveries would not be within the same hour, and no overlap would occur.

8.2. Smaller deliveries will be made via third party suppliers (bread, sandwiches, newspapers, etc.); however, the vehicles and loads associated with these deliveries are not anticipated to result in any significant noise impact, since they are smaller vehicles and metal roll cages are not used.

8.3. The proposed loading bay is on Forsyth Street, alongside the north elevation of the store. The loading bay location means that the vehicle does not need to reverse to arrive or leave, minimising the time on site and the manoeuvring required. Goods will be unloaded into the BOH by trolleys.

Nearest noise sensitive receptors

8.4. The nearest noise sensitive properties to the loading bay and BoH entrance are on the north side of Forsyth Street (Receptor R2 in **Appendix B**), approximately 14m from the loading bay, trolley route and entrance.

Sound pressure levels of activities associated with store deliveries

8.5. The sound pressure levels associated with refrigerated lorry deliveries were established by measurement of a delivery at a similar convenience store in operation. The measurements included all aspects of the delivery including, but not limited to, the arrival, unloading, movement of cages and the departure of the lorry. The sound pressure levels were normalised to a distance of 10m from the delivery area and have been converted to Sound Exposure Levels (SEL) for ease of comparison/calculation. Typical L_{Amax} levels were also established.

8.6. It should be noted that the example delivery represented a standard operation; the refrigeration unit was switched off as standard.

8.7. Table 16, below, details typical source noise levels, used within the assessment, with the data presented in terms of SEL and maximum individual noise event levels (L_{AFmax}).

Table 16 Reference noise data for delivery activities (at 10m)

Noise Source	SEL, dB(A)	L_{Afmax}, dB(A)
Lorry arrival	68	62
Unloading cages on to lift	71	74
Unloading pallets on to lift	75	73
Lift up	73	65
Lift down	71	71
Unloading cages into BoH	78	75
Lorry departure	75	68

Predicted impact

8.8. The information contained in Table 16 was used to 'build-up' a source noise level based on the number of activity events over the required assessment period using the following equation:

$$L_{Aeq,T} = SEL + 10.\log\left(\frac{1}{T}\right) + 10.log(N) \quad \text{(Equation 1)}$$

Where:
SEL is the L_{Aeq} over a one second period, and represents the noise energy from an event (e.g. cage movement) compressed into one second;
T is the reference time period in seconds; and
N is the number of movements in the time period, T.

8.9. The delivery noise level at the nearest receptor has been predicted. Full calculations are shown in **Appendix E** and are summarised in Table 17.

Table 17 Predicted delivery noise levels

Receptor	Predicted noise levels at window of most affected residential dwelling	
	$L_{Aeq,T}$, dB	Range of L_{Afmax} (dB)
R2, 33 Forsyth Street	53 $L_{Aeq,1hr}$	59-72

BS 4142:2014 delivery noise assessment

8.10. Table 18 below presents the initial assessment of the likely impact during the daytime period in accordance with the BS 4142:2014 methodology at the identified receptor:

Table 18 Assessment of predicted external delivery noise levels at Receptor R2 using BS 4142:2014 during the daytime

Results	Mon-Sat 07.00 – 20.00, Sunday 08.00 – 18.00	Relevant Clauses of BS 4142:2014	Commentary
Background Sound level	L_{A90} = 43dB	8.1, 8.2	Representative typical background sound level during permitted delivery period, determined from a range of measurements
Assessment made during the daytime, so the reference interval is one hour		7.2	
Specific Sound Level	$L_{Aeq,T}$ = 53dB	7.3.6	Calculations presented in Appendix E
Acoustic Feature Correction	6dB	9.2	Impulsivity (bangs and clatters) could be perceptible
Rating Level	(53+6) dB = 59dB		
Excess of Rating Level over background sound level	(59-43) dB = +16dB		
Context	Site is on a road with local traffic, including buses, producing short periods of high noise levels		
Assessment of impact:	Potential adverse impact		

8.11. The assessment indicates that, for deliveries made within the typical delivery periods as noted, the rating level is above the representative background sound level and there is therefore the possibility of an adverse noise impact.

8.12. From analysis of the noise survey data, the ambient ($L_{Aeq\ 15min}$) sound level during the delivery periods noted are between 59dB and 69dB Monday to Saturday and between 61dB and 67dB on Sunday. The predicted delivery specific sound level noted above would lead to an increase of no more than 1dB in the $L_{Aeq\ 1hour}$ sound level and would therefore represent, at worst, a "Minor" noise impact, according to the TAN methodology set out in Table 1.

Recommended Delivery Noise Mitigation

8.13. It is recommended that the store implements a noise management plan to reduce the noise impact of deliveries on the neighbours as much as possible. A typical set of mitigation measures is given below.

Noise Management Plan for deliveries

- Drivers contact the store prior to arrival to ensure staff are ready to assist;
- Deliveries are scheduled and agreed with the store to reduce to a minimum the time taken to deliver the goods and therefore limit potential for noise impact;
- Delivery doors are well maintained to minimise noise when opening / closing;
- Lorry engine and refrigeration is turned off as soon as practicable and they are not left running during deliveries;
- An isolating mat is placed under the tail/scissor lift to reduce the noise of the plates on the pavement or the loading bay;
- The radio in the lorry cabin is switched off / muted before arrival;
- All employees speak in hushed voices;
- All employees avoid going over drains and loose paving when moving cages.
- There is a general requirement for all drivers to minimise noise at all times;
- Delivery vehicles are driven around the area in a considerate manner, e.g. speed being kept to a practical minimum and all items properly fastened in order to ensure rattles and bangs are kept to a minimum;
- If a complaint arises, employees will follow a set of guidelines which set out how to deal with complaints quickly and effectively and to address any issues raised.

9.0 Industrial unit outline noise impact assessment

Likely source noise level

9.1. Operational noise sources within the Starter Unit will depend on its use. This could be a relatively quiet use, such as storage and light works, or a noisier car workshop or sheet metal workshop. It is reasonable to consider the latter as a worst-case.

9.2. Guidance published by the Health and Safety Executive[6] indicates that short-term noise levels due to the use of orbital sanders may be up to 97dB(A) at the operator's ear. Sheet metal workshops could have similar noise levels.

9.3. The following assessment is based on the unit operating only between 07.00 hours and 18.00 hours, Monday to Saturday.

Noise sensitive receptors

9.4. The nearest noise-sensitive receptors to the starter unit are at on the north side of Forsyth Street and Tulloch House (Receptors R2 and R3 respectively in **Appendix B**). The front windows of the nearest properties to the north are approximately 25m from the closest corner of the starter unit. The side windows of Tulloch House are approximately 14m from the closest corner of the unit.

Calculation methodology and assessment

9.5. The noise levels at the nearest residential receptors due to noise within the starter unit may be predicted by applying corrections for typical duration of operation during a worst-case hour, reverberant field corrections within the workshop, the sound insulation of the external building envelope of the workshop and the distance between the unit and the receptor. The likely impact of the noise source may then be assessed using the method described in BS 4142:2014 and the TAN impacts table.

9.6. It is understood that the proposed construction of the starter unit is lightweight cladding, with windows from Perspex or similar. The airborne sound insulation of these building elements will depend on the precise constructions and products used, but would typically be around R_w 30dB for the cladding and windows and R_w 20 dB for the roller shutter / sectional door. These values are at the low-end of the range of likely performance values; higher values would be achievable by internal linings, the use of double-glazed windows, and installation of high-performance doors, for example.

[6] HSG261 *Health and safety in motor vehicle repair and associated industries*

9.7. The predicted noise levels at the nearest receptors have been calculated in **Appendix F** and are summarised in Table 19.

Table 19 Predicted noise levels – breakout from industrial unit

Receptor	Predicted noise levels at window of most affected residential dwelling
	$L_{Aeq,T}$, dB
R2, Forsyth Street	37 $L_{Aeq,1hr}$
R3, Tulloch House	39 $L_{Aeq,1hr}$

9.8. Table 20 presents the assessment of the likely impact during the daytime period in accordance with the BS 4142:2014 methodology at Receptor R3, where the predicted breakout noise-level is highest. In accordance with the methodology in BS 4142:2014, the predicted rating noise level due to noise from the unit industrial unit is compared with the representative background sound level during the proposed periods at which those operations will take place (i.e. Monday to Saturday, 07.00 to 18.00 hours, as noted in Paragraph 5.16).

Table 20. Assessment of predicted external noise levels (08.00 to 18.00 hours)

Results	Mon-Sat 07.00 – 18.00	Relevant Clauses of BS4142:2014	Commentary
Background Sound level	L_{A90} = 43dB	8.1, 8.2	Representative typical background sound level determined from a range of measurements
Assessment made during the daytime, so the reference interval is one hour		7.2	
Specific Sound Level	$L_{Aeq,T}$ = 39dB	7.3.6	Calculations presented in Appendix F
Acoustic Feature Correction	10dB	9.2	Tonality of some tools could be perceptible; impulsivity may be clearly perceptible
Rating Level	(39+10) dB =49dB		
Excess of Rating Level over background sound level	(49-43) dB = +6dB		
Assessment of impact: Potential adverse impact (depending on context)		11	

9.9. This assessment shows that during a worst-case hour with the noisiest likely noise levels within the starter unit, the BS 4142:2014 rating level may be 6dB above the existing representative background sound level, when a pessimistic 10dB feature correction is included.

9.10. From analysis of the noise survey data, the ambient ($L_{Aeq\ 15min}$) sound level during the proposed hours of operation of the industrial unit as noted are between 59dB and 69dB Monday to Saturday. The predicted specific sound level noted above would lead to less than 0.1 dB increase in the $L_{Aeq\ 1hour}$ sound level and would therefore represent, "No change", according to the TAN methodology set out in Table 1.

10.0 Discussion of results and uncertainties

10.1. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- The measurement of the background sound levels was taken over a 72-hour weekend period.
- The meter and calibrator used have a traceable laboratory calibration and was field calibrated before and after the measurements.
- Uncertainty in the calculated impacts has been reduced by the use of well-established calculation methods.

11.0 Summary

11.1. Noise Solutions Limited has been commissioned by Springfield Real Estate Management Limited to undertake a planning stage noise assessment for a proposed mixed-use development at Forsyth Street, Hopeman.

11.2. The results of the assessments were analysed and reviewed in line with the aims and advice contained within the relevant planning policies and recognised Standards and guidance.

11.3. The external building fabric assessment found that within all assessed rooms, the calculated internal noise meets the guidance in recognised Standards and professional guidance. The assessment has demonstrated that taking into consideration the provision of reasonable practicable measures (i.e. the provision of trickle ventilators for background ventilation and good quality thermal double glazing) adverse effects of noise can be minimised for the residential development proposals. The site can, therefore, be considered suitable for residential development.

11.4. Guidance on the maximum noise emissions from the proposed plant has been provided. NSL should be consulted once the final layout/selections have been confirmed.

11.5. For main store deliveries made between 07.00 hours and 20.00 hours Monday to Saturday and between 08.00 hours and 18.00 hours on Sunday, there would be no worse than a "minor" noise impact, as assessed using the method described in the TAN guidance. The impact may be minimised by implementation of an appropriate noise management plan.

11.6. For the noisiest likely activities within the start unit, between 07.00 hours and 18.00 hours Monday to Saturday, there would be "no change" as assessed using the method described in the TAN guidance.

11.7. Based on the findings of this assessment, noise should not be grounds for refusal of planning permission for the proposed development.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Aerial photograph of site with overlaid development plan

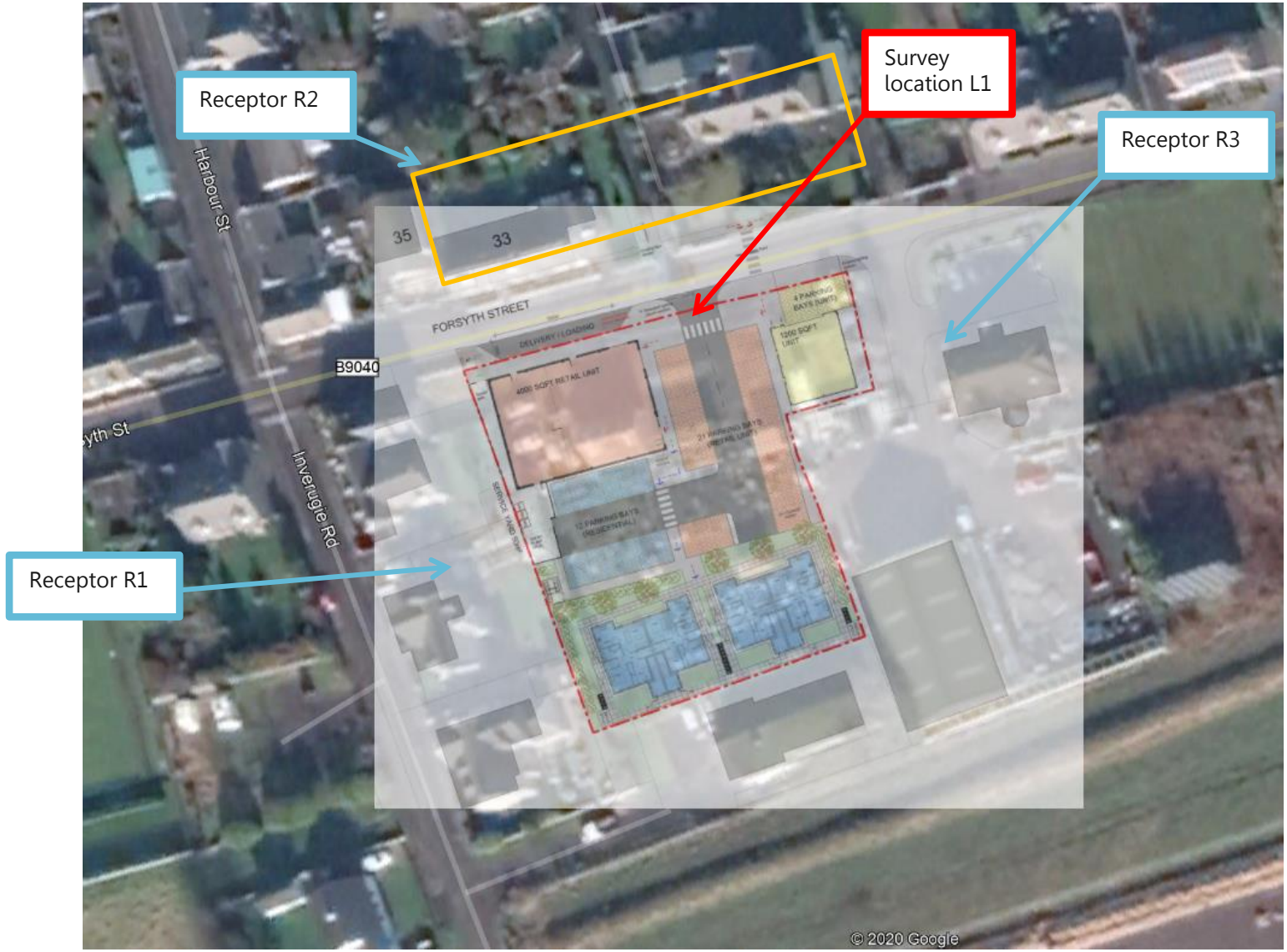
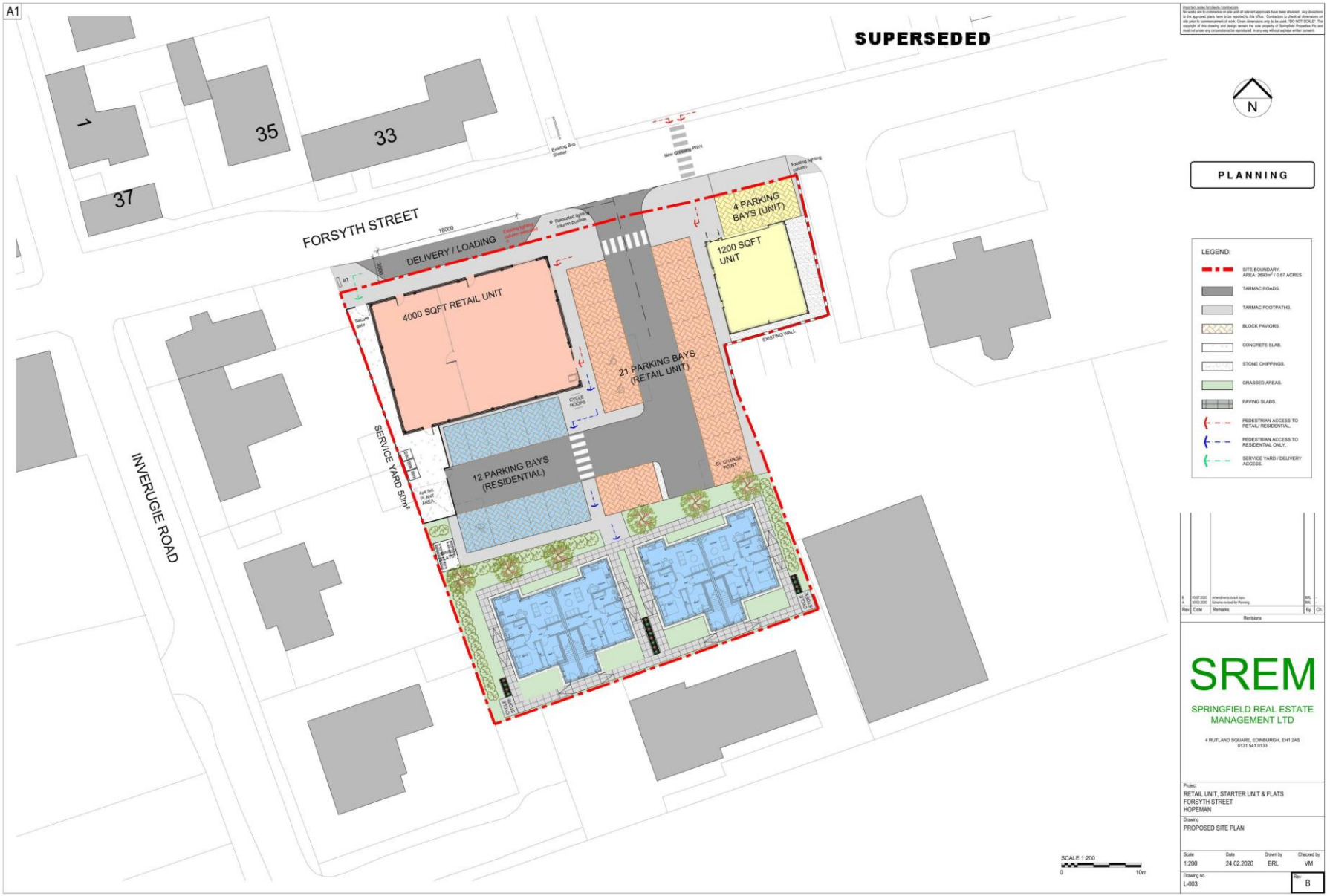
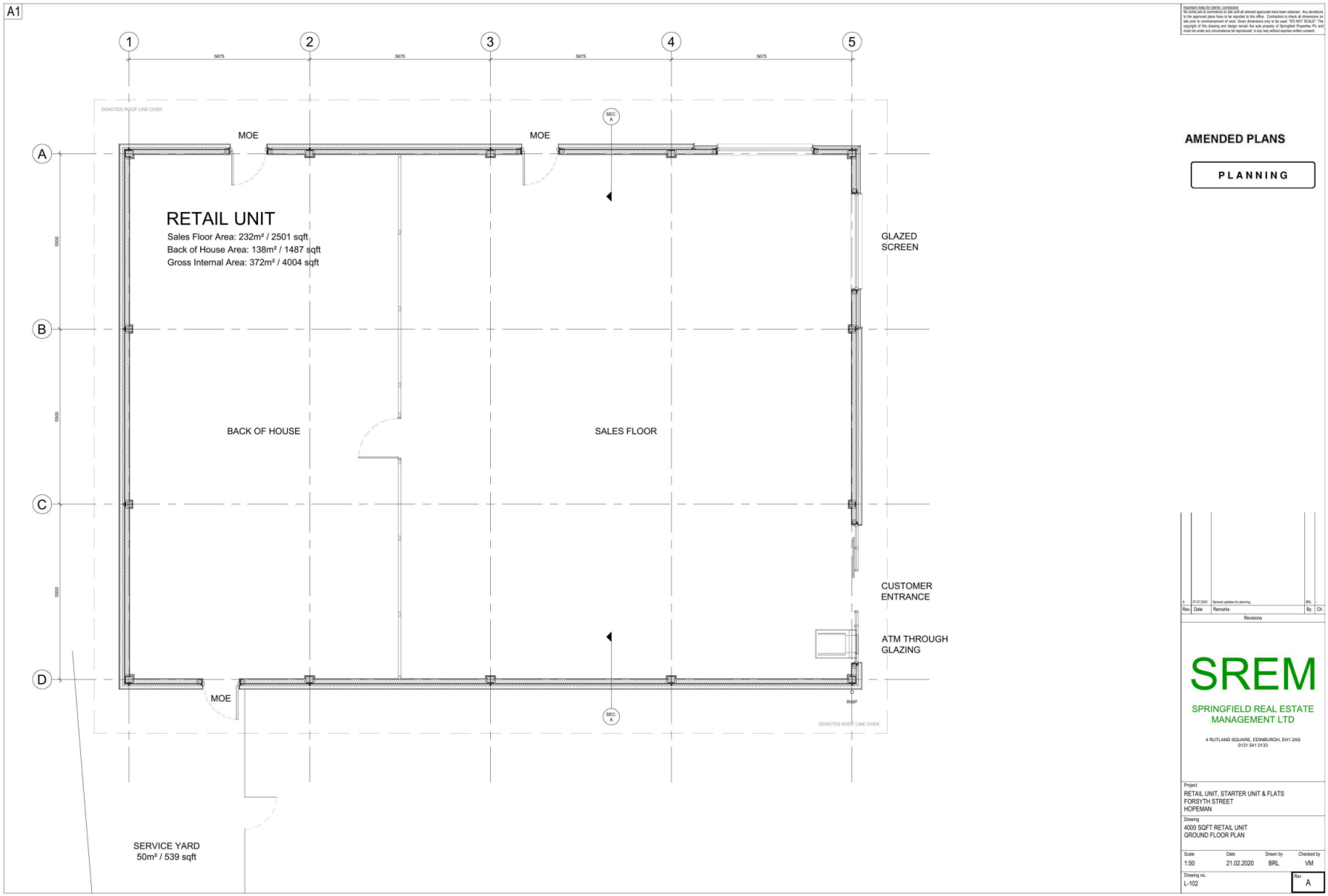


Image © Google 2020

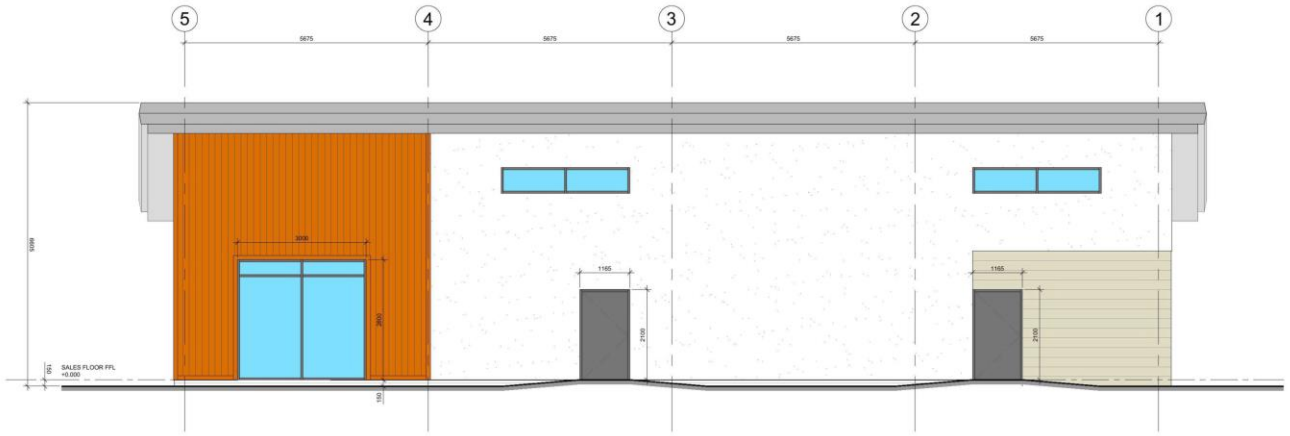
Appendix C Development plans and elevations



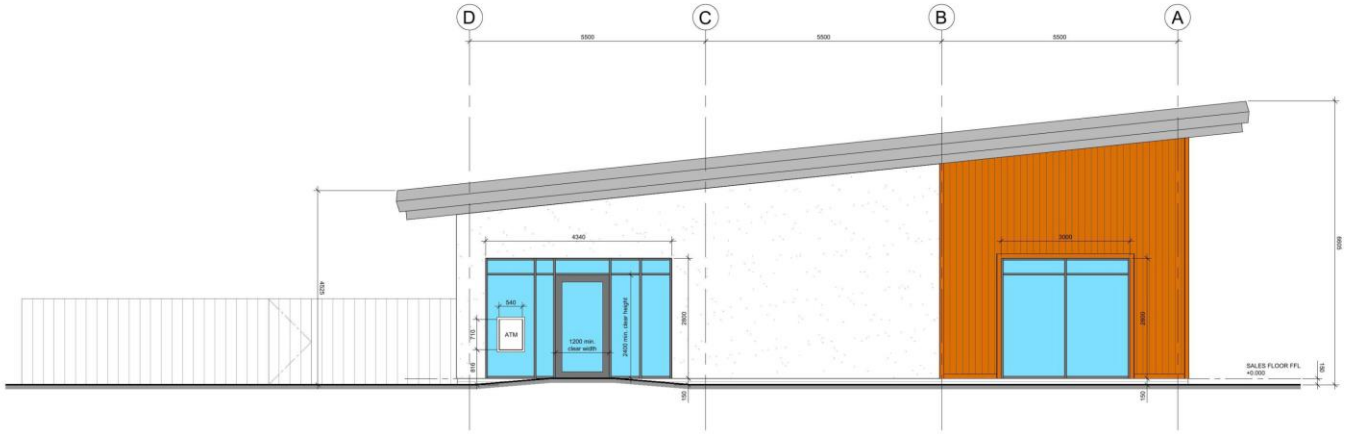

A1
8813
Rear Elevation 1:100
Side Elevation 1:100
Front Elevation 1:100
Side Elevation 1:100
PLANNING
0m 2 4 6 8
scale bar 1:100
0m 1 2 3 4
scale bar 1:50
FINISHES LEGEND:
NORDIC SPRUCE VERTICAL SHIPLAP EXTERNAL GRADE TIMBER CLADDING BOARDS
MARLEY 'EDGEMERE' CONCRETE TILE SMOOTH GREY
20mm THICK DRY DASH K-REND FINISH TO EXTERNAL WALLS. COLOUR: WHITE.
CAITHNESS STONE FEATURE TO EXTERNAL WALLS.
RAL 7016 GREY UPVC WINDOWS
RAL 7016 GREY COMPOSITE DOORS
RAL 7016 UPVC SOFFIT AND FASCIA
15436
13165
Kitchen
Lounge
Lounge
Kitchen
Bath
Bath
Hall
C
C
Hall
W
W
W
W
Bed 2
Bed 1
Bed 1
Bed 2
Ground Floor Plan 1:50
15436
13165
Kitchen
Lounge
Lounge
Kitchen
Bath
Bath
C
Hall
Hall
C
W
W
W
W
Bed 2
Bed 1
Bed 1
Bed 2
First Floor Plan 1:50
AMENDED PLANS
Rev. Date Remarks By Ch.
Revisions
SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133
Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN
Drawing
CAWDOR COTTAGE APARTMENTS
PLANNING SUBMISSION PLANS AND ELEVATIONS
Scale 1:50 / 1:100
Date 10/07.2020
Drawn by SM
Checked by BW
Drawing no. L-300
Rev –


A1
1
2
3
4
5
5675
5675
5675
5675
A
B
C
D
5500
5500
5500
DENOTES ROOF LINE OVER
MOE
MOE
MOE
SEC. A
RETAIL UNIT
Sales Floor Area: 232m² / 2501 sqft
Back of House Area: 138m² / 1487 sqft
Gross Internal Area: 372m² / 4004 sqft
BACK OF HOUSE
SALES FLOOR
GLAZED SCREEN
CUSTOMER ENTRANCE
ATM THROUGH GLAZING
RAMP
SERVICE YARD
50m² / 539 sqft
AMENDED PLANS
PLANNING
Rev Date Remarks By Ch.
Revisions
SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133
Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN
Drawing
4000 SQFT RETAIL UNIT
GROUND FLOOR PLAN
Scale 1:50
Date 21.02.2020
Drawn by BRL
Checked by VM
Drawing no. L-102
Rev A

A1



FORSYTH STREET ELEVATION



STORE ENTRANCE ELEVATION

AMENDED PLANS

PLANNING

FINISHES LEGEND:

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- NORDIC SPRUCE VERTICAL SHIPLAP EXTERNAL GRADE TIMBER CLADDING BOARDS
- 20mm THICK DRY DASH K-REND FINISH TO EXTERNAL WALLS. COLOUR: WHITE.
- CAITHNESS STONE FEATURE TO EXTERNAL WALLS.

Rev	Date	Remarks	By	Ch.
A	07.07.2020	General updates for planning	BRL	

Revisions

SREM

SPRINGFIELD REAL ESTATE MANAGEMENT LTD

4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN

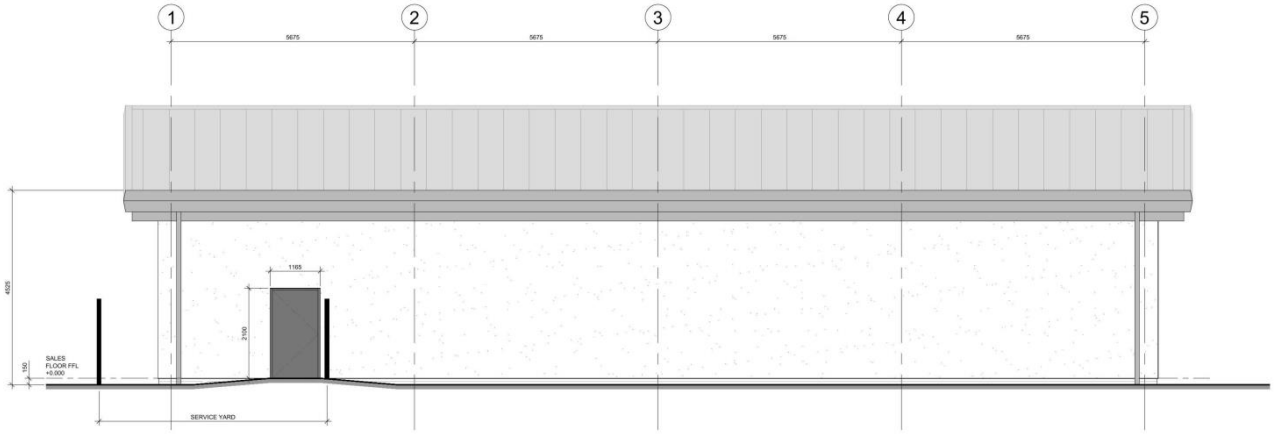
Drawing
4000 SQFT RETAIL UNIT
ELEVATIONS
SHEET 1

Scale	Date	Drawn by	Checked by
1:50	21.02.2020	BRL	VM

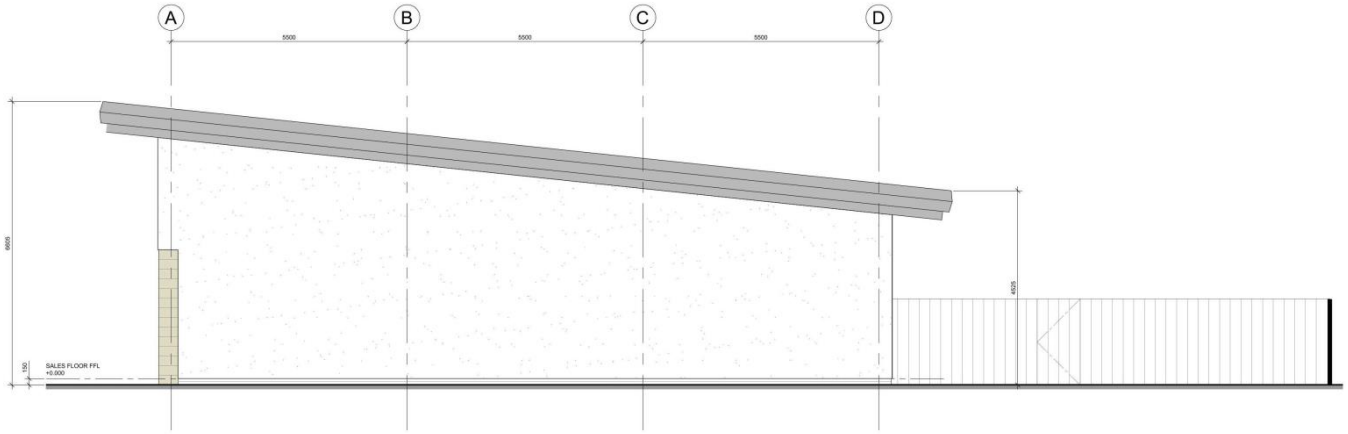
Drawing no. L-106

Rev A

A1



CAR PARK/ SERVICE YARD ELEVATION



GABLE ELEVATION

AMENDED PLANS

PLANNING

FINISHES LEGEND:

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- NORDIC SPRUCE VERTICAL SHIPLAP EXTERNAL GRADE TIMBER CLADDING BOARDS
- 20mm THICK DRY DASH K-REND FINISH TO EXTERNAL WALLS. COLOUR: WHITE.
- CAITHNESS STONE FEATURE TO EXTERNAL WALLS.

Rev	Date	Remarks	By	Ch.
A	07.07.2020	General updates for planning	BRL	

Revisions

SREM

SPRINGFIELD REAL ESTATE MANAGEMENT LTD

4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN

Drawing
4000 SQFT RETAIL UNIT
ELEVATIONS
SHEET 2

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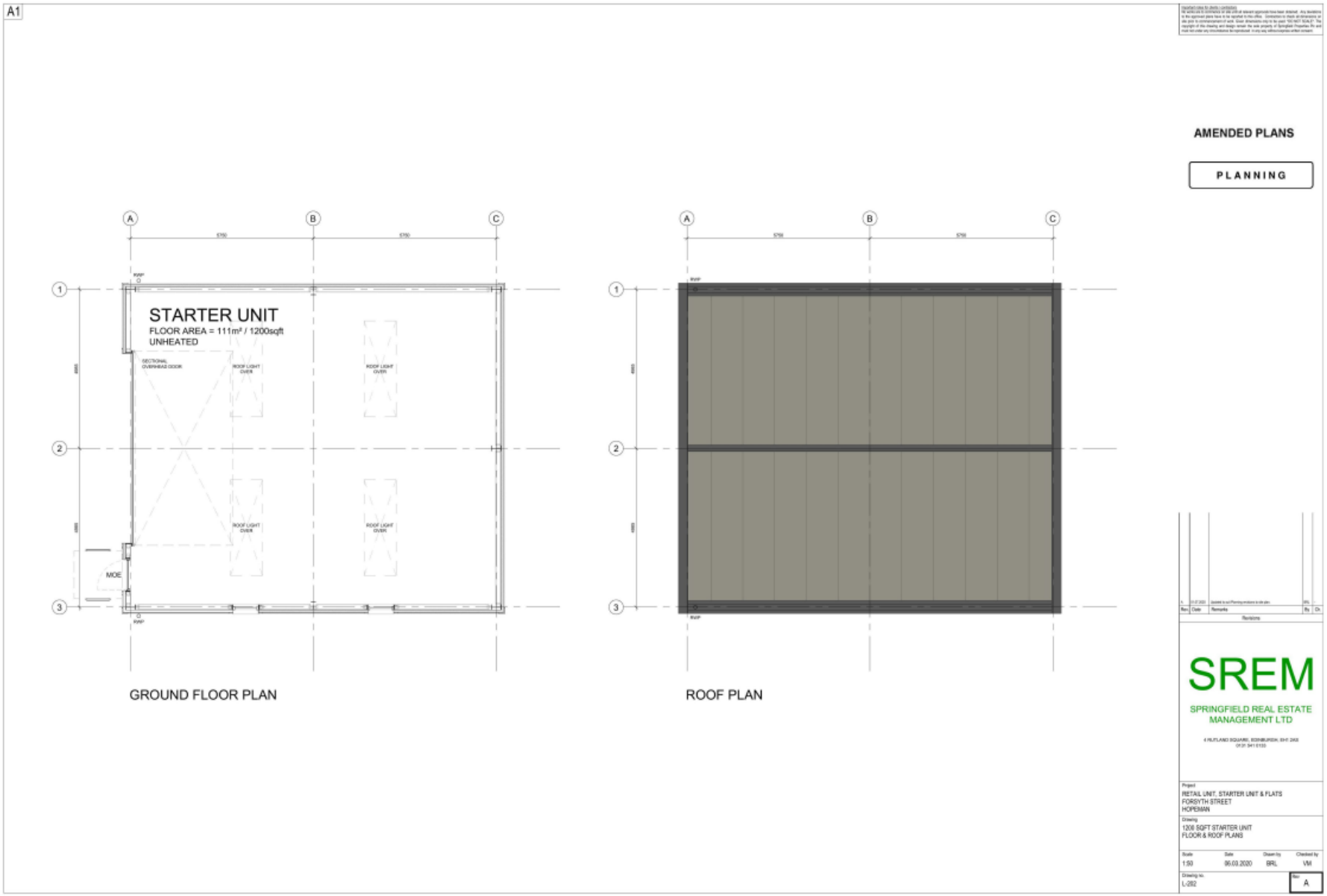
Drawing no.
L-107

Rev
A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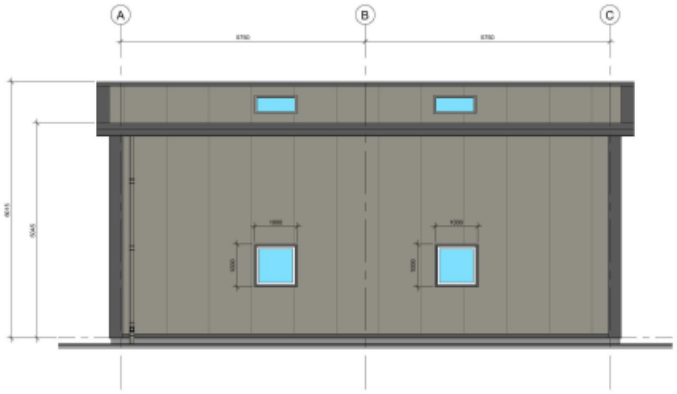
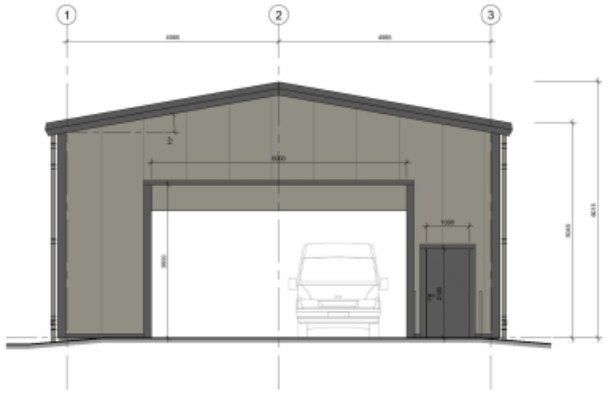
PLANNING
STARTER UNIT
FLOOR AREA = 111m² / 1200sqft
UNHEATED
GROUND FLOOR PLAN
ROOF PLAN
SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN
1200 SQFT STARTER UNIT
FLOOR & ROOF PLANS
1:50
06.03.2020
BRL
VM
L-282
A

A1



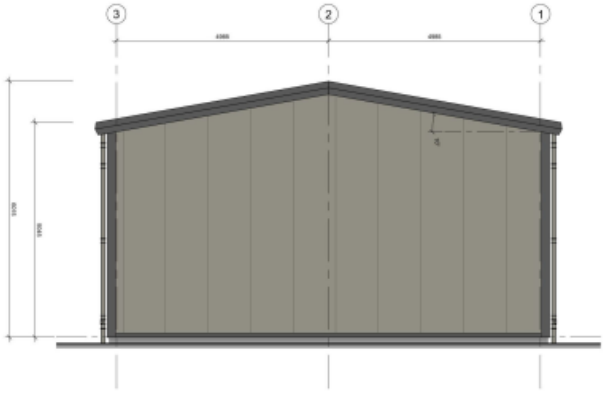
CAR PARK ELEVATION



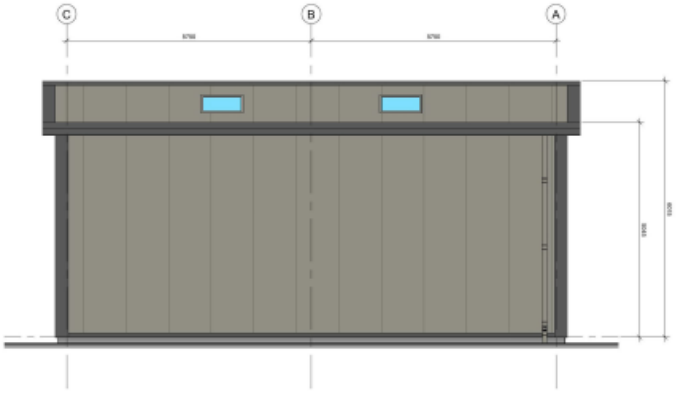
FORSYTH STREET ELEVATION

AMENDED PLANS

PLANNING



GABLE ELEVATION



REAR ELEVATION

Revisions

SREM

SPRINGFIELD REAL ESTATE MANAGEMENT LTD

Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN

Drawing
1306 SQFT STARTER UNIT
ELEVATIONS

Scale	Date	Drawn by	Checked by
1:50	06.03.2020	BRL	VM

Drawing no. L-285 Rev A

Appendix D Environmental sound survey

Details of environmental sound survey

D.1 Measurements of the sound pressure levels at the site were undertaken between 12.30 hours on Friday 21st August and 12:30 hours on Monday 24th August 2020.

D.2 The sound level meters were programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive 15-minute sample periods for the duration of the survey.

Measurement position

D.3 Unattended measurements were made at position L1 shown in **Appendix B**. The meter was secured to a lamp column with the microphone approximately 3m above the ground.

D.4 In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

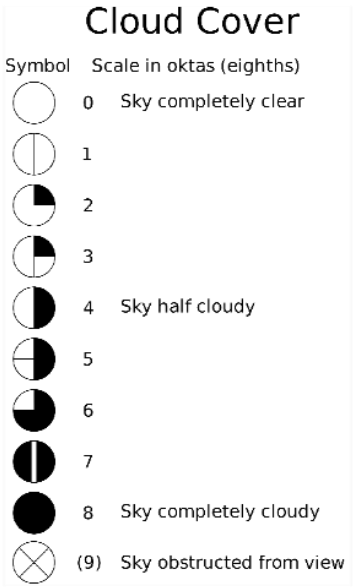
Equipment

D.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Location	Description	Model / serial no.	Calibration date	Calibration certificate no.
L1	Class 1 Sound level meter	Svantek 977 / 36190	16/07/2020	TCRT20/1383
	Condenser microphone	ACO Pacific 7052E / 57366		
	Preamplifier	Svantek SV12L / 41504		
	Calibrator	Svantek SV33A / 73430	15/07/2020	TCRT/1380

Weather Conditions

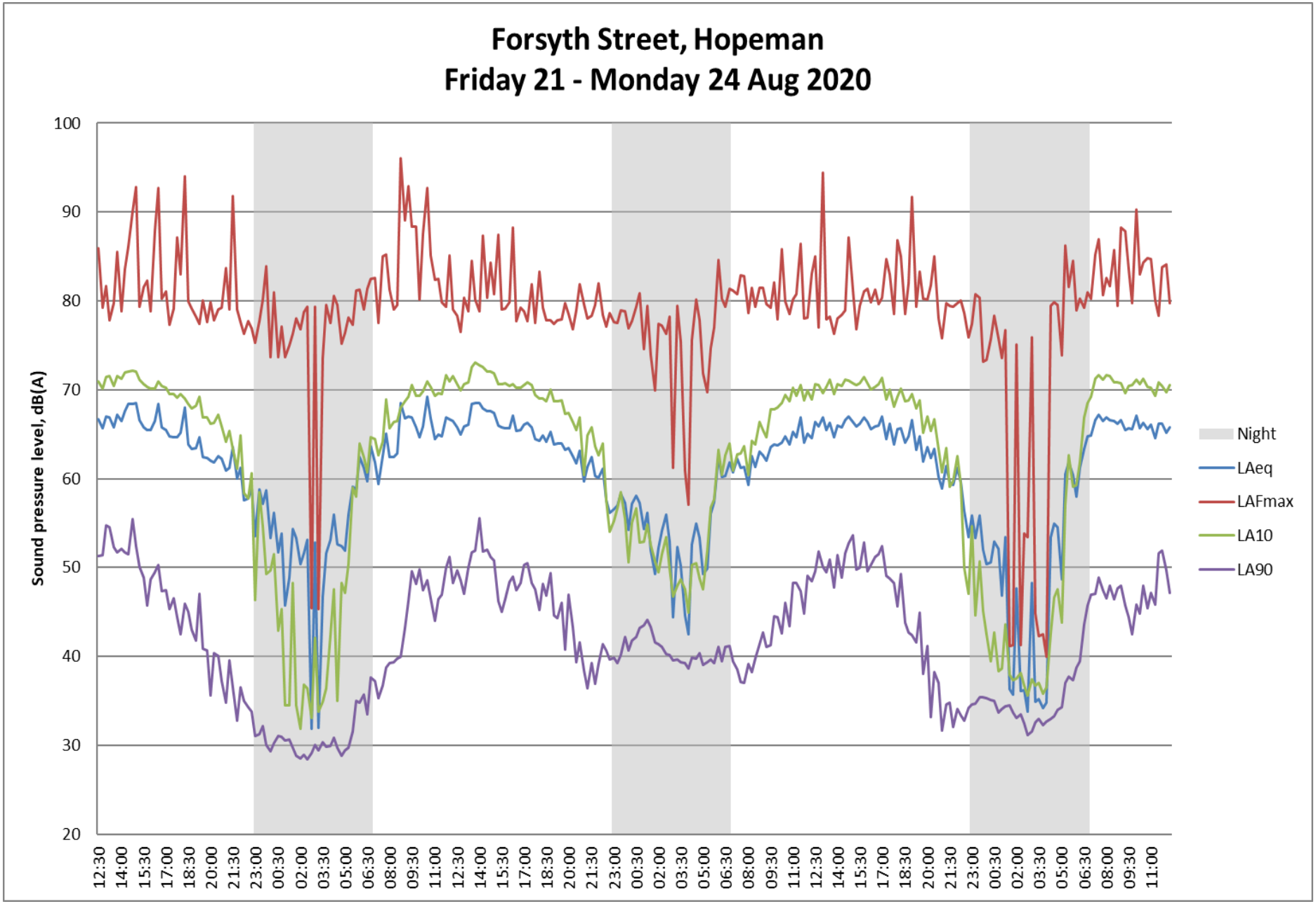
D.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	12:30 21 Aug 2020-12:30 24 Aug 2020	Temperature (°C)	17	14
		Precipitation:	Light	No
		Cloud cover (oktas - see guide)	6	2
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	2	1
		Wind Direction	NW	NW
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results and observations

D.7 The noise climate at the measurement position was dominated by local road traffic, including buses, with aircraft from RAF Lossiemouth occasionally audible.

D.8 The results of the unattended survey are presented in a time history graph overleaf.


Forsyth Street, Hopeman
Friday 21 - Monday 24 Aug 2020
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
20
12:30
14:00
15:30
17:00
18:30
20:00
21:30
23:00
00:30
02:00
03:30
05:00
06:30
08:00
09:30
11:00
12:30
14:00
15:30
17:00
18:30
20:00
21:30
23:00
00:30
02:00
03:30
05:00
06:30
08:00
09:30
11:00
Night
LAeq
LAFmax
LA10
LA90

Appendix E Delivery noise calculations

Receptor R2

Activity	Measured noise levels		Correction for no. of occurrences		Distance correction		Resultant SEL at receptor (dB)	Resultant L_{Amax} at receptor (dB)
	SEL @ 10m	L_{Amax} @10m	No. of occurrences	Correction (dB)	Distance (m)	Correction (dB)		
Lorry arrival	68	62	1	0	14	-3	65	59
Unloading cages on to lift	71	74	10	10	14	-3	78	71
Unloading pallets on to lift	75	73	10	10	14	-3	82	70
Lift up	73	65	10	10	14	-3	80	62
Lift down	71	71	10	10	14	-3	78	68
Trollies moved from lorry to store entrance	78	75	10	10	14	-3	85	72
Lorry departure	75	68	1	0	14	-3	72	65
						Cumulative SEL:	89	
						$L_{Aeq\ (1\ hour)}$:	53	
						Range of L_{Amax}:		59-72

Appendix F Noise from industrial starter unit

Noise break-out to Receptor R2

Reference		dB(A)	Notes
Noise level at operator's ear, dB(A)	Sander	97	
Reverberant field correction within workshop, dB		-5	Based on workshop dimensions
On-time correction	30min / hour	-3	Worst-case operation in noisiest hour
Reverberant sound pressure level within workshop, dB(A)	$L_{Aeq, 1hr}$	89	
Sound reduction of building envelope, dB R_w		-20	Typical roller shutter / sectional door
Wall area correction, dB	$22m^2$	+13	Door 6m x 3.6m
Inside-outside correction, dB		-6	
Sound power level of building envelope, dB(A)		76	
Distance correction to receiver, dB	25m	-39	Nearest windows with a view of the door
Resultant workshop noise level at receptor, dB(A)		37	

Noise break-out to Receptor R3

Reference		dB(A)	Notes
Noise level at operator's ear, dB(A)	Sander	97	
Reverberant field correction within workshop, dB		-5	Based on workshop dimensions
On-time correction	30min / hour	-3	Worst-case operation in noisiest hour
Reverberant sound pressure level within workshop, dB(A)	$L_{Aeq, 1hr}$	89	
Sound reduction of building envelope, dB R_w		-30	Typical for lightweight cladding
Wall area correction, dB	100m^2	+20	Two elevations visible from receptor
Inside-outside correction, dB		-6	
Sound power level of building envelope, dB(A)		73	
Distance correction to receiver, dB	14m	-34	
Resultant workshop noise level at receptor, dB(A)		39	

NORTH
PLANNING & DEVELOPMENT

North Planning & Development
2nd Floor
Tay House
300 Bath Street
Glasgow G2 4JR

06 November 2020

Moray Council
Planning Department

Dear Sir/Madam

PLANNING APPLICATION 20/00474/APP

DEMOLISH EXISTING SERVICE STATION AND GARAGE AND ERECT RETAIL UNIT, LIGHT INDUSTRIAL UNIT AND 2 NO. BLOCKS OF RESIDENTIAL FLATS AT HOPEMAN SERVICE STATION, FORSYTH STREET, HOPEMAN

Springfield Real Estate Management Ltd have instructed North Planning & Development to review and respond to the Bidwells Further Comments relative to the above application, as provided by email on the 3rd November 2020.

As set out in our earlier Retail Planning Statement and letter of 18th September 2020, one of the most important considerations in this matter is the lack of any town centre within Hopeman or any of the other towns in the catchment area of the proposed new retail store, as that establishes a position where there is no planning policy that affords primacy to existing stores and/or that requires other sites within the catchment to be considered in the manner of a sequential assessment.

Notwithstanding that, the suggestion made by Bidwells, that evidence should be provided of other sites having been considered, indicates that the principle of retail development in Hopeman is considered acceptable, otherwise why ask for other sites to be considered. That the Forsyth Street site is not in their opinion the "optimum" is not material to the consideration of the Springfield application.

Bidwells also refer to the 2020 LDP and Hopeman Caravan Park "being capable of providing ancillary services to appropriate tourist development including uses such as a shop in the village". Whilst it is unclear if capacity, impact and/or sequential assessments were carried out to support this statement in the LDP, it does nevertheless indicate that the Council is supportive of additional retail provision within Hopeman.

Our Retail Planning Statement defines a catchment area – which has not been questioned – and we demonstrated that there is convenience goods expenditure of at least £4.85m within the Hopeman catchment, not accounting for tourist expenditure that likely occurs, and also that the existing shops in the town have a combined average turnover of £1.38m. Setting aside the fact that none of the existing stores are within a town centre, we nevertheless applied £1.38M of expenditure to these stores, and that leaves at least £3.47m remaining. Most of tht £3.47M likely currently leaks from the catchment to larger stores in Elgin and/or Forres, with consequent car trips and carbon impacts, linked trips benefits to those locations and jobs being supported there rather than in Hopeman. The

remaining £3.47M of expenditure is available for drawing back to the catchment, and as the proposed retail store is predicted to have a turnover £2M there is at least £1.47M of expenditure still available with the proposed store in place.

With regards to the comments made by Bidwells about the Floorspace Split we would reiterate that the intended occupier of the proposed retail unit is the Co-op, and in our capacity as planning consultant acting for the Co-op acting across Scotland we know that 70/30 is a typical floorspace split across all new Co-op units. This is supported by the Co-op store at Lhanbryde – also in Moray Council area – with the committee report for that application (ref. 15/02252/APP) confirming the sales/trading space in that store is 189 sqm and the back of house/storage is 86sqm, which equates to a 69%/31% split, which is essentially 70/30. The Bidwells assertion that this floorspace split is low and not representative is not supported by this local, recent, and directly comparable or any other evidence.

The Bidwells Further Comments say that it is “difficult to make direct comparisons to the Co-op application in Lhanbryde”, but we cannot agree with this as there are several relevant and straightforward comparisons to make between the two, and we set these out in detail in our earlier letter. By way of summary, the Lhanbryde Co-op is an equivalent size of store to that now proposed in Hopeman, in a town with similar population, where there is no town centre designation, and with a broadly similar existing number of shops. The Lhanbryde Co-op now exists and trades alongside the previously existing shops without any closures having resulted. These comparisons and provide compelling evidence to support the case we have made for permission to be granted for an equivalent new Co-op convenience retail store in Hopeman.

I trust that the content of this letter and earlier submissions will be considered by the Council when determining this application.

Yours sincerely

David Campbell MRTPI
Director
North Planning & Development

david@northplan.co.uk
T. 0141 212 2627

DRUMMOND BLACK CONSULTING LTD

Springfield Real Estate Management (SREM) Ltd.

Proposed Mixed Use Development
Forsyth Street, Hopeman

Combined Stage 1 & 2 Road Safety Audit

Report No. D00041 – RSA2

4 Kempston Place
South Queensferry
Edinburgh,
EH30 9QW

Date: 18 January 2021

DOCUMENT CONTROL

Document:	Combined Stage 1 & Stage 2 Road Safety Audit
Project:	Proposed Mixed Use Development, Forsyth Street, Hopeman
Client:	SREM
Job Number:	D00041
File Origin:	C:\DBC Projects\D00041 - Forsyth Street, Hopeman\Reports\Forsyth St Hopeman RSA St1_2 (For Issue).docx

Document Checking:

Primary Author	Richard Pearson	Initialled:	RP
Contributor		Initialled:	
Review By	Kevin Nicholson	Initialled:	KN

Issue	Date	Status	Checked for Issue
1	18 January 2021	For Issue	KN

Contents

Appendices

1 Introduction

1.1 This report results from a Combined Stage 1 & Stage 2 Road Safety Audit carried out on the proposed mixed-use development on the south side of Forsyth Street, Hopeman at the request of Springfield Real Estate Management (SREM) Ltd. on behalf of The Moray Council (TMC) as the Overseeing Organisation. The project comprises of a simple priority junction access (to replace the existing 2 former garage forecourt accesses) to access parking for 2 retail units and 8 residential apartments. As part of the proposal a crossing will be provided across Forsyth Street.

1.2 The scope of the Road Safety Audit is to review the access junction and internal layout of the proposed scheme.

1.3 A road safety audit brief was provided by SREM in the form of an instructional email containing design drawings, street engineering review and a Transport Statement. It is not general practice of TMC to approve the audit brief and audit team prior to an audit, however the audit is considered acceptable, so long as qualification criteria and process of national standard has been followed. The Audit Team accepted the brief.

1.4 This site is a former Garage/Petrol Filling Station. Forsyth Street is a long straight road subject to a 30-mph limit with footways and street lighting on both sides of the street at the location of the site. There is a bus stop directly opposite the site (eastbound) and westbound bus stops either side of the site.

1.5 An initial investigation of collision history of the location shows no collisions in the past 5 years in the immediate vicinity of the site.

1.6 The audit was carried out by the following:

Audit Team Leader

Richard Pearson BSc (Hons) CMILT MCIHT MSoRSA
HE Approved Certificate of Competency
Director, Drummond Black Consulting Ltd.
Edinburgh

Audit Team Member

Kevin Nicholson BSc CMaths MCIHT FSoRSA
HE Approved Certificate of Competency
Director, Nicholson Sloan Consultancy Limited

1.7 The audit took place during January 2021 and comprised of a desk top study of the plans and reports provided, which are listed in **Appendix A.** A site visit was also carried out at 12 noon on the 13th January 2021. The site visit was carried out by the Audit Team Leader alone as a result of COVID restrictions in place. At the time of the site visit it was overcast and the road surface was damp from earlier rain. Traffic was light.

1.8 The terms of reference of the audit are generally as described in DMRB Volume 5 Section 2 GG119 (Rev 2) "Road Safety Audit". As this standard is primarily focused on the strategic road network and TMC does not have its own standard, the Audit Team has followed guidance from the CIHT Guidelines for Road Safety Audit on implementing the standard as appropriate to this scheme. The points not followed in particular are the approval of audit team and brief (See para. 1.3) and the Audit Team deals directly with the Design Team and not the Overseeing Organisation.

1.9 The team has examined and reported only on the road safety implications of the scheme and has not examined or verified the compliance of the design to any other criteria. Reference may be made to certain design standards however this report is not intended to provide a design check. The team has examined and reported only on the road safety implications of the chosen design. No attempt has been made to comment on the justification of the scheme or the appropriateness of the design. Consequently, the Auditors accept no responsibility for the design or the construction of the scheme.

1.10 All of the problems described in this report are considered by the audit team to require action in order to improve the safety of the scheme and minimise the likelihood of a collision. The location of the site and the locations of any specific problems are referenced on the plans in **Appendix B**.

2 Items Raised at Previous Road Safety Audits

2.1 The Audit Team has not been advised of any previous Road Safety Audits on this scheme.

3 Items Raised at this Combined Stage 1 & Stage 2 Road Safety Audit

NON-MOTORISED USERS

3.1 PROBLEM

Location: Proposed crossing facilities.

Summary: The absence of dropped kerbs and tactile paving could lead to pedestrians tripping and falling or being struck by vehicles.

Dropped kerbs and tactile paving are not shown with the proposed crossing facilities. Notwithstanding that the Local Highway Authority may have a policy to install dropped facilities only in areas of heavy pedestrian traffic, if these are not provided, wheelchair users could attempt to cross and find themselves stranded in the carriageway on the exit side, increasing the risk of collisions and of overturning. Visually impaired pedestrians could be confused as to where to cross, again increasing the risk of trips or of conflicts with vehicles.

RECOMMENDATION

It is recommended that dropped kerbs and tactile paving are provided at the crossing facilities.

3.2 PROBLEM

Location: Proposed Disabled parking.

Summary: Absence of dropped kerbs at disabled parking bays.

No kerbing details are shown on the design to indicate the location of the proposed dropped kerbs. It is not clear if a dropped kerb is to be provided adjacent to the disabled parking bays within the car park. The absence of dropped kerbs to assist mobility impaired users to gain access to the footway could be hazardous and result in trip and fall accidents as well as a risk of wheelchair users overturning.

RECOMMENDATION

It is recommended that dropped kerbs are provided adjacent to the disabled parking bays.

3.3 PROBLEM

Location: Westbound bus stops on Forsyth Street.

Summary: Absence of footway connections to westbound bus stops.

There is currently no direct footway connection to either of the westbound bus stops. The absence of provision could result in pedestrians walling on the carriageway or on the grass verge, risking being struck by a vehicle or risking trip and fall accidents.

Figure 1: Route to westbound bus stops

RECOMMENDATION

It is recommended that a direct footway connection is provided. It is understood that TMC have plans for a footway to the west of the site. The design team should discuss this with them and ensure this co-ordinates with the development proposals.

3.4 PROBLEM (read in conjunction with 3.5 below)

Location: Proposed crossing facilities on Forsyth Street.

Summary: Insufficient detail of proposed crossing.

The drawings (and Transport Statement) specify the provision of zebra crossing facilities, however, the drawings do not include full details of the required beacons and road markings for these types of crossing. The absence of markings and beacons can result in drivers failing to stop and colliding with pedestrians. The absence of zig-zag markings could also result in parking in close proximity of the crossing, restricting visibility.

RECOMMENDATION

It is recommended that the crossing is designed with the full markings and beacons as required for these crossing types.

3.5 PROBLEM (read in conjunction with 3.4 above)

Location: Proposed crossing facilities on the development access road.

Summary: The location of the crossing could increase the risk of collisions.

The Transport Statement and drawings identify a Zebra crossing for the access road. If this in installed to full specification, motorists will be obliged to give way to pedestrians once they have established precedence by stepping on to the crossing. This could result in drivers of long turning vehicles braking suddenly and overhanging the carriageway on Forsyth Street, with the attendant risk of collisions involving westbound vehicles.

RECOMMENDATION

It is recommended that the crossing point is installed as an informal facility.

3.6 PROBLEM

Location: Proposed Forsyth Street crossing.

Summary: Potential collisions with pedestrians and manoeuvring vehicles.

The proposed zebra crossing in close proximity to the access to the 4 parking bays could potentially create a risk of collisions between pedestrians and manoeuvring vehicles. The Audit Team are particularly concerned where vehicles may be reversing out of spaces where they could collide with pedestrians either on the crossing or on the footway. Visibility for these drivers may also be restricted by the wall to the east of the parking bays.

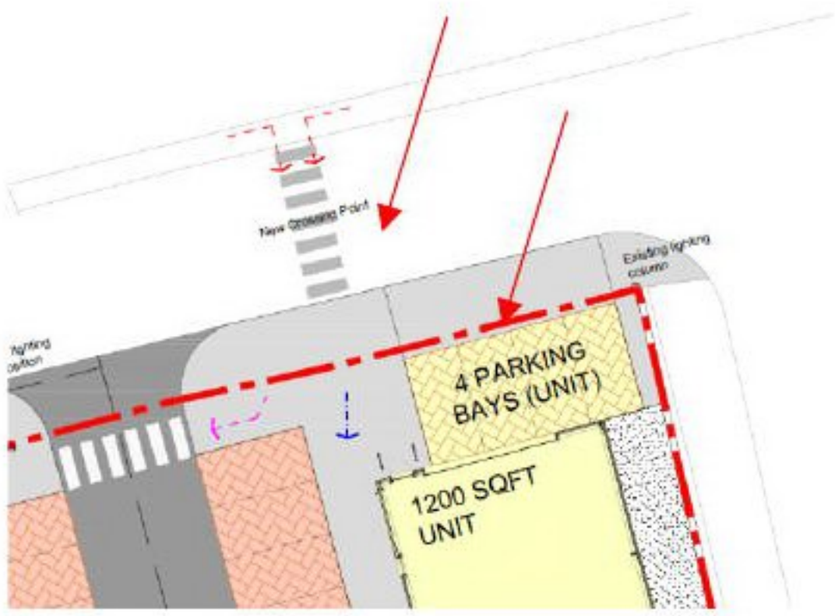


Figure 2: Parking Bays

RECOMMENDATION

It is recommended that the parking bays are moved directly adjacent to the carriageway with the footway behind. It is also recommended the crossing be relocated slightly east to allow space for a reversing car to not encroach onto the crossing point.

SIGNING, ROAD MARKINGS & LIGHTING

3.7 PROBLEM

Location: Proposed access and crossing on Forsyth Street

Summary: Increase in use and lack of junction and crossing warning signs could result in a variety of collision types at the crossing/ access junction.

As the junction proposals will facilitate an increase in use and with the introduction of a new controlled crossing, there is likely to be an increase in traffic turning into the access from Forsyth Street. With drivers not expecting this increase in turning movements, this could result in motorists following too close and with some hesitation, could result in rear shunt type collisions. In addition to this, drivers may not expect this level of traffic to emerge from the minor arm access. This could increase risk of side impact collisions. The introduction of the crossing with the absence of warning signs could increase risk of rear shunt collisions or vehicles overshooting the crossing and colliding with pedestrians.

RECOMMENDATION

It is recommended that advanced junction warning signs are provided on both approaches to the junction and crossing. A “New Road Layout Ahead sign” would appear to be the most appropriate.

4 Audit Team Statement

4.1 We certify that the terms of reference of the audit are generally in accordance with GG119 and additional guidance set out in CIHT guidelines for Road Safety Audit.

Audit Team Leader

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Signed: [redacted]

Date: 18 January 2021

Audit Team Member

Kevin Nicholson BSc CMaths MCIHT FSoRSA
HE Approved Certificate of Competency
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Cherry Tree Cottage
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Brampton
Cumbria
CA8 9HT

Signed: [redacted]

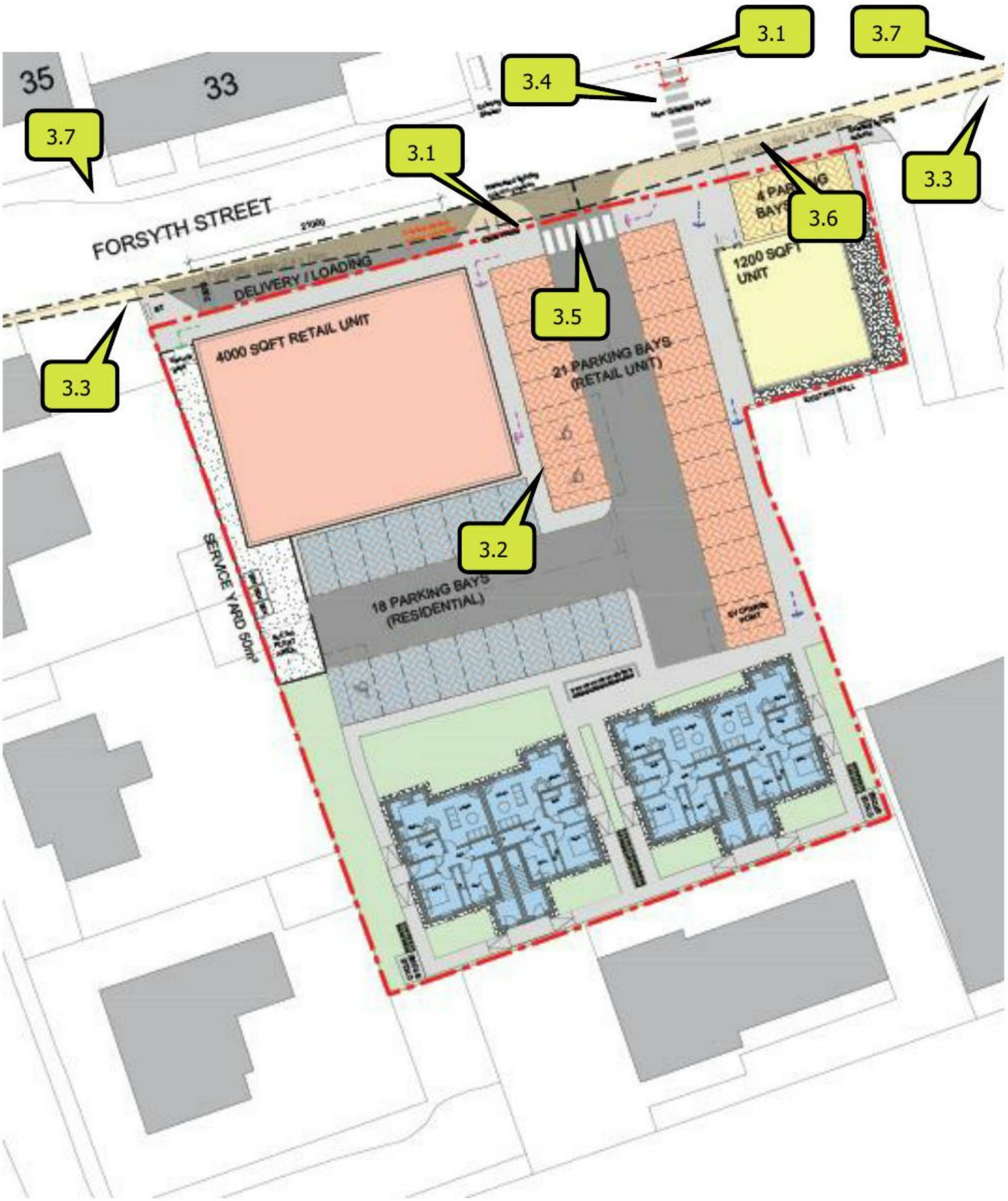
Date: 18 January 2021

Appendix A – List of drawings/documents provided

List of Drawings and Documents Provided

Doc. No.	Doc Title
20044	Transport Statement
L001	Location Plan
L003-D	Proposed Site Plan
10045-301-B	Levels Layout
N/A	Street Engineering Review (August 2020) – Containing detailed drawings

Appendix B – Location plan of problems identified


35
33
3.7
3.1
3.4
3.7
3.1
3.3
3.6
FORSYTH STREET
DELIVERY / LOADING
4000 SQFT RETAIL UNIT
3.5
1200 SQFT UNIT
3.3
21 PARKING BAYS (RETAIL UNIT)
3.2
SERVICE YARD 50m²
18 PARKING BAYS (RESIDENTIAL)

Hopeman Service Station(20/00474/APP)

Response to Transportation comments dated 6 January 2021

Road Safety

This response should be read in conjunction with the Combined Stage 1 & 2 Road Safety Audit, Report No. D00041 – RSA2 dated 18 January 2021, prepared by Drummond Black Consultants Limited.

Drawing 20044-005 submitted as part of this response which indicates a visibility splay of 2.4 x 43m with the envelope out with 3rd party land. The visibility splay is taken from the Scottish Government document Designing Streets which clearly indicates on page 4 that this document should apply within urban areas. The visibility splay is also consistent with that applied to the recently approved residential development on Forsyth Street.

ECS drawings 20044-06 & 20044-07, submitted with this response, indicate that the visibility splay from the proposed access with a rigid and articulated vehicle, respectively. The drawings confirm that a 2.4m x 43m visibility splay can still be achieved to the oncoming traffic lane which ensures that adequate visibility can be maintained during delivery times.

The existing wall adjacent to the starter unit is approximately 2.8m from the existing channel line and is below 1.05m for a further 2.5m. We are not aware of this being an issue for the existing neighbouring access.

Footpath width between retail unit and service lay-by has been increased to 2m.

Pedestrian crossing at the site access has been deleted and is not required given the estimated pedestrian and vehicle generation.

The building standards require a minimum access width of 1200mm if serving not more than 10 dwellings. All proposed private footpath widths are above the minimum requirement. The footpaths are not through routes and will only serve the residential aspect of the development which is estimated to generate a maximum of 2 pedestrians during the worst-case peak hour as indicated in the supporting Transport Statement. Therefore, it is evident that the proposed footway provision is adequate to serve the anticipated demand.

The proposed cycle hoops have now been relocated as indicated on the revised planning layout.

The zebra crossing on Forsyth Street has been removed as this is not required and recent guidance from Transport Scotland indicates that zebra crossings are not a preferred form of controlled crossing. The zebra crossing has been replaced by 2 dropped kerb crossings on either side of the retail store which will serve the pedestrian desire lines from both the east and west. These are located on the Eastern side of the access and at the North-West corner of the development.

Servicing

Frontage layby servicing arrangements have been approved and accepted on other Coop retail sites within the Moray area. These have been subject to an agreed Delivery Management Plan being required through conditions attached to the planning approval. The Coop are prepared to accept similar conditions for this development. The Delivery Management Plan is an establish method used

by them throughout Scotland and can be programmed to avoid peak times. The delivery times for this store will be short duration.

As stated in our previous response there are a number of instances along the length of Forsyth Street of on street parking at junctions and private driveways which do not appear to be problematic and the submitted accident data would support this.

Drawing 1002/A is submitted indicating the tracking for the recommended refuse collection vehicle.

Drainage

Proposed drainage layout, 10045 – 201C, is submitted as part of this response.

Parking and EV Charging

The parking bay size of 2.4m x 4.8m is a recognised and accepted design for off street private parking and is used by the Coop throughout its stores in Scotland.

As stated in previous submissions although the gross footprint is 371m2 there is a proportionately greater Back of House area of 139m2 leaving a retail floor area of 232m2. Taking the nett sales floor area into consideration we would request flexibility within the standards in regard to parking provision and hope an acceptable level of parking can be agreed.

The Coop have also confirmed that due to the short stay nature of convenience stores, the average stay being 6 minutes, they do not need a higher number of parking spaces.

In relation to the Rapid Charger for electric vehicle spaces we are agreeable to the specification being covered under condition.

The 3no. cycle stands have been relocated adjacent to the starter unit.

Fast EV charging points have been indicated for the 8no. residential properties.

Cycle stores are indicated on the layout and we are agreeable to the design and detail of the stores being covered under condition.

The current occupant of the existing garage will be relocating to the starter unit. Our understanding is that he will garage and maintain his own private vehicles from this facility. Provision for an EVCP has been indicated at one of the bays and a disabled bay has been shown.

We would like to note that the application was validated on 4 May 2020 with the parking levels being designed to the guidelines in place at that time. The layout is now being assessed against the current guidelines adopted on 27 July 2020 which require a greater level of residential parking leading to a shortfall in the retail parking. We would request that this factor is taken into consideration by the planning authority when assessing the development in parking terms.

Neil Donaghy.

SREM

SPRINGFIELD REAL ESTATE
MANAGEMENT LTD

Street Engineering Review (SER)

Forsyth Street

Hopeman

Revision A

February 2021

Street Engineering Review (SER)

As detailed in the Designing for Streets Manual (Page 57) the SER should include:

– Vehicle tracking of layout
– Approval of key visibility splays
– Speed control
– Agreement of drainage discharge rates
– Agreement of SUDS techniques
– Schematic drainage layout for foul and surface water including dimension requirements against building and landscaping
– Key materials palette
– Utilities strategy

- **Vehicle Tracking of Layout** – refer to Vehicle Swept Path Layout Drawing NO. 110045/401 and 15424-1002 **(Appendix A).** The swept path analysis was checked for Refuse Vehicle and Fire Appliance vehicle types.

- **Approval of Visibility Splays** – refer to Site Layout Drawing No. L-003 **(Appendix B).** Visibility Splays have been added to the layout and meet the requirements of design criteria outlined in Designing for Streets/Moray Council guidelines.

- **Speed Control** – refer to Site Layout Drawing No. L-003 **(Appendix B).** The nature and size of this development meant it did not require any specific traffic calming. The parking access road will naturally provide traffic calming.

- **Agreement of drainage discharge rates -** Refer to Drawing no. 10045/201 **(Appendix C).** The surface water will discharge into the existing swale and then eventually on to the existing off-site detention basin and swale to the east was previously constructed by Springfield Properties. The outfall from the site will connect into the existing swale before it reaches the detention basin. The greenfield run-off rate was calculated for the site using the HR Wallingford online greenfield estimation tool as being 0.54l/sec. Refer to the Drainage Impact Assessment Report for more information.

- **Drainage Layout** – refer to Drainage Layout Drawing NO. 10045/201 **(Appendix C)** Separate foul and surface water design of sewers.

  Surface Water - The surface water from the development will receive the following levels of treatment –

  - Residential Roofs – Existing Swale and Detention Basin off site
  - Commercial Roofs – Existing Swale and Detention Basin off site
  - Roads and Car Park – Porous Paving and Detention Basin

  All surface water drainage has been checked so that no properties flood during a 1 in 200 year flood event plus climate change.

  Foul Drainage – The foul drainage network is gravity fed and discharges into the existing foul sewer on Forsyth Street.

- **Key materials palette**
  Refer to Site Layout Drawing No. L-003 **(Appendix B).**

- **Utilities Strategy**
  All utilities will be below footways and service strips and will be to the depths as shown on the detail in the Road Construction Details Drawing, drawing no. 10045/302 **(Appendix D).**

  BT – Overhead BT cables that currently serve the existing garage will be removed. There may be an existing overhead BT cable serving the adjacent commercial building crossing the site. This will be diverted as required following consultation with BT. Refer to the drawing no. 10045/501 (**Appendix E)** detailing the existing BT information.

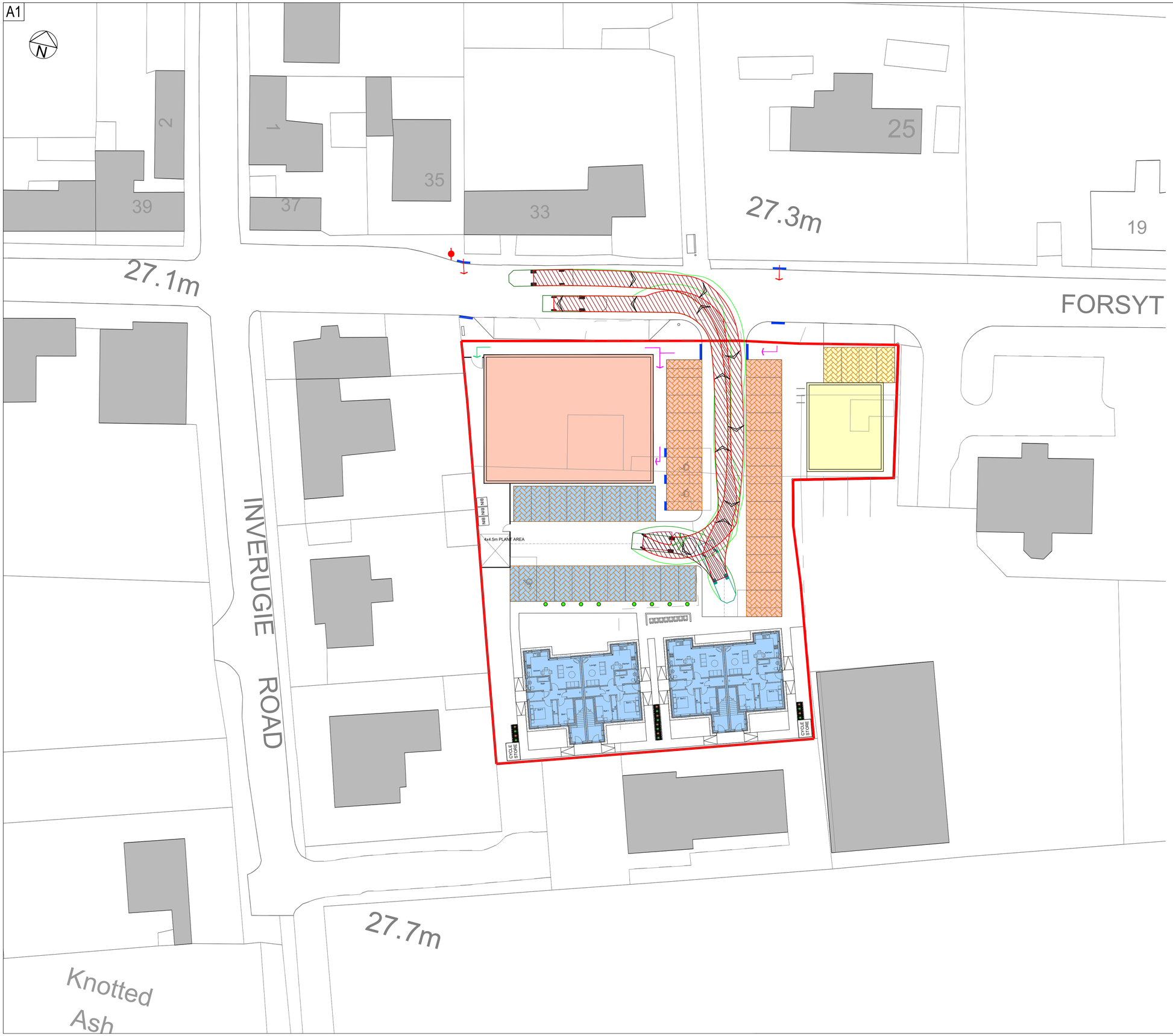
  Electricity – There is currently a LV electricity supply for the garage which will be disconnected/removed. An electricity design will be carried out by the chosen supplier on receipt of the quotations in due course. The record plans are shown in **Appendix E**.

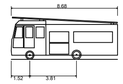
  Water – There is an existing 8" water main in the near side footpath adjacent to the site. A water design will be carried out by an approved designer and will be approved by Scottish Water in sue course. The record plans are shown in **Appendix E.**

  Street Lighting – There is an existing street lighting column locate in front of the development which will have to be locally relocated to accommodate a new lay-by. An indicative street lighting design is shown on Drawing No. 10045/502 **(Appendix E)**. A detailed design will be carried out by a street lighting designer to ensure that the commercial and residential properties are suitably lit.

APPENDIX A

A1





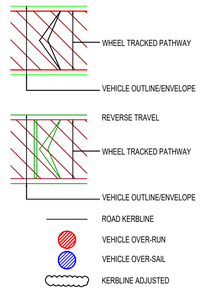
DB32 Fire Appliance

Overall Length	8.680m
Overall Width	2.180m
Overall Body Height	3.452m
Min Body Ground Clearance	0.337m
Max Track Width	2.121m
Lock to lock time	6.00s
Kerb to Kerb Turning Radius	7.910m

NOTES:

1. SITE MEASUREMENTS OR VEHICLE TRACKING SHOULD BE ASSESSED ON A LARGE SCALE ENGINEERING TOPOGRAPHICAL SURVEY OR ARCHITECTS PRECISION LAYOUTS TO VERIFY THAT ADEQUATE CLEARANCES CAN BE ACHIEVED.

LEGEND



PLANNING

Rev.	Date	Remarks	By	Ch.
B	05.02.21	Layout revised.	PD	
A	26.08.20	Layout revised.	PD	

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

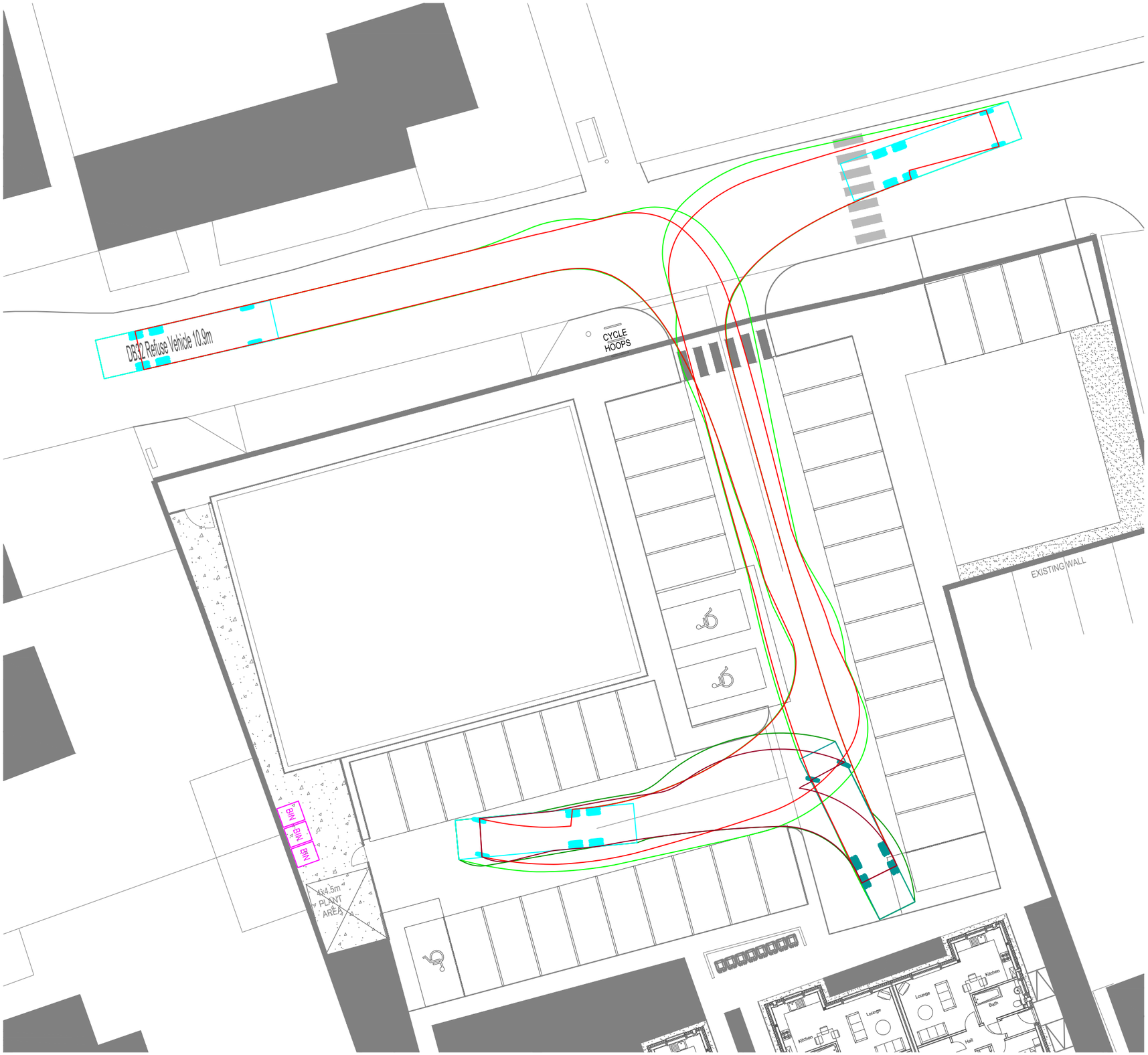
Project
RETAIL UNIT, STARTER UNIT AND FLATS
FORSYTH STREET
HOPEMAN

Drawing
VEHICLE SWEPT PATH

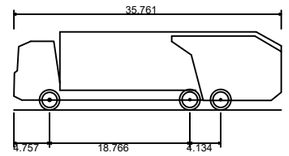
Scale	Date	Drawn by	Checked by
1:250	08.07.20	PD	

Drawing no.
10045-C-401

Rev
B



REFUSE VEHICLE ENTERING SITE, TURNING AND EXITING SITE
Scale 1:250



DB32 Refuse Vehicle 10.9m	
Overall Length	10.900m
Overall Width	2.400m
Overall Body Height	3.185m
Min Body Ground Clearance	0.390m
Max Track Width	2.400m
Lock to lock time	6.00s
Kerb to Kerb Turning Radius	9.625m

Revision	Date	By	Comments
A	25.01.21	FM	Analysis updated to show 10.9m long refuse vehicle

MACLEOD JORDAN

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Client
SREM LTD.

Project
RETAIL UNIT, STARTER UNIT & FLATS AT FORSYTH STREET, HOPEMAN, ELGIN

Title
REFUSE VEHICLE SWEPT PATH ANALYSIS

Drawn By	MJ	Date	19.08.20
Checked By	RM		
Status	REVIEW	Scale at A3	1:250

Project No.	Drawing No.	Rev.
15424	1002	A

APPENDIX B

A1

N

PLANNING

LEGEND:

- SITE BOUNDARY. AREA: 2693m² / 0.67 ACRES
- TARMAC ROADS.
- TARMAC FOOTPATHS.
- BLOCK PAVIORS.
- CONCRETE SLAB.
- STONE CHIPPINGS.
- GRASSED AREAS.
- PAVING SLABS.
- PEDESTRIAN ACCESS TO RETAIL/ RESIDENTIAL.
- PEDESTRIAN ACCESS TO RETAIL ONLY.
- PEDESTRIAN ACCESS TO RESIDENTIAL ONLY.
- SERVICE YARD / DELIVERY ACCESS.
- DROPPED KERB WITH TACTILE PAVING.
- NEW ROAD SIGN - "NEW ROAD LAYOUT AHEAD".
- POTENTIAL EV CHARGE POINT FOR FLATS.

1
37
35
33
Existing Bus Shelter
New Crossing Point
New sign "New Road Layout Ahead".
New Crossing Point
FORSYTH STREET
21000
Relocated lighting column position
Existing lighting column to be relocated
Existing lighting column
4 PARKING BAYS (UNIT)
1200 SQFT UNIT
Cycle Hoops
DELIVERY/ LOADING
2850
2 MOTORCYCLE BAYS
BT
Secure gate
4000 SQFT RETAIL UNIT
22 PARKING BAYS (RETAIL UNIT)
EXISTING WALL
EV CHARGE POINT
18 PARKING BAYS (RESIDENTIAL)
SERVICE YARD 50m²
BIN
BIN
BIN
4x4.5m PLANT AREA
BIN COLLECTION POINT
CYCLE STORE
CYCLE STORE
INVERUGIE ROAD

SCALE 1:200
0 10m

Rev.	Date	Remarks	By	Ch.
G	03.02.2021	Footpath widened on Forsyth Street.	BRL	-
F	27.01.2021	Road safety audit & Planning updates.	BRL	-
E	31.08.2020	Motorcycle bays and bin collection note added.	BRL	-
D	21.08.2020	Loading bay extended. Pedestrian routes updated.	BRL	-
C	18.08.2020	Parking reconfigured & footpath to east boundary added to suit Planning feedback.	BRL	-
B	03.07.2020	Amendments to suit topo.	BRL	-
A	30.06.2020	Scheme revised for Planning.	BRL	-

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED SITE PLAN

Scale	Date	Drawn by	Checked by
1:200	24.02.2020	BRL	VM

Drawing no. L-003
Rev G

APPENDIX C

A1

N

35

33

19

15

F3
Build on Existing Sewer
CL27.25
IL23.89(200mm)
IL23.94(150mm)

New sign "New Road Layout Ahead".

Existing Bus Shelter

Existing 200mm FW Sewer Approx 1 in 246

FORSYTH STREET

26.3m

Channel Drain

Relocated lighting column position

Existing lighting column

New sign "New Road Layout Ahead".

BT

RE

Secure gate

4000 SQFT RETAIL UNIT

FFL
27.50

1200 SQFT UNIT

FFL
27.25

S1

25.960

150mm 1 in 100

150mm 1 in 60

Porous Paving - Total Depth 1m

RWP

SERVICE YARD 50m²

Gulley

Porous Paving - Total Depth 1m

S3

24.969

S2

25.270

25.539

24.539

F2

F1

Diam 600 Grad 1 in 500

Diam 150 Grad 1 in 60

Grad 1 in 100

23.219

Porous Paving - Total Depth 1m

Porous Paving - Total Depth 1m

600mm 1 in 500

150mm 1 in 11

24.385

F4

25.285

S6

Diam 600

Hydro-brake MH S4
0.54l/sec
DH 1.05m
CTL-SHE-0032-5000-1050-5000

S4

CL27.30
IL26.30

Grad 1 in 11

RWP

RE

FFL
27.60

FFL
27.45

CYCLE STORE

Surface Water treatment for the roofs is provided in the off-site attenuation basin

225mm 1 in 170

5m Wayleave. Third party land agreements to be put in place ASAP.

27.7m

Diam 300 Grad 1 in 200
Type PLASTIC Length 94.989

25.89 25.89
S4 CL27.73

Diam 300 Grad 1 in 200
Type PLASTIC Length 95.303

25.42 25.42
S5 CL27.07

Diam 300 Grad 1 in 45
Type PLASTIC Length 64.854

Refer to the Drainage Impact Assessment Report for details of the off-site detention basin

Connect into existing swale which connects into the existing Attenuation Basin

S5

Existing Swale to Detention Basin

LEGEND:

- Proposed Surface Water Sewer (Private)
- Proposed Foul Water Sewer (Private)
- Existing Surface Water Drainage (Scottish Water)
- Existing Foul Drainage (Scottish Water)
- Proposed Gully within Porous Paving (Private)
- Proposed Porous Paving (Private)

1. All existing drainage to be checked by contractor prior to construction.
2. All drainage filter trenches to be continuous protected from ingress of construction materials during the construction phase of the works.
3. Prior to concreting all filter trenches to be washed down into silt traps and waste material to be removed when washings running clear.
4. All silt traps to be continuously monitored during construction and cleaned out weekly during construction phase of works
5. On completion of works, all pipework and filter trenches to be cleared of detritus and made ready to accept rainwater runoff from the site
6. The maintenance required to be adopted should initially be based on a bi-monthly routine during both wet and dry seasons when silt traps and pipework are routinely inspected and cleaned
7. It is anticipated that this will increase to quarterly cycle as the system acquires maturity and usage of the storage areas are determined
8. Channel drainage should be constructed to manufacturers specifications.

PLANNING

Rev.	Date	Remarks	By	Ch.
D	05.02.21	Layout revised. Channel drain added at loading bay.	PD	
C	26.08.20	Layout revised.	PD	
B	16.06.20	Surface Water outfall amended to connect to existing swale. Invert levels amended.	PD	
A	03.04.20	Surface Water outfall amended to exit through the rear properties land. Wayleave required.	PD	

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT AND FLATS
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED DRAINAGE LAYOUT

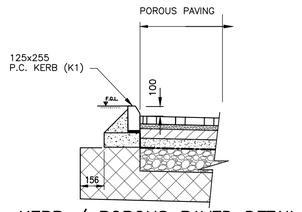
Scale	Date	Drawn by	Checked by
1:250	26.03.20	PD	

Drawing no.
10045-C-201

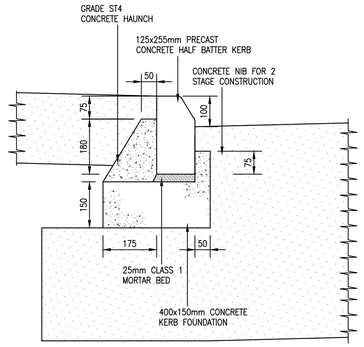
Rev
D

APPENDIX D

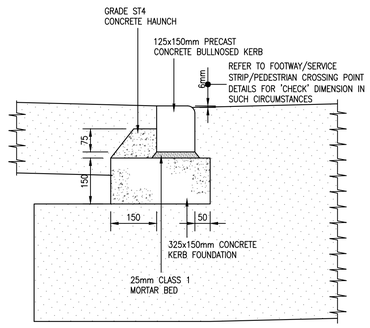
A1



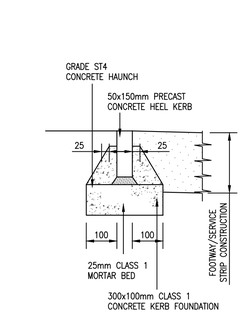
KERB / POROUS PAVED DETAIL



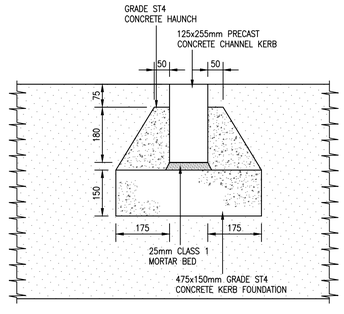
KERB TYPE K1 – 100mm UPSTAND
1:10



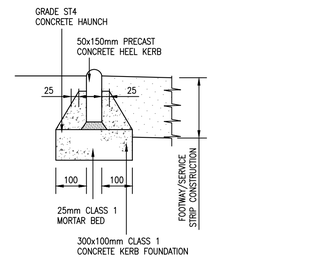
KERB TYPE K3 – DROP KERB DETAIL
1:10



KERB TYPE K4 – EDGING KERB
1:10



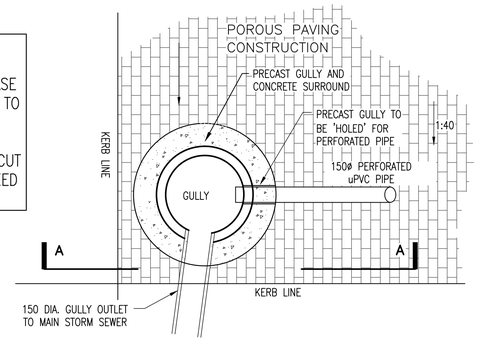
KERB TYPE K5 – CHANNEL KERB
1:10



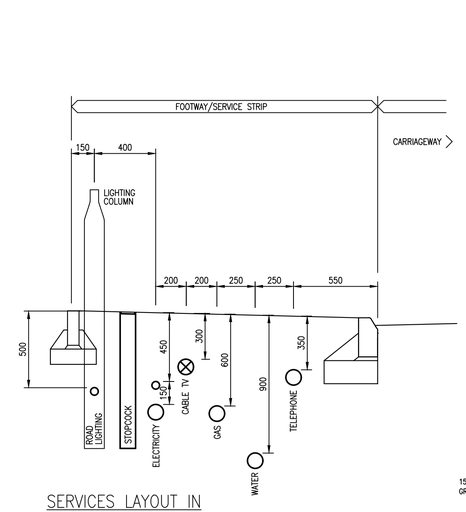
KERB TYPE K6 – EDGING KERB (round top)
1:10

POROUS PAVIOR CONSTRUCTION NOTE:

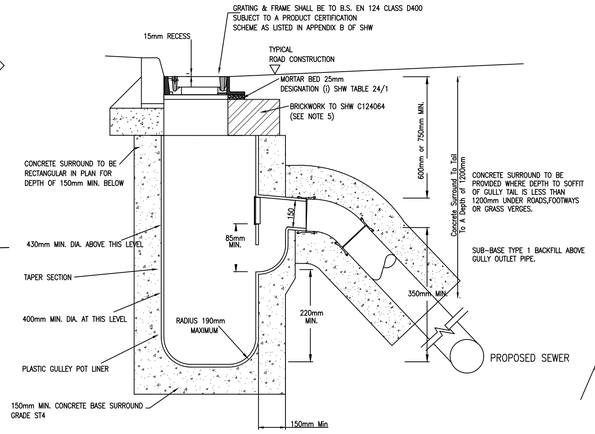
THE DBM LAYER IS REQUIRED FOR PROTECTION TO PERMEABLE SUB-BASE PRIOR TO LAYING OF BLOCKS AND LAYING COURSE. IMMEDIATELY PRIOR TO LAYING BLOCKS, DBM SURFACE TO BE CLEANED THEN DRILLED WITH 100mmø HOLES AT 1m CENTRES. HOLES TO BE FILLED WITH 2–6mm AGGREGATE AS PER LAYING COURSE. HOLES TO BE DRILLED OR CORE CUT IN AREAS OF POROUS BLOCK PAVING ONLY. ROAD NOT TO BE TRAFFICKED BY CONSTRUCTION VEHICLES AFTER BLOCKS HAVE BEEN LAID.



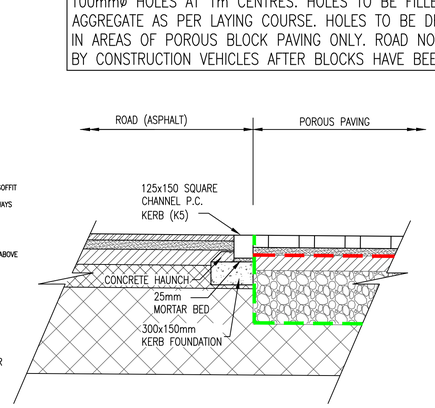
TYPICAL DETAIL AT POROUS PAVING DRAINAGE OUTLET
1:20



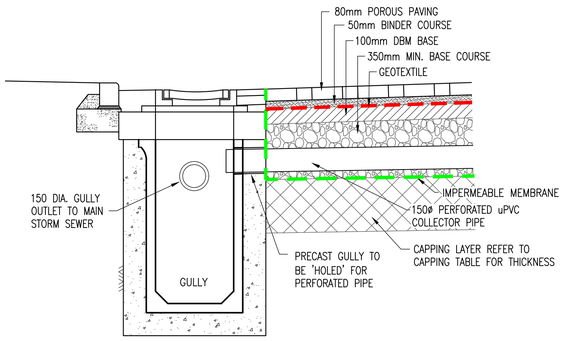
SERVICES LAYOUT IN FOOTWAY/SERVICE STRIP DETAIL
1:20



ROAD GULLY DETAIL
1:20

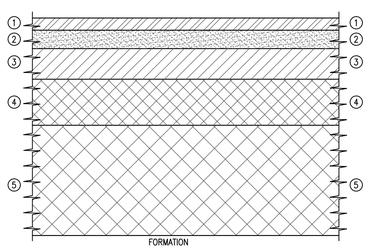


JUNCTION BETWEEN ASPHALT ROAD AND POROUS PAVING PARKING
1:20



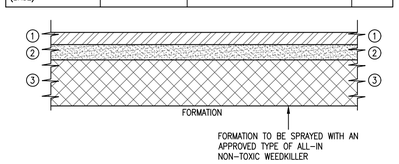
SECTION A–A
1:20

CONSTRUCTION SPECIFICATION			
LAYER	THICKNESS (mm)	DESCRIPTION	CLAUSE
1. WEARING COURSE (SURFACE COURSE)	45	ASPHALT SURFACE COURSE	911
2. BASE COURSE (BINDER COURSE)	55	DENSE BITUMEN MACADAM	906
3. ROAD–BASE (BASE)	80	ROAD BASE	906
4. SUB–BASE	REFER TO SUB–BASE & CAPPING REQUIREMENT TABLE	TYPE 1	803
5. CAPPING		TYPE 1	803

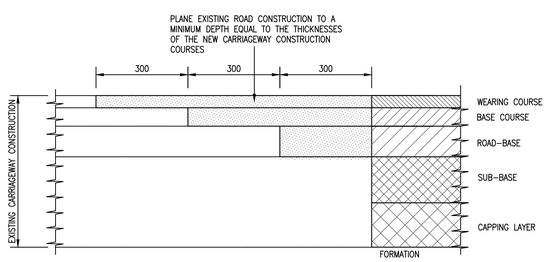


ASPHALT CARRIAGEWAY CONSTRUCTION DETAIL
1:10

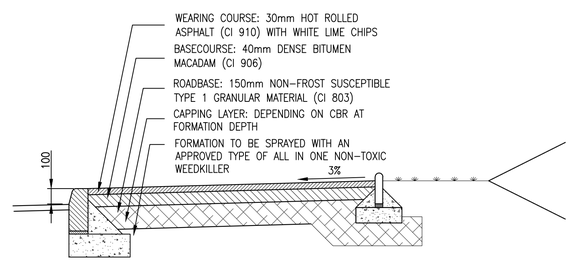
CONSTRUCTION SPECIFICATION			
LAYER	THICKNESS (mm)	DESCRIPTION	CLAUSE
1. WEARING COURSE (SURFACE COURSE)	30	HOT ROLLED ASPHALT	910
2. BASE COURSE (BINDER COURSE)	40	DENSE BITUMEN MACADAM	906
3. ROAD–BASE (BASE)	150	TYPE 1	803



FOOTWAY CONSTRUCTION DETAIL
1:10



NEW TO EXISTING CARRIAGEWAY TIE–IN DETAIL
1:10



TYPICAL FOOTWAY CONSTRUCTION (TARMAC)
1:20

Important notes for clients / contractors

No works are to commence on site until all relevant approvals have been obtained. Any deviations to the approved plans have to be reported to this office. Contractors to check all dimensions on site prior to commencement of work. Given dimensions only to be used. "DO NOT SCALE". The copyright of this drawing and design remain the sole property of Springfield Properties Plc and must not under any circumstance be reproduced in any way without express written consent.

ROAD CONSTRUCTION NOTES

1. ALL ROAD DESIGNS SHOWN ARE ONLY RELEVANT FOR AREAS FALLING UNDER "NIXON CONSULTANT" REMIT. FOR ALL OTHER AREAS REFER TO ARCHITECT'S DRAWINGS.
2. ROAD CONSTRUCTION LAYER DEPTHS SHOULD BE DETERMINED USING SITE INVESTIGATION CBR RESULTS AND RECOMMENDATIONS. CBRs SHOULD BE INSITU TESTED AS AN ADDITIONAL CHECK, HOWEVER, INSITU CBR RESULTS SHOULD NOT BE USED FOR ROAD CONSTRUCTION DESIGN. SHOULD CBR RESULTS BE <15%, CAPPING AND SUB–BASE LAYERS SHOULD BE CONSTRUCTED FOLLOWING THE BELOW TABLE:

SUB–BASE & CAPPING REQUIREMENTS		
CBR VALUE	SUB–BASE DEPTH †	CAPPING DEPTH
≤2%	150mm	600mm
>2%≤5%	150mm	350mm
>5%≤15%	225mm	0mm
>15%	150mm	0mm

† SUB–BASE FIGURES NOT RELEVANT FOR PERMEABLE PAVING CONSTRUCTION

ANY DEVATION FROM THE SHOWN MAKE–UPS WILL REQUIRE AGREEMENT WITH THE TRANSPORTATION DEPARTMENT.

TRAFFICKING OF THESE LAYERS BY CONSTRUCTION PLANT MAY REQUIRE AN INCREASED CONSTRUCTION SPECIFICATION. IN THIS INSTANCE A SUITABLE DESIGN SHOULD BE PROVIDED BY THE CONTRACTOR TO THE ENGINEER FOR COMMENT.

WHERE A CAPPING LAYER IS REQUIRED, IN–SITU CBR TESTS TO THE CAPPING SURFACE SHOULD BE CARRIED OUT TO ENSURE A MIN VALUE OF 15% IS ACHIEVED.

3. NON–FROST SUSCEPTIBLE MATERIAL TO BE 450mm MINIMUM DEPTH FROM THE FINAL SURFACE.
4. ALL SOFT SPOTS I.E PEAT, SOFT CLAYS, SATURATED SILTS, AND RUNNING SAND MUST BE REMOVED FROM THE CONSTRUCTION CORRIDORS AND REPLACED WITH SUITABLE COMPACTED MATERIAL.
5. ALL MATERIALS AND DEPTHS SPECIFIED ARE SUBJECT TO APPROVAL BY THE CLIENT.
6. TACTILE PAVING TO BE LAID ALIGNED WITH THE DIRECTION OF TRAVEL.
7. ALL KERB LINES LESS THAN 12m RADIUS SHALL BE CONSTRUCTED USING RADII KERBS.
8. ALL KERBING 90° INTERNAL OR EXTERNAL CHANGES IN DIRECTION SHALL BE FORMED USING STANDARD CORNER UNITS.

Rev.	Date	Remarks	By	Ch.

Revisions

SREM

SPRINGFIELD REAL ESTATE MANAGEMENT LTD

4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED CONSTRUCTION DETAILS

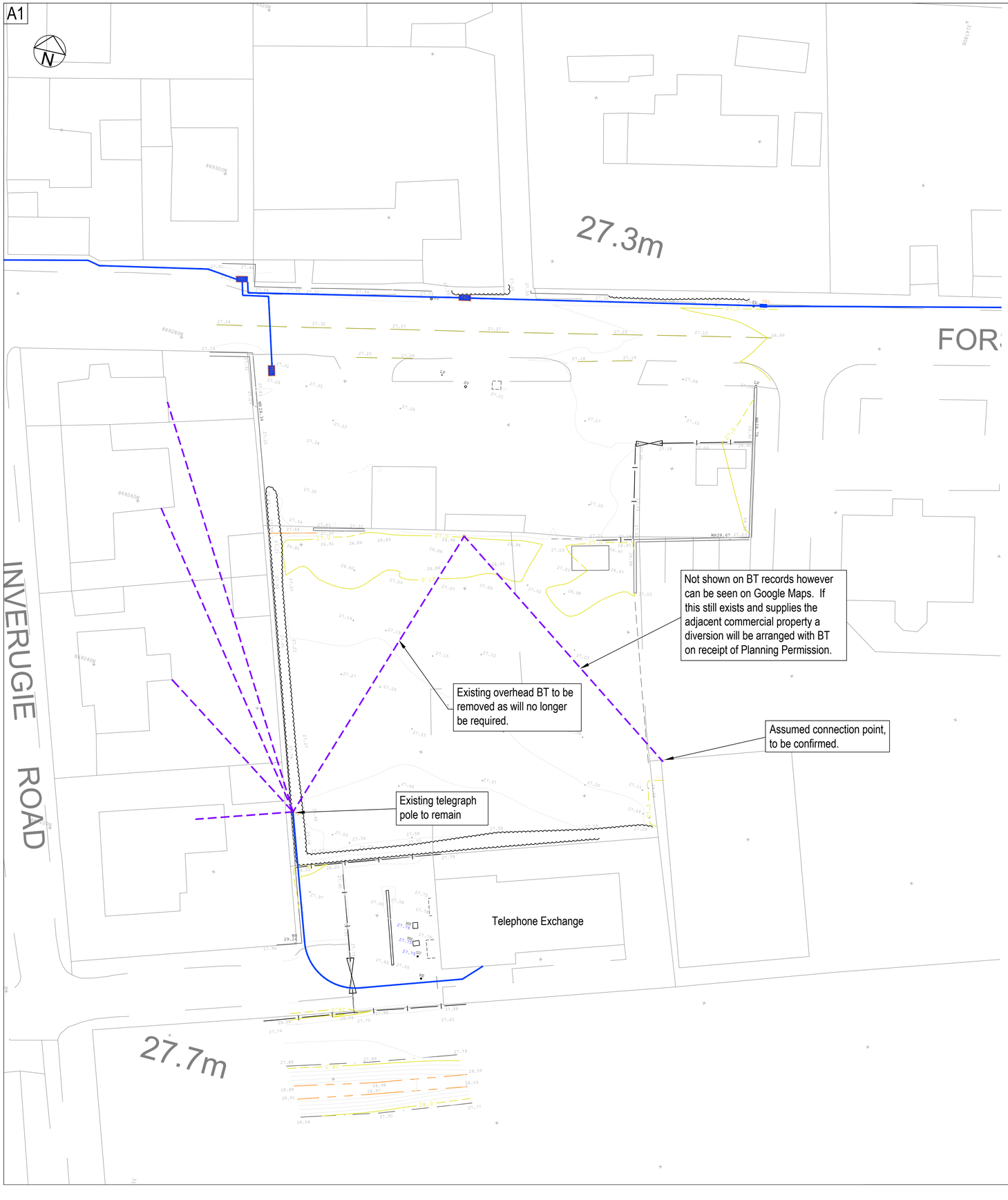
Scale	Date	Drawn by	Checked by
See Dwg	21.08.20	PD	

Drawing no.
10045-C-302

Rev

APPENDIX E

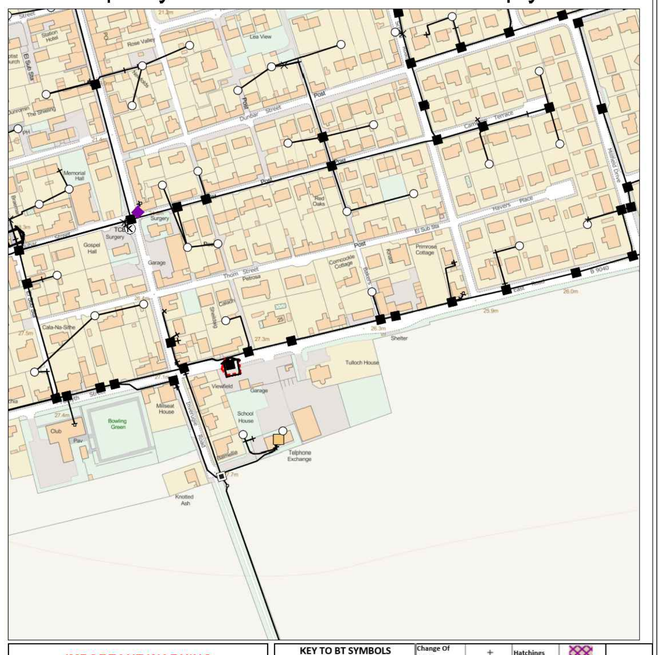
A1



Legend

- Existing Overhead BT
- Existing Underground BT
- Existing BT Junction Box

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED (Office hours: Monday - Friday 08.00 to 17.00)

www.openreach.co.uk/cbyd

KEY TO BT SYMBOLS

	Planned	Live
PCP		
Pole		
Box		
Manhole		
Cabinet		

Change Of State	+	Hatchings	
Split Coupling		Built	
Duct Tee		Planned	
Building		Inferred	
Kiosk	K	Duct	

Other proposed plant is shown using dashed lines. BT Symbols not listed above may be disregarded. Existing BT Plant may not be recorded. Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	In Place	Pending Remove	Not In Use
Power Cable				
Power Duct				N/A

BT Ref : SYX101852
Map Reference : (centre) NJ1479369316
Easting/Northing : (centre) 314793,869316
Issued : 24/09/2018 10:18:54

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

PLANNING

Rev.	Date	Remarks	By	Ch.

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT AND FLATS
FORSYTH STREET
HOPEMAN

Drawing
EXISTING BT APPARATUS

Scale	Date	Drawn by	Checked by
1:250	20.08.20	PD	

Drawing no.
10045-C-501

Rev

Maps by email Plant Information Reply

IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only.
No guarantee is given of its accuracy.
It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

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(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

KEY TO BT SYMBOLS

	Planned	*Live*
PCP		
Pole		
Box		
Manhole		
Cabinet		

Change Of State	+	Hatchings	
Split Coupling	×	Built	
Duct Tee	▲	Planned	
Building		Inferred	
Kiosk	K	Duct	

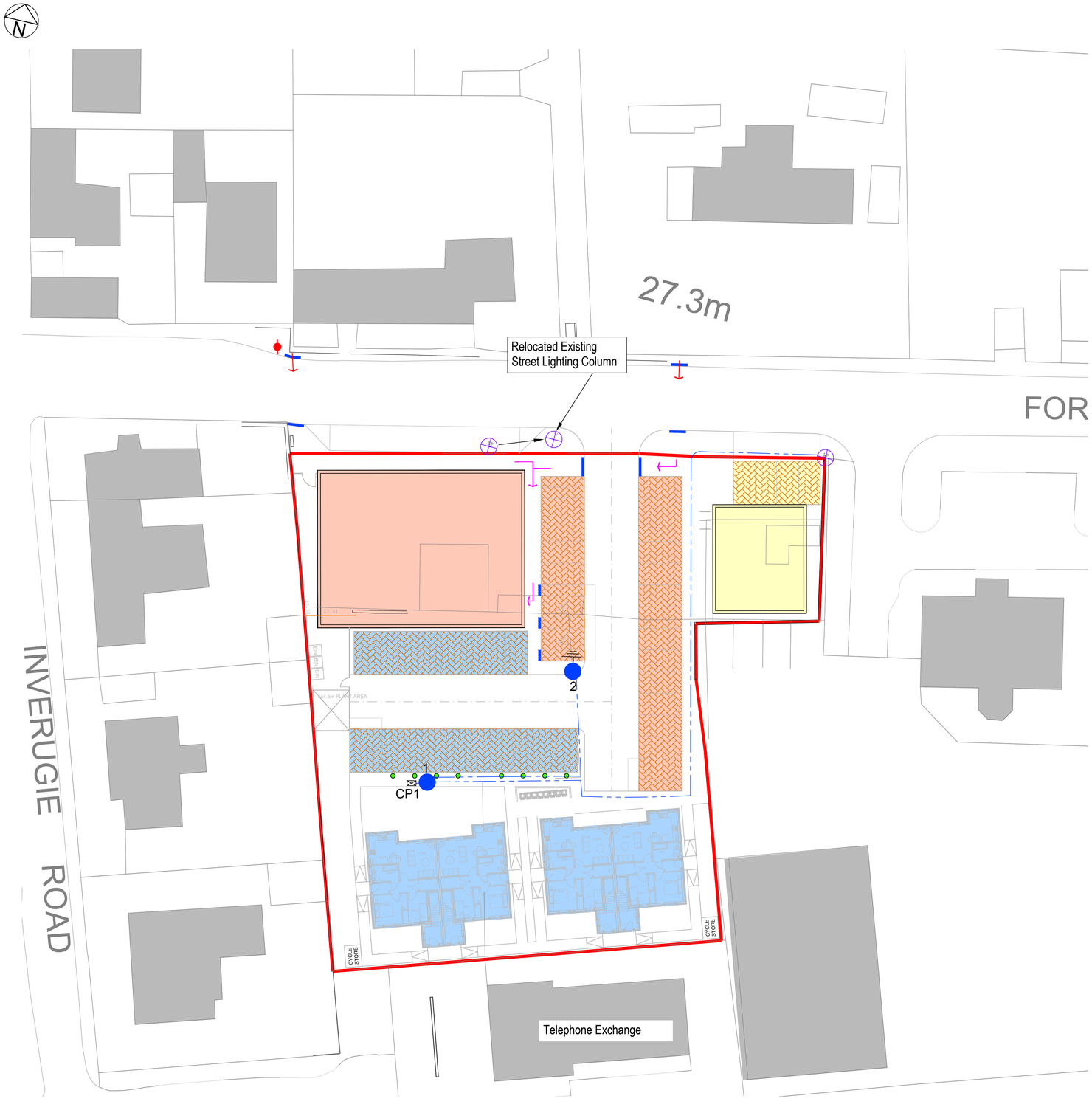
Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	*In Place*	*Pending Remove*	*Not In Use*
Power Cable				
Power Duct				N/A

BT Ref : SYX10185Z
Map Reference : (centre) NJ1479369316
Easting/Northing : (centre) 314793,869316
Issued : 24/09/2018 10:18:54

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

A1



Legend

- Existing Street Lighting Column
- Proposed 6m Lighting Column (to Moray Council Specification)
- CP1 — Proposed Private Control Pillar

Street lighting design to be finalised by street lighting designer and approved by Moray Council.

PLANNING

Rev.	Date	Remarks	By	Ch.
A	05.02.21	Layout revised.	PD	

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

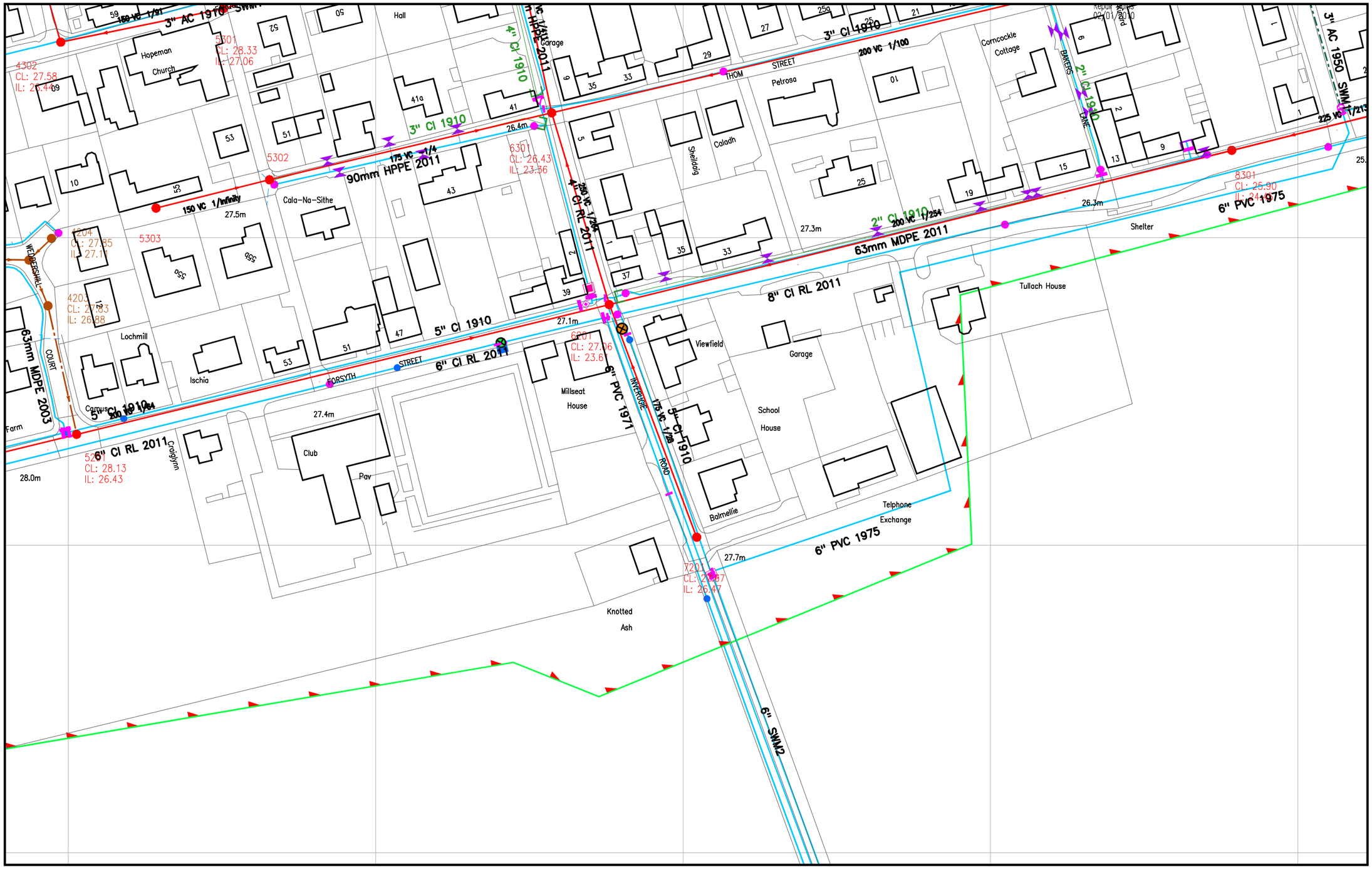
Project
RETAIL UNIT, STARTER UNIT AND FLATS
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED & EXISTING STREET LIGHTING LAYOUT

Scale	Date	Drawn by	Checked by
1:250	20.08.20	PD	

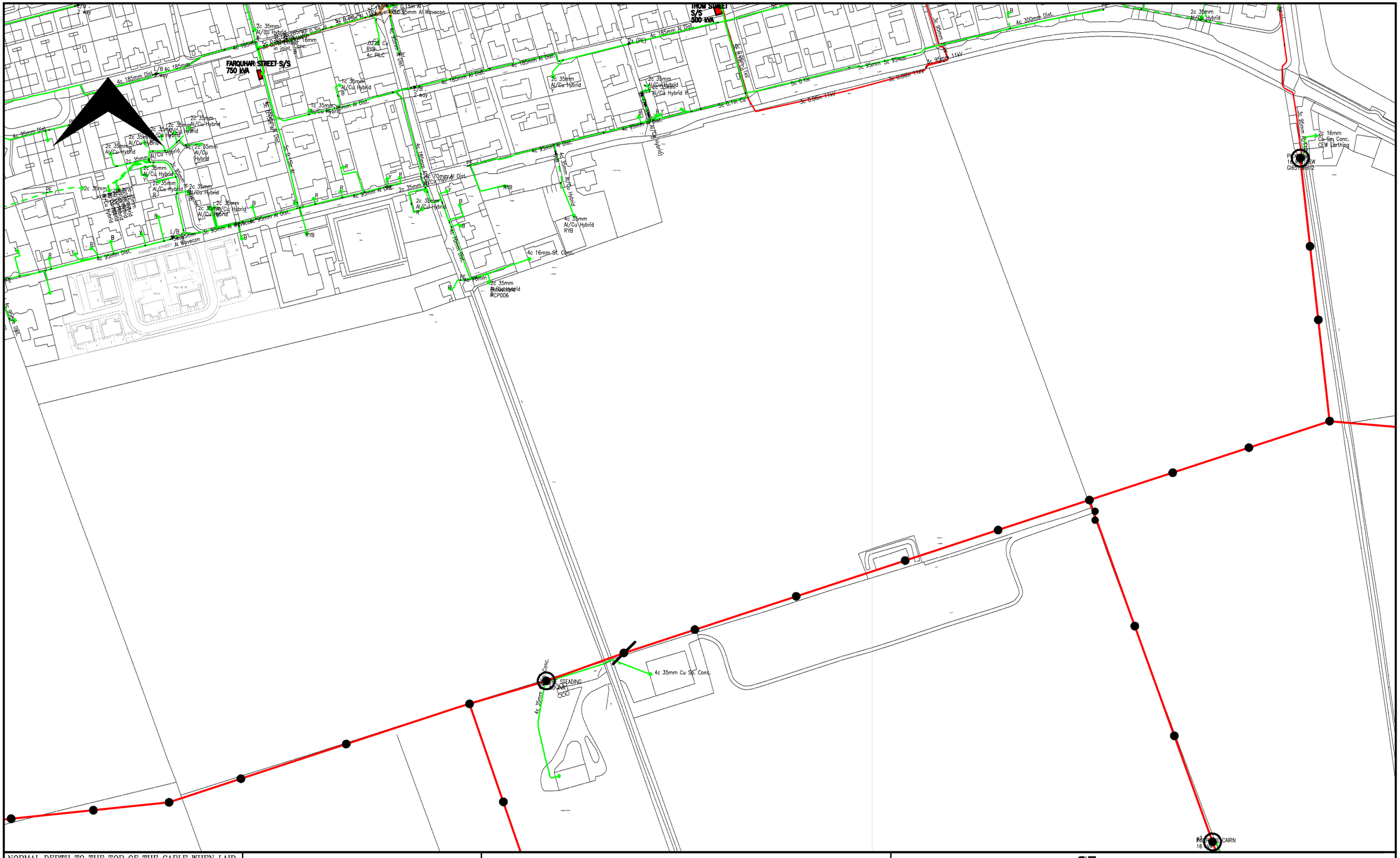
Drawing no.
10045-C-502

Rev
A



N	The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District Office.	Forsyth Street Hopeman 0 — 118 metres	(c) Crown copyright and database rights 2017 Ordnance Survey 100023460. You are permitted to use this data solely to enable you to respond to, or interact with, the organisation that provided you with the data. You are not permitted to copy, sub-licence, distribute or sell any of this data to third parties in any form
	Date Plotted: 25/03/2020	Scale: 1:1250	Plotted By: spring01

Scottish Water
Always serving Scotland
Castle House,
6 Castle Drive,
Dunfermline,
KY11 8GG
Tel No: 0845 601 8855



NORMAL DEPTH TO THE TOP OF THE CABLE WHEN LAID.

	services	l.v.	h.v.	e.h.v.
FOOTPATH	0.40m	0.45m	0.60m	0.75m
ROAD CROSSING	0.60m	0.60m	0.75m	0.90m

l.v./services – up to 1000V.
h.v. – over 1000V to 11,000V.
e.h.v. – 22,000V to 132,000V,

WARNING

There may have been subsequent alterations to the surface levels. Trial holes must be taken to determine positions and depth of cables. HS (G) 47 Booklet from the Health and Safety Executive – Avoiding Danger from Buried Cables – should be consulted before commencing excavation work. (available from THE HSE)

WHEN WORKING IN THE VICINITY OF OVERHEAD LINES THE HEALTH AND SAFETY GUIDANCE NOTE GS6 SHOULD BE CONSULTED. (AVAILABLE FROM THE HSE)

Scottish Hydro Electric Power Distribution plc,
Registered in Scotland No. SC213460
and Scottish Hydro Electric Transmission plc,
Registered in Scotland No. SC213461 both
having their registered Office: at Inveralmond House
200 Dunkeld Road Perth PH1 3AQ

UNCONTROLLED COPY

Subject to revision without notice.

Scottish & Southern Electricity Networks

NORTH EAST DISTRICT
Tel: 01224 667200

Grid Ref: NJ14876909
Scale: 1:2500
Date: 21/02/2018
All Voltages

Drainage Impact Assessment

For

Saltire Business Parks Limited

Forsyth Street, Hopeman

10045/CIVIL/R001C

February 2021

Document History

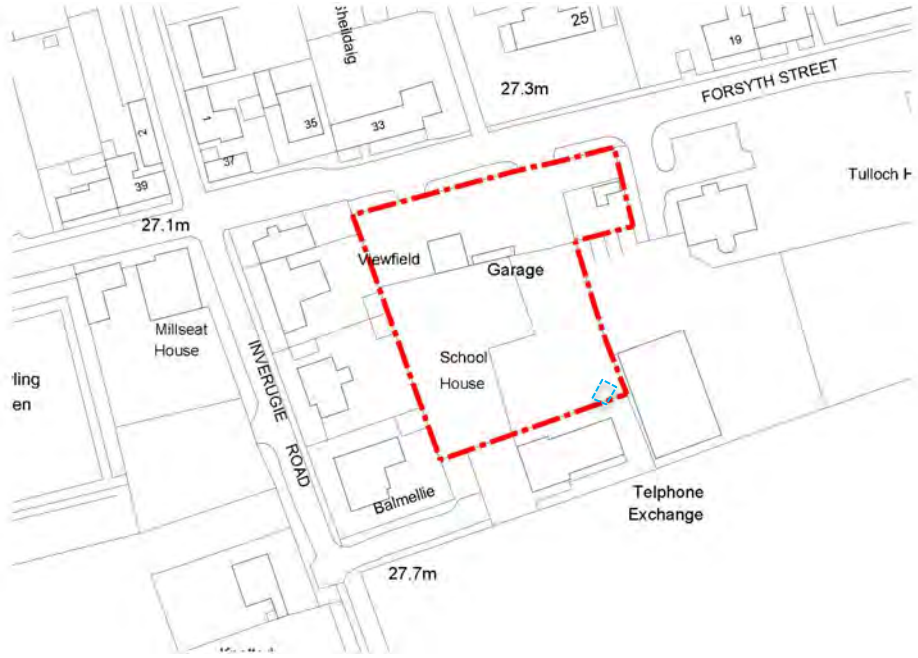
Issue	Date	Purpose	Author	Checked
04	25/02/21	Rev C	PD	ND
03	15/02/21	Rev B	PD	ND

Table of Contents

1 Introduction

1.1 Current Use and Introduction

This report is written to support the Planning Application to Moray Council for the Planning Application No. 20/00474/APP.



1.2 Development Proposals

This site is a former garage located on Forsyth Street in the centre of Hopeman. The proposals for the site consist of a retail unit, a starter unit and cottage flats. There will be associated roads, parking and landscaping.

Refer to **Appendix A** for the Site Layout.

1.3 Data Collection

The table below indicates the data that has been collected and used within this assessment and sets the basis of the proposed methodology. This will be reflected throughout the report.

Purpose	**Data and Source**
Hydrological Data	Flood Estimation Handbook (FEH-13)
Site Features	Site visit
Proposed Layout	Site Plan
Site Survey	Site Topographic Survey

2 Site Drainage Characteristics

2.1 Existing Drainage Infrastructure

There is an existing 200mm foul water sewer running from east to west directly in front of the site on Forsyth Street as shown on the Scottish Water record plans in **Appendix B**. There was no record of any Scottish Water surface water sewers within the immediate vicinity.

2.2 Existing Drainage Scheme

Springfield Properties constructed a Drainage Scheme to the south of this development in agricultural land as part of their development 200m west of the site and to assist with existing overland flow. The scheme involved the construction of a swale and detention basin. This development area was within the catchment area for this sheme. Details of the catchment areas and these works are shown in **Appendix C**.

3 Flood Risk

3.1 Scottish Planning Policy Requirements

SPP requires that –

"Infrastructure and Buildings should generally be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5% (1 in 200 years)".

To achieve this, the drainage system will require either to contain such an event or the site should be designed such that any volumes leaving or not entering the system should be stored above ground or routed overland without flooding any new or existing buildings or infrastructure.

This enables compliance with the requirement that new developments do not increase the risk of surface water flooding on the site or elsewhere.

3.2 Development Drainage Modelling

Hydraulic modelling or detailed calculations should be undertaken as part of the detailed design process. This should be undertaken using industry standard modelling software such as WinDes, Flow or other recognised form of calculation. Note that Sewers for Scotland 4 (SfS4) advises that rainfall input data should be taken from the FEH.

Detailed modelling should include the following:

- Simulation for the 1 in 30 year storm event including an allowance of 35% for climate change without surcharging. No allowance was required for urban creep as the site is mainly hardstanding.
- Simulation for the 1 in 200 year storm event.

3.3 Assessment of Fluvial, Coastal and Pluvial Flood Risk

Due to site location, the development was not deemed to be at risk from coastal flooding or from fluvial flooding. The site is not at risk from pluvial flooding however areas near the site are shown to have been at risk. The site is outlined in red on the SEPA flood maps below.

4 Surface Water Drainage Proposals

4.1 Proposed Drainage Strategy including SUDS

The drainage strategy for the site access road, parking and roof surface water requires that the surface water is treated to a standard that satisfies the SEPA Simple Index Tool. The proposals for the site are to treat the surface water as listed below. The Simple Index Tool results are shown in **Appendix E**.

- Residential Roofs – Existing Swale and Detention Basin off site
- Commercial Roofs – Existing Swale and Detention Basin off site
- Roads and Car Park – Porous Paving and Detention Basin

The greenfield run-off rate was calculated for the site using the HR Wallingford online greenfield estimation tool as being **0.04l/sec**.

HR Wallingford recommend where the Q_{BAR} is less than 2l/sec then the flow rate should be calculated from 2l/sec/ha which would equate to **0.54 l/sec** (0.27ha x 2). See **Appendix F** for calculation.

We propose to use a Hydro-brake flow control device in MH S4 to restrict the flow to 0.54l/sec.

The porous paving depth of stone has been increased so that as well as providing at source treatment it also provides attenuation. We have also upsized pipes to provide the further attenuation.

The existing off site detention basin and swale to the east was previously constructed by Springfield Properties. The outfall from the site will connect into the existing swale before it reaches the detention basin.

The foul drainage will discharge into the existing 200mm combined sewer on Forsyth Street.

Refer to Appendix D for the Drainage Layout and Drainage Details.

4.2 Flow Drainage Software

The pipe network was added to the Flow software using the greenfield run-off rate. The 30yr and 1:200yr + 35% climate change storm events where run and confirmed that was no flooding within the network within these storm events.

Flow calculations can be found in **Appendix G**.

4.3 SEPA Consultation

SEPA were not required to be consulted for the site.

5 Maintenance Proposals

5.1 Maintenance

An operation and maintenance manual will be produced and will include -

- Location of all SUDS, i.e the porous paving
- Brief summary of design
- Depth of silt that will trigger requirement for removal
- Visual indicators that will trigger maintenance
- A Maintenance Plan
- An action plan for dealing with accidental spillages of pollutants

5.2 Maintenance Plan

The maintenance will come under 3 categories of

1. Regular Maintenance - leaf collection, litter collection, check that inlets and outlets are free of blockages etc
2. Occasional Maintenance - sediment removal
3. Remedial Maintenance – Jetting and brushing to remove clogging

It is vital that a maintenance record is kept of the inspections and maintenance work that has been carried out. This allows the response of the system to different regimes to be assessed in future.

6 Maintenance of Existing Drainage Scheme

6.1 Maintenance

The existing drainage scheme maintenance schedule is shown below. This was included in the Envirocentre report that formed part of this original approval.

Monthly maintenance	Half Yearly	As Required
Litter & debris removal	Grass cutting (spring and autumn)	Re-seed areas of poor vegetation growth.
Manage vegetation		Prune & trim trees
Inspect outlets and inlets from blockages.		Remove sediment from pre-treatment swale (when 50% full)
Inspect banksides, structures and pipework for damage.		Repair of any damages or blockages. Rehabilitation of any surfaces as required.

APPENDIX A

Site Layout

A1

N

PLANNING

LEGEND:

- SITE BOUNDARY. AREA: 2693m² / 0.67 ACRES
- TARMAC ROADS.
- TARMAC FOOTPATHS.
- BLOCK PAVIORS.
- CONCRETE SLAB.
- STONE CHIPPINGS.
- GRASSED AREAS.
- PAVING SLABS.
- PEDESTRIAN ACCESS TO RETAIL/ RESIDENTIAL.
- PEDESTRIAN ACCESS TO RETAIL ONLY.
- PEDESTRIAN ACCESS TO RESIDENTIAL ONLY.
- SERVICE YARD / DELIVERY ACCESS.
- DROPPED KERB WITH TACTILE PAVING.
- NEW ROAD SIGN - "NEW ROAD LAYOUT AHEAD".
- POTENTIAL EV CHARGE POINT FOR FLATS.

1
35
33
37
FORSYTH STREET
INVERUGIE ROAD
New sign "New Road Layout Ahead".
New Crossing Point
Existing Bus Shelter
New Crossing Point
New sign "New Road Layout Ahead".
Existing lighting column
Relocated lighting column position
21000
DELIVERY/ LOADING
2850
BT
Secure gate
4000 SQFT RETAIL UNIT
2 MOTORCYCLE BAYS
22 PARKING BAYS (RETAIL UNIT)
4 PARKING BAYS (UNIT)
1200 SQFT UNIT
Cycle Hoops
EXISTING WALL
EV CHARGE POINT
18 PARKING BAYS (RESIDENTIAL)
SERVICE YARD 50m²
BIN
BIN
BIN
4x4.5m PLANT AREA
BIN COLLECTION POINT
CYCLE STORE
CYCLE STORE

SCALE 1:200
0 10m

Rev.	Date	Remarks	By	Ch.
G	03.02.2021	Footpath widened on Forsyth Street.	BRL	-
F	27.01.2021	Road safety audit & Planning updates.	BRL	-
E	31.08.2020	Motorcycle bays and bin collection note added.	BRL	-
D	21.08.2020	Loading bay extended. Pedestrian routes updated.	BRL	-
C	18.08.2020	Parking reconfigured & footpath to east boundary added to suit Planning feedback.	BRL	-
B	03.07.2020	Amendments to suit topo.	BRL	-
A	30.06.2020	Scheme revised for Planning.	BRL	-

Revisions

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0131 541 0133

Project
RETAIL UNIT, STARTER UNIT & FLATS
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED SITE PLAN

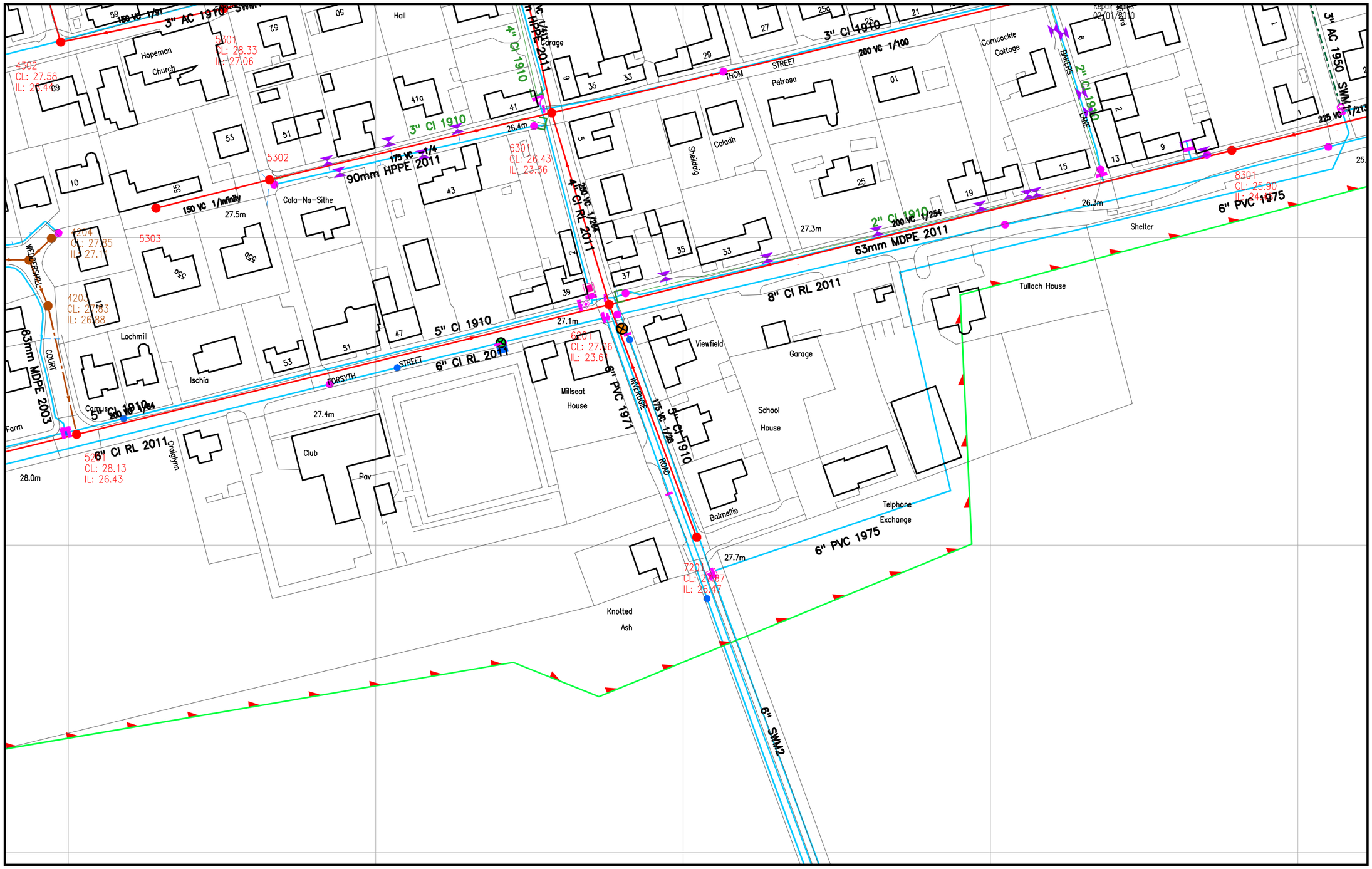
Scale	Date	Drawn by	Checked by
1:200	24.02.2020	BRL	VM

Drawing no. L-003

Rev G

APPENDIX B

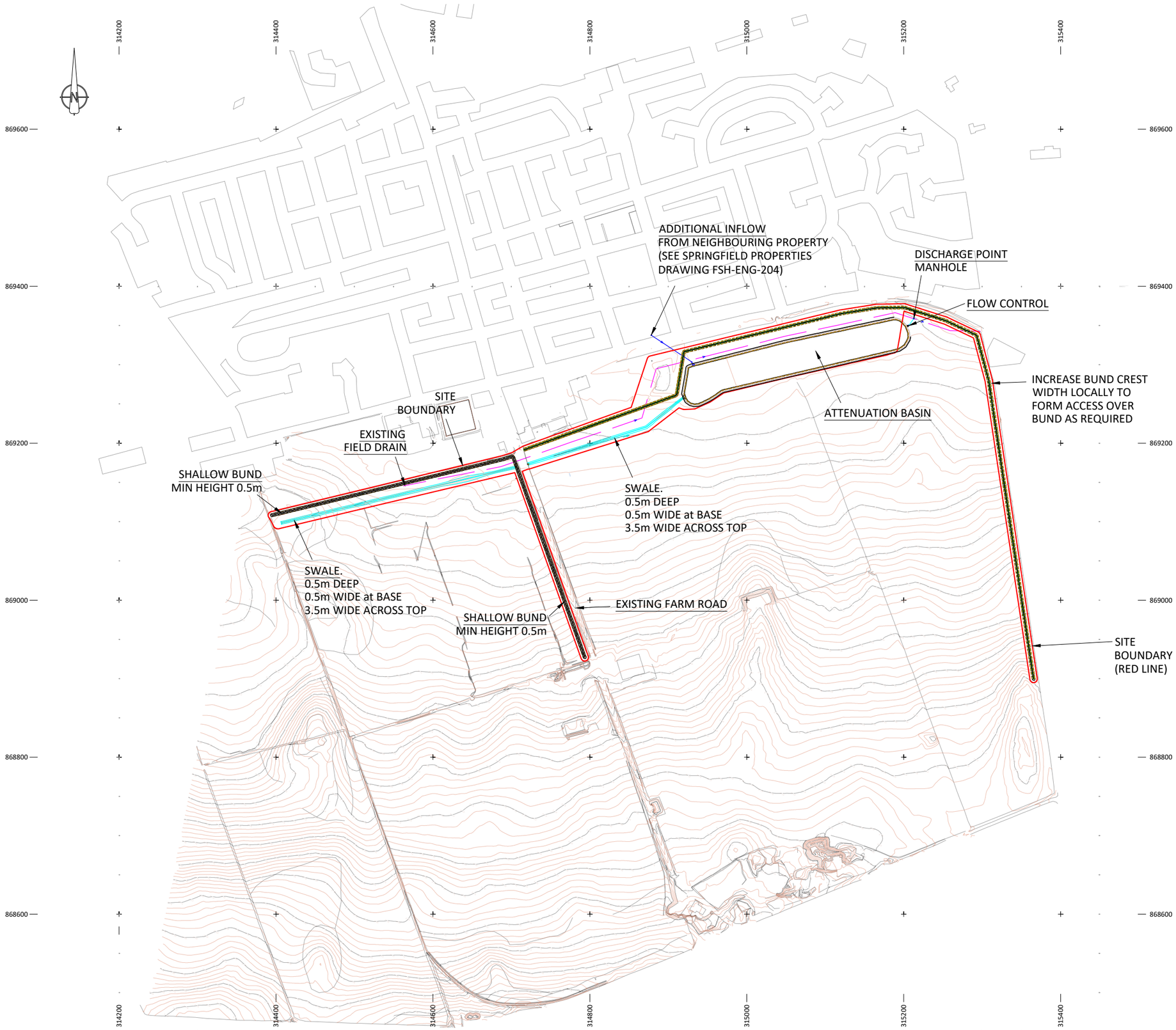
Scottish Water Record Plans



N	The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District Office.	Forsyth Street Hopeman	(c) Crown copyright and database rights 2017 Ordnance Survey 100023460. You are permitted to use this data solely to enable you to respond to, or interact with, the organisation that provided you with the data. You are not permitted to copy, sub-licence, distribute or sell any of this data to third parties in any form	Scottish Water Always serving Scotland Castle House, 6 Castle Drive, Dunfermline, KY11 8GG Tel No: 0845 601 8855
	Date Plotted: 25/03/2020	0 — 118 metres Scale: 1:1250	Plotted By: sprtg01	

APPENDIX C

Existing Drainage Scheme



Notes

1. Levels to be confirmed by supervising engineer prior to works commencing.
2. Envirocentre Ltd is not supervising construction works. Works to be supervised by a suitably qualified, experienced professional with design details to be confirmed as suitable for site conditions by works supervisor.
3. Pollution prevention measures to be in place and works to comply with agreed construction method statement.
4. All dimensions in metres (unless otherwise stated) and levels stated to Ordnance Datum.
5. Design includes detention pond with basal area, 11,313m^2, and top surface area, 13,435m^2 . See section detail drawing 670830-007.
6. Design includes 523m linear length of swale. See section detail drawing 670830-007.
7. Design includes 1679m linear length of shallow bund. See section detail drawing 670830-008.

Do not scale this drawing

Rev	Date	Amendment	Initials
A	01/10/2018	Updated Layout	SMC

ENVIRO Centre
Craighall Business Park, Eagle Street, Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

Client
Springfield Properties PLC.

Project
Land at Hopeman, Moray

Title
Hopeman Overall Layout and Location Plan

Status
CONSTRUCTION DRAWING

Drawing No.
670830-001

Revision

File path:k:\670830\drgs\cad

Scale		Date
1:5000	A3	03 August 2018

Drawn	Checked	Approved
CM	NG	NG

Legend

- Site Catchment
- Western Fields Catchment
- Culvert
- Field Drain
- 5m Contours

Do not scale this map

Client
Springfield Properties Ltd

Project
Land at Hopeman, Moray

Title
Field Drain Catchment

Status
Final

Drawing No.
368688 - 005

Revision

Scale
1:7,500

A3

Date
08 Dec 2016

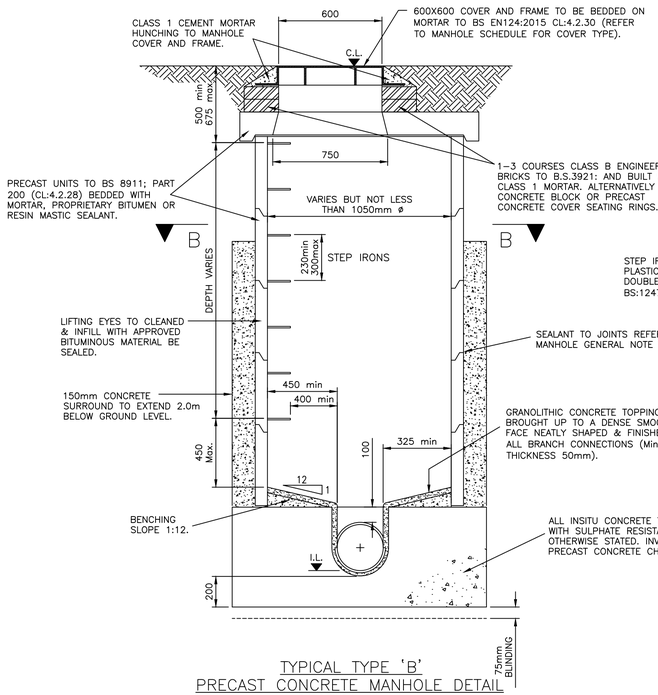
Drawn	Checked	Approved
JMC	NG	NG

ENVIRO Centre
Craighall Business Park, Eagle Street, Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

APPENDIX D

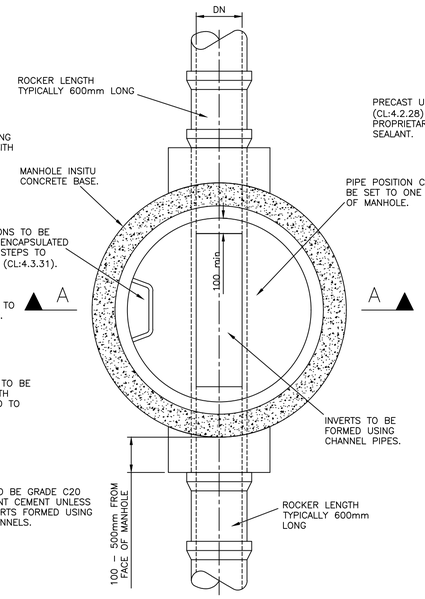
Drainage Layout and Details

A1



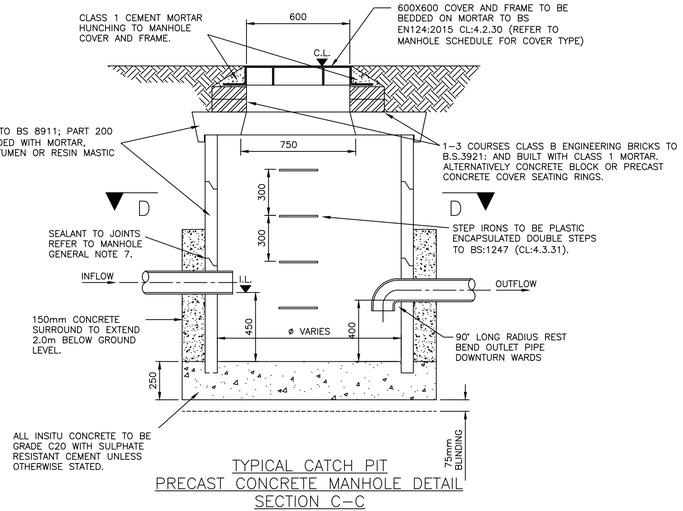
TYPICAL TYPE 'B'
PRECAST CONCRETE MANHOLE DETAIL
SECTION A–A

DEPTH FROM GROUND LEVEL TO SOFFIT 1.5m – 3.0m
(Scale 1:20)



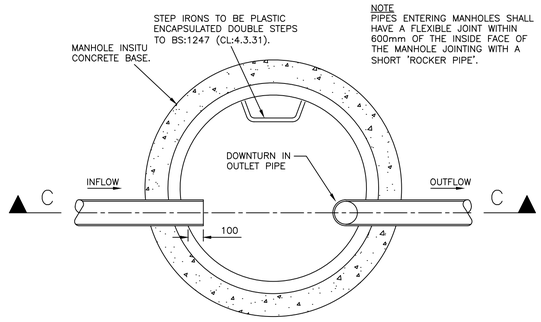
TYPICAL TYPE 'B'
PRECAST CONCRETE MANHOLE DETAIL
PLAN SECTION B–B

DEPTH FROM GROUND LEVEL TO SOFFIT 1.5m – 3.0m
(Scale 1:20)



TYPICAL CATCH PIT
PRECAST CONCRETE MANHOLE DETAIL
SECTION C–C

DEPTH FROM GROUND LEVEL TO SOFFIT 1.5m – 3.0m
(Scale 1:20)



TYPICAL CATCH PIT
PRECAST CONCRETE MANHOLE DETAIL
PLAN SECTION D–D

DEPTH FROM GROUND LEVEL TO SOFFIT 1.5m – 3.0m
(Scale 1:20)

GENERAL MANHOLE NOTES

1 ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH RELEVANT CODES OF PRACTICE AND BRITISH STANDARDS IN COMPLAISANCE WITH BUILDING CONTROL AND SEPA REGULATIONS.

2 ALL ADOPTED SEWERS MUST BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR SCOTLAND 4th EDITION.

3 ALL DIMENSIONS ARE IN MILLIMETERS AND ALL LEVELS ARE IN METERS.

4 MANHOLE COVERS WITHIN TRAFFICKED AREAS TO BE SAINT–GOBAIN, INTER–AX D400–N, HEAVY DUTY, DOUBLE TRIANGULAR, DUCTILE IRON TO BS:EN 124, 600x600 CLEAR OPENING, NON ROCK, LOCKABLE COVER OR EQUAL APPROVED.

5 MANHOLE COVERS IN AREAS ACCESSIBLE TO PEDESTRIANS ONLY TO BE SAINT–GOBAIN, TROJAN MEDIUM DUTY B125, SINGLE PIECE, DUCTILE IRON TO BS:EN 124, 600x600 CLEAR OPENING, SCREW DOWN COVER OR EQUAL APPROVED.

6 ALL MANHOLE & ACCESS COVERS WITHIN BUILDING FOOTPRINT TO BE DOUBLED SEALED. COVERS IN OPEN SPACE TO BE VENTILATED. REFER TO MANHOLE SCHEDULE FOR TYPE AND LOCATION.

7 FIRST FLEXIBLE JOINTS IN PIPES ADJACENT TO A MANHOLE SHALL BE A MAXIMUM OF 600mm FROM INSIDE FACE OF MANHOLE, CONNECTING TO ROCKER PIPE. REFER TO MANHOLE DIMENSIONS TABLE FOR ROCKER PIPE LENGTH.

8 MANHOLE CHAMBERS RINGS SHALL BE PRECAST UNITS TO BS:8911;PART 200 (CL:4.2.28) BEDDED WITH MORTAR, PROPRIETARY BITUMEN OR RESIN MASTIC SEALANT OR OTHER SIMILAR APPROVED MATERIAL APPLIED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.

9 THE LOWEST CHAMBER RING BEARING ON THE FOUNDATION AND THE HIGHEST CHAMBER RING RECEIVING THE COVER SLAB SHALL HAVE PLAIN ENDS AND BE BEDDED IN MORTAR.

10 MANHOLE ACCESS HOLE AND STEP IRON POSITIONS TO BE LOCATED TO GIVE GREATEST FREE AREAS OF BENCHING IMMEDIATELY BELOW.

11 STEP IRONS NOT TO PROTRUDE INTO 675 SQUARE ACCESS OPENING SHAFT COVER SLAB. STEP IRONS TO BE PLASTIC ENCAPSULATED DOUBLE STEPS TO BS:1247 (CL:4.3.31).

12 TOP STEP IRON TO BE LOCATED NOT LESS THAN 500 AND NOT GREATER THAN 675 FROM THE FINISHED MANHOLE COVER LEVEL.

13 CONCRETE FOUNDATION TO BE SCRABBLED BEFORE PLACING BENCHING.

14 WHERE OUTLET PIPE DIAMETER IS GREATER THAN INLET, PIPE SOFFIT TO BE THE SAME LEVEL UNLESS NOTED OTHERWISE. A MINIMUM FALL OF 50mm SHOULD BE ACHIEVED ACROSS MANHOLE IN DIRECTION OF FLOW

15 GRANOLITHIC CONCRETE TOPPING TO BE BROUGHT UP TO A DENSE SMOOTH FACE NEATLY SHAPED & FINISHED TO ALL BRANCH CONNECTIONS (Min. THICKNESS 50mm).

16 BENCHING SHALL BE TROWEL SMOOTH AND SLOPED TOWARDS THE CHANNEL AT 1 IN 12.

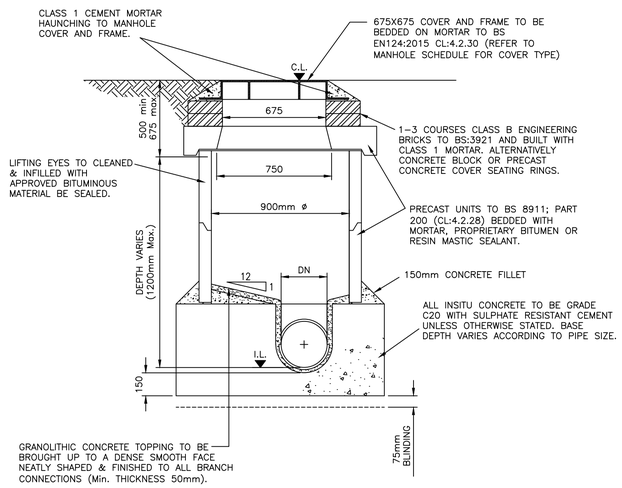
17 SELF CLEANING TOE HOLES TO BE PROVIDED WHERE CHANNELS EXCEED 600mm WIDE.

18 BRANCH BENDS AND BENCHING TO BE CURVED IN THE DIRECTION OF FLOW AND FORMED FROM GRANOLITHIC CONCRETE, HIGH STRENGTH CONCRETE TOPPING OR WITH GRADE C20/20 CONCRETE TOWELED SMOOTH MONOLITHICALLY WITH THE BASE SLAB.

19 MANHOLES WITH OUTGOING PIPES GREATER THAN 450mm DIAMETER SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER SAFETY DEVICES.

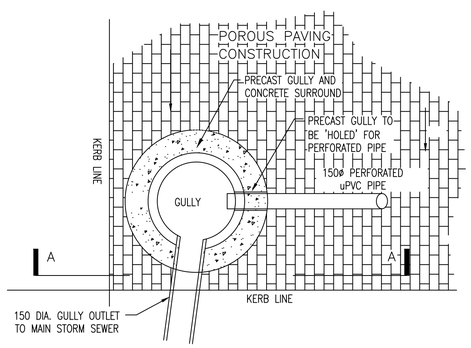
20 ALL PRECAST CONCRETE PRODUCTS (i.e. PIPES, MANHOLE RINGS etc.) SHALL BE TO DESIGN SULPHATE CLASS DS–2 AND CHEMICAL DESIGN DC–3, IN ACCORDANCE WITH BRE SPECIAL DIGEST 1 AND BS:5911.

21 REFER TO SITE INVESTIGATION REPORT OR STRUCTURAL FOUNDATION DRAWINGS FOR IN–STU CONCRETE SULPHATE CLASSIFICATION.



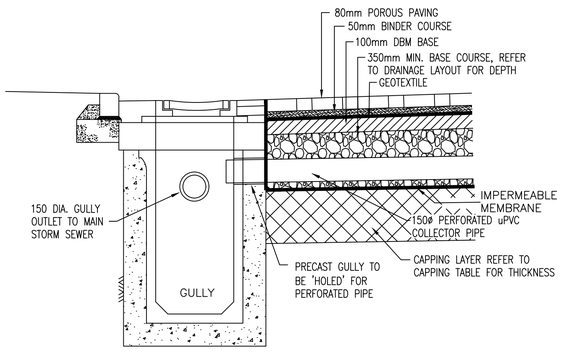
TYPICAL PRECAST MANHOLE
INSPECTION CHAMBER

DEPTH FROM GROUND LEVEL TO SOFFIT 0.9m – 1.5m
(Scale 1:20)



TYPICAL DETAIL AT POROUS
PAVING DRAINAGE OUTLET

1:20



SECTION A–A

1:20

Rev.	Date	Remarks	By	Ch.

Revisions

SREM
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Project
FORSYTH STREET
HOPEMAN

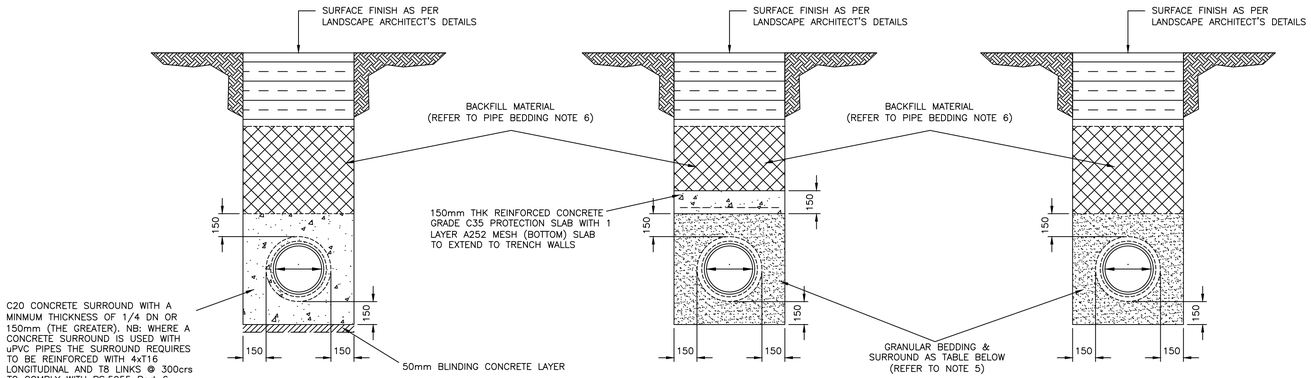
Drawing
PROPOSED DRAINAGE
CONSTRUCTION DETAILS
SHEET 1 OF 2

Scale	Date	Drawn by	Checked by
See Dwg	08.07.20	PD	

Drawing no.
10045-C-202

Rev

A1



FULL CONCRETE SURROUND TO PIPEWORK
(Scale 1:20)

ALTERNATIVE TO CONCRETE SURROUND TO PIPEWORK
(Scale 1:20)

CLASS S BEDDING TO PIPEWORK
(Scale 1:20)

PIPE BEDDING SPECIFICATION TABLE

(THIS TABLE TO BE READ IN CONJUNCTION WITH W.I.S. No. 4–08–02A:2008)

PIPE NOMINAL BORE	CLASS OF BEDDING	NOMINAL MAXIMUM PRACTICLE SIZE	Max. CF VALUE NON–PRESSURE PIPE	Max. CF VALUE PRESSURE PIPE	MATERIALS SPECIFIED IN BRITISH STANDARDS
100mm	'S'	10mm	0.15 0.30	0.30	10mm NOMINAL SINGLE SIZE
100 – 150mm	'S'	15mm	0.15 0.30	0.30	10 OR 14mm NOMINAL SINGLE SIZE OR 14mm TO 5mm GRADED
150 – 300mm	'S'	20mm	0.15 0.30	0.30	10, 14 OR 20mm NOMINAL SINGLE SIZE OR 14mm TO 5mm GRADED OR 20mm TO 5mm GRADED
300 – 550mm	'S'	20mm	0.15 0.30	0.30	14 OR 20mm NOMINAL SINGLE SIZE OR 14mm TO 5mm GRADED OR 20mm TO 5mm GRADED
<550mm	'S'	40mm	0.15 0.30	0.30	14, 20 OR 40mm NOMINAL SINGLE SIZE OR 14mm TO 5mm GRADED OR 20mm TO 5mm GRADED OR 40mm TO 5mm GRADED

PIPE BEDDING REQUIREMENT

LOCATION	COVER TO PIPE SOFFIT	BEDDING TYPE
ROADS (ADOPTED SEWERS)	>1.2m	CLASS 'S' GRANULAR BED & SURROUND
	<1.2m	CONCRETE SURROUND
	<1.5m	CONCRETE SURROUND
UNDER BUILDING SLAB	>0.45m	CLASS 'B' GRANULAR BED & SURROUND
	<0.45m	CONCRETE SURROUND

PIPE TYPE & BEDDING NOTES

1 THE FOLLOWING PIPE STRENGTHS SHALL BE ADOPTED UNLESS NOTED OTHERWISE:–

uPVC SHALL BE DOUBLE STRUCTURED WALL SEWER PIPE SHALL COMPLY WITH THE RELEVANT PROVISIONS OF WIS–4–35–01 IN ACCORDANCE WITH BS EN1401 PE 1 2009.

uPVC JOINTS & FITTINGS FOR GRAVITY SEWERS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS:4346 Part 3. AND BS:4660:2000, SOLVENT CEMENT MAY ALTERNATIVELY COMPLY WITH BS:6209.

PIPES UP TO AND INCLUDING 300mm ø TO BE UNPLASTICISED PVC DOUBLE STRUCTURED WALL UNLESS NOTED OTHERWISE.

PIPES ABOVE 300mm ø TO BE CLASS M CONCRETE UNLESS NOTED OTHERWISE.

2 REFER TO LAYOUT PLAN FOR PIPEWORK TYPE & LOCATION.

3 WHERE COVER IS LESS THAN 1.2m Dp BELOW TRAFFICKED AREA OR 0.9m DP BELOW LANDSCAPE AREAS SHALL BE PROVIDED WITH CONCRETE SURROUND TO COMPLY WITH BS:5955 Part 6 REQUIREMENT OR THE ALTERNATIVE CONCRETE SURROUND DETAIL SHOULD BE ADOPTED.

4 ALL WORK AND MATERIAL TO COMPLY WITH THE SEWERS FOR SCOTLAND 4th EDITION.

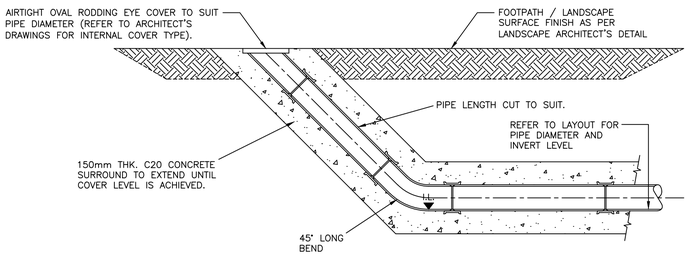
5 SPECIFICATION FOR BEDDING AND SIDEWALL MATERIALS TO BE WATER INDUSTRY SPECIFICATION (WIS) 4–08–02A:2008

6 BACKFILL SHALL BE UNIFORM READILY COMPATIBLE MATERIAL FREE FROM VEGETABLE MATTER, BUILDING RUBBISH, FROZEN SOIL, MATERIAL SUSCEPTIBLE TO SPONTANEOUS COMBUSTION & CLAY LUMPS & STONE RETAINED ON 75mm SIEVE & 37.5mm SIEVE RESPECTIVELY.

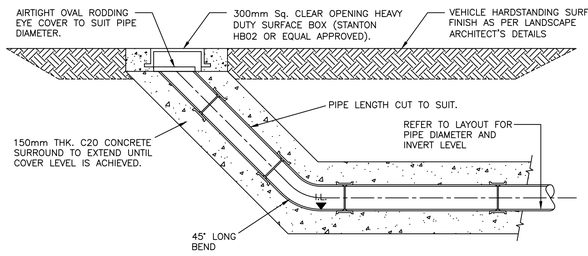
7 ALL PIPE RUNS TO BE LAID WITH FLEXI–JOINTS.

8 ALL PIPE BENDS TO SUIT DIRECTION OF FLOW.

9 FOR DETAILS OF GROUND CONDITIONS REFER TO GROUND INVESTIGATION REPORT.

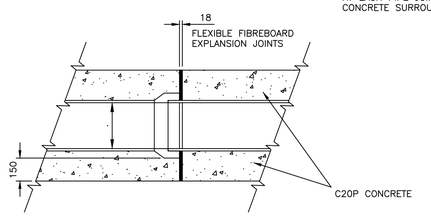


TYPICAL RODDING EYE DETAIL
NON–TRAFFICKED AREAS
(Scale 1:20)

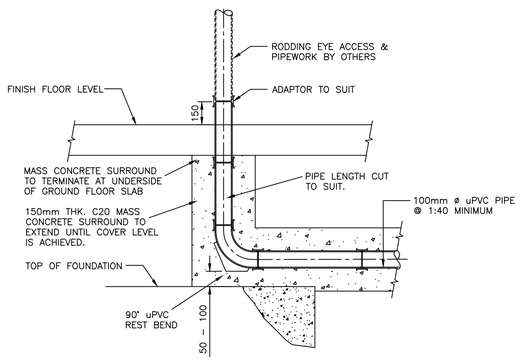


TYPICAL RODDING EYE DETAIL
TRAFFICKED AREAS
(Scale 1:20)

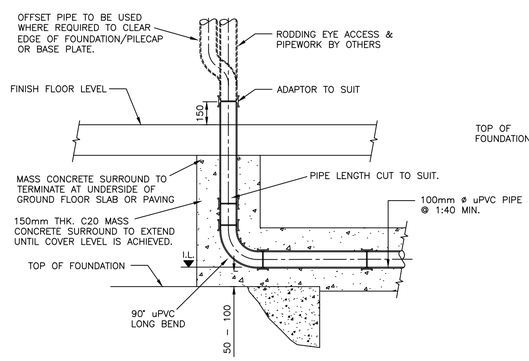
NOTE
EXPANSION JOINTS TO BE USED AT EACH PIPE JOINT WHERE CONCRETE SURROUND IS USED.



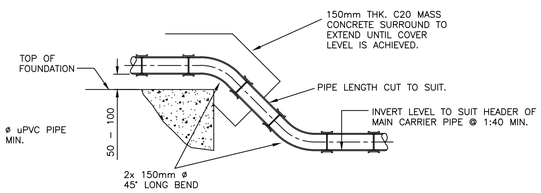
SECTION THRO' EXPANSION JOINT IN CONCRETE SURROUND
(SCALE 1:20)



TYPICAL SOIL VENT PIPE
OUTLET DETAIL
(Scale 1:20)



TYPICAL RAINWATER DOWNPIPE
OUTLET DETAIL
(Scale 1:20)



TYPICAL PIPE DETAIL
OVER FOUNDATION
(Scale 1:20)

Rev.	Date	Remarks	By	Ch.

Revisions

SREM
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4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED DRAINAGE CONSTRUCTION DETAILS
SHEET 2 OF 2

Scale	Date	Drawn by	Checked by
See Dwg	08.07.20	PD	

Drawing no.
10045-C-203

Rev

A1

N

35

33

19

15

FORSYTH STREET

New sign "New Road Layout Ahead".

Existing Bus Shelter

F3
Build on Existing Sewer
CL27.25
IL23.89(200mm)
IL23.94(150mm)

Existing 200mm FW Sewer Approx 1 in 246

Channel Drain

Relocated lighting column position

Existing lighting column

BT

RE

Secure gate

4000 SQFT RETAIL UNIT

FFL
27.50

1200 SQFT UNIT

FFL
27.25

S1

25.960

Porous Paving - Total Depth 1m

150mm 1 in 100

150mm 1 in 60

RWP

SERVICE YARD 50m²

Gulley

MH

S3

24.969

S2

25.270

25.539

24.539

F1

F2

F4

S6

25.285

24.785

Diam 600 Grad 1 in 500

Diam 150 Grad 1 in 60

600mm 1 in 500

150mm 1 in 11

Grad 1 in 10d

23.219

Diam 600

Hydro-brake MH S4
0.54l/sec
DH 1.05m
CTL-SHE-0032-5000-1050-5000

S4

CL27.30
IL26.30

11.36

RWP

RE

FFL
27.60

FFL
27.45

CYCLE STORE

Surface Water treatment for the roofs is provided in the off-site attenuation basin

225mm 1 in 170

5m Wayleave. Third party land agreements to be put in place ASAP.

Tulloch House

Diam 300 Grad 1 in 45
Type PLASTIC Length 64.854

25.42

25.42

CL27.07

S5

Refer to the Drainage Impact Assessment Report for details of the off-site detention basin

Diam 300 Grad 1 in 200
Type PLASTIC Length 95.303

25.89

25.89

S4

CL27.73

Diam 300 Grad 1 in 200
Type PLASTIC Length 94.989

Connect into existing swale which connects into the existing Attenuation Basin

S5

Existing Swale to Detention Basin

27.7m

26.3m

LEGEND:

- Proposed Surface Water Sewer (Private)
- Proposed Foul Water Sewer (Private)
- Existing Surface Water Drainage (Scottish Water)
- Existing Foul Drainage (Scottish Water)
- Proposed Gully within Porous Paving (Private)
- Proposed Porous Paving (Private)

1. All existing drainage to be checked by contractor prior to construction.
2. All drainage filter trenches to be continuous protected from ingress of construction materials during the construction phase of the works.
3. Prior to concreting all filter trenches to be washed down into silt traps and waste material to be removed when washings running clear.
4. All silt traps to be continuously monitored during construction and cleaned out weekly during construction phase of works
5. On completion of works, all pipework and filter trenches to be cleared of detritus and made ready to accept rainwater runoff from the site
6. The maintenance required to be adopted should initially be based on a bi-monthly routine during both wet and dry seasons when silt traps and pipework are routinely inspected and cleaned
7. It is anticipated that this will increase to quarterly cycle as the system acquires maturity and usage of the storage areas are determined
8. Channel drainage should be constructed to manufacturers specifications.

PLANNING

Rev.	Date	Remarks	By	Ch.
D	05.02.21	Layout revised. Channel drain added at loading bay.	PD	
C	26.08.20	Layout revised.	PD	
B	16.06.20	Surface Water outfall amended to connect to existing swale. Invert levels amended.	PD	
A	03.04.20	Surface Water outfall amended to exit through the rear properties land. Wayleave required.	PD	

Revisions

SREM
SPRINGFIELD REAL ESTATE MANAGEMENT LTD
4 RUTLAND SQUARE, EDINBURGH, EH1 2AS
0131 541 0133

Project
RETAIL UNIT, STARTER UNIT AND FLATS
FORSYTH STREET
HOPEMAN

Drawing
PROPOSED DRAINAGE LAYOUT

Scale	Date	Drawn by	Checked by
1:250	26.03.20	PD	

Drawing no.
10045-C-201

Rev
D

APPENDIX E

SEPA Simple Index Tool

SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Hazard Level*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable):	Non-residential car parking with frequent change (eg hospitals, retail)	Medium	0.7	0.6	0.7
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
Landuse Pollution Hazard Index		**Medium**	**0.7**	**0.6**	**0.7**

DESIGN CONDITIONS: 1; 2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list:	Pervious pavement (where the pavement is not designed as an infiltration component)	0.7	0.6	0.7
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list:	Detention basin	0.5	0.5	0.6
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list:	None	0	0	0
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:		0.5	0.33	0.8
Aggregated Surface Water Pollution Mitigation Index		**0.95**	**0.85**	**>0.95**

DESIGN CONDITIONS: 1; 2; 3

1: SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B

2: SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B. Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B

No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS: 1; 2; 3; 4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.95**	**0.85**	**>0.95**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS: 1

1: Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Hazard Level*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Commercial/Industrial roofing: Inert materials	Very low	0.3	0.2	0.05
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
Landuse Pollution Hazard Index		**Very low**	**0.3**	**0.2**	**0.05**

DESIGN CONDITIONS: 1; 2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Detention basin	0.5	0.5	0.6
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	None	0	0	0
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None	0	0	0
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:		0.5	0.33	0.8
Aggregated Surface Water Pollution Mitigation Index		**0.5**	**0.5**	**0.6**

DESIGN CONDITIONS: 1; 2; 3

SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B

Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B

No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: → None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS: 1; 2; 3; 4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.5**	**0.5**	**0.6**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS: 1

Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Hazard Level*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable):	Residential roofing	Very low	0.2	0.2	0.05
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
Landuse Pollution Hazard Index		**Very low**	**0.2**	**0.2**	**0.05**

DESIGN CONDITIONS: 1; 2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list:	Detention basin	0.5	0.5	0.6
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list:	None	0	0	0
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list:	None	0	0	0
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:		0.5	0.33	0.8
Aggregated Surface Water Pollution Mitigation Index		**0.5**	**0.5**	**0.6**

DESIGN CONDITIONS: 1; 2; 3

SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B

Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B

No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS: 1; 2; 3; 4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.5**	**0.5**	**0.6**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS: 1

Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

APPENDIX F

Greenfield Run-off Calcs

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Pauline Davies
Site name:	Forsyth Street
Site location:	Hopeman

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	57.70511° N
Longitude:	3.43284° W
Reference:	324391664
Date:	Jun 08 2020 14:51

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.27

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	1	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.1

Hydrological characteristics

	Default	Edited
SAAR (mm):	611	611
Hydrological region:	1	1
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.95	1.95
Growth curve factor 100 years:	2.48	2.48
Growth curve factor 200 years:	2.84	2.84

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

As QBar is less than 2l/sec
= 2 x 0.27ha =0.54l/sec

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.04	0.04
1 in 1 year (l/s):	0.03	0.03
1 in 30 years (l/s):	0.08	0.08
1 in 100 year (l/s):	0.1	0.1
1 in 200 years (l/s):	0.11	0.11

APPENDIX G

Surface Water Details and Storm Events

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
CV	0.750	Preferred Cover Depth (m)	1.500
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.037	5.00	27.225	1200	314746.090	869281.920	1.350
7	0.040	5.00	27.091	1500	314753.783	869253.202	1.714
2	0.057	5.00	27.151	1500	314751.832	869260.484	1.948
3	0.035	5.00	27.303	1500	314724.814	869253.274	2.170
4	0.000		27.250	1500	314724.780	869241.317	2.147
5	0.000		27.000	1200	314744.152	869186.773	2.237
6			27.000	1200	314747.095	869185.560	2.256

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	22.192	0.600	25.875	25.653	0.222	100.0	150	5.37	50.0
2.000	7	2	7.539	0.600	25.377	25.358	0.019	400.0	600	5.10	50.0
1.001	2	3	27.963	0.600	25.203	25.133	0.070	400.0	600	5.75	50.0
1.002	3	4	11.957	0.600	25.133	25.103	0.030	400.0	600	5.92	50.0
1.003	4	5	57.882	0.600	25.103	24.763	0.340	170.0	225	6.88	50.0
1.004	5	6	3.183	0.600	24.763	24.744	0.019	170.0	225	6.94	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.005	17.8	5.0	1.200	1.348	0.037	0.0	54	0.863
2.000	1.211	342.4	5.4	1.114	1.193	0.040	0.0	52	0.457
1.001	1.211	342.4	18.2	1.348	1.570	0.134	0.0	93	0.656
1.002	1.211	342.4	22.9	1.570	1.547	0.169	0.0	104	0.701
1.003	1.000	39.7	22.9	1.922	2.012	0.169	0.0	123	1.034
1.004	1.000	39.7	22.9	2.012	2.031	0.169	0.0	123	1.034

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	22.192	100.0	150	Circular_Default Sewer Type	27.225	25.875	1.200	27.151	25.653	1.348
2.000	7.539	400.0	600	Circular_Default Sewer Type	27.091	25.377	1.114	27.151	25.358	1.193
1.001	27.963	400.0	600	Circular_Default Sewer Type	27.151	25.203	1.348	27.303	25.133	1.570
1.002	11.957	400.0	600	Circular_Default Sewer Type	27.303	25.133	1.570	27.250	25.103	1.547
1.003	57.882	170.0	225	Circular_Default Sewer Type	27.250	25.103	1.922	27.000	24.763	2.012
1.004	3.183	170.0	225	Circular_Default Sewer Type	27.000	24.763	2.012	27.000	24.744	2.031

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1500	Manhole	Adoptable
2.000	7	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
1.001	2	1500	Manhole	Adoptable	3	1500	Manhole	Adoptable
1.002	3	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
1.003	4	1500	Manhole	Adoptable	5	1200	Manhole	Adoptable
1.004	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	314746.090	869281.920	27.225	1.350	1200	 0	1.000	25.875	150
7	314753.783	869253.202	27.091	1.714	1500	 0	2.000	25.377	600
2	314751.832	869260.484	27.151	1.948	1500	 1 2 0	2.000 1.000 1.001	25.358 25.653 25.203	600 150 600
3	314724.814	869253.274	27.303	2.170	1500	 1 0	1.001 1.002	25.133 25.133	600 600
4	314724.780	869241.317	27.250	2.147	1500	 1 0	1.002 1.003	25.103 25.103	600 225
5	314744.152	869186.773	27.000	2.237	1200	 1 0	1.003 1.004	24.763 24.763	225 225
6	314747.095	869185.560	27.000	2.256	1200	 1	1.004	24.744	225

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	✓	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	35	0	0
200	35	0	0

Node 4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	25.103	Product Number	CTL-SHE-0032-5000-1050-5000
Design Depth (m)	1.050	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.300	Slope (1:X)	125.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	18.600		

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.000	Slope (1:X)	125.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	15.000		

Node 7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	25.800	Slope (1:X)	125.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	16.000		

Node 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.000	Slope (1:X)	125.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	7.500		

Node 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.150	Slope (1:X)	125.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	16.200		

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.250	Slope (1:X)	125.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	16.200		

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	1	1350	26.560	0.685	1.0	23.0961	0.0000	SURCHARGED
1440 minute winter	7	1350	26.560	1.183	2.2	24.9370	0.0000	SURCHARGED
1440 minute winter	2	1350	26.560	1.357	1.6	11.1527	0.0000	SURCHARGED
1440 minute winter	3	1350	26.560	1.427	2.0	14.1828	0.0000	SURCHARGED
1440 minute winter	4	1350	26.560	1.457	1.1	10.5348	0.0000	SURCHARGED
1440 minute winter	5	1350	24.783	0.020	0.6	0.0222	0.0000	OK
1440 minute winter	6	1350	24.763	0.019	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	1	1.000	2	0.5	0.412	0.031	0.3907	
1440 minute winter	7	2.000	2	-1.6	0.297	-0.005	2.1236	
1440 minute winter	2	1.001	3	1.2	0.170	0.004	7.8765	
1440 minute winter	3	1.002	4	1.1	0.082	0.003	3.3680	
1440 minute winter	4	Hydro-Brake®	5	0.6				
1440 minute winter	5	1.004	6	0.6	0.356	0.015	0.0052	47.9

Results for 200 year +35% CC Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	1	945	26.776	0.901	2.4	37.9140	0.0000	SURCHARGED
960 minute winter	7	945	26.776	1.399	2.9	32.3008	0.0000	SURCHARGED
960 minute winter	2	945	26.776	1.573	3.0	14.8851	0.0000	SURCHARGED
960 minute winter	3	945	26.776	1.643	3.8	21.6016	0.0000	SURCHARGED
960 minute winter	4	945	26.776	1.673	1.9	17.8840	0.0000	SURCHARGED
960 minute winter	5	945	24.783	0.020	0.6	0.0229	0.0000	OK
960 minute winter	6	945	24.763	0.019	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	1	1.000	2	-0.8	0.439	-0.046	0.3907	
960 minute winter	7	2.000	2	-2.1	0.330	-0.006	2.1236	
960 minute winter	2	1.001	3	1.8	0.193	0.005	7.8765	
960 minute winter	3	1.002	4	-2.2	0.115	-0.006	3.3680	
960 minute winter	4	Hydro-Brake®	5	0.6				
960 minute winter	5	1.004	6	0.6	0.363	0.015	0.0054	36.9