Goodson Associates

# DRAINAGE STRATEGY REPORT

## MIXED USE DEVELOPMENT
## KELTY

| | |
|---|---|
| **Project No:** | **P14681** |
| **Date:** | **01/04/2022** |
| **Document Ref:** | **Drainage Strategy Report** |

Goodson Associates
53 Melville Street
Edinburgh
0131 226 2044
edinburgh@goodsons.com
www.goodsons.com

| Project Number: P14681 | | Signature | Date |
|---|---|---|---|
| **Prepared by:** | Robbie Douglas | | 16/12/20 |
| **Checked by:** | Euan Kerr | | 17/12/20 |

| Project Number: A | | Signature | Date |
|---|---|---|---|
| **Prepared by:** | Robbie Douglas | | 08/03/21 |
| **Checked by:** | Euan Kerr | | 08/03/21 |
| **Revision Notes** | | Ch g introduction of foul pump system, separate attenuation tanks and a different discharge location. | |

| Project Number: B | | Signature | Date |
|---|---|---|---|
| **Prepared by:** | Robbie Douglas | | 15/03/21 |
| **Checked by:** | Euan Kerr | | 15/03/21 |
| **Revision Notes** | | Update | |

| Project Number: C | | Signature | Date |
|---|---|---|---|
| **Prepared by:** | Robbie Douglas | | 12/04/21 |
| **Checked by:** | Euan Kerr | | 12/04/21 |
| **Revision Notes** | | Revised site layout | |

Goodson Associates
53 Melville Street
Edinburgh
EH3 7HL

| Project Number: D | | Signature | Date |
|---|---|---|---|
| **Prepared by:** | Dale Cunningham | [redacted] | 22/03/22 |
| **Checked by:** | Euan Kerr | | 22/03/22 |
| **Revision Notes** | • Revised site layout<br>• Revised foul and surface water drainage layout<br>• Extension of site boundary to facilitate SUDS solutions | | |

Goodson Associates
53 Melville Street
Edinburgh
EH3 7HL

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Goodson Associates
53 Melville Street
Edinburgh
EH3 7HL

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## 1.0 Introduction

Goodson Associates were appointed by a applicants Mr Ian Maclellan and TG Convenience Stores Ltd to prepare a Drainage Strategy Plan for a proposed petrol filling station and associated retail kiosk as well as a restaurant with a drive through option. The new development is located at junction 4 of the M90 adjacent to the former Baxters outlet. The design of new developments must take into consideration the latest Planning Policies (SPP and PAN 69) as well as Scottish Water and SEPA guidelines. The purpose of this report is to describe in detail the design of both the foul and surface water drainage systems for the development.

## 2.0 Existing Site

### *2.1 General Description*

The proposed site is accessed from the B194 adjacent to the western slip road of the M90. The site is centred on National Grid Reference 313330, 693800. Figure 1.0 shows an aerial photograph of the area with the site boundary highlighted in red. The site is bounded by the B194 to the immediate north and the historic Baxter's farm shop to the south. To the immediate west of the site is the access road to Baxter's and to the east is the border to the slip road for the M90.

### *2.2 Site Topography*

As Figure 1.0 shows, the area is currently a brownfield site, with the majority acting as an over spill car park for the former Baxter's farm shop. The site is approximately 1.1 hectares. The high point of this area is in the north western corner at 194.5m AOD with a topography sloping from west to east creating a site low point of 187.6m in the south eastern corner. Future headings of this report detail the proposed drainage layout which includes the positioning of Sustainable Urban Drainage System options in the neighbouring land to the site. While not included within the site red line boundary, this land is under the same ownership as the proposed development and agreements are in place to enable the drainage disposal route as proposed.

Figure 1.0 Aerial photograph showing the current site

### 2.3 *Existing Natural Drainage Features*

There are no natural water courses running through the site and the site is located around 12km from the banks of the River Forth.

The nearest minor watercourses are the Drumnagoil Burn, approximately 1km to the northwest of the site and an open loch is found to the south west of the site which was previously the site of the St Ninians Opencast Coal Mine. This together with several other minor watercourses feed into the Lochfitty burn.

### 2.4 *Existing Drainage Infrastructure*

Scottish Water records reveal that no adopted sewers serve the site or the surrounding area. A copy of the current Scottish Water record drawings for the area can be found in Appendix 1.

Scottish Water surface and foul sewers are found to the east of the site that serve the town of Kelty. Unfortunately these are not easily accessible and would involve crossing the M90 motorway.

A topographical survey of the site and local surroundings has been performed which has not detected any significant drainage features other than local road drainage to both the M90 and B194 trunk network.

The surface water from the existing car park and neighboring properties is found to go to soakaway and all foul water directed to a reed bed to the south of the properties where it soaks away.

It is noted that there is a historic and abandoned 300mm ductile iron public main water distribution pipe passing through the site. As this is abandoned, it is not believed that this development will cause any impact on water supply to neighboring properties.

## 3.0 Proposed Development

As discussed, the proposed development is to consist of a Petrol Filling Station and associated retail kiosk, freestanding restaurant including drive-thru lane and parking provisions also on site there will be HGV fuel filling stations and parking for HGV vehicles. The proposed development layout can be found in Appendix 2.

In accordance with Scottish Water and SEPA requirements and the Fife Council SUDS Design Criteria the following is proposed:

- Separate foul and surface water drainage networks.
- Surface water potentially contaminated with fuels will be treated via a Class 1 Forecourt Separator prior to joining the surface water network.
- Foul water will be processed via a package treatment station before discharging to a soakaway dedicated basin.
- Surface water will collect into two attenuation units. Flows will be restricted on site prior to discharge. Section 7 contains specific details of the surface water drainage scheme.
- The flow will then leave the site and enter a controlled respective soakaways where it will dissipate to groundwater through infiltration.

## 4.0 Flood Risk Assessment

The possible sources of flooding have been considered for the site. There are no records of incidents of flooding on this site and the site is located outwith a potential flood risk area identified on the SEPA Flood Map. It is concluded that it is unlikely that flooding will occur.

## 5.0 Drainage Disposal Options

Various disposal options have been considered for the drainage from this site given its remoteness from a sewer network.

Rainwater harvesting has been considered for the use as grey water within each building, however, the cost of installation, maintenance and monitoring has rendered this unviable for this development.

Disposal to existing Scottish Water sewer infrastructure has been considered in detail. As mentioned previously, the existing infrastructure in located in Kelty on the other side of the M90 motorway. Methods for crossing this main trunk road have been investigated and Transport Scotland approached for record drawings of the bridge. These have been provided and an extract can be found below.

It is noted that there are already many services within both trenches either side of the bridge. In particular, there is found to be existing Scottish Water mains infrastructure in service chambers to each side of the bridge. On discussion with Scottish Water these are understood to be mains from the local reservoir network and it is deemed unacceptable to locate a new foul sewer in the same service trench.

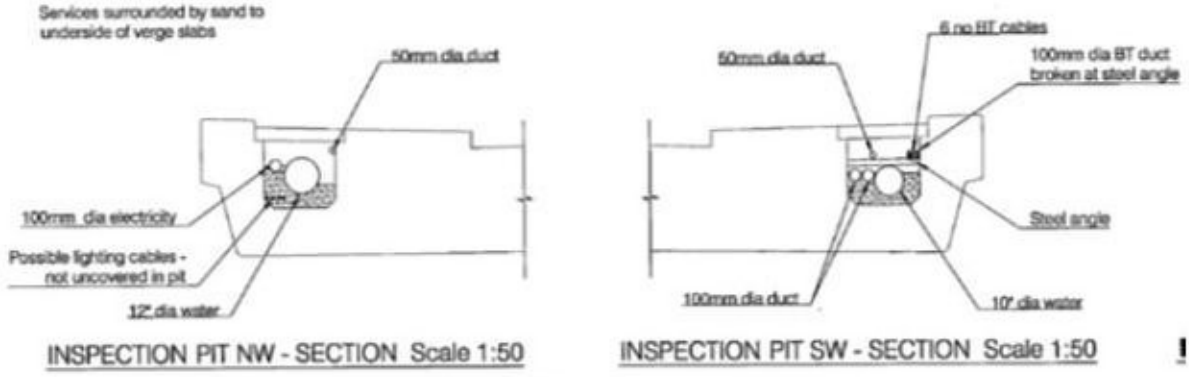



Figure 1 - Record Drawings of Bridge Showing Service Trenches

Based on the above restriction and fundamental challenge in accessing sewer infrastructure, discharge of all waste water to groundwater via a soakaway is considered the most viable option for the development. It is proposed all foul discharge shall be fed through a package treatment station prior to discharge to a foul soakaway adjacent to the existing reed bed. Discussion are ongoing as to whether this reed bed will be upgraded and replaced as part of this project for the overall betterment of the environment. A separate, dedicated surface water soakaway shall also be formed.

The large area of unused land directly to the south of the development is reasoned to be ideally suited for a soakaway solution. This land is under the same ownership as the main body of proposed development and agreements are in place to use this land for the drainage disposal route as proposed.

## 6.0 Foul Water

The foul drainage will be a gravity fed system conveyed to a package treatment station. After treatment the outflow will discharge into a soakaway system and infiltrate into the ground.

The package treatment stations have been sized assuming the following 24hr demand from each facility as categorized by British Water's "Flows and Loads".

- Fast Food Meal (McDonalds) = 1616 meals a day

- Fast Food Snacks (PFS) = 285 snacks per day

These expected numbers are based on worst case figures as predicted from previous developments.

Average foul water discharges for the development have been calculated in accordance with the guidelines presented in British Water's "Flows and Loads 4". The average flow from the site has been calculated to be 0.264 l/s (refer to Appendix 3 for the foul flow calculations).

The associated population equivalence (PE) for the development has been calculated as follows:

Flow PE = 153
BOD PE = 380

A CAR license for the development shall be obtained through SEPA on confirmation of planning approval and at this stage the correct package treatment and infiltration bed detailed to meet the requirements of the license.

The current proposed discharge concentrations from the site are as follows but these shall be agreed with SEPA through the CAR application process:

BOD = 10 mg/l, SS = 20 mg/l, Ammonia = 10 mg/l

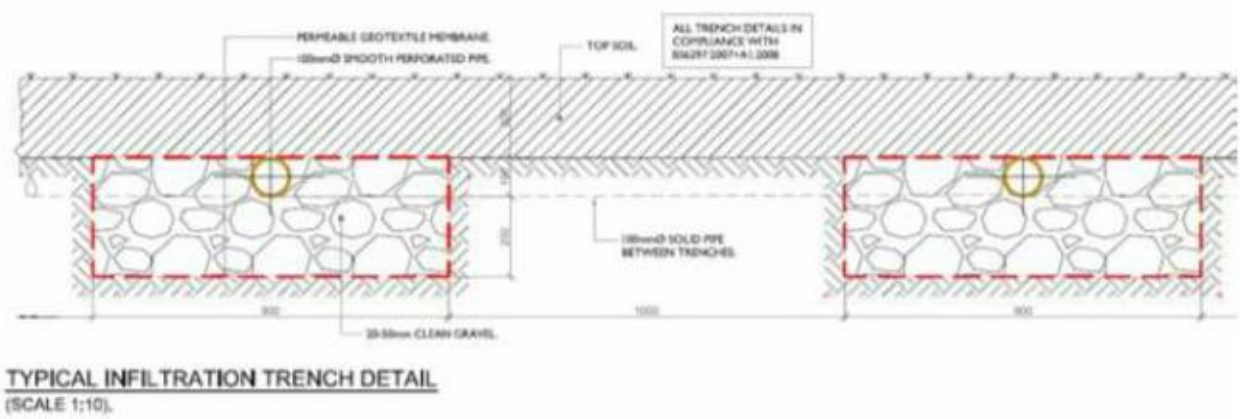



Figure 2 - Typical Proposed Infiltration/Soakaway Details

It is acknowledged that the site use has potential contamination, however, through careful design and use of modern technology and treatment methods there should be no detrimental impact on discharging the end product/treated outflow to the environment. There is even the potential to improve the environment should the drainage from the neighboring properties be upgraded through these works.

Installing a suitable drainage system as proposed will unlock the development of this brownfield site for the betterment of the local area.

## 7.0 Surface Water

### *7.1 Planning and Regulatory Framework*

The design of the drainage system must consider the guidance and design criteria published by various key stakeholders, including the local authority (Fife Council), SEPA and Scottish Water.

In addition to the requirements of the statutory consultees given above, the concepts of best practice should also be incorporated into the design of the drainage systems, Table 1 below.

| Publications | Key Requirements |
|---|---|
| The SUDS Manual (CIRA Document C753) | A treatment system should be provided to improve the water quality prior to being discharged to the publicly owned sewerage system or natural water environment. |
| Scottish Planning Policy | The development must incorporate a SUDS scheme, in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations (CAR).<br><br>The proposed drainage scheme must minimise the pollutant impacts upon people and the environment.<br><br>Sufficient free-board must be allowed for between the peak flood level and the finished floor levels. |
| BS EN 752:2008 and UKNA & BS EN 12056-2:2000 | The drainage system must provide sufficient hydraulic capacity to cope with the flow rates calculated in accordance with the standard.<br>The proposed drainage scheme must minimise the pollutant impacts upon people and the environment. |

Fife Council

Fife Council SuDS Design Criteria requires that all developments adhere to accepted technical SuDS requirements i.e. all proposed development must be drained by SuDS designed in accordance with The SuDS Manual (CIRIA C753), Sewers for Scotland and Planning Advice Note 61: Planning and Sustainable Urban Drainage Systems (PAN 61).

The local authority, being responsible for flood prevention, is focused mainly on the issues surrounding the quantity of water discharging from the site and the degree of attenuation required to reduce the risk of flooding to an acceptable level. Fife Council therefore publishes SUDS design criteria for new developments through its Flood Prevention Guidelines document "Design Criteria Guidance on Flooding and Surface Water Management Plan Requirements" which aims to inform developers, their consultants and all stakeholders involved in the planning process in relation to flooding and surface water management of the requirements of Fife Council. The latest science predicts a sea level rise of 0.85-0.86m by 2100 for the Fife region, it is therefore imperative that flooding, flood risk and flood risk management are primary concerns for the development.

From a review of the latest revision of this document it is apparent that the surface water drainage system for the proposed development must:

1. Reduce the peak discharge from the site, to reduce the pressure on the receiving sewerage system or watercourse.

2. Provide sufficient storage below ground to ensure that there is no surface water flooding during a 1 in 30-year return period event.

3. Provide sufficient storage, including temporary above ground storage where appropriate, to ensure that there are no detrimental effects on the site, neighbouring properties or public highways during a 1 in 200-year return period event with a 40% uplift to account for climate change.

Scottish Environmental Protection Agency (SEPA)

As an environmental protection agency SEPA's role in the drainage approval process relates to issues of water quality and the protection of the natural water environment. Since April 2006 SEPA have fulfilled this duty through the Water Environment (Controlled Activities) (Scotland) Regulations – more commonly known as the Controlled Activities Regulations or CAR. Under these regulations, which were introduced in response to the Water Environment and Water Services (Scotland) Act 2003, there are three levels of authorisation. The three levels allow for a proportionate and risk-based approach to control and are in ascending order of rigorousness:

1. General Binding Rules
2. Registrations
3. Licenses

From a review of SEPA's guidance document, Water Environment (Controlled Activities)(Scotland) Regulations 2011 - A Practical Guide, it can be seen that the proposed development falls within the scope of "Discharge of water run-off from a surface water drainage system to the water environment from buildings, roads other than waterbound roads, yards or any other built development constructed on or after 1 April 2007, unless covered by one of the listed exceptions" and hence is to comply with General Binding Rules (GBR10A) authorisation. This should be reviewed during the detailed design and the relevant registrations or licensing application progressed with SEPA if necessary.

Surface water systems must also be designed in accordance with the latest SEPA guidelines. In the case of separate foul and surface water systems, SEPA require that surface water runoff be treated. Low risk areas such as roofs are subject to one stage of treatment whilst higher risk areas such as car parks, are subject to two. Surface water treatment is covered under Heading 7.3.

Scottish Water

As the local water authority, Scottish Water publish design guidance that relates to publicly adoptable drainage schemes and connections to the publicly owned sewerage system. Although not strictly applicable to the design of the privately maintained parts of the drainage system, Sewers for Scotland is considered to provide guidance on best practice for sewerage design in Scotland.

From a review of this document the following major implications for the drainage system have been identified:

1. Separate foul and surface water systems should be provided.

2. Self-cleansing should be ensured. Either by designing for a minimum velocity - taken to be 1m/s at pipe full flow in surface water sewers and 0.75m/s at one-third design flow in foul sewers – or adopting the pipe size and gradients specified in Sewers for Scotland.

3. The 1 in 30-year return period should be considered and an allowance of 30% made for climate change when designing adoptable SUDS devices.

### *7.2 Surface Water Attenuation*

From a review of the above frameworks Fife Council SuDS Design Criteria is reasoned to be the most onerus, for this reason the surface water attenuation design will follow the below scope:

1. Provides sufficient storage below ground to ensure that there is no surface water flooding during a 1 in 30-year return period event.

2. Provides sufficient storage, including temporary above ground storage where appropriate, to ensure that there are no detrimental effects on the site, neighbouring properties or public highways during a 1 in 200-year return period event with a 40% uplift to account for climate change.

As previously noted, the site is approximately 1.1 ha in size and comprises the following:

- 9000m2 of hard surfaces = 9000 x 1.0 = 9000m2
- 2000m2 of soft surfaces = 2000 x 0.1 = 200m2
- Total impermeable area assumed in calculations = 9,200m$^2$

These areas and the proposed drainage layout have been modelled in the Microdrainage computer analysis package where results determined the provision of two attenuation tanks (50m$^3$ and 70m$^3$) aided with filter trenches on the southern boundary and along the route to the soakaway location provides sufficient attenuation to satisfy the flood events.

Microdrainage outputted report is included in Appendix 4. The results depict that in accordance with Fife Council SuDS Design Criteria no flooding occurs during the 1-in-30 year storm event with a 40% uplift to account for climate change. Where flooding at 1no manhole is demonstrated during the 1-in-200 year storm event with a 40% uplift to account for climate change the site layout utilizes the natural topography to control the flooding and prevent any detrimental effect to the development or surrounding areas.

Pre and post development flow paths are shown in Appendix 5.

### 7.3 *Surface Water Treatment*

In accordance with Table 3.3 of The CIRIA SuDS Manual the following will be provided on site:

| Location | Stages of Treatment |
|---|---|
| Building Roofs | 1 |
| Car Park | 2 |

Table 1.0 Surface Water Treatment Requirements

All surface water will be subject to appropriate stages of treatment by being processed by the soakaway prior to infiltration to groundwater. In some instances, surface water will receive an additional level of treatment via filter trenches prior to being treated by the soakaway.

**TABLE 26.7 Indicative suitability of SuDS components within the Management Train**

| SuDS component | Interception[1] | Close to source/ primary treatment | Secondary treatment | Tertiary treatment |
|---|---|---|---|---|
| Rainwater harvesting | Y | | | |
| Filter strip | Y | Y | | |
| Swale | Y | Y | Y | |
| Filter drain | Y | | Y | |
| Pervious pavements | Y | Y | | |
| Bioretention | Y | Y | Y | |
| Green roof | Y | Y | | |
| Detention basin | Y | Y | Y | |
| Pond | [2] | Y[3] | Y | Y |
| Wetland | [2] | Y[3] | Y | Y |
| Infiltration system (soakaways/ trenches/ blankets/basins) | Y | Y | Y | Y |
| Attenuation storage tanks | Y[4] | | | |
| Proprietary treatment systems | | Y[4] | Y[4] | Y[4] |

The SEPA index tool has been used for the worst-case usage on the site (i.e. Lorry park) to ensure all surface water from the development is adequately treated. A copy of this document can be found in Appendix 6. The tool notes that additional hydrocarbon mitigation is required – this is achieved by a Class 1 Forecourt Separator which will treat all surface water runoff potentially contaminated with fuels prior to discharging to the surface water system.

### 7.4 *Surface Water Discharge*

Restriction of flow from the site will be achieved by means of a control mechanism on the attenuation outlets. Using such a device has obvious blockage issues, however guidance will be provided in the Health and Safety and O&M Files regarding how regular maintenance is to be undertaken.

### 7.5 *Ground Investigation*

#### 7.5.1 *Soakaway*

Trial pits have been undertaken on site to determine soil makeup and infiltration rate. The report by DAM Geotechnical Services has been included in Appendix 7. Based on soakaway values obtained

from the site testing, the surface water soakaway basin has been positioned at the location of greatest infiltration rate. Tekla TEDDS computer analysis has been utilised to size a soakaway basin with outputs also included in Appendix 7.

### 7.5.2 *Groundwater*

Archived borehole logs obtained through British Geological Survey interactive maps conducted on site depict that groundwater was not identified within the intended manhole or SuDS component depths. This review concludes that that the base of these features will remain above the groundwater level.

It is noted that the site has been heavily mined for coal in the past. Due to the nature of the buildings associated with this development it is not envisaged that ground stabilisation through grouting will be required, however, if this is deemed to be required, this shall be undertaken with suitable CAR license consent.

## *7.6 Surface Water Maintenance*

The drainage system and SUDS features will remain private and the maintenance responsibility of the development landowner.

These SUDS features will be maintained regularly and in accordance with the below tabulated guidance from CIRIA The SUDS Manual and manufacturer's recommendations (where applicable) to ensure continuing operation to design performance standards.

### 7.6.1 *Gullies and ACO Channels*

As part of the maintenance regime all gullies are to be inspected every 6 months and emptied and cleansed at least once a year unless local conditions necessitate emptying on a more regular basis. No more than 50mm of debris should remain in the pot before it is recharged with clean water.

ACO channels should be inspected at frequent and regular intervals (at least every six months). Inspections and maintenance should be carried out in strict accordance with the manufacturer's recommendations.

### 7.6.2 *Attenuation Tank*

Regular inspection and maintenance is required to ensure the effective long-term operation of belowground storage systems.

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

Additional, specific maintenance requirements in accordance with the manufacturer's specification may be required.

### 7.6.3 *Filter Trench*

Litter (including leaf litter) and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All other maintenance tasks should be undertaken in line with the recommendations below:

| Maintenance schedule | Required action | Typical frequency |
|---|---|---|
| Regular maintenance | Remove litter (including leaf litter) and debris from filter drain surfaces, access chambers and pre-treatment devices | Monthly (or as required) |
| | Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage | Monthly |
| | Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies | Six monthly |
| | Remove sediment from pre-treatment devices | Six monthly, or as required |
| Occasional maintenance | Remove or control tree roots where they are encroaching the sides of the filter drain | As required |
| | At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium | Five yearly, or as required |
| | Clear perforated pipework of blockages | As required |

### 7.6.4 *Soakaway*

The bioretention zones on site will also require regular maintenance as the treatment performance of bioretention systems is dependent on this. In general, upkeep of the bioretention areas should be undertaken as part of routine landscape maintenance. As with swales, maintenance of bioretention zones are relatively straightforward. A summary of the requirements is tabulated below.

| Maintenance schedule | Required action | Typical frequency |
|---|---|---|
| Regular inspections | Inspect infiltration surfaces for sitting and ponding, record de-watering time of the facility and assess standing water levels in underdrain to determine if maintenance is necessary | Quarterly |
| | Check operation of underdrains by inspection of flows after rain | Annually |
| | Assess plants for disease infection, poor growth, incasive species etc and replace as necessary | Quarterly |
| | Inspect inlets for blockages | Quarterly |
| Regular maintenance | Remove litter and surface debris and weeds | Quarterly (or more frequently for tidiness or aesthetic reasons) |
| | | |
| | Replace any plants, to maintain planting density | As required |
| | Remove sediment, litter and debris build-up from around inlets or from forebays | Quarterly to biannually |
| Occasional maintenance | Infill any holes or scour in the filter medium, improve erosion protection if required | As required |
| | Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch | As required |
| Remedial actions | Remove and replace filter medium and vegetation above | As required but likely to be > 20 years |

The soakaway will meet all SEPA requirements and is to be monitored consistently for contamination of the local environment.

### 7.6.5 *Hydrobrake*

The flow control mechanism at the disconnecting chamber on site will require specific maintenance. Maintenance will be dependent on the site, the size and characteristics of the flow control, the nature of the influent and any physical characteristics of any control chamber. Once the details and manufacturer of this proposed unit is confirmed detailing maintenance requirements will be provided.

## 8.0 Previous Consultation

Previous Drainage Strategy reports for this proposed development have received consultation feedback from local stakeholder authorities – Fife Council, SEPA and Scottish Water. This section of the report aims to provide a commentary to this feedback to demonstrate how this drainage strategy addresses the comments raised.

Fife Council

It was requested that the application include:

- *Calculations of any SuDS/attenuation volume required. The results should show the 1 in 200-year return period events plus climate change (40%).*

  This has been discussed under Heading 7.2 with Microdrainage output report included in Appendix 4.

- *Subsoil porosity testing for proposed overflow granular soakaway and infiltration filter trenches should be undertaken in line with the requirements of BRE Digest 365 or similar recognised methodology.*

  Ground investigation has been conducted by DAM Geotechnical Services with the report included in Appendix 7. A surface water soakway has been designed to BRE Digest 365 – refer to Appendix 7

- *Assessment of the maximum groundwater level at the location of the proposed overflow granular soakaway and underground attenuation features to demonstrate that the base of these features will remain above the groundwater level. The soakaway should be a minimum of 5m away from any building or development site boundary.*

  A review of archived borehole logs demonstrate that a shallow groundwater table is not present hence SUDS components are all assured to remain above groundwater.

- *The final discharge to "combined foul soakaway" is outwith the development site boundary. The Applicant must provide confirmation of ownership of the site of the proposed soakaway and approval for use of the land. SEPA should be consulted on the use of a foul soakaway.*

  The adjacent fields to the south of the site are under the same ownership as the development plot, and agreements are in place to enable the drainage disposal route as proposed. See below for SEPA correspondence relating to the foul soakaway.

- *Confirmation of who will adopt/vest and maintain the surface water network out with property boundaries, including any SuDS.*

  The full drainage will remain private and owned by the local landowner. It is the responsibility of the owner to maintain the private drainage.

- *Completed SuDS design and check certificates (Appendices 1&2).*

  Completed design and check certificates are included in Appendix 9.

SEPA

- *Technical and economic reasons why the development is unable to connect to Scottish Water sewerage infrastructure*

As discussed in section 5.0 the existing Scottish Water sewer infrastructure is located on the opposite side of the M90 motorway. Methods of accessing the sewer infrastructure have been explored, however the existing service chambers/trenches within the bridge have found to be full and not suited to house a new foul sewer. Installation of a sewer to the external face of the sewer has been discounted on safety and maintenance grounds. Therefore, the cost and challenge in accessing the existing sewer network outweighs the benefits for a development of this scale.

Scottish Water

For the reasons discussed above and the challenges associated with reaching the Scottish Water Sewer network, the drainage strategy does not seek to connect to the Scottish Water network.

Instead, soakaway SUDS components are proposed to utilise the areas and appropriate ground conditions available to the proposed development. This solution is both economical in negating the required construction to connect to the existing network in Kelty by crossing the M90 motoroway, and sustainable by not providing additional demand on the Scottish Water network.

## 9.0 Conclusion

In summary, the need for a suitable 'Sustainable Urban Drainage Scheme' has been recognised and incorporated within the design proposals for the surface water system. The surface water will be attenuated on site before discharging into a soakaway component.

Full attenuation for the 1 in 200-year storm event +40% climate change will be provided in accordance with Fife Council requirements. There will therefore be no detrimental effect on the development or surrounding properties.

A traditional gravity system will collect and coney the foul water to an onsite package treatment station which will then discharge into the developments dedicated foul soakaway.

A copy of the proposed drainage layout has been included in Appendix 8.

The proposed system aims to unlock this brownfield site for future development in a sustainable and economic manner while not causing a detrimental impact on the surrounding environment.

# Appendices

# Appendix 1 - Scottish Water Record Plan


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.

Date Plotted: 20/05/2020

0 236 metres

Scale: 1:2500



Scottish Water

Castle House,
6 Castle Drive,
Dunfermline,
KY11 8GG
Tel No: 0845 601 8855

# Appendix 2 - Proposed Development Layout

# Appendix 3 - Foul Discharge Calculations

| Goodson Associates | Consulting Civil and Structural Engineers | Contract: Kelty Retail Development |
|---|---|---|
| | | Prepared by R.D. Date 06/10/2020 |
| | | Ref No P14681 |

Title Post-Development Foul Water Discharge in Accordance with Flows and Loads 4

**Description of Development:** Restaurant with Drive Through.

Table of Loadings for Sewage Treatment Systems

Per person / activity / day (unless otherwise specified)

| | Flow (Litres) | Population (P) | Average Foul Water Discharge (l/s) |
|---|---|---|---|
| Domestic Dwellings | | | |
| Standard Residential | 150 | 0 | 0.0000 |
| Mobile Home Type Caravans with full services | 150 | 0 | 0.0000 |
| Industrial | | | |
| Office/Factory without canteen | 50 | 0 | 0.0000 |
| Office/Factory with canteen | 100 | 0 | 0.0000 |
| Open Industrial Site e.g. construction, quarry, without canteen | 60 | 0 | 0.0000 |
| Full-Time Day Staff | 90 | 10 | 0.0104 |
| Part-Time Staff (4hr shift) | 45 | 0 | 0.0000 |
| Schools | | | |
| Non-residential with canteen cooking on site | 90 | 0 | 0.0000 |
| Non-residential without a canteen | 50 | 0 | 0.0000 |
| Boarding School i) residents | 175 | 0 | 0.0000 |
| Boarding School ii) day staff (inc. mid-day meal) | 90 | 0 | 0.0000 |
| Hotels, Pubs & Clubs | | | |
| Hotel Guests (Prestige Hotels) | 300 | 0 | 0.0000 |
| Hotel Guests (3 and 4 Star Hotels) | 250 | 0 | 0.0000 |
| Guests (Bedroom Only - no meals) | 80 | 0 | 0.0000 |
| Residential Training/Conference Guest (inclusive all meals) | 350 | 0 | 0.0000 |
| Non-residential Conference Guest | 60 | 0 | 0.0000 |
| Drinkers | 12 | 0 | 0.0000 |
| Holiday Camp Chalet Resident | 227 | 0 | 0.0000 |
| Resident Staff | 180 | 0 | 0.0000 |
| Restaurants - Full Meals - Luxury Catering | 30 | 0 | 0.0000 |
| Restaurants - Full Meals - Pre-prepared Catering | 25 | 0 | 0.0000 |
| Restaurants - Snack Bars and Bar Meals | 15 | 0 | 0.0000 |
| Restaurants - Function Rooms including Buffets | 15 | 0 | 0.0000 |
| Restaurants - Fast Food i.e. roadside restaurants | 12 | 1616 | 0.2244 |
| Restaurants - Fast Food Meal (burger chain and similar) | 12 | 0 | 0.0000 |
| Students (Accommodation Only) | 100 | 0 | 0.0000 |

| | | | |
|---|---|---|---|
| *Amenity Sites* | | | |
| Toilet Blocks (per use) | 10 | 0 | 0.0000 |
| Toilet WC (per use) | 10 | 0 | 0.0000 |
| Toilet Urinal (per use) | 5 | 0 | 0.0000 |
| Toilet Blocks in Long Stay Car Parks/Lorry Parks (per use) | 10 | 0 | 0.0000 |
| Showers (per use) | 40 | 0 | 0.0000 |
| Golf Club | 20 | 0 | 0.0000 |
| Local Community Sports Club e.g. squash, rugby & football | 40 | 0 | 0.0000 |
| Swimming (where a separate pool exists without an associated sports centre) | 10 | 0 | 0.0000 |
| Health Club / Sports Centre | 50 | 0 | 0.0000 |
| Tent Sites | 75 | 0 | 0.0000 |
| Caravan Sites i) Touring not serviced | 100 | 0 | 0.0000 |
| Caravan Sites ii) Static not serviced | 100 | 0 | 0.0000 |
| Caravan Sites iii) Static fully serviced | 150 | 0 | 0.0000 |
| *Hospitals & Residential Care Homes* | | | |
| Residential old people/nursing | 350 | 0 | 0.0000 |
| Small Hospitals | 450 | 0 | 0.0000 |
| Large Hospitals | - | - | Assess Individually |
| | | Average FW Discharge (l/s) | 0.2349 |
| (Assuming a peaking factor of 6) | | Peak FW Discharge (l/s) | 1.4092 |

| Goodson Associates | Consulting Civil and Structural Engineers | Contract: Kelty Retail Development |
|---|---|---|
| | | Prepared by R.D. Date 06/10/2020 |
| | | Ref No P14681 |

Title Post-Development Foul Water Discharge in Accordance with Flows and Loads 4

**Description of Development:** Fuel Station and associated Retail Kiosk

Table of Loadings for Sewage Treatment Systems

Per person / activity / day (unless otherwise specified)

| | Flow (Litres) | Population (P) | Average Foul Water Discharge (Qa) |
|---|---|---|---|
| Domestic Dwellings | | | |
| Standard Residential | 150 | 0 | 0.0000 |
| Mobile Home Type Caravans with full services | 150 | 0 | 0.0000 |
| Industrial | | | |
| Office/Factory without canteen | 50 | 0 | 0.0000 |
| Office/Factory with canteen | 100 | 0 | 0.0000 |
| Open Industrial Site e.g. construction, quarry, without canteen | 60 | 0 | 0.0000 |
| Full-Time Day Staff | 90 | 10 | 0.0104 |
| Part-Time Staff (4hr shift) | 45 | 0 | 0.0000 |
| Schools | | | |
| Non-residential with canteen cooking on site | 90 | 0 | 0.0000 |
| Non-residential without a canteen | 50 | 0 | 0.0000 |
| Boarding School i) residents | 175 | 0 | 0.0000 |
| Boarding School ii) day staff (inc. mid-day meal) | 90 | 0 | 0.0000 |
| Hotels, Pubs & Clubs | | | |
| Hotel Guests (Prestige Hotels) | 300 | 0 | 0.0000 |
| Hotel Guests (3 and 4 Star Hotels) | 250 | 0 | 0.0000 |
| Guests (Bedroom Only - no meals) | 80 | 0 | 0.0000 |
| Residential Training/Conference Guest (inclusive all meals) | 350 | 0 | 0.0000 |
| Non-residential Conference Guest | 60 | 0 | 0.0000 |
| Drinkers | 12 | 0 | 0.0000 |
| Holiday Camp Chalet Resident | 227 | 0 | 0.0000 |
| Resident Staff | 180 | 0 | 0.0000 |
| Restaurants - Full Meals - Luxury Catering | 30 | 0 | 0.0000 |
| Restaurants - Full Meals - Pre-prepared Catering | 25 | 0 | 0.0000 |
| Restaurants - Snack Bars and Bar Meals | 15 | 0 | 0.0000 |
| Restaurants - Function Rooms including Buffets | 15 | 0 | 0.0000 |
| Restaurants - Fast Food i.e. roadside restaurants | 12 | 285 | 0.0396 |
| Restaurants - Fast Food Meal (burger chain and similar) | 12 | 0 | 0.0000 |

| | | | |
|---|---|---|---|
| *Amenity Sites* | | | |
| Toilet Blocks (per use) | 10 | 0 | 0.0000 |
| Toilet WC (per use) | 10 | 0 | 0.0000 |
| Toilet Urinal (per use) | 5 | 0 | 0.0000 |
| Toilet Blocks in Long Stay Car Parks/Lorry Parks (per use) | 10 | 0 | 0.0000 |
| Showers (per use) | 40 | 0 | 0.0000 |
| Golf Club | 20 | 0 | 0.0000 |
| Local Community Sports Club e.g. squash, rugby & football | 40 | 0 | 0.0000 |
| Swimming (where a separate pool exists without an associated sports centre) | 10 | 0 | 0.0000 |
| Health Club / Sports Centre | 50 | 0 | 0.0000 |
| Tent Sites | 75 | 0 | 0.0000 |
| Caravan Sites i) Touring not serviced | 100 | 0 | 0.0000 |
| Caravan Sites ii) Static not serviced | 100 | 0 | 0.0000 |
| Caravan Sites iii) Static fully serviced | 150 | 0 | 0.0000 |
| *Hospitals & Residential Care Homes* | | | |
| Residential old people/nursing | 350 | 0 | 0.0000 |
| Small Hospitals | 450 | 0 | 0.0000 |
| Large Hospitals | - | - | Assess Individually |
| | | Average FW Discharge (l/s) | 0.0500 |
| (Assuming a peaking factor of 6) | | Peak FW Discharge (l/s) | 0.3000 |

# Appendix 4 - Microdrainage Report

# Appendix 5 - Pre and Post Development Flow Path

# Appendix 6 - SEPA Index Tool

| SUMMARY TABLE | | DESIGN CONDITIONS | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| **Land Use Type** | Lorry park | These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site. | In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment. | | |
| **Pollution Hazard Level** | High | | | | |
| **Pollution Hazard Indices** | | | | | |
| **TSS** | 0.8 | | | | |
| **Metals** | 0.8 | | | | |
| **Hydrocarbons** | 0.9 | | | | |
| **SuDS components proposed** | | | | | |
| **Component 1** | None | | | | |
| **Component 2** | None | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Component 3** | None | | | | |
| **SuDS Pollution Mitigation Indices** | | | | | |
| **TSS** | 0 | | | | |
| **Metals** | 0 | | | | |
| **Hydrocarbons** | 0 | | | | |
| **Groundwater protection type** | Bioretention component underlain by 300 mm minimum depth of soils with good contamination attenuation potential | All designs must include a minimum of 1 m unsaturated depth of subsoil or aquifer material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be preceded by upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate lined zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events | The underlying soils must provide good contaminant attenuation potential (eg as recommended in Sniffer 2008 (a) and (b) / Scott Wilson (2010) or other appropriate guidance). Alternative depth and soil combinations must provide equivalent protection to the underlying groundwater | | |
| **Groundwater protection Pollution Mitigation Indices** | | | | | |
| **TSS** | 0.8 | | | | |
| **Metals** | 0.8 | | | | |
| **Hydrocarbons** | 0.8 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Combined Pollution Mitigation Indices** | | 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 | | | |
| **TSS** | 0.8 | | | | |
| **Metals** | 0.8 | | | | |
| **Hydrocarbons** | 0.8 | | | | |
| **Acceptability of Pollution Mitigation** | | | | | |
| **TSS** | Sufficient | | | | |
| **Metals** | Sufficient | | | | |
| **Hydrocarbons** | Additional Hydrocarbon Mitigation Required | | | | |

# Appendix 7 - Ground Investigation

# Appendix 8 - Proposed Drainage Layout

# Appendix 9 - Sustainable Drainage Design Compliance Certificate

# Appendices

# Appendix 1 - Scottish Water Record Plan


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.

Date Plotted: 20/05/2020

0 236 metres

Scale: 1:2500



Scottish Water

Castle House,
6 Castle Drive,
Dunfermline,
KY11 8GG
Tel No: 0845 601 8855

# Appendix 2 - Proposed Development Layout

Scale Bar 1:250 @ A1 (Metres)
0 1 2 3 4 5 10 15 20

NORTH

B914

6m x 210m Visibility Splay

4.5 x 210m visibility splay

existing trees retained

existing kerbline removed and a new wider entrance road formed

new entrance road formed

new kerbs

new landscaping

company sign

footpath

trief kerbs

trash and storage compound

back of house

kiosk

plant area

Sales Building (4,884ft²)

191.200 FFL

pfs customer entrance

FTG Area

customer parking

bollards

cycle stands

motorcycle parking

4 island starter gate forecourt

Canopy over at 5.2m min. ht w/s

tank farm

offset fills and vents

3no. hgv parking spaces

gabion retaining wall

2m high close boarded fence

new pedestrian footpath for access to PFS

new fence

proposed pedestrian crossing point

pedestrian crossing

new sub station

4No. 150kW Swarco EV chargers to serve 8No. bays

new kerbing

road way infilled, existing kerbing removed

Car Park

new pedestrian footpath for access to McDonalds

existing fence removed and replaced with a new 1200mmm high close boarded fence

new retaining wall

banner sign

max height barrier

drive thru lanes

menu boards

order point

DRIVE THRU

delivery

comm

customer parking

patio

cycle stands

waiting bays

new 20m high totem sign subject to a seperate application

new 1800mm high close boarded fence

existing fence removed and replaced with a new 1200mm high close boarded fence

HGV FUEL ONLY

HGV PARKING

RIGHT TURN ONLY

ALL FUEL

EXIT ONLY

EXIT

## PROPOSED OVERALL SITE PLAN
## SCALE 1:250

LEVELS KEY

187.50 — EXISTING LEVEL

× 187.50 NEW LEVEL

| rev | date | by | description |
|---|---|---|---|
| I | 14/03/22 | DB | Additional road survey information overlaid. 8No. new EV bays and sub station added. |
| H | 29/03/21 | DB | Revised PFS forecourt layout plan. HGV pump island and tank farm moved in a Southerly direction. |
| G | 10/02/21 | DB | Pedestrian footpath added from new road crossing up to PFS. McDonalds banner sign moved to the East to accommodate pedestrian footpath in to McDonalds site. New ghost island indicated for right turn into site, road markings amended to suit. |
| F | 29/01/21 | DB | Levels key added. |
| E | 20/01/21 | DB | Existing electric pylon and overhead electric cable removed and re-routed underground. Retaining wall and boundary fences amended to suit revised site levels. Revised site levels indicated. |
| D | 08/01/21 | DB | Retaining wall indicated around drive thru lane. Indicative spot levels added. |
| C | 07/01/21 | JF | Fencing and signage locations clarified. |
| B | 23/12/20 | DB | Entrance kerbs to site amended. Pedestrian crossing added across B914. Visibility splay added. |
| A | 13/11/20 | DB | Canopy raised to 5.2m min. to underside. |
| – | 03/11/20 | DB | Drawing created. |

PLANNING

| rev | date | by | description |
|---|---|---|---|

CLIENT
SGN Limited
3 C Twyford Court, High Street
Dunmow, CM6 1AE

PROJECT LOCATION
Blairadam Forrest Services
Kelty, Fife (B914)
Scotland KY4 0JR

DRAWING
Proposed Site Layout Plan

Wyeth Projects Services
The Cart Shed, Amberley Court, Amberley Lane, Milford, Surrey, GU8 5EB, United Kingdom
Tel: +44 (0)1483 424704
Email: enquires@wyethprojects.com



| Date: | Draw By: | A1 |
|---|---|---|
| November 2020 | DB | original plot size |
| Scale: 1:250 | Dwg No: WPS-SGN-002/P-05 | Rev: I |

CAD file ref: Kelty - WPS-SGN-002_PLANNING_Rev 13.dwg

# Appendix 3 - Foul Discharge Calculations

| Goodson Associates | Consulting Civil and Structural Engineers | Contract: Kelty Retail Development |
|---|---|---|
| | | Prepared by R.D. Date 06/10/2020 |
| | | Ref No P14681 |

Title Post-Development Foul Water Discharge in Accordance with Flows and Loads 4

**Description of Development:** Restaurant with Drive Through.

Table of Loadings for Sewage Treatment Systems

Per person / activity / day (unless otherwise specified)

| | Flow (Litres) | Population (P) | Average Foul Water Discharge (l/s) |
|---|---|---|---|
| Domestic Dwellings | | | |
| Standard Residential | 150 | 0 | 0.0000 |
| Mobile Home Type Caravans with full services | 150 | 0 | 0.0000 |
| Industrial | | | |
| Office/Factory without canteen | 50 | 0 | 0.0000 |
| Office/Factory with canteen | 100 | 0 | 0.0000 |
| Open Industrial Site e.g. construction, quarry, without canteen | 60 | 0 | 0.0000 |
| Full-Time Day Staff | 90 | 10 | 0.0104 |
| Part-Time Staff (4hr shift) | 45 | 0 | 0.0000 |
| Schools | | | |
| Non-residential with canteen cooking on site | 90 | 0 | 0.0000 |
| Non-residential without a canteen | 50 | 0 | 0.0000 |
| Boarding School i) residents | 175 | 0 | 0.0000 |
| Boarding School ii) day staff (inc. mid-day meal) | 90 | 0 | 0.0000 |
| Hotels, Pubs & Clubs | | | |
| Hotel Guests (Prestige Hotels) | 300 | 0 | 0.0000 |
| Hotel Guests (3 and 4 Star Hotels) | 250 | 0 | 0.0000 |
| Guests (Bedroom Only - no meals) | 80 | 0 | 0.0000 |
| Residential Training/Conference Guest (inclusive all meals) | 350 | 0 | 0.0000 |
| Non-residential Conference Guest | 60 | 0 | 0.0000 |
| Drinkers | 12 | 0 | 0.0000 |
| Holiday Camp Chalet Resident | 227 | 0 | 0.0000 |
| Resident Staff | 180 | 0 | 0.0000 |
| Restaurants - Full Meals - Luxury Catering | 30 | 0 | 0.0000 |
| Restaurants - Full Meals - Pre-prepared Catering | 25 | 0 | 0.0000 |
| Restaurants - Snack Bars and Bar Meals | 15 | 0 | 0.0000 |
| Restaurants - Function Rooms including Buffets | 15 | 0 | 0.0000 |
| Restaurants - Fast Food i.e. roadside restaurants | 12 | 1616 | 0.2244 |
| Restaurants - Fast Food Meal (burger chain and similar) | 12 | 0 | 0.0000 |
| Students (Accommodation Only) | 100 | 0 | 0.0000 |

| | | | |
|---|---|---|---|
| *Amenity Sites* | | | |
| Toilet Blocks (per use) | 10 | 0 | 0.0000 |
| Toilet WC (per use) | 10 | 0 | 0.0000 |
| Toilet Urinal (per use) | 5 | 0 | 0.0000 |
| Toilet Blocks in Long Stay Car Parks/Lorry Parks (per use) | 10 | 0 | 0.0000 |
| Showers (per use) | 40 | 0 | 0.0000 |
| Golf Club | 20 | 0 | 0.0000 |
| Local Community Sports Club e.g. squash, rugby & football | 40 | 0 | 0.0000 |
| Swimming (where a separate pool exists without an associated sports centre) | 10 | 0 | 0.0000 |
| Health Club / Sports Centre | 50 | 0 | 0.0000 |
| Tent Sites | 75 | 0 | 0.0000 |
| Caravan Sites i) Touring not serviced | 100 | 0 | 0.0000 |
| Caravan Sites ii) Static not serviced | 100 | 0 | 0.0000 |
| Caravan Sites iii) Static fully serviced | 150 | 0 | 0.0000 |
| *Hospitals & Residential Care Homes* | | | |
| Residential old people/nursing | 350 | 0 | 0.0000 |
| Small Hospitals | 450 | 0 | 0.0000 |
| Large Hospitals | - | - | Assess Individually |
| | | Average FW Discharge (l/s) | 0.2349 |
| (Assuming a peaking factor of 6) | | Peak FW Discharge (l/s) | 1.4092 |

| Goodson Associates | Consulting Civil and Structural Engineers | Contract: Kelty Retail Development |
|---|---|---|
| | | Prepared by R.D. Date 06/10/2020 |
| | | Ref No P14681 |

Title Post-Development Foul Water Discharge in Accordance with Flows and Loads 4

**Description of Development:** Fuel Station and associated Retail Kiosk

Table of Loadings for Sewage Treatment Systems

Per person / activity / day (unless otherwise specified)

| | Flow (Litres) | Population (P) | Average Foul Water Discharge (Qa) |
|---|---|---|---|
| Domestic Dwellings | | | |
| Standard Residential | 150 | 0 | 0.0000 |
| Mobile Home Type Caravans with full services | 150 | 0 | 0.0000 |
| Industrial | | | |
| Office/Factory without canteen | 50 | 0 | 0.0000 |
| Office/Factory with canteen | 100 | 0 | 0.0000 |
| Open Industrial Site e.g. construction, quarry, without canteen | 60 | 0 | 0.0000 |
| Full-Time Day Staff | 90 | 10 | 0.0104 |
| Part-Time Staff (4hr shift) | 45 | 0 | 0.0000 |
| Schools | | | |
| Non-residential with canteen cooking on site | 90 | 0 | 0.0000 |
| Non-residential without a canteen | 50 | 0 | 0.0000 |
| Boarding School i) residents | 175 | 0 | 0.0000 |
| Boarding School ii) day staff (inc. mid-day meal) | 90 | 0 | 0.0000 |
| Hotels, Pubs & Clubs | | | |
| Hotel Guests (Prestige Hotels) | 300 | 0 | 0.0000 |
| Hotel Guests (3 and 4 Star Hotels) | 250 | 0 | 0.0000 |
| Guests (Bedroom Only - no meals) | 80 | 0 | 0.0000 |
| Residential Training/Conference Guest (inclusive all meals) | 350 | 0 | 0.0000 |
| Non-residential Conference Guest | 60 | 0 | 0.0000 |
| Drinkers | 12 | 0 | 0.0000 |
| Holiday Camp Chalet Resident | 227 | 0 | 0.0000 |
| Resident Staff | 180 | 0 | 0.0000 |
| Restaurants - Full Meals - Luxury Catering | 30 | 0 | 0.0000 |
| Restaurants - Full Meals - Pre-prepared Catering | 25 | 0 | 0.0000 |
| Restaurants - Snack Bars and Bar Meals | 15 | 0 | 0.0000 |
| Restaurants - Function Rooms including Buffets | 15 | 0 | 0.0000 |
| Restaurants - Fast Food i.e. roadside restaurants | 12 | 285 | 0.0396 |
| Restaurants - Fast Food Meal (burger chain and similar) | 12 | 0 | 0.0000 |

| | | | |
|---|---|---|---|
| *Amenity Sites* | | | |
| Toilet Blocks (per use) | 10 | 0 | 0.0000 |
| Toilet WC (per use) | 10 | 0 | 0.0000 |
| Toilet Urinal (per use) | 5 | 0 | 0.0000 |
| Toilet Blocks in Long Stay Car Parks/Lorry Parks (per use) | 10 | 0 | 0.0000 |
| Showers (per use) | 40 | 0 | 0.0000 |
| Golf Club | 20 | 0 | 0.0000 |
| Local Community Sports Club e.g. squash, rugby & football | 40 | 0 | 0.0000 |
| Swimming (where a separate pool exists without an associated sports centre) | 10 | 0 | 0.0000 |
| Health Club / Sports Centre | 50 | 0 | 0.0000 |
| Tent Sites | 75 | 0 | 0.0000 |
| Caravan Sites i) Touring not serviced | 100 | 0 | 0.0000 |
| Caravan Sites ii) Static not serviced | 100 | 0 | 0.0000 |
| Caravan Sites iii) Static fully serviced | 150 | 0 | 0.0000 |
| *Hospitals & Residential Care Homes* | | | |
| Residential old people/nursing | 350 | 0 | 0.0000 |
| Small Hospitals | 450 | 0 | 0.0000 |
| Large Hospitals | - | - | Assess Individually |
| | | Average FW Discharge (l/s) | 0.0500 |
| (Assuming a peaking factor of 6) | | Peak FW Discharge (l/s) | 0.3000 |

# Appendix 4 - Microdrainage Report

## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

| | | | |
|---|---|---|---|
| Return Period (years) | 200 | PIMP (%) | 100 |
| M5-60 (mm) | 16.500 | Add Flow / Climate Change (%) | 40 |
| Ratio R | 0.250 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 1.200 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Soffits

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.000 | 51.193 | 2.048 | 25.0 | 0.022 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.001 | 37.628 | 0.251 | 149.9 | 0.097 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 3.000 | 55.437 | 2.217 | 25.0 | 0.102 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.002 | 17.823 | 0.891 | 20.0 | 0.217 | 0.00 | 0.0 | 0.600 | o | 250 | Pipe/Conduit | |
| 2.003 | 24.667 | 1.233 | 20.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.004 | 36.491 | 2.027 | 18.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 4.000 | 25.028 | 0.313 | 80.0 | 0.058 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 4.001 | 39.508 | 0.658 | 60.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |

### Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.000 | 50.00 | 5.42 | 189.300 | 0.022 | 0.0 | 0.0 | 1.2 | 2.02 | 35.7 | 4.2 |
| 2.001 | 50.00 | 6.19 | 187.300 | 0.119 | 0.0 | 0.0 | 6.5 | 0.82 | 14.5« | 22.6 |
| 3.000 | 50.00 | 5.46 | 189.300 | 0.102 | 0.0 | 0.0 | 5.5 | 2.02 | 35.7 | 19.4 |
| 2.002 | 50.00 | 6.28 | 187.049 | 0.439 | 0.0 | 0.0 | 23.8 | 3.14 | 154.3 | 83.1 |
| 2.003 | 50.00 | 6.46 | 186.158 | 0.439 | 0.0 | 0.0 | 23.8 | 2.26 | 40.0« | 83.1 |
| 2.004 | 50.00 | 6.72 | 184.925 | 0.439 | 0.0 | 0.0 | 23.8 | 2.39 | 42.2« | 83.1 |
| 4.000 | 50.00 | 5.37 | 185.300 | 0.058 | 0.0 | 0.0 | 3.1 | 1.12 | 19.9 | 11.0 |
| 4.001 | 50.00 | 5.88 | 185.000 | 0.058 | 0.0 | 0.0 | 3.1 | 1.30 | 23.0 | 11.0 |

## Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.000 | 29.191 | 0.487 | 59.9 | 0.013 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 4.002 | 38.561 | 1.428 | 27.0 | 0.280 | 0.00 | 0.0 | 0.600 | o | 250 | Pipe/Conduit | |
| 2.005 | 61.009 | 2.440 | 25.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.006 | 57.491 | 2.242 | 25.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.007 | 63.546 | 4.413 | 14.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.008 | 15.207 | 0.354 | 43.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |

## Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.000 | 50.00 | 5.37 | 184.887 | 0.013 | 0.0 | 0.0 | 0.7 | 1.30 | 23.0 | 2.4 |
| 4.002 | 50.00 | 6.11 | 184.300 | 0.350 | 0.0 | 0.0 | 19.0 | 2.70 | 132.8 | 66.4 |
| 2.005 | 50.00 | 7.22 | 182.898 | 0.789 | 0.0 | 0.0 | 42.7 | 2.02 | 35.7« | 149.6 |
| 2.006 | 50.00 | 7.70 | 180.458 | 0.789 | 0.0 | 0.0 | 42.7 | 2.00 | 35.3« | 149.6 |
| 2.007 | 50.00 | 8.10 | 178.216 | 0.789 | 0.0 | 0.0 | 42.7 | 2.67 | 47.2« | 149.6 |
| 2.008 | 50.00 | 8.26 | 173.800 | 0.789 | 0.0 | 0.0 | 42.7 | 1.54 | 27.2« | 149.6 |

## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 191.100 | 1.800 | Open Manhole | 1200 | 2.000 | 189.300 | 150 | | | | |
| 2 | 189.000 | 1.748 | Open Manhole | 1200 | 2.001 | 187.300 | 150 | 2.000 | 187.252 | 150 | |
| 4 | 191.000 | 1.700 | Open Manhole | 1200 | 3.000 | 189.300 | 150 | | | | |
| 3 | 188.800 | 1.751 | Open Manhole | 1200 | 2.002 | 187.049 | 250 | 2.001 | 187.049 | 150 | |
| | | | | | | | | 3.000 | 187.083 | 150 | |
| 5 | 188.000 | 1.842 | Open Manhole | 1200 | 2.003 | 186.158 | 150 | 2.002 | 186.158 | 250 | |
| 6 | 187.000 | 2.075 | Open Manhole | 1200 | 2.004 | 184.925 | 150 | 2.003 | 184.925 | 150 | |
| 10 | 186.500 | 1.200 | Open Manhole | 1200 | 4.000 | 185.300 | 150 | | | | |
| 9 | 187.400 | 2.413 | Open Manhole | 1200 | 4.001 | 185.000 | 150 | 4.000 | 184.987 | 150 | |
| 8 | 186.900 | 2.013 | Open Manhole | 1200 | 5.000 | 184.887 | 150 | | | | |
| 7 | 187.400 | 3.100 | Open Manhole | 1200 | 4.002 | 184.300 | 250 | 4.001 | 184.342 | 150 | |
| | | | | | | | | 5.000 | 184.400 | 150 | |
| 11 | 184.500 | 1.628 | Open Manhole | 1200 | 2.005 | 182.898 | 150 | 2.004 | 182.898 | 150 | |
| | | | | | | | | 4.002 | 182.872 | 250 | |
| 12 | 182.000 | 1.542 | Open Manhole | 1200 | 2.006 | 180.458 | 150 | 2.005 | 180.458 | 150 | |
| 13 | 180.000 | 1.784 | Open Manhole | 1200 | 2.007 | 178.216 | 150 | 2.006 | 178.216 | 150 | |
| 14 | 175.000 | 1.200 | Open Manhole | 1200 | 2.008 | 173.800 | 150 | 2.007 | 173.803 | 150 | 3 |
| | 175.000 | 1.554 | Open Manhole | 0 | | OUTFALL | | 2.008 | 173.446 | 150 | |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| 1 | 3489.227 | -5717.608 | 3489.227 | -5717.608 | Required | |
| 2 | 3537.370 | -5700.201 | 3537.370 | -5700.201 | Required | |
| 4 | 3497.421 | -5754.643 | 3497.421 | -5754.643 | Required | |
| 3 | 3549.557 | -5735.800 | 3549.557 | -5735.800 | Required | |
| 5 | 3562.270 | -5748.292 | 3562.270 | -5748.292 | Required | |
| 6 | 3586.098 | -5741.915 | 3586.098 | -5741.915 | Required | |

## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| 10 | 3593.016 | -5687.722 | 3593.016 | -5687.722 | Required | |
| 9 | 3569.300 | -5695.718 | 3569.300 | -5695.718 | Required | |
| 8 | 3610.375 | -5723.376 | 3610.375 | -5723.376 | Required | |
| 7 | 3582.768 | -5732.859 | 3582.768 | -5732.859 | Required | |
| 11 | 3621.326 | -5732.400 | 3621.326 | -5732.400 | Required | |
| 12 | 3649.546 | -5786.490 | 3649.546 | -5786.490 | Required | |
| 13 | 3674.238 | -5838.409 | 3674.238 | -5838.409 | Required | |
| 14 | 3700.160 | -5896.428 | 3700.160 | -5896.428 | Required | |
| | 3688.010 | -5905.573 | | | No Entry | |

## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| 2.000 | o | 150 | 1 | 191.100 | 189.300 | 1.650 | Open Manhole | 1200 |
| 2.001 | o | 150 | 2 | 189.000 | 187.300 | 1.550 | Open Manhole | 1200 |
| 3.000 | o | 150 | 4 | 191.000 | 189.300 | 1.550 | Open Manhole | 1200 |
| 2.002 | o | 250 | 3 | 188.800 | 187.049 | 1.501 | Open Manhole | 1200 |
| 2.003 | o | 150 | 5 | 188.000 | 186.158 | 1.692 | Open Manhole | 1200 |
| 2.004 | o | 150 | 6 | 187.000 | 184.925 | 1.925 | Open Manhole | 1200 |
| 4.000 | o | 150 | 10 | 186.500 | 185.300 | 1.050 | Open Manhole | 1200 |
| 4.001 | o | 150 | 9 | 187.400 | 185.000 | 2.250 | Open Manhole | 1200 |
| 5.000 | o | 150 | 8 | 186.900 | 184.887 | 1.863 | Open Manhole | 1200 |
| 4.002 | o | 250 | 7 | 187.400 | 184.300 | 2.850 | Open Manhole | 1200 |
| 2.005 | o | 150 | 11 | 184.500 | 182.898 | 1.452 | Open Manhole | 1200 |
| 2.006 | o | 150 | 12 | 182.000 | 180.458 | 1.392 | Open Manhole | 1200 |
| 2.007 | o | 150 | 13 | 180.000 | 178.216 | 1.634 | Open Manhole | 1200 |
| 2.008 | o | 150 | 14 | 175.000 | 173.800 | 1.050 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| 2.000 | 51.193 | 25.0 | 2 | 189.000 | 187.252 | 1.598 | Open Manhole | 1200 |
| 2.001 | 37.628 | 149.9 | 3 | 188.800 | 187.049 | 1.601 | Open Manhole | 1200 |
| 3.000 | 55.437 | 25.0 | 3 | 188.800 | 187.083 | 1.567 | Open Manhole | 1200 |
| 2.002 | 17.823 | 20.0 | 5 | 188.000 | 186.158 | 1.592 | Open Manhole | 1200 |
| 2.003 | 24.667 | 20.0 | 6 | 187.000 | 184.925 | 1.925 | Open Manhole | 1200 |
| 2.004 | 36.491 | 18.0 | 11 | 184.500 | 182.898 | 1.452 | Open Manhole | 1200 |
| 4.000 | 25.028 | 80.0 | 9 | 187.400 | 184.987 | 2.263 | Open Manhole | 1200 |
| 4.001 | 39.508 | 60.0 | 7 | 187.400 | 184.342 | 2.908 | Open Manhole | 1200 |
| 5.000 | 29.191 | 59.9 | 7 | 187.400 | 184.400 | 2.850 | Open Manhole | 1200 |
| 4.002 | 38.561 | 27.0 | 11 | 184.500 | 182.872 | 1.378 | Open Manhole | 1200 |
| 2.005 | 61.009 | 25.0 | 12 | 182.000 | 180.458 | 1.392 | Open Manhole | 1200 |
| 2.006 | 57.491 | 25.6 | 13 | 180.000 | 178.216 | 1.634 | Open Manhole | 1200 |
| 2.007 | 63.546 | 14.4 | 14 | 175.000 | 173.803 | 1.047 | Open Manhole | 1200 |
| 2.008 | 15.207 | 43.0 | | 175.000 | 173.446 | 1.404 | Open Manhole | 0 |

## Simulation Criteria for Storm

| | | | |
|---|---|---|---|
| Volumetric Runoff Coeff | 0.750 | Additional Flow - % of Total Flow | 0.000 |
| Areal Reduction Factor | 1.000 | MADD Factor * 10m³/ha Storage | 6.000 |
| Hot Start (mins) | 0 | Inlet Coeffiecient | 0.800 |
| Hot Start Level (mm) | 0 | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins) | 60 |
| Foul Sewage per hectare (l/s) | 0.000 | Output Interval (mins) | 1 |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 7 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 200 | Cv (Summer) | 0.750 |
| Region | Scotland and Ireland | Cv (Winter) | 0.840 |
| M5-60 (mm) | 16.500 | Storm Duration (mins) | 30 |
| Ratio R | 0.250 | | |

## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: 3, DS/PN: 2.002, Volume (m³): 3.6

| | |
|---|---|
| Unit Reference | MD-SHE-0231-3000-1451-3000 |
| Design Head (m) | 1.451 |
| Design Flow (l/s) | 30.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 231 |
| Invert Level (m) | 187.049 |
| Minimum Outlet Pipe Diameter (mm) | 300 |
| Suggested Manhole Diameter (mm) | 1800 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.451 | 30.0 |
| Flush-Flo™ | 0.457 | 30.0 |
| Kick-Flo® | 0.997 | 25.1 |
| Mean Flow over Head Range | - | 25.7 |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 7.7 | 1.200 | 27.4 | 3.000 | 42.5 | 7.000 | 64.1 |
| 0.200 | 23.2 | 1.400 | 29.5 | 3.500 | 45.8 | 7.500 | 66.3 |
| 0.300 | 29.1 | 1.600 | 31.4 | 4.000 | 48.9 | 8.000 | 68.4 |
| 0.400 | 29.9 | 1.800 | 33.3 | 4.500 | 51.7 | 8.500 | 70.4 |
| 0.500 | 30.0 | 2.000 | 35.0 | 5.000 | 54.4 | 9.000 | 72.4 |
| 0.600 | 29.7 | 2.200 | 36.6 | 5.500 | 57.0 | 9.500 | 74.4 |
| 0.800 | 28.5 | 2.400 | 38.2 | 6.000 | 59.5 | | |
| 1.000 | 25.2 | 2.600 | 39.7 | 6.500 | 61.8 | | |

### Hydro-Brake® Optimum Manhole: 7, DS/PN: 4.002, Volume (m³): 4.7

| | |
|---|---|
| Unit Reference | MD-SHE-0185-2000-1900-2000 |
| Design Head (m) | 1.900 |
| Design Flow (l/s) | 20.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 185 |
| Invert Level (m) | 184.300 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1800 |

## Hydro-Brake® Optimum Manhole: 7, DS/PN: 4.002, Volume (m³): 4.7

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.900 | 19.9 |
| Flush-Flo™ | 0.557 | 19.9 |
| Kick-Flo® | 1.184 | 15.9 |
| Mean Flow over Head Range | - | 17.3 |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 6.5 | 1.200 | 16.0 | 3.000 | 24.8 | 7.000 | 37.3 |
| 0.200 | 16.8 | 1.400 | 17.2 | 3.500 | 26.7 | 7.500 | 38.5 |
| 0.300 | 18.7 | 1.600 | 18.4 | 4.000 | 28.5 | 8.000 | 39.7 |
| 0.400 | 19.5 | 1.800 | 19.4 | 4.500 | 30.1 | 8.500 | 40.9 |
| 0.500 | 19.9 | 2.000 | 20.4 | 5.000 | 31.7 | 9.000 | 42.1 |
| 0.600 | 19.9 | 2.200 | 21.4 | 5.500 | 33.2 | 9.500 | 43.2 |
| 0.800 | 19.4 | 2.400 | 22.3 | 6.000 | 34.6 | | |
| 1.000 | 18.4 | 2.600 | 23.1 | 6.500 | 35.9 | | |

## Storage Structures for Storm

### Cellular Storage Manhole: 3, DS/PN: 2.002

Invert Level (m) 187.049 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 90.0 | 90.0 | 0.900 | 0.0 | 120.4 |
| 0.800 | 90.0 | 120.4 | | | |

### Filter Drain Manhole: 6, DS/PN: 2.004

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Pipe Diameter (m) | 0.150 |
| Infiltration Coefficient Side (m/hr) | 0.00000 | Pipe Depth above Invert (m) | 0.000 |
| Safety Factor | 2.0 | Number of Pipes | 1 |
| Porosity | 0.30 | Slope (1:X) | 0.0 |
| Invert Level (m) | 186.000 | Cap Volume Depth (m) | 1.000 |
| Trench Width (m) | 1.0 | Cap Infiltration Depth (m) | 0.000 |
| Trench Length (m) | 36.5 | | |

### Cellular Storage Manhole: 7, DS/PN: 4.002

Invert Level (m) 184.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 60.0 | 60.0 | 0.900 | 0.0 | 85.6 |
| 0.800 | 60.0 | 85.6 | | | |

### Filter Drain Manhole: 11, DS/PN: 2.005

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Pipe Diameter (m) | 0.150 |
| Infiltration Coefficient Side (m/hr) | 0.00000 | Pipe Depth above Invert (m) | 0.000 |
| Safety Factor | 2.0 | Number of Pipes | 1 |
| Porosity | 0.30 | Slope (1:X) | 0.0 |
| Invert Level (m) | 183.500 | Cap Volume Depth (m) | 1.000 |
| Trench Width (m) | 1.0 | Cap Infiltration Depth (m) | 0.000 |
| Trench Length (m) | 61.0 | | |

### Filter Drain Manhole: 12, DS/PN: 2.006

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Trench Length (m) | 89.7 |
| Infiltration Coefficient Side (m/hr) | 0.00000 | Pipe Diameter (m) | 0.150 |
| Safety Factor | 2.0 | Pipe Depth above Invert (m) | 0.000 |
| Porosity | 0.30 | Number of Pipes | 1 |
| Invert Level (m) | 181.000 | Slope (1:X) | 0.0 |
| Trench Width (m) | 1.0 | Cap Volume Depth (m) | 1.000 |

## Filter Drain Manhole: 12, DS/PN: 2.006

Cap Infiltration Depth (m) 0.000

## Filter Drain Manhole: 13, DS/PN: 2.007

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Pipe Diameter (m) | 0.150 |
| Infiltration Coefficient Side (m/hr) | 0.00000 | Pipe Depth above Invert (m) | 0.000 |
| Safety Factor | 2.0 | Number of Pipes | 1 |
| Porosity | 0.30 | Slope (1:X) | 0.0 |
| Invert Level (m) | 179.000 | Cap Volume Depth (m) | 1.000 |
| Trench Width (m) | 1.0 | Cap Infiltration Depth (m) | 0.000 |
| Trench Length (m) | 65.0 | | |

## Filter Drain Manhole: 14, DS/PN: 2.008

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Pipe Diameter (m) | 0.150 |
| Infiltration Coefficient Side (m/hr) | 0.00000 | Pipe Depth above Invert (m) | 0.000 |
| Safety Factor | 2.0 | Number of Pipes | 1 |
| Porosity | 0.30 | Slope (1:X) | 0.0 |
| Invert Level (m) | 173.800 | Cap Volume Depth (m) | 1.000 |
| Trench Width (m) | 1.0 | Cap Infiltration Depth (m) | 0.000 |
| Trench Length (m) | 63.5 | | |

## Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 6.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 0.800 |
| Manhole Headloss Coeff (Global) | 0.500 | Flow per Person per Day (l/per/day) | 0.000 |
| Foul Sewage per hectare (l/s) | 0.000 | | |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 7 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | | FSR | Ratio R 0.250 |
| Region | Scotland and Ireland | Cv (Summer) | 0.750 |
| M5-60 (mm) | 16.300 | Cv (Winter) | 0.840 |

| | | | |
|---|---|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status | OFF |
| Analysis Timestep | Fine | Inertia Status | OFF |
| DTS Status | ON | | |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 30, 200 |
| Climate Change (%) | 0, 0 |

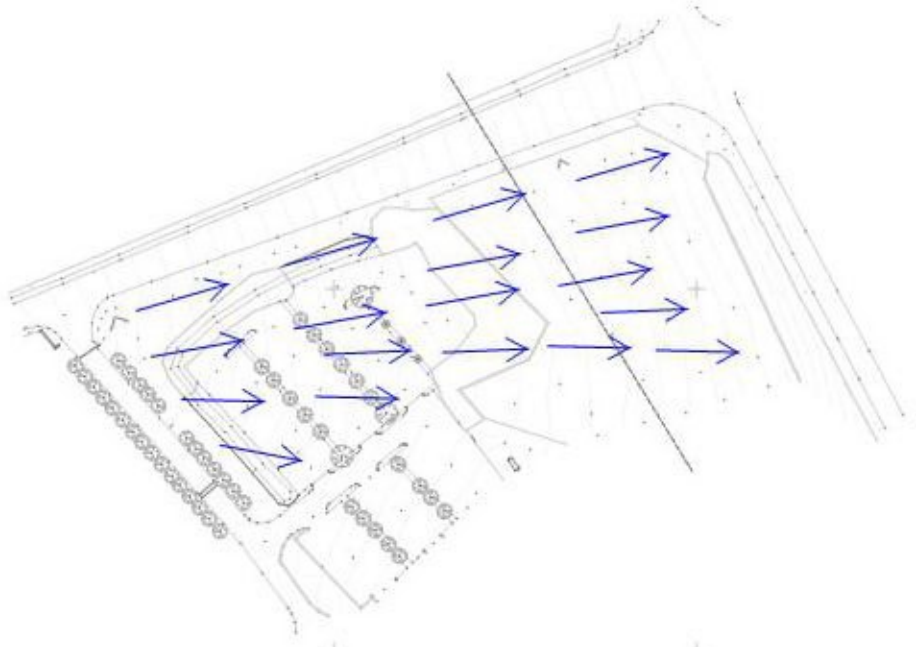
| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 2.000 | 1 | 15 Summer | 30 | +0% | | | | |
| 2.001 | 2 | 15 Summer | 30 | +0% | 30/15 Summer | | | |
| 3.000 | 4 | 15 Summer | 30 | +0% | 200/15 Winter | | | |
| 2.002 | 3 | 15 Summer | 30 | +0% | 30/15 Summer | | | |
| 2.003 | 5 | 15 Summer | 30 | +0% | | | | |
| 2.004 | 6 | 15 Summer | 30 | +0% | 30/60 Winter | | | |
| 4.000 | 10 | 15 Summer | 30 | +0% | 200/15 Winter | | | |
| 4.001 | 9 | 15 Summer | 30 | +0% | 200/15 Summer | | | |
| 5.000 | 8 | 15 Summer | 30 | +0% | 200/30 Summer | | | |
| 4.002 | 7 | 15 Summer | 30 | +0% | 30/15 Summer | | | |
| 2.005 | 11 | 180 Winter | 200 | +0% | 30/15 Summer | 200/60 Summer | | |
| 2.006 | 12 | 15 Summer | 30 | +0% | 30/15 Summer | | | |
| 2.007 | 13 | 15 Summer | 30 | +0% | | | | |
| 2.008 | 14 | 15 Summer | 30 | +0% | 30/15 Summer | | | |

Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| 2.000 | 1 | 189.338 | -0.112 | 0.000 | 0.14 | | | 5.0 | OK |
| 2.001 | 2 | 187.836 | 0.386 | 0.000 | 1.43 | | | 20.0 | SURCHARGED |
| 3.000 | 4 | 189.390 | -0.060 | 0.000 | 0.66 | | | 23.0 | OK |
| 2.002 | 3 | 187.347 | 0.048 | 0.000 | 0.20 | | 14 | 27.4 | SURCHARGED |
| 2.003 | 5 | 186.253 | -0.055 | 0.000 | 0.72 | | | 27.4 | OK |
| 2.004 | 6 | 185.015 | -0.060 | 0.000 | 0.67 | | 20 | 27.4 | OK |
| 4.000 | 10 | 185.393 | -0.057 | 0.000 | 0.69 | | | 13.0 | OK |
| 4.001 | 9 | 185.083 | -0.067 | 0.000 | 0.58 | | | 12.8 | OK |
| 5.000 | 8 | 184.923 | -0.114 | 0.000 | 0.13 | | | 2.8 | OK |
| 4.002 | 7 | 184.682 | 0.132 | 0.000 | 0.15 | | 15 | 18.9 | SURCHARGED |
| 2.005 | 11 | 184.514 | 1.466 | 14.266 | 1.18 | | 27 | 41.3 | FLOOD |
| 2.006 | 12 | 180.962 | 0.354 | 0.000 | 1.08 | | 10 | 37.2 | SURCHARGED |
| 2.007 | 13 | 178.318 | -0.048 | 0.000 | 0.80 | | 13 | 37.2 | OK |
| 2.008 | 14 | 174.285 | 0.335 | 0.000 | 1.40 | | 7 | 35.2 | SURCHARGED |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| 2.000 | 1 | |
| 2.001 | 2 | |
| 3.000 | 4 | |
| 2.002 | 3 | |
| 2.003 | 5 | |
| 2.004 | 6 | |
| 4.000 | 10 | |
| 4.001 | 9 | |
| 5.000 | 8 | |
| 4.002 | 7 | |
| 2.005 | 11 | 9 |
| 2.006 | 12 | |
| 2.007 | 13 | |
| 2.008 | 14 | |

# Appendix 5 - Pre and Post Development Flow Path



LEGEND

ABBREVIATIONS

NOTES

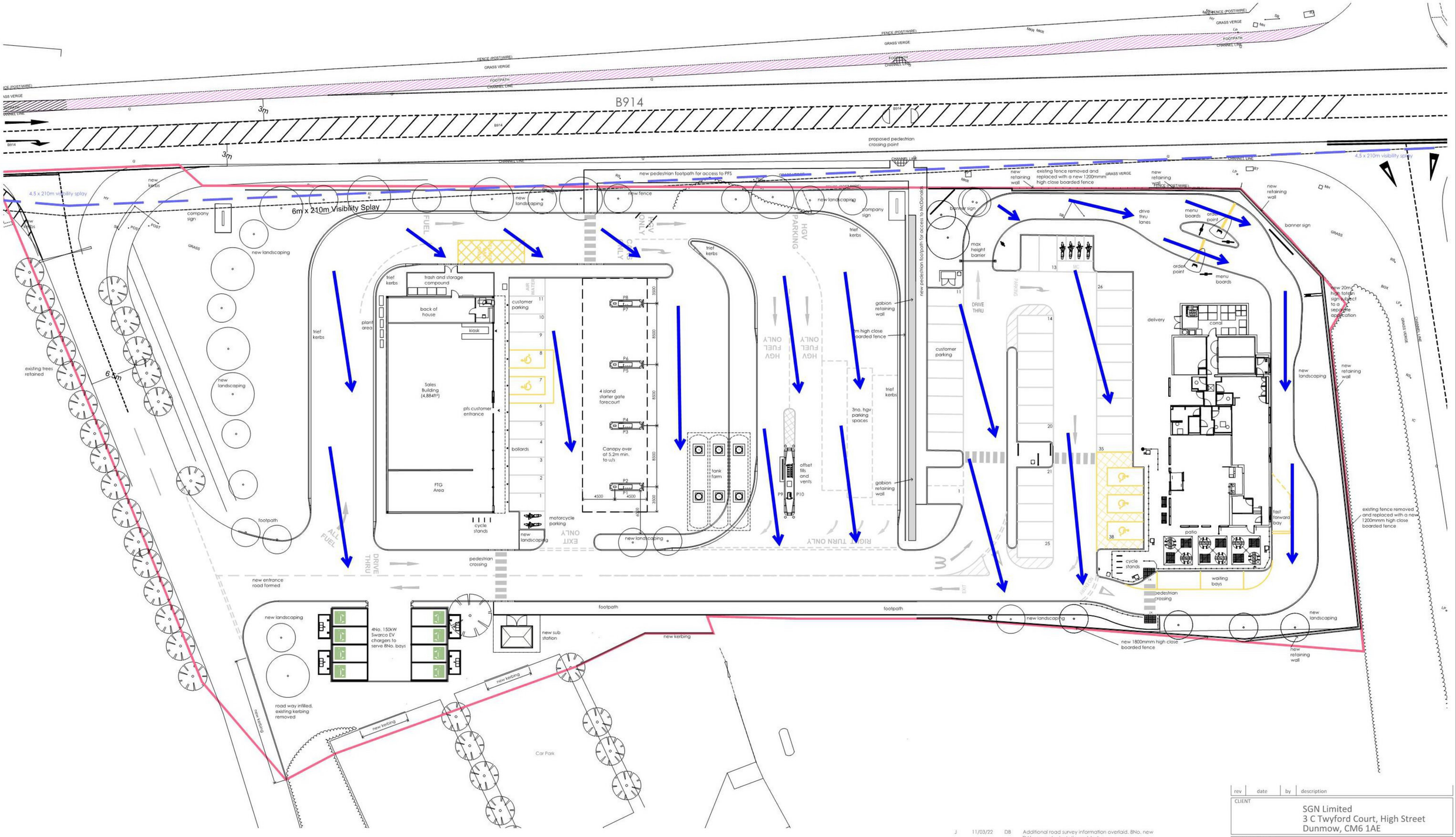
CONTROL STATIONS

Douglas LAND SURVEYS Ltd

BAXTERS FARM,
KELTY.

25320

01




PROPOSED OVERALL SITE PLAN REMOVED ITEMS NOT SHOWN
SCALE 1:250

Scale Bar 1:250 @A1 (Metres)
0 5 10 15 20

LEVELS KEY

187.80 × PROPOSED LEVEL

| rev | date | by | description |
|---|---|---|---|
| J | 11/03/22 | DB | Additional road survey information overlaid. 8No. new EV bays and sub station added. |
| I | 29/03/21 | DB | Revised PFS forecourt layout plan , HGV pump island and tank farm moved in a Southerly direction. |
| H | 19/03/21 | JF | PFS entrance location amended. |
| G | 18/03/21 | JF | PFS orientation reversed, twin Jetwash and Vacuum bay removed, storage tank locations combined, Offset fill position moved to HGV island, 1no. HGV parking bays removed. |
| F | 10/02/21 | DB | Pedestrian footpath added from new road crossing up to PFS. McDonalds banner sign moved to the East to accommodate pedestrian footpath in to McDonalds site. New ghost island indicated for right turn into site, road markings amended to suit. |
| E | 29/01/21 | DB | Levels key added. |
| D | 20/01/21 | DB | Existing electric pylon and overhead electric cable removed and re-routed underground. Retaining wall and boundary fences amended to suit revised site levels. Revised site levels indicated. |
| C | 07/01/21 | JF | Fencing and signage locations clarified. Retaining wall indicated around drive thru lane. Levels amended to drive thru lane and additional levels shown. |
| B | 23/12/20 | DB | Entrance kerbs to site amended. Pedestrian crossing added across B914. Visibility splay added. |
| A | 13/11/20 | DB | Canopy raised to 5.2m min. to underside. |
| – | 03/11/20 | DB | Drawing created. |

| rev | date | by | description |
|---|---|---|---|

CLIENT
SGN Limited
3 C Twyford Court, High Street
Dunmow, CM6 1AE

PROJECT LOCATION
Blairadam Forrest Services
Kelty, Fife (B914)
Scotland KY4 0JR

DRAWING
Proposed Site Redevelopment
Removed Items - Not Shown

PLANNING

Wyeth Projects Services
The Cart Shed, Amberley Court, Amberley Lane, Milford, Surrey, GU8 5EB, United Kingdom
Tel: +44 (0)1483 424704
Email: enquires@wyethprojects.com


| Date: | Draw By: | A1 |
|---|---|---|
| November 2020 | DB | |
| Scale: | Dwg No: | Rev: |
| 1:250 | WPS-SGN-002-P-06 | J |

CAD file ref: Kelty - WPS-SGN-002_PLANNING_Rev 13_recover.dwg

# Appendix 6 - SEPA Index Tool

| SUMMARY TABLE | | DESIGN CONDITIONS | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| **Land Use Type** | Lorry park | These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site. | In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment. | | |
| **Pollution Hazard Level** | High | | | | |
| **Pollution Hazard Indices** | | | | | |
| **TSS** | 0.8 | | | | |
| **Metals** | 0.8 | | | | |
| **Hydrocarbons** | 0.9 | | | | |
| **SuDS components proposed** | | | | | |
| **Component 1** | None | | | | |
| **Component 2** | None | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Component 3** | None | | | | |
| **SuDS Pollution Mitigation Indices** | | | | | |
| **TSS** | 0 | | | | |
| **Metals** | 0 | | | | |
| **Hydrocarbons** | 0 | | | | |
| **Groundwater protection type** | Bioretention component underlain by 300 mm minimum depth of soils with good contamination attenuation potential | All designs must include a minimum of 1 m unsaturated depth of subsoil or aquifer material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be preceded by upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate lined zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events | The underlying soils must provide good contaminant attenuation potential (eg as recommended in Sniffer 2008 (a) and (b) / Scott Wilson (2010) or other appropriate guidance). Alternative depth and soil combinations must provide equivalent protection to the underlying groundwater | | |
| **Groundwater protection Pollution Mitigation Indices** | | | | | |
| **TSS** | 0.8 | | | | |
| **Metals** | 0.8 | | | | |
| **Hydrocarbons** | 0.8 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Combined Pollution Mitigation Indices** | | 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 | | | |
| **TSS** | 0.8 | | | | |
| **Metals** | 0.8 | | | | |
| **Hydrocarbons** | 0.8 | | | | |
| **Acceptability of Pollution Mitigation** | | | | | |
| **TSS** | Sufficient | | | | |
| **Metals** | Sufficient | | | | |
| **Hydrocarbons** | Additional Hydrocarbon Mitigation Required | | | | |

# Appendix 7 - Ground Investigation

# FACTUAL REPORT
# ON
# SOAKAWAY TESTING
# AT
# PROPOSED PFS & DRIVE THRU
# KELTY
# FIFE

**Submitted: February 2022**

**Job Reference: GA 14681**

***Client***

**Goodson Associates Ltd**

**DAM** Geotechnical Services Ltd
69 Glasgow Road | Dumbarton | G82 1RE
**T:** 01389 731 870
**E:** enquiries@dam.co.uk
**W:** www.dam.co.uk

# APPENDIX A

## SITE LOCATION PLAN


D.A.M.

## VectorMap Local

**Published 2020**

**Source map scale - 1:10,000**

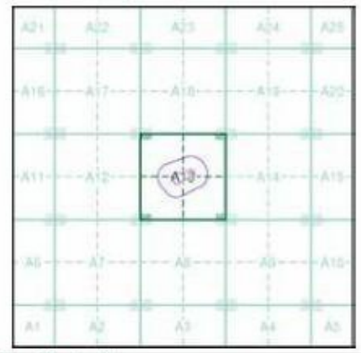
VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

## Map Name(s) and Date(s)

NT19NW 2020 Variable

NT19SW 2020 Variable

## Historical Map - Slice A




## Order Details

| | |
|---|---|
| Order Number: | 267464434_1_1 |
| Customer Ref: | GA 14681 |
| National Grid Reference: | 313330, 693800 |
| Slice: | A |
| Site Area (Ha): | 1.11 |
| Search Buffer (m): | 1000 |

## Site Details

Proposed Development Site, Kelty, KY4 0JR

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

# APPENDIX B

## EXPLORATORY HOLE LOCATION PLAN
## TRIAL PIT LOGS & PHOTOGRAPHS

# EXPLORATORY HOLE LOCATION PLAN

| | | | |
|---|---|---|---|
| Project Id: | **GA 14861** | Title: | **Site Plan** |
| Project Title: | **Kelty PFS & Drive Thru** | Scale: | **1:2500** |
| Location: | **Kelty, Fife** | | |
| Client: | **Goodson Associates** | | |

Legend Key

Locations By Type - TP

# TRIAL PIT LOGS & PHOTOGRAPHS

# Trial Pit Log

TrialPit No **SK01** Sheet 1 of 1

| | | | |
|---|---|---|---|
| **Project Name:** Kelty PFS & Drive Thru | **Project No.** GA 14861 | **Co-ords:** E: 313521.8 N: 693528.3 **Level:** 169.43 | **Date** 03/02/2022 |
| **Location:** Kelty, Fife | | Dimensions (m): 4.50 × 1.20 | **Scale** 1:10 |
| **Client:** Goodson Associates | | Depth (m): 1.50 | **Plant Used** 8T Tracked JCB |

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | MADE GROUND: Grass overlying dark brown clayey sandy topsoil with frequent rootlets. Sand is fine to coarse. |
| | | | | 0.40 | 169.03 | | MADE GROUND: Medium dense brown and black slightly clayey sandy gravel with frequent cobbles and occasional boulders. Sand is medium to coarse. Gravel cobbles and boulders are subangular to angular primarily of sandstone and coal. |
| | | | | | | | SEPA GPP4 Soakaway conducted between 1.20-1.50mbgl |
| | | | | 1.50 | 167.93 | | End of Pit at 1.50m |

Remarks: Machine excavated trial pit to conduct SEPA GPP4 percolation test. Trial pit dry.

Stability: Stable

| Logged By: | Checked By: |
|---|---|
| DC | DAM |

FINAL


PHOTOGRAPHIC BOARD
PROJECT NAME:
PROJECT NUMBER:
LOCATION ID:
SAMPLE ID:
DATE:
DEPTH: FROM
TO

# Trial Pit Log

TrialPit No **SK02** Sheet 1 of 1

| | | | |
|---|---|---|---|
| **Project Name:** Kelty PFS & Drive Thru | **Project No.** GA 14861 | **Co-ords:** E: 313476.8 N: 693611.3 **Level:** 176.95 | **Date** 03/02/2022 |
| **Location:** Kelty, Fife | | Dimensions (m): 4.50 × 1.20 Depth (m): 1.50 | **Scale** 1:10 |
| **Client:** Goodson Associates | | | **Plant Used** 8T Tracked JCB |

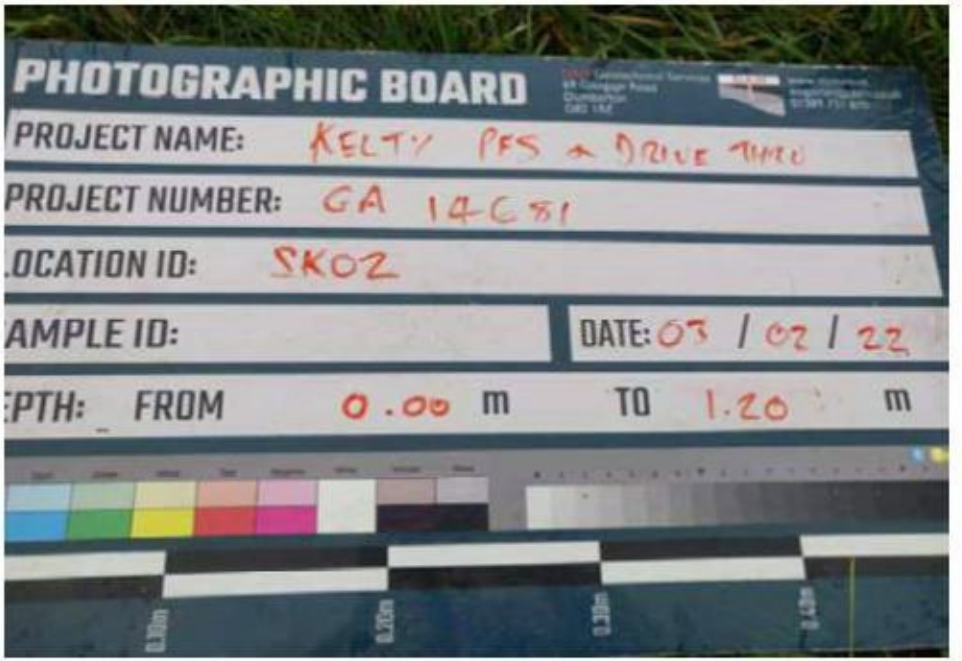
| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | MADE GROUND: Grass overlying dark brown clayey sandy topsoil with frequent rootlets. Sand is fine to coarse. |
| | | | | 0.40 | 176.55 | | MADE GROUND: Medium dense brown slightly clayey sandy gravel with frequent cobbles and occasional boulders. Sand is medium to coarse. Gravel cobbles and boulders are subangular to angular and of sandstone. |
| | | | | | | | SEPA GPP4 Soakaway conducted between 1.20-1.50mbgl |
| | | | | 1.50 | 175.45 | | End of Pit at 1.50m |

Remarks: Machine excavated trial pit to conduct SEPA GPP4 percolation test. Trial pit dry. Moved to SK02A as test soaking away instantly.

Stability: Stable

| Logged By: | Checked By: |
|---|---|
| DC | DAM |

FINAL


PHOTOGRAPHIC BOARD
PROJECT NAME: KELTY PFS + DRIVE THRU
PROJECT NUMBER: GA 14C81
LOCATION ID: SK02
SAMPLE ID:
DATE: 03 / 02 / 22
DEPTH: FROM 0.00 m TO 1.20 m

# Trial Pit Log

TrialPit No: **SK02A**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| **Project Name:** Kelty PFS & Drive Thru | **Project No.** GA 14861 | **Co-ords:** E: 313481.2 N: 693604.2 | **Date** 03/02/2022 |
| **Location:** Kelty, Fife | | **Level:** 176.28 | **Scale** 1:10 |
| **Client:** Goodson Associates | | Dimensions (m): 4.00 × 1.20 Depth (m): 1.20 | **Plant Used** 8T Tracked JCB |

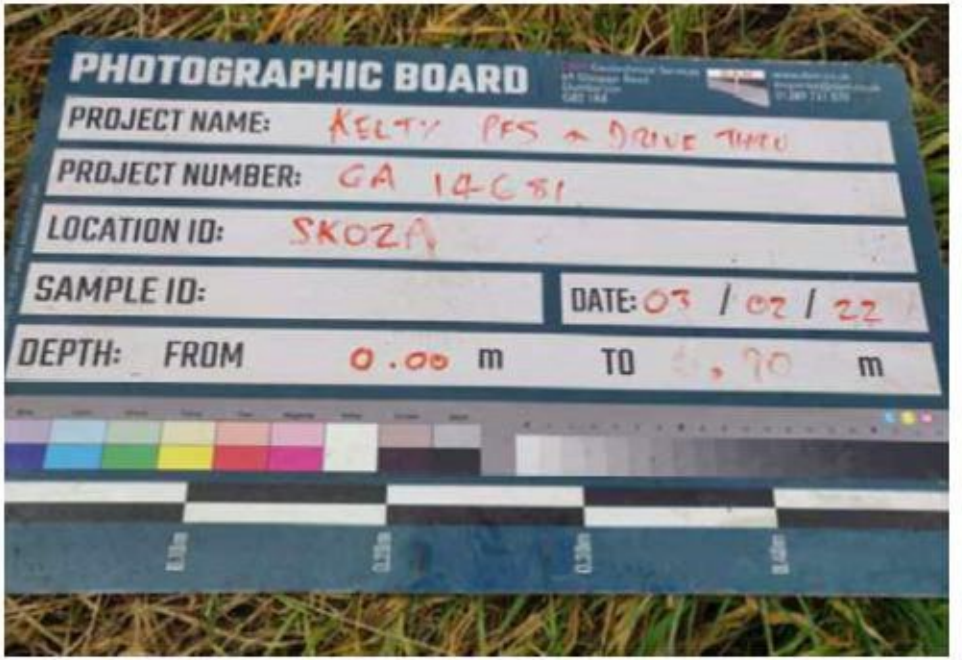
| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | MADE GROUND: Grass overlying dark brown clayey sandy topsoil with frequent rootlets. Sand is fine to coarse. |
| | | | | 0.35 | 175.93 | | MADE GROUND: Medium dense brown and black slightly clayey sandy gravel with frequent cobbles and occasional boulders. Sand is medium to coarse. Gravel cobbles and boulders are subangular to angular and of sandstone mudstone and occasional coal. |
| | | | | | | | *SEPA GPP4 Soakaway conducted between 0.90-1.20mbgl* |
| | | | | 1.20 | 175.08 | | End of Pit at 1.20m |

Remarks: Machine excavated trial pit to conduct SEPA GPP4 percolation test. Trial pit dry.

Stability: Stable

| Logged By: | Checked By: |
|---|---|
| DC | DAM |

FINAL


PHOTOGRAPHIC BOARD
PROJECT NAME: KELTY PFS + DRIVE THRU
PROJECT NUMBER: GA 14C81
LOCATION ID: SKOZA
SAMPLE ID:
DATE: 03 / 02 / 22
DEPTH: FROM 0.00 m TO 0.90 m

# Trial Pit Log

TrialPit No **SK03** Sheet 1 of 1

| | | | |
|---|---|---|---|
| **Project Name:** Kelty PFS & Drive Thru | **Project No.** GA 14861 | **Co-ords:** E: 313377.3 N: 693795.4 **Level:** 187.00 | **Date** 03/02/2022 |
| **Location:** Kelty, Fife | | Dimensions (m): 3.50 × 1.20 Depth (m): 1.30 | **Scale** 1:10 |
| **Client:** Goodson Associates | | | **Plant Used** 8T Tracked JCB |

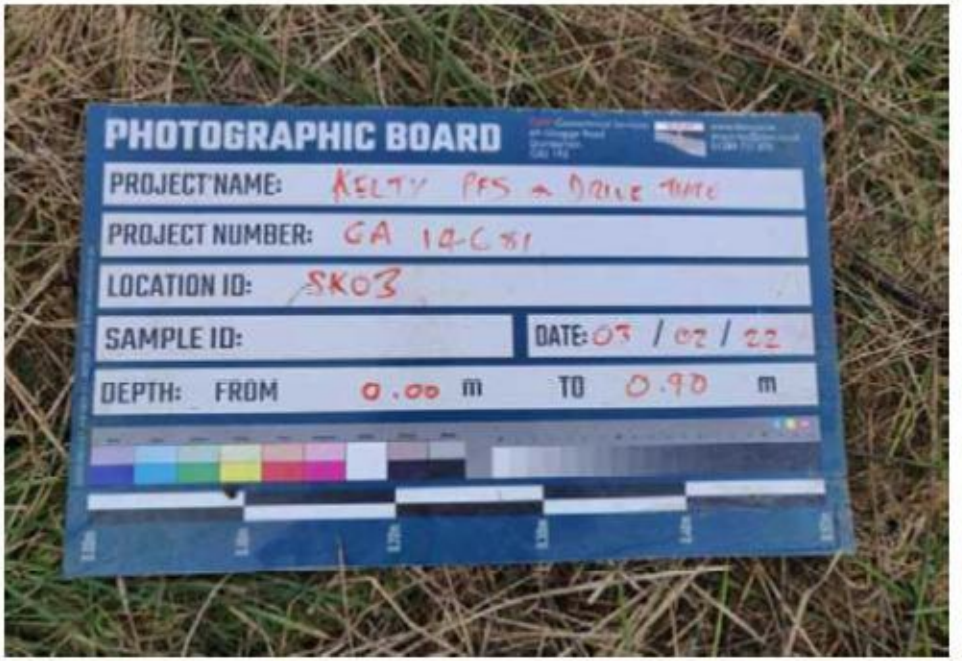
| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | MADE GROUND: Grass overlying dark brown clayey sandy topsoil with frequent rootlets. Sand is fine to coarse. |
| | | | | 0.40 | 186.60 | | MADE GROUND: Firm brown sandy very gravelly clay (reworked). Sand is fine to coarse. Gravel is subangular to angular of sandstone. |
| | | | | 0.60 | 186.40 | | MADE GROUND: Stiff to very stiff dark brown very gravelly clay (reworked) with occasional cobbles. Gravel is angular to subangular of sandstone mudstone and occasionally coal. |
| | | | | | | | *SEPA GPP4 Soakaway conducted between 1.00-1.30mbgl* |
| | | | | 1.30 | 185.70 | | End of Pit at 1.30m |

Remarks: Machine excavated trial pit to conduct SEPA GPP4 percolation test. Trial pit dry.

Stability: Stable

| Logged By: | Checked By: |
|---|---|
| DC | DAM |

FINAL


PHOTOGRAPHIC BOARD
PROJECT NAME: KELTY PFS & DRIVE THRU
PROJECT NUMBER: GA 14-C81
LOCATION ID: SK03
SAMPLE ID:
DATE: 03 / 02 / 22
DEPTH: FROM 0.00 m TO 0.90 m

# APPENDIX C

## SEPA GPP4 SOAKAWAY TEST RESULTS

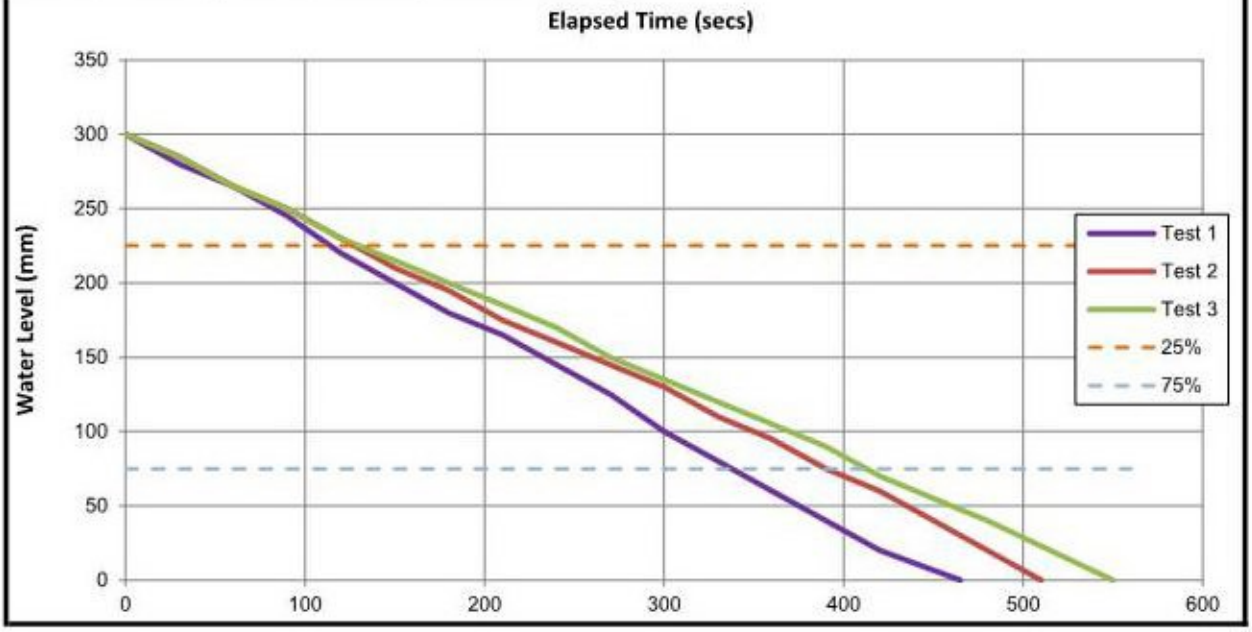
# SEPA GPP4 PERCOLATION TEST RESULT

**Pit No: SK01**

| | | | |
|---|---|---|---|
| Project Name: | Kelty PFS & Drive Thru | Pit Length: | 300 mm |
| Project No: | GA 14681 | Pit Width: | 300 mm |
| Date of Test: | 03/02/2022 | Pit Depth: | 300 mm |
| Easting: | 313521.8 | Notes: | Machine excavated trial pit to 1.20mbgl |
| Northing: | 693528.3 | | SEPA GPP4 pit conducted at base. |
| Elevation: | 169.43 mAOD | | |

| Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|
| Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) |
| 0 | 300 | 0 | 300 | 0 | 300 |
| 30 | 280 | 30 | 285 | 30 | 285 |
| 60 | 265 | 60 | 265 | 60 | 265 |
| 90 | 245 | 90 | 250 | 90 | 250 |
| 120 | 220 | 120 | 230 | 120 | 230 |
| 150 | 200 | 150 | 210 | 150 | 215 |
| 180 | 180 | 180 | 195 | 180 | 200 |
| 210 | 165 | 210 | 175 | 210 | 185 |
| 240 | 145 | 240 | 160 | 240 | 170 |
| 270 | 125 | 270 | 145 | 270 | 150 |
| 300 | 100 | 300 | 130 | 300 | 135 |
| 330 | 80 | 330 | 110 | 330 | 120 |
| 360 | 60 | 360 | 95 | 360 | 105 |
| 390 | 40 | 390 | 75 | 390 | 90 |
| 420 | 20 | 420 | 60 | 420 | 70 |
| 465 | 0 | 450 | 40 | 450 | 55 |
| | | 480 | 20 | 480 | 40 |
| | | 510 | 0 | 550 | 0 |
| | | | | | |
| | elapsed t | | elapsed t | | elapsed t |
| t75 | 120 | t75 | 125 | t75 | 125 |
| t25 | 375 | t25 | 395 | t25 | 405 |

| | | |
|---|---|---|
| $VP_1$ = | 1.70 | s/mm |
| $VP_2$ = | 1.80 | s/mm |
| $VP_3$ = | 1.87 | s/mm |



# SEPA GPP4 PERCOLATION TEST RESULT

**Pit No: SK02**

| | | | |
|---|---|---|---|
| Project Name: | Kelty PFS & Drive Thru | Pit Length: | 300 mm |
| Project No: | GA 14681 | Pit Width: | 300 mm |
| Date of Test: | 03/02/2022 | Pit Depth: | 300 mm |
| Easting: | 313476.8 | Notes: | Machine excavated trial pit to 1.20mbgl SEPA GPP4 pit conducted at base. Moved to SK02A due to rapid percolation. |
| Northing: | 693611.3 | | |
| Elevation: | 176.95 mAOD | | |

| Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|
| Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) |
| 0 | 300 | | | | |
| 30 | 145 | | | | |
| 56 | 0 | | | | |
| | | | | | |
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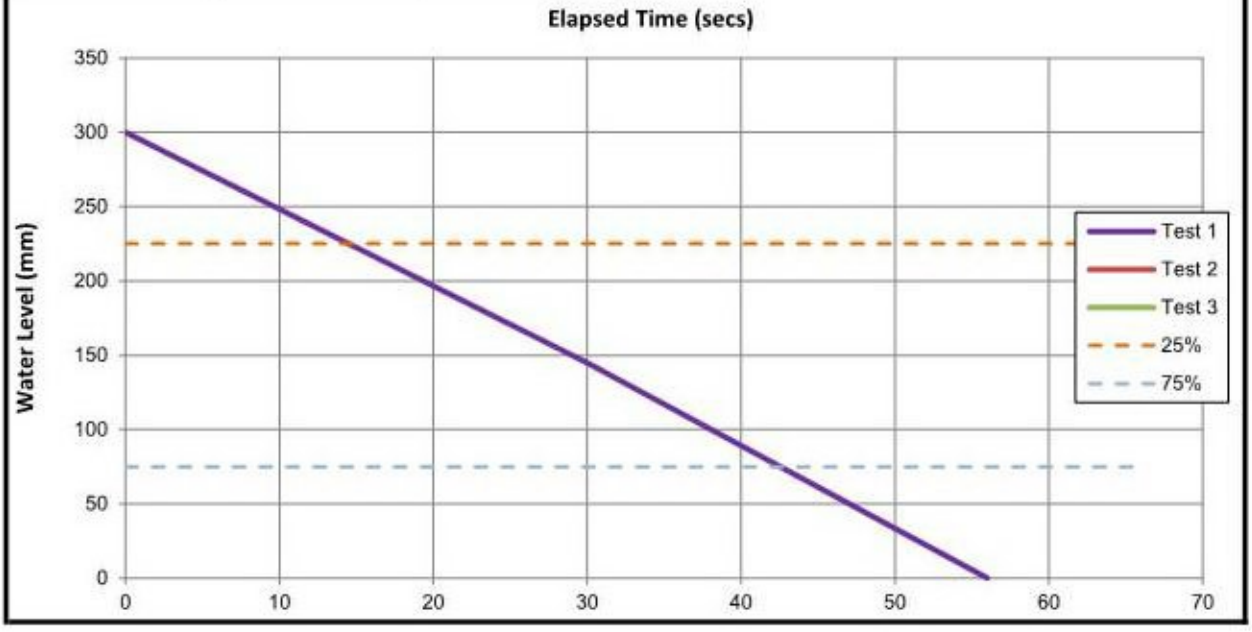
| | | | | | |

| | elapsed t | | elapsed t | | elapsed t |
|---|---|---|---|---|---|
| t75 | 15 | t75 | | t75 | |
| t25 | 42 | t25 | | t25 | |

| | | |
|---|---|---|
| $VP_1$ = | 0.18 | s/mm |
| $VP_2$ = | n/a | s/mm |
| $VP_3$ = | n/a | s/mm |



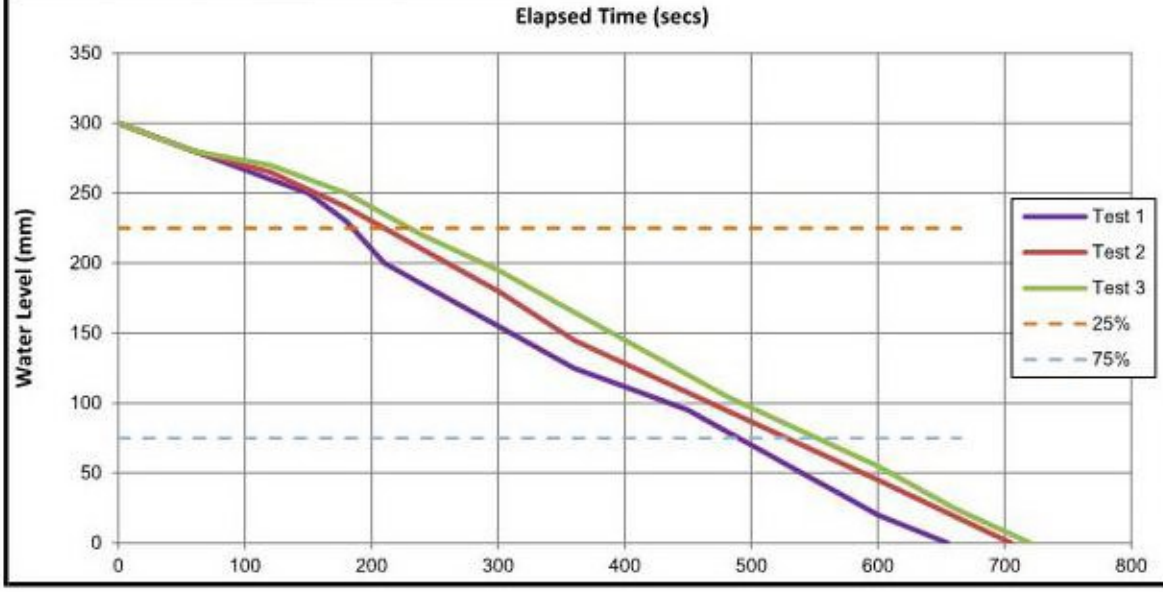
# SEPA GPP4 PERCOLATION TEST RESULT

**Pit No: SK02A**

| | | | |
|---|---|---|---|
| Project Name: | Kelty PFS & Drive Thru | Pit Length: | 300 mm |
| Project No: | GA 14681 | Pit Width: | 300 mm |
| Date of Test: | 03/02/2022 | Pit Depth: | 300 mm |
| Easting: | 313481.2 | Notes: | Machine excavated trial pit to 0.90mbgl |
| Northing: | 693604.2 | | SEPA GPP4 pit conducted at base. |
| Elevation: | 176.28 mAOD | | |

| Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|
| Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) |
| 0 | 300 | 0 | 300 | 0 | 300 |
| 30 | 290 | 60 | 280 | 60 | 280 |
| 60 | 280 | 120 | 265 | 120 | 270 |
| 90 | 270 | 180 | 240 | 180 | 250 |
| 120 | 260 | 240 | 210 | 240 | 220 |
| 150 | 250 | 300 | 180 | 300 | 195 |
| 180 | 230 | 360 | 145 | 360 | 165 |
| 210 | 200 | 420 | 120 | 420 | 135 |
| 240 | 185 | 480 | 95 | 480 | 105 |
| 270 | 170 | 540 | 70 | 540 | 80 |
| 300 | 155 | 600 | 45 | 600 | 55 |
| 330 | 140 | 705 | 0 | 660 | 25 |
| 360 | 125 | | | 720 | 0 |
| 390 | 115 | | | | |
| 420 | 105 | | | | |
| 450 | 95 | | | | |
| 480 | 80 | | | | |
| 510 | 65 | | | | |
| 540 | 50 | | | | |
| 570 | 35 | | | | |
| 600 | 20 | | | | |
| 655 | 0 | | | | |
| | | | | | |
| | elapsed t | | elapsed t | | elapsed t |
| t75 | 190 | t75 | 205 | t75 | 225 |
| t25 | 490 | t25 | 520 | t25 | 550 |

| | | |
|---|---|---|
| $VP_1$ = | 2.00 | s/mm |
| $VP_2$ = | 2.10 | s/mm |
| $VP_3$ = | 2.17 | s/mm |



# SEPA GPP4 PERCOLATION TEST RESULT

**Pit No: SK03**

| | | | |
|---|---|---|---|
| Project Name: | Kelty PFS & Drive Thru | Pit Length: | 300 mm |
| Project No: | GA 14681 | Pit Width: | 300 mm |
| Date of Test: | 03/02/2022 | Pit Depth: | 300 mm |
| Easting: | 313377.3 | Notes: | Machine excavated trial pit to 1.0mbgl SEPA GPP4 pit conducted at base. No appreciable infiltration after 4 hours. Test aborted. |
| Northing: | 693795.4 | | |
| Elevation: | 187.00 mAOD | | |

| Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|
| Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) | Time (secs) | Water Level (mm) |
| 0 | 300 | | | | |
| 60 | 295 | | | | |
| 120 | 295 | | | | |
| 300 | 295 | | | | |
| 900 | 295 | | | | |
| 1800 | 295 | | | | |
| 3600 | 295 | | | | |
| 5400 | 295 | | | | |
| 7200 | 295 | | | | |
| 9000 | 295 | | | | |
| 10800 | 295 | | | | |
| 12600 | 295 | | | | |
| 14400 | 295 | | | | |
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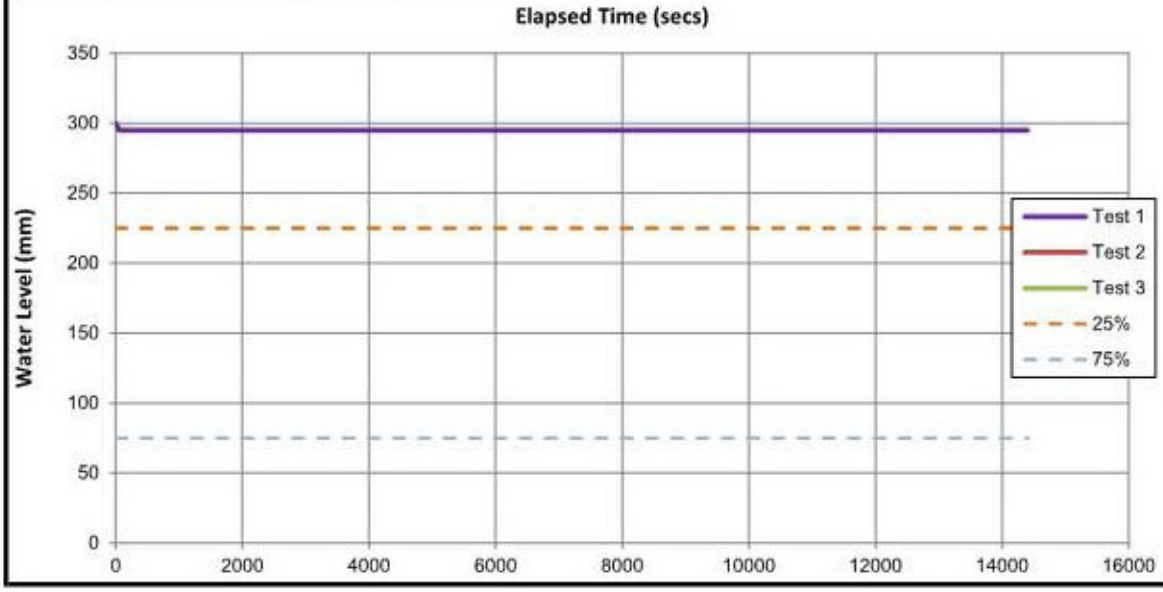
| | | | | | |
| | | | | | |
| | | | | | |
| | elapsed t | | elapsed t | | elapsed t |
| t75 | | t75 | | t75 | |
| t25 | | t25 | | t25 | |

| | | |
|---|---|---|
| $VP_1$ = | n/a | s/mm |
| $VP_2$ = | n/a | s/mm |
| $VP_3$ = | n/a | s/mm |



**Soakaway design in accordance with CIRIA C753 SUDS**

Tedds calculation version 2.0.04

**Design rainfall intensity**

| | |
|---|---|
| Location of catchment area | Edinburgh |
| Impermeable area drained to the system | A = **11000.0** m² |
| Return period | Period = **200** yr |
| Ratio 60 min to 2 day rainfall of 5 yr return period | r = **0.250** |
| 5-year return period rainfall of 60 minutes duration | M5_60min = **13.3** mm |
| Increase of rainfall intensity due to global warming | $p_{climate}$ = **30** % |

*Note that the following values for Z2 have been extrapolated from the 50 year and 100 year Z2 values due to the limitations of the Wallingford Procedure.*

**Soakaway details**

| | |
|---|---|
| Soakaway type | Concentric ring in rectangular pit |
| Width of pit | w = **10500** mm |
| Length of pit | l = **25719** mm |
| Internal diameter of concrete ring | $D_{ring}$ = **1200** mm |
| Thickness of concrete ring walls | $T_{ring}$ = **150** mm |
| Percentage free volume | $V_{free}$ = **90** % |

**Soil infiltration rate (BRE digest 365)**

| | |
|---|---|
| Length of trial pit | $l_{trial}$ = **300** mm |
| Width of trial pit | $b_{trial}$ = **300** mm |
| Depth of trial pit (below invert) | $d_{trial}$ = **300** mm |
| Free volume (if fill used) | $V_{trial}$ = **100** % |
| 75% depth of pit | $d_{75} = (d_{trial} \times 0.75)$ = **225.00** mm |
| 50% depth of pit | $d_{50} = (d_{trial} \times 0.50)$ = **150.00** mm |
| 25% depth of pit | $d_{25} = (d_{trial} \times 0.25)$ = **75.00** mm |
| Test 1 - time to fall from 75% depth to 25% depth | T1 = **2** min |
| Test 2 - time to fall from 75% depth to 25% depth | T2 = **5** min |
| Test 3 - time to fall from 75% depth to 25% depth | T3 = **5** min |
| Longest time to fall from 75% depth to 25% depth | $t_{lg}$ = max(T1, T2, T3) = **5** min |
| Storage volume from 75% to 25% depth | $V_{p75\_25} = (l_{trial} \times b_{trial} \times (d_{75} - d_{25})) \times V_{trial}$ = **0.01** m³ |
| Internal surface area to 50% depth | $a_{p50} = ((l_{trial} \times b_{trial}) + (l_{trial} + b_{trial}) \times 2 \times d_{50})$ = **0.27** m² |
| Surface area of soakaway to 50% storage depth | $A_{s50} = 2 \times (l_{trial} + b_{trial}) \times d_{trial} / 2$ = **0.180** m² |
| Soil infiltration rate | $f = V_{p75\_25} / (a_{p50} \times t_{lg})$ = **173.×10⁻⁶** m/s |
| Effective porosity of fill material | $V_{free}' = (\pi \times D_{ring}^2 / 4 + V_{free} \times (w \times l - \pi \times (D_{ring} + 2 \times T_{ring})^2 / 4)) / (w \times l)$ = **0.90** |
| Base area | $A_b = w \times l$ = **270049500** mm² |
| Perimeter | $P = 2 \times (w + l)$ = **72438** mm |
| Coefficient b | $b = P \times f / (A_b \times V_{free}')$ = **0.19** hr⁻¹ |

**Table equations (Eq. 25.4)**

| | |
|---|---|
| Rainfall intensity | i = M200 / D |
| Coefficient a | $a = A_b / P - (A \times i / (P \times f))$ |
| Minimum depth required | $H = a \times (e^{(-bD)} - 1)$ |

| Duration, D (min) | Growth factor Z1 | M5 rainfalls (mm) | Growth factor Z2 | 200 year rainfall, M200 (mm) | Intensity, i (mm/hr) | a (mm) | Min depth req (mm) |
|---|---|---|---|---|---|---|---|
| 5 | 0.32; | 5.5; | 2.36; | 12.9; | 154.93; | -34150; | 524 |
| 10 | 0.47; | 8.1; | 2.46; | 19.8; | 118.93; | -25348; | 772 |
| 15 | 0.57; | 9.8; | 2.52; | 24.7; | 98.85; | -20440; | 926 |
| 30 | 0.75; | 13.0; | 2.54; | 33.0; | 66.06; | -12424; | 1100 |
| 60 | 1.00; | 17.3; | 2.51; | 43.4; | 43.36; | -6873; | 1164 |
| 120 | 1.29; | 22.3; | 2.43; | 54.3; | 27.13; | -2906; | 901 |
| 240 | 1.69; | 29.2; | 2.34; | 68.2; | 17.06; | -443; | 232 |
| 360 | 1.96; | 33.9; | 2.28; | 77.1; | 12.85; | 586; | 0 |
| 600 | 2.35; | 40.6; | 2.19; | 88.7; | 8.87; | 1560; | 0 |
| 1440 | 3.27; | 56.5; | 2.08; | 117.4; | 4.89; | 2532; | 0 |

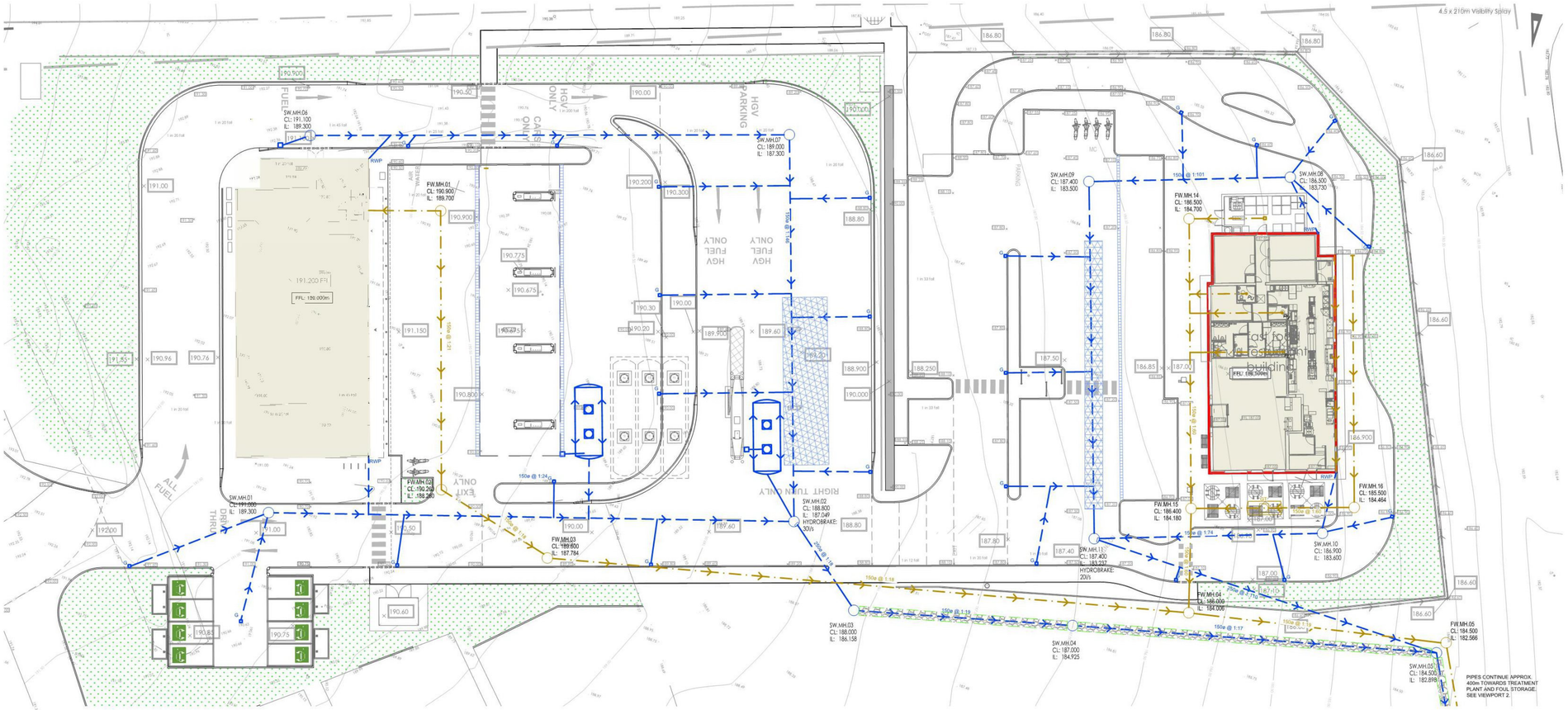
Minimum depth of soakaway $H_{max}$ = **1164** mm

Time to empty soakaway to half vol. - Eq.24.6(2) $t_{s50} = V_{free}' \times A_b / (f \times P) \times Ln((H_{max} + A_b / P) / (H_{max} / 2 + A_b / P))$ = 40min 58s

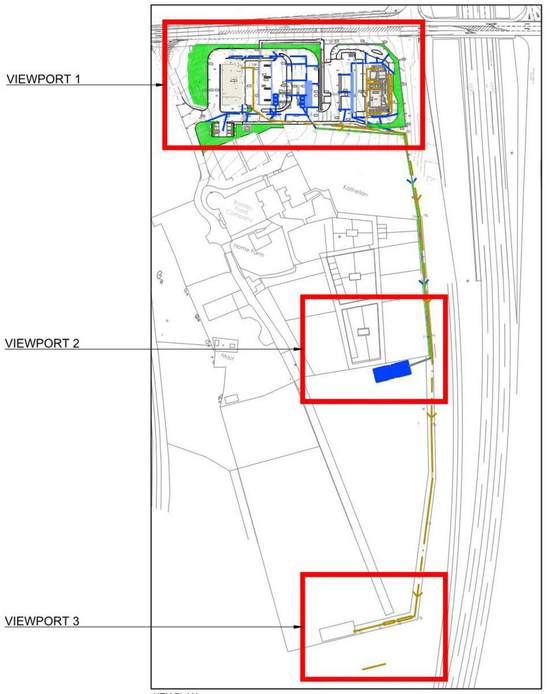
***PASS - Soakaway discharge time less than or equal to 24 hours***

# Appendix 8 - Proposed Drainage Layout

DO NOT SCALE, IF IN DOUBT ASK. DO NOT INTERROGATE CAD BASE




VIEWPORT 1 - SITE DRAINAGE LAYOUT PLAN
SCALE 1:200




KEY PLAN
NTS

## DRAINAGE LEGEND

SW.MH.01
CL: 55.600m
IL: 59.950m
PROPOSED SURFACE WATER MANHOLE WITH MANHOLE REFERENCE, COVER AND INVERT LEVEL INCLUDED.

FW.MH.01
CL: 58.080m
IL: 56.115m
PROPOSED FOUL WATER MANHOLE WITH MANHOLE REFERENCE, COVER AND INVERT LEVEL INCLUDED.

PROPOSED FOUL WATER DRAINAGE LINE WITH FLOW DIRECTION INDICATED.

PROPOSED COMBINED DRAINAGE LINE WITH FLOW DIRECTION INDICATED.

EXISTING COMBINED DRAINAGE LINE WITH FLOW DIRECTION INDICATED.

ATTENUATION STORAGE TANK.

ACO CHANNEL.

PROPOSED FILTER TRENCH.

RE PROPOSED SURFACE WATER RODDING EYE.

RE PROPOSED FOUL RODDING EYE.

G PROPOSED FOUL GULLY.

G PROPOSED SURFACE WATER GULLY.

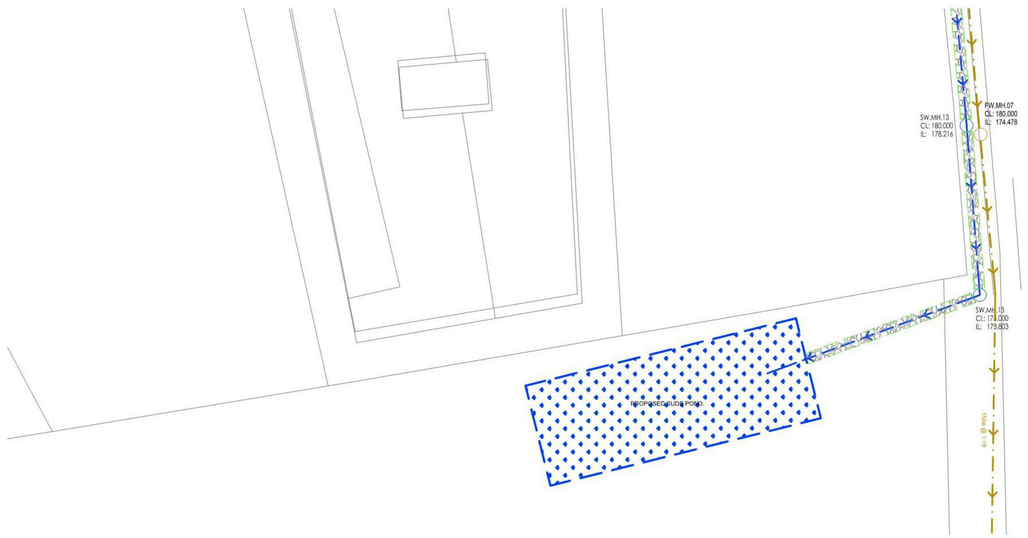
RWP PROPOSED SURFACE WATER RAIN WATER PIPE.

PU PROPOSED FOUL POP UP.

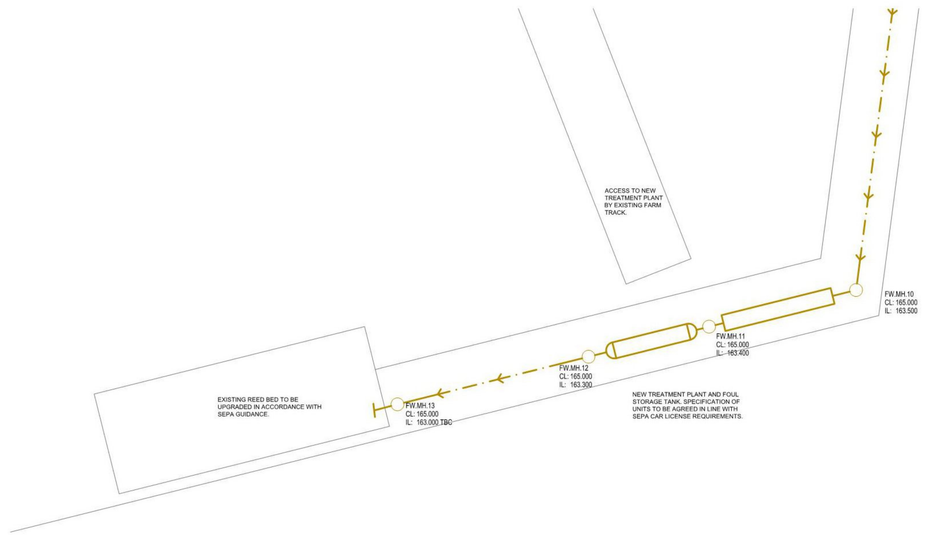
## DRAINAGE NOTES:

1. THIS DRAWING HAS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. FOR DRAINAGE DETAILS REFER TO DRAWING 14681-GOO-ZZ-XX-DR-C-0501.
3. FOR LOCATION OF ALL R.W.P's & INTERNAL POP-UP's REFER TO ARCHITECTS DRAWING. ALL DOWN PIPES TO BE FITTED WITH ACCESS HANDHOLES ABOVE F.F.L. OR GROUND LEVEL.
4. ALL GULLY CONNECTIONS TO BE 150Ø U.N.O. ALL S.V.P. CONNECTIONS TO BE MINIMUM 100Ø OR TO MATCH S.V.P. DOWNPIPE IF GREATER. ALL R.W.P. CONNECTIONS TO BE 150Ø OR TO MATCH R.W.P. DOWNPIPE.
5. ALL PIPES UP TO 450Ø TO BE UPVC PIPES. PIPES GREATER THAN 450Ø TO BE CONCRETE.
6. PIPES UNDER ROADS HAVING 1200mm OR LESS COVER ARE TO BE ENCASED IN CONCRETE IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
7. MANHOLE COVER LEVELS ARE INDICATIVE AND SHOULD BE SET TO SUIT FINISHED ROAD LEVEL AND CAMBER.
8. ALL INTERNAL MANHOLES, INSPECTION COVERS & RODDING EYES TO BE FITTED WITH DOUBLE SEAL COVERS AND MECHANICALLY SCREWED DOWN.
9. ALL EXTERNAL MANHOLES WITHIN ROADS TO BE FITTED WITH LOADCLASS D400 COVERS U.N.O. ALL EXTERNAL MANHOLES WITHIN SOFT LANDSCAPING TO BE FITTED WITH LOADCLASS B125 COVERS U.N.O. ALL IN ACCORDANCE WITH BS EN 124:2015 (ALL PARTS).
10. INVERT LEVELS OF EXISTING DRAINS AND MANHOLES TO BE CONFIRMED ON SITE PRIOR TO COMMENCING OPERATIONS. NO EXISTING SEWER MANHOLE TO BE OPENED OR ENTERED WITHOUT THE PERMISSION OF THE LOCAL AUTHORITY DRAINAGE DEPARTMENT AND THE ATTENDANCE OF SEWER PERSON AS REQUIRED.
11. DRAINAGE DESIGN AND INSTALLATION TO BE TO THE SATISFACTION OF THE LOCAL BUILDING CONTROL DEPARTMENT AND TO COMPLY WITH BS EN 752:2017, BS EN 1610:2015, BS EN 12056-1:2000, BS EN 12056-2:2000 and BS EN 12056-3:2000.
12. ADOPTABLE DRAINAGE WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE LATEST EDITION OF 'SEWERS FOR SCOTLAND'.
13. ALL SUDS COMPONENTS TO BE MAINTAINED IN ACCORDANCE WITH CIRIA C 768.
14. MANHOLE CHAMBER DIAMETERS TO COMPLY WITH THE TABLE BELOW.

| SCHEDULE OF CHAMBER DIAMETERS | |
|---|---|
| DIA. OF LARGEST PIPE IN MANHOLE | INTERNAL DIA. OF MANHOLE |
| LESS THAN 375Ø | 1200 |
| 375-450 | 1350 |
| 450-700 (INCL). | 1500 |
| 750-1050 (INCL). | 1800 |
| 1125-1500 | 2100 |
| >1500 | CONSULT SCOTTISH WATER |




VIEWPORT 2 - SURFACE WATER DISCHARGE
SCALE 1:200




VIEWPORT 3 - FOUL TREATMENT PLANT STORAGE
SCALE 1:200

| REV. | DATE: | REVISION: | BY. | CHK. |
|---|---|---|---|---|
| P01 | 04.03.22 | FIRST ISSUE. | GA | DC |
| P02 | 22.03.22 | LAYOUT AMENDED TO SUIT UPDATED SITE PLAN. | GA | DC |

Graham & Sibbald (Glasgow)

Mixed Use Development
Baxters Farm, Kelty

External Works
Drainage Layout


Goodson Associates
Tel: +44 (0)141 337 6868
Fax: +44 (0)141 337 1738
Email: glasgow@goodsons.com
Web: www.goodsons.com
Consulting Civil, Structural & Transportation Engineers
4 Lansdowne Crescent, Glasgow, G20 6NQ
Also at Aberdeen, Edinburgh and Leeds


| STATUS: | SUITABILITY |
|---|---|
| Building Warrant | S2 |

ORIGINATOR'S JOB No: P14681

DATE CREATED: 04.03.22 | SCALE: As Shown @ A0

DRAWING No: 14681-GOO-ZZ-XX-DR-C-0500 | REV: P02

# Appendix 9 - Sustainable Drainage Design Compliance Certificate

## Appendix 1 - Sustainable Drainage Design Compliance Certificate

I certify that all the reasonable skill, care and attention to be expected of a qualified and competent professional in this field has been exercised in designing the sustainable drainage system for the below named development in accordance with CIRIA C753: The SuDS Manual 2015, the current edition of Sewers for Scotland and Fife Council's – Design Criteria Guidance Note on Flooding and Surface Water Management Plan Requirements.

ePlanning Reference No. t.b.c

Planning Application No. (completed by Fife Council Planning Service) .....

Roads Construction Consent No. (completed by Fife Council Planning Service) .....

Name of Development Proposed Roadside Retail Development, Kelty

Name of Developer Wyeth Project Services

Name and Address of Designers Organisation

Goodson Associates

53 Melville Street

Edinburgh

Name of Designer Euan Kerr

Position Held Senior Engineer

Engineering Qualifications (2) CEng MICE MIStructE

Signed [redacted]

Date 22.03.22

Drawing No's relative to this certificate

14681-GOO-ZZ-XX-DR-C-0500

(2) **Minimum Qualification - Incorporated Engineer or equivalent from an appropriate Engineering Institution.**

## Appendix 2 - Sustainable Drainage Design – Independent Check Certificate

I certify that all the reasonable skill, care and attention to be expected of a qualified and competent professional in this field has been exercised in the below named development with a view to securing that:

1. It has been designed in accordance with CIRIA C753: The SuDS Manual 2015, Current Edition of Sewers for Scotland, Fife Council – Design Criteria Guidance Note on Flooding and Surface Water Management Plan Requirements.
2. It shall be accurately translated into construction drawings and schedules.
3. I hereby confirm that I hold professional indemnity insurance for £5 million pounds.

ePlanning Reference No. .. t.b.c.

Planning Application No. (completed by Fife Council Planning Service) .....

Roads Construction Consent No. (completed by Fife Council Planning Service) .....

Name of Development..... Proposed Roadside Retail Development, Kelty

Name of Developer..... Wyeth Project Services

Name and Address of Checker's Organisation .....

Goodson Associates

53 Melville Street

Edinburgh

Name of Checker..... Andy Mitchell

Position Held..... Director

Engineering Qualifications [2] CEng MIStructE

Signed [redacted]

Date 22.03.22

(2) **Minimum Qualification - Incorporated Engineer or equivalent from an appropriate Engineering Institution.**

## Appendix 5 - Confirmation of future maintenance of Sustainable Drainage Apparatus

I hereby confirm that the future maintenance of the Sustainable Drainage Apparatus as detailed below and on the drawing numbered 14681-GOO-ZZ-XX-DR-C-0500 will be carried out in accordance with the attached maintenance schedule, by the undernoted organisation.

Planning Application No. (completed by Fife Council Planning Service) .....

Roads Construction Consent No. (completed by Fife Council Planning Service) .....

Name of Development Mixed Use Development, Kelty

Name of Developer Mr Ian Maclellan and TG Convenience Stores Ltd

Name and address of maintenance organisation (including contact telephone number and e-mail address)

To be appointed at the care of the Developer

.....

.....

Telephone: ..... Email: .....

Details of sustainable drainage apparatus to be maintained:

Gullies and Channel Drains Hydraulic Flow Control Mechanism

Attenuation Tank

Filter Trench

Soakaway

Signed [redacted]

Name Euan Kerr

Position Held Senior Engineer

Name of Organisation Goodsons Associates

Date 12.04.22

## Appendix 8 - Full Planning Application Checklist

| Point | Description | Provided Y (Yes), N (No), N/A |
|---|---|---|
| 3.0 | Flood Risk Assessment. | Refer to section 4 of DSP - Flood risk low |
| 4.4.1 | A drainage layout. | Y |
| 4.4.2 | Confirmation of discharge rate. | Y |
| 4.4.3 | Calculations for any attenuation volume required. | Y |
| 4.4.4 | Soakaway information (i.e. ground investigation, porosity test). | Y |
| 4.4.5 | Pre-development and post-development flow path diagrams. | Y |
| 4.4.6 | Confirmation of the SuDS treatment train. | Y |
| 4.4.7 | Assessment of the maximum groundwater level at the location of any underground attenuation features is applicable. | Y |
| 4.4.8 | **Written evidence of Scottish Water's approval of the surface water drainage connection into their network at the rate agreed with Scottish Water.** | N/A - no connection into Scottish Water system required. |
| 4.4.9 | Confirmation of who will adopt and maintain the surface water network, including any SuDS as per Appendix 5. | Y |
| 4.4.10 | A maintenance schedule for all proposed SuDS, to include a detailed list of activities and timescales. | Y |
| 4.4.11 | Confirmation of Construction Status SuDS compliance. | N/A |
| 4.4.12 | Completed SuDS certification as per Appendices 1 and 2.<br>*(For single dwelling, only Appendix 1 is required)* | Y |