

7. Water Resources

Introduction

- 7.1 This chapter deals with the assessment of the potential impacts of the Proposed Development on water quality and hydrology in the study area. The study area is defined as that within a 1 km radius of the Site, although a number of issues are considered at the river catchment level.
- 7.2 The assessment of effects encompasses surface water and groundwater quality, surface water and groundwater resources (in terms of water quality) and flooding.

Policy Context

European Legislation

- 7.3 With regard to the protection of specific water resources, permissible water quality standards and related policy are set out in the following European legislation:
- EC Water Framework Directive (2000/60/EC);
 - EC Surface Water Abstraction Directive (75/440/EEC);
 - EC Bathing Water Directive (76/160/EEC);
 - EC Freshwater Fish Directive (78/659/EEC);
 - EC Shellfish Directive (79/923/EEC);
 - EC Dangerous Substances Directive (76/464/EEC);
 - EC Groundwater Directive (80/68/EEC);
 - EC Urban Waste Treatment Directive (91/271/EEC); and
 - EC Nitrate Directive (91/676/EEC).

National Legislation and Policies

- 7.4 The aim of water policy in England is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, ponds) and groundwater.
- 7.5 The Department of the Environment, Food and Rural Affairs (DEFRA) is responsible for all aspects of water policy in England. Management and enforcement of water policy is the responsibility of the EA. A summary of the relevant UK water legislation is provided below:
- *Environmental Protection Act (1990)*: sets out a range of provisions for environmental protection, including integrated pollution control for dangerous substances;
 - *Water Resources Act (1991)*: consolidated previous water legislation with regard to both the quality and quantity of water resources;
 - *Water Industry Act (1991)*: consolidated previous legislation relating to water supply and the provision of sewerage services;
 - *Environment Act (1995)*: established a new body (the Environment Agency) with responsibility for environmental protection and enforcement of legislation. This Act introduced measures to enhance protection of the environment including further powers for the prevention of water pollution;

- *Anti-Pollution Works Regulations (1999)*: provide powers to the EA to stop any activity (e.g. construction) that is giving or is likely to give rise to environmental pollution or to adequately enforce pollution control measures; and
- *Water Act (2003)*: extends the provisions of the Water Resources Act (1991) and the Environment Act (1995) with regard to abstractions and discharges, water conservation and pollution control.

7.6 At the national planning policy level, there are two key elements of Planning Policy Statements (PPS) that are directly relevant:

- PPS 23 – Planning and Pollution Control; and
- PPS 25 – Development and Flood Risk.

Regional Policies

7.7 The West Sussex Structure Plan 2001-2016 was approved by the County Council on 23rd July 2004 and adopted on 25th October 2004 when it replaced the approved 1993 Structure Plan. It is the most up-to-date statement of the County Council's strategic land-use and transport planning policy and has been recently revised with various planning policies deleted beyond 24th October 2007. The Structure Plan provides the framework for the local plans prepared by the seven district and borough councils in West Sussex. The strategy aims to deliver a triangulated vision of regenerating the coastal area; managing the pressure for economic growth in the north east of the County; and meeting the needs of rural communities. The plans and policies relating to water resources, flooding and drainage are summarised below:

- Policy CH1 – Character: Development should not be permitted unless it maintains and, where possible, enhances the character, distinctiveness and sense of place of the settlements and different areas and features of the County, including the woodlands, forests, rivers, waterways, wetlands and the coast and that it reflects and, where possible, reinforces the character of the main natural character areas of the County - the South Coast Plain, the South Downs, the Wealden Fringe, the Low Weald, and the High Weald.
- Policy ERA 3 – The Coast: Development should not be permitted unless the distinctive character and resources of the County's coast and coastal waters, including river estuaries, will be conserved and, where possible, enhanced taking into account the impact on the landscape, the environment, coastal processes, the heritage, nature conservation, recreation and economic interests. Development on the coast outside built-up areas should not be permitted unless there is a demonstrable need for a coastal location and it cannot be located elsewhere. District planning authorities will define in local plans, the seaward and landward extent of the coastal zone.
- Policy ERA 4 – Flooding and coastal defence: Development should not be permitted in areas at risk or potential risk of fluvial or coastal flooding or where it would increase the risk of flooding elsewhere. Development should not be permitted where it would adversely affect the integrity of functional floodplains or flood protection or coastal defence measures. Development should not be permitted where there is a risk or potential risk to people and property from other natural causes including storm, erosion and land instability.
- Policy ERA 5 – Air, Soil and Water: Development should not be permitted unless the quality of and, where appropriate, the quantity of the air, soil

and water resources of the County will be protected and, where possible, enhanced. Proposals for the introduction of sensitive uses should not be permitted in areas subject to existing or potential pollution.

Local Policies

7.8 The Arun District Local Plan (1996-2011) sets out the Council's policies and proposals for the development and use of land within West Sussex and importantly in Bognor Regis. The Plan has been prepared within the Planning Policy context provided at the national, regional and county level in order to meet the Council's statutory responsibilities as a Local Planning Authority. The plan was adopted in 2003. A review of the plans and policies relating to water resources, flooding and drainage are provided below:

- Policy GEN 9 – Foul and surface water drainage: Planning permission for development which will materially increase foul and/or surface water discharges will be refused unless the Local Planning Authority is satisfied that either adequate drainage capacity exists or appropriate drainage capacity can be provided as part of the development. Consideration should also be given to the use of Sustainable Urban Drainage Systems (SUDS) as alternatives to conventional drainage, where appropriate.
- Policy GEN 10 – Tidal Flooding and Coastal Defence: Planning permission will be refused for development which would be at an unacceptable risk of tidal flooding and/or where proposals are detrimental to the integrity of tidal defences or the ability to maintain or improve them. In areas identified to be at risk: (i) outside the built-up areas, planning permission will not be granted for new development or the significant intensification of existing development; and (ii) within the built-up areas, planning permission will only be granted where the local planning authority is satisfied that appropriate flood and coastal defence and mitigation measures have been provided so that the development will not itself be at unacceptable risk and, furthermore, does not pose an unacceptable risk to existing development in the area.
- Policy GEN 11 – Inland Flooding: Permission for development which would be at risk from flooding and/or materially decrease the capacity of a floodplain to store or pass flows of floodwater, will be refused unless the Local Planning Authority is satisfied that compensatory flood storage/waterway areas can be provided as part of the development and the function and effectiveness of existing watercourses or their replacements, are not adversely affected.
- Policy GEN 23 – The Water Environment: Development will not be permitted if it would have a direct or indirect unacceptable adverse impact on the water environment, notably in relation to rivers, ponds, wetlands, public access in river corridors and water-related recreation. Where appropriate, the Council will support initiatives which seek to restore or enhance the water environment.
- Policy GEN 24 – Energy and Water Conservation: The Council will expect all new developments to facilitate energy and water efficiency. These should be of a design and layout that: (i) minimises heat loss from dwellings; (ii) provides for the maximisation of passive and active solar gain and other renewable energy sources, whilst minimising the exposure of structures to wind and wind driven rain through appropriate landscaping; (iii) minimises specific requirements for wholesome potable water from mains sources and provides infrastructure for water harvesting and/or grey water recycling; and (iv) provides effectively for short term individual and community storage of re-usable and recyclable waste.

- Policy GEN 25 – Water Resources: Development will only be permitted where the Local Planning Authority is satisfied that adequate water resources are available or will be provided in time to serve the development and that provision is not considered detrimental to existing abstractions, river flows, water quality, fisheries, amenity or nature conservation.
- Policy GEN 26 – Water Quality: Development will only be permitted where the Local Planning Authority is satisfied that it would not lead to deterioration in the quality or potential yield of surface and ground water resources.

Assessment Methodology & Significance Criteria

7.9 This assessment has been undertaken in accordance with current Government guidance on EIA and has involved review of the following sources of baseline data:

- review of Landmark Envirocheck data for the Site at Oldlands Farm and a 1 km radius; providing data on surface water and groundwater discharges and abstractions, baseline hydrogeology and groundwater vulnerability and pollution incidents;
- review of Environment Agency (EA) data records on groundwater Source Protection Zones (SPZs), chemical and biological river quality and the location of indicative floodplain (www.environment-agency.gov.uk);
- review of relevant European, national and regional plans and policies as well as the West Sussex local plan to identify specific requirements relating to the aquatic environment; and
- consultation with the EA, Southern Water and Portsmouth Water regarding flood risk, infrastructure and water resources.

7.10 The assessment methodology has been largely desk-based, in accordance with the proposed methodology. Data on river quality has been acquired from the EA and therefore no additional water sampling was considered necessary.

Baseline Conditions

Surface Water Quality

7.11 The nearest main river³ to the Proposed Development is the Lidsey Rife confluence of the Aldingbourne Rife which lies to the south east of the Site and was classified between 2004 and 2006 as Grade E (Poor) for chemical quality under the EA's General Quality Assessment scheme (GQA) and as Grade C (Fairly Good) for biological quality in 2006. The status of river quality targets were recorded as 'significant failure' between 2004 and 2006.

7.12 There are no records of pollution incidents attributable to the Site. There are eight records of pollution incidents within a 1 km radius of the Site; all are Category 3 - Minor Incidents. The closest pollution incident occurred 576 m to the north west of the Site on the 15th February 1996 at 'The Holding', Shripney Road. The incident involved the discharge of diesel leaking from a storage tank to a drainage ditch and was categorised as a

³ In broad terms, main rivers include all watercourses that contribute significantly to a catchments' drainage.

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Category 3 - Minor Incident. No major pollution incidents have occurred within 1 km of the Site.

- 7.13 The site has a discharge consent operated by Messrs John Turner & Partners and is located on Oldlands Farm. The discharge type is classified as 'non water company sewage' and the discharge environment is 'controlled sea.' There are an additional 25 discharge consents within 1 km of the Site (Table 7.1).

- 7.14 Table 7.1 below details the water discharge consents.

TABLE 7.1: WATER DISCHARGE CONSENTS

Operator	Location	Discharge Type	Discharge Environment	Distance from Site (m)
Zurich Assurance Limited	KFC Drive Through, Bognor Regis Retail Park, Shripney Road	Sewage and trade combined	Freshwater Stream/river	414
Southern Water Services	Spine Road, North Bersted	Discharge of other matter-surface water	Freshwater Stream/river	417
Peel Investments (UK) Ltd.	Whitehouse Farm Caravan Park, Shripney Road	Discharge of other matter-surface water	Freshwater Stream/river	441
Block Securities (Arun) Ltd	Peel Centre, Bognor Regis Park	Sewage and trade combined	Onto land/ into watercourse	443
Zurich Assurance Limited	Peel Centre, Bognor Regis Park	Sewage and trade combined	Onto land/ into watercourse	443
Southern Water Services (Ltd)	Spine Road, North Bersted	Discharge of other matter-surface water	Freshwater Stream/river	500, 536, 580, 619, 641, 701, 854
Block Securities (Arun) Ltd	Land at Do-it-all, Peel Centre Shripney Road	Sewage discharges-final/treated effluent	Freshwater Stream/river	789
Southern Water Services (Ltd)	Downview Road, Felpham	Discharge of other matter-surface water	Controlled Sea	880
Ronald Lyon (Estates) Co. Ltd.	Plot 14, Durban Way, South Bersted.	Discharge of other matter-surface water	Freshwater river	906
Southern Water Services (Ltd)	Durban Road Cso Bognor Regis	Sewage discharges	Freshwater Stream/river	908
The Occupier	Lidsey Lodge Farm, Shripney	Discharge of other matter-surface water	Controlled sea	923
Riverside Caravan Centre Limited	Swimming pool, Riverside Caravan Camp, Shripney Road	Discharge of other matter-swimming pool contents	Freshwater river	940

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TABLE 7.1: WATER DISCHARGE CONSENTS

Operator	Location	Discharge Type	Discharge Environment	Distance from Site (m)
Galliford Construction	Residential development, Rookery Farm, North Bersted	Discharge of other matter-surface water	Freshwater Stream/river	941
Ronald Lyon (Estates) Co. Ltd	Factories north of the new road, Industrial Estate, South Bersted	Discharge of other matter-surface water	Controlled sea	945, 957
Tesco Stores Ltd.	Tesco Superstore, Shripney Road	Discharge of other matter-surface water	Controlled sea	948
City grove Developments Ltd.	Formerly Munday's caravan site, Shripney road	Discharge of other matter-surface water	Freshwater Stream/river	991

7.15 There is only one surface water abstraction within 1 km of the Site which is operated by The Donald Langmead Partnership and lies 691 m south west of the Site. It is located at Whitehouse Farm in Bersted and abstraction is for spray irrigation. Four additional water abstractions are recorded between 1 km and 2 km of the Site; the majority of which are for spray irrigation (Table 7.2). There are two groundwater abstractions within 1-2 km of the Site.

7.16 Table 7.2 below details the water abstraction licences.

TABLE 7.2: WATER ABSTRACTION LICENCES

Operator	Source	Location	Estimated distance from site (m)	Abstraction
The Donald Langmead Partnership	Surface	Aldingbourne Rife at Whitehouse Farm	1295	General agriculture-spray irrigation
Ashmarden Ltd	Surface	Between points C & D at Lidsey, Bersted	1391	General agriculture-spray irrigation
Langmead Farms Ltd	Groundwater	Shripney Farm	1607	General agriculture-spray irrigation
Lidsey Farm	Surface	Lidsey Rife reach A-B	1703	General agriculture-spray irrigation
Lidsey Farm	Surface	West branch of the Lidsey Rife	1782	General agriculture-spray irrigation (storage)
The Donald Langmead Partnership	Groundwater	Flansham Farm, Flansham	1869	General farming and Domestic

Hydrology and Flood Risk

- 7.17 The Envirocheck's indicative floodplain of the coastal region is shown in Figure 7.1. Interpretation of the EA's detailed flood map (Figure 1) indicates that the Site lies within the tidal Zone 3a floodplain (an annual flood risk of 0.5% or greater). However, the Site is protected from flooding by the sea defences to at least the 1 in 200 year (0.5%) standard.
- 7.18 The Shripney roundabout to the south west of the Site lies in Flood Zone 2 and the chance of being exposed to extreme tidal flooding each year is between 0.1% (1 in 1000) and 0.5% (1 in 200) for tidal flood risk.
- 7.19 The topographical survey plan of the site shows existing ground levels between 2.0 and 3.9 metres Above Ordnance Datum (mAOD), with levels generally rising gradually from north-east to south-west. In fact, the site is restricted to land with ground levels at or above 2.0 mAOD. This results in the eastern and part of the northern boundary of the site, which cross the arable farmland, being defined by the 2.0 mAOD contour. The land falls gently away from the site in an easterly and north-easterly direction to meet the low-lying floodplain of Lidsey Rife, where ground levels are as low as 0.7 mAOD. The A29 Shripney Road alongside the western boundary of the site rises gradually from 2.7 mAOD in the north to 3.9 mAOD in the south.
- 7.20 Further details of the Site's flood risk are discussed in the operational impacts section.

Geology

- 7.21 The underlying geology for the Site was determined using the British Geological Survey mapping (SU90SW, 1:10,000, 1981), which indicates that the Site is directly underlain by Quaternary deposits of Brickearth, comprising yellow to brown silty loam with flint seams and nodules of chalk towards the base.
- 7.22 The solid geology underlying the Site is indicated as the Cretaceous Upper Chalk Formation comprising white, highly fissured limestone with beds of flint, nodular chinks and marl seams.
- 7.23 The groundwater vulnerability map of the Site and surrounding area shows that the site is located on a major aquifer. Major aquifers are highly permeable, with the possible presence of significant fracturing. This type of aquifer has a greater potential capacity to transmit contaminated recharge entering at the surface, which could affect groundwater quality. Major aquifers can be very productive with the ability to provide larger water abstractions for public supply and other uses.
- 7.24 The solid geology is off-white structureless putty chalk with occasional flint fragments encountered between 2 to 5 metres below ground level (mbgl) and proven to depths of up to 13 mbgl (i.e. the maximum depth of drilling).

Identification & Evaluation of Key Impacts

Construction Impacts

Contamination Arising from General Construction Drainage

- 7.25 The operation of construction vehicles and general construction activities give rise to the potential for surface runoff to become contaminated with hydrocarbons, silt or other construction materials. They may in turn lead to a contamination event should site drainage be allowed to enter surface watercourses or the ground untreated.
- 7.26 It is understood that construction site drainage will be routed to the ground. Discharges will be treated in settling tanks to remove suspended sediments and oil interceptors (in areas where risk of oil contamination is high) prior to discharge.
- 7.27 Depending on meteorological conditions, excavations may require dewatering (of accumulated rainfall or runoff) during construction. In such circumstances, care will be taken to ensure the quality of the water is sufficiently high enough to allow discharge into the ground.

Potential Groundwater Interruption / Contamination during Construction

- 7.28 The proposed development site lies on a major aquifer. The piling depths are not available at this stage, but it is considered unlikely that the depth of piling will be sufficient to encounter groundwater.
- 7.29 As the Site is Greenfield, the likelihood of contamination is low and therefore piling would also not open up conduits for contamination to reach the underlying major aquifer.

Operational Impacts

Land Drainage

- 7.30 The site is currently occupied by arable farmland which extends to 8.8 hectares. Therefore the site is classified as Greenfield.
- 7.31 Surface water runoff from the site presently drains to a ditch that flows in a northerly direction from the south-east corner of the site. This ditch outfalls to a tributary of the Lidsey Rife approximately 0.3 km from the south-east corner of the site.
- 7.32 A stand alone FRA has been prepared by a land drainage and flood defence consultant, Chris Dartnell⁴. The FRA is included as Appendix 7.1 of this ES and is summarised within this chapter.
- 7.33 According to the FRA, the peak rate of surface water runoff from the site, following development, will not exceed the peak rate of surface water runoff from the site pre-development due to the use of mitigation measures.
- 7.34 The underlying subsoil has clay content which is not conducive to infiltration. Therefore, surface runoff will be controlled using surface attenuation-based measures.
- 7.35 The peak "greenfield" runoff rate will be limited to 5 litres/second/hectare for the 1 in 100 (1%) annual probability storm of critical duration. The resulting flood attenuation storage requirement for the developed site will be

⁴ Chris Dartnell (2007) Oldlands Farm Business Park off A29 Shipney Road at Bognor Regis in West Sussex - Flood Risk Assessment

increased by 20% to allow for an increase in peak rainfall intensity due to climate change over the next 50 years.

- 7.36 The peak rate of surface water runoff from the developed site will be restricted through the provision of a flood storage ditch. A 'hydrobrake' will be used to control the flow from the outlet. The outlet will incorporate a trash screen to minimise the risk of blockage by debris of the flow control device. An emergency overflow will also be included in the design as a safeguard.
- 7.37 The surface water runoff from the developed site will drain to surface water sewers that will all outfall to the flood attenuation storage ditch. These sewers will adhere to the following hydraulic design criteria:
- no surcharging of sewers under "free" outfall for 2 year return period storm of duration critical for sewer length;
 - no flooding out of manholes under "free" outfall for 30 year return period storm of duration critical for sewer length; and
 - no flooding out of manholes under "drowned" outfall level of 1.82 m AOD for 2 year return period storm of duration critical for sewer length.

Flood Risk

- 7.33 The FRA has considered flood risk from both tidal and fluvial sources, the conclusions of which are summarised in the following paragraphs.

Tidal Flooding

- 7.34 Capita Symonds produced a draft Strategic Flood Risk Assessment (SFRA) on behalf of Arun District Council earlier this year. The SFRA concluded that the continuous sea defence along the coastline protects against tidal flooding from the 1 in 200 (0.5%) annual probability (200 year return period) event occurring now, in 50 years time or even in 100 years time. It also indicates that the sea defence protects against the 1 in 1000 (0.1%) annual probability (1000 year return period) event occurring now or in 50 years time. Therefore, the buildings, access and parking areas of the proposed business park and an ingress and egress route from the developed site will be protected against tidal flooding to the required standards.

Fluvial Flooding

- 7.35 WSP Development undertook a flood study of Aldingbourne Rife and Lidsey Rife through Bognor Regis and its surrounding area⁵. The report estimates the present 1 in 100 (1.0%) annual probability (100 year return period) fluvial flood peak level alongside the development site from Lidsey Rife as 1.70 mAOD.
- 7.36 When flood flows are increased by 20% to allow for climate change over the next 50 years, the report estimates the fluvial flood peak level alongside the development site from Lidsey Rife as 1.82 m AOD. Both peak flood levels have been conservatively estimated because the pumping station at the Aldingbourne Rife outfall to the English Channel has been ignored.
- 7.37 The topographical survey plan of the site shows existing ground levels between 2.0 and 3.9 metres Above Ordnance Datum (mAOD), with levels generally rising gradually from north-east to south-west. Therefore, in the event of a 1 in 100 year fluvial flood event the site would not be flooded

⁵ WSP Development (June 2003) Aldingbourne and Lidsey Rife Flood Study Report

7.38 Buildings on the proposed business park will have floor levels of at least 2.42 m AOD so they will be protected against fluvial flooding from Lidsey Rife.

7.39 In consideration of the site ground levels (2.0 – 3.9 m AOD) and fluvial flood peak levels, the access and parking areas of the proposed business park and an ingress and egress route from the developed site will be protected against fluvial flooding from Lidsey Rife. This gives rise to a safe escape route in the event of a flood.

Contamination of Groundwater from Site Drainage

7.40 The principal source of contamination from routine operation of the Site is hydrocarbon contamination from vehicles parked on site.

Increased Water Consumption

7.41 Average rainfall for the Bognor Regis area according to the Meteorological Office data is 717.4 mm/year, which is low in comparison to the national average of 897 mm/year (Environment Agency). Demand for water is forecast to increase across South East England, where significant housing growth is planned. The population of the South East is expected to grow by 800,000 between 2003 and 2021. In addition, the impacts of climate change are predicted to reduce water availability during the summer months. Therefore, greater water efficiency in new development is essential for the sustainable management of water resources in the region (Environment Agency).

7.42 The proposed development site is currently unoccupied. Therefore, development will lead to an increase in the number of site occupants and an accompanying increase in water consumption. Water supply is available via an existing water main running beneath Shripney Road to the west of the Site. Portsmouth Water has confirmed that there is sufficient capacity for mains water to be supplied to the development.

Foul Drainage Capacity

7.43 Consultation from Southern Water has confirmed that there is no positive drainage system within the Site itself. However, it is understood that foul sewers exist either along Shripney Road to the east of the Site or associated with development to the south of the Site. Further information / clarification is being sought from Southern Water.

Prediction of Impact Magnitude

7.44 Table 7.3 details the predicted magnitude of impact and sensitivity of each key impact.

TABLE 7.3: IMPACT MAGNITUDE AND SENSITIVITY OF KEY IMPACTS PRIOR TO MITIGATION

Key Impact	Magnitude of impact	Sensitivity
Construction		
Contamination Arising from General Construction Drainage.	Minor	Moderate
Potential Groundwater Interruption during Construction	Minor	Moderate
Operational		
Land drainage	Moderate	Moderate
Flood risk	Negligible	Low
Contamination of groundwater from site drainage	Negligible	Moderate
Increased water consumption	Minor	Low
Foul drainage capacity	Minor	Low

Assessment of Impact Significance

7.45 Table 7.4 details the impact significance of key impacts, prior to mitigation.

TABLE 7.4: IMPACT SIGNIFICANCE PRIOR TO MITIGATION

Key Impact	Impact Significance
Construction	
Construction Arising from General Construction Drainage.	Minor Adverse
Potential Groundwater Interruption during Construction	Minor Adverse
Operational	
Land drainage	Moderate Adverse
Flood risk	Negligible
Contamination of ground water from site drainage	Moderate Adverse
Increased water consumption	Negligible / Minor Adverse
Foul drainage capacity	Negligible / Minor Adverse

Mitigation Measures

Contamination arising from General Construction Drainage

7.46 Interceptors and silt traps will be regularly inspected, cleaned and maintained. Full records will be kept of inspection, maintenance works and measures undertaken to sustain equipment performance. These provisions should ensure that there are no significant impacts on water quality. The use of settlement facilities will aid the removal of any potentially contaminated material that might be derived from construction materials.

7.47 All site works will be undertaken in accordance with the EA's Pollution Prevention Guidance Note 6 'Working at Construction and Demolition

sites.' Construction vehicles will be properly maintained to reduce the risk of hydrocarbon contamination and will only be active when required. Construction materials will be stored, handled and managed with due regard to the sensitivity of the local aquatic environment and thus the risk of accidental spillage or release will be minimised. Construction contractors will also take full account of the requirements of the EA'S General Guide to the Prevention of Pollution of Controlled Waters (PPG1) and guidance set out in PPG2 (Above Ground Oil Storage Tanks) and PPG3 (The Use and Design of Oil Separators).

- 7.48 In accordance with the Control of Pollution (Oil storage) (England) Regulations 2001, any tanks storing more than 200 litres of oil will have secondary bunding. Bunding will be specified as having a minimum capacity of *"not less than 110% of the container's storage capacity or, if there is more than one container within the system, of "not less than 110% of the largest container's storage capacity or 25% of their aggregate storage capacity, whichever is the greater."* Above ground storage tanks will be located on a designated area of hardstanding. No underground storage tanks will be used during the construction period. Storage of liquids such as degreasers, solvents, lubricants and paints would be in segregated, bunded enclosures.
- 7.49 The construction drainage system will be designed and managed to comply with BS6031:198 "The British Standard Code of Practice for Earthworks", which details methods that should be considered for the general control of drainage on construction sites. Further advice is also contained with the British Standard Code of Practice for Foundations (BS8004, 1986).
- 7.50 Furthermore, these mitigation measures will be incorporated into a Construction Environmental Management (CEMP) which will set out measures for the control of site drainage, reducing the risk of accidental spillages and the storage and handling of materials.

Potential Groundwater Interruption during Construction

- 7.51 Due to the Site's location on a major aquifer, dewatering of excavations may be required during construction. It is intended to discharge accumulated surface water during construction to the ground following appropriate treatment to ensure that there is no loss of recharge to the underlying aquifer, during construction.

Land Drainage and Flood Risk

- 7.52 A flood attenuation storage ditch will be located immediately on the development side of the site boundary between where it meets the proposed Bognor Regis northern relief road to the north and the existing ditch to the south-east. The top of the far bank of the storage ditch will be at a level of 2.0 mAOD throughout its 300 m length. The top of the near bank of the storage ditch will be at a slightly higher level because the ground rises gradually into the site. The outlet control structure will be located where the flood attenuation storage ditch meets the existing ditch in the south-east corner of the site. Although the outlet structure will incorporate a trash screen to minimise the risk of blockage by debris of the flow control device, an emergency overflow will also be included as a safeguard.
- 7.53 The flood attenuation storage ditch will have a trapezoidal cross section with 1:1 side slopes and a bed level of 0.8 m AOD throughout its length. This level corresponds to the bed level in the existing ditch where the storage ditch will connect to it. Hydraulic and hydrological analyses will

establish the required storage capacity and necessary bed width. The water level in the storage ditch at its design capacity will not exceed 1.82 m AOD. This level will also be the threshold for the emergency overflow in the outlet structure.

- 7.54 Although the ground levels of the redeveloped site will remain the same, any hollows will be filled and humps levelled to produce even grades in all directions. This will minimise the ponding of floodwater. An additional precaution will be to ensure that the floor levels of the proposed buildings will be at least 0.3 m above the highest ground level around the building.

Contamination of Groundwater from Routine Site Drainage

- 7.55 Surface water runoff from car parking areas and roads will be diverted through oil interceptors prior to discharge to ground to ensure potential contaminants are removed.

Increased Water Consumption

- 7.56 Water efficiency measures can reduce consumption by 20-25% (Environment Agency). Therefore water minimisation and conservation measures are important considerations for the Proposed Development, to minimise the increase in water demand.
- 7.57 Water demand will be reduced as far as possible, through the incorporation of appropriate water saving devices, wherever practicable. For example, grey water recycling, low flow taps and dual flush toilets could be fitted subject to feasibility.
- 7.58 Portsmouth Water has been consulted with regard to availability of mains supply at the Site. The utilities search that water mains are available along Shripney Road. Portsmouth Water has confirmed that sufficient water resources and infrastructure are available to supply the water demand for the proposed development.

Foul Drainage

- 7.59 According to the Southern Water response, there would be no problem connecting the site to the Southern Cross Industrial Estate immediately to the south of the Oldlands Farm site.

Cumulative Effects

- 7.60 The EIA process includes the need for the assessment of the cumulative effects of other committed developments, where there are likely to be significant effects. Cumulative effects arise from proposed developments in combination. Best practice guidance suggests that committed developments should be considered as part of the cumulative assessment.
- 7.61 There are two other committed developments in the vicinity of the Site: Reference BE/45/04 for the residential development of land North of Bersted. The second committed development is Reference FP/92/04 for the residential development of land North of Felpham.
- 7.62 The application site: BE/45/04 for residential development North of Bersted, extends to an area of 67.7 hectares and is located adjacent to the northern edge of Bersted. The site forms an extension to the existing urban area, which will be bounded to the north by the new Bognor Regis Northern Relief Road. This site lies 2000 m from the Oldlands Farm application site.
- 7.63 The proposed land use will be mixed use development, to provide 650 residential dwellings with a school and community sports facilities.

- 7.64 As the Site currently is Greenfield, the new development will result in a higher proportion of impermeable surface. The new development will incorporate SUDS, which will be designed to ensure that site runoff will be no greater than the existing situation. Surface water runoff from the development will be attenuated in balancing ponds in the central open space area prior to discharge into the local ditch system. The proposed development plans to incorporate a permanent wet stormwater detention basin, a flood compensation area and free open space.
- 7.65 The application site FP/92/04: for residential development is located between the residential area of Felpham and the hamlet of Flansham, which are in turn located to the north east of Bognor Regis. Felpham lies to the south of the development area, Flansham to the north, with Bognor Regis Golf Course and agricultural land situated to the west. The site is approximately 700 m from the Oldlands Farm application site.
- 7.66 The application site is located within the agricultural plain of the lower coastal plain. Existing land uses consist of productive arable fields and in former times the plain was characterised by tree and hedgerow cover with grassland habitat. The site is about 4 m AOD at its highest, although there is a fall in land level towards the west and northwest. The southern boundary of the Site abuts the urban area of Felpham. To the north of the Site is Flansham, which is a small rural hamlet containing some listed buildings.
- 7.67 The proposed land use will be mixed use development, to provide 700 residential units with a new community building or a local primary school. Public open space and play space is also planned and will comprise sports pitches and open space associated with residential areas, such as informal open areas and smaller play areas.
- 7.68 As the Site currently is Greenfield, the new development will result in a higher proportion of impermeable surface. The new development will incorporate SUDS, which will be designed to ensure that site runoff will be no greater than the existing situation.
- 7.69 Brookbanks Consulting Ltd was appointed to consider the effects of the development in terms of water and geological impacts. A survey report by DTS Raeburn identified the underlying geology and soil structure of the Site and was used by Brookbanks in their assessment of existing conditions. It concluded that suitable site management practices can reduce any potential spillages from construction plant to a minimum. The disposal of surface water has been carefully designed with specialist collection, conveyance and treatment systems in the form of balancing ponds. In relation to flood risk, the consultants have agreed with the EA that the level of the Site should be remodelled to 1.82 m AOD. The consultants have prepared a detailed hydraulic flood model, which demonstrates that flooding will not affect existing or new residents.
- 7.70 In terms of utilities infrastructure, the other outline applications for residential development will lead to further demands on the capacity of local utility services. These further demands will be considered by local service providers before any works are made to increase capacity.

Residual Effects

- 7.71 In conclusion, given the location and nature of the nearest sensitive receptors, the overall environmental impact of the proposed development in relation to water quality and hydrology is considered to be Negligible.
- 7.72 A summary of the key impacts and their mitigation measures is provided below:
- all construction activities will be carried out in accordance with the EA's pollution prevention guidelines, notably PPG 'Working at Construction and Demolition Sites'. This will reduce the risk of surface water or groundwater contamination during construction (residual impact - negligible);
 - the FRA concluded that the site was located within Zone 2 and 3 floodplain, due to the presence of tidal flood defences. All buildings will have finished floor levels of 2.42 m AOD. The climate change corrected (20%) 1 in 100 year flood level for the Lidsey Rife is 1.82 mAOD. Therefore, all buildings will be above the 100 year flood level for the lifetime of the development (residual impact - negligible);
 - in accordance with PPS25, the FRA undertook an assessment of surface runoff rates before and after development of the site. The assessment concluded that the development proposals would give rise to an increase in surface runoff. However, the increase in surface runoff will be managed through the use of an attenuation basin which will be designed to manage surface runoff to achieve greenfield runoff rates from the site (residual impact - negligible);
 - the proposed development will increase the number of occupants using the site and will therefore increase the water demand. However, the increase in water demand will be offset through the use of water efficiency measures (residual impact - negligible / minor adverse); and
 - the foul drainage requirements will increase from the existing situation, which is acceptable to the water company (residual impact - negligible / minor adverse).

Summary

- 7.73 The key construction impacts were considered to be contamination arising from general construction drainage and potential groundwater interruption during construction. All construction activities will be carried out in accordance with the EA's pollution prevention guidelines, notably PPG6 'Working at Construction and Demolition Sites'. This will reduce the risk of surface water or groundwater contamination during construction. It was considered possible that groundwater would be encountered during excavations for the proposed development. However, the impact on groundwater is considered to be minor and any water encountered during excavations will be managed in the same way as surface water. Therefore, it is considered that the residual impact from construction activities will be negligible.
- 7.74 The key operational impacts were considered to be surface water management, flood risk, contamination of groundwater from site drainage, increased water consumption and increased foul drainage demand. The Flood Risk Assessment (FRA) concluded that the site was located within the Zone 2 and 3 floodplains, due to the presence of tidal flood defences. All buildings will have finished floor levels of 2.42 m AOD. The climate change corrected (20%) 1 in 100 year flood level for the Lidsey Rife is 1.82 mAOD. Therefore, all buildings will be above the 100 year flood level for

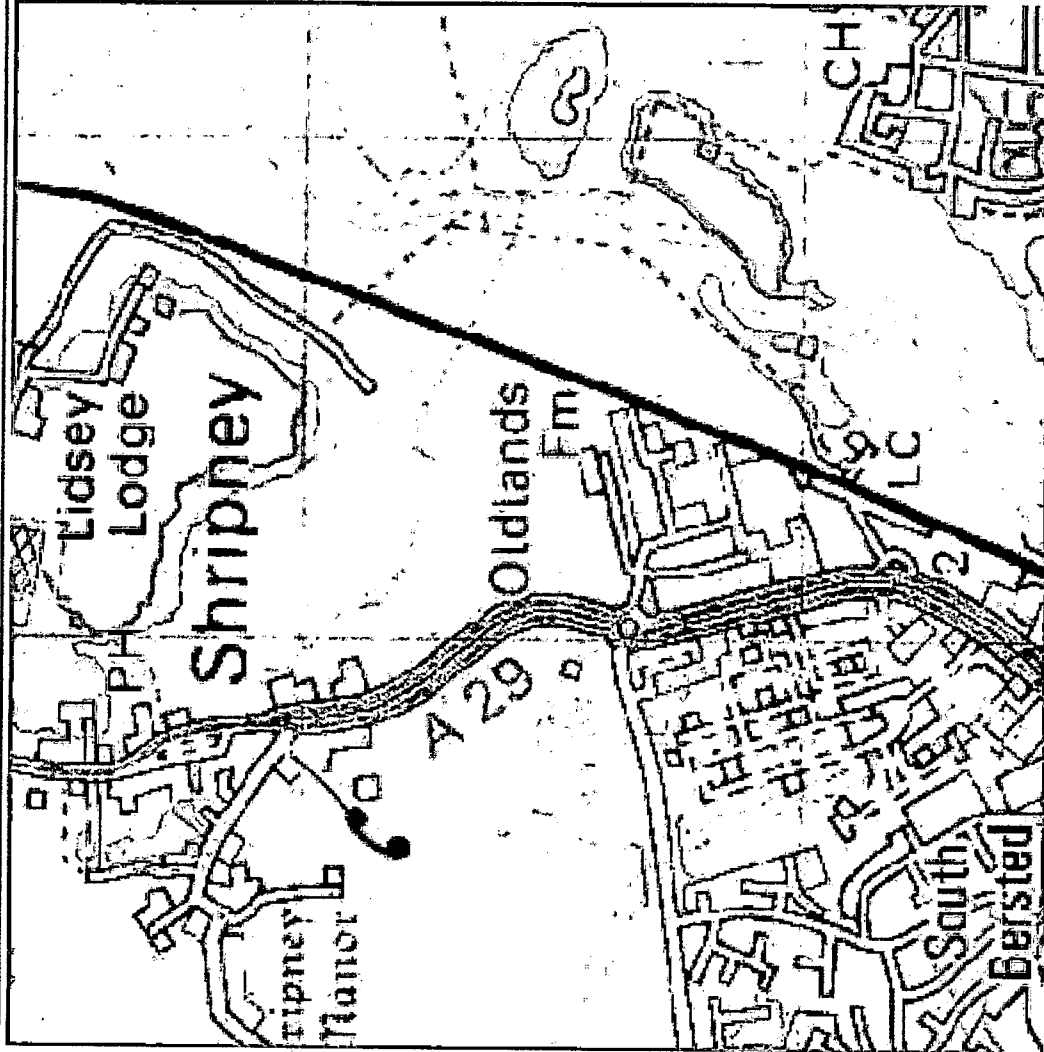
the lifetime of the development and will not be a risk from flooding. Therefore the residual impact from floor risk is negligible.

- 7.75 The FRA also undertook an assessment of surface runoff rates before and after development of the site. The assessment concluded that the development proposals would give rise to an increase in surface runoff. However, the increase in surface runoff will be managed through the use of an attenuation basin which will be designed to manage surface runoff to achieve greenfield runoff rates from the site. Therefore, the residual impact on surface runoff rates generated by the development is negligible.
- 7.76 The site is located on a major aquifer, which makes the groundwater particularly sensitive to any pollution incidents. However, the development will not be discharging directly into the groundwater; therefore the impact is negligible.
- 7.77 The proposed development will increase the number of occupants using the site and will therefore increase the water demand. However, the increase in water demand will be offset through the use of water efficiency measures such as low flow taps, dual flush toilets. The mains water provider (Portsmouth Water) has been consulted and has confirmed that they will be able to service the development and they have not identified any supply issues. Therefore, the residual impact is negligible / minor adverse.
- 7.78 The proposed development will also lead to an increase in the foul drainage requirements when compared to the existing situation. However, Southern Water has been consulted and has agreed that they have the capacity to accommodate the increase in demand. Therefore the residual impact on foul drainage is negligible / minor adverse.
- 7.79 Therefore, the overall impact of the development following mitigation is negligible.

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7.80 Table 7.3 below presents a summary of the impacts following mitigation.

TABLE 7.3: IMPACT MAGNITUDE AND SENSITIVITY OF KEY IMPACTS FOLLOWING MITIGATION			
Key Impact	Magnitude of impact	Sensitivity	Impact Significance
Construction			
Contamination Arising from General Construction Drainage.	Minor	Moderate	Negligible
Potential Groundwater Interruption during Construction	Minor	Moderate	Negligible
Operational			
Land drainage	Moderate	Moderate	Negligible
Flood risk	Negligible	Low	Negligible
Contamination of groundwater from site drainage	Negligible	Moderate	Negligible
Increased water consumption	Minor	Low	Negligible
Foul drainage capacity	Minor	Low	Negligible / Minor Adverse



- ☐ Flooding from rivers or sea without defences
- ☐ Extent of extreme flood
- ☒ Flood defences
- ☒ Areas benefiting from flood defences

Figure:

Figure 7.1

Title:

EA Indicative Flood Map

Project:

Oldlands Farm

Date:

11/12/2007

Scale:

NTS