

**Proposed Sainsbury's,
Shripney Road,
Bognor Regis**

**Condition 11 – Surface and Foul
Water Drainage**

March 2012



the journey is the reward

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Shripney Road,
Bognor Regis**

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Water Drainage**

March 2012

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1.0 INTRODUCTION

- 1.1 Planning permission has been obtained to construct a new Sainsbury's supermarket and petrol filling station located off Shripney Road, Bognor Regis. Condition 11, is a pre-start condition, and relates to the surface and foul water strategy for the development.
- 1.2 Condition 11 from approved planning permission is as follows:

Foul and surface water drainage

No development shall take place until a scheme for the disposal of foul & surface water drainage has been submitted to and approved in writing by the Local Planning Authority. The approved scheme shall be implemented before the retail store is occupied.

- 1.3 This document describes the proposed surface and foul water drainage design philosophy for the development, with accompanying calculations, in sufficient detail to enable the pre-start Condition 11 to be discharged. A detailed design of the surface water network has been undertaken by Gary Gabriel Associates with the proposed GA in appendix I, and the accompanying calculations in appendix C.

2.0 FOUL WATER DRAINAGE

- 2.1 The proposed foul water drainage design and accompanying design philosophy have been carried out by Gary Gabriel Associates, which are contained in Appendix G of this report.

3.0 SURFACE WATER DRAINAGE – ON SITE

Outfall Location

- 3.1 The existing, or pre demolition, drainage layout can be seen in appendix D. A small area to the south east of the site discharged directly to Aldingbourne Rife. The remainder of the site drained to the east through two outfalls under the railway line and then by open ditches to Aldingbourne Rife.
- 3.2 The proposal is to drain the entire development, with a hard standing area of approximately 4.7 hectares, to one of the existing outfalls under the railway line. The 15m outfall pipe has been measured as a 450mm diameter culvert with an upstream invert level of 0.25mAOD and outfall invert level of -0.21mAOD, which works out with a gradient of approximately 1 in 40. The full bore discharge capacity of this sewer is approximately 445 litres / second based upon a high “K” value of 1.5. The outfall discharges into an existing (unnamed) open ditch approximately 150 metres upstream of Aldingbourne Rife.

Discharge Rate

- 3.3 The Existing site is viewed as a brownfield development and the proposed surface water discharge rate is measured against existing surface water discharge. CIRIA's definition of Greenfield run-off is as follows: *This is the surface water run-off from a site before development, or the existing site conditions for brownfield redevelopment sites* (similar definition in the jointly authored DEFRA and EA document, titled “Rainfall Management for Developments – Interim National Procedure”).
- 3.4 Bearing this in mind the proposal, as approved in the flood risk assessment that accompanied the planning application, the proposed rate of surface water run-off to will not exceed 80% of the peak existing rate surface water run-off, including an additional allowance for climate change. The restriction will be achieved using sustainable drainage (SUDS).
- 3.5 As described in Paragraph 3.1 there were a number of surface water outfalls from the 4.19 hectare existing site, which was circa 98% impermeable and eventually discharged into Aldingbourne Rife. There was limited survey information available to replicate the existing drainage arrangement so the following method was used for the calculation of brownfield runoff rates for the 1 in 2, 1 in 30 and 1 in 100 year return periods:
Brownfield runoff = Rainfall Intensity x impermeable Area (The rainfall data for different storm events were taken from Flood Estimation Handbook CD Rom). A relatively short duration rainfall event of 30 minutes has been assumed as the peak existing surface water run-off

- 80% Existing 1 in 2 year = 160 l/s for 30 min storm
- 80% Existing 1 in 30 year = 430 l/s for 30 min storm
- 80% Existing 1 in 100 year = 640 l/s for 30 min storm

The Micro drainage calculated discharge rates from the proposed network are as follows, which are considerably lower than the existing rates

- Proposed 1 in 2yr discharge = 86l/s for 30min Storm
- Proposed 1 in 30yr discharge = 104 l/s for 30min Storm
- Proposed 1 in 100yr discharge (incl. 20%cc) = 200 l/s for 30min Storm

- 3.6 The proposed discharge rate is actually limited by the full bore (unsurcharged) carrying capacity of the 450mm diameter culvert underneath the railway line, and because the proposed surface water network has quite flat gradients. The peak discharge is actually 340 litres / second for the 120 minute storm event. The proposed network was modelled in detail Micro drainage, with the network details and simulated results in Appendix C.

Sustainable Drainage (SUDS)

- 3.7 The method of restricting surface water from the site is known as Sustainable Urban Drainage Systems (SUDS) or source control in new developments to control surface water runoff and encourages natural groundwater recharge. These drainage systems also reduce the hydraulic and hydrological impact on the local area and downstream catchments. There are a number of options available to impose surface water restrictions on proposed development plots such as oversized sewers, below ground storage tanks, permeable paving, or infiltration systems. Approved document Part H sets out a hierarchy for surface water disposal, which encourages a sustainable approach.

- An adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable,
- A Watercourse, or where that is not reasonably practicable,
- A sewer.

- 3.8 Extensive site investigation work has been carried out that determined the underlying soil is contaminated, and the required remediation has been addressed and approved during the planning process. One of the outcomes is that no infiltration drainage should be used on the proposed development to ensure underlying residual contaminants are not mobilised. Therefore, the proposed surface water system will continue to match the existing and discharge (at an attenuated rate) into Aldingbourne Rife As described in paragraph 3.2.

- 3.9 The reduced rate of discharge from the proposed development will require surface water attenuation on site. The type of attenuation will be below ground proprietary units that

are suitable for use below car parks and trafficked areas. The system specified is the Geolight by SDS limited and their brochure and technical data is located in Appendix G.

- 3.10 There will be rainwater harvesting used on this site to utilise the surface water run-off generated by the roof water syphonic drainage system. This has been ignored for the purpose of this surface water design on the assumption the rainwater storage tank may be full during a high intensity rainfall event.

Surface Water Treatment

- 3.11 All surface water run-off from will pass through an appropriately sized class 1 petrol interceptor before discharging from the site. All surface water run-off from the roof areas will not pass through petrol interceptors prior to leaving the site. The interceptors will be proprietary units selected with reference to the SEPA PPG3. A maintenance schedule will be put in place as soon as the project is complete that will ensure the petrol interceptors are regularly maintained and cleaned. The separator specified are from SPEL products with their literature located in appendix F.
- 3.12 Surface water run-off from roof drainage is considered 'clean' and will not require treatment prior to discharging into the subterranean storage and eventual discharge into the Thames Water sewer.

Surface Water Run-off to Foul Sewers

- 3.13 Cut-off drains will surround the compactors and permanent skips that will discharge to the foul system. The vehicle wash effluent will be fully recycled with overspill discharging the foul system. The surface water run-off from the hard standing area serving the fuel delivery and dispensing area will discharge into the foul sewer. This will discharge via a full retention forecourt separator with extra capacity (+7600 litres – capacity of one compartment of a standard fuel tanker) to store potential spillage that may occur during a fuel delivery. These areas are to be designed in accordance with the Pollution Prevention Guidelines located in appendix C.

Maintenance

- 3.14 This finished site will be owned and operated by a single body. This should enable tight control over the operation and maintenance of the facilities and drainage / SUDS systems on site. A maintenance schedule will be put in place as soon as the project is complete that will ensure the petrol interceptors and drainage network are maintained and cleaned at regular intervals.

Design Criteria

- 3.15 The positive drainage will be designed in accordance with Sewers for Adoption 6th Edition, and BS EN 752 – Drain and sewer systems outside buildings and the Building Regulations - part H (2002).
- 3.16 The surface water network design and rate of surface water run off would be based on the Modified Rational method and designed in accordance with the Wallingford Procedure. In order to carry out the design of the networks, a number of Global Variables are used. These Global Variables / parameters are related to the location of the site in the UK and have been obtained from Maps for “design and analysis of urban storm drainage – Wallingford procedure”. These are as follows;
- Region = England & Wales
 - $M(5-60) = 19.0\text{mm}$
 - Ratio (r) = 0.35
- 3.17 The positive surface water system would be designed such that:
- The pipes remain unsurcharged during the worst case 1 in 2 year design storm;
 - The system should not flood during the worst case 1 in 30 year storm with a free outfall;
 - The surface water run-off from the proposed development would be contained on site for up to and including the worst case 1 in 100 year storm event, plus an additional 20% for climate change;
 - The pipe velocities are such that self cleansing is achieved at lesser, more moderate, storm intensities :-
 - Pipe roughness (k_s) = 0.6
 - Minimum pipe velocity at full flow = 1.0m/s
 - Percentage Impermeable areas
 - Buildings = 100%
 - Carriageways and Footpaths = 100%
 - Customer Car Park (drains into drainage blanket) = 100%
 - Service Yard = 100%

4.0 SURFACE WATER DRAINAGE – SECTION 278 WORKS

- 4.1 Shripney Road is a dual carriageway along the length of road where the proposed S278 works are to be carried out. The existing carriageway widths are generally 7m wide and are separated by a soft landscaped central reservation that ranges in width from circa 4.0m to 5.0m. The level difference across the central reservation, between the two channel lines, is circa 0.25m. The majority of the S278 works are to be carried out on the eastern carriageway fronting onto the proposed Sainsbury's Store.
- 4.2 The Shripney Road carriageways are drained by a traditional network of gullies that discharge into a 225mm diameter highway sewer located in the central reservation between the carriageways. This highway drain eventually discharges into the Aldingbourne Rife located along the southern boundary of Shripney Trade Park, which is just to the south of the proposed Sainsbury's Store. Refer to drawing SSLBOGNOR.2 attached.
- 4.3 The S278 works also cover Shripney Road Spur link that runs behind the existing car dealership and will be stopped up as part of the proposed development. This length of road also utilises a traditional gully system that discharges into a 225mm diameter highway drain positioned in the spur road and the eastern side of the carriageway before it eventually connects to the main carrier sewer located in the central reservation. Refer to drawing.
- 4.4 The eastern carriageway has a combination of a constant cross fall, where gullies are located along the central reservation, and then rolls over by the existing pedestrian crossing to a cambered cross fall with gullies on both sides of the road. The existing vertical alignment of the road is approximately 1 in 170 along the constant cross fall area, but is almost entirely flat along the cambered areas resulting in significant ponding along both sides of the carriageway.

Proposed S278 Surface Water Drainage

- 4.5 The detailed drainage design for the proposed S278 works on Shripney Road will require relatively minor alterations to the existing drainage network.
- 4.6 Shripney Road Spur road will be stopped up and the associated gullies and carrier sewer described in paragraph 1.3 will be removed and / or decommissioned.

- 4.7 The proposed general arrangement requires a dedicated right turn lane across the existing central reservation in order to gain access from the western carriageway to the proposed development. This requires the vertical alignment of the eastern carriageway to be raised to reduce the level difference of circa of 0.25m described in paragraph 1.1. The revised eastern carriageway will also need to provide a relatively level access to the proposed store.
- 4.8 The proposed alterations to the vertical alignment of the eastern carriageway will result in a number of new hog and sag curves along the road in front of the store where a minimum longitudinal fall of 1 in 150 will be achieved.
- 4.9 A relatively similar drainage arrangement will be maintained consisting of a constant cross fall with gullies located along the central reservation, which rolls over to a cambered cross fall with gullies on both sides of the road. The improved longitudinal alignment will provide much improved drainage along this length of road.
- 4.10 The existing gullies where the road will be raised are to be broken out and new gullies provided, connected to the existing carrier sewer located in the central reservation.
- 4.11 Double gullies will be located at all low points.
- 4.12 The hard standing areas draining to the new gullies will not exceed 150m² per gully.
- 4.13 A new carrier sewer and 2 manholes are required to drain the new bus lay-by and will connect to an existing manhole on the highway sewer in the central reservation.
- 4.14 There are no flow control structures or attenuation tanks specified within the S278 works.

APPENDIX A

Planning Permission Condition Schedule

PLANNING CONDITION SCHEDULE –29th February 2012



WYG Job Number: A040655
 Job: Sainsbury's Bognor Regis
 Client: Sainsbury's
 Planning Application Ref: BE/122/08

No	Issue	Condition	Information required / current planning status	Consultant	Submission Date	Date Approved
PRE-COMMENCEMENT						
2	Hard and soft landscaping	No development shall take place until a scheme of hard and soft landscaping for the site has been submitted to, and approved in writing by, the Local Planning Authority. The approved details of the soft landscaping shall be carried out in the first planting and seeding season following the occupation of the retail store and any trees or plants which, within a period of five years from occupation of the retail store, die, are removed or become seriously damaged or diseased, shall be replaced in the next planting season with others of similar size and species, unless the Local Planning Authority gives written consent to any variation. The approved details of the hard landscaping scheme shall be implemented before the retail store is opened to the public.	Soft landscaping: Arthur Amos Associates have provided drawings - submitted Hard landscaping: CHQ provided surfaces finishing information - submitted	CHQ & AAA	09/12/2011	
6	Site Contamination	No development shall take place until the following components of a scheme to deal with the risk associated with contamination of the site, to include an implementation programme, have each been submitted to and approved in writing by the Local Planning Authority: 1. A site investigation scheme, based on the Desk Top Study and historical site investigations to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.	APPROVED.	Mayer Brown	25 May 2011	27 June 2011

		2. Based on the results and the detailed risk assessment referred to in 6.1 above, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken. 3. A Verification Plan providing details of the data that will be collected in order to demonstrate that the works set out in 6.2 above are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.				
9	Piling methodology	No development shall take place until details of piling or other foundation designs using penetrative methods have been submitted to and approved in writing by the Local Planning Authority. The development shall be carried out in accordance with the approved details.	Awaiting details from Longcross	Longcross		
10	Underground tanks for PFS	No development shall take place until a scheme to install the underground tank(s) for the petrol filling station has been submitted to and approved in writing by the Local Planning Authority. The installation of the tanks shall be carried out in accordance with the approved scheme prior to the opening of the petrol filling station. The scheme shall include the full structural details of the installation, including details of: excavation, the tank(s), tank surround, associated pipe work and monitoring system.		Martindales	17.02.11	
11	Foul and surface water drainage	No development shall take place until a scheme for the disposal of foul & surface water drainage has been submitted to and approved in writing by the Local Planning Authority. The approved scheme shall be implemented before the retail store is occupied.	Drawings provided by Leigh Fotiadis (Mayer Brown). LPA requested further details. MB has had a few issues which have caused a delay to issuing the additional details requested. In addition, they have been trying to locate an existing outfall which has been proven to be nearly impossible with the current work being undertaken on site (remediation and major earthworks). At this stage they are unable to provide a completion date.	Mayer Brown	09/12/2011	
24	Biomass boiler details	Details of the bio-mass boiler, to include details of all emissions and its physical form, and details of the associated chip store, to include details of the elevations of this building, shall be submitted to and approved in writing by the Local Planning Authority prior to commencement of the development. The boiler and the	Basic details on the biomass submitted, but it is likely that the LPA will request further information.		17.02.11	

		chip store shall be provided in accordance with the approved details before the retail store opens for trading.				
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PRIOR TO RETAIL STORE DEVELOPMENT

3	External lighting – Sainsbury's store	No development of the retail store element of the development shall take place until details of any external lighting/floodlighting for the retail store, including details of levels of luminance, have been submitted to, and approved in writing by the Local Planning Authority. The approved details shall be implemented and operational, before the retail store is opened to the public.	Synergy have provided plan showing lighting strategy for SSL store, based on approved plan.	Synergy	09/12/2011	
22	Temporary construction site access	The retail store shall not be commenced until a temporary site construction access has been provided in accordance with a plan and details to be submitted to and approved in writing by the Local Planning Authority.	Awaiting details from Longcross	Longcross		

PRIOR TO CAR DEALERSHIP DEVELOPMENT

4	External lighting – car dealership	No development of the car dealership element of the development shall take place until details of any external lighting/floodlighting, visitor car parking spaces and boundary treatment in relation to that part of the development have been submitted to and approved in writing by the Local Planning Authority. The approved details shall be implemented and operational, before the car dealership is opened to the public.				
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WITHIN 6MONTHS OF COMMENCEMENT

25	Public Art	Within 6 months of the commencement of development, details of the art panels to be included on the Shripney Road elevation of the retail store shall be submitted to and approved in writing by the Local Planning Authority. The approved art panels shall be erected as part of the store construction.	Call made to LPA 09/12/2011 to discuss. WYG have requested that GKA formulate a design brief and a letter to go the local artists group to start this process. GKA confirmed on 24.02.2012 that a finalised letter will be ready shortly.	CHQ/GKA		
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PRE-OCCUPATION CONDITIONS

5	Flood Risk measures	The development shall only be carried out in accordance with the approved Flood Risk Assessment (FRA) and Addendum (document ref HA/2008/105829/ 02-L01) and in particular, the following mitigation measures as detailed within the FRA: 1. Limiting the surface water run-off generated by the critical storm so that it will not exceed the run-off from the undeveloped site and not increase the risk of flooding off site. 2. Provision of compensatory flood storage on the site. 3. Identification and provision of safe route(s) into and out of the site to an appropriate safe haven. 4. Setting of finished floor levels no lower than 2.20 m above Ordnance Datum (AOD).	No further information required – scheme to be built out as per approved FRA.			
7	Remediation strategy compliance	A Verification Report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved in writing by the Local Planning Authority before the retail store is occupied. The Report shall include results of sampling and monitoring carried out in accordance with the approved Verification Plan to demonstrate that the site remediation criteria have been met.		Mayer Brown / Celtic?		
12	Signalised junction provision	The retail store shall not be opened for trade until the approved A29, Shripney Road/site access road signalised junction has been provided in accordance with the approved master plan drawing No. CHQ.08.8157-002 C.	No further information required			
13	Toucan crossing	The retail store shall not be opened for trade until the approved signalised toucan crossing has been provided across the A29, Shripney Road, in accordance with the approved master plan drawing No. CHQ.08.8157-002 C.	No further information required			
14	Bus lay-by	The retail store shall not be opened for trade until the bus lay-by and bus shelter with seating, lighting and bus information timetables has been provided on the A29, Shripney Road, site frontage in accordance with a scheme to be submitted to, and approved in writing by the Local Planning Authority.		Mayer Brown?		

15	Existing site access	The retail store shall not be opened for trade until the existing site accesses have been physically closed in accordance with a scheme to be submitted to and approved in writing by the local planning authority.		Mayer Brown?		
16	Proposed road and footways access	The retail store shall not be opened for trade until the site access road and its associated footways have been provided in accordance with the approved master plan drawing No. CHQ.08.8157-002 C.	No further information required			
17	Car park	The retail store shall not be opened for trade until the car park circulatory aisles, the car parking spaces, the disabled spaces and the parent and child spaces have been provided, surfaced and marked out in accordance with the approved master plan drawing No. CHQ.08.8157-002 C. These vehicle parking spaces shall thereafter be retained at all times for their designated users.	No further information required			
18	Motorcycle parking	The retail store shall not be opened for trade until the motorcycle parking area within the store car park has been provided, surfaced and marked out in accordance with the approved master plan drawing No. CHQ.08.8157-002 C. This motor cycle parking area shall thereafter be retained at all times for its designated use.	No further information required			
19	Customer and staff cycle parking	The retail store shall not be opened for trade until the customer and staff cycle parking spaces have been provided within the site in accordance with the approved master plan drawing No. CHQ.08.8157-002 C. These cycle parking spaces shall thereafter be retained at all times for their designated use.	No further information required			
20	Store service road	The retail store shall not be opened for trade until the store service road and its associated service yard have been provided in accordance with the approved master plan drawing No. CHQ.08.8157-002 C.	No further information required			
21	Travel Plan	The Travel Plan (May 2009) hereby approved shall be implemented in accordance with the details therein on first occupation of the retail store.	No further information required			

OPERATIONAL CONDITIONS

8	Contamination	If, during development, contamination not previously identified is found to be present at the site then no further development shall be carried out until an amendment to the remediation strategy detailing how this unsuspected contamination will be dealt with has been submitted to and approved in writing by the Local Planning Authority, and the measures included in the amended strategy shall be carried out in accordance with the details approved by the Local Planning Authority prior to the opening of the retail store.	Watching brief condition			
23	Floorspace restriction	In the retail store no more than 3,570 sq. m of the floor space shall be used for the sale of convenience goods and no more than 1,640 sq. m for the sale of comparison goods.				
26	Planning approved drawings	This planning permission relates to the following plans and statement: Site Location Plan (Red Line) – No. CHQ.08.8157-001 Proposed Master Plan – No. CHQ.08.8157-002 C Proposed ground floor Plan – No. CHQ.08.8157-003 A Proposed first floor plan – No. CHQ.08.8157-004 A Proposed elevations – No. CHQ.08.8157-005 Proposed rendered elevations No. CHQ.08.8157-006 Proposed PFS elevation No. CHQ.08.8157-007 A Proposed car dealership plans and elevations – No. CHQ.08.8157-008 A Topographical Survey – No. CHQ.08.8157.009 Design and Access Statement (January 2009)				

OTHER

1	3 year commencement limit	The development hereby permitted shall be begun before the expiration of three years from the date of this permission.				
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APPENDIX B

Flood Risk Assessment



BOGNOR REGIS

RETAIL DEVELOPMENT

Flood Risk Assessment

Kate Darlington
Leigh Fotiadis

Date: November 2008



REPORT CONTROL

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C	Topographic Survey of the Development Site
D	Development proposals
E	Notes of Telephone Discussions with the Environment Agency
F	Existing Drainage
G	Flood Zone Identification
H	Sequential Test



1.0 INTRODUCTION

1.1 Instruction

WYG Engineering Ltd was appointed by Sainsbury's to carry out a Flood Risk Assessment for the proposed re-development of the LEC Site, an industrial site of approximately 4.8 hectares in Bognor Regis.

1.2 Brief

This Flood Risk Assessment is prepared in accordance with the requirements of Planning Policy Statement (PPS) 25: 'Development and Flood Risk', published by the Department of Communities and Local Government in 2006 as a part of the Government's overall approach to managing future flood risks.

PPS 25 obliges Local Planning Authorities to consult with the Environment Agency on all applications for development in areas of flood risk or where critical drainage problems exist, other than minor development, and for development of sites of more than 1ha elsewhere.

PPS 25 sets out the framework for planning decisions made by the local, regional and national government and the Environment Agency. In order that planning authorities can make informed decisions on the development of sites in areas at risk of flood, PPS 25 requires the developer to carry out an assessment of flood risk. This report addresses the requirements given in PPS 25, and other issues which are deemed relevant to flood risk.

2.0 EXISTING SITE

2.1 Location

The proposed development site is located adjacent to the A29 Shripney Road on the north-eastern fringes of Bognor Regis, as shown by the location plan in Appendix A of this report. The site is bordered to the south by the Aldingbourne Rife and a new development of business/trade counter units. Approximately 100 metres east of the site the Aldingbourne Rife combines with the Lidsey Rife, and then flows southwards to the English Channel. The site is bordered to the west by the A29 Shripney Road, to the north by greenfield land, and to the east by railway lines, with open land including a private airstrip and the Bognor Regis Golf Club beyond.

2.2 Current Land Use

The proposed development site has until recently been industrial land, occupied by LEC Refrigeration for the last 50 years. The site consists of a number of large disused industrial buildings and offices, generally separated by impermeable hard standings. As such, the site is approximately 98% impermeable, with only minor landscaped strips, as shown by the aerial photograph in Appendix A.

2.3 Topography

The topographic survey in Appendix C shows that the site generally slopes from north to south, towards the Aldingbourne Rife. The levels at the north of the site are approximately at 2.30m AOD, and the site falls at a gradient of approximately 1:500 to levels of around 1.50m AOD at the southern end of the main buildings.

2.4 Existing Drainage Infrastructure

Public sewer records have been obtained from Southern Water for the immediate vicinity of the development site. These show both surface water and foul water sewers running parallel to the western edge of the site, under the A29 Shripney Road (Appendix F).

The plans show a 675mm diameter surface water sewer running southwards down Shripney Road, that appears to discharge into the Aldingbourne Rife immediately to the south-west of the site.

The current site drainage layout is shown in Appendix F. A small area at the south-east of the site discharges to the Aldingbourne Rife. The remainder of the site drains to the east through two outfalls under the railway line and then by open ditches to the Lidsey Rife.



3.0 PROPOSED DEVELOPMENT

3.1 Development Description

The southern site is to be developed as a supermarket with associated car parking. A petrol filling station is also to be located within the site. A plan showing the proposed development is included in Appendix D. The remaining development will be retained for commercial development.

3.2 Development Drainage Infrastructure

The surface water from the site discharges to the Aldingbourne Rife and Lidsey Rife. PPS 25 states that rates of discharge of surface water from developments should be based on existing values, but that a reduction in discharge is desirable where achievable. Similarly, if the site discharges via the public surface water sewer network, Southern Water are likely to restrict discharges to a rate less than or equal to the existing site run-off. Further information is given in Section 5 of this report.

4.0 FLOOD RISK TO THE DEVELOPMENT

4.1 Data Collection

Data on flood risk was obtained from the following sources:

- Environment Agency and
- Arun SFRA

The flood map for the area was obtained from the Environment Agency website. This information is included in Appendix B. This suggests that the site is entirely situated within Flood Zone 3 (High Risk). This zone comprises land defined in PPS 25 as “having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.”

To clarify the risk with regard to flooding from rivers and flooding from the sea further discussions were held with the Environment Agency. These discussions are summarised in the relevant section below with further information in Appendix E.

The Arun SFRA was published in February 2007 this covers the site in Bognor Regis. This SFRA has investigated different sources of flooding including flooding from rivers and flooding from the sea.

4.2 Flooding from the Sea

The Environment Agency flood map shows that the site is within tidal Flood Zone 3. The Environment Agency advised that the site was defended however under a breach scenario the appropriate flood level was around 3.5m AOD.

The Arun SFRA does not show the site as being at risk from flooding from the sea on the Actual Flood Risk map (Map A1-T - taking into account defences) showing that the defences in this area defend the site against a flood event of 1 in 200 years (0.5%). There is however still a risk of flooding from the sea should these defences be overtopped or breach in an extreme event.

The site is therefore considered to be in tidal Flood Zone 3a high risk (defended).

4.3 Flooding from Rivers

The Environment Agency advised that a level of 1.9m AOD can be applied in this area as the level of the 1 in 100 year fluvial flood event, including for climate change.

The levels at the north of the proposed developable site (Sainsbury's boundary line) are approximately at 2.30m AOD, and the site falls at a gradient of approximately 1:500 to levels of around 1.80m AOD at the southern end of the main buildings. Therefore using the information provided by the Environment Agency it can be concluded that some of the site is at risk of flooding in a 1 in 100 year event.

Due to the levels on the southern end of the site and on the road the site is not likely to flood in the 1 in 20 year event and therefore none of the site is classed as Flood Zone 3b, functional flood plain.

The Arun SFRA shows the site to be low risk of fluvial flooding. Discussions with the Environment Agency confirmed that the Arun SFRA is a broad scale assessment and as such may not be the most appropriate data for the site in question. Therefore the flood level provided by the Environment Agency is used to assess flood risk on the site.



The lower part of the site is therefore considered to be in Flood Zone 3a high risk. The higher part of the site is considered to be in Flood Zone 2 medium risk. These flood zones are shown in Appendix G.



4.4 Development Vulnerability

As outlined previously, the development proposals will consist of retail / commercial components. The development is therefore categorised as “less vulnerable” in accordance with PPS 25.

4.5 Sequential Test

The sequential test has been carried out by WYG Planning, investigating other potential sites for the development. The methodology for applying the sequential test was agreed with Arun District Council.

Alternative sites for the development were investigated and it was concluded that there are no suitable and available alternative sites for the proposed Sainsbury's development.

A copy of the Sequential Test is included in Appendix H of this report.

As the proposed development is “less vulnerable” the exception test does not apply to this development.

The Sime Darby land (Blue Boundary line) and its submitted proposals suggest a continuation of employment development on an existing employment site and therefore a Sequential Test report is not necessary for this part of the development.

4.6 Mitigation

The preferred basic method of protection would be to ensure that finished floor levels should be a minimum of 300mm above the predicted design flood level (i.e 2.20m AOD or above).

External escape routes should also be provided at this level.

Where this is not possible, secondary protection could be provided in the form of bunds or flood walls. Where practical flood gates should be avoided and access provided by ramps over the defence.

There should be no net loss of flood plain storage. Where ground levels within the high risk area are raised compensatory storage should be provided. This should be at the southern end of the site so that the compensatory storage is connected to the Aldingbourne Rife.

Notwithstanding the above, all units will remain at some risk of tidal flooding and flood resistant/resilient construction should be adopted, with particular reference to the choice of materials for the ground floor and installation of electrical equipment at high level.

All occupants of the site should be encouraged to join the Environment Agency's flood warning scheme.



5.0 MANAGING SURFACE WATER

WYG Engineering was commissioned to undertake a drainage assessment for the site. The conclusions of this assessment are as follows:

The results of the initial study suggest that there are readily available points of connection for surface water discharge.

The existing network on the site is unlikely to be in a suitable either in terms of hydraulic capability or condition for use as the proposed drainage network. The existing “spurs” and outfalls to the watercourses should be retained if possible to avoid any consents and applications being made to the E.A.

The existing network on the site does not appear to comply with adopting authority requirements.

The current run-off discharge rate would probably be reduced to 80%. Consequently on site storage will be required for the proposed development.

Early negotiations with Environment Agency should be undertaken to secure and agree discharge rates and points of connection.

The EA consultation response will probably recommend that the conditions outlined are incorporated in any planning permission granted.

The E.A may require a provision of an easement strip in order to be able to undertake maintenance to Aldingbourne Rife.

Pollution control measures need to be implemented in the final drainage design to avoid any contamination to the Aldingbourne Rife.

Existing groundwater issues should be taken into consideration when full design is implemented.

The proposed layout should be flexible enough to provide relatively level areas where surface water can be attenuated.

Replacement of impermeable areas with vegetated self drained areas could be used to minimise run off.



6.0 CONCLUSIONS

A retail development is proposed for the southern area of former LEC site in Bognor Regis. The northern area will be developed for commercial use. As a commercial use this development would be classed as “less vulnerable” development in line with PPS 25.

The site is located in PPS 25 Flood Zone 3, high risk, according to the Environment Agency’s Indicative Flood Zones Maps. Further investigation has shown that flood risk at the site is actually as follows:

- 1) Risk of flooding from the sea – The site is defended against the 1 in 200 year event. A more extreme event or a breach in the defences could however flood the site. The site should be considered to be in flood zone 3a (defended). The Environment Agency has given the level as 3.5mAOD as a flood level should the defence’s breach.
- 2) Risk of flooding from rivers – The Environment Agency have advised that the 1 in 100 year flood level is 1.9m AOD and therefore the lower parts of the site are considered to be in fluvial Flood Zone 3a while the higher parts of the site (above 1.9mAOD) are considered to be in fluvial Flood Zone 2.

As some of the site is shown as within Flood Zone 3 the sequential test has been carried out by WYG Planning. The methodology for this was agreed with Arun District Council. The conclusion is that there are no suitable and available alternative sites for the proposed retail development.

Development within the site must take account of the residual risk and provide appropriate mitigation to ensure that the development is safe, without increasing flood risk elsewhere and where possible reduce flood risk overall.

The preferred basic method of protection would be to ensure that finished floor levels should be a minimum of 300mm above the predicted design flood level (i.e 2.20m AOD or above).

There should be no net loss of flood plain storage. Where ground levels within the high risk area are raised compensatory storage should be provided. This should be at the southern end of the site so that the compensatory storage is connected to the Aldingbourne Rife.

All occupiers to be encouraged to join the Environment Agency’s Flood Warning Scheme.

Surface water management has been addressed in the drainage assessment carried out for the site.

APPENDIX A

Location Plan



NOTES :

1. DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS
2. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE

LEGEND:

- SAINSBURYS BOUNDARY
- SIME DARBY BOUNDARY
- GREEN TOPPER AREA BOUNDARY

REPORT ISSUE

04	BOUNDARY UPDATED	NM	LF	08.12.2008
03	BOUNDARY UPDATED	NM	LF	01.12.2008
02	BOUNDARIES UPDATED	NM	LF	26.11.2008
01	REPORT ISSUE	DB	KD	24.10.2008
REV	DESCRIPTION	BY	CHK APP	DATE

12, ST. ANDREWS CRESCENT
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e-mail: cardiff@wyg.com

Project:
RE-DEVELOPMENT OF FORMER LEC SITE,
BOGNOR REGIS

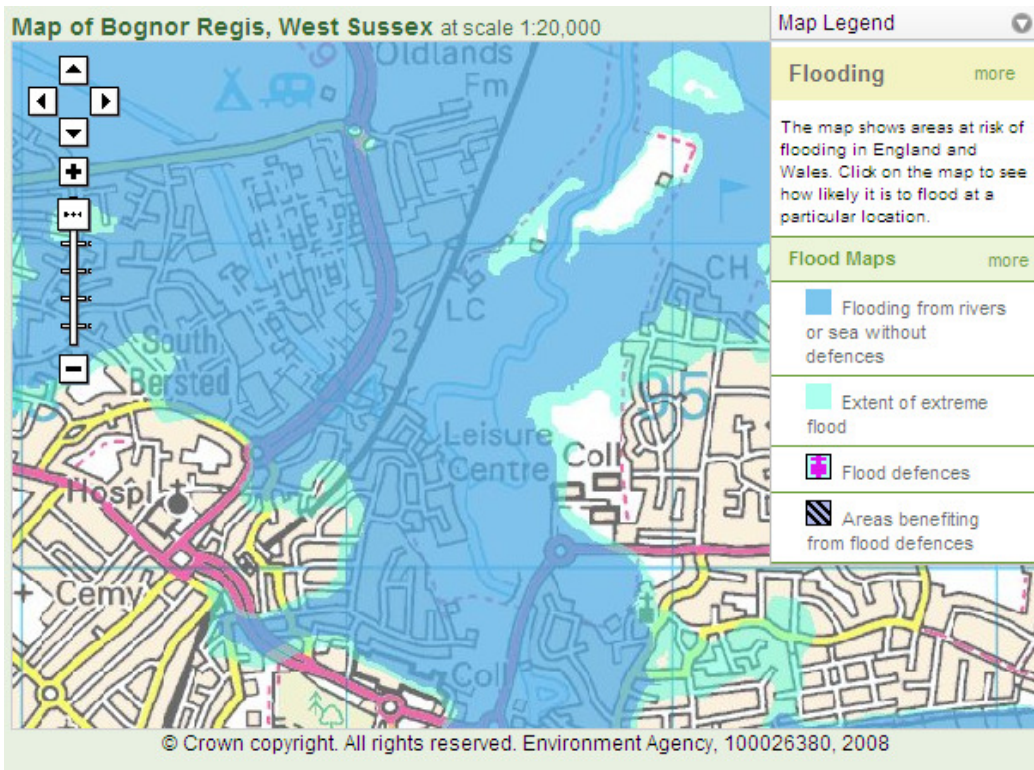
Drawing Title:

SITE LOCATION PLAN

Scale	N.T.S	Drawn	Date	Checked	Date	Approved	Date
		DB	24.10.2008	KD	24.10.2008	-	-
Project No.	A050949	Office	34	Type	01	Drawing No.	FIG_1
							04
Revision							

APPENDIX B

Environment Agency's Flood Map



APPENDIX C

Topographic Survey of the Development Site



NOTES :

1. DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS
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LEGEND:

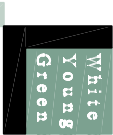
- SAINSBURY'S BOUNDARY
- SIME DARBY BOUNDARY

REPORT ISSUE

03	BOUNDARY UPDATED	NM	LF	LF	01.12.08
02	BOUNDARIES UPDATED	NM	LF	LF	26.11.08
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Project:
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BOGNOR REGIS

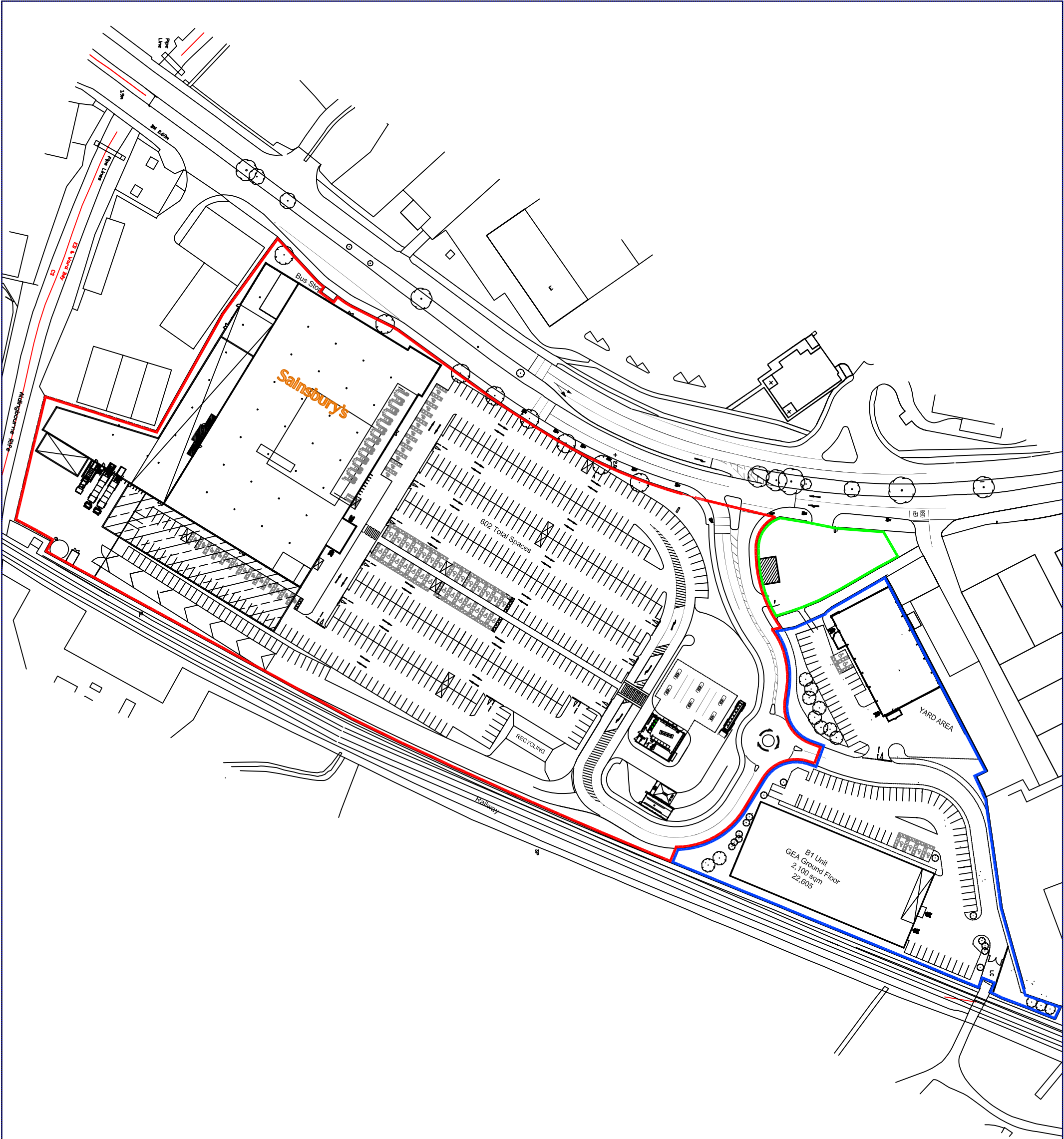
Drawing Title:

TOPOGRAPHICAL SURVEY

Scale	Drawn	Date	Checked	Date	Approved	Date
N.T.S	DB	24.10.2008	KD	24.10.2008	-	-
Project No.	Office	Type	Drawing No.	Revision		
A050949	34	01	FIG_2	03		

APPENDIX D

Development Proposals



NOTES :

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LEGEND:

- SAINSBURYS BOUNDARY
- SIME DARBY BOUNDARY
- GREEN TOPPER AREA BOUNDARY

REPORT ISSUE

04	SIME DARBY LAYOUT ADDED	NM	LF	LF	04.12.08
03	BOUNDARY UPDATED	NM	LF	LF	01.12.08
02	BOUNDARIES UPDATED	NM	LF	LF	26.11.08
01	REPORT ISSUE	DB	KD	-	24.10.2008
REV	DESCRIPTION	BY	CHK	APP	DATE

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Drawing Title:

DEVELOPMENT PROPOSALS

Scale	N.T.S	Drawn	Date	Checked	Date	Approved	Date
Project No.	DB	24.10.2008	Office Type	KD	24.10.2008	-	-
A050949	34	01	FIG_4	04	Revision	04	04

APPENDIX E

Notes on Discussions with Environment Agency

Minutes of *Meeting*



White
Young
Green

Project Number: A050959

Title: Bognor Regis – Former LEC Site

Name Of Meeting: Environment Agency Meeting

Meeting Held At: EA Office Worthing

Date And Time: 3rd October 2008, 10:00

Minutes Taken By: Kate Darlington

Attendees: Keeley Mowatt – Environment Agency
Phil Hailey – Environment Agency
Leigh Fotiadass – White Young Green
Kate Darlington - White Young Green
Andy Traves - Opus

Apologies:

Distribution:

Date Of Next Meeting:

Date Of Issue:

File Reference: A050959/4/1



Office address to be inserted here

■ Tel:

■ Fax:

■ Email: enquiries@wyg.com

■ Website: www.wyg.com

Item	Action
WYG outlined the site and the relationship between the various parties. White Young Green are acting for Sainsburys who are looking to buy the site and will in time submit a planning application for the site. Opus are acting for Sime Derby who are selling the site. WYG tabled the plan from the FRA produced for Sime Derby showing the different designations of flood plain. An extract from the Arun SFRA was also tabled for discussion. Further investigation is required to establish if it is valid to class an area of the site as functional flood plain when it is uncertain as to how flood water would enter the area. A proposal for using the service yard as a compensatory storage area was tabled. The EA suggested that pollution of the watercourse may be an issue if this method of creating compensatory storage is adopted. The EA suggested that the SFRA should be examined in more detail. The EA queried whether the sequential test had been carried out for the site. WYG stated that it had not as yet but the SFRA should provide useful information for carrying this out. WYG explained surface water strategy. As the site is brownfield it was proposed that brownfield runoff rates were used. There was discussion of SUDS although the EA acknowledged that factors such as high water table and contamination may mean that SUDS are not practical for the site. Andy Traves outlined that his Client would be interested in ensuring that drainage on the retained site would remain functional. This is something that Sainsbury's would have to agree to and it is not a compulsory requirement. E.A has requested to provide an 8m easement from the bank of the Rife. E.A has requested to look at the possibility for Rainwater Harvesting system. This was dismissed by WYG on the basis that the capital cost is far greater than the benefit of the use of recycling water as there is no sufficient demand for the recycled water. E.A have requested that evacuation procedures need to be outlined and incorporated into the F.R.A	

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Kate

As identified in your email I confirm that the fluvial flood level that we have used for new developments adjacent to the Aldingbourne Rife in Bognor is 1.9mAOD. This is the modelled 1 in 100 year fluvial flood including an allowance for climate change over the next 100 years.

I also agree with your comments in relation to the SFRA and CFMP.

Regards

Phil Hailey
Development Control Technical Specialist

From: kate.darlington [mailto:kate.darlington@wyg.com]

Sent: 24 October 2008 14:45

To: Hailey, Phil

Subject: Bognor Regis - Aldingbourne Rife

Click [here](#) to report this email as spam.

Phil,

Further to our conversation I write to confirm the most appropriate flood data to use for the FRA for the Sainsbury's site adjacent to the Aldingbourne Rife in Bognor Regis.

You quoted a flood level of 1.9m AOD which is the 1 in 100 year plus climate change level. We understand that this level has been derived from previous modelling and has been the accepted flood level for some time.

The levels on the site are a minimum of 1.7m AOD adjacent to the Aldingbourne Rife and therefore we believe that the site would not be classed as functional flood plain.

As we discussed there is other information available for the area such as the Arun SFRA. However in this case studies such as the SFRA and CFMP are catchment wide and not as appropriate for this site.

I would be grateful if you could confirm the above flood level / logic by reply to this email.

Regards

Kate Darlington
Senior Engineer

WYG ENGINEERING LTD

12 St. Andrews Crescent, Cardiff, CF10 3DD

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📠 +44 (0)29 20727649

🌐 www.wyg.com

WYG Engineering Ltd. Registered in England number: 1959704. Registered Office: Arndale Court, Otley Road, Headingley, Leeds, West Yorkshire LS6 2UJ
VAT No: 431-0326-08

Winner NCE Major Consultant of the Year 2008

Winner ACEI Innovation Award 2008

Winner Sustainable City Award for Sustainable Building 2008

Winner British Expertise Open Award for Sustainability 2007/08

Winner APM Award for Programme of the Year 2007

30/10/2008

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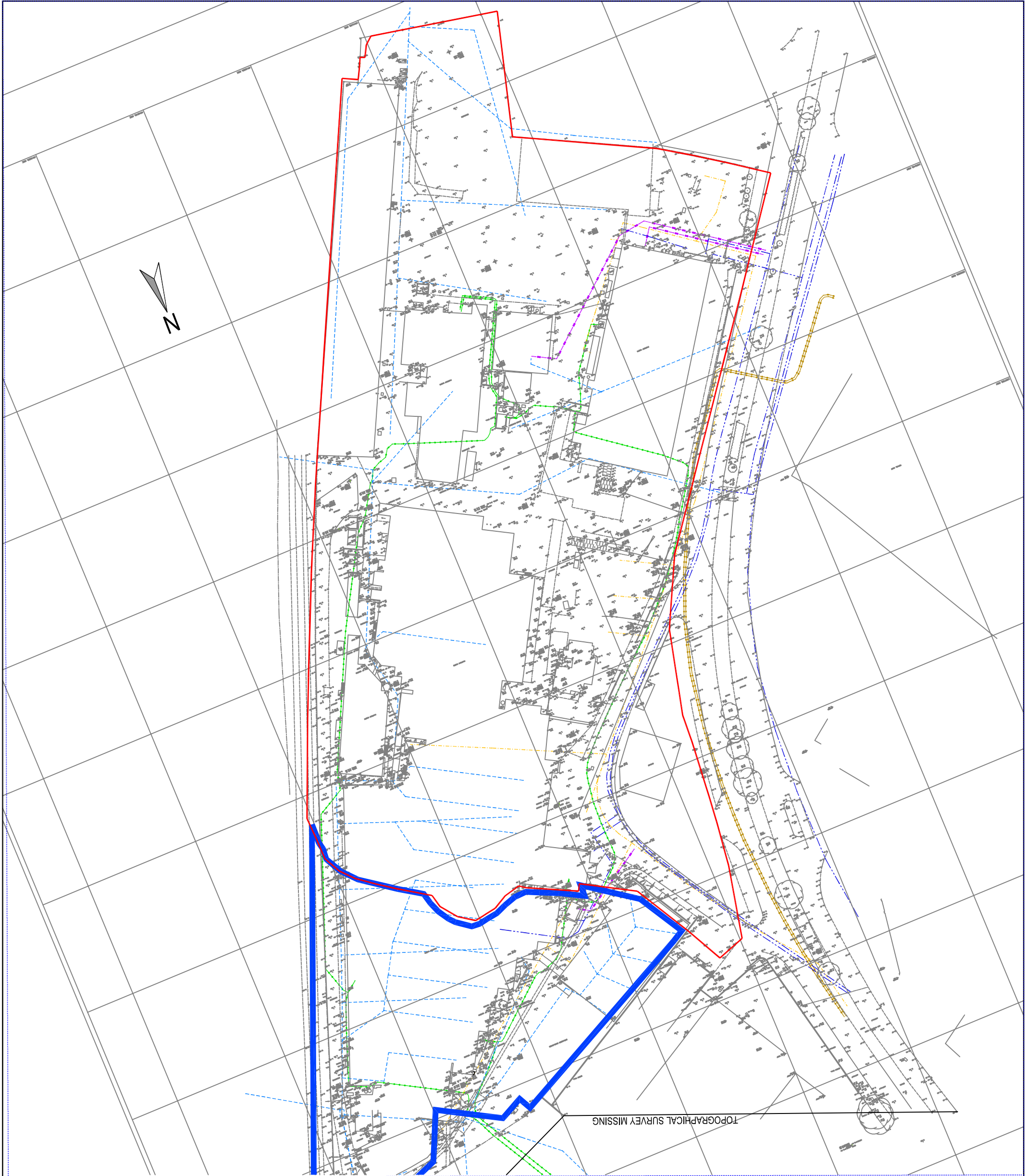
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APPENDIX F

Existing Drainage Plan



NOTES :

1. DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS
2. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE

LEGEND:

— SAINSBURY'S BOUNDARY
— SIME DARBY BOUNDARY

EXISTING SERVICES KEY

--- ELECTRICAL CABLES
--- WATER PIPELINE
--- FOUL WATER
--- SURFACE WATER
--- GAS PIPELINE

REPORT ISSUE

03	BOUNDARY UPDATED	NM	LF	LF	01.12.08
02	BOUNDARIES AMENDED	NM	LF	LF	26.11.08
01	REPORT ISSUE	DB	KD	-	24.10.2008
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Project:
RE-DEVELOPMENT OF FORMER LEC SITE,
BOGNOR REGIS

Drawing Title:

EXISTING SERVICES

Scale	Drawn	Date	Checked	Date	Approved	Date
1:1250	DB	24.10.2008	KD	24.10.2008	-	-
Project No.	Office	Type	Drawing No.	Revision		
A050949	34	01	FIG_3	03		

APPENDIX G

Flood Zone Identification



NOTES :

1. DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS
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LEGEND:

- SAINSBURY'S BOUNDARY
- SIME DARBY BOUNDARY
- FLUVIAL FLOOD ZONE 3A HIGH RISK (DEFENDED)
- TIDAL FLOOD ZONE 3A HIGH RISK (DEFENDED)
- FLUVIAL FLOOD ZONE 2 LOW - MEDIUM RISK
- TIDAL FLOOD ZONE 3A HIGH RISK (DEFENDED)

REPORT ISSUE

03	BOUNDARY UPDATED	NM	LF	LF	01.12.2008
02	BOUNDARIES UPDATED	NM	LF	LF	26.11.08
01	REPORT ISSUE	DB	KD	-	24.10.2008
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Drawing Title:

EXTENT OF FLOOD ZONES

Scale	Drawn	Date	Checked	Date	Approved	Date
N.T.S	DB	24.10.2008	KD	24.10.2008	-	-
Project No.	Office	Type	Drawing No.	Revision		
A050949	34	01	FIG_5	03		

APPENDIX H

Sequential Test



FLOOD RISK SEQUENTIAL TEST

**LEC SITE, SHRIPNEY ROAD, BOGNOR
REGIS**

SAINSBURY'S SUPERMARKETS LTD

OCTOBER 2008



CONTENTS

1.0	INTRODUCTION
2.0	FLOOD RISK SEQUENTIAL TEST METHODOLOGY
3.0	THE APPLICATION SITE
4.0	ALTERNATIVE SITE CRITERIA
5.0	SEQUENTIAL SITE ANALYSIS AND CONCLUSIONS
6.0	APPENDICES



1.0 INTRODUCTION

- 1.1 This Flood Risk Sequential Test (FRST) has been prepared in support of a planning application on behalf of Sainsbury's Supermarkets Ltd for the erection of a new Class A1 supermarket on land identified as the Lec Refrigeration site, Shripney Road, Bognor Regis.
- 1.2 The site falls within flood zone 3a due to its coastal location and subsequent risk of flooding from the sea (see map in **Appendix A**), and as such the application requires a supporting Flood Risk Sequential Test (FRST) due to guidelines set out in Planning Policy Statement (PPS) 25 – Development and Flood Risk.
- 1.3 A supporting Flood Risk Assessment is also required, and has been produced by WYG.



2.0 FLOOD RISK SEQUENTIAL TEST METHODOLOGY

- 2.1 At the outset it is useful to note that there are a number of parameters in place that set the context of this FRST. These parameters centre on the nature of the proposal, as a large A1 retail store on a brown field site.
- 2.2 Government guidance contained within PPS25, and the associated Practice Guide (June 2008), informs that developers should examine the potential to locate their schemes on allocated sites within the lower flood risk zones, in this case Flood Zones 1 and 2.
- 2.3 In February 2008 Arun District Council published a Strategic Flood Risk Assessment (SFRA) to inform their district wide Local Development Framework. In keeping with Government guidance contained within PPS25, the SFRA will provide the basis from which to apply the Sequential Test.
- 2.4 Following discussions with Arun District Council Development Control Department, White Young Green Planning (WYG) agreed on the methodology behind the FRST.
- 2.5 It was agreed that WYG would examine all potential town and edge of centre sites in Bognor Regis that were preferable from a flood risk perspective (i.e. located in lower risk flood zones than the application site). It is noted that the sites are consistent with those considered by Drivers Jonas in their Retail Assessment for the Asda application and have been agreed to by the Council's planning department as the only potentially available (though not currently vacant) sites.
- 2.6 Consequently the alternative sites assessment contained within **Appendix B** examines 7 alternative sites located around the whole district.



3.0 THE APPLICATION SITE

3.1.1 In order to determine whether any of the identified sites are suitable alternatives for the proposed development, it is important to examine the specifics of the application site and understand the constraints on the application.

3.1.2 The application site is located in an out-of-centre location, approximately 1 mile from Bognor Regis town centre. It comprises approximately 4.3 ha in area and largely consists of vacant industrial land and buildings. The site is situated amongst a variety of surrounding uses including retail and trade uses, leisure facilities and residential properties.

3.1.3 The proposed development comprises:

- The construction of a new 8806 sqm gross (94,787 sqft) supermarket;
- Ancillary supermarket parking of 675 vehicles, including XX disabled spaces and XX parent and toddler spaces;
- The construction of a X pump island petrol filling station;
- Relocated car dealership (Green Topper); and
- Associated highways works to improve accessibility of the A29 to the site.

3.3 The current application proposes development on a brownfield site, which is currently predominantly occupied by a number of vacant industrial buildings. The scheme therefore utilises previously developed land without encroaching onto the open space, and brings into use an area of land that has been largely disused since LEC vacated the site in 2004. Consequently there are significant benefits in this site over a greenfield site, and other sites which are currently in beneficial use.



4.0 ALTERNATIVE SITE CRITERIA

- 4.1 The identified alternative allocated sites need to be assessed for suitability for a scheme equivalent to that proposed at the Lec Refrigeration site. For the purposes of this exercise, the assessment of alternative sites will be based on the following criteria:

Fundamental Criteria:

- 4.2 ***Accommodate 8,806 sqm (gross) of new A1 Retail floorspace*** – As outlined in the Retail Assessment prepared by WYG that accompanies this planning application, it is clear that there is demonstrable quantitative and qualitative need for the provision of an additional foodstore in Bognor Regis. The proposed scheme will ‘claw back’ leaked expenditure from the Study Area. It will introduce sufficient choice and competition within the local market, increasing the ability of Bognor Regis to satisfy the modern aspirations and needs of local consumers in terms of convenience.
- 4.3 ***Accommodate a petrol filling station*** – The proposal includes the provision of a petrol filling station, which will compliment the overall scheme.
- 4.4 ***Accommodate ancillary supermarket parking for 675 vehicles and have adequate transport infrastructure in place to cope with increased traffic flows*** – In order to ensure ease of accessibility 675 car parking spaces are proposed, which will include disabled spaces and parent and toddler spaces. The existing surrounding road network should be able accommodate the increased levels of traffic associated with such a scale of retail development. A flexible approach will be taken that will consider whether a decked car park could achieve this aim.
- 4.5 ***Be allocated / deemed suitable for retail development*** – In July 2008 Cabinet supported and endorsed the contents of a Development Brief for the Lec Refrigeration



site. This Development Brief outlines three development options for the site, two of which include scope for a new retail food store / supermarket.

Additional Criteria:

- 4.4 ***Secures the future of a currently underutilised site*** – The Lec Refrigeration site is currently not being fully utilised but accommodates a number of vacant industrial units. This represents a wasted opportunity in land use terms. The proposed scheme will fully utilise this site and bring it into beneficial use.
- 4.5 ***Reuse previously developed brownfield land*** – A development on this site provides the opportunity to reuse this land, thus protecting the district's green field land.
- 4.7 ***Be deliverable in a reasonable timescale*** – The Lec Refrigeration site is vacant and available, and development can, in theory, begin once consent is granted.

5.0 SEQUENTIAL SITE ANALYSIS AND CONCLUSIONS

5.1 WYG has assessed all the identified alternative sites, and the detailed analysis of each individual site is contained within **Appendix B**. The table below summarises the reasons for each site being disregarded.

Site Reference Number and name	Reason Site was Disregarded			
	Unable to accommodate development of such a scale	Alternative form of development proposed on site / Not allocated for retail use	Existing surrounding road network incapable of accommodating and coping with the increased traffic flows	Undeliverable within a reasonable timescale
1. Hothampton site	✓		✓	
2. The Regis Centre	✓			✓
3. W Jones Garages	✓	✓		✓
4. Land adjoining the railway station (Covers)	✓	✓	✓	✓
5. Morrison's car park	✓			✓
6. Sudley Street car park	✓			
7. Builders Yard, London Road	✓			



- 5.2 When assessing each individual site, we looked at both the fundamental and additional criteria set out in the previous chapter.
- 5.2 WYG concludes that there are no suitable and available alternative sites for the proposed Sainsbury's development.
- 5.3 Although the identified sites are not suitable for the proposed development, they may be suitable for other forms of development at a substantially different scale.

6.0 APPENDICES

APPENDIX A – EXTRACT FROM SFRA MAP F1-T – TIDAL FLOOD ZONE EXTENTS

APPENDIX B – DETAILED ALTERNATIVE SITES ASSESSMENT

APPENDIX C

Microdrainage, Surface Water Drainage Calculations

Gary Gabriel Associates		Page 0							
Becket House Vestry Road Kent TN14 5EL	SSL BOGNOR REGIS SURFACE WATER DRAINAGE 100 YR STORM + CC								
Date 18th MAY 2012 File 28506 - SW DESIG...	Designed by MRW - REV C Checked by								
Micro Drainage Network W.12.6.1									
<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u>									
* - Indicates pipe has been modified outside of System 1									
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	
* 1.000	11.354	0.057	199.2	0.279	5.00	0.600	o	375	
* 1.001	16.365	0.065	251.8	0.097	0.00	0.600	o	450	
* 2.000	20.797	0.083	250.6	0.103	5.00	0.600	o	300	
* 1.002	16.468	0.066	249.5	0.000	0.00	0.600	o	450	
* 3.000	8.569	0.024	357.0	0.297	5.00	0.600	o	375	
* 1.003	29.760	0.119	250.1	0.072	0.00	0.600	o	450	
* 4.000	5.000	0.020	250.0	0.210	5.00	0.600	o	300	
* 1.004	53.016	0.212	250.1	0.041	0.00	0.600	o	450	
* 1.005	77.292	0.309	250.1	0.046	0.00	0.600	o	450	
* 5.000	32.000	0.107	299.1	0.112	5.00	0.600	o	225	
5.001	90.000	0.300	300.0	0.000	0.00	0.600	o	225	
6.000	90.000	0.600	150.0	0.052	5.00	0.600	o	225	
7.000	9.871	0.025	394.8	0.368	5.00	0.600	o	300	
PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
* 1.000	S12.1	2.000	1.153	0.472	2.000	1.096	0.529		1800
* 1.001	S12	2.000	1.021	0.529	2.000	0.956	0.594		1800
* 2.000	S11.1	2.000	1.189	0.511	2.000	1.106	0.594		1800
* 1.002	S11	2.000	0.956	0.594	2.000	0.890	0.660		1800
* 3.000	S10.1	2.000	0.989	0.636	2.000	0.965	0.660		1800
* 1.003	S10	2.000	0.890	0.660	2.000	0.771	0.779		1800
* 4.000	S9.1	2.000	0.941	0.759	2.000	0.921	0.779		1800
* 1.004	S9	2.000	0.771	0.779	2.000	0.559	0.991		1800
* 1.005	S8	2.000	0.559	0.991	1.750	0.250	1.050		1800
* 5.000	S7	2.150	0.894	1.031	2.050	0.787	1.038		1200
5.001	S6	2.050	0.680	1.145	1.820	0.380	1.215		1200
6.000	S5	2.330	0.980	1.125	1.820	0.380	1.215		1200
7.000	Syphon Drop	2.100	1.300	0.500	2.200	1.275	0.625		300
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Becket House			SSL BOGNOR REGIS								
Vestry Road			SURFACE WATER DRAINAGE								
Kent TN14 5EL			100 YR STORM + CC								
Date 18th MAY 2012			Designed by MRW - REV C								
File 28506 - SW DESIG...			Checked by								
Micro Drainage						Network W.12.6.1					
<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u>											
	PN	Length	Fall	Slope	I.Area	T.E.	k	HYD	DIA		
		(m)	(m)	(1:X)	(ha)	(mins)	(mm)	SECT	(mm)		
		7.001	6.250	0.025	250.0	0.000	0.00	0.600	o	375	
*		7.002	6.250	0.025	250.0	0.000	0.00	0.600	o	375	
		7.003	47.048	0.110	427.7	0.000	0.00	0.600	o	450	
		8.000	2.864	0.025	114.6	0.364	5.00	0.600	o	300	
		8.001	17.995	0.076	236.8	0.000	0.00	0.600	o	375	
*		7.004	36.000	0.085	423.5	0.000	0.00	0.600	o	450	
*		9.000	56.750	0.000	0.0	0.076	5.00	0.600	o	225	
*		9.001	9.550	0.000	0.0	0.011	0.00	0.600	o	350	
		10.000	50.700	0.000	0.0	0.145	5.00	0.600	o	350	
*		10.001	24.399	0.125	195.2	0.000	0.00	0.600	o	375	
*		10.002	32.201	0.000	0.0	0.047	0.00	0.600	o	51	
*		9.002	15.214	0.100	152.1	0.000	0.00	0.600	o	450	
		9.003	15.680	0.000	0.0	0.106	0.00	0.600	o	51	
		11.000	48.067	0.000	0.0	0.209	5.00	0.600	o	350	
		12.000	14.097	0.000	0.0	0.038	5.00	0.600	o	225	
		12.001	3.982	0.000	0.0	0.000	0.00	0.600	o	225	
PN	US/MH	US/CL	US/IL	US	DS/CL	DS/IL	DS	Ctrl	US/MH		
	Name	(m)	(m)	C.Depth	(m)	(m)	C.Depth	(m)	(mm)		
	7.001	SB2	2.200	0.700	1.125	2.080	0.675	1.030		1800	
*	7.002	RHU	2.080	0.675	1.030	2.080	0.650	1.055	6000 x	2400	
	7.003	S4	2.080	0.575	1.055	2.080	0.465	1.165		1200	
	8.000	Syphon Drop	2.200	1.600	0.300	2.200	1.575	0.325		300	
	8.001	SB1	2.200	1.000	0.825	2.080	0.924	0.781		1800	
*	7.004	S3	2.080	0.465	1.165	1.820	0.380	0.990		1800	
*	9.000	AP	2.000	1.590	0.185	2.000	1.590	0.185		225	
*	9.001	Step	2.000	1.465	0.185	2.000	1.465	0.185		350	
	10.000	AP	1.900	1.250	0.300	1.900	1.250	0.300		350	
*	10.001	Outlet	1.900	1.225	0.300	2.000	1.100	0.525		375	
*	10.002	Inlet	2.000	1.100	0.367	2.000	1.100	0.367	600 x	600	
*	9.002	Inlet / Outlet	2.000	1.100	0.450	1.700	1.000	0.250	600 x	600	

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Micro Drainage						Network W.12.6.1				
<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u>										
	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	
	12.002	15.250	0.000	0.0	0.040	0.00	0.600	o	225	
	11.001	32.376	0.100	323.8	0.000	0.00	0.600	o	375	
	13.000	27.677	0.000	0.0	0.179	5.00	0.600	o	350	
	11.002	31.328	0.000	0.0	0.108	0.00	0.600	o	51	
	* 14.000	22.269	0.000	0.0	0.037	5.00	0.600	o	225	
	* 15.000	52.422	0.000	0.0	0.040	5.00	0.600	o	225	
	* 14.001	27.225	0.210	129.6	0.000	0.00	0.600	o	225	
	* 16.000	10.994	0.000	0.0	0.213	5.00	0.600	o	350	
	* 17.000	55.542	0.000	0.0	0.247	5.00	0.600	o	51	
	* 14.002	39.394	0.110	358.1	0.000	0.00	0.600	o	375	
	* 9.004	4.627	0.010	462.7	0.000	0.00	0.600	o	600	
	9.005	5.627	0.100	56.3	0.000	0.00	0.600	o	600	
	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
	12.002	AP	1.700	1.290	0.185	1.700	1.290	0.185		225
	11.001	Inlet / Outlet	1.700	1.140	0.185	1.700	1.040	0.285		600 x 600
	13.000	AP	1.700	1.165	0.185	1.700	1.165	0.185		350
	11.002	Step	1.700	0.892	0.275	1.700	0.892	0.275		600 x 600
	* 14.000	AP	1.870	1.460	0.185	1.870	1.460	0.185		225
	* 15.000	AP	1.870	1.460	0.185	1.870	1.460	0.185		225
	* 14.001	Inlet / Outlet B	1.870	0.860	0.785	1.650	0.650	0.775		1200
	* 16.000	AP	1.650	1.115	0.185	1.650	1.115	0.185		350
	* 17.000	AP	1.650	1.115	0.002	1.650	1.115	0.002		600 x 600
	* 14.002	Inlet / Outlet A	1.650	0.630	0.645	1.700	0.520	0.805		1200
	* 9.004	Inlet / Outlet	1.700	0.500	0.600	1.800	0.490	0.710		1325
	9.005	Separator	1.800	0.490	0.710	1.820	0.390	0.830		1875 x 5070
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Micro Drainage			Network W.12.6.1							
<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u>										
	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	
	* 5.002	18.000	0.050	360.0	0.000	0.00	0.600	oo	-1	
	* 5.003	18.000	0.050	360.0	0.000	0.00	0.600	oo	-1	
	* 1.006	11.000	0.000	0.0	0.000	0.00	0.600	o	450	
	* 18.000	21.629	0.090	240.3	0.063	5.00	0.600	o	225	
	* 19.000	13.881	0.160	86.8	0.143	5.00	0.600	o	225	
	20.000	73.998	0.550	134.5	0.109	5.00	0.600	o	225	
	20.001	5.815	0.550	10.6	0.000	0.00	0.600	o	225	
	21.000	19.535	0.110	177.6	0.054	5.00	0.600	o	150	
	21.001	80.000	0.755	106.0	0.000	0.00	0.600	o	150	
	* 20.002	32.722	0.220	148.7	0.000	0.00	0.600	o	300	
	* 18.001	2.541	0.030	84.7	0.000	0.00	0.600	o	300	
	* 18.002	2.788	0.030	92.9	0.000	0.00	0.600	o	300	
	* 18.003	125.879	-1.170	-107.6	0.000	0.00	0.600	o	100	
	1.007	15.698	0.150	104.7	0.000	0.00	0.600	O	53	
PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)	
* 5.002	S2	1.820	0.380	0.990	1.780	0.330	1.000		1800	
* 5.003	SDS Tank	1.780	0.330	1.000	1.750	0.280	1.020		1800	
* 1.006	S1A	1.750	0.280	1.020	1.750	0.280	1.020		2100	
* 18.000	S14	0.880	-0.245	0.900	1.140	-0.335	1.250		1800	
* 19.000	S13	0.950	-0.175	0.900	1.140	-0.335	1.250		1800	
20.000	AP	1.410	0.985	0.200	0.860	0.435	0.200		225	
20.001	Outlet	0.860	0.435	0.200	1.010	-0.115	0.900		600 x 600	
21.000	S17	1.650	0.900	0.600	1.540	0.790	0.600		1200	
21.001	S16	1.540	0.715	0.675	1.010	-0.040	0.900		1200	
* 20.002	S15	1.010	-0.190	0.900	1.140	-0.410	1.250		1800	
* 18.001	S12	1.140	-0.410	1.250	1.190	-0.440	1.330		2100	
* 18.002	Separator	1.190	-0.540	1.430	1.210	-0.570	1.480		2260 x 1225	
* 18.003	SW Pump Station	1.210	-0.570	1.680	1.750	0.600	1.050	Pump	3000	
1.007	S1	1.750	0.250	0.814	1.800	0.100	1.014		1800	
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Conduit Sections for 28506 - SW DESIGN - 25-04-12.SWS

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \ / open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m ²)
51	O	356	533			0.412	0.145
53	O	457	686			0.529	0.240
-1	oo	900	450			0.450	0.318

Becket House
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 100 YR STORM + CC



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Setting Out Information - True Coordinates (28506 - SW DESIGN - 25-04-12.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
1.000	S12.1	1800		494218.041	100822.367	
1.001	S12	1800		494216.872	100810.929	
2.000	S11.1	1800		494239.362	100827.607	
1.002	S11	1800		494232.940	100807.826	
3.000	S10.1	1800		494252.140	100812.875	
1.003	S10	1800		494249.137	100804.850	
4.000	S9.1	1800		494274.083	100787.870	
1.004	S9	1800		494270.624	100784.260	
1.005	S8	1800		494258.278	100732.702	
5.000	S7	1200		494168.169	100803.422	
5.001	S6	1200		494172.584	100771.728	
6.000	S5	1200		494225.825	100765.262	
7.000	Syphon Drop	300		494114.463	100672.642	
7.001	SB2	1800		494119.330	100681.229	
7.002	RHU	6000	2400	494124.768	100678.148	

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Setting Out Information - True Coordinates (28506 - SW DESIGN - 25-04-12.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
7.003	Syphon Drop	S4	1200	494130.205	100675.066	
8.000			300	494182.881	100634.630	
8.001		SB1	1800	494181.220	100636.964	
7.004		S3	1800	494171.137	100651.868	
9.000	AP	225		494107.001	100693.981	
9.001	Step	350		494156.407	100666.060	
10.000	AP	350		494172.836	100577.503	
10.001	Outlet	375		494197.779	100621.643	
10.002	Inlet	600	600	494192.755	100645.519	
9.002	Inlet / Outlet	600	600	494164.721	100661.362	
9.003	Inlet	600	600	494172.206	100674.607	
11.000	AP	350		494199.873	100657.751	
12.000	AP	225		494239.919	100728.614	
12.001	Outlet	225		494232.983	100716.341	
12.002	AP	225		494231.024	100712.874	

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Setting Out Information - True Coordinates (28506 - SW DESIGN - 25-04-12.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
11.001	Inlet / Outlet	600	600	494223.523	100699.597	
13.000	AP	350		494208.957	100739.622	
11.002	Step	600	600	494195.338	100715.528	
14.000	AP	225		494110.887	100701.519	
15.000	AP	225		494147.636	100766.544	
14.001	Inlet / Outlet B	1200		494121.851	100720.902	
16.000	AP	350		494140.136	100697.941	
17.000	AP	600	600	494172.878	100755.864	
14.002	Inlet / Outlet A	1200		494145.553	100707.508	
9.004	Inlet / Outlet	1325		494179.922	100688.256	
9.005	Separator	1875	5070	494183.950	100685.980	
5.002	S2	1800		494188.848	100683.210	
5.003	SDS Tank	1800		494204.507	100674.335	
1.006	S1A	2100		494220.167	100665.459	
18.000	S14	1800		494147.084	100562.239	

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Setting Out Information - True Coordinates (28506 - SW DESIGN - 25-04-12.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
19.000	S13	1800		494152.316	100548.722	
20.000	AP	225		494213.511	100647.546	
20.001	Outlet	600	600	494177.104	100583.124	
21.000	S17	1200		494228.655	100667.810	
21.001	S16	1200		494219.492	100650.557	
20.002	S15	1800		494182.035	100580.042	
18.001	S12	2100		494165.901	100551.574	
18.002	Separator	2260	1225	494168.111	100550.321	
18.003	SW Pump Station	3000		494170.537	100548.946	
1.007	S1	1800		494229.737	100660.036	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.007	1	1800		494243.703	100652.868	

Free Flowing Outfall Details for 28506 - SW DESIGN - 25-04-12.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	1	1.800	0.100	0.000	1800	0

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Simulation Criteria for 28506 - SW DESIGN - 25-04-12.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
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	1
Number of Online Controls	1	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)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for 28506 - SW DESIGN - 25-04-12.SWS

Pump Manhole: SW Pump Station, DS/PN: 18.003, Volume (m³): 12.6

Invert Level (m) -0.570

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	30.0000	0.900	30.0000	1.700	30.0000	2.500	30.0000
0.200	30.0000	1.000	30.0000	1.800	30.0000	2.600	30.0000
0.300	30.0000	1.100	30.0000	1.900	30.0000	2.700	30.0000
0.400	30.0000	1.200	30.0000	2.000	30.0000	2.800	30.0000
0.500	30.0000	1.300	30.0000	2.100	30.0000	2.900	30.0000
0.600	30.0000	1.400	30.0000	2.200	30.0000	3.000	30.0000
0.700	30.0000	1.500	30.0000	2.300	30.0000		
0.800	30.0000	1.600	30.0000	2.400	30.0000		

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Storage Structures for 28506 - SW DESIGN - 25-04-12.SWS

Cellular Storage Manhole: SDS Tank, DS/PN: 5.003

Invert Level (m) 0.330 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1920.0	1920.0	0.600	0.0	2012.0
0.500	1920.0	2012.0			

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Summary of Critical Results by Maximum Level (Rank 1) for 28506 - SW DESIGN - 25-04-12.SWS									
Margin for Flood Risk Warning (mm) Analysis Timestep 2.5 Second Increment (Extended) DTS Status DVD Status Inertia Status 300.0 ON ON ON									
Profile(s) Duration(s) (mins) Return Period(s) (years) Climate Change (%) Summer and Winter 15, 30, 60, 120, 240, 360, 480, 960, 1440 100 20									
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.	
1.000	30 Winter	100	+20%	100/15 Summer	100/15 Summer			6	
1.001	15 Winter	100	+20%	100/15 Summer	100/15 Summer			5	
2.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			5	
1.002	15 Winter	100	+20%	100/15 Summer	100/15 Summer			2	
3.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			5	
1.003	15 Winter	100	+20%	100/15 Summer	100/15 Summer				
4.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			3	
1.004	15 Summer	100	+20%	100/15 Summer					
1.005	15 Winter	100	+20%	100/15 Summer					
5.000	15 Winter	100	+20%	100/15 Summer					
5.001	15 Winter	100	+20%	100/15 Summer					
6.000	15 Winter	100	+20%	100/15 Summer					
7.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			2	
7.001	15 Winter	100	+20%	100/15 Summer					
7.002	15 Winter	100	+20%	100/15 Summer					
7.003	15 Winter	100	+20%	100/15 Summer					
8.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			4	
8.001	15 Winter	100	+20%	100/15 Summer					
7.004	15 Winter	100	+20%	100/15 Summer					
9.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			4	
9.001	15 Winter	100	+20%						
10.000	15 Winter	100	+20%	100/15 Summer					
10.001	15 Winter	100	+20%	100/15 Summer					
10.002	15 Winter	100	+20%	100/15 Summer					
9.002	15 Winter	100	+20%	100/15 Summer					
9.003	15 Winter	100	+20%	100/15 Summer					
11.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			4	
12.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			5	
12.001	15 Winter	100	+20%	100/15 Summer	100/15 Summer			4	
12.002	15 Winter	100	+20%	100/15 Summer	100/15 Summer			4	
11.001	15 Winter	100	+20%	100/15 Summer	100/15 Summer			4	
13.000	15 Winter	100	+20%	100/15 Summer					
11.002	15 Winter	100	+20%	100/15 Summer					
14.000	15 Winter	100	+20%	100/15 Summer					
15.000	15 Winter	100	+20%	100/15 Summer					
14.001	15 Winter	100	+20%	100/15 Summer					
16.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer			4	

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Becket House		SSL BOGNOR REGIS							
Vestry Road		SURFACE WATER DRAINAGE							
Kent TN14 5EL		100 YR STORM + CC							
Date 18th MAY 2012		Designed by MRW - REV C							
File 28506 - SW DESIG...		Checked by							
Micro Drainage		Network W.12.6.1							
Summary of Critical Results by Maximum Level (Rank 1) for 28506 - SW DESIGN - 25-04-12.SWS									
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.	
17.000	15 Winter	100	+20%	100/15 Summer	100/15 Summer				5
14.002	15 Winter	100	+20%	100/15 Summer					
9.004	15 Winter	100	+20%	100/15 Summer					
9.005	15 Winter	100	+20%	100/15 Summer					
5.002	120 Winter	100	+20%	100/15 Summer					
5.003	120 Winter	100	+20%	100/30 Winter					
1.006	120 Winter	100	+20%	100/15 Summer					
18.000	30 Winter	100	+20%	100/15 Summer	100/15 Summer				8
19.000	30 Winter	100	+20%	100/15 Summer	100/15 Summer				7
20.000	15 Winter	100	+20%	100/15 Summer					
20.001	60 Winter	100	+20%	100/15 Summer	100/15 Summer				8
21.000	15 Winter	100	+20%	100/15 Summer	100/15 Winter				2
21.001	15 Winter	100	+20%	100/15 Summer					
20.002	15 Summer	100	+20%	100/15 Summer					
18.001	15 Summer	100	+20%	100/15 Summer					
18.002	30 Summer	100	+20%	100/15 Summer					
18.003	30 Summer	100	+20%	100/15 Summer					
1.007	120 Winter	100	+20%						
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status	
1.000		S12.1	2.027	0.499	26.723	0.69	0.0	74.3	FLOOD
1.001		S12	2.011	0.540	10.638	0.61	0.0	97.2	FLOOD
2.000		S11.1	2.009	0.520	9.388	0.87	0.0	53.1	FLOOD
1.002		S11	2.001	0.595	0.757	0.72	0.0	115.0	FLOOD
3.000		S10.1	2.009	0.645	9.259	1.59	0.0	109.2	FLOOD
1.003		S10	1.987	0.647	0.067	1.16	0.0	203.8	FLOOD
4.000		S9.1	2.001	0.760	1.269	2.11	0.0	97.7	FLOOD
1.004		S9	1.907	0.686	0.000	1.47	0.0	274.3	FLOOD RISK
1.005		S8	1.445	0.436	0.000	1.47	0.0	280.1	SURCHARGED
5.000		S7	2.099	0.980	0.000	1.59	0.0	44.6	FLOOD RISK
5.001		S6	1.834	0.929	0.000	1.36	0.0	39.7	FLOOD RISK
6.000		S5	1.328	0.123	0.000	0.56	0.0	23.0	SURCHARGED
7.000	Syphon	Drop	2.103	0.503	2.574	4.66	0.0	175.8	FLOOD
7.001		SB2	1.823	0.748	0.000	1.97	0.0	161.7	SURCHARGED
7.002		RHU	1.712	0.662	0.000	1.59	0.0	130.2	SURCHARGED
7.003		S4	1.602	0.577	0.000	0.92	0.0	129.4	SURCHARGED
8.000	Syphon	Drop	2.207	0.307	7.105	2.56	0.0	147.5	FLOOD
8.001		SB1	1.650	0.275	0.000	1.37	0.0	146.6	SURCHARGED
7.004		S3	1.507	0.592	0.000	2.00	0.0	275.2	SURCHARGED
9.000		AP	2.002	0.187	1.900	1.86	0.0	28.9	FLOOD
9.001		Step	1.688	-0.127	0.000	0.73	0.0	32.5	OK
10.000		AP	1.860	0.260	0.000	1.45	0.0	70.5	FLOOD RISK
10.001		Outlet	1.793	0.193	0.000	0.47	0.0	57.3	FLOOD RISK
10.002		Inlet	1.687	0.054	0.000	1.13	0.0	69.3	SURCHARGED
9.002	Inlet /	Outlet	1.648	0.098	0.000	0.57	0.0	101.9	SURCHARGED
9.003		Inlet	1.527	0.102	0.000	2.52	0.0	124.0	FLOOD RISK
11.000		AP	1.716	0.201	15.741	1.67	0.0	79.2	FLOOD
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Becket House Vestry Road Kent TN14 5EL	SSL BOGNOR REGIS SURFACE WATER DRAINAGE 100 YR STORM + CC	
Date 18th MAY 2012 File 28506 - SW DESIG...	Designed by MRW - REV C Checked by	
Micro Drainage	Network W.12.6.1	

Summary of Critical Results by Maximum Level (Rank 1) for 28506 - SW DESIGN
- 25-04-12.SWS

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m ³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
12.000	AP	1.704	0.189	3.768	2.39	0.0	26.6	FLOOD
12.001	Outlet	1.701	0.186	0.686	1.05	0.0	26.4	FLOOD
12.002	AP	1.703	0.188	2.687	3.20	0.0	34.4	FLOOD
11.001	Inlet / Outlet	1.701	0.186	0.683	0.79	0.0	78.0	FLOOD
13.000	AP	1.698	0.183	0.000	2.47	0.0	84.5	FLOOD RISK
11.002	Step	1.639	0.214	0.000	3.05	0.0	184.4	FLOOD RISK
14.000	AP	1.794	0.109	0.000	1.90	0.0	19.2	FLOOD RISK
15.000	AP	1.821	0.136	0.000	1.22	0.0	18.9	FLOOD RISK
14.001	Inlet / Outlet B	1.759	0.674	0.000	0.76	0.0	32.2	FLOOD RISK
16.000	AP	1.657	0.192	7.511	2.48	0.0	99.0	FLOOD
17.000	AP	1.666	0.018	16.318	1.10	0.0	88.5	FLOOD
14.002	Inlet / Outlet A	1.633	0.628	0.000	1.54	0.0	146.5	FLOOD RISK
9.004	Inlet / Outlet	1.473	0.373	0.000	1.86	0.0	403.9	FLOOD RISK
9.005	Separator	1.319	0.229	0.000	1.16	0.0	401.3	SURCHARGED
5.002	S2	1.200	0.370	0.000	1.61	0.0	434.2	SURCHARGED
5.003	SDS Tank	1.162	0.382	0.000	0.81	0.0	217.5	SURCHARGED
1.006	S1A	1.123	0.393	0.000	4.28	0.0	308.5	SURCHARGED
18.000	S14	0.889	0.909	9.192	0.55	0.0	16.8	FLOOD
19.000	S13	0.955	0.905	5.020	0.82	0.0	40.0	FLOOD
20.000	AP	1.406	0.196	0.000	1.07	0.0	46.5	FLOOD RISK
20.001	Outlet	0.886	0.226	25.800	0.28	0.0	28.8	FLOOD
21.000	S17	1.650	0.600	0.466	1.81	0.0	22.5	FLOOD
21.001	S16	1.512	0.647	0.000	0.89	0.0	15.0	FLOOD RISK
20.002	S15	0.907	0.797	0.000	0.41	0.0	34.1	FLOOD RISK
18.001	S12	0.915	1.025	0.000	1.29	0.0	79.4	FLOOD RISK
18.002	Separator	0.912	1.152	0.000	1.05	0.0	64.5	FLOOD RISK
18.003	SW Pump Station	0.909	1.379	0.000	16.30	0.0	30.0	SURCHARGED
1.007	S1	0.814	-0.122	0.000	1.03	0.0	339.8	OK

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Becket House Vestry Road Kent TN14 5EL	SSL BOGNOR REGIS SURFACE WATER DRAINAGE 1 & 30 YR STORMS																																																																																																																																																																																																																																																																											
Date 18th MAY 2012 File 28506 - SW DESIG...	Designed by MRW - REV C Checked by																																																																																																																																																																																																																																																																											
Micro Drainage Network W.12.6.1																																																																																																																																																																																																																																																																												
<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u> * - Indicates pipe has been modified outside of System 1 <table><thead><tr><th>PN</th><th>Length (m)</th><th>Fall (m)</th><th>Slope (1:X)</th><th>I.Area (ha)</th><th>T.E. (mins)</th><th>k (mm)</th><th>HYD SECT</th><th>DIA (mm)</th></tr></thead><tbody><tr><td>* 1.000</td><td>11.354</td><td>0.057</td><td>199.2</td><td>0.279</td><td>5.00</td><td>0.600</td><td>o</td><td>375</td></tr><tr><td>* 1.001</td><td>16.365</td><td>0.065</td><td>251.8</td><td>0.097</td><td>0.00</td><td>0.600</td><td>o</td><td>450</td></tr><tr><td>* 2.000</td><td>20.797</td><td>0.083</td><td>250.6</td><td>0.103</td><td>5.00</td><td>0.600</td><td>o</td><td>300</td></tr><tr><td>* 1.002</td><td>16.468</td><td>0.066</td><td>249.5</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>450</td></tr><tr><td>* 3.000</td><td>8.569</td><td>0.024</td><td>357.0</td><td>0.297</td><td>5.00</td><td>0.600</td><td>o</td><td>375</td></tr><tr><td>* 1.003</td><td>29.760</td><td>0.119</td><td>250.1</td><td>0.072</td><td>0.00</td><td>0.600</td><td>o</td><td>450</td></tr><tr><td>* 4.000</td><td>5.000</td><td>0.020</td><td>250.0</td><td>0.210</td><td>5.00</td><td>0.600</td><td>o</td><td>300</td></tr><tr><td>* 1.004</td><td>53.016</td><td>0.212</td><td>250.1</td><td>0.041</td><td>0.00</td><td>0.600</td><td>o</td><td>450</td></tr><tr><td>* 1.005</td><td>77.292</td><td>0.309</td><td>250.1</td><td>0.046</td><td>0.00</td><td>0.600</td><td>o</td><td>450</td></tr><tr><td>* 5.000</td><td>32.000</td><td>0.107</td><td>299.1</td><td>0.112</td><td>5.00</td><td>0.600</td><td>o</td><td>225</td></tr><tr><td>5.001</td><td>90.000</td><td>0.300</td><td>300.0</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>225</td></tr><tr><td>6.000</td><td>90.000</td><td>0.600</td><td>150.0</td><td>0.052</td><td>5.00</td><td>0.600</td><td>o</td><td>225</td></tr><tr><td>7.000</td><td>9.871</td><td>0.025</td><td>394.8</td><td>0.368</td><td>5.00</td><td>0.600</td><td>o</td><td>300</td></tr></tbody></table> <table><thead><tr><th>PN</th><th>US/MH Name</th><th>US/CL (m)</th><th>US/IL (m)</th><th>US C.Depth (m)</th><th>DS/CL (m)</th><th>DS/IL (m)</th><th>DS C.Depth (m)</th><th>Ctrl</th><th>US/MH (mm)</th></tr></thead><tbody><tr><td>* 1.000</td><td>S12.1</td><td>2.000</td><td>1.153</td><td>0.472</td><td>2.000</td><td>1.096</td><td>0.529</td><td></td><td>1800</td></tr><tr><td>* 1.001</td><td>S12</td><td>2.000</td><td>1.021</td><td>0.529</td><td>2.000</td><td>0.956</td><td>0.594</td><td></td><td>1800</td></tr><tr><td>* 2.000</td><td>S11.1</td><td>2.000</td><td>1.189</td><td>0.511</td><td>2.000</td><td>1.106</td><td>0.594</td><td></td><td>1800</td></tr><tr><td>* 1.002</td><td>S11</td><td>2.000</td><td>0.956</td><td>0.594</td><td>2.000</td><td>0.890</td><td>0.660</td><td></td><td>1800</td></tr><tr><td>* 3.000</td><td>S10.1</td><td>2.000</td><td>0.989</td><td>0.636</td><td>2.000</td><td>0.965</td><td>0.660</td><td></td><td>1800</td></tr><tr><td>* 1.003</td><td>S10</td><td>2.000</td><td>0.890</td><td>0.660</td><td>2.000</td><td>0.771</td><td>0.779</td><td></td><td>1800</td></tr><tr><td>* 4.000</td><td>S9.1</td><td>2.000</td><td>0.941</td><td>0.759</td><td>2.000</td><td>0.921</td><td>0.779</td><td></td><td>1800</td></tr><tr><td>* 1.004</td><td>S9</td><td>2.000</td><td>0.771</td><td>0.779</td><td>2.000</td><td>0.559</td><td>0.991</td><td></td><td>1800</td></tr><tr><td>* 1.005</td><td>S8</td><td>2.000</td><td>0.559</td><td>0.991</td><td>1.750</td><td>0.250</td><td>1.050</td><td></td><td>1800</td></tr><tr><td>* 5.000</td><td>S7</td><td>2.150</td><td>0.894</td><td>1.031</td><td>2.050</td><td>0.787</td><td>1.038</td><td></td><td>1200</td></tr><tr><td>5.001</td><td>S6</td><td>2.050</td><td>0.680</td><td>1.145</td><td>1.820</td><td>0.380</td><td>1.215</td><td></td><td>1200</td></tr><tr><td>6.000</td><td>S5</td><td>2.330</td><td>0.980</td><td>1.125</td><td>1.820</td><td>0.380</td><td>1.215</td><td></td><td>1200</td></tr><tr><td>7.000</td><td>Syphon Drop</td><td>2.100</td><td>1.300</td><td>0.500</td><td>2.200</td><td>1.275</td><td>0.625</td><td></td><td>300</td></tr></tbody></table>			PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	* 1.000	11.354	0.057	199.2	0.279	5.00	0.600	o	375	* 1.001	16.365	0.065	251.8	0.097	0.00	0.600	o	450	* 2.000	20.797	0.083	250.6	0.103	5.00	0.600	o	300	* 1.002	16.468	0.066	249.5	0.000	0.00	0.600	o	450	* 3.000	8.569	0.024	357.0	0.297	5.00	0.600	o	375	* 1.003	29.760	0.119	250.1	0.072	0.00	0.600	o	450	* 4.000	5.000	0.020	250.0	0.210	5.00	0.600	o	300	* 1.004	53.016	0.212	250.1	0.041	0.00	0.600	o	450	* 1.005	77.292	0.309	250.1	0.046	0.00	0.600	o	450	* 5.000	32.000	0.107	299.1	0.112	5.00	0.600	o	225	5.001	90.000	0.300	300.0	0.000	0.00	0.600	o	225	6.000	90.000	0.600	150.0	0.052	5.00	0.600	o	225	7.000	9.871	0.025	394.8	0.368	5.00	0.600	o	300	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)	* 1.000	S12.1	2.000	1.153	0.472	2.000	1.096	0.529		1800	* 1.001	S12	2.000	1.021	0.529	2.000	0.956	0.594		1800	* 2.000	S11.1	2.000	1.189	0.511	2.000	1.106	0.594		1800	* 1.002	S11	2.000	0.956	0.594	2.000	0.890	0.660		1800	* 3.000	S10.1	2.000	0.989	0.636	2.000	0.965	0.660		1800	* 1.003	S10	2.000	0.890	0.660	2.000	0.771	0.779		1800	* 4.000	S9.1	2.000	0.941	0.759	2.000	0.921	0.779		1800	* 1.004	S9	2.000	0.771	0.779	2.000	0.559	0.991		1800	* 1.005	S8	2.000	0.559	0.991	1.750	0.250	1.050		1800	* 5.000	S7	2.150	0.894	1.031	2.050	0.787	1.038		1200	5.001	S6	2.050	0.680	1.145	1.820	0.380	1.215		1200	6.000	S5	2.330	0.980	1.125	1.820	0.380	1.215		1200	7.000	Syphon Drop	2.100	1.300	0.500	2.200	1.275	0.625		300
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)																																																																																																																																																																																																																																																																				
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* 5.000	32.000	0.107	299.1	0.112	5.00	0.600	o	225																																																																																																																																																																																																																																																																				
5.001	90.000	0.300	300.0	0.000	0.00	0.600	o	225																																																																																																																																																																																																																																																																				
6.000	90.000	0.600	150.0	0.052	5.00	0.600	o	225																																																																																																																																																																																																																																																																				
7.000	9.871	0.025	394.8	0.368	5.00	0.600	o	300																																																																																																																																																																																																																																																																				
PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)																																																																																																																																																																																																																																																																			
* 1.000	S12.1	2.000	1.153	0.472	2.000	1.096	0.529		1800																																																																																																																																																																																																																																																																			
* 1.001	S12	2.000	1.021	0.529	2.000	0.956	0.594		1800																																																																																																																																																																																																																																																																			
* 2.000	S11.1	2.000	1.189	0.511	2.000	1.106	0.594		1800																																																																																																																																																																																																																																																																			
* 1.002	S11	2.000	0.956	0.594	2.000	0.890	0.660		1800																																																																																																																																																																																																																																																																			
* 3.000	S10.1	2.000	0.989	0.636	2.000	0.965	0.660		1800																																																																																																																																																																																																																																																																			
* 1.003	S10	2.000	0.890	0.660	2.000	0.771	0.779		1800																																																																																																																																																																																																																																																																			
* 4.000	S9.1	2.000	0.941	0.759	2.000	0.921	0.779		1800																																																																																																																																																																																																																																																																			
* 1.004	S9	2.000	0.771	0.779	2.000	0.559	0.991		1800																																																																																																																																																																																																																																																																			
* 1.005	S8	2.000	0.559	0.991	1.750	0.250	1.050		1800																																																																																																																																																																																																																																																																			
* 5.000	S7	2.150	0.894	1.031	2.050	0.787	1.038		1200																																																																																																																																																																																																																																																																			
5.001	S6	2.050	0.680	1.145	1.820	0.380	1.215		1200																																																																																																																																																																																																																																																																			
6.000	S5	2.330	0.980	1.125	1.820	0.380	1.215		1200																																																																																																																																																																																																																																																																			
7.000	Syphon Drop	2.100	1.300	0.500	2.200	1.275	0.625		300																																																																																																																																																																																																																																																																			
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Becket House Vestry Road Kent TN14 5EL			SSL BOGNOR REGIS SURFACE WATER DRAINAGE 1 & 30 YR STORMS						
Date 18th MAY 2012 File 28506 - SW DESIG...			Designed by MRW - REV C Checked by						
Micro Drainage							Network W.12.6.1		
<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u>									
	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)
		7.001	6.250	0.025	250.0	0.000	0.00	0.600	o 375
*		7.002	6.250	0.025	250.0	0.000	0.00	0.600	o 375
		7.003	47.048	0.110	427.7	0.000	0.00	0.600	o 450
		8.000	2.864	0.025	114.6	0.364	5.00	0.600	o 300
		8.001	17.995	0.076	236.8	0.000	0.00	0.600	o 375
*		7.004	36.000	0.085	423.5	0.000	0.00	0.600	o 450
*		9.000	56.750	0.000	0.0	0.076	5.00	0.600	o 225
*		9.001	9.550	0.000	0.0	0.011	0.00	0.600	o 350
		10.000	50.700	0.000	0.0	0.145	5.00	0.600	o 350
*		10.001	24.399	0.125	195.2	0.000	0.00	0.600	o 375
*		10.002	32.201	0.000	0.0	0.047	0.00	0.600	o 51
*		9.002	15.214	0.100	152.1	0.000	0.00	0.600	o 450
		9.003	15.680	0.000	0.0	0.106	0.00	0.600	o 51
		11.000	48.067	0.000	0.0	0.209	5.00	0.600	o 350
		12.000	14.097	0.000	0.0	0.038	5.00	0.600	o 225
		12.001	3.982	0.000	0.0	0.000	0.00	0.600	o 225
PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
	7.001	SB2	2.200	0.700	1.125	2.080	0.675	1.030	1800
*	7.002	RHU	2.080	0.675	1.030	2.080	0.650	1.055	6000 x 2400
	7.003	S4	2.080	0.575	1.055	2.080	0.465	1.165	1200
	8.000	Syphon Drop	2.200	1.600	0.300	2.200	1.575	0.325	300
	8.001	SB1	2.200	1.000	0.825	2.080	0.924	0.781	1800
*	7.004	S3	2.080	0.465	1.165	1.820	0.380	0.990	1800
*	9.000	AP	2.000	1.590	0.185	2.000	1.590	0.185	225
*	9.001	Step	2.000	1.465	0.185	2.000	1.465	0.185	350
	10.000	AP	1.900	1.250	0.300	1.900	1.250	0.300	350
*	10.001	Outlet	1.900	1.225	0.300	2.000	1.100	0.525	375
*	10.002	Inlet	2.000	1.100	0.367	2.000	1.100	0.367	600 x 600
*	9.002	Inlet / Outlet	2.000	1.100	0.450	1.700	1.000	0.250	600 x 600
	9.003	Inlet	1.700	0.892	0.275	1.700	0.892	0.275	600 x 600
	11.000	AP	1.700	1.165	0.185	1.700	1.165	0.185	350
	12.000	AP	1.700	1.290	0.185	1.700	1.290	0.185	225
	12.001	Outlet	1.700	1.290	0.185	1.700	1.290	0.185	225

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Becket House Vestry Road Kent TN14 5EL			SSL BOGNOR REGIS SURFACE WATER DRAINAGE 1 & 30 YR STORMS							
Date 18th MAY 2012 File 28506 - SW DESIG...			Designed by MRW - REV C Checked by							
Micro Drainage						Network W.12.6.1				
<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u>										
	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	
	12.002	15.250	0.000	0.0	0.040	0.00	0.600	o	225	
	11.001	32.376	0.100	323.8	0.000	0.00	0.600	o	375	
	13.000	27.677	0.000	0.0	0.179	5.00	0.600	o	350	
	11.002	31.328	0.000	0.0	0.108	0.00	0.600	o	51	
	* 14.000	22.269	0.000	0.0	0.037	5.00	0.600	o	225	
	* 15.000	52.422	0.000	0.0	0.040	5.00	0.600	o	225	
	* 14.001	27.225	0.210	129.6	0.000	0.00	0.600	o	225	
	* 16.000	10.994	0.000	0.0	0.213	5.00	0.600	o	350	
	* 17.000	55.542	0.000	0.0	0.247	5.00	0.600	o	51	
	* 14.002	39.394	0.110	358.1	0.000	0.00	0.600	o	375	
	* 9.004	4.627	0.010	462.7	0.000	0.00	0.600	o	600	
	9.005	5.627	0.100	56.3	0.000	0.00	0.600	o	600	
	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
	12.002	AP	1.700	1.290	0.185	1.700	1.290	0.185		225
	11.001	Inlet / Outlet	1.700	1.140	0.185	1.700	1.040	0.285		600 x 600
	13.000	AP	1.700	1.165	0.185	1.700	1.165	0.185		350
	11.002	Step	1.700	0.892	0.275	1.700	0.892	0.275		600 x 600
	* 14.000	AP	1.870	1.460	0.185	1.870	1.460	0.185		225
	* 15.000	AP	1.870	1.460	0.185	1.870	1.460	0.185		225
	* 14.001	Inlet / Outlet B	1.870	0.860	0.785	1.650	0.650	0.775		1200
	* 16.000	AP	1.650	1.115	0.185	1.650	1.115	0.185		350
	* 17.000	AP	1.650	1.115	0.002	1.650	1.115	0.002		600 x 600
	* 14.002	Inlet / Outlet A	1.650	0.630	0.645	1.700	0.520	0.805		1200
	* 9.004	Inlet / Outlet	1.700	0.500	0.600	1.800	0.490	0.710		1325
	9.005	Separator	1.800	0.490	0.710	1.820	0.390	0.830		1875 x 5070
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Becket House Vestry Road Kent TN14 5EL			SSL BOGNOR REGIS SURFACE WATER DRAINAGE 1 & 30 YR STORMS																																																																																																																																																																																																																																																																																																																																																	
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<u>Existing Network Details for 28506 - SW DESIGN - 25-04-12.SWS</u> <table border="1"> <thead> <tr> <th></th> <th>PN</th> <th>Length (m)</th> <th>Fall (m)</th> <th>Slope (1:X)</th> <th>I.Area (ha)</th> <th>T.E. (mins)</th> <th>k (mm)</th> <th>HYD SECT</th> <th>DIA (mm)</th> <th></th> </tr> </thead> <tbody> <tr><td></td><td>* 5.002</td><td>18.000</td><td>0.050</td><td>360.0</td><td>0.000</td><td>0.00</td><td>0.600</td><td>oo</td><td>-1</td><td></td></tr> <tr><td></td><td>* 5.003</td><td>18.000</td><td>0.050</td><td>360.0</td><td>0.000</td><td>0.00</td><td>0.600</td><td>oo</td><td>-1</td><td></td></tr> <tr><td></td><td>* 1.006</td><td>11.000</td><td>0.000</td><td>0.0</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>450</td><td></td></tr> <tr><td></td><td>* 18.000</td><td>21.629</td><td>0.090</td><td>240.3</td><td>0.063</td><td>5.00</td><td>0.600</td><td>o</td><td>225</td><td></td></tr> <tr><td></td><td>* 19.000</td><td>13.881</td><td>0.160</td><td>86.8</td><td>0.143</td><td>5.00</td><td>0.600</td><td>o</td><td>225</td><td></td></tr> <tr><td></td><td>20.000</td><td>73.998</td><td>0.550</td><td>134.5</td><td>0.109</td><td>5.00</td><td>0.600</td><td>o</td><td>225</td><td></td></tr> <tr><td></td><td>20.001</td><td>5.815</td><td>0.550</td><td>10.6</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>225</td><td></td></tr> <tr><td></td><td>21.000</td><td>19.535</td><td>0.110</td><td>177.6</td><td>0.054</td><td>5.00</td><td>0.600</td><td>o</td><td>150</td><td></td></tr> <tr><td></td><td>21.001</td><td>80.000</td><td>0.755</td><td>106.0</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>150</td><td></td></tr> <tr><td></td><td>* 20.002</td><td>32.722</td><td>0.220</td><td>148.7</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>300</td><td></td></tr> <tr><td></td><td>* 18.001</td><td>2.541</td><td>0.030</td><td>84.7</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>300</td><td></td></tr> <tr><td></td><td>* 18.002</td><td>2.788</td><td>0.030</td><td>92.9</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>300</td><td></td></tr> <tr><td></td><td>* 18.003</td><td>125.879</td><td>-1.170</td><td>-107.6</td><td>0.000</td><td>0.00</td><td>0.600</td><td>o</td><td>100</td><td></td></tr> <tr><td></td><td>1.007</td><td>15.698</td><td>0.150</td><td>104.7</td><td>0.000</td><td>0.00</td><td>0.600</td><td>O</td><td>53</td><td></td></tr> <tr> <th></th> <th>PN</th> <th>US/MH Name</th> <th>US/CL (m)</th> <th>US/IL (m)</th> <th>US C.Depth (m)</th> <th>DS/CL (m)</th> <th>DS/IL (m)</th> <th>DS C.Depth (m)</th> <th>Ctrl</th> <th>US/MH (mm)</th> </tr> <tr><td></td><td>* 5.002</td><td>S2</td><td>1.820</td><td>0.380</td><td>0.990</td><td>1.780</td><td>0.330</td><td>1.000</td><td></td><td>1800</td></tr> <tr><td></td><td>* 5.003</td><td>SDS Tank</td><td>1.780</td><td>0.330</td><td>1.000</td><td>1.750</td><td>0.280</td><td>1.020</td><td></td><td>1800</td></tr> <tr><td></td><td>* 1.006</td><td>S1A</td><td>1.750</td><td>0.280</td><td>1.020</td><td>1.750</td><td>0.280</td><td>1.020</td><td></td><td>2100</td></tr> <tr><td></td><td>* 18.000</td><td>S14</td><td>0.880</td><td>-0.245</td><td>0.900</td><td>1.140</td><td>-0.335</td><td>1.250</td><td></td><td>1800</td></tr> <tr><td></td><td>* 19.000</td><td>S13</td><td>0.950</td><td>-0.175</td><td>0.900</td><td>1.140</td><td>-0.335</td><td>1.250</td><td></td><td>1800</td></tr> <tr><td></td><td>20.000</td><td>AP</td><td>1.410</td><td>0.985</td><td>0.200</td><td>0.860</td><td>0.435</td><td>0.200</td><td></td><td>225</td></tr> <tr><td></td><td>20.001</td><td>Outlet</td><td>0.860</td><td>0.435</td><td>0.200</td><td>1.010</td><td>-0.115</td><td>0.900</td><td></td><td>600 x 600</td></tr> <tr><td></td><td>21.000</td><td>S17</td><td>1.650</td><td>0.900</td><td>0.600</td><td>1.540</td><td>0.790</td><td>0.600</td><td></td><td>1200</td></tr> <tr><td></td><td>21.001</td><td>S16</td><td>1.540</td><td>0.715</td><td>0.675</td><td>1.010</td><td>-0.040</td><td>0.900</td><td></td><td>1200</td></tr> <tr><td></td><td>* 20.002</td><td>S15</td><td>1.010</td><td>-0.190</td><td>0.900</td><td>1.140</td><td>-0.410</td><td>1.250</td><td></td><td>1800</td></tr> <tr><td></td><td>* 18.001</td><td>S12</td><td>1.140</td><td>-0.410</td><td>1.250</td><td>1.190</td><td>-0.440</td><td>1.330</td><td></td><td>2100</td></tr> <tr><td></td><td>* 18.002</td><td>Separator</td><td>1.190</td><td>-0.540</td><td>1.430</td><td>1.210</td><td>-0.570</td><td>1.480</td><td></td><td>2260 x 1225</td></tr> <tr><td></td><td>* 18.003</td><td>SW Pump Station</td><td>1.210</td><td>-0.570</td><td>1.680</td><td>1.750</td><td>0.600</td><td>1.050</td><td>Pump</td><td>3000</td></tr> <tr><td></td><td>1.007</td><td>S1</td><td>1.750</td><td>0.250</td><td>0.814</td><td>1.800</td><td>0.100</td><td>1.014</td><td></td><td>1800</td></tr> </tbody> </table>												PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)			* 5.002	18.000	0.050	360.0	0.000	0.00	0.600	oo	-1			* 5.003	18.000	0.050	360.0	0.000	0.00	0.600	oo	-1			* 1.006	11.000	0.000	0.0	0.000	0.00	0.600	o	450			* 18.000	21.629	0.090	240.3	0.063	5.00	0.600	o	225			* 19.000	13.881	0.160	86.8	0.143	5.00	0.600	o	225			20.000	73.998	0.550	134.5	0.109	5.00	0.600	o	225			20.001	5.815	0.550	10.6	0.000	0.00	0.600	o	225			21.000	19.535	0.110	177.6	0.054	5.00	0.600	o	150			21.001	80.000	0.755	106.0	0.000	0.00	0.600	o	150			* 20.002	32.722	0.220	148.7	0.000	0.00	0.600	o	300			* 18.001	2.541	0.030	84.7	0.000	0.00	0.600	o	300			* 18.002	2.788	0.030	92.9	0.000	0.00	0.600	o	300			* 18.003	125.879	-1.170	-107.6	0.000	0.00	0.600	o	100			1.007	15.698	0.150	104.7	0.000	0.00	0.600	O	53			PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)		* 5.002	S2	1.820	0.380	0.990	1.780	0.330	1.000		1800		* 5.003	SDS Tank	1.780	0.330	1.000	1.750	0.280	1.020		1800		* 1.006	S1A	1.750	0.280	1.020	1.750	0.280	1.020		2100		* 18.000	S14	0.880	-0.245	0.900	1.140	-0.335	1.250		1800		* 19.000	S13	0.950	-0.175	0.900	1.140	-0.335	1.250		1800		20.000	AP	1.410	0.985	0.200	0.860	0.435	0.200		225		20.001	Outlet	0.860	0.435	0.200	1.010	-0.115	0.900		600 x 600		21.000	S17	1.650	0.900	0.600	1.540	0.790	0.600		1200		21.001	S16	1.540	0.715	0.675	1.010	-0.040	0.900		1200		* 20.002	S15	1.010	-0.190	0.900	1.140	-0.410	1.250		1800		* 18.001	S12	1.140	-0.410	1.250	1.190	-0.440	1.330		2100		* 18.002	Separator	1.190	-0.540	1.430	1.210	-0.570	1.480		2260 x 1225		* 18.003	SW Pump Station	1.210	-0.570	1.680	1.750	0.600	1.050	Pump	3000		1.007	S1	1.750	0.250	0.814	1.800	0.100	1.014		1800
	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)																																																																																																																																																																																																																																																																																																																																											
	* 5.002	18.000	0.050	360.0	0.000	0.00	0.600	oo	-1																																																																																																																																																																																																																																																																																																																																											
	* 5.003	18.000	0.050	360.0	0.000	0.00	0.600	oo	-1																																																																																																																																																																																																																																																																																																																																											
	* 1.006	11.000	0.000	0.0	0.000	0.00	0.600	o	450																																																																																																																																																																																																																																																																																																																																											
	* 18.000	21.629	0.090	240.3	0.063	5.00	0.600	o	225																																																																																																																																																																																																																																																																																																																																											
	* 19.000	13.881	0.160	86.8	0.143	5.00	0.600	o	225																																																																																																																																																																																																																																																																																																																																											
	20.000	73.998	0.550	134.5	0.109	5.00	0.600	o	225																																																																																																																																																																																																																																																																																																																																											
	20.001	5.815	0.550	10.6	0.000	0.00	0.600	o	225																																																																																																																																																																																																																																																																																																																																											
	21.000	19.535	0.110	177.6	0.054	5.00	0.600	o	150																																																																																																																																																																																																																																																																																																																																											
	21.001	80.000	0.755	106.0	0.000	0.00	0.600	o	150																																																																																																																																																																																																																																																																																																																																											
	* 20.002	32.722	0.220	148.7	0.000	0.00	0.600	o	300																																																																																																																																																																																																																																																																																																																																											
	* 18.001	2.541	0.030	84.7	0.000	0.00	0.600	o	300																																																																																																																																																																																																																																																																																																																																											
	* 18.002	2.788	0.030	92.9	0.000	0.00	0.600	o	300																																																																																																																																																																																																																																																																																																																																											
	* 18.003	125.879	-1.170	-107.6	0.000	0.00	0.600	o	100																																																																																																																																																																																																																																																																																																																																											
	1.007	15.698	0.150	104.7	0.000	0.00	0.600	O	53																																																																																																																																																																																																																																																																																																																																											
	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)																																																																																																																																																																																																																																																																																																																																										
	* 5.002	S2	1.820	0.380	0.990	1.780	0.330	1.000		1800																																																																																																																																																																																																																																																																																																																																										
	* 5.003	SDS Tank	1.780	0.330	1.000	1.750	0.280	1.020		1800																																																																																																																																																																																																																																																																																																																																										
	* 1.006	S1A	1.750	0.280	1.020	1.750	0.280	1.020		2100																																																																																																																																																																																																																																																																																																																																										
	* 18.000	S14	0.880	-0.245	0.900	1.140	-0.335	1.250		1800																																																																																																																																																																																																																																																																																																																																										
	* 19.000	S13	0.950	-0.175	0.900	1.140	-0.335	1.250		1800																																																																																																																																																																																																																																																																																																																																										
	20.000	AP	1.410	0.985	0.200	0.860	0.435	0.200		225																																																																																																																																																																																																																																																																																																																																										
	20.001	Outlet	0.860	0.435	0.200	1.010	-0.115	0.900		600 x 600																																																																																																																																																																																																																																																																																																																																										
	21.000	S17	1.650	0.900	0.600	1.540	0.790	0.600		1200																																																																																																																																																																																																																																																																																																																																										
	21.001	S16	1.540	0.715	0.675	1.010	-0.040	0.900		1200																																																																																																																																																																																																																																																																																																																																										
	* 20.002	S15	1.010	-0.190	0.900	1.140	-0.410	1.250		1800																																																																																																																																																																																																																																																																																																																																										
	* 18.001	S12	1.140	-0.410	1.250	1.190	-0.440	1.330		2100																																																																																																																																																																																																																																																																																																																																										
	* 18.002	Separator	1.190	-0.540	1.430	1.210	-0.570	1.480		2260 x 1225																																																																																																																																																																																																																																																																																																																																										
	* 18.003	SW Pump Station	1.210	-0.570	1.680	1.750	0.600	1.050	Pump	3000																																																																																																																																																																																																																																																																																																																																										
	1.007	S1	1.750	0.250	0.814	1.800	0.100	1.014		1800																																																																																																																																																																																																																																																																																																																																										
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Conduit Sections for 28506 - SW DESIGN - 25-04-12.SWS

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \ / open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m ²)
51	O	356	533			0.412	0.145
53	O	457	686			0.529	0.240
-1	oo	900	450			0.450	0.318

Becket House
Vestry Road
Kent TN14 5EL

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Setting Out Information - True Coordinates (28506 - SW DESIGN -
25-04-12.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
7.003	Syphon Drop	S4	1200	494130.205	100675.066	
8.000			300	494182.881	100634.630	
8.001		SB1	1800	494181.220	100636.964	
7.004		S3	1800	494171.137	100651.868	
9.000	AP	225		494107.001	100693.981	
9.001	Step	350		494156.407	100666.060	
10.000	AP	350		494172.836	100577.503	
10.001	Outlet	375		494197.779	100621.643	
10.002	Inlet	600	600	494192.755	100645.519	
9.002	Inlet / Outlet	600	600	494164.721	100661.362	
9.003	Inlet	600	600	494172.206	100674.607	
11.000	AP	350		494199.873	100657.751	
12.000	AP	225		494239.919	100728.614	
12.001	Outlet	225		494232.983	100716.341	
12.002	AP	225		494231.024	100712.874	

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Setting Out Information - True Coordinates (28506 - SW DESIGN - 25-04-12.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
19.000	S13	1800		494152.316	100548.722	
20.000	AP	225		494213.511	100647.546	
20.001	Outlet	600	600	494177.104	100583.124	
21.000	S17	1200		494228.655	100667.810	
21.001	S16	1200		494219.492	100650.557	
20.002	S15	1800		494182.035	100580.042	
18.001	S12	2100		494165.901	100551.574	
18.002	Separator	2260	1225	494168.111	100550.321	
18.003	SW Pump Station	3000		494170.537	100548.946	
1.007	S1	1800		494229.737	100660.036	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.007	1	1800		494243.703	100652.868	

Free Flowing Outfall Details for 28506 - SW DESIGN - 25-04-12.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	1	1.800	0.100	0.000	1800	0

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Simulation Criteria for 28506 - SW DESIGN - 25-04-12.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
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	1
Number of Online Controls	1	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)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for 28506 - SW DESIGN - 25-04-12.SWS

Pump Manhole: SW Pump Station, DS/PN: 18.003, Volume (m³): 12.6

Invert Level (m) -0.570

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	30.0000	0.900	30.0000	1.700	30.0000	2.500	30.0000
0.200	30.0000	1.000	30.0000	1.800	30.0000	2.600	30.0000
0.300	30.0000	1.100	30.0000	1.900	30.0000	2.700	30.0000
0.400	30.0000	1.200	30.0000	2.000	30.0000	2.800	30.0000
0.500	30.0000	1.300	30.0000	2.100	30.0000	2.900	30.0000
0.600	30.0000	1.400	30.0000	2.200	30.0000	3.000	30.0000
0.700	30.0000	1.500	30.0000	2.300	30.0000		
0.800	30.0000	1.600	30.0000	2.400	30.0000		

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Becket House Vestry Road Kent TN14 5EL	SSL BOGNOR REGIS SURFACE WATER DRAINAGE 1 & 30 YR STORMS																			
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Micro Drainage Network W.12.6.1																				
<u>Storage Structures for 28506 - SW DESIGN - 25-04-12.SWS</u> <u>Cellular Storage Manhole: SDS Tank, DS/PN: 5.003</u> Invert Level (m) 0.330 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>1920.0</td> <td>1920.0</td> <td>0.600</td> <td>0.0</td> <td>2012.0</td> </tr> <tr> <td>0.500</td> <td>1920.0</td> <td>2012.0</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	1920.0	1920.0	0.600	0.0	2012.0	0.500	1920.0	2012.0			
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	1920.0	1920.0	0.600	0.0	2012.0															
0.500	1920.0	2012.0																		
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<u>Summary of Critical Results by Maximum Level (Rank 1) for 28506 - SW DESIGN</u> <u>- 25-04-12.SWS</u>		
Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status ON DVD Status ON Inertia Status ON		
Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440 Return Period(s) (years) 1, 30 Climate Change (%) 0, 0		
PN	Storm	Return Climate First X First Y First Z O/F Lvl Period Change Surcharge Flood Overflow Act. Exc.
1.000	15 Winter	30 0% 30/15 Summer
1.001	15 Winter	30 0% 30/15 Summer
2.000	15 Winter	30 0% 30/15 Summer
1.002	15 Winter	30 0% 30/15 Summer
3.000	15 Winter	30 0% 30/15 Summer
1.003	15 Winter	30 0% 30/15 Summer
4.000	15 Winter	30 0% 30/15 Summer
1.004	15 Winter	30 0% 30/15 Summer
1.005	15 Winter	30 0% 30/15 Summer
5.000	15 Winter	30 0% 30/15 Summer
5.001	15 Winter	30 0% 30/15 Summer
6.000	15 Winter	30 0%
7.000	15 Winter	30 0% 1/15 Summer
7.001	15 Winter	30 0% 30/15 Summer
7.002	15 Winter	30 0% 30/15 Summer
7.003	15 Winter	30 0% 30/15 Summer
8.000	15 Winter	30 0% 30/15 Summer
8.001	15 Winter	30 0% 30/15 Winter
7.004	15 Winter	30 0% 30/15 Summer
9.000	15 Winter	30 0% 30/15 Summer
9.001	15 Winter	30 0%
10.000	15 Winter	30 0%
10.001	15 Winter	30 0%
10.002	15 Winter	30 0%
9.002	15 Winter	30 0%
9.003	15 Winter	30 0%
11.000	15 Winter	30 0% 30/15 Summer
12.000	15 Winter	30 0% 30/15 Summer
12.001	15 Winter	30 0% 30/15 Summer
12.002	15 Winter	30 0% 30/15 Summer
11.001	15 Winter	30 0%
13.000	15 Winter	30 0% 30/15 Summer
11.002	15 Winter	30 0%
14.000	15 Winter	30 0% 30/15 Summer
15.000	15 Winter	30 0%
14.001	15 Winter	30 0% 30/15 Summer
16.000	15 Winter	30 0% 30/15 Summer
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Summary of Critical Results by Maximum Level (Rank 1) for 28506 - SW DESIGN								
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PN	Storm	Return Climate Period	Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
17.000	15 Winter	30	0%					
14.002	15 Winter	30	0%	30/15 Summer				
9.004	15 Winter	30	0%	30/15 Summer				
9.005	15 Winter	30	0%	30/15 Summer				
5.002	15 Winter	30	0%	30/15 Summer				
5.003	240 Winter	30	0%					
1.006	120 Winter	30	0%	30/120 Winter				
18.000	30 Winter	30	0%	30/15 Summer				
19.000	30 Winter	30	0%	30/15 Summer				
20.000	15 Winter	30	0%					
20.001	30 Winter	30	0%	30/15 Winter				
21.000	15 Winter	30	0%	30/15 Summer				
21.001	15 Winter	30	0%	30/15 Summer				
20.002	30 Winter	30	0%	30/15 Summer				
18.001	30 Winter	30	0%	30/15 Summer				
18.002	30 Winter	30	0%	1/15 Summer				
18.003	30 Winter	30	0%	1/15 Summer				
1.007	120 Winter	30	0%					
PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000		S12.1 1.875	0.347	0.000	0.65	0.0	69.4	FLOOD RISK
1.001		S12 1.847	0.376	0.000	0.56	0.0	89.1	FLOOD RISK
2.000		S11.1 1.841	0.352	0.000	0.38	0.0	23.5	FLOOD RISK
1.002		S11 1.817	0.411	0.000	0.67	0.0	107.1	FLOOD RISK
3.000		S10.1 1.751	0.387	0.000	1.20	0.0	82.3	FLOOD RISK
1.003		S10 1.724	0.384	0.000	1.08	0.0	188.8	FLOOD RISK
4.000		S9.1 1.614	0.373	0.000	1.26	0.0	58.3	SURCHARGED
1.004		S9 1.584	0.363	0.000	1.30	0.0	242.3	SURCHARGED
1.005		S8 1.217	0.208	0.000	1.27	0.0	242.9	SURCHARGED
5.000		S7 1.415	0.296	0.000	1.21	0.0	33.8	SURCHARGED
5.001		S6 1.307	0.402	0.000	0.88	0.0	25.6	SURCHARGED
6.000		S5 1.084	-0.121	0.000	0.39	0.0	16.1	OK
7.000	Syphon Drop	1.812	0.212	0.000	3.27	0.0	123.6	FLOOD RISK
7.001		SB2 1.367	0.292	0.000	1.43	0.0	117.8	SURCHARGED
7.002		RHU 1.306	0.256	0.000	1.24	0.0	101.6	SURCHARGED
7.003		S4 1.267	0.242	0.000	0.70	0.0	98.3	SURCHARGED
8.000	Syphon Drop	2.097	0.197	0.000	2.09	0.0	120.6	FLOOD RISK
8.001		SB1 1.376	0.001	0.000	1.12	0.0	119.6	SURCHARGED
7.004		S3 1.213	0.298	0.000	1.45	0.0	199.6	SURCHARGED
9.000		AP 1.950	0.135	0.000	1.49	0.0	23.2	FLOOD RISK
9.001		Step 1.657	-0.158	0.000	0.58	0.0	25.8	OK
10.000		AP 1.540	-0.060	0.000	0.94	0.0	45.8	OK
10.001		Outlet 1.450	-0.150	0.000	0.34	0.0	41.9	OK
10.002		Inlet 1.409	-0.224	0.000	0.83	0.0	50.7	OK
9.002	Inlet / Outlet	1.348	-0.202	0.000	0.40	0.0	71.0	OK
9.003		Inlet 1.324	-0.101	0.000	1.88	0.0	92.2	OK
11.000		AP 1.602	0.087	0.000	1.37	0.0	64.9	FLOOD RISK
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Summary of Critical Results by Maximum Level (Rank 1) for 28506 - SW DESIGN
- 25-04-12.SWS

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m ³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
12.000	AP	1.591	0.076	0.000	1.15	0.0	12.8	FLOOD RISK
12.001	Outlet	1.568	0.053	0.000	0.51	0.0	13.0	FLOOD RISK
12.002	AP	1.559	0.044	0.000	2.44	0.0	26.2	FLOOD RISK
11.001	Inlet / Outlet	1.438	-0.077	0.000	0.82	0.0	80.4	FLOOD RISK
13.000	AP	1.547	0.032	0.000	1.74	0.0	59.5	FLOOD RISK
11.002	Step	1.382	-0.043	0.000	2.43	0.0	146.7	OK
14.000	AP	1.702	0.017	0.000	1.23	0.0	12.5	FLOOD RISK
15.000	AP	1.625	-0.060	0.000	0.86	0.0	13.3	FLOOD RISK
14.001	Inlet / Outlet B	1.518	0.433	0.000	0.54	0.0	22.8	SURCHARGED
16.000	AP	1.495	0.030	0.000	1.83	0.0	73.1	FLOOD RISK
17.000	AP	1.540	-0.108	0.000	0.89	0.0	71.3	FLOOD RISK
14.002	Inlet / Outlet A	1.467	0.462	0.000	1.42	0.0	135.5	FLOOD RISK
9.004	Inlet / Outlet	1.283	0.183	0.000	1.63	0.0	354.6	SURCHARGED
9.005	Separator	1.159	0.069	0.000	1.02	0.0	353.4	SURCHARGED
5.002	S2	1.035	0.205	0.000	2.20	0.0	590.4	SURCHARGED
5.003	SDS Tank	0.771	-0.009	0.000	0.18	0.0	48.3	OK
1.006	S1A	0.731	0.001	0.000	1.14	0.0	82.2	SURCHARGED
18.000	S14	0.817	0.837	0.000	0.41	0.0	12.3	FLOOD RISK
19.000	S13	0.825	0.775	0.000	0.64	0.0	31.4	FLOOD RISK
20.000	AP	1.146	-0.064	0.000	0.80	0.0	34.8	FLOOD RISK
20.001	Outlet	0.836	0.176	0.000	0.27	0.0	28.7	FLOOD RISK
21.000	S17	1.149	0.099	0.000	1.39	0.0	17.3	SURCHARGED
21.001	S16	0.999	0.134	0.000	0.86	0.0	14.6	SURCHARGED
20.002	S15	0.828	0.718	0.000	0.37	0.0	31.0	FLOOD RISK
18.001	S12	0.809	0.919	0.000	0.91	0.0	56.1	SURCHARGED
18.002	Separator	0.726	0.966	0.000	0.80	0.0	49.2	SURCHARGED
18.003	SW Pump Station	0.645	1.115	0.000	16.30	0.0	30.0	SURCHARGED
1.007	S1	0.518	-0.418	0.000	0.34	0.0	112.3	OK

APPENDIX D

Gary Gabriel Associates Foul
Water Drainage Strategy



SAINSBURY'S STORE, SHRIPNEY ROAD,
BOGNOR REGIS

FOUL WATER DRAINAGE ASSESSMENT

1.0 INTRODUCTION

The development comprises a new Sainsbury's store set at ground level with an associated car park and petrol filling station. Access to the site will be from Shripney Road (A29).

2.0 EXISTING DRAINAGE

An existing public foul sewer is located under the edge of Shripney Road and crossing the north part of the site and passing under the site entrance road.

3.0 PROPOSED FOUL WATER DRAINAGE

Two new connections are proposed. The main connection from the store will discharge to the sewer to the north of the store adjacent to the bus stop.

A second connection is proposed to the east from the petrol filling station.

Prepared By: M Hargrave

Approved By:

Project No.

28506

Revision

Date

12/03/12

APPENDIX E

Pollution Prevention Guidelines

GENERAL GUIDE TO THE PREVENTION OF POLLUTION: PPG1

POLLUTION PREVENTION GUIDELINES

These guidelines are an introduction to both pollution prevention and the guidance notes on this subject produced by the Environment Agency for England & Wales, the Scottish Environment Protection Agency and the Environment and Heritage Service in Northern Ireland. These bodies are referred to in these notes as the Agency or Agencies. Each site and potential source of pollution should be assessed individually and we advise you to consult your local Agency office. Contact details are listed at the end of these guidelines.

Note that in these guidelines the term 'oil separator' is used. This has the same meaning as 'oil interceptor'.

1. INTRODUCTION

Businesses and individuals are responsible for complying with environmental regulations and for preventing pollution of air, land and water. Many thousands of pollution incidents occur each year, originating from factories, farms, transport activities and even homes. Each incident is an offence and can result in prosecution as well as environmental damage. However, most cases are avoidable, given careful planning of operations, responsible waste management and suitable facilities to reduce the risk of spillage - along with simple precautions to deal with any spillages, in case they occur.

Responsible waste management can ensure that you comply with the relevant regulations, while minimising waste can reduce the amount of waste produced, which in turn cuts the risk of environmental damage and the costs of waste disposal.

The series of Pollution Prevention Guidance notes (known as PPGs), of which this is the first, provides practical advice that will help you to avoid causing pollution, minimise waste and comply with the requirements of the law. Often the necessary measures cost little, especially if you think about them early on, for example at the design stage, and can save you money, too. In contrast, the fines for failing to comply with the relevant regulations or the costs of cleaning up pollution (which are recovered from the polluter wherever possible) can be very high.

The guidance notes cover either a topic of relevance to many sectors, such as oil storage or the use of pressure washers, or are specific to a particular type of site, such as schools, vehicle-servicing garages or hospitals. In general, they are cross-referenced to reduce repetition; the guidance on hospitals, for example, refers to the guidance on oil storage and does not repeat it in detail. You may therefore need several different guidance notes for any one site or operation. Additional guidance on complying with environmental regulations is available - see Reference 1.

2. AVAILABILITY

The PPGs are published jointly by the three principal environmental regulators in the UK, and appear on the Environment Agency and SEPA web sites. A full list of PPGs and small numbers of them can be ordered, free of charge, from the local Agency offices (listed at the end of these guidelines). Bulk supplies are also available, although a charge to cover printing costs may be made.

3. LEGAL FRAMEWORK

The Agencies are responsible for protecting "controlled waters" from pollution, for preventing waste management from polluting the environment, causing harm to human health and detriment to local amenity and for regulating radioactive substances (except in Northern Ireland). The release of the most seriously polluting substances to water, land or air from prescribed processes may be subject to additional regulation under the system of Integrated Pollution Control introduced by the Environmental Protection Act 1990.

"Controlled waters" include all watercourses, lakes, lochs, canals, coastal waters and water contained in underground strata (or "groundwater"), and it is an offence to pollute such waters - deliberately or accidentally. In addition, the formal consent of the Agency is required for many discharges to controlled waters, including direct discharges and discharges to soakaways. Such consents are granted subject to conditions, and are not issued automatically.

Any other waste produced on a site will be subject to the Duty of Care (Reference 2) and may also be subject to control under the Waste Management Licensing Regulations 1994. In addition, certain wastes are defined as "Special Wastes" and are subject to more rigorous controls (Reference 3). Advice is available from the Agencies.

The Agencies are also responsible for implementing the legislation on packaging, which affects companies with an annual turnover above £2 million and handling more than 50 tonnes of packaging per year (see Reference 4).

All discharges to the foul sewer (see 4a) require authorisation by the sewerage undertaker and may be subject to the terms and conditions of a trade effluent consent.

4. SITE DRAINAGE

a. Drainage

Most existing sites will have two types of drain. Surface water drains, including land drains and most road drains, should carry only uncontaminated rainwater, as they will lead to a local river, stream or soakaway. The foul water drain is designed to carry contaminated waste water safely to a storage lagoon, treatment system or sewage works for treatment. In the case of an isolated house, or a small community biological treatment plant, care should be taken not to overload this by disposing of disinfectant or grease down the foul drain (see PPG4 – Reference 5). Prior agreement from the local sewerage undertaker is required before you connect to the public foul water system. Where significant work is being undertaken on an existing site or a new development, the Agencies encourage the consideration of an alternative approach for surface drainage, which uses a combination of techniques known collectively as **Sustainable Drainage Systems (SuDS)**. This approach has significant environmental benefits and may also have lower installation costs. See Reference 6 for further details.

b. Surface water treatment

Surface water can be contaminated with silt, heavy metals, chemicals and oil, which can be damaging in watercourses and groundwater. In many cases, it will require treatment by controlling the pollution at its source or just before the discharge point. SuDS may provide a suitable solution (see Reference 6). In areas where there is a high risk of oil pollution, it may be necessary to install an oil separator to protect the surface water system and reduce the risk of pollution. See separate guidelines for details (PPG3 - Reference 7).

c. Wrong connections

Wrongly connected effluents can cause severe pollution problems, which can be difficult to remedy. Sources of dirty water, such as sinks and toilets, should be connected to the foul sewer and the nearest drain. Manhole covers and gullies should be clearly marked, by colour coding, with red for foul and blue for surface water, and site drainage plans should be readily accessible.

d. Garage forecourts and fuel delivery areas

Because of the potential for pollution from these areas, oil separation is required. Effluent resulting from the cleaning of forecourts must not be discharged to surface water drains, watercourses or soakaways. Details of surface water disposal and other potentially polluting activities are included in PPG7 – Reference 8.

e. Cleaning activities

Wash waters from mobile pressure washers should not be discharged to surface water drains, watercourses or soakaways. Even if described as bio-degradable, detergents are not suitable for discharge to surface drains, so such activities should be carried out in designated areas draining to the foul sewer (subject to the approval of the local sewerage undertaker). Alternatively, closed loop vehicle wash recycling systems are available. See PPG13 - Reference 9 for further details.

f. Sewage disposal

All foul sewage should pass to the local foul sewer if possible. If not, other arrangements should be discussed with your local Agency office (see PPG4 - Reference 5). Most alternatives will normally require the formal consent of the Agency.

g. Chemical storage areas

Drainage from such areas presents special problems and you should consult fully with your local Agency office to minimise the pollution risks.

5. WASTE STORAGE AND DISPOSAL

a. Reduce, re-use and recycle

Methods to reduce the amount of waste generated in the first place, together with the re-use and recycling of wastes, must be considered. There is scope for significant savings, as the costs of raw materials and waste disposal continue to rise. Advice on waste minimisation and local initiatives can be obtained from your nearest Agency office. Independent advice on this and on any other environmental problem is available free through the Envirowise Helpline on 0800 585794.

b. Duty of Care and waste legislation

To prevent fly-tipping, producers of waste must ensure that it remains under their control and is passed on only to a registered waste carrier and is accompanied by a full description. Some wastes, such as used mineral oil, are subject to the Special Waste Regulations, which impose additional controls on movement and disposal (Reference 3). Contact your local Agency office for further advice.

c. Storage

All wastes must be stored in designated areas that are isolated from surface drains and banded to contain any spillages. Rubbish compactors should be covered to prevent the build-up of contaminated rainwater and drained to the foul sewer to prevent polluting liquid entering the surface water drains. Compactor hydraulics should be maintained in good order.

6. DELIVERIES AND SECURITY

a. Deliveries

Special care should be taken during deliveries, particularly when hazardous materials are involved. Deliveries should be supervised at all times, tanks and containers should be labelled with the nature and volume of their contents, and the levels should be checked before delivery to prevent overfilling.

b. Delivery areas

Where possible, loading and unloading areas should be roofed and drained to the foul sewer. If not, they should be clearly marked and isolated from the surface water drainage system, either by catch-pits or sumps with isolating valves. Cut-off valves in the drainage system and raised kerb surrounds may be needed. Delivery pipes should be fitted with automatic cut-off valves to prevent overfilling. You are recommended to consult with the Agency.

c. Security

Vandalism and theft are frequent causes of pollution. Lockable valves should be fitted on all storage tanks, fences should be secure, and doors and gates kept locked. Where possible, materials should be stored under cover and potential pollutants should be transferred into safe storage without delay.

7. OIL STORAGE AND PIPELINES

The storage of oil at industrial, commercial, institutional and institutional residential premises in England is to be the subject of new regulations due to be introduced in late 2000. Similar regulations for Wales and Scotland are under consideration. These will introduce statutory minimum storage standards. PPG2 - Reference 10 covers above ground oil storage, with the key points listed below;

a. Storage

Any oil storage tank and oil stored in drums should be sited on an impervious base within an oil-tight bund with no drainage outlet. All fill pipes, draw pipes and sight gauges should be enclosed within the bund, and the tank vent pipe should be directed downwards into it. Advice is available on the construction of bund walls (References 11 and 12) and the storage and disposal of used oils (PPG8 - Reference 13).

b. Pipelines

Site pipelines in an accessible position above the ground where possible, as underground tanks and pipelines may be subject to damage and corrosion. Where a pipeline has to be laid underground, it should be corrosion resistant and placed in a protective sleeve or a duct with open grating covers for inspection purposes, and should be tested regularly. Underground pipeline connections should be minimised and, where used, should have access points for inspection. Underground tanks and pipelines may be subject to special restrictions where there is a risk to groundwaters.

8. CONTINGENCY PLANS

Spillages and run-off water from fire-fighting may have the potential to cause enormous damage to controlled waters (see PPG18 - Reference 14). It is recommended that appropriate spill kits or absorbent materials are held on site. It is essential that staff know what to do in an emergency. An up-to-date drainage plan should be maintained, hazards identified and a contingency plan drawn up, giving advice on what action to take and who to inform. These plans should be displayed clearly and regular exercises undertaken. Guidance on the development of a pollution incident response plan and a template plan are provided in PPG21 - Reference 15.

9. CONSTRUCTION AND DEMOLITION

Detailed guidance is available on construction and demolition (PPG6 - Reference 16). It is important to note that the prior approval of the Agency must be obtained where site de-watering might result in a discharge to controlled waters. Any discharge must be free from solids in suspension, oil or other polluting materials. Silt is a non-toxic pollutant and, in the absence of other contaminants, silty water may be disposed of by pumping to the foul sewer, a settlement tank or over a grassed area. However, if any other contaminant is present, you should consult the Agency on its disposal.

10. AGRICULTURE

Agricultural activities have resulted in significant water pollution in the past, and continue to have the potential to cause such damage unless properly managed. Detailed guidance on preventing pollution from agricultural activities is available (see Reference 17).

11. GROUNDWATER POLLUTION

Spillage, incorrect storage of chemicals or waste materials or unsuitable disposal activities can result in pollutants seeping through the soil, causing serious harm to groundwater – which is a vital source of drinking water. Chlorinated solvents are the most widespread and severe cause of groundwater pollution, and handling them requires special care. The Agencies have strong powers to take action relating to the storage, handling, use or disposal of certain dangerous substances posing a risk of contaminating groundwaters. The prior authorisation of the Agency is required before you dispose of wastes containing certain dangerous substances into or onto land, and advice on this is available from your local Agency office.

12. REFERENCES

1. NetRegs - www.environment-agency.gov.uk/netregs
 2. Waste Management - The Duty of Care - A Code of Practice Revised 1996): ISBN 0-11-753210-X: The Stationery Office Tel. 08706 005522
 3. A guide to the Special Waste Regulation: Environment Agency
A guide to the Special Waste Regulations 1996: SEPA
A guide to the Special Waste Regulations (Northern Ireland) 1998: Environment and Heritage Service
 4. Producer responsibility obligations (packaging waste) Regulations 1997: SEPA/Environment Agency
 5. PPG4: Disposal of sewage where no mains drainage is available
 6. Sustainable Urban Drainage – an introduction: SEPA/Environment Agency/EHS(NI)
 7. PPG3: Use and design of oil separators in surface water drainage systems
 8. PPG7: Fuelling stations: construction and operation
 9. PPG13: The use of high pressure water and steam cleaners
 10. PPG2: Above ground oil storage tanks
 11. Masonry bunds for oil storage tanks
 12. Concrete bunds for oil storage tanks
 13. PPG8: Safe storage and disposal of used oils
 14. PPG18: Managing fire water and major spillages
 15. PPG21: Pollution incident response planning
 16. PPG6: Working at demolition and construction sites
 17. Codes of Good Agricultural Practice for the Protection of Water, Soil and Air: MAFF Publications, Telephone: 0645 556000
- Prevention of Environmental Pollution from Agricultural Activity:
The Scottish Executive Rural Affairs Department (SERAD), Edinburgh
- Water - Preventing Pollution, series of 11 leaflets: Department of Agriculture and Rural Development for Northern Ireland
- References 3-16 are available from the Agency

All the Agencies' pollution prevention guidance notes are available on the web sites listed below.

ENVIRONMENT AGENCY

HEAD OFFICE

Rio House, Waterside Drive, , Aztec West
Almondsbury, Bristol BS32 4UD.
Tel: 01454 624 400 Fax: 01454 624 409
World Wide Web: <http://www.environment-agency.gov.uk>

REGIONAL OFFICES

ANGLIAN

Kingfisher House
Goldhay Way
Orton Goldhay
Peterborough PE2 5ZR
Tel: 01733 371 811
Fax: 01733 231 840

MIDLANDS

Sapphire East
550 Streetsbrook Road
Solihull B91 1QT
Tel: 0121 711 2324
Fax: 0121 711 5824

NORTH EAST

Rivers House
21 Park Square South
Leeds LS1 2QG
Tel: 0113 244 0191
Fax: 0113 246 1889

NORTH WEST

Richard Fairclough House
Knutsford Road
Warrington WA4 1HG
Tel: 01925 653 999
Fax: 01925 415 961

SOUTHERN

Guildbourne House
Chatsworth Road
Worthing
West Sussex BN11 1LD
Tel: 01903 832 000
Fax: 01903 821 832

SOUTH WEST

Manley House
Kestrel Way
Exeter EX2 7LQ
Tel: 01392 444 000
Fax: 01392 444 238

THAMES

Kings Meadow House
Kings Meadow Road
Reading RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

WELSH

Rivers House
St Mellons Business Park
St Mellons
Cardiff CF3 0EY
Tel: 029 2077 0088
Fax: 029 2079 8555

SCOTTISH ENVIRONMENT PROTECTION AGENCY

CORPORATE OFFICE

Erskine Court
The Castle Business Park
Stirling FK9 4TR
Tel: 01786 457 700
Fax: 01786 446 885
World Wide Web: <http://www.sepa.org.uk>

AREA OFFICES

HIGHLANDS, ISLAND AND GRAMPIAN AREA

Graesser House
Fodderty Way
Dingwall Business Park
Dingwall IV15 9XB
Tel: 01349 862 021
Fax: 01349 863 987

SOUTH WEST AREA

SEPA West
5 Redwood Crescent
Peel Park
East Kilbride G74 5PP
Tel: 01355 574 200
Fax: 01355 574 688

SOUTH EAST AREA

Clearwater House
Heriot-Watt Research Park
Avenue North
Riccatorn
Edinburgh EH14 4AP
Tel: 0131 449 7296
Fax: 0131 449 7277

ENVIRONMENT & HERITAGE SERVICE

Calvert House,
23 Castle Place,
Belfast
BT1 1FY
Tel: 028 9025 4868
Fax: 028 9025 4777

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water in England, Wales, Scotland and Northern Ireland.

EMERGENCY HOTLINE

0800 80 70 60



ENVIRONMENT
AGENCY



ENVIRONMENTAL ALLIANCE – WORKING TOGETHER

Environment Alliance - working together

pollution prevention guidelines

Vehicle washing and cleaning: PPG13

These guidelines are jointly produced by the Environment Agency for England and Wales, the Scottish Environment Protection Agency, and the Environment and Heritage Service for Northern Ireland (referred to here as 'we' or 'us').

Following this good practice guidance doesn't remove your responsibility to comply with the law and prevent pollution from your activities. Causing or allowing pollution is a criminal offence; compliance with this or any guidance isn't a defence. You should make sure that the references to other sources of guidance are still current; use updated guidance if it exists.

This guidance covers vehicle washing and cleaning by all methods, including:

- automatic wash systems
- washing by hand
- using high pressure or steam cleaners

at all sites including:

- retail premises
- business and industrial premises
- public and private car parks
- former petrol filling stations

This guidance also applies to washing and cleaning plant, machinery, equipment and boats as the principles are generally the same. It doesn't cover household activities but our good practice advice would be to use a commercial facility (car wash) that re-uses water, or hand wash with a bucketful of water and a sponge without using detergent, traffic film removers, degreasants or other proprietary cleaners. We discourage the use of hose-pipes or high pressure cleaners for car washing at home. Contact us if you need further advice.

Following this guidance will help you plan and deal with liquid and solid waste, reduce the risk of causing pollution, and, by using water wisely, could save you money.

1. Introduction

Effluent and run-off from vehicle washing and cleaning activities can damage the environment and pollute rivers, streams, burns and groundwater. Dirt, brake dust, traffic film residue and oil that is washed off are all pollutants. The cleaning agents you use (including those labelled biodegradable or traffic film removers) are very poisonous to river life. If you cause pollution, you are breaking the law and spoiling your environment.

Dirty water or run-off from vehicle washing and cleaning carried out as a business or industrial activity is called trade effluent. Whether you're cleaning just one vehicle or responsible for a large lorry fleet, you must arrange for collection and disposal of effluent to prevent pollution. It's illegal to discharge trade effluent to the environment or into drains without permission.

1.1 Find out about drainage systems and get a drainage plan

Understanding your drainage system is the key to preventing pollution. Most areas have what is known as a separate drainage system where there are two types of drain:

- **Surface water or clean water drains** should only carry uncontaminated rainwater; they lead directly to ditches, streams, burns, rivers and soakaways. Roof water, car park, road and some yard drainage is usually connected to the surface water drainage system
- **Foul water drains** carry contaminated water (sewage and/or trade effluent) safely to a sewage treatment facility, which is either owned privately or by the local sewage treatment provider. Any system designed to carry foul water is called a foul water drainage system

Drains (surface water and foul) are also known as sewers. Your local sewer provider is the organisation with the legal responsibility to provide public sewerage and sewage treatment facilities in your area. Drains owned by the local sewer provider are known as mains drainage, main sewers or public sewerage systems.

Older, urban areas might have a **combined** drainage system that has one drain, carrying both foul and surface water to a sewage treatment facility.

Techniques called “sustainable drainage systems” (SUDS) are now used as a better way of dealing with surface water run-off, rather than using piped outfalls to rivers, streams or burns. In Scotland, the use of SUDS is a legal requirement for surface water disposal. These systems must be protected from contamination in the same way as piped surface water drainage systems. See reference 1 for more information on SUDS.

To prevent pollution, don't allow washing or cleaning effluent, runoff or cleaning chemicals to enter oil separators, drains or gullies connected to the surface water drainage system. You need to have a good, up-to-date drainage plan of your whole site, including areas where vehicle washing and cleaning will take place. If you don't have a plan, you can't be sure that drainage is connected to the right system. If there is no in-house expertise to do this, use a reputable drainage consultant or consulting engineering company.

In Scotland, General Binding Rules (GBRs) apply to discharges into surface water drainage systems. See reference 2. Under the GBRs:

- trade effluent mustn't be discharged into any surface water drainage system; and
- detergents or other pollutants mustn't be disposed of into, or onto surfaces that drain into, any surface water drainage system

1.2 Protecting our groundwater supplies

In some parts of the UK, over 70% of the drinking water is supplied from natural underground reservoirs in porous rocks, called aquifers. Cleaning up groundwater is difficult and very expensive so you must protect it from pollution. Never carry out washing or cleaning on unmade ground or other porous surfaces where run-off could soak down through the soil and pollute valuable groundwater resources, always check with your local office for advice.

In some very sensitive groundwater areas, we might ask for more stringent pollution prevention measures than those detailed in this guidance note. In some cases, this might mean we won't allow this activity to take place at all.

1.3 General advice on drainage, trade effluent, environmental legislation and good practice

For more general information on drainage, trade effluent and good environmental practices see reference 3. The NetRegs website has information about the environmental regulations you must comply with, and good practice recommendations that you should follow, for trade effluent, preventing water pollution, efficient water use and other relevant topics. See reference 4.

2. What kind of vehicle washing and cleaning are you doing?

Think about what you're doing and the best way to manage your cleaning activity and any effluent.

Are you:

washing and cleaning your own business vehicles and plant on your own premises?

What do you need to wash or clean, and where? If you use a vehicle cleaning business or contractor to work on your site, it's your responsibility to provide appropriate facilities such as those detailed in section 3. Using washing equipment that re-uses water might be more cost effective, as would using a nearby commercial wash facility.

allowing washing and cleaning to be carried out for commercial gain by someone else on land or premises that you own?

Are you giving clear instructions about where and how the washing and cleaning is to be carried out and how solid and liquid waste should be dealt with? Have you provided appropriate facilities? As a landowner or landlord, you are responsible for:

- trade effluent and surface water discharges
- pollution caused by site contractors, service providers and tenants. You must provide good environmental practices and guidelines and make sure that site operators follow them; see section 3, 4 and 5. If you allow washing and cleaning to take place in an unsuitable area, you might be prosecuted for permitting pollution

washing and cleaning vehicles as your business?

Where and how will you carry out your business? If you offer an on-site vehicle washing and cleaning service (including franchises), you must use a designated washing area that has proper drainage arrangements if run-off is produced from your activities; see section 3. If there isn't a designated area, your activities might cause pollution and you will be responsible even though you don't own the site. If your business involves washing cars by hand see section 4. What solid wastes will you produce and what arrangements have you made for its correct disposal? See section 5.

3. Requirements for all vehicle washing and cleaning activities

Activities that produce run-off from the vehicle onto the ground and use cleaning and valeting products should be carried out in areas that are clearly marked and isolated from surface water drainage systems, unmade ground and porous surfaces. These areas are called **designated washing bays**.

A designated washing bay should be designed so that run-off is:

- isolated using channels, gullies, gradient (fall on the surface) and kerbs
- directed to a silt trap or settlement tank to remove larger particles of silt and sediment
- either collected in a sealed system for reuse, discharged to the public foul sewer with prior permission of the local sewer provider or collected in a sealed system for authorised disposal

You should also:

- have procedures for everyone, including contractors, that cover where and how vehicle washing and cleaning should be carried out and what to do in a spillage emergency
- provide notices for designated washing bays saying what they're for and that washing and cleaning should only be carried out in the bay
- consider whether a fence or barrier is required to prevent spray or wind drift out of the designated area
- have procedures and equipment which minimises water use and solid waste production

3.1 Reduce, reuse and recycle – resource efficiency and waste minimisation

You should consider ways to reduce the volume of water you use for washing and cleaning, and the amount of liquid and solid waste you produce. Recycling effluent and reusing the water is the best environmental option for dealing with vehicle washing and cleaning effluent. Use washing equipment that has a collection and re-use or re-circulation process. These systems usually require regular, off-site removal of some water, silt or sludge so waste management licensing legislation will apply; see section 3.2 and 5

A waste minimisation review will help you save money on raw materials and waste disposal costs. Free, independent and practical advice on how to minimise waste is available from Envirowise; this includes free publications, events, site visits and waste reviews. See reference 5.

3.2 Connecting and discharging to a public foul sewer

If recycling and reuse isn't possible, discharging all the vehicle washing and cleaning effluent to a public foul sewer is generally the next best environmental option as the effluent is carried to a purpose-built and closely monitored sewage treatment plant. You need permission from your local sewer provider to discharge vehicle washing and cleaning effluent to a public foul sewer. Permission (a consent or agreement) isn't given automatically so you must talk to your sewer provider before you make any connection or discharge. If you don't have their consent, you're breaking the law. See reference 6 to find your local sewer provider.

You're likely to pay for this discharge; the amount depends on volume and chemical composition. You should give your local sewer provider an accurate site drainage plan to support your proposals. You might have to cover your designated washing bay to prevent clean rainwater adding to the volume of effluent. You might also be required to provide an oil separator for the discharge.

3.3 What happens if a public foul sewer isn't available?

If you can't recycle water or connect to a suitable public foul sewer, you'll have to consider these options:

- carry out washing and cleaning activities on another site that does have proper facilities
- collect all the effluent in a sealed system for off-site removal as a liquid waste. Waste management licensing legislation will apply; see section 5
- install your own trade effluent treatment system. The system must be designed, manufactured and installed to treat washing effluent to a good enough quality to discharge to the environment (to land or watercourse) or to a private surface water sewer. You need our permission (a consent or authorisation) for this and an annual charge is payable. We don't give permission automatically so you must talk to us before you buy any equipment or make any connection or discharge. A discharge of treated effluent to a public surface water sewer needs the prior permission of the local sewer provider, which may not be given in some areas. A suitably designed and installed sustainable drainage solution, such as a reedbed, might be an acceptable, cost effective alternative. See reference 7 for more information

3.4 Using and storing cleaning chemicals

- Only use biodegradable washing and cleaning products. This will help treatment processes when effluent is discharged to the foul sewer
- Follow the manufacturer's environmental and health & safety information, such as for the COSHH (Control of Substances Hazardous to Health) Regulations
- Use non-corrosive products. Corrosive products, such as traffic film remover, can damage paintwork, metal surfaces, ground coverings and drains
- Store all detergents, emulsifiers and other cleaning agents in suitable bunded or containment facilities, within a locked storage area or building away from any surface water drains
- Only use the minimum amount needed for a job diluted to the appropriate working strength. Never use undiluted concentrates
- Prepare working strength solutions in the storage area, never in areas that drain to the surface water system

3.5 Dealing with spillages of cleaning chemicals

- Produce a spillage response plan; test and use it (see reference 8)
- Deal with all spillages immediately; follow the manufacturer's health and safety advice
- Keep suitable spill kits where cleaning chemicals are stored and used, and make sure everyone knows how to use them. Make sure kits are replenished after use
- Stop spillages from entering drains, channels, gullies, watercourses and unmade ground. Use proprietary sorbent materials, sand or drain mats
- Make sure your spillage response plan includes information about how to recover, handle and correctly dispose of all waste produced from a spillage. Make sure you deal with all waste safely and legally (see section 5)
- Tell us immediately if you have a pollution emergency using the free emergency hotline number 0800 807060

See reference 8 for more information on storage, training and emergencies.

4. Good practice for different washing and cleaning methods

4.1 High pressure washers (jet washers) and steam cleaning

High pressure washers (including jet washers) and steam cleaners are effective at removing dirt, grease and coatings from vehicles, machinery and surfaces. But they use large volumes of water (500 – 7,200 litres an hour), often at high temperatures and containing cleaning chemicals. If you are cleaning vehicles and plant with a high-pressure washer (jet wash) or steam cleaner, you must use a designated washing bay.

If you use a pressure washer to clean roads, yard surfaces, other equipment or in areas where the drainage isn't collected or connected to the foul sewer, you must stop run-off from entering surface water drains. See section 3 for good practice advice for dealing with this runoff. Never allow run-off containing cleaning chemicals, detergents or emulsifiers to enter surface water drains as this will cause pollution and prevent oil separators from working properly. See reference 9 for more information.

4.2 Washing and valeting by hand

If you wash, clean or valet vehicles by hand, or are responsible for a site where this service is offered, you must have good site management procedures and practices in place to avoid pollution. You should use designated wash bays as detailed in section 3, or make sure that you have other satisfactory arrangements in place.

However, it may be acceptable to clean or valet private cars by hand in areas such as car parks, without designated wash bays (roving activities), if:

- only clean water is used and no detergents or cleaning chemicals
- or your working method doesn't produce any runoff from the vehicle
- or the runoff from the vehicle is contained, collected or treated in some way and dealt with or disposed of legally
- and you can show us that the proposed activity will not adversely affect separators and SUDS, or damage the environment at any time

Remember that in Scotland, General Binding Rules (GBRs) prohibit the discharge of trade effluent and detergents to surface water drains. In England, Northern Ireland and Wales, we (or the sewer provider) may not allow roving hand car washing (as described above) to take place because of the environmental sensitivity of the site or other factors which makes the activity likely to cause environmental harm. You are advised to contact us before you set up or start a roving washing operation to find out if your proposals are acceptable from an environmental protection point of view. If you don't you could make costly mistakes.

If we do agree (in England, Northern Ireland and Wales) to roving activities (as described above), you must also have:

- clear, well understood procedures
- good working practices
- close management control at all times

and:

- only use the minimum amount of water
- never use hoses or high pressure washers
- don't carry out roving activities where dirty water or other runoff could enter or be washed by rain into surface water drains
- make sure that buckets and containers of dirty water/effluent are emptied into clearly marked and agreed points connected to the foul sewer. This water is also a trade effluent and you need permission from the local sewer provider to dispose to a public foul sewer; see section 3.3 and 3.4

and, where you are producing no noticeable runoff from the vehicle or collecting it in some way:

- apply the minimum amount of cleaning product and ensure no spray drift
- use cleaning and valeting chemicals diluted to appropriate working strengths; never use undiluted concentrates
- don't use products that are unsuitable for hand washing, e.g. commercial traffic film remover

Please note – washing very dirty vehicles, commercial vehicles or engine compartments by hand must only be carried out in designated wash bays.

4.3 Automatic vehicle washing systems

These systems use a variety of techniques but generally involve the use of water jets and rotating brushes, and they often have a drying facility. It's possible to get systems which filter, re-circulate and re-use most of the water but they still require a connection to the foul sewer for overflow and filter backwash water. As with all discharges to the public foul sewer, this would be regarded as a trade effluent and its disposal requires permission from the local sewer provider. If no foul sewer is available, you'll have to consider the options in section 3.3. Waste management legislation applies to the disposal of solid trade waste, silt and sump sludge from these systems. See section 5.

4.4 Cleaning platforms

In this system, a vehicle is driven onto a mobile or static cleaning platform, which has an integral containment sump for holding wash water. Cleaning chemicals are sprayed or applied by hand onto the vehicle, which is then sponged and wiped dry. The wash water is either discharged to a foul drain or settled and passed through a series of filters and tanks where it's cleaned and then circulated for re-use. When using this system, you must contain wash water and cleaning chemicals to prevent them entering surface water drains. Waste management legislation applies to the disposal of solid trade waste, silt and sump sludge. See section 5.

4.5 Cleaning methods that don't use water

Technologies for hand washing that don't use water on site have been developed. Vehicles are sprayed with a product which cleans the surface and applies a polish in one application. Towels and micro-fibre materials are used to remove dirt and polish the vehicle. Used towelling is machine washed off site.

Providing no liquid effluent or application spray drift is produced, this method is unlikely to cause water pollution on site. The cleaning agent must be used as intended and stored safely. You must follow the requirements for general hand washing in section 4.2 where appropriate and consider how you will prevent spray drift from landing on hard surfaces draining to surface water drains. Waste management legislation applies to the storage and disposal of solid trade waste, such as used polishing cloths and empty containers. See section 5.

You must follow the manufacturer's recommendations for handling and using these products including the need to use appropriate personal protective equipment.

5. Waste management and your legal duty of care

Waste produced from vehicle washing and cleaning businesses can include, for example, water contaminated with oil, detergents or silt; silt, sludge, empty containers, product packaging, washing and polishing materials such as cloths.

There are strict legal requirements for the storage, movement and disposal of business waste. You have a duty of care to make sure that any waste you produce:

- does not escape from your control
- is transferred only to a registered waste carrier for recycling or disposal at a suitably licensed facility
- is accompanied by a transfer note with a full description of what it is
- is disposed of lawfully

Disposing of hazardous waste (such as oily wastes, acids, solvents and solvent-based products) has stricter requirements. You must find out if any of the waste you produce is classified as hazardous or, in Scotland, special waste; if it is, and you are in England, Northern Ireland or Wales, you must register with us. The NetRegs website (reference 4) explains how to comply with waste legislation. Alternatively, contact us for advice or visit our websites.

Useful References

1. Sustainable drainage systems (SUDS) an introduction - for England and Wales; download or order from www.environment-agency.gov.uk/suds which has other useful information.

SUDS – Setting the scene in Scotland, from: www.sepa.org.uk/publications/leaflets/suds/index.htm
More UK wide information and publications can be obtained from CIRIA, the Construction Information and Research Association at www.ciria.org/suds
2. The Water Environment (Controlled Activities) (Scotland) Regulations 2005, download from: www.sepa.org.uk/wfd/regimes/index.htm
3. Pollution prevention pays, getting your site right – industrial and commercial pollution prevention; download or order from www.environment-agency.gov.uk/ppg
4. NetRegs website - www.netregs.gov.uk - provides free information on environmental regulations that small and medium sized businesses have to comply with, and relevant good practice. Visit the Water and Waste sections of NetRegs Guidance by Environmental Topic to obtain more information on the issues mentioned in this PPG.
5. Envirowise – www.envirowise.gov.uk or call the Environment and Energy Helpline on 0800 585794. Ask for your free copy of IT 313 Waste Wise - Increased Profits at Your Fingertips. This is an interactive CD-Rom with all the information you need to minimise waste and save money.
6. Water UK – the industry association representing all UK water and wastewater service suppliers. www.water.org.uk/home/resources-and-links/links/water-operators/sewerage-operators

7. PPG 4: Treatment and disposal of sewage where no foul sewer is available.
www.environment-agency.gov.uk/ppg or www.sepa.org.uk/guidance/ppg/index.htm
8. PPG 21: Pollution incident response planning.
www.environment-agency.gov.uk/ppg or www.sepa.org.uk/guidance/ppg/index.htm
9. PPG 3: Use and design of oil separators in surface water drainage systems.
www.environment-agency.gov.uk/ppg or www.sepa.org.uk/guidance/ppg/index.htm

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pollution prevention guidelines

Use and design of oil separators in surface water drainage systems: PPG 3

These guidelines will help you decide if you need an oil separator at your site and, if so, what size and type of separator is appropriate.

Following the good practice described does not remove your obligation to comply with relevant legislation and to prevent pollution from your site. Pollution of the environment is a criminal offence and compliance with one or more Guidance Note is not a defence to such offences. You should check the references to other sources of guidance to ensure they are still current.

These guidelines are produced jointly by the Environment Agency for England and Wales, the Scottish Environment Protection Agency, and the Environment and Heritage Service for Northern Ireland. You should consider the needs of each site individually and we advise you to contact us for advice as early as possible.

The Construction Products Regulations 1991 dictate the essential requirements that an oil separator must fulfil to be supplied legally in the UK. Where the word 'must' is used in this guidance, compliance with that particular part of the guidance is a legal requirement under these regulations. The Trading Standards Authorities enforce these regulations.

Throughout these guidelines we use the term 'separator' rather than the term 'interceptor'. These terms have the same meaning.

In these guidelines, the word oil means liquid hydrocarbons that float on water such as diesel, petrol and engine oil.

1. Introduction

a. How do oil separators work?

Oil separators can be fitted to surface water drainage systems to protect the environment from pollution by oils. They separate the oil from the water, and then retain the oil safely until it is removed. They are installed to contain oil leaks from vehicles and plant and accidental spillages. To be effective, oil separators need to be correctly designed, installed and maintained.

b. Where are separators needed?

Surface water may be contaminated by oil at a number of different sites. These sites need to have measures in place to prevent this oil from polluting the environment. These sites include:

- ◆ car parks typically larger than 800m² in area or for 50 or more car parking spaces
- ◆ smaller car parks discharging to a sensitive environment
- ◆ areas where goods vehicles are parked or manoeuvred
- ◆ vehicle maintenance areas
- ◆ roads
- ◆ industrial sites where oil is stored or used
- ◆ refuelling facilities
- ◆ any other site with a risk of oil contamination.

Trapped gully pots can provide adequate protection for car parks that are too small to justify the installation of a separator, but they must be properly maintained.

You might not need an oil separator if you use ‘sustainable drainage systems’ (SUDS). The SUDS approach should be used on all sites to minimise the impact of the development on the environment. In Scotland, the use of the SUDS approach is a legal requirement. Techniques that control pollution close to the source, such as permeable surfaces or infiltration trenches, can offer a suitable means of treatment for run-off from low risk areas such as roofs, car parks, and non-operational areas. In higher risk areas you might need other SUDS facilities such as constructed ponds, wetlands or swales. For detailed information on SUDS, see references 1-4. Where there is a high risk of oil contamination, it may be appropriate to use an oil separator as part of the SUDS scheme.

If you do need an oil separator, you will need to consider where it will discharge. It is important to speak to us as early as possible if you plan to discharge to surface water drains, to a watercourse or to the ground, as you might require our consent. In Northern Ireland any discharge from an oil separator will require consent. We do not issue these consents automatically and, if we allow a discharge, we might impose strict controls on the level of polluting substances in it such as oils. If you install a separator discharging to surface water you will need a Class 1 separator (see Section 3a)

If your separator will discharge to a foul sewer, you must contact your local sewer provider before doing so. For discharges to foul sewer you will need a Class 1 or Class 2 separator (see Section 3a). If your separator will discharge to a surface water sewer that is owned by the sewer provider, you must also contact them before you connect to that sewer.

Drainage from areas such as scrapyards, storage and handling areas for chemicals (solvents, acids etc), and washing bays are likely to be contaminated with substances other than oil, and should normally drain to the foul sewer with the approval of the sewer provider. The local sewer provider might require the discharge to have a separator and you must consult them. Discharge from such areas is not suitable for drainage to surface water drains, a watercourse or to the ground.

Drainage containing detergents should not pass to a separator that discharges to surface water because the detergents prevent the separator from working properly.

For general guidance on preventing pollution from your site, see Reference 9.

2. Choosing the right separator

Use the flow chart to help you select the appropriate system for your site. More than one separator might be required on larger sites or a site with many activities. You will need to consider the local circumstances and risk factors including:

- ◆ the discharge point of your proposed separator
- ◆ the environmental sensitivity of your location
- ◆ activities on your site

We advise that SUDS should be incorporated into the surface water drainage whenever possible and in Scotland, this is a legal requirement. This may remove the requirement for an oil separator.

Notes to accompany the flowchart

¹ You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.

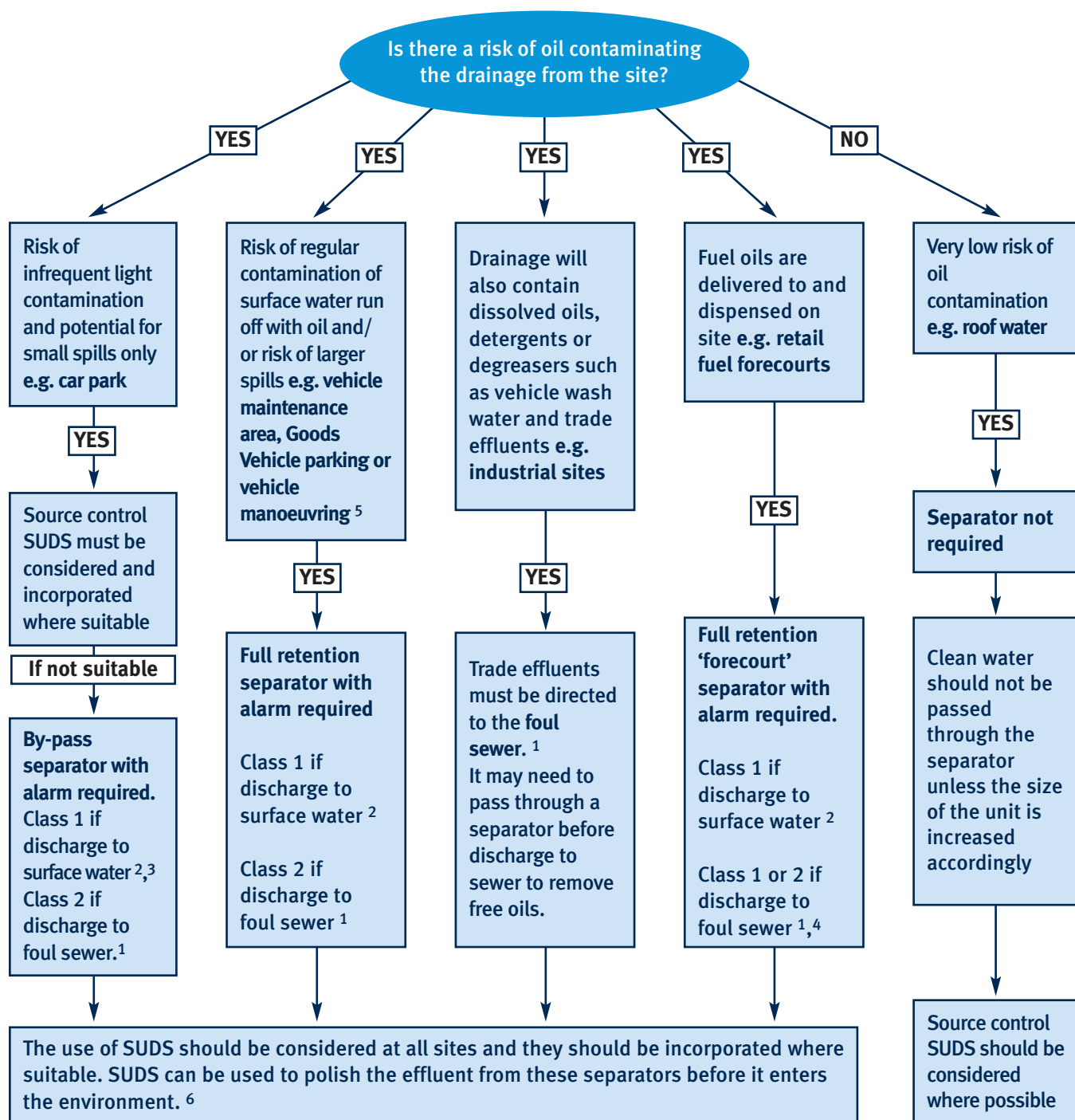
² You must seek prior permission from us before you decide which separator to install.

³ In this case, if it is considered that there is a low risk of pollution a source control SUDS scheme may be appropriate.

⁴ In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.

⁵ Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.

⁶ In certain circumstances, a separator may be one of the devices used in the SUDS scheme. Ask us for advice.



3. Separator standards and types

The UK has adopted a two-part European Standard (BS EN 858-1:2002 and BS EN 858-2:2003; Reference 5) for the design, use, selection, installation, operation and maintenance of prefabricated oil separators. The Construction Products Regulations require that new prefabricated separators (made off site and then installed) must satisfy certain essential requirements. Demonstration of fulfilment of these requirements can be provided by compliance with the mandated clauses of BS EN 858-1. You can obtain a list of separators through our websites that identifies the separators for which evidence of oil separating performance has been supplied, examined and accepted. When using this list, you must check on the website that you are using the current version, as it will be updated regularly.

a. Separator classes

BS EN 858 refers to two 'classes' of separator, based on performance under standard test conditions.

♦ **Class 1 separators** are designed to achieve a discharge concentration of less than 5 mg/litre of oil under standard test conditions. These separators are **required for discharges to surface water drains and the water environment**. Many Class 1 separators contain coalescing devices, which draw the oil droplets together and facilitate the separation.

♦ **Class 2 separators** are designed to achieve a discharge concentration of less than 100 mg/litre of oil under standard test conditions. They are suitable for dealing with discharges where a lower quality requirement applies such as **discharges to the foul sewer** (but check first with your sewer provider).

Both classes can be produced as 'full retention', 'bypass' or 'forecourt' separators (see below).

The oil concentration limits of 5 mg/litre and 100 mg/litre only apply under standard test conditions. You should not expect separators to always perform within these limits under field conditions. In addition, these levels of oil might be too high in some environmentally sensitive areas to allow the discharge to pass into the water environment without additional treatment.

b. Full retention separators

Full retention separators treat the full flow that can be delivered by the drainage system. The 'full flow' is normally equivalent to the flow generated by a rainfall intensity of 65 mm/hour

Full retention separators are used where there is a risk of regular contamination with oil and a foreseeable risk of significant spillages e.g. vehicle maintenance areas and retail fuel forecourts.

You need to consider the flow rates of potential spillages delivered to the separator from the drainage system and the oil storage volume of the separator needs to be sufficient to retain the entire spillage. See Section 9 for more information about preparing for emergencies.

On large sites, some short-term storage upstream of the separator might be an acceptable means of limiting the flow rate and the size of separator needed. Any surface water stored cannot be pumped through the separator unless the separator is specifically designed to receive pumped inflows and a low-shear, non-emulsifying pump is used.

c. Bypass separators

Bypass separators fully treat all flows, for the area served, generated by rainfall rates of up to 6.5 mm/hour. This covers most rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, e.g. where only small spillages can occur and the risk of spillage is small such as on short stay car parks.

In cases where a large spillage might occur, it is not acceptable to use a by-pass separator. The only exception to this is a major trunk road where the size and type of spillage is impossible to foresee and the surface area drained makes it impractical to provide a full retention separator. For major trunk roads a SUDS approach incorporating a number of SUDS techniques is likely to be more appropriate.

On sites where high levels of silt are likely to enter the separator, the build up of silt must not be allowed to compromise the operation of either the separator or the by-pass device. On such sites (e.g. major trunk roads and quarries) an adequately sized silt separation chamber should be installed upstream of the separator and appropriate management systems put in place to monitor the situation and remove the silt when necessary. The use of SUDS techniques can minimise the amount of silt in the surface water run-off.

d. Forecourt separators

This document uses the term 'forecourt' to refer to all forms of liquid-fuel dispensing outlets, both retail and non-retail, including those where only diesel is dispensed. A forecourt separator must be a 'full retention' separator, large enough to serve the catchment area of the site and have a sufficient oil storage volume to retain any foreseeable spillages.

It is important to install a forecourt separator of an appropriate size. On a forecourt where tanker deliveries are received, a separator with an oil storage capacity of 7,600 litres will meet the requirements of BS EN 858-2, clause 4.3.6. If a smaller unit is proposed, the size should be determined by undertaking a risk assessment incorporating catchment size, potential spillages during delivery, and other risks such as safety issues. If the compartment size of the tanker that delivers to your site is greater than 7,600 litres your separator should be sized accordingly. For detailed information on the design of fuel dispensing forecourts see Reference 10.

4. Separator size

a. Nominal size

Separators are tested in accordance with the standard test procedure in the European Standard. Each separator is allocated a nominal size (NS) on the basis of the test results. Full retention and bypass separators are referred to as NS and NSB, respectively.

The nominal size of a full retention separator that is required for a catchment area (A) is obtained using the following formula:

$$NS = 0.018 \times A \text{ (in m}^2\text{)}$$

For a bypass separator, the formula is:

$$NSB = 0.0018 \times A \text{ (in m}^2\text{)}$$

In addition, capacity for silt storage (C) must be provided for all separators – either as an integral part of the separator or as a separate upstream unit – according to the following:

$$C \text{ (in litres)} = NS \times 100 \text{ or } C \text{ (in litres)} = NSB \times 100$$

Silt capacity for a bypass separator must be provided either upstream of the separator or in the bypass weir chamber, and not in the main oil separating chamber.

Separators must be designed such that when the silt chamber or silt area of the separator is full of silt, this will not affect the operation of the separator, the skim pipe or the by-pass device.

b. Oil storage capacity

The oil storage capacity is defined as the volume of separated oil that can be stored in the separator without any of the stored oil entering the inlet or outlet of the separator. The oil storage volume (V) is given by the following:

$$V \text{ (in litres)} = NS \times 10 \text{ or } V \text{ (in litres)} = NSB \times 15$$

On sites where significant oil spillages are foreseeable, make sure the oil storage capacity is sufficient to retain any such spillage and a separator larger than that identified in Section 4a may be required.

c. Minimum size

The minimum working capacity (which excludes any provision for silt deposition) of a separator should be 1,000 litres; though for forecourts, it is likely that risk assessment will indicate the need for a larger separator. For bypass separators, the minimum capacity is defined as the working capacity of the oil separating chamber only.

5. Closure devices and alarms

a. Closure devices

If too much oil is allowed to accumulate inside a separator, it will not work effectively and oil will escape. To avoid this, full retention separators must be provided with an automatic closure device that will prevent flow passing through the separator when the quantity of oil in the separator exceeds the oil storage volume (V).

Also, during emptying or maintenance the separator should be isolated to prevent the escape of waste oil. Open all isolation valves when the operation is complete.

Do not fit automatic closure devices to bypass separators unless they have been designed specifically to operate on such separators.

If the automatic closure device is activated the operator should be alerted by a high level alarm so that immediate maintenance can be carried out.

b. Automatic Warning Devices/Alarm systems

Separators must be provided with a robust device to provide visual and audible warning (if necessary to a remotely located supervisory point) when the level of oil reaches 90 per cent of the oil storage volume (V) under static liquid level conditions. This automatic warning device indicates that the separator is in need of immediate emptying for it to continue to work effectively.

Also, as the build up of silt will prevent the separator from working effectively, we recommend that you install a silt level alarm or another suitable device in your separator to alert you to the build-up of excessive levels of silt. In many cases, oil and silt alarms can be fitted to an existing separator. Silt alarms are most useful on those sites where high volumes of silt are likely to enter the separator, such as quarries, builder's yards and major trunk roads.

Further equipment can be fitted to the separator, alongside a closure device and warning device, to alert the site operator to the routine maintenance requirements of the separator. This equipment might, for example, indicate when the next inspection is due and such 'separator management systems' will ensure that the separator continues to receive the appropriate level of attention.

Any electrical device used within a separator or used to monitor sensors placed within a separator must be intrinsically safe and certified to a suitable explosion protection standard. The location of the monitoring device, such as the alarm or 'separator management system' control panel, must be located within a safe area and conform to the requirements of BS EN 60079-10. For this reason it is important to always use qualified technicians who are familiar with the installation, calibration and servicing of intrinsically safe equipment. Regular maintenance and testing of equipment is essential.

6. Installation and labelling

a. Installation

Any clean water should be discharged downstream of the separator. If any clean water is drained through your separator, you will need to consider this extra water volume when selecting the separator type and size.

If the discharge for the separator is subject to the controls of a permit to discharge granted by us, a sampling chamber will be required downstream of the separator, to allow representative samples to be taken.

Provide separators with sufficient access points to allow for the inspection and cleaning of all internal chambers. Keep access to the separator clear and do not use this area for storage.

If the separator is installed to retain flammable liquids, provide appropriate ventilation.

b. Labelling

Provide separators with a visible and durable label that can be read after installation and which contains the following information:

- ◆ manufacturer's reference number and year of manufacture
- ◆ bypass/full retention
- ◆ unique identifier for the design of separator (name or number)
- ◆ class of separator
- ◆ nominal size
- ◆ oil storage capacity
- ◆ volume of separator
- ◆ silt storage capacity
- ◆ oil level warning device details
- ◆ depth of oil storage
- ◆ closure device details.

Mark the position of all separators clearly on all drainage plans and identify the separator on the ground by marking the manhole cover 'Separator'.

7. Maintenance and use

To prevent pollution and minimise your costs, you need to manage your separator effectively. To make this easy, all parts of the separator that have to be regularly maintained must be accessible at all times.

Every six months, or in accordance with manufacturer's instructions, experienced personnel should:

- ◆ Physically inspect the integrity of the separator and all mechanical parts
- ◆ Assess the depth of accumulated oil and silt
- ◆ Service all electrical equipment such as alarms and separator management systems
- ◆ Check the condition of any coalescing device and replace it if necessary

Some heavily used or high-risk sites might require more frequent inspections.

Keep a detailed log of when the separator is inspected, maintained, emptied and serviced. Also record specific events relating to the separator system such as cleaning, repairs, accidents and incidents.

All sites should empty their separator as soon as a significant quantity of oil and/or silt has built up. The retained waste, including the silt, must be removed and the separator must be refilled with clean water before being put back in to service to prevent damage and to prevent oil passing through it. In addition to normal emptying of the separator, it will also need to be emptied right away if oil or silt levels exceed 90 per cent of the storage volume of the separator and the alarm is activated (see Section 5b). When the oil or silt reaches this level or after a spillage, employ a registered waste removal company to empty the separator (see Section 8 for information about waste management). For all waste removal operations you must make sure that the waste removal company has experience in emptying separators and that they do not allow any of the contents to escape from the outlet during emptying.

Every five years it is recommended that separators be emptied and given a general inspection to test the integrity and performance of the system. The separator must be refilled with clean water following such an inspection.

Information on separator maintenance is in Part 2 of the European Standard (Reference 5).

8. Waste management

All waste must be handled, stored and disposed of correctly to avoid pollution. Waste oil is designated as hazardous/special waste and as a waste producer and holder, you are responsible for complying with the Hazardous Waste (England and Wales) Regulations 2005, the Special Waste Amendment (Scotland) Regulations 2004, or the Hazardous Waste (Northern Ireland) Regulations 2005 (see Reference 11).

You may need to register as a producer of hazardous/special waste, and you should refer to our websites for guidance. You must follow the Duty of Care Code of Practice (Reference 6) which requires you to make sure that the waste oil:

- ◆ does not escape from your control
- ◆ is transferred only to a registered waste carrier to be sent for recycling or disposal at a suitably licensed facility
- ◆ is accompanied by an appropriate transfer note with a full written description of the waste

Detailed guidance on how to comply with the regulations governing waste handling, storage and disposal is given in Reference 6. The detail of the Regulations themselves is in Reference 11.

The NetRegs website (www.netregs.gov.uk) provides information on waste legislation and how you can comply with it. In addition, you can contact our local office for advice or visit the waste sections of our websites.

9. Emergencies

Draw up a Pollution Incident Response Plan (PIRP) that includes all oil separators. Reference 7 offers advice on how to produce or update such a plan. Keep a spill kit on site.

Do not use a separator as the primary method of containing a large oil spill from above ground oil storage; this should be protected by a secondary containment system (see Reference 8 for details).

We recommend that all oil deliveries to the site be supervised.

Notify us immediately in the event of an emergency using the emergency hotline number 0800 80 70 60.

10. References

1. Sustainable Drainage Systems (SUDS) – an introduction. www.environment-agency.gov.uk/suds
SUDS – Setting the scene in Scotland from: www.sepa.org.uk/publications/leaflets/suds/index.htm
2. www.ciria.org/suds
3. Sustainable urban drainage systems -- design manual for Scotland and Northern Ireland. CIRIA C521. ISBN 0-86017-521-9.
Sustainable urban drainage systems - design manual for England and Wales. CIRIA C522. ISBN 0-86017-522-7.
CIRIA C521 and C522 are due to be replaced by a new SUDS Manual in autumn 2006. Please make sure you refer to the current guidance.
CIRIA Tel: 020 7549 3300. www.ciria.org
4. British Water Technical Guidance – Guidance to proprietary sustainable drainage systems and components – SUDS. ISBN 1 9034810 4 10.
British Water Tel: 020 7967 4554 www.britishwater.co.uk
5. BS EN 858-1:2002. Separator systems for light liquids (e.g. oil and petrol). Principles of product design, performance and testing, marking and quality control.
BS EN 858-2:2003. Separator systems for light liquids (e.g. oil and petrol). Selection of nominal size, installation, operation and maintenance.
BSI. Tel: 020 8996 9001. www.bsi-global.com
6. Waste management, the Duty of Care, a code of practice (revised 1996). ISBN 0-11-753210X.
The Stationery Office. Tel: 0870 600 5522
7. PPG21: Pollution incident response planning. www.environment-agency.gov.uk/ppg or www.sepa.org.uk/guidance/ppg/
8. PPG2: Above ground oil storage tanks. www.environment-agency.gov.uk/ppg or www.sepa.org.uk/guidance/ppg/
9. Pollution Prevention Pays. Getting your site right – industrial and commercial pollution prevention. Available to download from the Preventing Pollution page of the business area of www.environment-agency.gov.uk
10. Design, construction, modification, maintenance and decommissioning of filling stations, 2005, ISBN 0 85293 419 X: Association for Petroleum and Explosives Administration/Energy Institute
Portland Customer Services Tel: 01206 796 351
11. Hazardous Waste (England and Wales) Regulations 2005, SI 894, ISBN 0 110726 855
Hazardous Waste (Northern Ireland) Regulations 2005, SR 300, ISBN 0 33796 064 X
Special Waste Amendment (Scotland) Regulations 2004, SSI 112, ISBN 0 11069 0303

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Pollution Prevention Guidelines:

July 2011

Safe storage

The safe operation of refuelling facilities: PPG 7

These guidelines are produced by the Environment Agency for England and Wales, the Northern Ireland Environment Agency and the Scottish Environment Protection Agency, referred to here as 'we' or 'us'.

Pollution Prevention Guidelines (PPGs) are based on relevant legislation and reflect current good practice. Following the guidelines will help you manage your environmental responsibilities to prevent pollution and comply with the law.

If you cause pollution or allow it to occur, you may be committing a criminal offence.

You can find our contact details at the end of these guidelines.

This document is produced in accordance with the Code of Practice on Guidance on Regulation, reference 1.

1. Introduction

These guidelines have been produced for operators of both retail and non-retail liquid fuel refuelling facilities.

They will help you prevent damage to surface waters, groundwater, land and air. They describe good practice in fuel storage and management that can reduce the environmental risk of your site. These guidelines also refer to the storage and handling of other liquids commonly used in association with fuel storage and dispensing.

These guidelines apply to all types of fixed refuelling facilities but you may need to comply with additional legislation and guidance depending on the:

- type of fuel you store
- quantity of fuel you store
- type of facility (commercial, retail or private)
- intended use of the fuel
- environmental sensitivity of the location.

Table 1 highlights other guidance and regulations that may apply to your refuelling facility. You should read the ones that apply to you together with these guidelines.

Table 1.

Type of facility	Guidance/Regulation
Mobile bowzers	For above ground storage, see reference 2 and working at construction and demolition sites, reference 3.

Type of facility	Guidance/Regulation
Drums and Intermediate Bulk Containers (IBC)	For correct storage and use, see reference 4.
Gaseous fuels at normal temperatures; for example liquid petroleum gas and compressed natural gas	Regulated by Petroleum Licensing Officers and Health and Safety Executive (HSE) - see HSE, in useful website list.
Storage for agricultural use	This type of facility is covered by the following regulations: In England, Northern Ireland and Wales : the Silage, Slurry and Agricultural Fuel Oil Regulations, (SSAFO) reference 5. In Scotland : The Water Environment (Oil Storage) (Scotland) Regulations 2006, reference 6.

These guidelines refer to environmental legislation you **‘must’** follow in England, Northern Ireland, Scotland and Wales. Where our recommendations aren’t a legal requirement, we say you ‘should’.

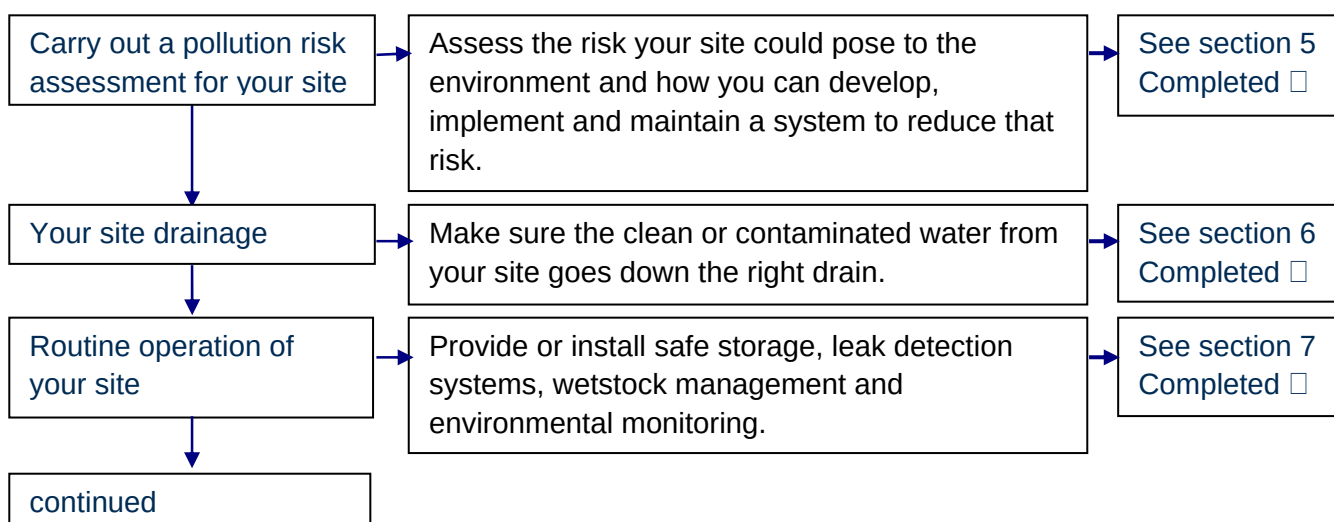
The guidance doesn’t cover:

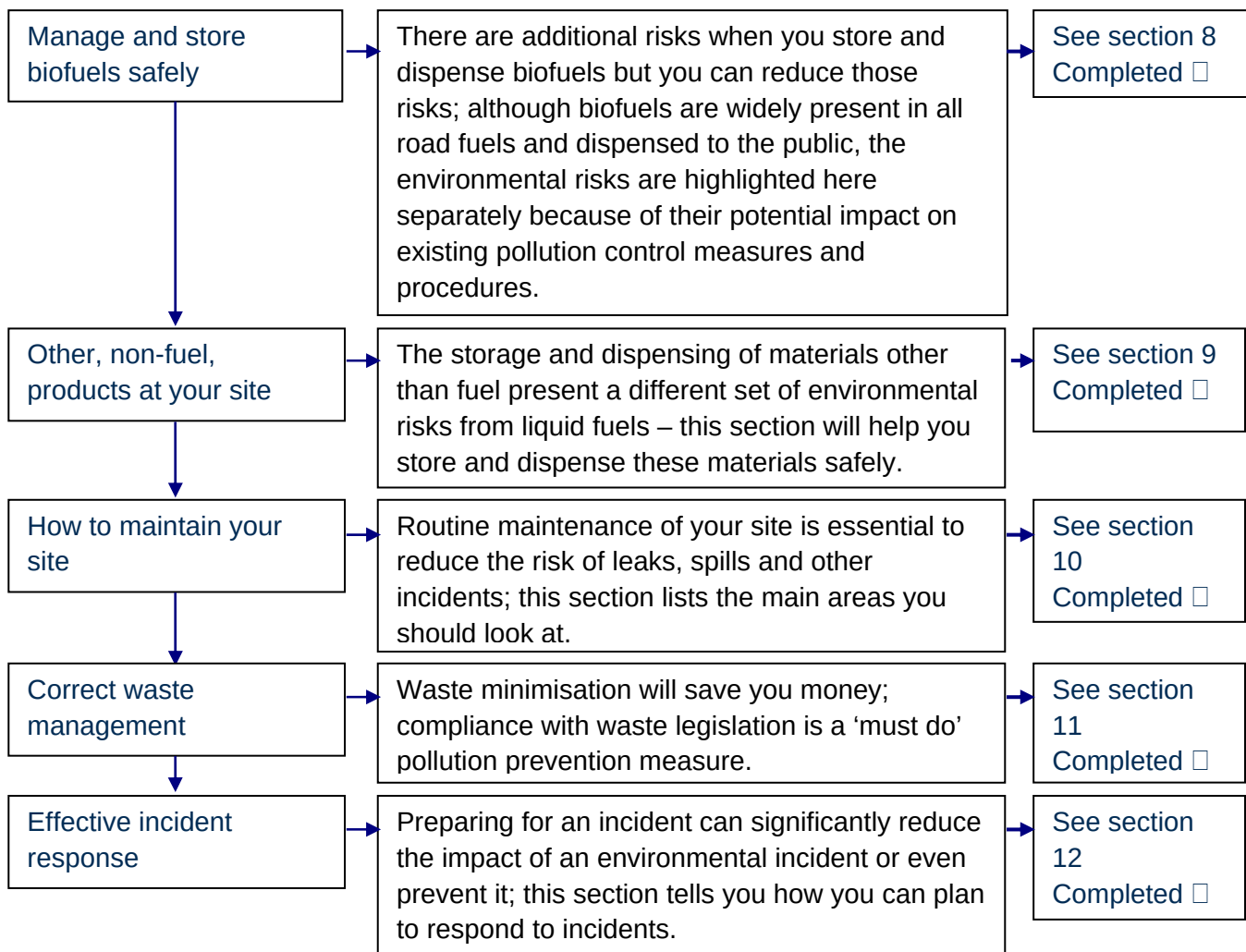
- health and safety aspects of refuelling facilities or incident management;
- fire prevention or control;
- design, construction or decommissioning.

For more information on these areas, see reference 7 which covers many aspects of design and construction, beyond the scope of this guidance. Although it refers primarily to retail facilities it's applicable to delivery, storage and dispensing from non-retail facilities.

2. Key points for the safe operation of refuelling facilities

You should consider the following points to make sure your refuelling facilities don’t put the environment at risk.





3. Background

Fuel storage and dispensing facilities have the potential to cause significant damage to the environment which could threaten water supplies, human health and wildlife. Causes of environmental incidents on your site include:

- delivery and use of materials;
- overfilling storage containers;
- plant or equipment failure;
- containment failure;
- fires, explosions and failure to contain fire fighting water;
- wrong connections of sewers and pipes;
- incompatible materials coming in contact, uncontrolled reactions;
- discharge of partially-treated or raw effluent;
- accidents and vandalism;
- flooding of part of, or your entire, site.

Any of these incidents could affect:

- drainage systems, surface waters, groundwater and soil;
- air quality by producing toxic fumes and airborne pollutants;
- thermal radiation.

All of which can damage human health, animals, ecosystems and the environment.

The impacts may be immediate or may take a while to become apparent but are generally long lasting; you may be responsible for the costs of clean-up. Remediation can be expensive and there may be additional costs associated with our incident response and/or fines or costs through the criminal and/or civil courts. Your company's business reputation may suffer.

4. Legal background

This section outlines your main legal obligations associated with permitting and licensing for environmental protection.

4.1 Permits and consents

Whilst various parts of the United Kingdom are covered by different sets of regulations, their aim is the same: to protect water, land and air against damage. The different requirements throughout the UK are outlined in the following sections.

4.1.1 England and Wales

Discharges into surface waters and groundwater (the water environment) are controlled by the Environmental Permitting Regulations (England and Wales) 2010.

These regulations apply to all direct contaminated discharges into surface waters or groundwater, and to discharges into groundwater via soakaways. We don't automatically grant a permit and, in environmentally sensitive areas, may refuse to grant a permit to protect the environment.

All discharges to the public sewers (foul or surface water) require prior authorisation from your local sewer provider and may be subject to the terms and conditions of a trade effluent consent or trade effluent agreement.

For guidance on how we manage and protect groundwater, see reference 8.

4.1.2 Northern Ireland

In Northern Ireland, the Water (NI) Order 1999, means you need a consent to discharge from the Northern Ireland Environment Agency (NIEA) before you make any discharges into the water environment, surface water or groundwater. If you make a discharge without a consent, or that doesn't meet the conditions of your consent, you are committing an offence. Pollution Prevention and Control Legislation regulates certain types of businesses. If your business carries out an activity regulated by the PPC legislation, you will need a PPC Permit from the NIEA.

4.1.3. Scotland

In Scotland, unloading petrol into stationary storage tanks at terminals and service stations (above certain qualifying thresholds) is regulated under the Pollution Prevention and Control (Scotland)

Regulations 2000 (as amended) Part B, for emissions of petrol vapour to air. Any operator of a petrol refuelling facility will need permission from the Scottish Environment Protection Agency (SEPA) before starting operation and must comply with the conditions contained within their permit. To apply to operate a service station, i.e. unload petrol into stationary storage tanks, see SEPA's Pollution Prevention and Control (PPC) application forms webpage, see useful websites. A further regulatory requirement will come into effect in 2012 where the refuelling of vehicles at a service station (above certain qualifying thresholds) will also be required to be permitted under the same legislation.

Where non-compliance is found, SEPA may issue a Notice requiring improvements in operation or suspension of the activity.

All sites must also comply with the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) which regulate discharges to the water environment. For more information, see CAR Practical Guide.

For more details on permits and authorisation, see reference 9.

4.2 Oil storage regulations

4.2.1 England

In England, above ground oil storage is regulated by the Control of Pollution (Oil Storage) (England) Regulations 2001, (OSR England). Oils covered by these regulations include petrol, diesel, vegetable, synthetic and mineral oils. They apply to most industrial, commercial and institutional sites storing oil in containers over 200 litres and to private dwellings with containers storing more than 3,500 litres.

4.2.2 Northern Ireland

In Northern Ireland, above ground oil storage is regulated by the Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2011, (OSR NI). These regulations apply to petrol, diesel, vegetable, synthetic and mineral oils. The regulations apply to most industrial, commercial and institutional sites storing oil in containers over 200 litres, including drums and IBCs.

4.2.3 Scotland

In Scotland, above ground oil storage is regulated by the Water Environment (Oil Storage) (Scotland) Regulations 2006 (OSR Scotland). These regulations apply to any kind of oil including petrol, diesel, mineral oil, heating oil, lubricating oil, agricultural fuel oil, waste oil, and vegetable and plant oil, but don't include uncut bitumen. See SEPA oil storage web pages, in useful websites.

4.2.4 Wales

There aren't any similar regulations that apply to Wales at this time but the standards set out in the Oil Storage Regulations of England should be followed.

For details on the OSR England, OSR NI or OSR Scotland see reference 6.

For underground storage of liquid hydrocarbon, and guidance on the storage of drums and bulk containers, see references 10 and 4.

Even if your above ground oil storage isn't covered by the oil storage regulations of the different countries, you should follow the good practice advice in reference 2 to prevent pollution.

4.3 Control of Major Accident Hazard Regulations (COMAH)

If you store fuel in volumes beyond the thresholds defined in the COMAH Regulations then they apply to your site. The competent authorities are the Health and Safety Executive (HSE), the Environment Agency, NIEA and SEPA who have issued a Containment Policy and Guidance for all COMAH sites; see reference 11.

4.4 Environmental Damage/Liability Regulations

Depending on where you are in the UK, the Environmental Damage Regulations (EDR) or Environmental Liability Regulations (ELR) apply. If serious environmental damage occurs or there's a risk of such damage as a result of your economic activity and you must do your best to prevent the damage occurring. 'Economic activity' includes:

- private businesses;
- farming;
- manufacturing;
- construction and demolition businesses;
- waste management businesses;
- forestry operations;
- public sector – schools, hospitals and government departments or agencies;
- charitable and voluntary organisations.

Environmental damage is considered to be:

- serious damage to surface water or groundwater;
- contamination of land where there is a significant risk to human health;
- serious damage to EU protected natural habitats and species or damage to Sites of Special Scientific Interest (SSSIs) in England and Wales or Areas of Special Scientific Interest (ASSIs) in Northern Ireland.

These regulations follow the 'polluter pays' principle. If you or your activities threaten to cause or have caused environmental damage, you must take steps to prevent the damage (or further damage) occurring. You must tell us about the damage; we'll tell you what to do to prevent and/or remedy it.

For more information on EDR and ELR, see reference 12.

4.5 Petroleum licences

The primary legislation covering refuelling facilities is the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR). It requires that the risk of fires and explosions caused by dangerous substances in the workplace must be assessed. In Northern Ireland, this is covered by the Dangerous Substances and Explosive Atmosphere Regulations (Northern Ireland) 2003. These regulations are administered by the HSE and enforced by the Petroleum Licensing Authority (PLA) where petrol is dispensed to motor vehicles.

Petrol filling stations are defined as sites that dispense petrol into the fuel tanks of vehicles, boats or aircraft by electrical or mechanical means. The Petroleum (Consolidation) Act 1928 (as amended by DSEAR) requires that anyone operating a petrol filling station should have a licence issued by their local PLA mostly every three years but some every year.

In Northern Ireland, this is covered by the Petroleum (Consolidation) Act (Northern Ireland) 1929 and Petroleum (Transfer of Licences) Act (NI) 1937 and licences are normally issued each year. The

licensing regime applies to petrol filling stations that are facilities where fuel is dispensed for retail and non-retail filling purpose. Filling stations operated by private individuals or recreational clubs (non workplace) where fuel is dispensed for the sole use of the owner or club members are also subject to the licensing regime but in these situations the provisions of DSEAR don't apply.

For consistency of enforcement throughout the UK, most PLAs have adopted the Model Conditions of Licence issued by the Petroleum Enforcement Liaison Group (PELG). The model conditions cover:

- notifications to the PLA;
- record keeping;
- restriction on the type of containers that can be filled;
- prohibition of sales to under 16s.

With the exception of non workplace filling stations, DSEAR still applies.

The Petroleum Enforcement Liaison Group (PELG) produces circulars (PETELs) to advise and guide local authorities on enforcement and technical matters to achieve consistent standards in health and safety enforcement across local authorities. The guidance in these circulars covers many aspects of a refuelling facility and may apply to non-retail facilities which dispense fuels other than petrol.

The HSE provides more information; see useful websites.

For more information on Petrol Licensing legislation, see references 13 and 14.

5. Identifying and managing your environmental risks and hazards

This section tells you how to assess the risk your site could pose to the environment and how you can develop, implement and maintain a system to reduce that risk.

5.1 Risk assessment

The best way to prevent pollution is to stop something becoming a hazard; it's better to avoid potential pollution problems in the first place than to try to control them through engineering, operational and management solutions.

We recommend you carry out a risk assessment, whatever size your site is, to evaluate the environmental risk. Guidance to help you complete a risk assessment is available in reference 15. Alternatively you could hire a consultant to help you do it.

For your site to pose a risk to environment and human health, three components need to be present: 'source - pathway – receptor'. 'Source' would be a potential source of pollution, 'receptor' would be what could potentially be affected by the pollution, and 'pathway' is the path/media source materials can potentially travel through, from source to receptor.

For a refuelling facility, stored fuel travelling through the site drainage could potentially leak into groundwater or a river if site drainage is faulty; so, the three components could be, for example:

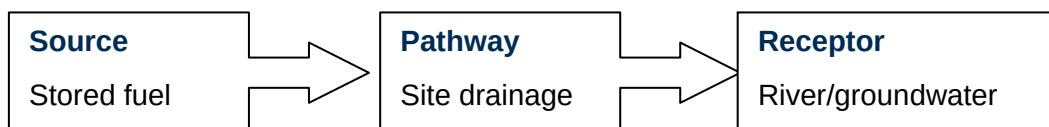
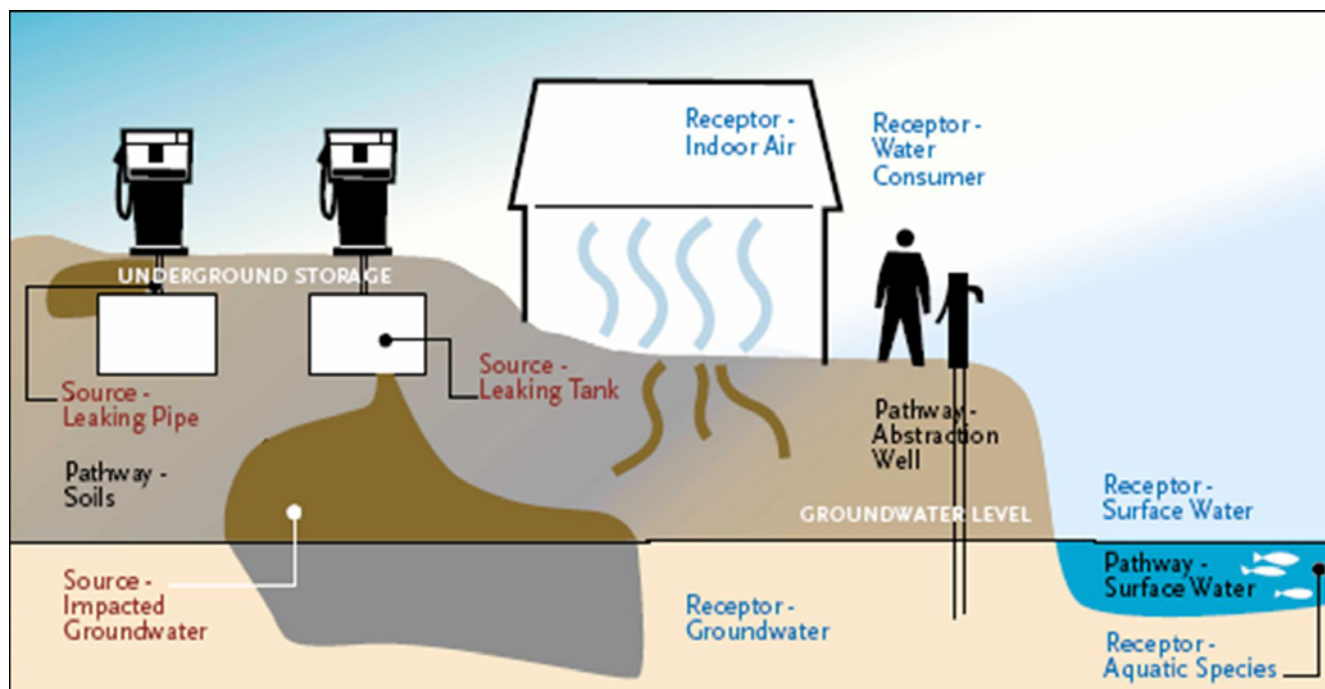


Figure 1 shows how the source/receptor/pathway can vary depending on the location and surrounding environment. Note how groundwater and surface water can also become a source once contaminated.

Figure 1.



An example of risk management that breaks the 'source – pathway – receptor' link is to use appropriate fuel storage and drainage systems that prevent the release from the source via a pathway into a receptor. You need to consider all the possible links, as there may be several. For example, you may need to consider the risk to the groundwater under the site and how this will affect local abstractors, or the movement of contaminants via groundwater to the river.

Your site environmental risk assessment can be carried out in stages and should take account of:

Hazard identification. Identifying polluting materials and processes such as:

- fuels
- detergents
- lubricants
- solvents
- storage
- catalytic reduction fluids
- wastes
- fuel delivery
- dispensing
- vehicle washing.

Possible causes of pollution. Consider what could go wrong:

- spills and leaks due to equipment failure, overfilling or mishandling of containers;
- damage, for example due to collisions;
- fire and explosions;
- vandalism;
- floods.

Your local environment. What's on and around your site including the:

- physical and chemical properties of your stored materials;
- potential impact of incidents occurring on your site;
- proximity to your site of sensitive receptors:
 - o watercourses
 - o canals
 - o lakes/lochs/loughs
 - o coastal waters
 - o groundwater
 - o nearby abstraction points
 - o protected environmental features
 - o local populations
- potential pathways from your site;
- type of operations you carry out on your site.

You should also consider the costs, benefits and social considerations as outlined in the Department for Environment Food and Rural Affairs (Defra) document for England and Wales - Guidelines for Environmental Risk Assessment and Management, see useful website list.

You can contact us for information about local environmental sensitivities. In England and Wales, you can follow the links to the 'What's in your backyard' section of the Environment Agency website; details at the end of this guidance.

5.2 Environmental management systems

You should use the results of your risk assessment to develop an environment management system (EMS) for your site; more details are on the Environment Agency's web site for England and Wales. This should detail the correct management and operational control procedures for your site which will greatly reduce the risk your site poses. As a minimum, the EMS produced for your site should include:

- operational control procedures;
- training provision and records:
 - o on site hazards and risks;
 - o risk management and procedures;
 - o emergency response;
 - o control of contractors;
- maintenance regimes and records;
- leak detection and environmental monitoring;
- appropriate emergency plans.

Activities that may need operational control procedures include:

- storage;
- delivery and unloading;
- dispensing;
- product volume monitoring (wetstock reconciliation see section 7.2);
- response to major and minor spills;
- leak detection and notification;
- maintenance;
- training.

Risk reduction measures that can be used in refuelling facilities include:

- built in automatic leak detection system (see section 7.2);
- wetstock reconciliation methods (see section 7.2);
- emergency shut down and pump shut down controls;
- use of dry break couplings for loading and dispensing;
- groundwater monitoring, both as a routine or if an actual or potential leak had been identified.

The government on-line business advice and support service, see useful websites, has guidance: 'How to set up your EMS'.

6. Your site drainage (pathways)

This section outlines good practice to help you deal with clean and contaminated water from your site and correct site drainage.

Incorrect or poorly designed and maintained site drainage systems are a common pathway for spills and leaks to enter the environment and cause pollution.

There are two types of drainage system that may serve your site. It's important to understand the difference between these two systems and the responsibilities linked with each of them so you can make sure you protect local environmental receptors.

Separate systems

These have two drains:

- **Foul sewer** carrying contaminated water (sewage and/or trade effluent, for example vehicle wash water) to a sewage treatment works; the works may either be private or run by your local sewage treatment provider.
- **Surface water drains** carrying uncontaminated clean water (drainage from roof or clean yard areas) connected directly to the water environment.

Combined systems

These have one sewer carrying both foul and surface water to a sewage treatment works. If you don't have access to public foul sewers, please see reference 16.

6.1 What to do with your clean water

All clean, uncontaminated rainwater should be drained to one of the following:

- a surface water drainage system;
- a combined drainage system downstream of the oil separator;
- directly to a local watercourse, to a sustainable drainage system (SUDS see section 6.4) or a soakaway.

This includes roof water and uncontaminated drainage from those areas of your site where vehicles aren't stored, repaired, refuelled or washed. These discharges may require prior permission from us or your local sewer provider.

6.2 What to do with your contaminated water; forecourt and site drainage

6.2.1 to foul sewer or combined drainage system

If you have access to a foul sewer system or a combined drainage system, you should direct any contaminated water to these. You may need permission from your local sewer provider before you can make these discharges.

6.2.2 to surface waters

Where your forecourt or site drainage connects to the surface water drainage system, we recommend you have a Class 1 full retention oil separator as the minimum level of protection for the environment. You should also have a method to close the outlet from the separator - either an automatic or manually operated shut off valve.

Class 1 separators are designed to achieve a discharge standard of less than 5 parts per million (ppm) of oil under standard test conditions. A full retention separator has the capacity to treat all the run-off from the drainage system. They are used where there is a risk of regular contamination with oil and a foreseeable risk of a significant spill, for example in vehicle maintenance areas and retail fuel forecourts.



Example of a full retention separator during installation.

You may need additional spill control measures for a road tanker delivery such as a dump tank designed to take the maximum volume of one tanker chamber. Bypass separators fully treat flows up to a certain rainfall rate. Flows above this rate are allowed to bypass the separator. You should only use these separators for areas of your site where only small spillages can occur or the risk of spillage is small. For detailed advice on oil separator design and use see reference 17.

6.3 Make sure you have a site drainage plan

An up to date drainage plan of your site will help you stop pollution. You can draw the plan yourself or employ a reputable drainage company. Make sure the plan includes:

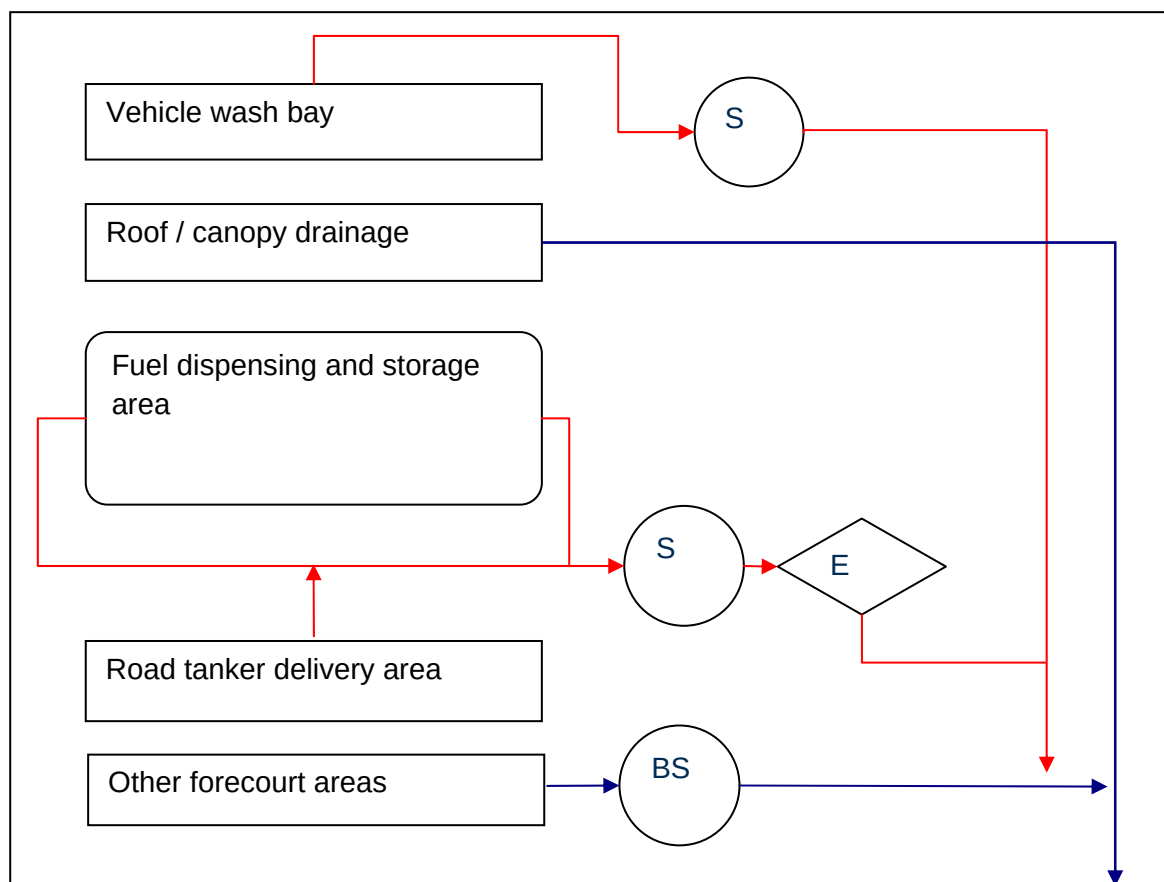
- the location of and direction of flow for all sewers and drains on your site;
- the location of all drain covers and gullies;
- all surface water drain outfalls;
- the destination of all foul sewers or combined drains;
- the location of all pollution control facilities, for example oil separators.

The common standards for drainage plans are to mark surface water drains in blue, foul sewers in red and combined systems with a red 'C'. This marking should be clear on the plan. We recommend you also paint these on the ground, especially for drain covers, indicating the direction of flow with arrows. This will save time identifying them if you have an accident on site where fuel is spilt.

You should make your plans available to everyone on site and any external responders to spills. If you make any changes on site, check the drainage plan to make sure new connections are made into the right drains. Update your drainage plan when the work has been finished.

Guidance to help you produce a drainage plan as part of your incident response planning is in reference 18.

Figure 2: Typical site drainage plan for a refuelling facility



Key to figure 2

S= Class 1 interceptor

E = Emergency shut off valve

BS = By-pass separator

Red = Foul drains connecting to local sewage treatment works

Blue = Surface drains connecting in to watercourses

6.4. Can you use sustainable drainage systems to protect the water environment?

You should consider using sustainable drainage systems (SUDS), known in Scotland as sustainable urban drainage systems, as part of your treatment of contaminated water. SUDS such as constructed wetlands or reed beds may offer an environmentally friendly and cheaper alternative to traditional methods of treating site drainage. They may also be suitable as a replacement for separators for oily water run-off, provided the system is compatible with local groundwater conditions and acceptable to the PLA.

Wetlands systems can offer an acceptable level of environmental protection provided they're properly designed installed and maintained. In some situations, they may provide better environmental protection than conventional drainage systems.



Example of a reed bed system

In England and Wales, you should contact us during the early design stages of any wetland system to make sure it will provide enough treatment and to check if you'll need a permit for the discharge. Information is available on the Environment Agency website.

In Northern Ireland, SUDS requirements are promoted by NIEA and the Rivers Agency and are starting to enter planning legislation following the findings of 'A Strategy for Promoting the use of Sustainable Urban Drainage Systems within Northern Ireland'.

In Scotland, SUDS are a legal requirement for all sites constructed after 1 April 2007, except single dwellings and those that discharge directly to coastal waters. For certain developments, such as industrial estates, car parks for more than 1000 cars, or developments with more than 1000 houses, you will require a licence from SEPA for SUDS. For smaller developments, where the risk of pollution is lower, you must follow CAR General Binding Rules 10 and 11, see CAR Practical Guide in reference 9. If your site was constructed after 1 April 2006, you must have a CAR licence to discharge into the surface water drainage system (even if this has SUDS), any untreated surface water which contains run-off from a fuel delivery or refuelling area, or from areas where potentially polluting materials, such as chemicals and oil, are delivered, handled or stored. These areas should be covered to prevent surface water run-off. Any discharges from these areas should either go to a foul sewer with the permission of your sewage provider, an on-site treatment facility or be stored for disposal off-site by a registered contractor. If a discharge to the surface water drainage system is unavoidable, you must obtain a CAR licence.

For more information on SUDS see useful websites, CIRIA's SUDS publications page, the government online business advice and support service, and in Scotland also SEPA's SUDS web pages.

6.5 Groundwater protection (receptor)

Groundwater is particularly vulnerable to pollution from underground fuel storage.

In England and Wales, policies related to development in areas of high groundwater sensitivity can be found in reference 8 and from the Environment Agency's website. We use Source Protection Zones (SPZ) as a primary risk screening tool for responding to developments and planning.

There are three SPZ subdivisions and bespoke SPZs defining all major abstraction sources intended for human consumption i.e. boreholes and springs.

Each zone has three subdivisions for each source moving out from the source. These are:

- Zone I (Inner Source Protection)
- Zone II (Outer Source Protection)
- Zone III (Source Catchment).

The closer your activities are to the inner area, Zone I, the greater are the restrictions we impose on activities and discharges to protect the groundwater.

An additional 'Zone of Special Interest' is defined in some areas. These zones highlight areas where known local conditions mean that potentially polluting activities could affect a groundwater source even though the area is outside the normal catchment of that source. Details on how to avoid groundwater pollution can be found in reference 8.

In Northern Ireland, regional groundwater vulnerability maps can be obtained from Geoindex – in the useful websites list. Site specific groundwater vulnerability might have to be established during a site visit. The site investigation should also include a water features survey to make sure minimum

distances to boreholes, wells or springs (as well as surface water receptors) including those used for private supplies. Consult the public water supplier Northern Ireland Water on the extent of source protection/safeguard zones.

In Scotland, the approach is more general. Operators should identify all potential receptors that could be affected by the activity and undertake an appropriate assessment of the risk to each receptor. Mitigation measures must then be introduced to reduce the risk to acceptable levels. Reference 8 gives more information on the storage and handling of chemicals, including hydrocarbons; more information for underground installations is in reference 10.

7. Routine operation

This covers:

- fuel storage
- leak detection systems
- delivery and dispensing of fuels.
- vapour recovery
- washing activities

7.1 Fuel storage and leak detection

The details in this section mainly refer to underground fuel storage. For further information about above ground tanks, see references 2, 5 and 7.

We recommend that underground tanks should be double skinned and provided with an automatic leak detection system. Although installing underground tanks reduces the risk of fire and explosion since they are protected against radiated heat or fire and they allow uninterrupted space at ground level, it's difficult to inspect the tank and ancillary equipment to check the condition and for leaks.

In England and Wales, we don't recommend the installation of new underground storage tanks and associated infrastructure below the groundwater table.

Tank systems should be designed, constructed and installed to protect the public and the environment against any release of product. When properly installed, the complete system should retain its integrity for the duration of its design life.

Underground tanks should have:

- suitable levels of leak detection;
- corrosion and chemical action protection;
- leak containment.

Double wall tanks manufactured to BS EN 12285-1 standards reference 19 meet these requirements.

In Scotland, those involved in the design, installation and operation of underground fuel storage tanks should see reference 10.

7.2 Leak detection systems

A major leak involving the loss of large volumes of product over a short period should be easy to detect.

Smaller leaks from storage tanks and pipework are more common and may be difficult to detect as they can be masked by normal variances in fuel throughput volume and the effects of dispensing vapour recovery systems when displaced vapours are returned to a storage tank. Over a long period, this can result in the loss of a large volume of fuel. Leak detection equipment and techniques are available and should be installed on all new installations or as modifications to existing equipment.

Different leak detection equipment, techniques and systems can identify leaks at varying minimum detectable volumes. The most appropriate way to detect leaks at your site may depend on the environmental sensitivity of the site and the outcome of your environmental risk assessment.

See reference 7 for detailed guidance on the types of leak detection available and the various conditions and locations where they should be used. Leak detection systems should comply with BS EN 13160 standards reference 19.

Summarised information about different leak detection systems is given below:

- automatic leak detection system;
- wetstock monitoring;
- environmental monitoring.

The level of leak detection you need for your site will be influenced by the sensitivity of its location and reflected in your environmental risk assessment. The potential severity or impact of a leak from your site will determine the level of leak detection you need. Information to help you assess the severity of a leak, the likelihood of a leak occurring and your site classification can be found in references 7 and 8.

The main types of leak detection and wetstock monitoring systems can be split into classes 1 to 7, summarised in Table 2.

Table 2

Class	Description	Detection capability	Effectiveness
1. Leak detection	Monitors for leaks in double skinned equipment using pressure or vacuum.	Leaks are detected in either skin of the equipment by changes in pressure equilibrium. Connects to control unit or automatic tank gauge with an alarm.	Indicates failure before loss to the environment.
2. Leak detection	Monitors for leaks using fluid between the two skins.	Detects a leak in the outer layer allowing only detection fluid to escape.	Indicates leaks above and below product level in outer skin of equipment.

Class	Description	Detection capability	Effectiveness
3. Leak detection	Monitors leaks using liquid level and fluid discriminating sensors or vapour detectors.	Detects below the product level only.	This class is usually more appropriate for monitoring double skinned pipe work underneath dispenser sumps and tank fill and dip chambers.
4.a,b and c Dynamic, Quiet Period and Static	Analyses rates of change of tank contents in conjunction with an automatic product gauge.	Leak isn't detected until product is lost to the environment.	These systems require the product levels to be within specified limits and their effectiveness depends on the frequency of testing.
5. Wetstock reconciliation*	Measures changes in, and compares the volume of, product in the tank with the volume delivered and dispensed.	This system can vary from a sophisticated statistical inventory reconciliation to simple dipstick monitoring.	Requires the collection, recording and reconciliation of data on a fixed daily period and relies on maintaining the accuracy of measurement gauges.
6. Environmental Monitoring	Monitoring wells outside the storage tank or area picking up vapour and product on groundwater.	Detects leaks in the ground outside the equipment.	There are limitations to the effectiveness of either vapour or product detection based on local conditions such as soil permeability, groundwater levels and location of bore holes relative to the product and receptors.
7. a and b Pressure line leak detection and mechanical in-line leak detection	Detect leaks by measuring pressure in double skinned pipe work only i.e. for dispensing systems.	Detect leaks by monitoring the changes in pressure characteristics of the line.	Limitation of this class is that it requires the system to be inactive for sufficient time to measure the specified test requirements.

* See reference 20.

7.2.1 Integrity test

Integrity testing should give a pass or fail result for tanks or pipework at any given time. An integrity test should be carried out before a facility is brought into service and after repairs have been made. You should also test for integrity:

- to support a monitoring system;
- if you suspect you have a leak;
- for the periodic testing of the vapour pipe work;
- before you reinstate a tank or containment system which has been out of operation for more than 12 months.

Tank or pipe work integrity tests should use a precision technique, such as a volumetric or non-volumetric test, in preference to a hydrostatic test. Integrity testing may allow a leak to continue undetected for a very long time (years/decades) and should be used only as a minimum level of leak detection. For further information see references 2 and 21.

7.3 Delivery to your tanks

Only staff who have been trained in delivery and emergency procedures should supervise deliveries. We recommend all deliveries are supervised. This helps avoid spills, prevents damage to the environment, reduces risks to people and saves valuable fuel oils. You should have a detailed discussion with your fuel delivery company covering the environmental risk assessment practices to agree safe delivery and emergency procedures. The measures you should put in place include:

- All tanks should be clearly labelled with the product name and volume of the tank.
- Make sure any storage tank is filled with the correct fuel intended for it.
- Display a notice giving details of safe delivery procedures and what to do in an emergency at the delivery point (your Incident Response Plan, section 12, should include a possible emergency during delivery, reference 18). As long as it's safe for people to respond to a spill they should follow your incident response plan.
- Establish the best sequence to attach and remove hoses to maximise vapour recovery, and follow that sequence for every delivery.
- Make sure the delivery points are clearly marked with the tank number, tank contents and maximum tank capacity and are secured when not in use.
- Make sure you accurately measure the volume of fuel stored and the available capacity in your tanks before every delivery to avoid tanks being overfilled.
- Use non-return (check) valves and sealed connections where appropriate.
- Protect filling points from overfill by installing high level alarms that can't be over-ridden (BS EN 13616 provides the standard for overfill devices reference 19).
- Wherever possible, keep the length of the delivery pipe as short as is practicable.
- The whole delivery area should drain to a suitably sized forecourt separator. We recommend the separator is fitted with a shut off valve.
- Where deliveries aren't supervised, make sure the driver has been trained to deal with an emergency at that location.

- Make pollution control equipment such as spill kits (for example drain mats or sorbent materials) readily available and train staff how to use them.
- Consider tanker access when planning a new installation.
- Where a tanker is used for deliveries, you may need to provide additional protection to contain a potentially large-scale spillage during the delivery.
- Protect your delivery point using drainage grids, gullies, kerbs or drain mats.
- Smaller losses can be contained using drip trays under delivery pipes which should be checked after each delivery and emptied. Alternative methods may be appropriate depending on whether the delivery point is above or below ground or made directly into, or offset from, the storage tank.

In Scotland, where an installation is permitted under PPC, controls are placed on the delivery and unloading of petrol into storage tanks at a service station. You must follow these controls to comply with the permit. Statutory guidance on unloading petrol into storage at petrol stations is in reference 22.

7.4 Dispensing from your tanks

The surface of fuel dispensing areas should be impermeable and drained through an oil separator, reference 17. Any damage to the surface should be repaired immediately to stop spilt fuels entering the ground and groundwater.

There are three main types of fuel dispensing systems, in order of preference:

- Suction systems, which draw fuel through the pipes using a partial vacuum; (below ground tanks).
- Pressure systems, which pump fuel using a high pressure pump (above ground tanks only).
- Gravity systems (above ground tanks only), which use the weight of the fuel in the tank to force fuel down the dispensing pipework.

We recommend dispensing fuel via a suction system because, provided it's correctly fitted with a non-return (check) valve directly below the dispenser, it allows fuel within the pipework to drain back to the tank if there's a leak, reducing the risk of a spill that could cause pollution.

A pressure system must have adequate secondary containment and a leak detection system fitted. Losses can be significant as the fuel is lost under pressure, but leak detection can be relatively fast if operated correctly.

We don't recommend using gravity systems because it's impossible to achieve accurate measurement during dispensing.

New dispensers should comply with BS EN 13617 standards reference 19 or be of a similar acceptable level of safety. Where older dispensers don't comply with this standard, you may need to fit and use break couplings, drip trays and under pump valves at higher risk sites. All fuel dispensing equipment must also be protected against collision damage from vehicles and unauthorised use.

People often put the wrong fuel in their cars; this then has to be dealt with, usually on the forecourt, and removed fuel will be hazardous/special waste (see section 11). Make sure vehicles and tanks are fuelled with the right fuel. Display warning notes visibly, to customers and operators, reminding them to double check that the correct fuel is being added to the correct tank.

7.5 Vapour recovery

The EC Directive 94/63/EC for the control of volatile organic compound (VOC) means you must recover petrol vapour from your storage equipment and unloading operations. The delivery and storage of petrol at many petrol stations, and refuelling activities at some petrol stations require an environmental permit. Guidance on standards throughout the UK is contained in Process guidance note PG1/14(06) available from the Defra web site. The regulator for these permits is the relevant local authority in England, Wales and Northern Ireland, and the Scottish Environment Protection Agency in Scotland. The technical details of vapour collection are beyond the scope of this guidance; please see reference 7. More detail on vapour recovery legislation on the European Commission Environment Legislation website, see useful websites.

7.6 Washing activities

We recommend that all washing and cleaning operations, including the washing vehicles or plant, are carried out in a designated area clearly marked on the ground and in any plans. This area should be isolated from both the surface water drainage system and unmade ground or porous surfaces (for example using drainage grids, gullies or kerbs).

Wash water should be re-circulated whenever possible. Otherwise it should drain to, or be disposed of, via the foul sewer (where available). You must check with your local sewerage provider before making a disposal to the foul sewer.

You should make sure that cleaning agents, such as detergents, (including biodegradable ones) can't enter the surface water system or soak into groundwater unless specifically permitted after appropriate treatment. They shouldn't enter oil separators because they reduce their effectiveness (the oil will be dispersed and washed through); see reference 23 for more guidance on preventing pollution from washing activities.

8. Biofuels

This section provides information about the additional risk associated with the storage and dispensing of biofuels and how you can reduce those risks. Although biofuels are widely present in all road fuels and dispensed to the public the environmental risks are highlighted here separately because of their potential impact on existing pollution control measures and procedures.

The Renewable Transport Fuel Obligations 2010 require road fuel suppliers in the UK to supply 5% by volume of all road vehicle fuel from a sustainable source. Biofuels is the generic term for all organically derived transport fuels. The main types of biofuels in the UK are blends of ethanol (Bioethanol) and oils (Biodiesel).

The change in the chemical composition of fuels, from previous non organic sources, means they may have additional storage and dispensing problems above those of traditional fuels. The ethanol in the fuel gives them properties that make them potentially harmful to the water environment; these include:

- If it reaches surface waters, ethanol breaks down in the water and reduces oxygen levels and therefore may kill fish.
- Other pollutants in the fuel, such as benzene and toluene, travel further in groundwater when ethanol is present, spreading contamination.
- By-products from the breakdown of ethanol can make water taste or smell unpleasant or result in low pH (acid conditions).

8.1 Bioethanol and Biodiesel

Bioethanol is usually dispensed as a 5% solution of ethanol blend (E5). But there are higher blend ethanol fuels (HBEF) up to 95% (E95) which aren't widely available to the public. Some commercial and fleet companies will store HBEF for their vehicles.

Biodiesels are blended up to 7% (B7) with oils such as waste cooking oil and oil seed rape.

The physical and chemical properties of ethanol blend fuels mean you need control measures to reduce both the risk of fire and their environmental impact. The properties are:

- altered material compatibility;
- increased conductivity;
- increased flammability range;
- solubility with water.

8.2 Materials compatibility

The material storage tanks and ancillary equipment are made from can be affected by the ethanol content of biofuels. Metals such as aluminium, zinc and brass can be affected, as well as plastics and rubber. Glass reinforced plastic (GRP) tanks can be softened and may fail. Epoxy lined steel tanks may not be suitable for ethanol blends. Contact your equipment supplier to check all your storage containers and ancillary pipe work/pumps, leak detection and dispensing equipment are compatible with the ethanol in the biofuels.

8.3 Increased conductivity

Biofuels have higher electrical conductivity than fuels that aren't blended with ethanol. This can increase galvanic corrosion which could affect equipment such as submersible pumps, tank gauge probes and overfill prevention devices.

8.4 Increased flammability range

Ethanol and petrol have different flash points and limits of flammability; an explosive gas atmosphere in an ethanol blend fuel storage tank will exist across a wider temperature range than that in a petrol storage tank.

8.5 Solubility with water

The ethanol in biofuels affects how water behaves with the fuel. Water is fully soluble in ethanol and your fuel can undergo phase separation this means that the ethanol can separate out of the fuel if there's water in the storage vessel.

More critically, the phase separation means that conventional oil water separators won't capture spills of biofuels with ethanol in them. The fuel will be released together with the water in the discharge. Ethanol is readily biodegradable which could cause rapid de-oxygenation in surface waters which can kill fish and cause other water quality problems.

For guidance on storage and dispensing E5 petrol and B5 diesel, see reference 24.

9. Other non-fuel products at your site

The storage and dispensing of materials other than fuel present a different set of environmental risks from liquid fuels; this section advises on how to store and dispense these materials safely.

There's a range of potentially polluting materials that are readily soluble in water, and can be stored and dispensed at refuelling facilities, particularly at retail outlets. These include:

- emission reduction solutions for example Adblue;
- screen and car wash fluids;
- solvents and paints.

9.1 Emission reduction solutions (ERS), for example AdBlue

Stricter exhaust emissions for commercial vehicles with diesel engines, (buses, trucks, HGVs and coaches) have been issued by the European Union. To meet these standards, the automotive industry has adopted several technologies. One is Selective Catalytic Reduction (SCR) using emission reduction solutions, where harmful exhaust gases are converted to nitrogen and water by catalytic conversion, typically using anhydrous ammonia, aqueous ammonia or urea.

ERS are stored at refuelling sites and will become a common feature at filling stations for commercial diesel vehicles and private depots. Vehicles using ERS have a separate tank, the solution is injected into the engine exhaust stream, from the tank, immediately after the combustion chamber.

If they get into the environment, ERS can seriously pollute groundwater and surface waters. It's important that they are stored, dispensed and handled correctly. They're often stored in drums and intermediate bulk containers (IBC); reference 4 gives general good practice advice on pollution prevention and correct storage of liquids in drums and IBCs. The principles of bulk storage can be found in reference 2 and should be followed for all types of bulk storage.

Ammonia can be corrosive to some metals, such as copper and its alloys. ERS should be stored in containers that are specifically designed and manufactured from materials that are suitable for use with urea. The same applies to the ancillary equipment, such as valves, dispensing nozzles and pipework.

ERS are soluble in water and should be kept out of surface water drainage systems that discharge to the environment. It will not be removed in an oil separator so it's important to isolate the ERS dispensing area drainage from the surface water system to reduce the possibility of spills and drips causing pollution. If this isn't possible, your site management systems should make sure any spills of ERS are cleaned up immediately with proprietary sorbents.

Tank manufacturers are now producing storage solutions for ERS. Steel and plastic storage systems with integral secondary containment are available. Some companies are proposing to supply specialist IBCs that are delivered full and then collected when empty, see reference 4.

9.2 Forecourt drainage

In addition to ERS, screen and car wash fluids and solvent or paints can all cause pollution if they're spilt.

If the site drainage from your site discharges into the surface water drain, a soakaway or the water environment (via a SUDS), seek our advice before introducing any bulk storage of soluble materials onto your site. You should:

- Make sure your storage containers, pipe work and dispensing equipment are all suitable and compatible for those products.
- Install appropriately sized secondary containment for the container and ancillary equipment.
- Design the dispensing area drainage so that it's not connected to surface water drains.
- Use trigger nozzles with an auto shut off to dispense the products and make sure that the nozzle can't be left in the open position.
- Provide appropriate pollution control equipment to deal with large and small spills, i.e. proprietary spill kits, drain mats, pipe blockers, or permanent valves on drainage systems to provide containment.
- Develop an emergency response plan and train staff to deal with a spill or other accident; see reference 18 for more details.

10. Maintenance

Routine maintenance on your site is essential to reduce the risk of leaks, spills and other incidents.

This section lists the main areas you should look at: tanks, containment systems monitoring equipment and site infra-structure.

Even a small fuel leak can result in significant pollution. You must frequently inspect and maintain all the equipment on your site, both above and below ground. This will reduce the risk of leaks. Keep a record of your inspections, any problems found and maintenance carried out.

As a minimum, your maintenance checks should cover inspecting:

- tanks and other storage containers for damage, leaks or corrosion;
- secondary containment for damage, cracks or leaks;
- pipework, particularly joints and connections;
- monitoring equipment, make sure these are calibrated regularly;
- dispensers;
- impermeable surfaces around storage areas;
- separators, which should be cleaned regularly;
- access chambers;
- drainage channels;
- any other associated equipment or areas.

If you identify problems, record and correct them as soon as possible. Follow the maintenance schedule in the manufacturer's instructions (where available) or as necessary to prevent polluting the environment.

Historically, more fuel leaks and other losses are caused by failures and/or damage to associated pipe work (particularly underground unprotected steel pipes) than by failure of the storage tank itself. We strongly recommended installing your pipework above ground wherever possible. If not above ground,

it should comply with BS EN 14125 reference 19 and, if pressured, should be doubled skinned. This allows you to carry out regular maintenance checks more easily and to identify leaks earlier.

In Scotland, businesses subject to PPC will have conditions placed in their permits that cover maintenance, they must comply with these requirements.

Where these are not a legal requirement, they should be followed as best practice. Further detailed guidance on maintenance inspections is in reference 25.

11. Waste management

Minimising waste will save you money and complying with waste legislation is a must do pollution prevention measure.

We suggest you carry out a waste minimisation review and consider how you can reduce the volume of waste you produce. This can reduce your raw material use and make your processes more efficient, saving you money and reducing your impact on the environment. Contact waste minimisation organisations, listed in useful websites, for free advice and publications.

Check with your suppliers if they can provide your materials in refillable or recyclable containers. Use these whenever possible.

11.1 Legal Overview

If you produce, import or arrange for waste to be disposed of, you have a legal responsibility to make sure it's stored, transported, kept, treated and/or disposed of without harming the environment. This is called your Duty of Care and it's a legal requirement.

The Duty of Care requires that you must:

- Deal with your waste so it can't escape your control.
- Only allow authorised people or businesses to transport or handle your waste.
- Complete transfer notes, or consignment notes for hazardous or special waste, to accompany your waste, with enough information to make sure it can be handled correctly by any recipient.
- Keep transfer notes for two years and consignment notes for three years.

If you produce hazardous waste, special waste in Scotland, for example waste oils, acids and solvents or sorbents and parts contaminated with these, there are legal requirements that apply to these wastes - in Scotland, see SEPA special waste pages in useful websites. In England and Wales, you must be registered as a hazardous waste producer. It's illegal to dilute or mix different categories of hazardous or special wastes or mix them with non hazardous wastes and you should store them separately, unless you hold a permit or licence that specifies you can mix them.

In Scotland you must pre notify SEPA between at least three working days and maximum of one month prior to moving the special waste. You can't move these wastes without a consignment note, unless it's an emergency. If you have to move hazardous or special waste in an emergency, you must take steps to minimise the risk to the public or the environment. You must complete the consignment note as soon as possible.

We recommend you check the government on-line business advice and support service for up to date legal requirements for your Duty of Care and for information about types of waste, maximum storage times, notices that must accompany waste transport and how to check that your waste carrier is authorised to move your waste. You must also check if you need a permit, licence or registered exemption for your waste activities.

11.2 Waste storage

Waste containers must always be clearly labelled with their contents. All waste and waste containers should be stored in designated areas, which are isolated completely from surface water drains or direct discharge to the environment.

The area where waste is collected and stored should be able to safely contain any spill or leak. Empty containers shouldn't be allowed to accumulate, but should be collected by your supplier (where possible), dealt with using suitable on-site facilities or removed as soon as possible by a registered waste carrier to a permitted or licensed facility. It's a good idea to remove wastes often enough so they don't cause odour, pest or vermin problems and so the risk of fires is reduced. For further information on the storage and disposal of waste oils, see reference 26.

12. Incident response

Preparing how you'll respond to an environmental incident can significantly reduce its impact on the environment or even prevent it causing pollution. This section tells you how you can plan to respond to incidents.

To respond effectively to an environmental incident, we recommend you produce an incident response plan. There is guidance and a template to help you in our guidance in references 18, 25 and 27.

Train your staff to deal with an environmental incident – this may be a legal requirement. Keep a record of all their training. Training should include a background to environmental sensitivities around the site and a formal emergency procedure that details actions to be taken in the event of:

- spills
- fires
- collision with storage or dispensing equipment
- odours being detected off-site
- suspected leaks.

The following checklist outlines the main points we recommend you follow to implement your plan.

Procedures checklist

- Clearly define when the plan should be activated. This will depend on the nature of your site and the type of the incident.
- Make sure all relevant staff know how and when to contact other emergency responders; emergency services, us, local authority, sewage treatment providers and other organisations identified in your emergency plan.
- Consider the impact that an incident on your site could have on the environment outside your boundary: nearby properties, surface waters, groundwater, downstream abstractors,

agricultural land or environmentally sensitive sites. Once identified, agree contact procedures with them if possible.

- Put in place staff evacuation procedures – your local authority emergency planning department will help you with these.
- Identify any special methods you need to deal with substances that pose particular health or environmental risks.
- Develop a fire fighting strategy with your local fire and rescue service; if a controlled burn is an agreed option, state this clearly. The same applies to the use of foam.
- Train staff to use spill kits, drain blockers and other pollution control equipment and how to operate pollution control devices.
- Identify procedures for recovering spilled product and the safe handling and legal disposal of any waste associated with the incident.
- We recommend that you train appropriate staff to deal with media enquiries.

13. Glossary

BS EN Standards	These are European technical standards adopted in the UK which often supersede existing national technical standards.
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. The saturation zone is where all the cracks in the rock and all the spaces between the grains of rock and within the soil are filled with water; these are known as aquifers.
Hazardous waste	This is specified in the European Waste Catalogue, that may be harmful to human health or the environment. This includes but isn't limited to: • all fuels and certain additives – petrol, diesel, biofuels, LPGs, some emission reduction solutions (check with the manufacturer for further information); • oils and oily sludges, for instance engine oil; • garage waste - used oil/fuel filters, aerosols, antifreeze and brake fluids, lead acid batteries and contaminated rags; • other chemical wastes such as solvents, paints (both oil and solvent based), screen and car washing fluids, and disinfectants.
Hydrostatic testing	The tank is filled with water (usually dyed) and put under pressure to check for leaks.
Non volumetric testing	The tank has a vacuum applied or is put under pressure and is monitored for: • air intake • increase in water content • increase or decrease of product level • decrease of vacuum or pressure.
Special waste	The term used in Scotland for what is known as Hazardous waste in England, Northern Ireland and Wales. See Hazardous waste above.

Surface water	Includes rivers, streams, burns, ditches, lakes, lochs, ponds, estuaries and coastal waters.
Volumetric testing	The change in volume in tank due to a leak by measuring the change in levels of a product over time.

14. References

All the Pollution Prevention Guidance notes (PPGs) are available at:

www.environment-agency.gov.uk/ppg

<http://www.doeni.gov.uk/niea/index/publications.htm?act=l&typ=s&ftx=ppg>

www.sepa.org.uk/about_us/publications/guidance/ppgs.aspx

1. [Code of Practice on Guidance on Regulation 2009](#).
2. Above Ground Oil Storage Tanks: PPG 2
3. Pollution prevention guidance for working at construction and demolition sites: PPG 6
4. Drums and intermediate bulk containers: PPG 26
5. For England: [Water Resources \(Control of Pollution\) \(Silage, Slurry and Agricultural Fuel\) \(England\) Regulations 2010](#)
For Northern Ireland: [The Control of Pollution \(Silage, Slurry and Agricultural Fuel Oil\) Regulations \(Northern Ireland\) 2003](#)
For Scotland: [The Water Environment \(Oil Storage\) \(Scotland\) Regulations 2006](#)
For Wales: [The Water Resources \(Control of Pollution\) \(Silage, Slurry and Agriculture Fuel Oil\) \(Wales\) Regulations 2010](#)
6. For England: [Guidance note for the Control of Pollution \(Oil Storage\) \(England\) Regulations 2001](#). Department for Environment, Food and Rural Affairs (Defra),
For Northern Ireland: [The Control of Pollution \(Oil Storage\) Regulations \(Northern Ireland\) 2010](#)
For Scotland: The Water Environment (Oil Storage) (Scotland) Regulations 2006.
7. Guidance for the design, construction, modification and maintenance of petrol filling stations (known as the Blue Book) 3rd edition. The Association for Petroleum and Explosives Administration/Energy Institute, 2011. Energy Institute. ISBN 978-0-85293-600-9
8. For England and Wales: [Groundwater Protection: Policy and Practice \(GP3\) Parts 1-4](#) (under review 2011)
For Scotland: [Section F of Groundwater Protection Policy for Scotland](#), v3, 2009, SEPA
9. For England and Wales: [Environmental Permitting \(England and Wales\) Regulations: Statutory Instrument 2010](#) No. 675 and amendments
For Northern Ireland: [The Water \(Northern Ireland\) Order 1999](#)
For Scotland: [The Pollution Prevention and Control \(Scotland\) Regulations 2000](#): SSI 323 and amendments [Water Environment \(Controlled Activities\) \(Scotland\) Regulations – A Practical Guide](#), usually known as 'CAR Practical Guide', SEPA 2008

10. [Underground Storage Tanks for Liquid Hydrocarbons – Code of Practice for Installers, Owners and Operators of Underground Storage Tanks \(and Pipelines\)](#), SEPA 2006
11. For England, Scotland and Wales: [Control of Major Accident Hazards Regulations 1999](#) SI 743 and amendments; [Control of Major Accident Hazards \(Amendments\) Regulations 2009](#)
For Northern Ireland: [Control of Major Accident Hazards \(Amendments\) 2005](#)
[COMAH competent authority policy on containment of bulk hazardous liquids at COMAH Establishments](#), 2008
[Secondary and Tertiary Containment of Bulk Hazardous Liquids at COMAH Establishments \(Operational Delivery Guide\)](#) – COMAH Competent Authority Work stream, 2010
[A guide to the Control of Major Accident Hazards Regulations 1999 \(Amended\)](#) 2006, Health and Safety Executive.
12. For England: [The Environmental Damage \(Prevention and Remediation\) Regulations 2009](#): Statutory Instrument 2009 No. 153
For Northern Ireland: [The Environmental Liability \(Prevention and Remediation\) Regulations \(Northern Ireland\) 2009](#): Statutory Rules of Northern Ireland 2009 No. 252
For Scotland: [The Environmental Liability \(Scotland\) Regulations 2009: Scottish Statutory Instrument 2009](#) No. 266 and amendment.
For Wales: [The Environmental Damage \(Prevention and Remediation\) \(Wales\) Regulations 2009](#): Statutory Instrument 2009 No. 995 (W.81)
13. [The Dangerous Substances and Explosive Atmosphere Regulations 2002](#)
14. [Petroleum \(Consolidation\) Act 1928](#) (as amended by DSEAR)
15. Controlled Burn: PPG 28
16. Treatment and disposal of sewage where no foul sewer is available: PPG 4
17. Use and design of oil separators for surface water drainage systems: PPG 3
18. Incident response planning: PPG 21
19. British Standards are available from the British Standards Institution
[Fabricated steel tanks BS 12285](#)
[Tank gauge leak detection systems BS 13160](#)
[Overfill prevention devices BS 13616](#)
[Metering pumps dispensing standards BS 13617](#)
[Underground pipework standards BS 2014125](#)
20. [Wetstock Reconciliation at Fuel Storage Facilities](#), Association for Petroleum and Explosives Administration (APEA)
21. Installation, decommissioning and removal of underground storage tanks: PPG 27
22. Process Guidance Note 1/14 (06), [Unloading of Petrol into Storage at Petrol Stations](#), 2006
23. Vehicle washing and cleaning: PPG 13
24. [Guidance for the storage and dispensing of E5 petrol and B5 diesel at filling stations](#), ISBN 978 0 85293 508 8 Energy Institute Publication 2008

25. [Petrol Filling Stations Guidance on Managing the Risk from Fire and Explosion](#), (known as the Red Guide), Health and Safety Executive and Local Authorities Enforcement Liaison Committee
26. Safe storage and disposal of used oils: PPG 8
27. Dealing with spills: PPG22

Other useful sources of information:

For general guidance on pollution prevention, see the following guidance available from our website:

- [Is your site right? - Pollution Prevention 10 Point Checklist](#)
- [Pollution Prevention Pays](#)
- [General Guide to the Prevention of Pollution: PPG1](#)

Environment Agency '[What's in your backyard](#)'.

Environmental Guidelines for petroleum distribution installations, ISBN 978 0 85293 Energy Institute Publications 2007

Sustainable Drainage systems at petroleum installations, ISBN 978 0 85293 439 5 Energy Institute Publication 2009

Guidance Document on Risk Assessment for the Water Environment at Operational Fuel Storage and Dispensing Facilities, ISBN 0 85293 256 1 Energy Institute Publications 1999

Environmental management toolkit – General version industry available from Environment Agency website

Defra – [The Groundwater Protection Code: Petrol Stations and other Fuel dispensing facilities involving underground storage tanks](#) - for England and Wales.

Useful websites:

Association for Petroleum and Explosives Administration: www.apea.org.uk/

CIRIA: Home page www.ciria.org

- CIRIA's SUDS publications <http://www.ciria.org.uk/suds/publications.htm>

European Commission Environmental Legislation: <http://ec.europa.eu/environment/air/legis.htm>

Health and Safety Executive (HSE): Home page www.hse.gov.uk

- The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) - <http://www.hse.gov.uk/fireandexplosion/dsear.htm>
- Petroleum Enforcement Liaison Group and circulars <http://www.hse.gov.uk/lau/pelqfoi.htm>

Department for Business, Innovation and Skills: www.bis.gov.uk

Department for Environment and Rural Affairs: www.defra.gov.uk

The government on-line business advice and support service:

- In England: Business Link www.businesslink.gov.uk
- In Northern Ireland: NIBusinessInfo www.nibusinessinfo.co.uk
- In Scotland: Business Gateway www.bgateway.com
- In Wales: FS4B www.fs4b.wales.gov.uk
- NetRegs: www.NetRegs.gov.uk

SEPA web pages

- [Oil Storage](#)
- [Pollution Prevention and Control \(PPC\) – application forms page](#)
- [Special Waste](#)
- [SUDS](#)
- [Water Regulations](#)

Waste minimisation information available from:

- In England: Envirowise, <http://envirowise.wrap.org.uk/> Tel: 0822 585 794
- In Scotland: Zero Waste Scotland, <http://www.zerowastescotland.org.uk/> Tel: 0808 100 2040
- In Wales: Envirowise, <http://www.envirowisewales.org.uk/>

For more information on groundwater see the following web pages:

- UK Groundwater Forum <http://www.groundwateruk.org/>
- Factsheet on the hydrological cycle http://www.doeni.gov.uk/niea/04_hydrological_cycle.pdf

In Northern Ireland the regional groundwater vulnerability can be obtained online via the Geoindex webpage. Guidance on how to access and use the webpage is available by e-mailing waterinfo@doeni.gov.uk.

We welcome any questions or comments about this guidance, or suggestions about how we could improve it. Please email us at pollution.prevention@environment-agency.gov.uk, phone us on 03708 506 506 or write to us at:

Environment Agency
99 Parkway Avenue
Sheffield
S9 4WG.

This PPG is next due to be reviewed by June 2015.

UK wide Incident/Pollution hotline 0800 80 70 60 (24 hrs)		
Floodline (England, Wales and Scotland) 0845 988 1188		flooding incident line (NI) 0300 2000 100
Environment Agency	Scottish Environment Protection Agency	Northern Ireland Environment Agency
www.environment-agency.gov.uk	www.sepa.org.uk	www.ni-environment.gov.uk
HEAD OFFICE Horizon House Deanery Road, Bristol BS1 5AH	CORPORATE OFFICE Erskine Court The Castle Business Park Stirling FK9 4TR	HEAD OFFICE Klondyke Building Cromac Avenue Gasworks Business Park Lower Ormeau Road Belfast BT7 2JA
Tel: 0117 934 4001	Tel: 01786 457 700 Fax: 01786 446 885	Tel: 0845 302 0008
Pollution.prevention@environment-agency.gov.uk	netregs@sepa.org.uk	NIEAPollutionPrevention@doeni.gov.uk

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