

5.0 SUSTAINABLE DRAINAGE SYSTEMS (SUDS)

5.1 Chapter 4 discusses the potential flood risk to the Site itself, however it is equally important to ensure that the development does not increase flood risk elsewhere by increasing surface water runoff.

5.2 PPS25 identifies how built development can cause flooding by increasing run-off. Development usually increases the area of impermeable surfaces, promoting rapid run-off to surface water sewers/watercourses rather than infiltrating into the ground. The effect can be to increase both total and peak water flows, contributing to flooding.

5.3 As this site is predominantly impermeable the EA have accepted that surface water should be attenuated to the existing rate, to prevent any increase in runoff and minimise the risk of increased flood risk downstream. The use of Sustainable Drainage Systems (SUDS), which the EA consider to be suitable for the Site, has therefore been considered. SUDS aim to mimic the drainage of green field sites by:

- Reducing the quantity of runoff from the Site (source control techniques)
- Slowing the velocity of runoff to allow settlement, filtering and infiltration (permeable conveyance)
- Providing passive treatment to collected surface water before discharge into land or to a watercourse (end of pipe system)

5.4 The design of SUDS falls outside the scope of this FRA, although as part of this study the potential SUDS methodology available for surface water drainage on the Site will be evaluated. As recognised in CIRIA 697 (Ref 9) Site characteristics have a significant influence on the type of SUDS suitable.

5.5 The following SUDS techniques have been considered for use at this Site.

Infiltration Techniques

5.6 Infiltration into the subsoil reduces the total volume of runoff, rather than simply reducing peak flows. The subsoil consists of Made Ground overlying River Terrace Deposits and Wittering Deposits (see Chapter 2), which are expected to be moderately permeable and therefore likely to be suitable for drainage by infiltration.

5.7 It is understood that some of the existing buildings on-site drain by use of a network of soakaways, and the detailed design will consider the possibility of providing the Site with new infiltration devices, to reduce the volume as well as rate of discharge from the Site.

5.8 As the proposed development is not situated within a Groundwater Source Protection Zone (SPZ – see Figure 4) additional infiltration is likely to be acceptable as long as there is no significant contamination present beneath the Site and satisfactory soakage rates can be achieved. It is recommended that soakage tests carried out in accordance with BRE Digest 365 should be undertaken to confirm that suitable infiltration rates can be achieved

5.9 Any infiltration device will need to consider the risk of mobilising contaminants as well as inducing new contaminants into groundwater sources. As such soakage infiltration devices might be considered for the drainage of roofs, however details of infiltration rates as well as levels of contamination will need to be obtained prior to designing a detailed system based on infiltration devices.

Surface Attenuation

5.10 Vegetated surface attenuation features, such as swales, filter strips and ponds collect surface water within the landscape of the site and a detention basin is proposed to provide attenuation for the “print works” in the southern part of the Site. The safety management procedures will need to be considered in detail.

Permeable Surfaces

5.11 Permeable surfaces such as permeable block paving and porous resin bound gravel or tarmacadam can mimic soft landscaping, by allowing surface water to drain between the blocks and into a granular sub base, from where infiltration into the underlying subsoil can occur. Permeable surfaces should ideally discharge into the ground, however, if following soakage tests the infiltration rate is not sufficient, the permeable surfaces could be designed to discharge into the surface water drainage system by incorporating an impermeable membrane below the sub base. The flow of water through a granular sub base would allow the removal of oil and other contaminants in the water through natural biological action, improving the quality of water discharged into the surface water sewer. In areas where permeable surfaces were provided, there would be no need for traditional drainage ironwork or an oil interceptor.

5.12 It is proposed that all parking areas and private roads (except those serving the “Print Works”), will be surfaced in permeable block paving. Ideally these will be able to infiltrate, however overflow connections will be provided to the on-site surface water drainage system. It is also proposed to connect the roof drainage to the permeable paving so that the flows from the roofs can be attenuated within the granular sub base.

Rainwater Harvesting and Green Roofs

5.13 Rainwater harvesting and green roofs provide both attenuation of surface water and reuse within the Site. In doing so they reduce the demand on potable water resources whilst minimising runoff from the development. However as attenuation for the roofs can be provided by the use of permeable paving, and given the pitch of the roofs required for residential accommodation it is unlikely that these features would be implemented on the Site.

Below Ground Storage

- 5.14 Although not strictly SUDS, below ground storage tanks can be installed to attenuate peak runoff from the Site with a hydrobrake or similar flow control structure limiting the discharge to an agreed rate. The volume of storage achievable would depend on the area available for such a structure, which could be a concrete tank or a system of lightweight geocellular units, and on the depth of the receiving surface water sewer.
- 5.15 The use of underground storage tanks should be used to supplement other more sustainable urban drainage techniques should these prove not to be practical.

6.0 SURFACE WATER STRATEGY

- 6.1 It can be seen from Chapter 5 that the use of permeable paving, surface attenuation and below ground attenuation devices are practicable at this Site, additionally soakage tests may prove infiltration techniques appropriate.
- 6.2 As a minimum requirement the surface water runoff rate will not exceed the existing surface water discharge rate from the Site. Woods Hardwick has undertaken an analysis of the existing surface water infrastructure in order to quantify the rates of discharge from the Site, details of the calculations are provided in Appendix E. The calculations show that the Site is served by a single 375mm diameter surface water pipe with a calculated maximum capacity of 120l/s.
- 6.3 The calculations provided in Appendix E by Woods Hardwick, show that 2000m³ of attenuation would be required in order to restrict the surface water runoff rate to 120l/s for the 1 in 100 year rainfall event including a 30% allowance for climate change.
- 6.4 The proposals to provide the attenuation are summarised in the Table 6.1 below and in given in further detail in Appendix F. In the absence of any soakage rates, it has been assumed at this stage that infiltration is not achievable, in order to demonstrate that sufficient attenuation can be provided in this scenario.

Table 1: Summary of Potential Attenuation Volumes

Permeable paving in the residential area:	1655.0 m ³
Permeable paving in the commercial area:	0.0 m ³
Balancing pond near printworks	345.0 m ³
Total Attenuation provided	2000.0 m ³
Attenuation required	2000.0 m ³
Attenuation deficit	0.0 m ³

Treatment of Existing Sewers

- 6.5 As the existing sewers on-site are in private ownership, they will be surveyed and tested to ensure that no private connections cross the Site, and should any private connections connect into the Site drainage these will need to be maintained.

Drainage Design Details

- 6.6 Under the Sewers for Adoption standards (Ref 10), the surface water system should be designed under pipe full conditions to accept the 1 in 2 year design storm without surcharging above the pipe soffit (BS EN 752: 1996). The system should be designed so as not to flood any part of the Site during a 1 in 30 year return period design storm, however the outline drainage strategy proposes that the 1 in 100 year flows will be attenuated below ground within permeable paving and a detention basin as demonstrated in Figure 4.

Maintenance of Drainage Systems

- 6.7 It is expected to be the intention to secure adoption of the sewer systems within the Site. This may prove problematic in the context of the ultimate points of outfall in the gardens of the Maybush Road properties where the pipelines do not have the status of public sewer.
- 6.8 Sewers for Adoption 6th Edition (Ref 13) specifies that "The Undertaker will not adopt SUDS features that are situated in private land. They should be sited in public open space, common shared areas held for general communal purposes or public highway, and have unrestricted access." Therefore the nature of the development may mean that the majority of the surface water drainage system and the responsibility of the SUDS systems will rest with the developer, requiring a Management Company maintain the drainage systems.
- 6.9 All surface water from roads and hard standings within the development area susceptible to petrol contamination, where permeable paving is not provided, shall be passed through an appropriate interceptor tank designed and constructed to have capacity compatible with the site being drained. On-going maintenance of the interceptor shall be provided in accordance with the manufacturer's instructions.

Summary

- 6.10 It is proposed to reduce the surface runoff to the existing rate, calculated by Woods Hardwick at 120l/s/ha for the 1 in 100 year storm including a suitable allowance for climate change over the lifetime of the development. It is proposed that parking areas and private roads totalling some 0.9ha will be surfaced in permeable paving providing 1650m³; ideally these will be allowed to infiltrate into the subsurface with overflows discharging to the local sewer system. A detention basin is proposed to the east of the Site to service drainage from the print works, additionally existing soakaways may be utilised and subsurface storage tanks may also prove appropriate for supplementary attenuation requirements.
- 6.11 These figures show that containment of surface flows up to the 1 in 100 year design event on the Site is feasible; however, it may be considered that some surface ponding at this return period is suitable in car parking and amenity areas providing that residential properties are not placed at risk.
- 6.12 Further design of the drainage strategy will be undertaken by Woods Hardwick during the detailed design stage.


7.0 CONCLUSIONS

- 7.1 The Site of the proposed development lies within Flood Zone 1 where the annual probability of flooding with defences where they exist for rivers is 0.1% or less, according to the Environment Agency's Flood Maps. Therefore the risk of flooding from fluvial or tidal sources is considered negligible.
- 7.2 The Site is predominantly hard landscaped and the proposals will increase the total permeable area. To ensure the development does not increase flood risk elsewhere, the rate of surface water discharge for the Site will be limited to the existing for storm events up to and including the 1% annual probability (1 in 100-year) event through the provision of onsite attenuation and potentially infiltration, with an allowance made for the future effects of climate change
- 7.3 The Environment Agency requires that the surface water drainage design should incorporate sustainable drainage techniques (SUDS) to provide amenity, water quality and habitat benefits. As the Site is currently served in part by soakaways, the use of infiltration techniques will be considered as part of the detailed design. It is likely that a connection to the existing sewer infrastructure would be required in order to provide an overflow for any infiltration devices; therefore it is likely that attenuation devices would also need to be required at the Site. The most practicable SUDS solutions for the Site will be permeable paving and a detention / infiltration basin.
- 7.4 The proposals presented herein indicate that the 1 in 100 year event can be attenuated onsite. The exact nature and composition of the SUDS techniques used to provide this attenuation will be confirmed during the detailed design stage by Woods Hardwick, the drainage consultant.
- 7.5 As long as the foul and surface water drainage systems are appropriately designed in accordance with the principles outlined in this report and with Southern Water's approval, the development will not be at significant risk of flooding and will not increase flood risk elsewhere.

8.0 REFERENCES

1. Communities and Local Government PPS25, Planning Policy Statement 25-Development and Flood Risk, (December 2006)
2. Environment Agency Website www.environment-agency.gov.uk
3. Environment Agency National Standing Advice to Local Planning Authorities on Development and Flood Risk
4. <http://www.southampton.gov.uk>
5. Measuring Progress – Preparing for climate change through the UK Climate Impacts Programme, June 2005, <http://www.ukcip.org.uk>
6. Phase 1 and Phase 2 Site Investigation and Environmental Risk Assessment, Ordnance Survey, Romsey Road, Southampton, Waterman Environmental, September 2007.
7. BS8110 Part 1, Structural use of concrete Part 1: Code of practice for design and construction, BSI 1997.
8. CIRIA Report R 139, Water resisting basements - a guide. Safeguarding new and existing basements against water and dampness
9. CIRIA C697, The SUDS Manual, 2007.
10. Sewers for Adoption 6th edition, a design and construction guide for developers, Water U.K. (2006)


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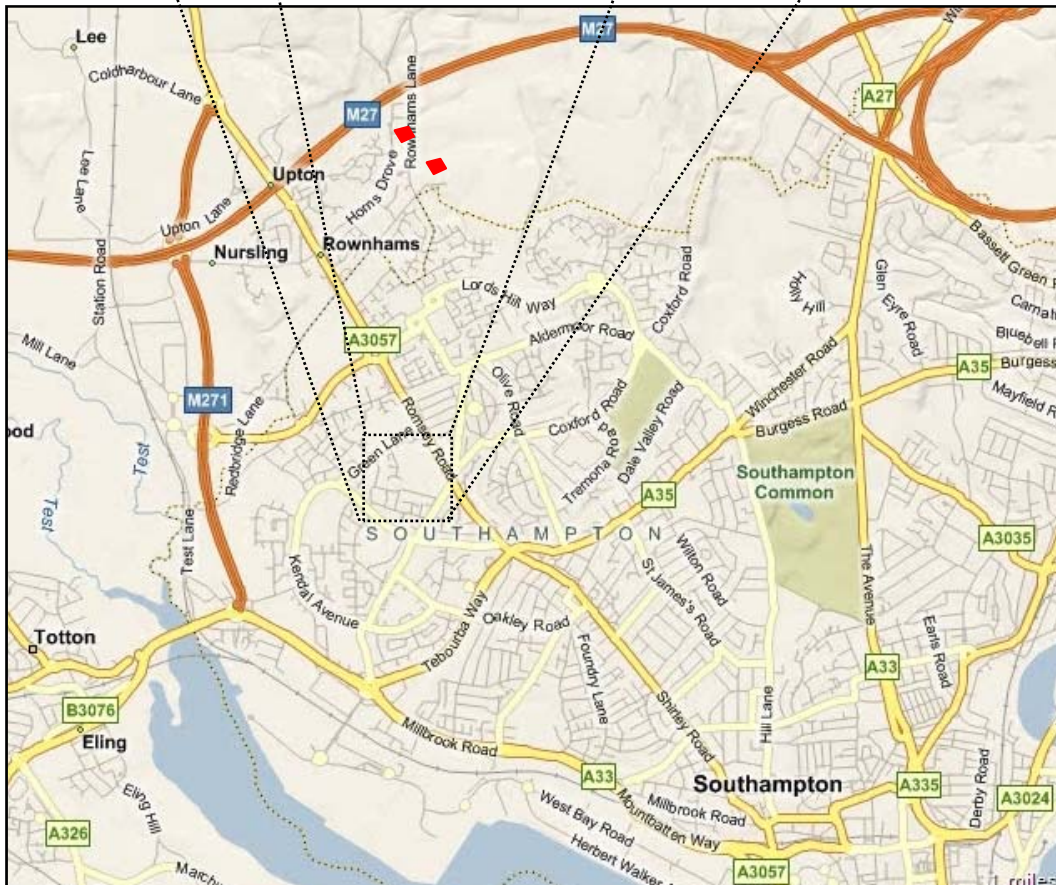


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Figures



SITE NGR; 438680, 114840.

NOT TO SCALE







Project Title: ROMSEY ROAD, SOUTHAMPTON

FIGURE 1

Title: SITE LOCATION PLAN

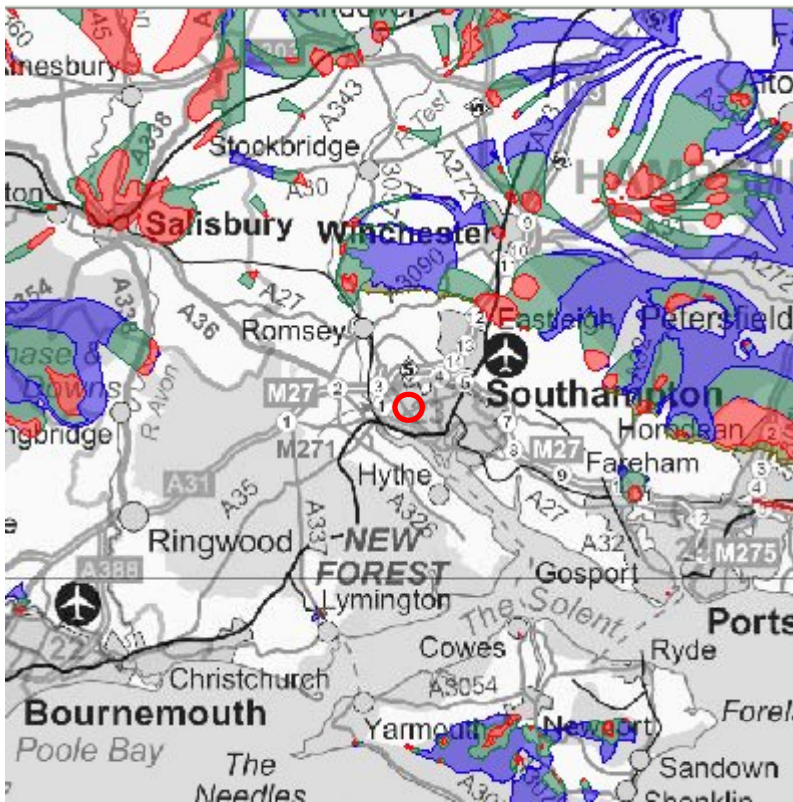
Date: MARCH 2008



-  SITE
-  FLOOD ZONE 3
-  FLOOD ZONE 2
-  FLOOD ZONE 1
-  FLOOD DEFENCES
-  AREAS BENEFITTING FROM DEFENCES

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Project Title:	ROMSEY ROAD, SOUTHAMPTON
	FIGURE 2
Title:	EA FLOOD ZONE MAP
Date:	MARCH 2008



- Site
- Borehole
- Inner Protection Zone
- Outer Protection Zone
- Total Catchment
- Special Interest



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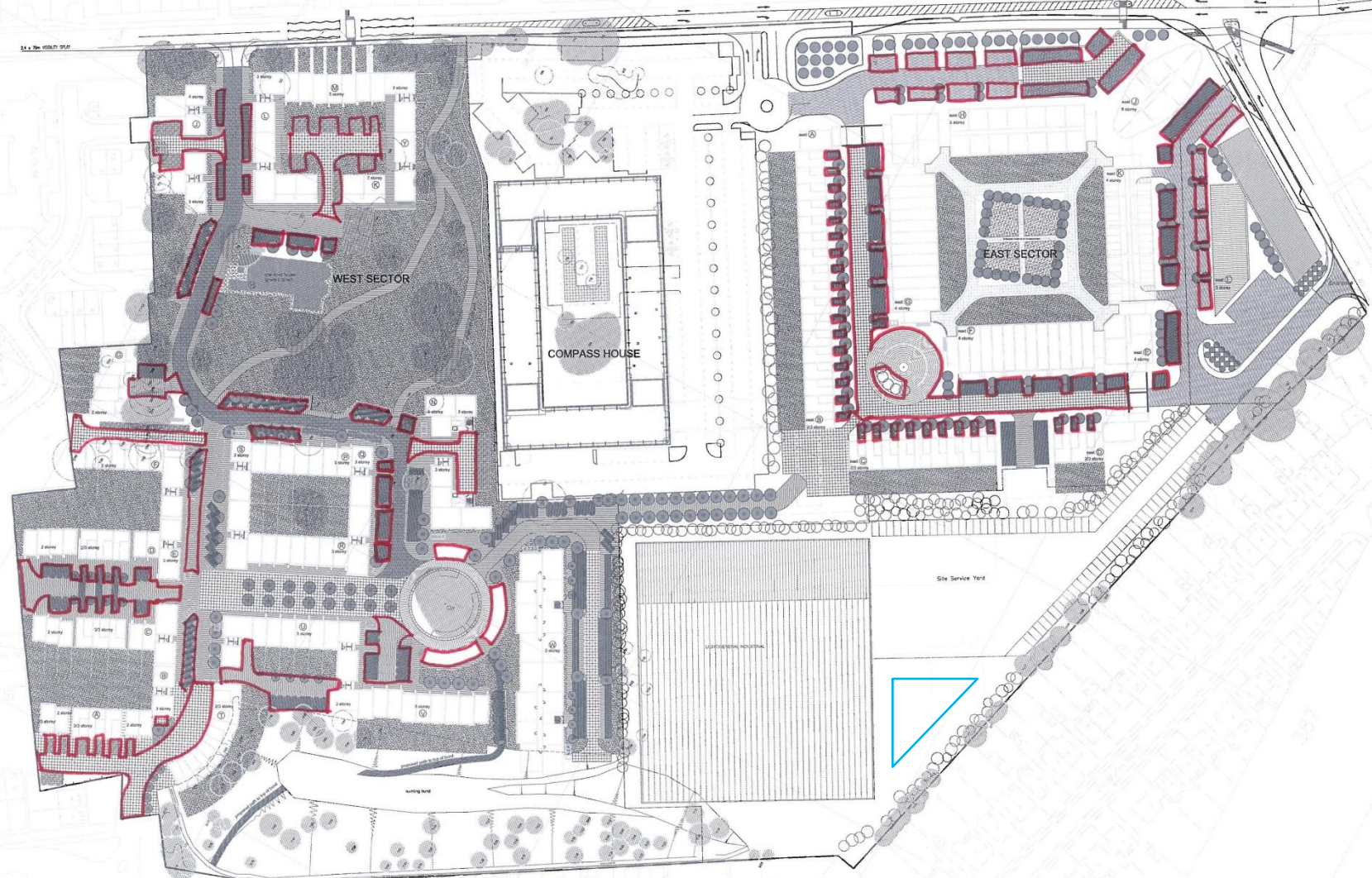
FIGURE 3

Title: EA SOURCE PROTECTION ZONE

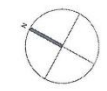
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Rev	Details	Date	Initials
A	Not been submitted	16.04.07	JK
B	Proposed for discussion	16.04.07	JK
C	Not submitted	16.04.07	JK



- INDICATIVE LOCATION OF PERMEABLE PAVING
- INDICATIVE LOCATION OF DETENTION BASIN



This drawing accompanies an Outline Planning Submission

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Client: **Kier Property**
Project: **Romsey Road, Southampton**
Description: **Site Layout: Alternative West Sector Floor Plan**

Scale: **DRAFT**
Scale: 1:500 (BAS) SHEET Date: Sept 2007
Job number: 24581 Drawing number: A-02-P002 Revision: C
Original size: 300mm x A4 Copyright Broadway Malayan Limited

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Project Title:	ROMSEY ROAD, SOUTHAMPTON
Title:	FIGURE 4
Title:	INDICATIVE AREAS FOR SUDS
Date:	MARCH 2008