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PERSIMMON HOMES SOUTH COAST

LAND AT CHICKERELL, WEYMOUTH

FLOOD RISK ASSESSMENT

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CONTENTS

PAGE NO.

APPENDICES

1. INTRODUCTION

1.1. This Flood Risk Assessment (FRA) has been prepared on behalf of Persimmon Homes in connection with the promotion of land for residential development at land at Chickerell, near Weymouth.

1.2. The location of the proposed site is situated in Chickerell, to the north west of Weymouth as shown on drawing P482/12 contained at **Appendix 1**.

1.3. This report will consider both the risk from pluvial and fluvial flooding and also the impact on the surrounding areas from the discharge of surface water from the development.

1.4. The purpose of this Flood Risk Assessment is to provide sufficient flood risk information in support of the proposals to demonstrate that the development could proceed without creating an unacceptable flood risk.

2. THE SCOPE OF THE ASSESSMENT

2.1. Planning Policy Statement 25: Development and Flood Risk (PPS25), published in December 2006, sets out the Government's policy on development and flood risk. It highlights the key role of the planning system in managing flood risk and planning's contribution to mitigating and adapting to climate change.

2.2. PPS25 requires that a sequential risk-based approach should be used to determine the suitability of land for development, and that flood risk assessments should be carried out to the appropriate degree at all levels of the planning process. A Regional Flood Risk Appraisal (RFRA) should inform the Regional Spatial Strategy (RSS) taking account of Strategic Flood Risk Assessments (SFRAs) where available. A SFRA should be carried out by the Local Planning Authority (LPA) to inform the preparation of its Local Development Documents (LDDs).

2.3. A SFRA provides the basis for the Sequential Test which should be applied at all stages of the planning process to steer new development to areas at the lowest probability of flooding. Weymouth and Portland Borough Council in its role as Local Planning Authority has produced a SFRA that includes the development site.

2.4. The SFRA advises that when a site lies within an area of potential flood risk, the Decision Flow Chart based on PPS25 should be used to determine the suitability of the site for development, having regard to its Vulnerability Classification. The Flood Risk Vulnerability Classification, contained in section 7.1 of the SFRA, is a reproduction of Table D2 in PPS25, which is based on the Environment Agency's Flood Zones. A copy of the SFRA Decision Flow Chart is reproduced in **Appendix 2** and the Environment Agency's Flood Map is reproduced in **Appendix 3**.

2.5. The Environment Agency's Flood Zones provide an indication of the probability of flooding and the predicted extent of the natural floodplain and extreme flood events. From an inspection of the Environment Agency's Flood Map the development site lies within Flood Zone 1. A copy of the map is reproduced at **Appendix 2**.

2.6. PPS25 defines Zone 1 as 'low probability' of flooding with an annual chance of flooding of < 0.1% (Greater than 1 in 1000). It also advises that all forms of development are suitable in this area.

2.7. The need for an appropriate assessment of flood risk is set out in paragraphs 8, 10-13, and 22 of PPS25. Guidance on the minimum requirements for Flood Risk Assessments is contained in Annex E of PPS25. Further guidance is given in Development and Flood Risk Planning Policy Statement 25: Practice Guide, published by the Department for Communities and Local Government in June 2008.

2.8. To assist local planning authorities in making decisions on planning applications, the Environment Agency has produced Standing Advice. The Standing Advice contains a consultation matrix which sets out when the LPA needs to consult the Environment Agency, and provides guidance on what that consultation could contain for different combinations of location and development type. The proposed development at Chickerell falls into the category 'Highly Vulnerable Development Over 1 Hectare'. For this category of development, falling within Flood Zone 1, the Consultation Matrix indicates that the LPA should consult with the Environment Agency, and that the planning application should be accompanied by a Flood Risk Assessment.

2.9. The Standing Advice also contains Development advice for Applicants and Agents, together with three Technical Guidance Notes on Flood Risk Assessment which provide information on the range of factors that need to be considered when assessing flood risk for various development types, at different scales and locations. The relevant Technical Guidance Note for the proposed development is FRA Guidance Note 1: Development Greater Than 1 Hectare (ha) in Flood Zone 1 (and Critical Drainage areas less than 1ha). A copy of FRA Guidance Note 1 is reproduced at **Appendix 4**.

2.10. Annex E of PPS25 advises that any assessment of flood risk should be proportionate to the risk and appropriate to the scale, nature, and location of the development. Guidance on the objectives and scope of site-specific Flood Risk Assessments is provided in paragraphs 2.70-2.76 and Figure 3.5 of the Practice Guide, as well as paragraphs 9.2 of the SFRA.

2.11. The scope of this Flood Risk Assessment is therefore to provide sufficient information to satisfy the relevant requirements of PPS25 Annex E, FRA Guidance Note 3 and the SFRA.

3. FLOOD RISK ASSESSMENT

Site Location

3.1. The Site Location Plan included at Appendix 1 is based on Ordnance Survey mapping, and shows geographical features and watercourses in the vicinity of the development site.

3.2. The site is situated immediately to the east of Chickerell, with Coldharbour Lane to the north and the B3157 to the south. A large electricity substation is situated to the east of the site.

3.3. The Southill Watercourse flows from west to east across the centre of the site passing under the substation in a culvert before returning to an open channel as it approaches the west side of Southill. A pond and ditch network connected to Bennetts Water Park is located to the south of the site.

Development Description and Planning Context

3.4. Weymouth and Portland Council's Local Development Documents (LDDs) include saved policies from the accepted Weymouth and Portland Local Plan 2005.

3.5. Policy N1 in the adopted Weymouth and Portland Local Plan 2005 deals with the protection of the quantity and quality of natural waters following development. Policy N2 states that surface water drainage should not cause increased risk to surrounding areas and should be where practical done in a sustainable manner. Policy N3 highlights the preference for development of sites with no flood risk in accordance with a sequential approach.

3.6. The site is presently open farm land used for grazing. It is proposed to have a mixed development including approximately 9.4Ha of residential housing a primary school, community hub and public open space.

3.7. A plan showing the outline design concept is shown on Pegasus Urban Design plan which is reproduced at **Appendix 5**.

3.8. Flood risk vulnerability classifications are provided in Annex D Table D.2 of

PPS25. With reference to Table D.2, the proposed development at Chickerell is classified as 'More Vulnerable'. The site lies within Flood Zone 1. PPS25 defines Flood Zone 1 as a 'Low Probability' zone assessed as having an annual probability of less than 1 in 1000 (0.1%) of river flooding. PPS25 advises that all uses of land are appropriate in this zone.

Site Levels

3.9. From the OS contours it is clear that the site falls at a steady gradient from a level of approximately 48m AOD in the north to about 13m AOD at the small unnamed watercourse crossing the centre of the site. The ground then rises again to the south of the ditch to approximately 25m before falling to 10m AOD at the southern edge of the site.

Existing Surface Water Drainage Arrangements

3.10. The site currently has no formal drainage in place with surface water flowing overland to either the Southill Watercourse at the centre of the site, the ditch network linked to Bennetts Water Park in the South, or directly to the surrounding land depending on the topography.

3.11. The Southill Watercourse is subject to an ongoing flood study undertaken by Weymouth and Portland Borough Council following the 13 December 2008 flood event. That event saw localised flooding in the Southill residential area and precinct. A copy of the second newsletter issued by Weymouth and Portland Borough Council appears as **Appendix 6.**

Definition of Flood Hazard

3.12. The Environment Agency's Flood Map indicates that the floodplain associated with the rivers and ditches in the area for flood events having an annual probability of less than 1 in 1000 (> 0.1%).

Climate Change

3.13. Annex B of PPS25 provides details on the allowances to be made for climate change effects when assessing flood risk. Table B.2 provides recommended national precautionary sensitivity ranges for peak rainfall intensities. With reference to Table B.2, the appropriate allowance for climate change when considering peak rainfall intensities for surface water drainage is 30%.

DRAINAGE STRATERGY

Sustainable Drainage Systems (SUDS)

3.14. PPS25 encourages the use of SUDS in new developments. Guidance on the use of SUDS is contained in Annex F of PPS25, and in the Practice Guide Companion.

3.15. Paragraph F6 of PPS25 Annex F states that surface water arising from a developed site should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere taking climate change into account. Information on SUDS is provided in the 'Interim Code of Practice for Sustainable Drainage Systems' published by the National SUDS Working Group in July 2004, as well as Ciria documents including C697 'The SUDS Manual'.

3.16. There are a number of potential SUDS techniques that might be used on any particular site. These include pervious pavements and infiltration devices such as soakaways and infiltration trenches, as well as flow balancing methods which include grass swales, ponds, detention basins and underground storage facilities. The use of infiltration devices depends on the underlying soil having a suitable permeability to accept the infiltration of surface water runoff to ground. The presence of made ground, a high water table or contamination in the underlying soil may preclude the use of infiltration devices.

3.17. The Geology maps for the area suggest that the underlying ground conditions in this area would be clay, which Indicates that soakaways would be unsuitable due to the low permeability of clays. This should be confirmed on site prior to detailed design.

Proposed Surface Water Drainage Arrangements

3.18. The Practice Guide Companion to PPS25 advises that runoff from proposed sites should be at Greenfield rates for the site before it was developed. Therefore the proposed development would be positively drained with flows balanced to match the existing runoff for the site.

3.19. The Practice Guide to PPS25 advises that guidance on the calculation of site runoff rates is given in Defra/Environment Agency Technical Report W5-

074/A/TR/1 Revision C September 2005, 'Preliminary rainfall runoff management for development'. This Technical Report advises that the Environment Agency will normally require that for the range of annual flow rate probabilities, up to and including the 1% annual probability (1 in 100 year event), the developed rate of runoff into a watercourse should be no greater than the undeveloped rate of runoff for the same event. The purpose of this is to retain a natural flow regime in the receiving watercourse and not increase peak rates of flow for events of an annual probability greater than 1%. Three annual probabilities merit specific consideration; 100%, 3.33% and 1%, corresponding to the 1 in 1 year, 1 in 30 year and 1 in 100 year events respectively.

3.20. Technical Report W5-074A/TR/1 Revision C states that the Institute of Hydrology Report 124 'Flood Estimation for Small Catchments' (IH Report 124) is to be used to determine peak Greenfield runoff rates for development sites of up to 200 hectares. The guidance also states that for developments smaller than 50 hectares the analysis for determining the peak Greenfield discharge rate should use 50 hectares in the formula and linearly interpolate the flow rate based on the ratio of the site area to 50 hectares.

3.21. The site currently is divided into four separate sections for drainage.

i) Area to north of site draining to existing unnamed Watercourse. (8.9 Ha)
ii) Area to south of site draining to existing unnamed Watercourse (1.0 Ha)
iii) Area to south of site draining to ditch network adjoining Bennetts Water Park. (2.7Ha)

3.22. The peak Greenfield runoff rates for these three separate areas have been determined using Micro Drainage's WinDes software system, based on the method set out in IH Report 124. A copy of the Micro Drainage results output for 50 hectares is reproduced in **Appendix 7**, for the 1 in 1, 30 and 100 year events including climate change (The 1 in 100 year including climate change is equivalent of the 1 in 360 year event).

3.23. A summary of the Greenfield runoff rates for the 1 in 1, 30 and 100 year events including climate change, for a 50 hectare site and for the total site area (excluding POS) draining to the existing ditch system are shown in Table 1 below:-

Return Period (Years)	1	30	360
Greenfield runoff rate for 50 Ha (l/s)	209	557	1039
Greenfield runoff rate for area i) (l/s)	37.2	99.1	184.9
Greenfield runoff rate for area ii) (l/s)	4.2	11.1	20.8
Greenfield runoff rate for area iii) (l/s)	11.3	30	56.1

Table 1 – Greenfield runoff rates

3.24. Preliminary calculations have been undertaken using Micro Drainage's WinDes software system to establish that it will be feasible to balance surface water runoff to existing runoff rates up to the 1 in 100 year event, including an appropriate allowance to take account of climate change.

3.25. To enable the discharge flows to be attenuated it is necessary to provide storage. This storage should be divided between that needed for the 30 year event which should be stored in the adoptable system and the remaining requirement for storage up to and including the 1 in 100 year event including an allowance for climate change. The approximate volumes of storage needed are summarised in Table 2 below.

Drainage Area	i)	ii)	iii)
Approximate storage required for 30 year event (m^3)	1990	170	320
Approximate storage required for 100 year event including climate change (m^3)	1252	90	300

Table 2 – Summary of approximate storage requirements m^3

3.26. The form of storage up to the 30 year event will need to be either in oversized pipes/culvert or in Wessex Water approved storage units. The remaining storage if adopted by Wessex will also need to be in the form of oversized pipes/culvert or in Wessex water approved storage units. If the remaining storage remains private then it could also be in the form of an off-line pond or other storage structures.

3.27. Copies of the Micro Drainage WinDes source control results for the 1 in 1, 30, and 100 year events plus a 30% increase in peak rainfall intensity to take account of climate change, are contained in **Appendix 8**. Discharge from the storage tanks should be limited to a maximum of the difference between the allowable 30 year discharge and the 100 year plus climate change discharge rate. The current calculations provide a conservative approach assuming that there is no discharge from the 100 + 30% storage. A summary of the maximum discharge compared to the allowable discharge, is shown in Tables 3 below:-

Return Period	1	30	Max Discharge from 100 + 30% storage
Outflow from area i) (l/s)	37.1	96.9	-
Allowable Greenfield Runoff (l/s)	37.2	99.1	85.9
Outflow from area ii) (l/s)	4.2	11.1	-
Allowable Greenfield Runoff (l/s)	4.2	11.1	9.7
Outflow from area iii) (l/s)	11.3	30	-
Allowable Greenfield Runoff (l/s)	11.3	30.0	26.1

Table 3 – Summary of Flows (l/s)

3.28. If Code for Sustainable Homes to be achieved then volume would need to be balanced by either water recycling units or the rate of discharge from the site would need to be reduced to either:

A: the pre-development site's estimated mean annual flood flow rate (Qbar);
B: 2l/s/ha
C: a minimum flow rate (litres per second), based on good practice guidelines to prevent easy blockage, by ensuring the outlet throttle is not too small.

This would require greater storage than is currently proposed and would need to be considered at detailed design stage.

3.29. From an inspection of Tables 2 and 3 it can be seen that it will be feasible to balance surface water runoff from the proposed development on the site to the

Greenfield runoff rates for all events up to the 1 in 100 year event, including an appropriate allowance to take account of climate change.

3.30. During detail design the exact location and size of the storage required will need to be confirmed to ensure adequate space is left to accommodate the required storage.

Off-Site Impacts

3.31. The discharge rate from the site when developed will remain the same or reduced to that which currently prevails, meaning there will be no increase to the rate of flows reaching the Southill Watercourse or ditch network from the site.

3.32. This approach should ensure that the impact on Southill Watercourse will not increase the risk of flooding downstream in the Southill residential area and precinct.

Proposed Foul Water Drainage Arrangements

3.33. The foul drainage for the site is separated into the same for areas as the surface water drainage.

3.34. It is proposed that each of these areas will drain to existing foul or combined sewers located as follows:-

i) To existing combined sewer crossing the site by the Southill Watercourse

ii) To existing combined sewer crossing the site by the Southill Watercourse

iii) To existing combined sewer crossing the site immediately to north of existing ditch network adjoining Bennetts Water Park

3.35. From the existing ground levels it appears that a gravity sewer connection should be possible at all locations. Exact flow rates and points of connection will need to be agreed with Wessex Water prior to detailed design

4. CONCLUSIONS

4.1. This Flood Risk Assessment (FRA) has been prepared on behalf of Persimmon Homes in connection with the promotion of land for residential development at land at Chickerell, near Weymouth.

4.2. The site is situated immediately to the east of Chickerell, with Coldharbour Lane to the north and the B3157 to the south. A large electricity substation is situated to the east of the site. The Environment Agency's Flood Map indicates that the site lies within Flood Zone 1 and therefore is safe from flooding during greater than 1 in 1000 year events.

4.3. Surface water discharges from the site will be the same or lower than the existing Greenfield runoff, with discharge rates being attenuated, by several potential methods such as onsite tanks, culverts or off-line ponds.

4.4. Thought will need to be given to the size and location of the required storage units during detailed design to ensure adequate space is provided. Consideration will also need to be given to the requirements of the Code for Sustainable Homes.

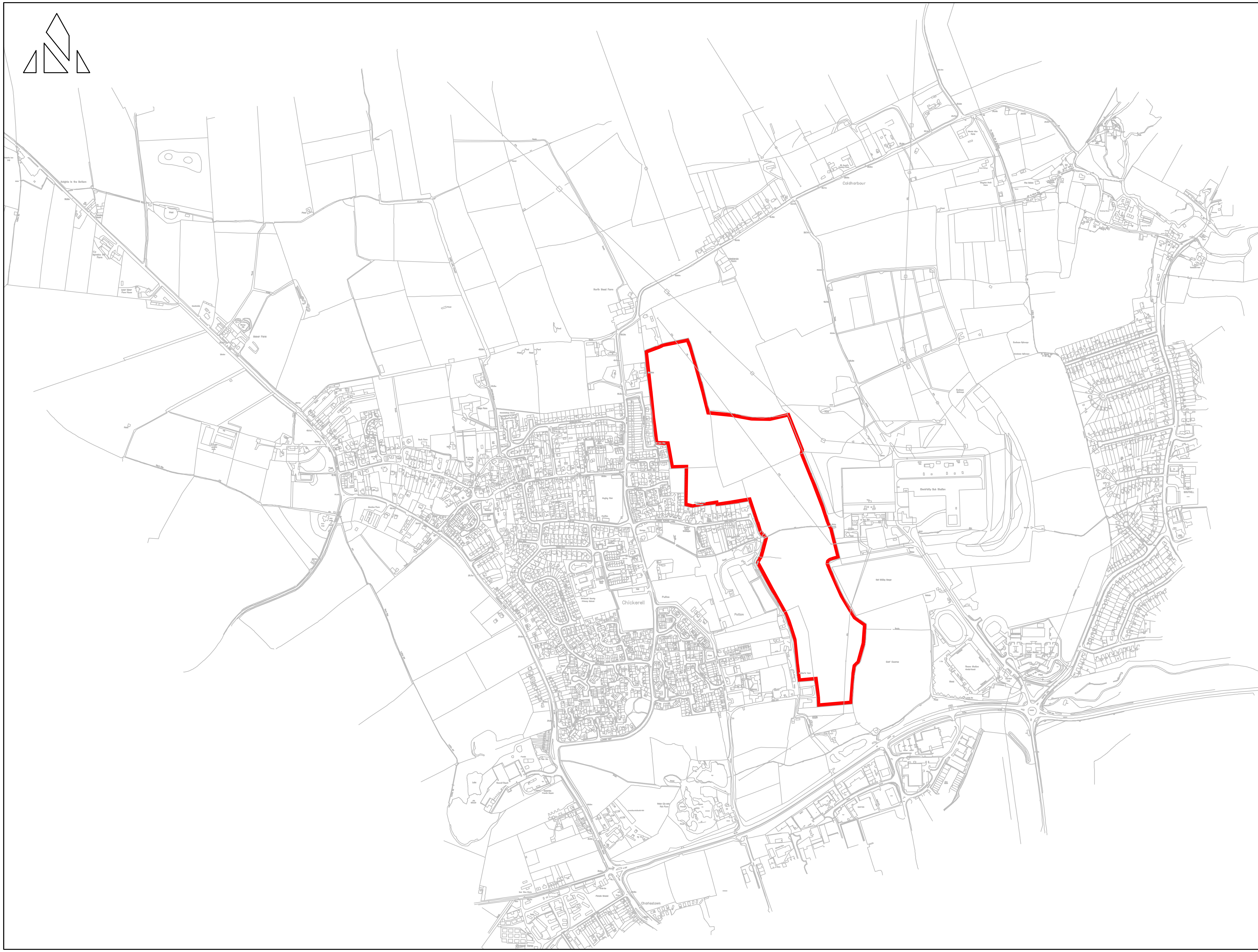
4.5. Foul water flows arising from the site will be discharge to either an existing foul of combined sewer either crossing the site or in the immediate vicinity. Based on existing ground levels it is anticipated that the connections could be made by a gravity sewer.

4.6. This Flood Risk Assessment demonstrates that the proposed flood risk management measures would ensure that the proposed development would remain operational and safe for users and would not increase flood risk elsewhere, including Southill.

4.7. The overall conclusion drawn from this Flood Risk Assessment is that the proposed development could proceed without creating an unacceptable flood risk, in accordance with PPS25.

Appendices

Appendix 1



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Key:

Site Boundary (Indicative Only)

Rev	Date	Description	Initials
A	25/03/10	Red line boundary updated	ATBD

Client

Persimmon Homes South Coast

Project

Land at Chickerell

Drawing Title

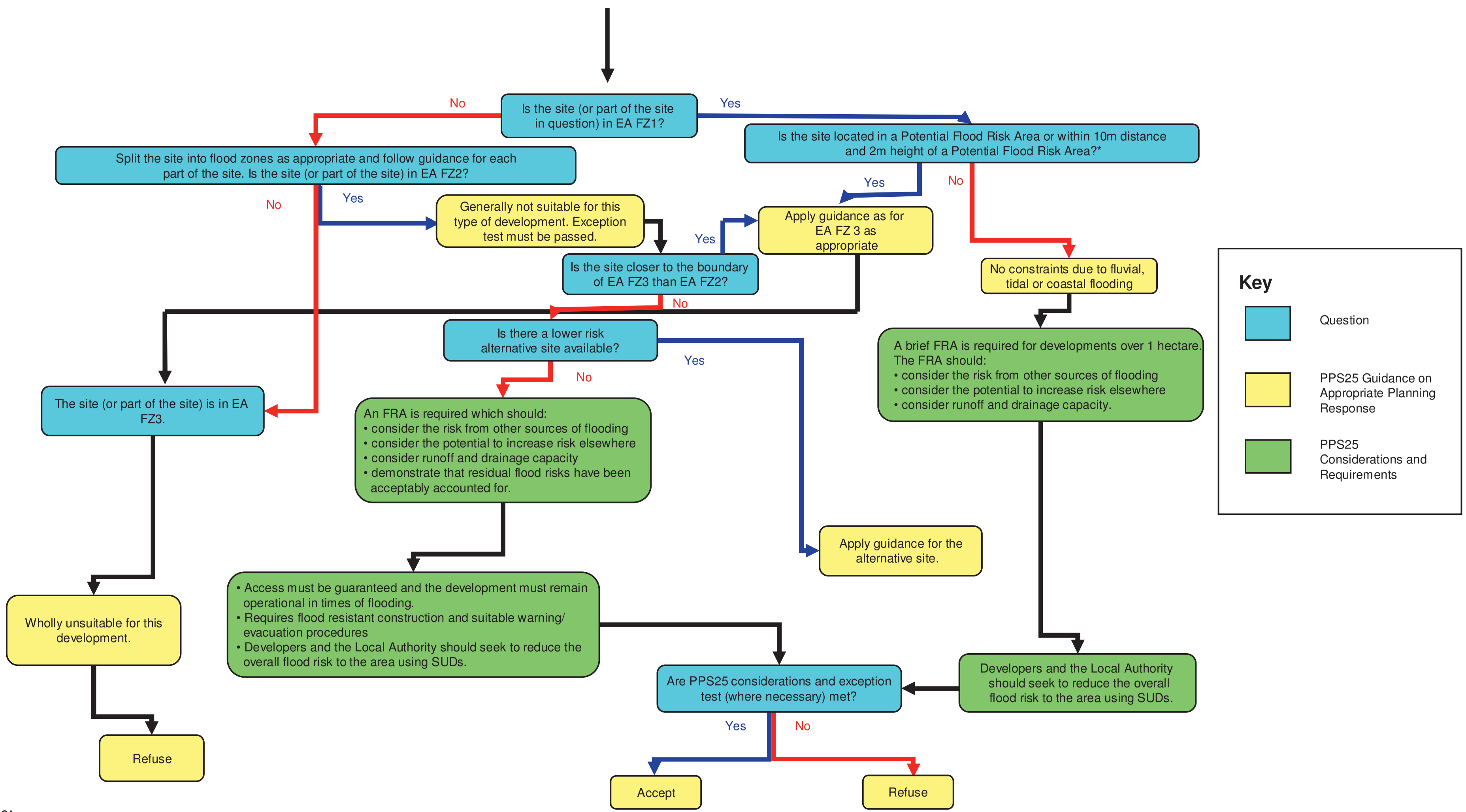
Location Plan

Drawing No. **P482/12** Rev A

Date	February 2010
Scale	1:10,000 @ A3
Drawn By	ATBD
Checked By	TS
E-Mail	tslater@pfaplc.com
File Ref.	P482_12.dwg

Appendix 2

PPS25 Flow Chart 2 – Highly Vulnerable Developments



Notes:

1. All risks relate to the time at which a land allocation decision is made or an application submitted
2. Development should not be permitted where existing sea or river defences, properly maintained, would not provide an acceptable standard of safety over the lifetime of the development, as such land would be extremely vulnerable should a flood defence embankment or sea wall be breached, in particular because of the speed of flooding in such circumstances.
3. Minimum standard of defence for fluvial risk areas is 1:100 + climate change, and for tidal risk areas is 1:200 + climate change.
4. Information above based on Table 7.2a in the SFRA (Planning response to sequential characterisation of flood risk). Refer to PPS25 for more detailed guidance.
5. *This width and height allowance of 10m and 2m is to take into account the potential increase in the extent of the Potential Flood Risk Area due to climate change and the large uncertainty in the extents of the Potential Flood Risk Areas.

Appendix 3

Flooding

Enter postcode or place name:

Chickerell, Dorset

Search

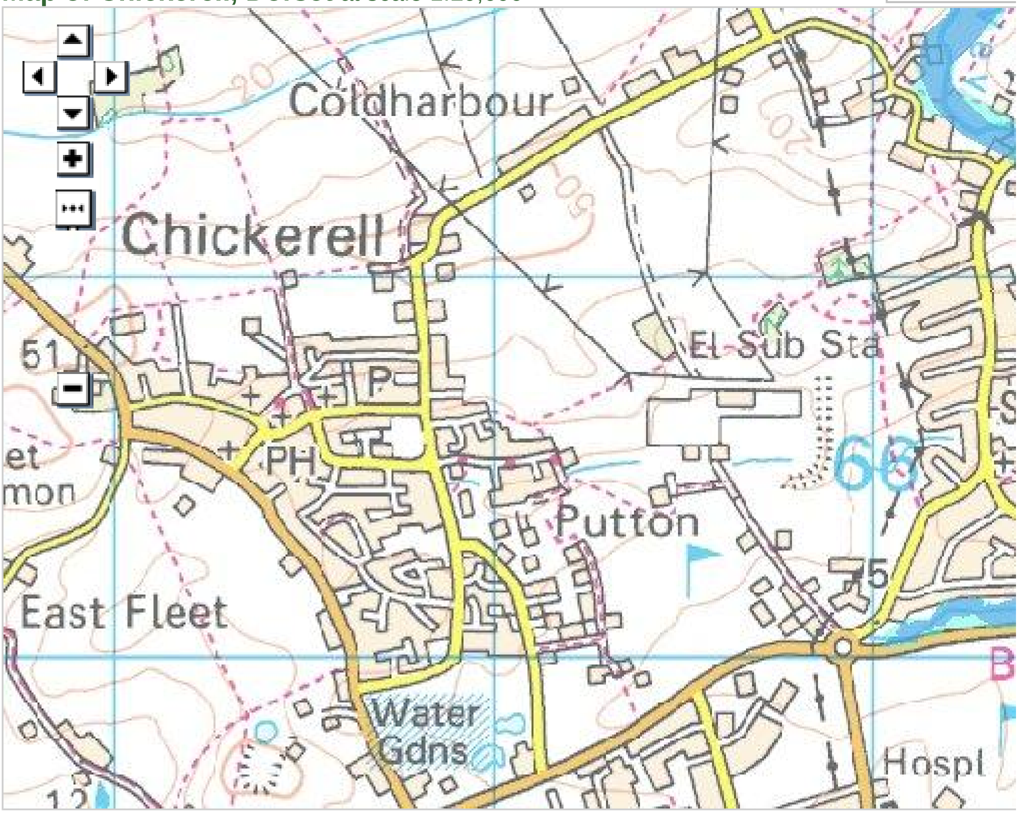
Overview map:

Other topics for this area...

- Flood Risk
- Flood Warning
- Rivers
- Bathing Water Quality
- Groundwater Sources
- Waste
- Pollution
- Air Pollution
- Environment Agency Offices
- River Basin Management Plans - Rivers
- River Basin Management Plans - Lakes
- River Basin Management Plans - Coastal Waters
- River Basin Management Plans - Estuarine

Map of Chickerell, Dorset at scale 1:20,000

Map Legen



view text version of all results

Problems viewing the map

An issue has been identified in Wigmore, Herefordshire:

This will be resolved during the next update in March 2010.
For further information regarding this area please contact us directly.

More about flooding:

Understanding the flood map
A more detailed explanation to help you understand the flood map shown above.

Current flood warnings
We provide flood warnings online 24 hours a day. Find out the current flood warning status in your local area.

Flood map - your questions answered
Answers to commonly asked questions about the flood map.

Appendix 4

Flood Risk Assessment (FRA) Guidance Note 1

Development Greater Than 1 Hectare (ha) in Flood Zone 1 (and Critical Drainage areas less than 1ha)

Environment Agency guidance on requirements for undertaking a Flood Risk Assessment (FRA) for planning applications.

Flood Risk Assessments at all levels should be undertaken under the supervision of an experienced flood risk management specialist (who would normally be expected to have achieved chartered status with a relevant professional body such as the Institution of Civil Engineers (ICE) or the Chartered Institution of Water and Environmental Management (CIWEM)).

This guidance note principally relates to the commissioning and undertaking of FRA studies for development greater than 1.0 ha in Flood Zone 1 (see footnote1). It is designed:

a. to consider the principles of the sustainable drainage[2] of surface water;
b. for use where works may affect watercourses or flood defences; or
c. for use where a Critical Drainage[3] area has been identified by the Environment Agency, or where the Local Planning Authority (LPA) has identified that a drainage problem exists on which they would like assurance from the developer that flood risk has been addressed.

Exceptions to this guidance note

For sites less than 1 hectare in Flood Zone 1, a formal FRA will not *usually* be required (see Table D1 of Planning Policy Statement 25 - PPS25). In these cases, applicants are advised to refer to the standard comments on managing surface water drainage as set out in our standing advice on development and flood risk. However, where (b) and/or (c) above apply, a FRA may still be required for development of less than 1 hectare and this guidance note can be used to inform the FRA.

[1] Flood Zone 1 comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.
[2] ~~Sustainable Drainage Systems (SUDS)~~ seek to mimic natural drainage systems and retain water on, or near to the site in contrast to traditional drainage approaches which tend to pipe water off site as quickly as possible. When considering site drainage in Flood Zone 1, the focus within the FRA must be on flood risk management, but the use of SUDS should also seek to maximise opportunities for water quality and amenity benefits.
[3] Critical Drainage Areas are areas with drainage problems that have been identified as such by the Environment Agency. A full list of Critical Drainage areas can be access from the Environment agency website on the Flood Risk Standing Advice pages - www.environment-agency.gov.uk

Why is a FRA required?

In Flood Zone 1, where the risk of flooding from rivers or the sea is classified as low, a FRA is still required **but it should be focused on the management of surface water run-off**. Development that increases the amount of impermeable surfaces can result in an increase in surface water run-off, which in turn can result in increased flood risk both on site and elsewhere within the catchment[4]. This is particularly important for larger scale sites, which have the potential to generate large volumes of surface water run-off. In addition, the site may also still be at risk from other sources of flooding (e.g. groundwater and overland runoff), which are not considered in the mapping of Flood Zones. Further information on flooding from other sources is provided in Annex C of PPS25.

What should be in the FRA?

The detail and technical complexity of a FRA will reflect the scale, nature and location of the development. Where available, reference should be made to the Strategic Flood Risk Assessment (SFRA) for locally specific guidance and information.

The following list sets out information that should be submitted as a FRA for developments covered by this guidance note:

Plans

- A location plan that includes geographical features, street names and identifies the catchment, watercourses or other bodies of water in the vicinity.
- A plan of the site showing:
  1. existing site;
  2. development proposals; and
  3. identification of any structures (e.g. embankments), which may influence local flood flow overland or in any watercourses (e.g. culverts) present on the site.

Surveys

- Site levels - both existing and proposed. Reference to Ordnance Datum[5], may be required where details of context of the site to its surroundings is needed.

Assessments

The Applicant should submit:

- Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the

[4] Catchment - The land which drains (normally naturally) to a given point on a river or drainage system.
[5] Ordnance Datum or the abbreviation 'OD' is the mean level of the sea at Newlyn in Cornwall from which heights above sea level are taken. The contour lines on Ordnance Survey maps measure heights above OD for example, though these are not accurate enough for a FRA.

development (in accordance with sustainable drainage principles, and the Local Planning Authority's published SFRA).
- Information about the surface water disposal measures already in place and their state of maintenance.
- An assessment of the volume of surface water run-off likely to be generated from the proposed development.
- Allowance in design for how the increased frequency and intensity of rainfall that is predicted as a result of climate change will affect the proposal (see Annex B of PPS25).
- Information about other potential sources of flooding, if any, that may affect the site e.g. streams, surface water run-off, sewers, groundwater, reservoirs, canals and other artificial sources or any combination of these; including details on how these sources of flooding will be managed safely within the development proposal.
- Confirmation as to whether Environment Agency consent is needed for any aspect of the work, and whether this has been applied for or not.

Dry islands

Some areas within Flood Zone 1 are surrounded by areas at a higher risk of flooding i.e. areas falling within Flood Zones 2 and 3. In certain cases development within such 'dry islands' can present particular hazards to public safety such as people being surrounded by water and needing to be rescued. The distribution of dry islands and risks posed by them in terms of access/exit vary considerably across the country. If you are in any doubt about how flood risks associated with 'dry islands' may affect your area, please contact your local Environment Agency Planning Liaison team on 08708 506 506.

Climate Change

As highlighted above, the frequency and intensity of rainfall is predicted to increase as a result of climate change and an allowance for how this will affect the proposal will need to be factored into design.

In addition rising sea levels may put some areas currently within Flood Zone 1 at risk from tidal flooding. These areas should have been identified in your Local Planning Authority's Strategic Flood Risk Assessment.

What is the Environment Agency's Role?

We recommend that pre application discussions take place for developments covered by this guidance note. We will usually provide comments at the planning application stage on FRAs covered by this guidance note (unless indicated otherwise by Environment Agency Planning Liaison team in the area where the development is proposed).

We have three main interests:

- Ensuring that the design of the site drainage system meets the aims of sustainable drainage management, and does not increase, and where practicable reduces, the current runoff from the site.
- If the proposal is within the Byelaw Distance[6] of a Main River[7] , sea defence, or flood defence structure; or includes diversion, culverting or erection of control structures in an Ordinary Watercourse[8], then formal consent for the proposal may also be required from us.
- Prior to carrying out a FRA, developers should contact the Environment Agency and other operating authorities (such as the engineering department of the local authority or Internal Drainage Board as appropriate) to establish whether information is available relating to flood risk at the site they propose to develop. Account should also be taken of local knowledge of flooding held in the community. Our records of flooding are not exhaustive and the absence of information does not mean that a site will not flood. Whilst we can provide information on flooding from rivers and the sea, we only record known problems relating to other sources.

Sources of information:

1. PPS25 Practice Guide and Appendix F of the PPS[9].
2. CIRIA C522 - Sustainable Urban Drainage Systems-design manual for England and Wales.
3. Interim Code of Practice for Sustainable Drainage Systems[10] .
4. The Local Planning Authority's Development Plan and Strategic Flood Risk Assessment.

[6] Byelaw distance varies across the country. To find out what distance applies in your area call 08708 506 506 and ask to speak to a member of your local Development Control team in the area where the development is planned.
[7] Main Rivers are watercourses designated as such on Main River maps and are generally the larger arterial watercourses. Main Rivers are indicated with a red line as part of the Flood Zones on maps held by the Local Planning Authority and on maps held by the Environment Agency.

[8] An Ordinary Watercourse is any watercourse that doesn't form part of a Main River
[9] PPS25 and the PPS25 Practice Guide can be viewed at - http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/pps25/?lang=_e
[10] Interim Code of Practice for Sustainable Drainage Systems – this document provides advice on design, adoption and maintenance issues and a good overview of other technical guidance on SUDS. It is available electronically on both the Environment Agency's web site at: www.environment-agency.gov.uk and CIRIA's web site at: www.ciria.org.uk.

Appendix 5

Key

- Proposed residential uses (10.16ha, 375 dwellings @37dph)
- Mixed use co-located with primary school (including circa 20 residential dwellings) (0.93ha)
- Primary school (2.1ha)
- Proposed bus route
- Potential pedestrian/cycle access connections (A-G)
- Main street
- Indicative access streets
- Potential vehicle access to development (1-3)(with allowance for foot/cycleways)
- Proposed strategic buffer planting
- Outdoor sports (a) Sports pitch (b) Kickabout area
- Linear Park and Wildlife Corridor - allowing transition to wider landscape (potential for informal, formal recreation SANGS and other green infrastructure uses)
- Existing Vegetation
- Existing hedgerows
- Contours at 1m intervals
- Proposed foot/cycleways (including diversions where logical)
- Existing public rights of way (including diversions where logical)
- Gas pipeline safeguarding corridor
- Possible locations of flood attenuation areas

Land at East Chickerell, Weymouth - Design Concept

Pegasus Urban Design

| T 01285 641717 | F 01285 642348 | www.ppg-llp.co.uk | Team MCC/SHF/CT | 26 March 2010 | 1:5000@A2 1:7500@A3 | drwg. P.0577_03-1J | Client: Persimmon Homes (South Coast Ltd.) |

Appendix 6

Southill Watercourse, Weymouth

Flood Study Results

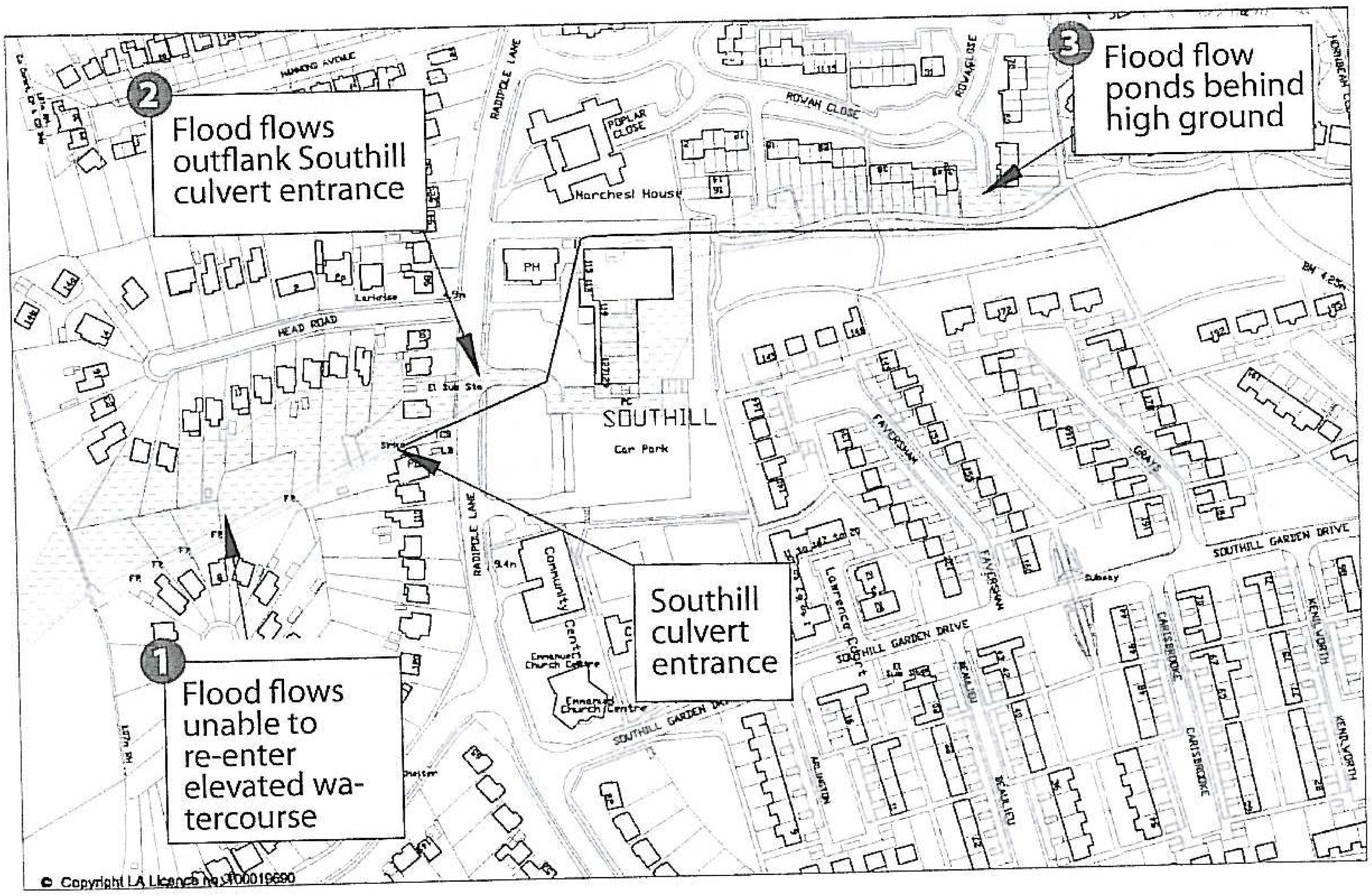
13th December 2008 flood event

AUGUST 2009

This is the second newsletter, following the flooding in Southill, and sets out the findings of the preliminary flood study.

The Councils of Weymouth & Portland and West Dorset wish to thank all those who completed and returned flood questionnaires which have helped during the preliminary study:

What caused the flooding? The volume of flow overwhelmed the watercourse upstream of Radipole Lane and spilled out across the low-lying back gardens of Mead Road and Mayfield Close ①. This overland flooding bypassed the entry to the Southill Culvert, which conveys normal flow, and flowed across Radipole Lane ② and into the Southill precinct area. Floodwaters then ponded behind higher ground in the valley bottom to the rear of Rowan Close ③. Local gulleys were unable to drain the 'ponded' floodwater back into the Southill culvert.



Weymouth & Portland Borough Council and West Dorset District Council are working in partnership to resolve flood risks along the Southill Watercourse, under powers conferred by the Land Drainage Act.

Weymouth & Portland Borough Council

West Dorset District Council

How much rain fell? A rain gauge within Chickerell recorded nearly 45mm of rain fell in under 1 hour.

Where did the flood flow come from? The Southill watercourse originates from Chickerell but most of this flow is diverted by a culvert into Chafey's Lake without passing through Southill. The flood flows through Southill were generated by runoff from the fields and hills immediately to the west including the National Grid sub-station.

Did the Water Level of Radipole Lake cause flooding? No. Lake levels are several metres lower than ground levels through Southill and did not cause or worsen the flooding.

Did the Southill culvert cause the flooding? The culvert was not the cause of the flooding; indeed there was spare capacity within the culvert. Calculations show that the culvert capacity would only be exceeded on average once in 50 years. A CCTV survey of the Southill culvert has indicated it to be in relatively good condition.

How likely is it that flooding will occur again in Southill? It is difficult to know with any certainty but calculations suggest that floodwaters will cross Radipole Lane on average once in 10 years plus.

Are the flood events which occurred in January and February 2009 related to the December 2009 event? No. These events were caused by blockage within the culvert outfall at Radipole Lake. This blockage caused water to back-up and surcharge out of upstream manholes and gulleys. The blockage, caused by a piece of chain link fencing, has since been removed by the Council.

What measures could be undertaken now to help reduce the risk of future flooding? Immediate measures could include better culvert screens, more inspections of screens and extra gulley capacity to drain ponded floodwaters into the Southill culvert in case of future emergency.

What are the main flood alleviation options?

1. Ensure flood flow does not bypass the entrance to the Southill culvert. This would be achieved by enlarging the watercourse through the back gardens (of Mayfield Close & Mead Road) and constructing an up-stream flood bank.
2. Construct a flood storage pond upstream (of Mayfield Close & Mead Road) to safely hold back floodwaters until it may be safely and gradually released.
3. A combination of a flood storage pond and local improvements to the watercourse channel in the back gardens of Mayfield Close & Mead Road.

What happens next? Weymouth & Portland Borough and West Dorset District Councils will assess the viability of undertaking flood alleviation work, which will involve talking to landowners and carrying out further surveys and design work to size and cost flood alleviation options.

In the meantime, quick-win works will be carried out this year:

1. The Council will construct an additional multi-gulley drainage system at the Rowan Close car park. This will provide a 'safety valve' to evacuate floodwaters back into the Southill Culvert.
2. Wessex Water will replace the existing screen at the Southill culvert outfall in Radipole Lake, with a new screen which is less prone to blockage.

Engineering Section
Weymouth & Portland Borough Council,
Council Offices,
North Quay,
Weymouth, DT4 8TA

Appendix 7

IH 124 Mean Annual Flood

Input

Return Period (years)	360	Soil	0.450
Area (Ha)	50.000	Urban	0.000
SAAR (mm)	771.000	Region Number	7

Results	**l/s**
QBAR Rural	245.9
QBAR Urban	245.9
Q 360 years	1039.0
Q 1 year	209.1
Q 2 years	216.7
Q 5 years	314.8
Q 10 years	398.4
Q 20 years	492.7
Q 25 years	528.3
Q 30 years	557.4
Q 50 years	644.4
Q 100 years	784.6
Q 200 years	922.3
Q 250 years	966.6
Q 1000 years	1269.1

Appendix 8

Global Variables

Region	FSR - England & Wales
Return Period (yrs)	30
M5-60 (mm)	19.500
Ratio R	0.450
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Inlet Coefficient	0.800
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	6
Number of On-Line Controls	4

Starting Storm file name

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Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.005	22	20.000	17.662	1200	0

On-Line Controls (Head/Flow)

US/PN	Volume (m³)	Ctrl MH Name	Invert (m)	Headloss (m)	Flow (l/s)
1.000	59.496	18	32.598	0.3	152.4000
				0.6	115.0000
				0.9	115.0000
				1.4	115.0000
				2.0	115.0000
				2.6	115.0000
				3.2	115.0000
				3.8	115.0000
				4.4	115.0000
				5.0	115.0000
				6.5	115.0000
				8.0	115.0000
2.000	106.007	11	46.845	0.2	60.0000
				0.4	60.0000
				0.6	60.0000
				0.8	60.0000
				1.0	60.0000
				1.4	60.0000
				1.8	60.0000
				2.2	60.0000
				2.6	60.0000
2.007	240.761	18	32.598	0.3	152.4000
				0.6	115.0000
				0.9	115.0000
				1.4	115.0000
				2.0	115.0000
				2.6	115.0000
				3.2	115.0000
				3.8	115.0000
				4.4	115.0000
				5.0	115.0000
				6.5	115.0000
				8.0	115.0000
1.004	102.624	58	17.672	0.2	37.2000
				0.4	37.2000
				0.6	37.2000
				0.8	37.2000
				1.0	37.2000
				1.4	97.1000
				1.8	97.1000
				2.2	97.1000
				2.6	97.1000

Off-line Weir Controls

DS/PN	Loop PN	MH Loss	Height above DS PN (m)	Width (m)	Discharge Coefficient
2.007	1.001	0.050	1.500	1.800	0.544
1.001	1.002	0.050	3.000	1.800	0.544
1.002	1.003	0.050	1.900	1.500	0.544
1.003	1.004	0.050	1.750	1.800	0.544
1.004	1.005	0.050	1.750	1.500	0.544
1.005	(None)	0.050	1.750	1.800	0.544

Storage Pond at pipe 1.001 USMH 18

Storage Pond Invert Level (m) 32.598

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.0	325.0	0.5	325.0	1.0	325.0	1.5	325.0	2.0	0.0	2.5	0.0
0.1	325.0	0.6	325.0	1.1	325.0	1.6	325.0	2.1	0.0		
0.2	325.0	0.7	325.0	1.2	325.0	1.7	0.0	2.2	0.0		
0.3	325.0	0.8	325.0	1.3	325.0	1.8	0.0	2.3	0.0		
0.4	325.0	0.9	325.0	1.4	325.0	1.9	0.0	2.4	0.0		

Storage Pond at pipe 1.005 USMH 58

Storage Pond Invert Level (m) 17.672

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.0	650.0	0.5	650.0	1.0	650.0	1.5	0.0	2.0	0.0	2.5	0.0
0.1	650.0	0.6	650.0	1.1	650.0	1.6	0.0	2.1	0.0		
0.2	650.0	0.7	650.0	1.2	650.0	1.7	0.0	2.2	0.0		
0.3	650.0	0.8	650.0	1.3	0.0	1.8	0.0	2.3	0.0		
0.4	650.0	0.9	650.0	1.4	0.0	1.9	0.0	2.4	0.0		

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

	PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
	1.000	70.51	0.141	500.0	0.000	5.00	1	0.600	o	1050
*	2.000	44.16	0.415	106.5	0.200	5.00	1	0.600	[]	14
*	2.001	30.45	0.886	34.4	0.100	0.00	1	0.600	[]	14
*	2.002	98.43	2.764	35.6	1.407	0.00	1	0.600	[]	14
*	2.003	45.46	3.143	14.5	1.407	0.00	1	0.600	[]	14
*	2.004	45.78	3.934	11.6	0.200	0.00	1	0.600	[]	14
*	2.005	97.90	2.481	39.5	0.950	0.00	1	0.600	[]	14
*	2.006	97.10	0.194	500.0	0.950	0.00	1	0.600	[]	14
*	2.007	99.71	0.199	500.0	0.950	0.00	1	0.600	[]	14
*	1.001	50.96	2.308	22.1	0.000	0.00	1	0.600	[]	14
*	1.002	47.64	4.705	10.1	0.550	0.00	1	0.600	[]	14
*	1.003	50.42	5.052	10.0	0.000	0.00	1	0.600	[]	14
*	1.004	43.53	2.561	17.0	0.000	0.00	1	0.600	[]	14
*	1.005	5.00	0.010	500.1	0.000	0.00	1	0.600	[]	14

	PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
	1.000	9	37.578	32.739	3.789	36.886	32.598	3.238		1800
*	2.000	10	48.910	47.485	0.225	48.495	47.070	0.225		1050
*	2.001	11	48.495	46.845	0.450	47.576	45.960	0.416	2	1050
*	2.002	12	47.576	45.960	0.416	44.797	43.196	0.401		1050
*	2.003	13	44.797	43.196	0.401	41.619	40.053	0.366		1050
*	2.004	14	41.619	40.053	0.366	37.685	36.119	0.366		1350
*	2.005	15	37.685	36.119	0.366	37.500	33.638	2.662		1350
*	2.006	16	37.500	33.263	3.037	38.128	33.069	3.859		1500
*	2.007	17	38.128	32.994	3.934	36.886	32.795	2.891		1800
*	1.001	18	36.886	32.598	3.088	32.349	30.290	0.858	2	1800
*	1.002	19	32.349	30.290	0.858	27.644	25.586	0.858		1800
*	1.003	20	27.644	25.586	0.858	22.592	20.533	0.858		1800
*	1.004	21	22.592	20.533	0.858	20.000	17.972	0.828		1800
*	1.005	58	20.000	17.672	1.128	20.000	17.662	1.138	2	1800

Global Variables

Region	FSR - England & Wales
Return Period (yrs)	1
M5-60 (mm)	19.000
Ratio R	0.450
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Inlet Coefficient	0.800
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	1
Number of On-Line Controls	3

Starting Storm file name

F:\Workfile\P482\Windes\Indicative Surface 01_10\SOUTH TO DITCH.SWS

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.001	2	20.000	19.425	1200	0

On-Line Controls (Non Return Valve)

US/PN	Volume (m^3)	Ctrl MH Name
2.000	0.088	

On-Line Controls (Complex Control)

US/PN	Volume (m^3)	Ctrl MH Name	Invert (m)	Filename (*.ccf)	Headloss (m)	Flow (l/s)
1.000	170.549	2	20.800	South to Ditch	0.2	4.2
					0.4	4.2
					0.6	4.2
					0.8	11.1
					1.0	11.1
					1.4	20.8
					1.8	20.8
					2.2	20.8
					2.6	20.8
					3.0	20.8
					3.4	20.8
					3.8	20.8
2.001	0.080	2	20.800	South to Ditch	0.2	4.2
					0.4	4.2
					0.6	4.2
					0.8	11.1
					1.0	11.1
					1.4	20.8
					1.8	20.8
					2.2	20.8
					2.6	20.8
					3.0	20.8
					3.4	20.8
					3.8	20.8

Off-line Weir Controls

DS/PN	Loop PN	MH Loss	Height above DS PN (m)	Width (m)	Discharge Coefficient
1.001	2.000	0.050	1.200	1.800	0.544

Storage Pond at pipe 2.001 USMH

Storage Pond Invert Level (m) 21.875

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.0	110.0	0.5	110.0	1.0	0.0	1.5	0.0	2.0	0.0	2.5	0.0
0.1	110.0	0.6	110.0	1.1	0.0	1.6	0.0	2.1	0.0		
0.2	110.0	0.7	110.0	1.2	0.0	1.7	0.0	2.2	0.0		
0.3	110.0	0.8	110.0	1.3	0.0	1.8	0.0	2.3	0.0		
0.4	110.0	0.9	0.0	1.4	0.0	1.9	0.0	2.4	0.0		

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

	PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
*	1.000	99.42	0.200	497.1	0.750	5.00	1	0.600	[]	10
*	2.000	2.00	0.025	80.0	0.000	5.00	1	0.600	o	375
*	2.001	2.00	0.025	80.0	0.000	0.00	1	0.600	o	375
*	1.001	2.00	1.375	1.5	0.000	0.00	1	0.600	o	375

	PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
*	1.000	1	23.429	21.000	1.428	23.000	20.800	1.200		1350
*	2.000		23.100	21.475	1.250	23.050	21.450	1.225		1200
*	2.001		23.050	21.450	1.225	23.000	21.425	1.200	3	1200
*	1.001	2	23.000	20.800	1.825	20.000	19.425	0.200	12	1350

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Level) Results for Design Storms

Margin for Flood Risk warning (mm)	750
DTS Status	OFF
DVD Status	ON
Inertia Status	ON
Analysis Time Step	2.5 second increment (extended)

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	120 Winter	1	0%	1	100/30 Summer			
2.000	15 Summer	1	0%	1	100/30 Summer			
2.001	15 Summer	1	0%	1	100/30 Summer			
1.001	120 Winter	1	0%	1	1/30 Summer		100/30 Summer	15

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	21.275	-0.725	0.000	0.01	0.0	30.9	O K
	2.000	21.475	-0.375	0.000	0.00	0.0	0.0	O K
	2.001	21.450	-0.375	0.000	0.00	0.0	0.0	O K
	1.001	21.275	0.100	0.000	0.01	0.0	4.2	SURCH'ED

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Level) Results for Design Storms

Margin for Flood Risk warning (mm)	750
DTS Status	OFF
DVD Status	ON
Inertia Status	ON
Analysis Time Step	2.5 second increment (extended)

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	120 Winter	30	0%	1	100/30 Summer			
2.000	15 Summer	30	0%	1	100/30 Summer			
2.001	15 Summer	30	0%	1	100/30 Summer			
1.001	120 Winter	30	0%	1	1/30 Summer		100/30 Summer	15

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	21.870	-0.130	0.000	0.03	0.0	72.1	O K
	2.000	21.475	-0.375	0.000	0.00	0.0	0.0	O K
	2.001	21.450	-0.375	0.000	0.00	0.0	0.0	O K
	1.001	21.853	0.678	0.000	0.02	0.0	11.1	SURCH'ED

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Level) Results for Design Storms

Margin for Flood Risk warning (mm)	750
DTS Status	OFF
DVD Status	ON
Inertia Status	ON
Analysis Time Step	2.5 second increment (extended)

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	120 Winter	100	30%	1	100/30 Summer			
2.000	120 Winter	100	30%	1	100/30 Summer			
2.001	120 Winter	100	30%	1	100/30 Summer			
1.001	120 Winter	100	30%	1	1/30 Summer		100/30 Summer	15

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	22.791	0.791	0.000	0.05	0.0	123.9	FLD RISK
	2.000	22.774	0.924	0.000	0.93	0.0	91.0	FLD RISK
	2.001	22.768	0.943	0.000	0.19	0.0	18.2	FLD RISK
	1.001	22.788	1.613	0.000	0.05	91.9	20.8	FLD RISK

Global Variables

Region	FSR - England & Wales
Return Period (yrs)	30
M5-60 (mm)	19.000
Ratio R	0.450
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Inlet Coefficient	0.800
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	1
Number of On-Line Controls	3

Starting Storm file name

F:\Workfile\P482\Windes\Indicative Surface 01_10\SOUTH TO SEWER.SWS

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.005	6	10.085	8.435	1200	0

On-Line Controls (Head/Flow)

US/PN	Volume (m^3)	Ctrl MH Name	Invert (m)	Headloss (m)	Flow (l/s)
1.004	171.384	6	9.400	0.2	11.3000
				0.4	11.3000
				0.6	11.3000
				0.8	11.3000
				1.0	11.3000
				1.4	30.0000
				1.8	30.0000
				2.2	59.0000
				2.6	59.0000
				3.0	59.0000
				3.4	59.0000
2.001	0.115	6	9.400	0.2	11.3000
				0.4	11.3000
				0.6	11.3000
				0.8	11.3000
				1.0	11.3000
				1.4	30.0000
				1.8	30.0000
				2.2	59.0000
				2.6	59.0000
				3.0	59.0000
				3.4	59.0000

On-Line Controls (Non Return Valve)

US/PN	Volume (m^3)	Ctrl MH Name
2.000	0.127	

Off-line Weir Controls

DS/PN	Loop PN	MH Loss	Height above DS PN (m)	Width (m)	Discharge Coefficient
1.005	2.000	0.050	1.400	1.800	0.544

Storage Pond at pipe 2.001 USMH

Storage Pond Invert Level (m) 9.425

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.0	460.0	0.5	460.0	1.0	0.0	1.5	0.0	2.0	0.0	2.5	0.0
0.1	460.0	0.6	460.0	1.1	0.0	1.6	0.0	2.1	0.0		
0.2	460.0	0.7	460.0	1.2	0.0	1.7	0.0	2.2	0.0		
0.3	460.0	0.8	460.0	1.3	0.0	1.8	0.0	2.3	0.0		
0.4	460.0	0.9	0.0	1.4	0.0	1.9	0.0	2.4	0.0		

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

	PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
*	1.000	99.00	4.391	22.5	0.400	5.00	1	0.600	o	300
*	1.001	77.96	3.378	23.1	0.400	0.00	1	0.600	o	375
*	1.002	97.63	3.895	25.1	0.450	0.00	1	0.600	o	450
*	1.003	49.28	1.160	42.5	0.405	0.00	1	0.600	[]	16
*	1.004	55.95	0.191	292.9	0.240	0.00	1	0.600	[]	16
	2.000	2.00	0.025	80.0	0.000	5.00	1	0.600	o	450
	2.001	2.00	0.025	80.0	0.000	0.00	1	0.600	o	450
	1.005	5.00	0.965	5.2	0.000	0.00	1	0.600	o	450

	PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
*	1.000	1	23.916	22.491	1.125	19.524	18.099	1.125		1050
*	1.001	2	19.524	18.099	1.050	16.146	14.721	1.050		1050
*	1.002	3	16.146	14.646	1.050	13.076	10.751	1.875		1050
*	1.003	4	13.076	10.751	1.125	11.991	9.591	1.200		1350
*	1.004	5	11.991	9.591	1.200	11.800	9.400	1.200		1350
	2.000		11.850	9.450	1.950	11.825	9.425	1.950		1200
	2.001		11.825	9.425	1.950	11.800	9.400	1.950	3	1200
	1.005	6	11.800	9.400	1.950	10.085	8.435	1.200	2	1350

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Outflow) Results for Design Storms

Margin for Flood Risk warning (mm) 750 Inertia Status ON
DTS Status ON Analysis Time Step Fine
DVD 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, 100
Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Winter	1	0%	1	100/15 Winter			
1.001	15 Winter	1	0%	1	100/15 Summer			
1.002	15 Winter	1	0%	1	100/15 Summer			
1.003	15 Winter	1	0%	1				
1.004	15 Winter	1	0%	1	30/30 Summer			
2.000	15 Summer	1	0%	1	30/60 Summer	100/120 Winter		
2.001	15 Summer	1	0%	1	100/30 Summer	100/240 Winter		
1.005	120 Summer	1	0%	1	1/15 Summer	100/240 Winter	30/30 Summer	31

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	22.591	-0.200	0.000	0.24	0.0	53.8	O K
	1.001	18.227	-0.247	0.000	0.25	0.0	100.3	O K
	1.002	14.798	-0.298	0.000	0.25	0.0	152.0	O K
	1.003	10.781	-1.170	0.000	0.02	0.0	198.0	O K
	1.004	10.160	-0.631	0.000	0.03	0.0	190.6	O K
	2.000	9.450	-0.450	0.000	0.00	0.0	0.0	O K
	2.001	9.425	-0.450	0.000	0.00	0.0	0.0	O K
	1.005	10.273	0.423	0.000	0.02	0.0	11.3	SURCH'ED

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Outflow)
Results for Design Storms

Margin for Flood Risk warning (mm)	750	Inertia Status	ON
DTS Status	ON	Analysis Time Step	Fine
DVD 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, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Winter	30	0%	1	100/15 Winter			
1.001	15 Winter	30	0%	1	100/15 Summer			
1.002	15 Winter	30	0%	1	100/15 Summer			
1.003	15 Winter	30	0%	1				
1.004	15 Summer	30	0%	1	30/30 Summer			
2.000	60 Winter	30	0%	1	30/60 Summer	100/120 Winter		
2.001	360 Winter	30	0%	1	100/30 Summer	100/240 Winter		
1.005	120 Winter	30	0%	1	1/15 Summer	100/240 Winter	30/30 Summer	31

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	22.658	-0.133	0.000	0.58	0.0	132.0	O K
	1.001	18.331	-0.143	0.000	0.68	0.0	268.8	O K
	1.002	14.927	-0.169	0.000	0.68	0.0	418.8	O K
	1.003	10.929	-1.022	0.000	0.05	0.0	559.5	O K
	1.004	10.791	0.000	0.000	0.08	0.0	451.3	O K
	2.000	10.176	0.276	0.000	1.37	0.0	195.9	SURCH'ED
	2.001	9.636	-0.239	0.000	0.07	0.0	9.3	O K
	1.005	10.930	1.080	0.000	0.05	137.6	30.0	SURCH'ED

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Outflow) Results for Design Storms

Margin for Flood Risk warning (mm) 750 Inertia Status ON
DTS Status ON Analysis Time Step Fine
DVD 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, 100
Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Winter	100	30%	1	100/15 Winter			
1.001	15 Winter	100	30%	1	100/15 Summer			
1.002	15 Winter	100	30%	1	100/15 Summer			
1.003	15 Winter	100	30%	1				
1.004	30 Winter	100	30%	1	30/30 Summer			
2.000	15 Winter	100	30%	1	30/60 Summer	100/120 Winter		
2.001	120 Winter	100	30%	1	100/30 Summer	100/240 Winter		
1.005	120 Winter	100	30%	1	1/15 Summer	100/240 Winter	30/30 Summer	31

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	22.857	0.066	0.000	0.94	0.0	214.4	SURCH'ED
	1.001	19.062	0.588	0.000	1.04	0.0	411.2	FLD RISK
	1.002	15.435	0.339	0.000	1.04	0.0	640.7	FLD RISK
	1.003	11.557	-0.394	0.000	0.07	0.0	869.6	O K
	1.004	11.442	0.651	0.000	0.12	0.0	633.3	FLD RISK
	2.000	11.213	1.313	0.000	4.01	0.0	574.1	FLD RISK
	2.001	11.817	1.942	0.000	0.35	0.0	50.7	FLD RISK
	1.005	11.761	1.911	0.000	0.11	295.1	58.8	FLD RISK