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Proposed Industrial Development – Shoreham Technical Centre, Shoreham-by-Sea, West Sussex

Flood Risk Assessment

Final Report

For

Ricardo PLC

Hydrock Ref: R/09240/001

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Client: RICARDO PLC

Project: PROPOSED INDUSTRIAL DEVELOPMENT – SHOREHAM TECHNICAL CENTRE, SHOREHAM-BY-SEA, WEST SUSSEX

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1	October 2009	Final issue.

Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above named Client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

1.0 INTRODUCTION

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of our client Ricardo PLC in support of a planning application to be submitted to Adur District Council for a proposed industrial development within Ricardo PLC's existing site at Shoreham Technical Centre, Shoreham-by-Sea, West Sussex.

Local Planning Authorities are advised by the Government's Planning Policy Statement *PPS25 Development and Flood Risk* (*PPS25*) to consult the Environment Agency (EA) on development proposals in areas at risk of flooding and / or for sites over 1ha in area. For a development of this nature the EA require a Flood Risk Assessment to be submitted in support of the planning application.

In order to satisfy any concerns the EA would have in connection with the development of this site, this report has been prepared to address Section C of the Exception Test, as defined within Paragraph D9 of *PPS25*, through:

- Providing an assessment of whether the proposed development is likely to be affected by flooding and whether it would increase flood risk elsewhere; and,

- Detailing any measures necessary to mitigate any flood risk identified, to ensure that the proposed development and occupants would be safe and that flood risk would not be increased elsewhere.

The report considers the requirements for undertaking a FRA stipulated in Annex E of *PPS25*. Only those requirements that are appropriate to a development of this nature have been considered in the compilation of this report.

This report has been developed in accordance with current EA policy.

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2.0 SITE INFORMATION

2.1 Site Location

The site is referenced in Table 2.1, and a site location map is provided in Appendix A.

Table 2.1: Site Referencing Information

Item	Brief Description
Site name	Shoreham Technical Centre
Site address and location	Shoreham Technical Centre, Shoreham-by-Sea, West Sussex
Council Area	Adur District Council
Approximate Grid Reference	OS: 520300, 106000 NGR: TQ203060

The site is located approximately 13km west of the centre of Brighton and around 2km north of Shoreham-by-Sea (coastline).

2.2 Existing Site

2.2.1 Boundaries and Surrounding Land

The boundary of the proposed development site is shown in Appendix A.

The overall Shoreham Technical Centre site comprises an approximately triangular parcel of land bounded by Shoreham By Pass (A27) to the north, the River Adur to the east and Old Shoreham Road to the south, beyond which lies Shoreham Airport.

The footprint of the proposed development within the site is located parallel to Old Shoreham Road on the southern site boundary, bounded by existing buildings to the north, the main service access road to the east and the main site entrance to the west.

2.2.2 Land use

The proposed development footprint is currently hardstanding, occupied by several temporary buildings / structures. The proposed development area is effectively 100% impermeable.

2.2.3 Access

Access to the site is provided off Old Shoreham Road, via the existing main site entrance.

2.2.4 Elevation and Topography

The proposed development footprint is relatively flat, ranging in level between around 1.7m AOD and 2.0m AOD. Old Shoreham Road to the south of the site is approximately 1.8m above site levels, separated by a planted bank. Likewise Shoreham By Pass (A27) to the north of the site is set atop a raised embankment. Flood defence earth embankments also border the site to the east, and therefore effectively the site is enclosed to all sides.

2.3 Proposed Development

2.3.1 Outline of Development Proposals

The proposed development consists of the erection of an approximately 600m² engine assembly building. The intention is that the scheme would evolve over three phases, with phase 1 consisting of the 600m² engine assembly facility, and phases 2 and 3 consisting of similar size units in the future, that would extend this initial facility towards the east.

This planning application applies only to phase 1 of the proposed scheme and as such this report only refers to the phase 1 proposal. However the principles established are likely to set a precedent for the future phases of the overall proposed scheme. The proposed site layout for this application is shown in Appendix B.

2.3.2 Development Design Life

The generally accepted development design life of industrial development for the assessment of flood risk is 60 years. This assessment therefore considers flood risk over the period 2009 to 2069.

2.3.3 *PPS25* Vulnerability Classification

PPS25 considers industrial development as 'less vulnerable' development in respect of flood risk.

3.0 IDENTIFICATION OF FLOOD RISK

Flood risk to the proposed development site is considered from all sources of flooding, as defined by the *PPS25 Practice Guide*.

3.1 Sources of Information

Table 3.1 summarises the main sources of information used in the identification of flood risk.

Table 3.1: Sources of information used in the identification of flood risk

Source of Information	Details
EA flood modeling information	Dated September 2009. Appendix C.
Strategic Flood Risk Assessment (SFRA) of Worthing Borough Council and Adur District Council	Dated January 2008. Relevant maps in Appendix C.

The assessment of flood risk draws primarily on assessment of the site and surrounding watercourses and coast via the EA provided data and the Local Authority SFRA.

3.2 Flooding from Rivers (Fluvial) and Sea (Tidal)

3.2.1 EA Flood Zone Mapping

The site is shown by the EA's Flood Zone mapping, included in Appendix C, to be within Flood Zone 3 which comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. It should however be noted that the EA's Flood Zone mapping ignores the presence of any existing flood defences offering protection to the area.

3.2.2 The Hydrological Regime

The River Adur flows immediately adjacent to the sites eastern boundary. The river at this point is tidally influenced, being only around 4km upstream from the coastline at Shoreham-by-Sea. As such the proposed development needs to be assessed against both fluvial and tidal sources of flooding, considering the critical events for each scenario (1 in 100 year plus climate event for fluvial flooding and 1 in 200 year plus climate event for tidal flooding).

The site is separated from the River Adur by EA maintained earth embankment flood defences. The EA have confirmed that the flood defences offer protection up to a 1 in 200 year flood event.

The SFRA for the area provides modelling of the River Adur considering both fluvial and tidal sources of flooding, and taking into account the presence of flood defences. The mapping, included in Appendix C, shows the site to be outside the 1 in 100 year plus climate change (2056) fluvial floodplain, but within the 1 in 200 year plus climate change (2056) tidal floodplain.

The SFRA indicates that this tidal flood risk is a result of the sea defences being overtopped along the lower reaches of the River Adur, rather than overtopping of the flood defences immediately adjacent to the site.

Flood depth mapping for the 1 in 200 year tidal event, included in Appendix C, indicates that the depth of flooding in such an event would vary across the overall site, however the footprint of the proposed building and access off Shoreham By Pass (A27) to the north are shown to be at risk of flooding to depths between 0.0m - 0.5m.

3.3 Flooding from the land (Surface Water)

The SFRA indicates that whilst the site or immediate area has not historically experienced flooding from the land, the site is considered to be at a 'medium to high' risk area prone to surface water flooding. Mapping from the SFRA showing the vulnerability of areas to surface water flooding is included in Appendix C.

The site is effectively enclosed by raised ground (highways and flood defences) to all sides, reducing the risk of surface water flows entering the site from the surrounding area. Furthermore the site currently has a positive surface water drainage system in place, with underground pipes and an open ditch / swale network. As such, the risk posed by surface water flooding to the site is considered low.

3.4 Flooding from Groundwater

The SFRA indicates that the site is underlain by clay which overlies chalk of the Newhaven Chalk Formation. A large chalk aquifer lies beneath the Adur area. The water level within chalk aquifers can fluctuate notably corresponding to seasonal rainfall and West Sussex is one of the better-known counties for groundwater flooding. Groundwater flooding occurs in lower lying regions of the Adur area between the South Downs and the sea when the water level is higher within the aquifer than ground level.

The SFRA indicates (mapping included in Appendix C) that whilst the area is not within an area that has previously experienced groundwater flooding or within a groundwater emergence zone, the site is at a 'high' risk of groundwater flooding. This is supported by previous ground investigations for the site which has identified groundwater at a relatively shallow depth (around 1.0 - 1.5m below ground level).

3.5 Flooding from Sewers

Given that the site is surrounded by raised structures and that the SFRA indicates that the area has not previously experienced sewer flooding (mapping included in Appendix C), the site is considered to be at a negligible risk of sewer flooding.

3.6 Flooding from Artificial Sources

No artificial bodies of water, such as ponds, are located within the vicinity of the site and therefore this potential source of flooding is not considered further.

3.7 Summary

The EA and SFRA data for the area indicates that the proposed development is not at risk of flooding from the fluvial 1 in 100 year plus climate change flood event, but is at risk of flooding from the tidal 1 in 200 year plus climate change flood event. Furthermore the site is

considered to be at a low risk of surface water and sewer flooding but at a higher risk of flooding from groundwater.

4.0 *PPS25* AND THE PROPOSED DEVELOPMENT SITE

4.1 Planning Policy Requirements

This assessment has demonstrated that the proposal site has been correctly classified as Flood Zone 3a.

Industrial development is considered 'less vulnerable' in terms of flood risk.

The *PPS25* flood risk vulnerability and flood zone compatibility matrix (*PPS25*, Table D.3) indicates that 'less vulnerable' development is appropriate in Flood Zone 3a.

The following section details any measures necessary to mitigate any identified flood risks, to ensure that the proposed development and occupants would be safe and that flood risk would not be increased elsewhere.

4.2 Resistance and Resilience of Proposed Building

Due to the nature of use of the proposed building, finished floor level will be set close to existing ground level, at 2.134m AOD, to allow external level access and match the finished floor level of the adjacent building. As such it is proposed to design and construct the proposed building to be flood resilient, i.e. reduce the impact of flood water should it enter the building, in line with *PPS25 Practice Guide* (Paragraph 6.27). Based on Government guidance document *Improving the flood performance of new buildings – Flood resilient construction* (May 2007) and the predicted 0.5m maximum depth of flooding, a 'water exclusion strategy' is proposed. This means placing an emphasis on minimising flood water entry and utilising materials and construction techniques to facilitate drying and cleaning of the building should the building be flooded.

Such design considerations should include, as a minimum:

- Ground supported concrete slab floor construction of suitable thickness to withstand potential water ingress uplift pressures;
- Use of smooth low porosity floor finish, such as epoxy resin, to permit quick drying and cleaning if necessary;
- Use of materials for wall construction that have low water penetration, are quick drying and retain pre-flood dimensions. The currently proposed wall construction materials (engineering bricks at a low level and panel systems at a higher level) should fulfil these criteria.
- Door and window materials should be waterproof and seals suitably robust. The use of temporary barriers and/or 'drop in boards' should be considered for all low level access points. Such barriers can be put in place upon receipt of flood warnings (described further in section 4.3) and removed once the risk has receded.
- Sensitive equipment should be raised as high as is feasible above floor level, with vulnerable services brought in from a high level and non-return valves fitted to waste water services where appropriate.

4.3 Flood Warning and Evacuation

The site is covered by the EA's flood warning service. As such it is recommended that the site, if not already, register with the EA's service. This would allow safe and timely evacuation of personnel and preparation of the building for the potential onset of flooding (i.e. fitting of temporary barriers and/or 'drop in boards' for all low level access points).

4.4 Flood Risk within Catchment

The proposed development and facilitating works are not considered to increase flood risk within the catchment. Details regarding the measures to manage any increase in surface water run-off as a result of the proposed development are provided in Chapter 5.0.

5.0 SURFACE WATER DRAINAGE STRATEGY

5.1 Existing Surface Water Drainage System

Currently the proposed development footprint is 100% impermeable. A site drainage investigation identified that the development footprint area currently drains to a central ACO channel running westward. This is believed to discharge into a 'soakaway' in the grass area to the immediate west of the proposed footprint. From this a 600mm diameter overflow pipe emerges which then connects into an existing drainage ditch that runs around the perimeter of the site. The ditch is understood to ultimately discharge into the River Adur to the north eastern corner of the site via a 300mm diameter outfall, with a flap valve. The existing drainage arrangement is shown in Appendix D.

Anecdotal evidence indicates that the soakaway does not currently perform well. This is believed to be due to the high groundwater table in the area. As such the surface water run-off from the proposed development footprint effectively has an unrestricted discharge to the River Adur.

5.2 Proposed Surface Water Drainage System

The proposed scheme results in the area remaining effectively 100% impermeable and as such there would be no increase in surface water run-off from the site.

Table 5.5 in The SUDS Manual (CIRIA C697 – 2007) states that:

Discharge to coastal or estuarial waters will not generally require peak flow or volume control as there will be no deterioration in flood risk as a result of increased runoff.

As such it is proposed to retain the existing drainage regime of discharging to the existing drainage ditch running around the perimeter of the site and ultimately discharging into the River Adur.

It is however proposed to remove the existing soakaway from the system due to its poor performance and risk posed by pollution via infiltration into shallow groundwaters.

A petrol interceptor is also proposed for treatment of run-off from hardstanding areas to the east of the proposed Phase 1 building, due to the proposed vehicular use of the area. The proposed drainage system is shown in Appendix D.

The existing flap valve outfall into the River Adur is set at such a level to be above the 'typical' river level. However during high tides and/or flood events the outfall is likely to be submerged and as such surface water would be unable to discharge via the pipe. In such situations, firstly the discharge from the site is likely to peak before peak water levels in a fluvial flood event, and as such there is unlikely to be significant surcharging of the outfall pipe; secondly, due to the tidal nature of the river the outfall is only likely to be submerged for several hours during high tide, and once river levels fall the outfall would become operational; and, thirdly, even if the outfall was submerged for a prolonged period of time, the available capacity within the existing drainage ditch is considered sufficient to ensure water would be contained within channel and highly unlikely to overtop onto the site.

6.0 CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

This report has considered the flood risk posed to the proposal site from a variety of sources of flooding, as defined by the *PPS25 Practice Guide.*

The report has identified that the proposed development is not at risk of flooding from the fluvial 1 in 100 year plus climate change flood event, but is at risk of flooding from the tidal 1 in 200 year plus climate change flood event. Furthermore the site is considered to be at a low risk of surface water and sewer flooding but at a higher risk of flooding from groundwater.

This analysis demonstrates that the site has been correctly classified as Flood Zone 3a. However, the proposed industrial development, considered 'less vulnerable', is appropriate in the proposed location under *PPS25* criteria.

Several measures have been outlined to ensure the proposed building would be suitably flood resilient. Recommendations cover floor construction and finish, wall construction, use of temporary barriers and/or 'drop in boards' on all low level access points, and location of sensitive equipment and services.

It has also been recommended that the site, if not already, register with the EA's flood warning service to allow safe and timely evacuation of personnel and preparation of the building in the event of a flood being forecast.

The site is currently 100% impermeable and would remain so following the proposed development. It is proposed to retain the existing drainage strategy via disposal of surface water to a drainage ditch running around the perimeter of the site and discharging to the River Adur via a flap valve outfall. This proposal is in accordance with The SUDS Manual. In the unlikely event of the outfall being submerged the drainage ditch is considered to have sufficient capacity to ensure the risk of the drainage system surcharging and causing out of bank flooding highly unlikely.

This report therefore demonstrates that the proposed scheme would:

- be safe and designed to be resilient to flooding in the critical design flood events;
- have a safe means of flood warning and evacuation; and,
- not increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage, impedance of flood flows or increase in surface water run-off.

Accordingly the application is shown to pass the Sequential and Exception Tests, as defined within *PPS25.*

Hydrock Consultants Limited

Appendix A – Site Details

CONTENTS	
Identifier	**Name**
Drawing No. 09240-001	Site Location Plan
Drawing No. 09240-002	Topographical Survey