



**PROPOSED RESIDENTIAL DEVELOPMENT
LAND OFF WESTWOOD CLOSE, EMSWORTH**

FLOOD RISK ASSESSMENT

JUNE 2018

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Flood Risk Assessment

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1.0 Executive Summary

Rogers Cory Partnership Limited has prepared this Flood Risk Assessment (FRA) in accordance with the guidance set out in the Department for Communities and Local Government National Planning Policy Framework (NPPF).

This report summarises the methodology and results of the FRA in relation to the planning application for the residential development of 46 dwellings at the land off Westwood Close in Emsworth, Hampshire.

According to data supplied by the Environment Agency (EA), the site lies partly within Flood Zone 1, 2 and 3 considered a low, medium and high risk of flooding from tidal sources respectively. This report therefore focuses on the site specific flood risk assessment and surface water management in line with the requirements of the Environment Agency and Hampshire County Council.

The study will also examine the effects of the development on adjacent parcels of land.

A surface water drainage strategy has been developed and hydraulically modelled incorporating sustainable urban drainage systems (SuDS) in line with the NPPF and EA standing advice. The strategy is based on a reduction in the surface water run-off rates thus ensuring that the development does not increase the risk of flooding from the site during peak storm events.

This report has therefore been prepared in support of a planning application for the residential development of 46 dwellings with associated access roads, parking areas and landscaping.

The report also aims to assess potential flood risk sources to and from the site and detail the drainage strategy for implementation on the scheme.

2.0 Introduction

Rogers Cory Partnership Limited have been instructed on behalf of Hampshire Homes Limited to prepare a Flood Risk Assessment (FRA) and surface water drainage strategy in support of a planning application for the proposed residential development in Emsworth.

The development site seeks planning permission from the Havant Borough Council for the residential development of 46 dwellings with associated access roads, driveways and open space.

The National Planning Policy Framework (NPPF) was published in March 2012 by the Department of Communities and Local Government and replaced all planning policy statements including Planning Policy Statement 25 (PPS 25): Development and Flood Risk. The NPPF set out the Government's planning policy for England and how these are expected to be applied. The Planning Practice Guidance (PPG), published in March 2014, provides additional guidance and retains key elements of the now superseded PPS 25.

Initial searches into the Environment Agency's (EA) website has identified the development site to lie mainly within flood zone 1, considered to be at low risk of flooding from rivers or sea, whilst the southern and eastern parts lie within Flood zones 2 and 3 considered to have a medium to high risk of flooding from the rivers. In this respect requirements in the NPPF (foot note 20) states the following:

"site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding."

The EA Guidance Note 3 (April 2012) highlights that a FRA is required to ensure flood risk to the proposed development is considered as well as the impact the development will have elsewhere on people and property. In addition the FRA should consider the risk of flooding from other sources (groundwater, overland flow, sewers).

The PPG sets out the objectives of a site specific FRA as to establish the following:

- *"Whether the proposed development is likely to be affected by current or future flooding from any source;*
- *Whether it will increase flood risk elsewhere;*
- *Whether the measures proposed to deal with these effects and risks are appropriate;*
- *The evidence for the local planning authority to apply (if necessary) the Sequential Test, and;*

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- *Whether the development will be safe and pass the Exception Test, if applicable."*

As such this report has been prepared in accordance with the requirements of the NPPF, PPG and EA Guidance.

3.0 Proposed Development Site

3.1 Site Location

The site is located off Westwood Close, Emsworth with National Grid reference 475222 106949 (See **Appendix A**).

The application site consists of open fields with grasslands. The site is bounded by residential properties to the north and west, by open fields and the A27 and to the east by fields and the River Ems. (see **Figure 1** below).



Figure 1- Site Location and Extent

3.2 Existing Topography

A topographical survey was carried out by Global Surveys in May 2017 and is related to Ordinance Survey Datum.

The survey generally shows the site falls to the north east and south west with levels ranging from approximately 9.20mAOD on the western boundary falling to 5.8m AOD on the north east boundary and 5.8mAOD on south eastern. (See **Appendix B**).

3.3 Development Proposals

The proposed development comprises of the construction of 46 new dwellings with associated access roads, parking and open space.

3.4 Existing Geological Information

According to existing British Geological Survey (BGS) maps the site is located over the London Clay Formation with a superficial Head deposit comprising of Clayey Gravel.

Intrusive ground investigations carried out by WDE Consulting in October 2017 indicate the in-situ ground as comprising of Topsoil to 0.3mbgl over soft Gravelly, Sandy Clay between 0.3m to greater than 1.90m in thickness, over stiff Clay proven from 1.90m to 5.0mbgl. Groundwater was encountered during the investigations between 1.20m to 1.50mbgl. Further Winter groundwater monitoring was carried out and indicated that the levels varied from 0.383 to 1.56m in parts of the site. The shallowest groundwater readings were found to be in BH4, located in the south eastern part of the site and outside of the proposed new built area of the development. BH3 which is located more centrally within the proposed built area yielded results from 0.420 to 1.25mbgl. Infiltration testing carried out indicated low infiltration rates ranging from 4.29×10^{-5} to 8.69×10^{-6} m/s. Infiltration drainage has been deemed unsuitable on this site due to the depth of the shallow groundwater.

3.5 National Policy Context

National policy regarding flood risk is contained within the National Planning Policy Framework and Technical guidance which was issued by the Department of Communities and Local Government in March 2012.

The Environment Agency's latest revision of their Flood Risk Standing Advised (FRSA) (version 3.1) was released in April 2012.

The Department for Environment, Food and Rural Affairs (DEFRA) released the Non-statutory technical standards for sustainable drainage systems in March 2015. The document sets out non-statutory technical standards for SuDS to be read in conjunction with the NPPF and PPG.

As of the 15th April 2015 the Lead Local Flood Authority (LLFA) has now become a statutory consultee on all major planning applications and as such will assess planning applications in respect of surface water drainage and sustainable drainage systems which was previously the responsibility of the Environment Agency. The LLFA's primary duties will be to ensure that flood risks from surface water run-off, groundwater and ordinary watercourses are identified and managed properly. The use of SuDS will be a material consideration in planning conditions and as such the proposed use of SuDS will need to be demonstrated on all major developments unless it can be demonstrated otherwise.

3.6 Local Planning Policies

As the site is located within Havant any future development would need to accord with the policies set out in the Havant Borough Council Core Strategy (adopted in 2011). The policies most relevant to flooding are CS15

"Policy CS15 Flood and Coastal Erosion Risk

Development in areas at risk of flooding now and in the future as identified on the latest Environment Agency flood risk maps and Strategic Flood Risk Assessment climate change maps will only be permitted where:

- 1. It meets the sequential and exception test (where required) in relation to PPS25.*
- 2. The site is located in a low hazard area as defined in the Strategic Flood Risk Assessment.*
- 3. A site-specific flood risk assessment demonstrates that the development will be safe, including the access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
- 4. The scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site.*
- 5. Appropriate flood warning and evacuation plans are in place.*
- 6. New site drainage systems are designed taking account of events which exceed the normal design standard.*

All development will be required to ensure that there is no net increase in surface water run off. Priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it is proven that SuDS are not appropriate. Where SuDs are provided arrangements must be put in place for their whole life management and maintenance.

The council will work with partners to implement the Coastal Policy Zones in the North Solent Shoreline Management Plan to ensure that development avoids areas at risk from coastal erosion and coastal flooding and that areas required to offset coastal squeeze and prevent habitat fragmentation, to allow species to adapt to climate change, are identified and protected from development."

3.7 Existing Flood Defences

The site does not benefit from any existing flood defences.

3.8 NPPF Flood Zone and Vulnerability

The National Planning Policy Framework Table 1 confirms the flood zone Classification based upon the probability of flooding. The site is shown to lie mainly within Flood Zone 1 (low risk of tidal flooding) with the southern portion partly within Flood Zones 2 and 3, considered medium to high risk of flooding from tidal sources

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respectively. At this location the risk of flooding is from tidal sources rather than fluvial and thus indicates that the southern part of the site could be susceptible to tidal flooding with an annual probability of 0.5%-0.1% for Flood Zone 2 and greater than 0.5% for parts within Flood Zone 3. It should be noted that the residential portion of the development is wholly within Flood Zone 1

Table 2 of the National Planning Policy Framework confirms the 'Flood Risk Vulnerability Classification' of a site, depending on its proposed use. The classification is then applied to Table 3 to determine whether:

- The proposed development is suitable for the flood zone in which it is located
- An Exception Test is required for the proposed development.

The proposed development is classified as 'More Vulnerable' according to the NPPF and suited for the flood zone in which it is located.

4.0 Flood Risk to the Site

The degree of detail appropriate to an FRA depends upon the scale and potential impact of the proposed development to and from the surrounding boundaries. In this case, the applicant has the intention of re-developing an area of land which is located mainly within Flood Zone 1, considered the lowest risk of flooding from fluvial sources, with the southern and eastern parts of the development within Flood Zones 2 and 3.



Figure 2- Extract from EA Website- Flood Map for Planning (Rivers and Sea)

4.1 Strategic Flood Risk Assessment

The National Planning Policy Framework confirms that Regional Planning Bodies (RPBs) or local planning authorities (LPAs) should prepare strategic Flood Risk Assessments (SFRA) in consultation with the EA. The SFRA is then used to refine information on areas liable to flooding by taking into account other sources of flooding and the impacts associated with climate change in addition to the EA flood map data.

The document informs the Council's policies in the emerging Local Development framework and a strategic approach to the allocation of sites for development and the future management of flood risk, in line with the National Planning Policy Framework.

The Partnership for Urban South Hampshire (PUSH) is made up of 10 local planning authorities within Hampshire. Atkins were commissioned in 2006 to undertake a Strategic Flood Risk Assessment (SFRA), which was divided into two stages.

The first stage of the SFRA included for the collation of data and production of scoping appraisal. This stage also provided a high level analysis of flood risk within each sub-region. This stage was developed to assist in assessing the feasibility of the PUSH housing allocation.

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The second stage of the SFRA involved the production of detailed mapping outputs to assist the Planners and Flood Risk Managers.

4.2 Existing Information on Flooding

Fluvial Flood Risk

The site lies partly within Flood Zone 1, 2 and 3 respectively. The residential portion of the development is proposed to be located wholly within Flood zone 1 (considered low risk of flooding from rivers and sea) **figure 2**. In accordance with the NPPF, Flood Zone is compatible with residential land use which is classified as “more vulnerable” development.

In order to assess the area within the site which falls wholly within Flood Zone 1, the fluvial flood model data was obtained from the EA to determine the extent the Flood Zones within the site. Using the modelled flood level data, the extent of Flood Zone 2, which is the extent of area susceptible to fluvial flooding between the 1 in 100 year and 1 in 1000-year event, has been assessed in relation to the existing site levels using topographic survey information. By assessing the extent of the 1 in 1000-year fluvial flood event and ensuring that the proposed residential development lies outside of this zone, this ensures that the residential development proposals will be kept outside of the 1 in 100 year plus climate change fluvial flood event, to satisfy the new climate change requirements introduced by DEFRA in February 2016.

Drawing HAM/E4559/SK001 provides an overlay of the modelled fluvial flood levels in relation to the topographic level information. This information has been used to determine the extent of the 1 in 1000-year flood event (Flood Zone 2) and thus determine area of the site which would be designated as Flood Zone 1.

Consultation with the Environment Agency to agree the principles of using this approach has been carried out and copies of the correspondence is provided in **Appendix E**.

Development has undertaken a site based sequential test approach by locating the residential portion of development solely within Flood Zone 1 and thus compatible development in relation to the designated Flood Zone in accordance with the NPPF and Planning Practice Guidance.

Proposed finished floor levels for plots along eastern side of development will be set a minimum of 600mm above existing ground levels, elsewhere plots will be set a minimum 300mm above existing ground levels. This ensures that the finished floor levels of a min. of 600mm above the 1 in 1000 year fluvial flood level.

Tidal Flood Risk

The site is not deemed to be at risk from fluvial flooding.

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Sewer Flood Risk

There are no recorded incidences of sewer flooding within the vicinity of the site. Any potential future risk to the proposed development from sewer flooding events is considered low in the context that the finished levels on the site will be designed to ensure that any overland flow is directed away from the buildings and not pose a risk to people or property.

Surface Water Flood Risk

The Environment Agency's maps for the risk of potential surface water flooding (**figure 3**) indicates that the proposed area for the residential portion within the site is not at risk of flooding from surface water. The EA's maps for surface water flooding is based on a coarse level of modelling which does not account for the presence of existing drainage networks or features which may already accommodate surface water run-off.



Figure 3- Extract from PUSH Maps of Surface Water Flooding Map

Groundwater Flood Risk

The PUSH maps indicate that whilst the site is located in an area with low bedrock permeability there are no recorded incidences of groundwater flooding. A review of the groundwater levels indicate that the site is subject to shallow groundwater.

Any potential residual risk to the new development will be mitigated through the detailed design of the finished ground levels which will seek to have building floor levels above the existing ground levels and ensure adequate falls away from the building to protect both building and people.

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Flood Warning

The EA's Flood Warning service is aimed to mitigate the impact of flooding for people who live in areas subject to flooding and is available for the areas within the floodplain of the main rivers in England and Wales.

This site falls within the current extent of area where the EA issue flood warnings.

4.3 Climate Change

As of the 19th February 2016, the EA has updated guidance on the application of climate changes allowances for the following:

- peak river flow by river basin district
- peak rainfall intensity
- sea level rise
- offshore wind speed and extreme wave height

Peak river flow allowances are now to be based on River Basin areas thus making them more geographically relevant, based on the range of predicted allowances.

Rainfall – increases in peak rainfall over time is to be assessed on two scenarios to assess the sensitivity of the areas as per table 1 below

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 1: Extract from www.gov.uk website- Table 2 – peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

As a conservative approach, a lifetime of the development should be considered of up to 100 years (i.e. up to 2117) when assessing flood risk for residential developments. According to Table 1 above, an increase of 20% to 40% on the peak rainfall intensity should be expected. To mitigate any residual risk at the site as a result of climate change, an appropriate climate change allowance (i.e. 30%

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increase in rainfall intensity) will therefore be considered and accommodated within the design strategy for managing surface water run-off.

4.4 The Sequential Test

The sequential test approach is aimed to steer new development to areas of lowest probability of flooding. In this regard to determine the suitability and classification of the development, as a check of the proposed scheme, consultation has been made to tables 2 and 3 of the NPPF.

Table 2 of the NPPF technical guidance determines that the proposed development is considered to be a 'more vulnerable' land class usage, in terms of flood risk, as illustrated in Figure 4.

More vulnerable
• Hospitals.
• Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
• Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
• Non-residential uses for health services, nurseries and educational establishments.
• Landfill and sites used for waste management facilities for hazardous waste ⁶ .
• Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan.</i> ⁷

Figure 4: Extract of Table 2: Flood Risk Vulnerability Classification

Table 3 of the NPPF considers sites providing a 'more vulnerable' land-class usage in a Flood Risk Zone 3 area to require the application of the Exception Test, (see Figure 4):

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓
	Zone 3a	Exception Test required	✓	✗	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗

Key: ✓ Development is appropriate.
✗ Development should not be permitted.

Figure 5: Table 3 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

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As the development lies partly within Flood Zone 2 and 3 and based on the proposed development's vulnerability it will need to pass the Exception Test in order to satisfy the requirements of the PPG.

For the Exception Test to be passed a development proposal:

- Must demonstrate that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA;
- The development should be on developable brownfield land or, if not, it must be demonstrated that there is no such alternative land available; and
- A FRA must demonstrate that the development will be safe for its lifetime taking into account the vulnerability of its users, without increasing flood risk elsewhere, and where possible, reducing flood risk overall.

5.0 Surface Water Management

Hampshire County Council (HCC) are the Lead local flood Authority for Havant Borough Council and statutory consultee on surface water management on all planning applications within the County.

The surface water management section should ensure that there is no adverse impact on flood risk elsewhere as a result of a change in the surface water runoff regime from the re-development.

5.1 Existing Surface Water Drainage Regime

A base line hydrology plan has been produced to review the current surface water run-off from this Greenfield site and into the existing ordinary watercourses along its southern and eastern boundary. This plan is presented as **Appendix F**

5.2 Pre-Development Run Off

The historic Greenfield run-off rate is based on the IH Report 124 'Flood estimation for small catchments' (Marshall and Bayliss, 1994).

Using the Micro drainage source control suite ICP SuDS methodology the following baseline parameters were used to determine the sites historic Greenfield run off rates:

SAAR (mm): 827

Soil: 0.45

Region 7

Area: 0.81ha (impermeable area of proposed site)

Return Period: 100 Year

The historic Greenfield run-off rates have been summarised in Table 2 below:

QBar Urban (L/sec)	Q1 Year (L/Sec)	Q30 Year (L/Sec)	Q100 Year (L/Sec)	Greenfield Run-off Volume (m3)
4.3	3.7	9.8	13.8	269.51

Table 2: Summary of Greenfield runoff rates and volumes

5.3 Design Principles

Key design principles in the following guidance documents steer the approach to managing surface water runoff at sites:

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- Building Regulations hierarchy of drainage (H3);
- Interim Code of Practice for SuDS; and
- CIRIA best practice guidance, including the use of the 'SuDS management train'

Building Regulations hierarchy of drainage outlines the preferred methods for the disposal of surface water with infiltration methods being the preferred option. If this is not possible the next favoured option is to drain to an existing watercourse. If neither of these options are feasible, the regulations state that rainwater discharge should be directed to a sewer.

The Interim Code of Practice for SuDS provides guidance about the hydraulic design criteria for Sustainable drainage systems. This in general refers to both peak rate of runoff and the volume of runoff, post development. Prior to mitigation measures such as the use of SuDS attenuation features, both the volume and peak rate of runoff may increase post development.

The design principles for surface water management extend beyond simple hydraulic criteria. CIRIA guidance promotes the use of the SuDS management train, a concept where SuDS techniques are used to treat, convey and store surface water runoff. This approach is considered as part of the SuDS selection methodology.

Sustainable Drainage Systems

To drain the development in a sustainable manner whilst complying with the requirements of the NPPF, the scheme should seek to adopt an appropriate form(s) of sustainable urban drainage systems (SuDS).

SuDS techniques comprise of implementation of infiltration drainage devices to discharge surface water to the underlying soil stratum (where ground conditions permit). These may be in the form of conventional soakaways, infiltration basins and ponds, filter strips, swales, permeable surfaces, green roofs, over-sized pipes/tanks geo-cellular attenuation units.

An additional storage provision should be provided as an allowance for any potential climate change impact (as stated in Table 5 of the NPPF for the scenario 2085 to 2115 associated with a residential scheme).

Infiltration Drainage

Intrusive ground investigations carried out indicate that the underlying strata consists of clay with low permeability and shallow groundwater. As such full infiltration drainage has not been deemed suitable for this site.

Existing Watercourses

Existing watercourses, have been identified along the southern boundary of the site.

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In reviewing the hierarchy for a proposed outfall and constraints associated with the re-development we have determined the proposed discharge from the residential portion of the site would continue to the existing watercourses via a new bio-retention swale located in the south eastern part of the site

5.4 Post Development Run Off

Using the Micro drainage simulation suite, an assessment of the proposed peak discharge rates prior to mitigation measures has been made. A 360min storm duration was then applied to ascertain the discharge volume.

The following parameters were used for the initial assessment and findings tabled below.

M5-60 (mm): 19.60

Ratio: 0.324

Time of Entry: 4 minutes

Impermeable Development Area (Ha)	Q1 Year (L/sec)	Q30 Year (L/Sec)	Q100 Year Plus Climate (L/Sec)	Discharge Volume (m3) (360min Winter)
0.903	67	146.9	203	708.29

Table 3: Summary of Post Development Runoff prior to mitigation

5.5 Surface Water Drainage Strategy

In view of the requirements of the NPPF, PPG, HCC the design parameters and constraints associated with redeveloping this site, a surface water drainage strategy design has been devised and hydraulically modeled to demonstrate that the scheme can be suitably implemented without increasing the level of flood risk, when the surface water drainage system experiences a 1:100 year rainfall event (including climate change).

The surface water drainage scheme has been designed to ensure:

- A reduction in the pre development site discharge for peak storm events.
- Sustainable Urban Drainage systems are wholly incorporated within the scheme.
- Consideration is given for the improvement of water quality within the design.
- The designed drainage scheme can satisfactorily retain a critical 1 in 100 Year storm event with climate change.

Having taken into consideration the above points, a scheme has been devised and hydraulically modelled based on attenuation techniques with a restricted discharge to the existing watercourse at the annual average Greenfield run-off rates. A copy of the proposed surface water strategy can be found in **Appendix G**.

5.5.1 Access Roads, Shared Surfaces, Private Drives and Roof Drainage

The proposed run-off from the access roads, drives and parking bays will be conveyed to the new below ground surface water network via trapped gullies and lined permeable paving where applicable. Rainfall run-off from the roofs of the new properties will discharge directly into the below ground surface water network

The surface water network will convey the flows, under gravity, southwards towards the new swale outfall, where the flows will be restricted upstream of this swale and attenuation provided within both the permeable paving and below ground cellular storage tanks.

5.5.3 Flow Control

A maximum overall development discharge is proposed to be limited to 4.2l/s which meets the pre-development annual average Greenfield run-off rate for the site.

The proposed discharge rate does however represent a betterment to the calculated 1 in 30 Year and 1 in 100 Year Greenfield run-off rates.

The hydraulic models of the proposed surface water networks, incorporating the SUDs attenuation basins and flow control devices can be found in **Appendix I**.

The hydraulic calculations have been simulated under various scenarios up to and included the critical 1 in 100 Year storm event with additional 40% allowance for climate change and an additional 10% to account for urban creep. The simulations confirm that the storm can be managed and maintained within the site without flooding.

The hydraulic model of the proposed surface water network, incorporating the SuDS attenuation systems can be found in **Appendix I**.

The hydraulic calculations have been simulated under various scenarios up to and included the critical 1 in 100 Year storm event with additional 40% allowance for climate change. The simulations confirm that the storm can be managed and maintained within the site without flooding.

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Impermeable Development Area (Ha)	Q1 Year (L/sec)	Q30 Year (L/Sec)	Q100 Year Plus Climate (L/Sec)	Discharge Volume (m3) (360min Winter)
0.903	4.0	4.0	4.2	155.74

Table 4: Summary of Post Development Runoff with mitigation measures**5.5.4 Water Quality**

It is important to address issues with regards to quality when considering surface water management. As the surface water is proposed to be discharge to the existing downstream watercourse, two stages of treatment is proposed as part of a SuDS Management Train in accordance with the recommendations of the SuDS Manual (Ciria 753) and as required by the LLFA.

This will be achieved though the permeable paving and swale outfall prior to discharging into the existing watercourse

5.5.5 Long Term Maintenance

Consideration has been given to the long term maintenance of the proposed drainage structures. SuDS attenuation basins, bio retention areas, granular filter drainage and all associated external pipework, chambers and manholes will be the responsibility of a management company.

A detailed maintenance schedule will be provided by the designers during the detailed design stage of the surface water proposals.

5.5.6 Exceedance

Whilst the drainage system has been designed to a very high standard (1 in 100 Year storm event including climate change), it is possible that a more extreme event will occur and that the design standard for the system will be exceeded. It is best practice to design the drainage system to shed water, primarily into landscaped and other areas, therefore reducing the risk of flooding areas of built development during extreme events.

A strategy for directing overland flows for the site will be confirmed using overland flow modeling as part of the detailed design once key ground levels or development levels across the site have been finalized. Based on the strategic finished floor levels and topographical survey it has however been possible to demonstrate the anticipated exceedance flow routes which can be found in **Appendix I**.

5.5.7 Safe means of access and egress.

A safe means of emergency dry access and egress is proposed from the development site through the proposed access road to Westwood Close.

6.0 Foul Water Drainage Strategy

Southern Water Services Limited are the Local Sewerage Authority in this area. The development proposals will seek to discharge to the existing Southern Water public sewer network.

The proposed connection to the existing foul public sewer will be undertaken under a Section 106 Agreement with Southern Water.

All domestic foul drainage should be designed in accordance with Part H of the Building Regulations.

7.0 Conclusion

This site specific flood risk assessment has demonstrated that the development proposals is appropriate in terms of flood risk and the provision of flood mitigation measures.

A preliminary design surface water drainage strategy has been prepared and hydraulically modelled which demonstrates that the redevelopment proposals can be successfully implemented and designed to withstand the impact of a 1:100 year rainfall event (including climate change), in accordance with the NPPF, PPG and HCC requirements

The development's surface water discharge is proposed to be attenuated to the pre-development annual average Greenfield run-off rate and thus represents a betterment to the site's existing 1 in 30 Year and 1 in 100 Year Greenfield run-off rates through the use of SuDS techniques and re-use of existing resources.

In view of this assessment, the report concludes that:

- i. That whilst the site is located partly within Flood Zones 2 and 3, the residential portion of the development is situated wholly within the Flood Risk Zone 1 area;
- ii. The Development and its occupants are not at an increased risk of flooding;
- iii. The Development does not increase the risk of flooding elsewhere;
- iv. The Development can be drained in a sustainable manner utilizing SuDS techniques;
- v. The Development will satisfactorily manage and maintain a 1 in 100 Year storm event with allowance for climate change

The findings of this report identify the opportunity to promote the sustainable re-use of existing resources and potential to implement an appropriate SUDS strategy.

Appendix (A)

Site Location Plan

Rev.	Date	Note	Author	Checked
A	21/06/18	Red line updated to incorporate Swale/Bio-retention ditch area	RR	JP



KEY

LAND OWNERSHIP 12 Acres 100%

SITE BOUNDARY 5.48 Acres 45.7%

1:1250

HAMPSHIRE HOMES

Project	NEW DWELLINGS EMS WALK EMSWORTH PO10 7QL	
Client	HAMPSHIRE HOMES	
Status	PLANNING	
Scale	1:1250	Sheet Size A1
Author	RH	Checked JP
Date	09/04/18	

Drawing LOCATION PLAN

Job-Dwg Number 17017A-PL-2-01

Rev. A

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Appendix (B)

Topographical Survey

Appendix (C)

Feasibility Study – Site Layout Plan

Rev.	Date	Note	Author	Checked
A	20/06/18	Plot 2 Car parking spaces adjusted to tandem spaces. Plot 2 Boundary updated to suit car parking with hedge planting added to road side fence boundary. Plot 37 - Plot Number/Name clarified.	LB	RR
B	21/06/18	Swale/Bio-retention ditch area moved south east	RR	JP

SCHEDULE OF ACCOMMODATION

Affordable Housing 30%

1No. Evans	4Bed	99m ² (1066 ftsq)
1No. Lincoln	3Bed	94m ² (1011 ftsq)
3No. Wilson	3Bed	94m ² (1011 ftsq)
5No. Windom	2Bed	71m ² (767 ftsq)
4No. Flat	1Bed	52m ² (555 ftsq)
SUB TOTAL:		14 UNITS
4 Beds: 1	(7%)	
3 Beds: 4	(29%)	
2 Beds: 5	(35%)	
1 Beds: 4	(29%)	

Private Housing 70%

2No. Ingram	4Bed	130m ² (1400 ftsq)
1No. Evans	4Bed	99m ² (1066 ftsq)
4No. Lincoln	3Bed	94m ² (1011 ftsq)
3No. Wilson	3Bed	94m ² (1011 ftsq)
8No. Turner	3Bed	93m ² (1001 ftsq)
14No. Windom	2Bed	71m ² (767 ftsq)
SUB TOTAL:		32 UNITS
4 Beds: 3	(9%)	
3 Beds: 15	(47%)	
2 Beds: 14	(44%)	

TOTAL UNITS: 46

ALLOCATED PARKING SPACES: 92

VISITORS PARKING SPACES: 24

TOTAL CAR PARKING SPACES: 116

KEY

- Current Trodden Footpath
- Flood Zone 1 boundary line
- Proposed Footpath
- Zone 1 Root protection zone (RPA)
- Existing trees
- Proposed trees
- Proposed hedgerow
- Existing hedgerow
- Bio retention area
- Connection points to open space.
- Existing gates to be retained.
- Existing gates to be relocated.
- Relocated gate position.
- Hampshire/ West Sussex County Boundary line
- V Visitors parking spaces
- G Garden gate location

SITE LAYOUT (COLOURED)
1:500

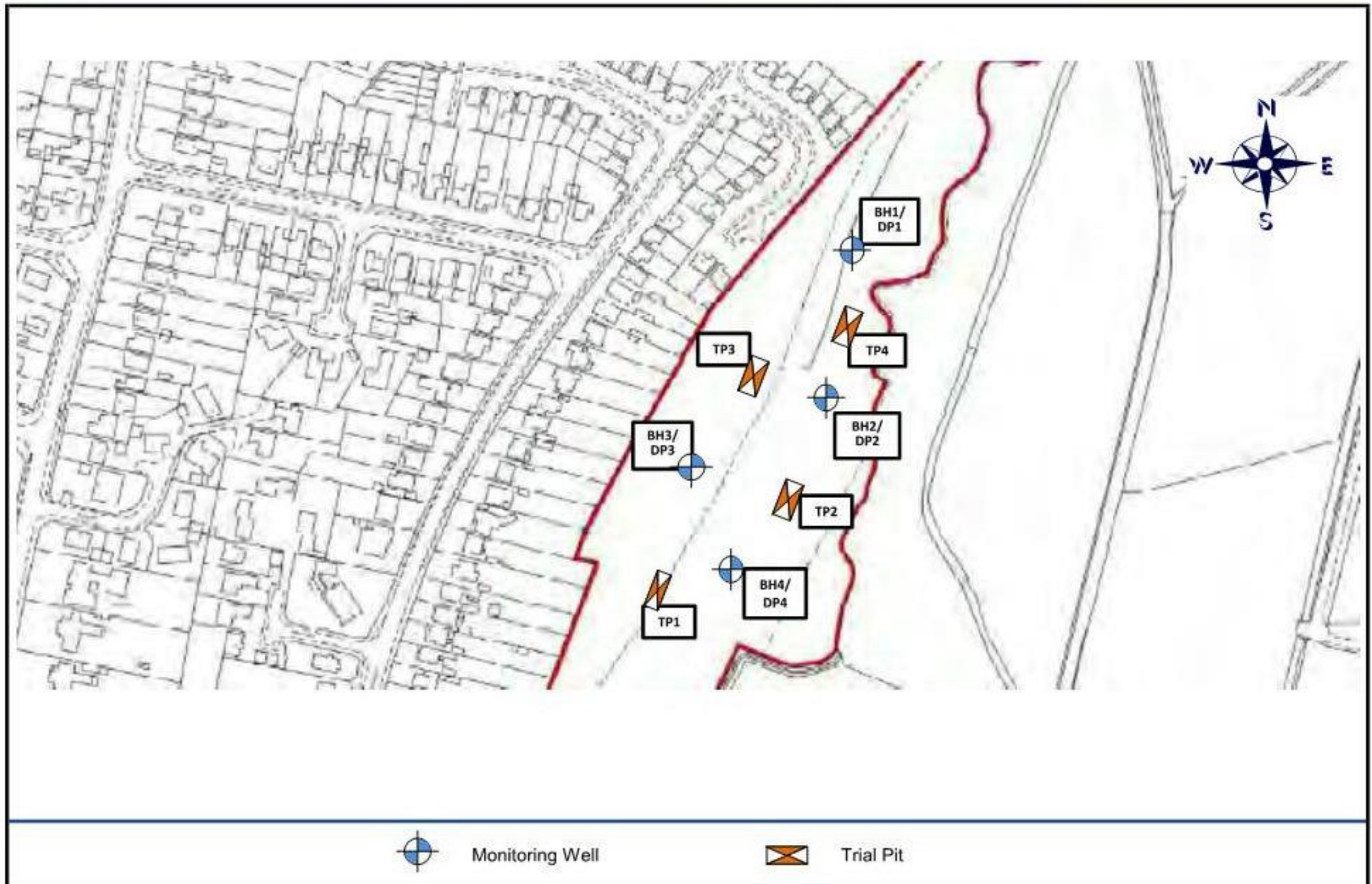


Project	NEW DWELLINGS EMS WALK EMSWORTH PO10 7QL		
Client	HAMPSHIRE HOMES		
Status	PLANNING		
Scale	1:500	Sheet Size	A1
Author	JP	Checked	RR
Date	19/04/18		

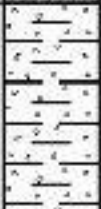
Drawing	SITE LAYOUT		
Job-Dwg Number	17017A-PL-2-02	Rev.	B
www.jpa.design			
JPA - PORTSMOUTH Suite 1, Wither Woods, Bay at 119 Winter Road Southsea, Portsmouth PO4 8DS t: +44(0)2393 871 000			

Appendix (D)

Geotechnical Information

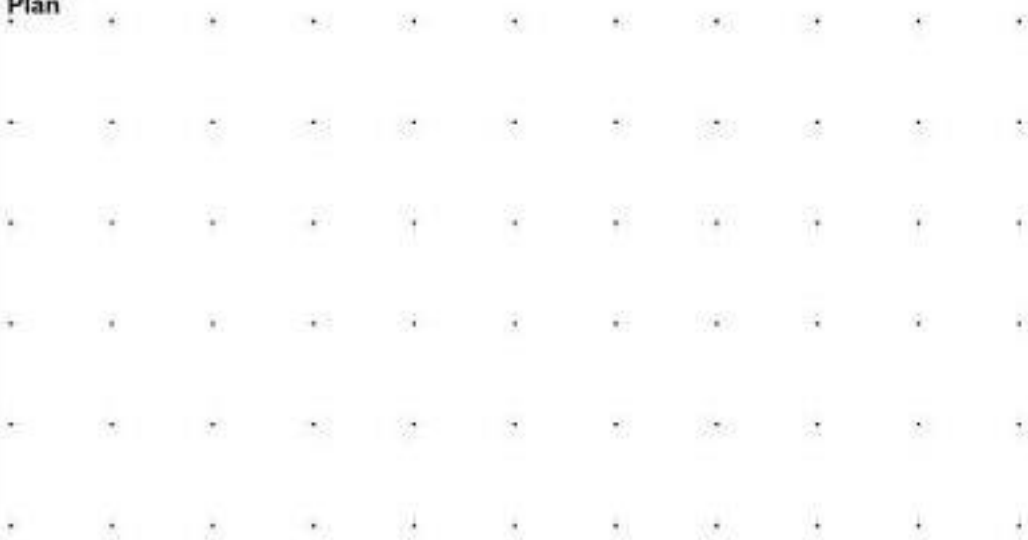


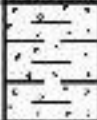
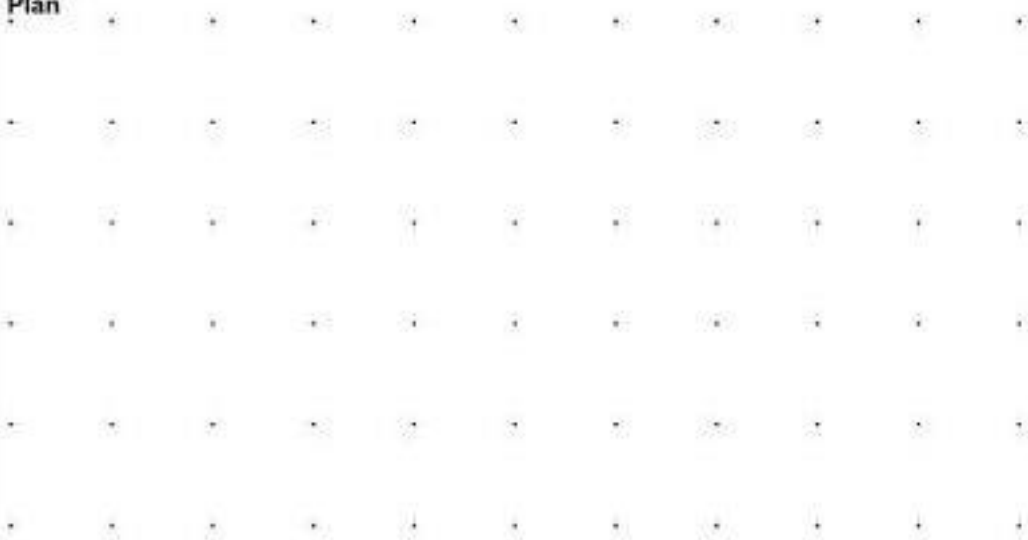
		62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410		Site Westwood Close, Emsworth		Number BH1			
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client Hampshire Homes		Job Number 20768	
		Location		Dates 24/10/2017		Engineer JWF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20	J1		0.0ppm		(0.30) 0.30	TOPSOIL: Dark brown sandy clay.			
1.00 1.00	J2 C1		1.0ppm			Soft to very stiff brown very gravelly, slightly sandy CLAY. Gravels are fine to coarse subangular flints.			
			Water strike(1) at 1.46m.		(2.50)				
			0.0ppm						
			0.0ppm		2.80	Stiff grey CLAY			
3.90 4.00	B1 C2		0.0ppm		(2.20)				
			0.0ppm		5.00	Complete at 5.00m			
Remarks							Scale (approx) 1:50	Logged By JWF	Figure No. 20768.BH1

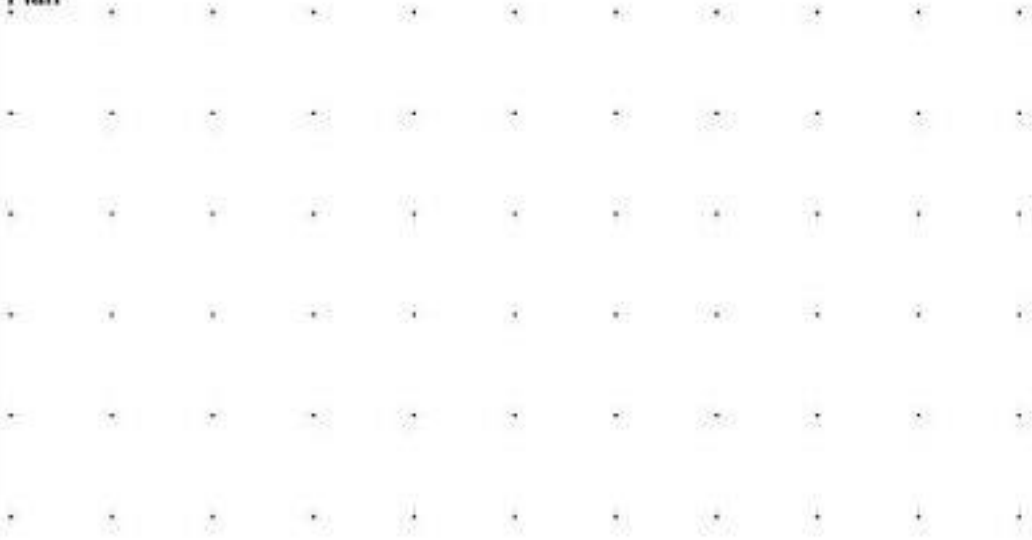
			62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410			Site Westwood Close, Emsworth			Number BH2	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client Hampshire Homes			Job Number 20768	
		Location		Dates 24/10/2017		Engineer JWF			Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
0.50	J1	0.0ppm			(0.30) 0.30	TOPSOIL: Dark brown sandy clay.				
1.00	C1				(1.10)	Soft to very stiff brown very gravelly CLAY. Gravels are fine to coarse subangular flints.				
2.00	J2	0.0ppm			1.40	Stiff brown grey mottled CLAY.				
3.00	C2	0.0ppm			(3.60)	... Becoming grey with depth.				
		0.0ppm			5.00	Complete at 5.00m				
Remarks No groundwater encountered.							Scale (approx) 1:50	Logged By JWF	Figure No. 20768.BH2	

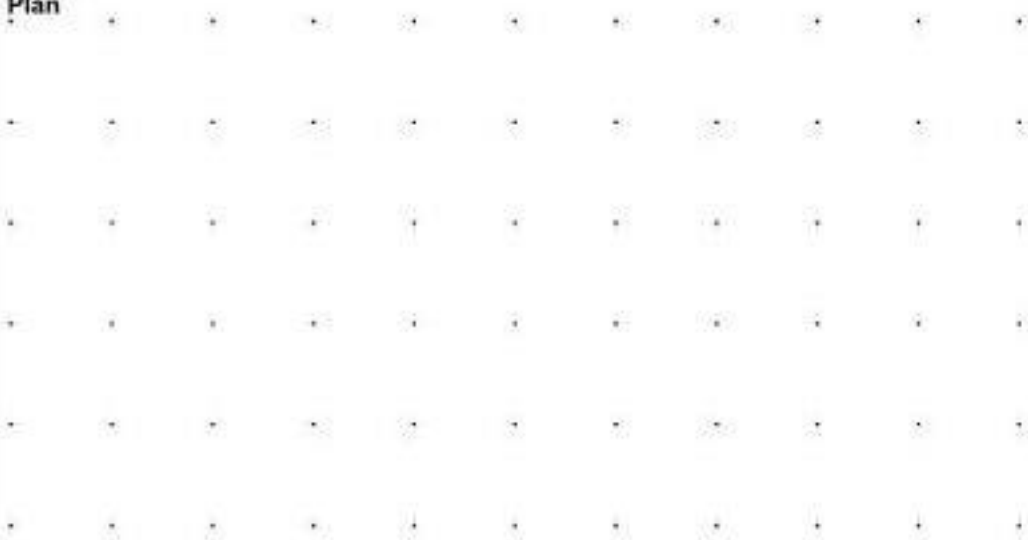
		62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410		Site Westwood Close, Emsworth		Number BH3			
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client Hampshire Homes		Job Number 20768	
		Location		Dates 24/10/2017		Engineer JWF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20	J1		0.0ppm		(0.30) 0.30	TOPSOIL: Dark brown sandy clay.			
0.80	J2		0.0ppm		(1.30)	Soft to very stiff brown very gravelly, sandy CLAY. Gravels are fine to coarse subangular flints.			
2.00	C1		0.0ppm		1.60	Stiff brownish grey CLAY. ... Becoming grey with depth.			
4.00	C2		0.0ppm		(3.40)				
			0.0ppm		5.00	Complete at 5.00m			
Remarks No groundwater encountered.							Scale (approx) 1:50	Logged By JWF	Figure No. 20768.BH3

			62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410			Site Westwood Close, Emsworth			Number BH4					
Excavation Method Drive-in Window Sampler			Dimensions			Ground Level (mOD)			Client Hampshire Homes			Job Number 20768		
			Location			Dates 24/10/2017			Engineer JWF			Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr					
			0.0ppm		(0.50)	TOPSOIL: Dark brown sandy clay.								
					0.50	Soft to very stiff brown very gravelly sandy CLAY. Gravels are fine to coarse subangular								
1.00	J1		0.0ppm		(1.30)									
1.20	C1		Water strike(1) at 1.20m.											
			0.0ppm		1.80	Stiff grey CLAY								
			0.0ppm		(3.20)									
3.80	B1		0.0ppm											
4.50	C2		0.0ppm											
			0.0ppm		5.00	Complete at 5.00m								
Remarks							Scale (approx) 1:50	Logged By JWF						
							Figure No. 20768.BH4							

				62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410		Site Westwood Close, Emsworth		Trial Pit Number TP1	
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client Hampshire Homes		Job Number 20768	
		Location		Dates 25/10/2017		Engineer JWF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
						TOPSOIL: Dark brown sandy clay.			
					(0.30) 0.30	Soft brown very gravelly CLAY. Gravels are fine to coarse subangular flints.			
					(0.70) 0.70				
					1.00 (0.50) 1.50	Stiff orange brown and grey CLAY			
						Complete at 1.50m			
Plan 						Remarks No groundwater encountered.			
						Scale (approx) 1:50		Logged By JWF	
						Figure No. 20768.TP1			

				62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410		Site Westwood Close, Emsworth		Trial Pit Number TP2	
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client Hampshire Homes		Job Number 20768	
		Location		Dates 25/10/2017		Engineer JWF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
						TOPSOIL: Dark brown sandy clay.			
					0.30 (0.60)	Soft brown very gravelly CLAY. Gravels are fine to coarse subangular flints.			
					0.90 (0.50)	Stiff brown CLAY			
					1.40	Complete at 1.40m			
Plan 					Remarks No groundwater encountered.				
					Scale (approx) 1:50		Logged By JWF		Figure No. 20768.TP2

				62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410		Site Westwood Close, Emsworth		Trial Pit Number TP3	
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client Hampshire Homes		Job Number 20768	
		Location		Dates 25/10/2017		Engineer JWF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
						TOPSOIL: Brown sandy clay.			
						Soft brown gravelly CLAY. Gravels are fine to coarse subangular flints.			
						Complete at 1.60m			
Plan 						Remarks No groundwater encountered.			
						Scale (approx) 1:50	Logged By JWF	Figure No. 20768.TP3	

				62a Western Road Tring, Hertfordshire HP23 4BB Tel: 01442 825570 Fax: 01442 891410		Site Westwood Close, Emsworth		Trial Pit Number TP4	
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client Hampshire Homes		Job Number 20768	
		Location		Dates 25/10/2017		Engineer JWF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
						TOPSOIL: Dark brown sandy clay.			
					0.30 (1.10)	Medium dense brown clayey fine to coarse subangular GRAVEL with occasional cobbles.			
			Water strike(1) at 1.40m.		1.40	Complete at 1.40m			
Plan						Remarks			
						Field interpretation of granular materials.			
						Scale (approx) 1:50		Logged By JWF	
						Figure No. 20768.TP4			

Method Dynamic Probe	Cone Dimensions	Ground Level (mOD)	Client Hampshire Homes	Job Number 20768
	Location	Dates 24/10/2017	Engineer JWF	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment
0.00-0.10	1			0.00	
0.10-0.20	1				
0.20-0.30	1				
0.30-0.40	2				
0.40-0.50	3				
0.50-0.60	1			0.50	
0.60-0.70	1				
0.70-0.80	1				
0.80-0.90	1				
0.90-1.00	1				
1.00-1.10	3			1.00	
1.10-1.20	5				
1.20-1.30	6				
1.30-1.40	8				
1.40-1.50	8				
1.50-1.60	8			1.50	
1.60-1.70	9				
1.70-1.80	8				
1.80-1.90	8				
1.90-2.00	5				
2.00-2.10	1			2.00	
2.10-2.20	1				
2.20-2.30	1				
2.30-2.40	1				
2.40-2.50	1				
2.50-2.60	1			2.50	
2.60-2.70	1				
2.70-2.80	1				
2.80-2.90	2				
2.90-3.00	1				
3.00-3.10	1			3.00	
3.10-3.20	2				
3.20-3.30	2				
3.30-3.40	2				
3.40-3.50	2				
3.50-3.60	2			3.50	
3.60-3.70	2				
3.70-3.80	2				
3.80-3.90	2				
3.90-4.00	3				
4.00-4.10	2			4.00	
4.10-4.20	3				
4.20-4.30	2				
4.30-4.40	3				
4.40-4.50	3				
4.50-4.60	3			4.50	
4.60-4.70	3				
4.70-4.80	3				
4.80-4.90	3				
4.90-5.00	2			5.00	

Remarks

Scale (approx) 1:25
Logged By JWF
Figure No. 20768.DP1

Method Dynamic Probe	Cone Dimensions	Ground Level (mOD)	Client Hampshire Homes	Job Number 20768
	Location	Dates 24/10/2017	Engineer JWF	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment									
0.00-0.10	1			0.00										
0.10-0.20	1													
0.20-0.30	1													
0.30-0.40	1													
0.40-0.50	1			0.50										
0.50-0.60	6													
0.60-0.70	7													
0.70-0.80	7													
0.80-0.90	5													
0.90-1.00	5			1.00										
1.00-1.10	7													
1.10-1.20	6													
1.20-1.30	3													
1.30-1.40	1			1.50										
1.40-1.50	1													
1.50-1.60	1													
1.60-1.70	2													
1.70-1.80	2													
1.80-1.90	2													
1.90-2.00	2			2.00										
2.00-2.10	1													
2.10-2.20	1													
2.20-2.30	2													
2.30-2.40	2													
2.40-2.50	2			2.50										
2.50-2.60	2													
2.60-2.70	2													
2.70-2.80	2													
2.80-2.90	2													
2.90-3.00	2			3.00										
3.00-3.10	1													
3.10-3.20	2													
3.20-3.30	2													
3.30-3.40	2													
3.40-3.50	2			3.50										
3.50-3.60	2													
3.60-3.70	2													
3.70-3.80	2													
3.80-3.90	2													
3.90-4.00	2			4.00										
4.00-4.10	3													
4.10-4.20	2													
4.20-4.30	2													
4.30-4.40	3			4.50										
4.40-4.50	3													
4.50-4.60	3													
4.60-4.70	3													
4.70-4.80	3													
4.80-4.90	3													
4.90-5.00	3			5.00										

Remarks	Scale (approx)	Logged By
	1:25	JWF
	Figure No. 20768.DP2	

Method Dynamic Probe	Cone Dimensions	Ground Level (mOD)	Client Hampshire Homes	Job Number 20768
	Location	Dates 24/10/2017	Engineer JWF	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment
0.00-0.10	1			0.00	
0.10-0.20	1				
0.20-0.30	1				
0.30-0.40	1				
0.40-0.50	1			0.50	
0.50-0.60	1				
0.60-0.70	1				
0.70-0.80	1				
0.80-0.90	1				
0.90-1.00	3			1.00	
1.00-1.10	6				
1.10-1.20	9				
1.20-1.30	12				
1.30-1.40	10				
1.40-1.50	9			1.50	
1.50-1.60	8				
1.60-1.70	5				
1.70-1.80	2				
1.80-1.90	2				
1.90-2.00	1			2.00	
2.00-2.10	1				
2.10-2.20	2				
2.20-2.30	2				
2.30-2.40	2				
2.40-2.50	1			2.50	
2.50-2.60	2				
2.60-2.70	2				
2.70-2.80	2				
2.80-2.90	3				
2.90-3.00	3			3.00	
3.00-3.10	3				
3.10-3.20	3				
3.20-3.30	4				
3.30-3.40	4				
3.40-3.50	3			3.50	
3.50-3.60	3				
3.60-3.70	3				
3.70-3.80	3				
3.80-3.90	4				
3.90-4.00	4			4.00	
4.00-4.10	3				
4.10-4.20	3				
4.20-4.30	3				
4.30-4.40	3				
4.40-4.50	3			4.50	
4.50-4.60	3				
4.60-4.70	2				
4.70-4.80	3				
4.80-4.90	3				
4.90-5.00	3			5.00	

Remarks	Scale (approx)	Logged By
	1:25	JWF
	Figure No. 20768.DP3	

Method Dynamic Probe	Cone Dimensions	Ground Level (mOD)	Client Hampshire Homes	Job Number 20768
	Location	Dates 24/10/2017	Engineer JWF	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment
0.00-0.10	1			0.00	
0.10-0.20	1				
0.20-0.30	1				
0.30-0.40	1				
0.40-0.50	1			0.50	
0.50-0.60	3				
0.60-0.70	5				
0.70-0.80	5				
0.80-0.90	5				
0.90-1.00	6			1.00	
1.00-1.10	9				
1.10-1.20	11				
1.20-1.30	9				
1.30-1.40	7				
1.40-1.50	3			1.50	
1.50-1.60	7				
1.60-1.70	6				
1.70-1.80	3				
1.80-1.90	2				
1.90-2.00	2			2.00	
2.00-2.10	1				
2.10-2.20	2				
2.20-2.30	2				
2.30-2.40	2				
2.40-2.50	2			2.50	
2.50-2.60	2				
2.60-2.70	2				
2.70-2.80	2				
2.80-2.90	2				
2.90-3.00	2			3.00	
3.00-3.10	2				
3.10-3.20	1				
3.20-3.30	2				
3.30-3.40	1				
3.40-3.50	2			3.50	
3.50-3.60	2				
3.60-3.70	2				
3.70-3.80	2				
3.80-3.90	2				
3.90-4.00	2			4.00	
4.00-4.10	2				
4.10-4.20	2				
4.20-4.30	2				
4.30-4.40	2				
4.40-4.50	2			4.50	
4.50-4.60	3				
4.60-4.70	2				
4.70-4.80	3				
4.80-4.90	3				
4.90-5.00	3			5.00	

Remarks

Scale (approx) 1:25
Logged By JWF
Figure No. 20768.DP4

APPENDIX E

Ground Gas Sheets
Permeability Sheets

					Gas Monitoring			
Site	Westwood Close, Emsworth				Job Number			
					20768			
Client	Hampshire Homes				Sheet			
					Number 1			
Date 25 th October 2017								
Air Temperature °C					°C			
Barometric Pressure 1021 mB					1021 mB			
Visit No								
Borehole No	BH1				BH2			
Condition of Standpipe	Good- Large Gas feed pipe				Good- Large Gas feed pipe			
Time	0 mins	5 mins	10 mins	15 mins	0 mins	5 mins	10 mins	15 mins
Combustible gas (CH4) % LEL	001	001	001	n/a	0	0	0	n/a
Combustible gas (CH4) % vol	00.1	00.1	00.1	n/a	0	0	0	n/a
Combustible Gas (CH4) Peak	00.1	00.1	00.1	n/a	0	0	0.1	n/a
Carbon Dioxide % vol	2.6	2.6	1.5	n/a	1.2	2.1	2.4	n/a
Oxygen % vol	17.7	17.4	19.0	n/a	19.4	17.5	17.1	n/a
Flow Rate (max) l/hr	-0			n/a	-0			n/a
Relative Downhole Pressure (mb)	+8.35			n/a	+2.2			n/a
Downhole Temperature (°C)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CO (ppm)	0000	0005	0002	n/a	0005	0008	0003	n/a
H2S (ppm)	0000	0000	0000	n/a	0000	0000	0000	n/a
Remarks								

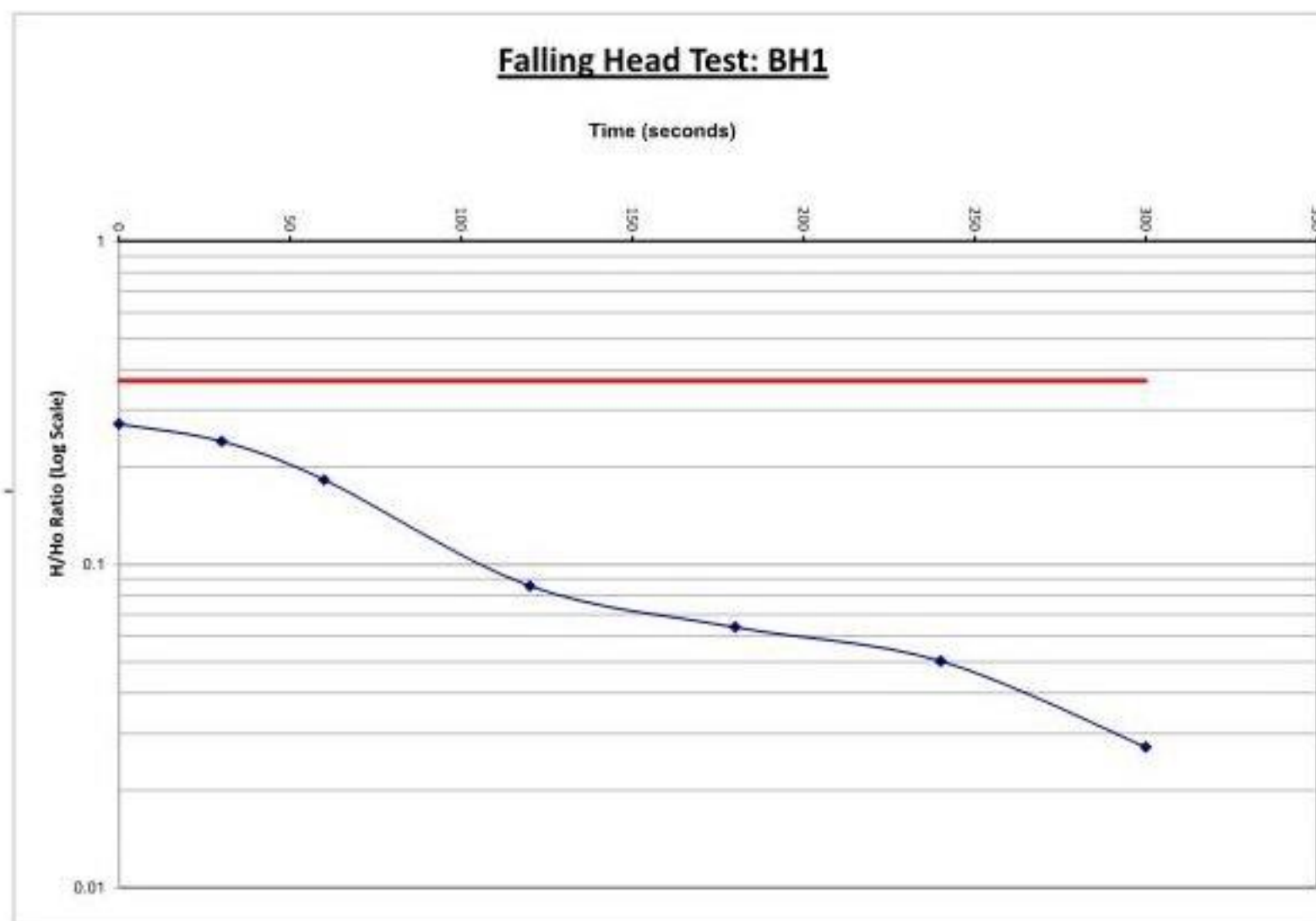
Date of Test	25/10/2017
Completed by	JWF
Site Name	WESTWOOD CLOSE, EMSWORTH
BH Location	BH1

Depth to Water-M (TOC)	4.08
Diameter of well (m)	0.05

		Units
Area (A)	0.00616225	m ²
F	0.1375	
Head (H ^o)	4.08	m
Time (T)	300	sec
Permeability K	0.000149388	m/sec

Time (Secs)	DTW	H	H/Ho Ratio
0	2.970	1.11000	0.272058824
30	3.099	0.98100	0.240441176
60	3.335	0.74500	0.182598039
120	3.730	0.35000	0.085784314
180	3.819	0.26100	0.063970588
240	3.875	0.20500	0.050245098
300	3.969	0.11100	0.027205882

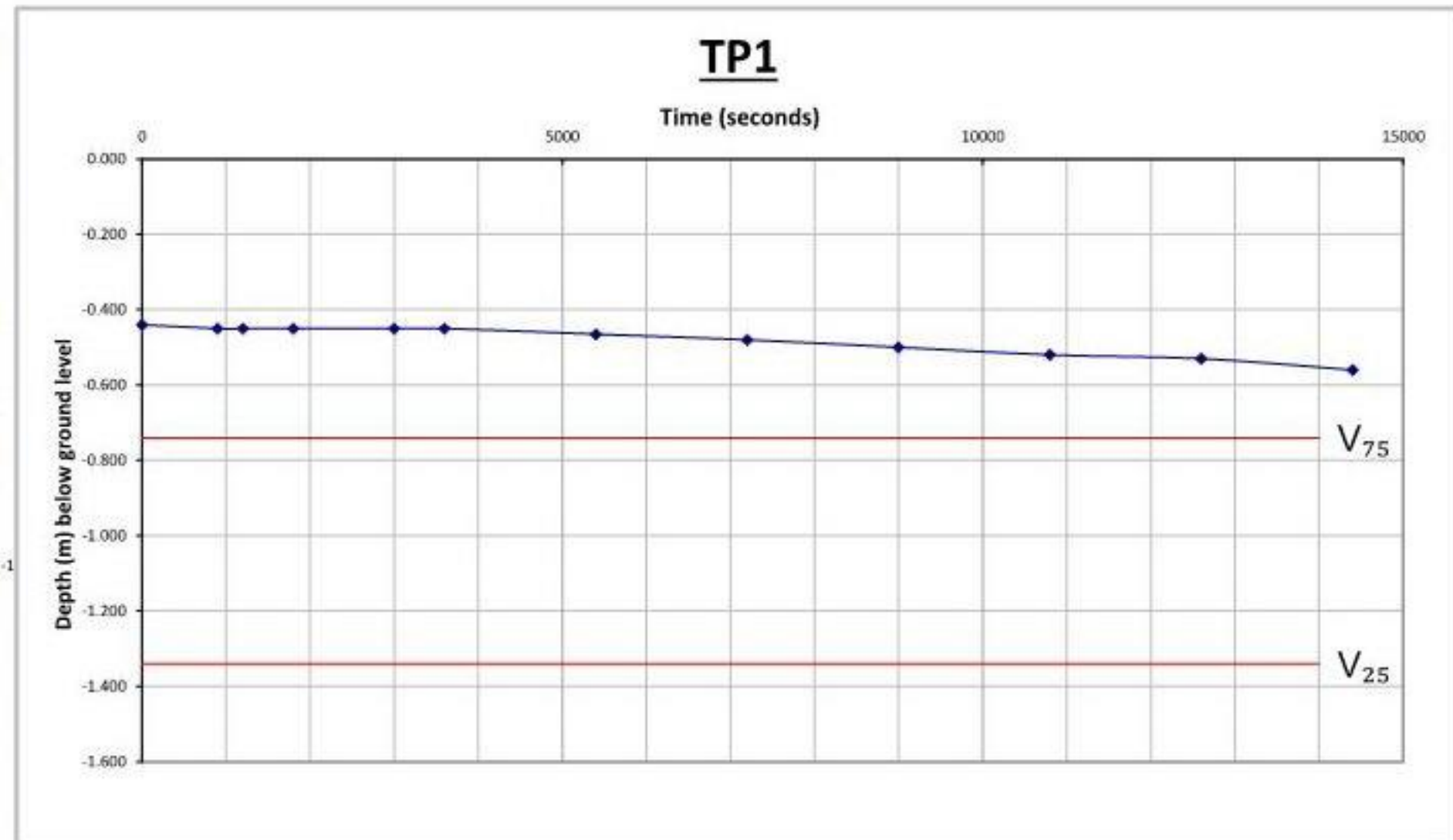
Comments:
>10 ⁻³



Location	TP1
Length (m)	2
Width (m)	0.5
Depth (m)	1.5
Surface Area (m ²)	8.5
Depth of Water Added (m)	1.20
Effective Storage Volume (Vp75-Vp25)	0.6

Time (s)	Depth to Water (m)
0	-0.440
900	-0.450
1200	-0.450
1800	-0.450
3000	-0.450
3600	-0.450
5400	-0.465
7200	-0.480
9000	-0.500
10800	-0.520
12600	-0.530
14400	-0.560

ap50	4.000
V ₇₅	14400
V ₂₅	14400
tp75 - 25	0



Comments:

Test concluded at 4 hours due to poor drainage. Failed to drain 25% of water added.

Vp	Amount of Water Lost	DTW bgl
75%	0.9	-0.74
25%	0.3	-1.34

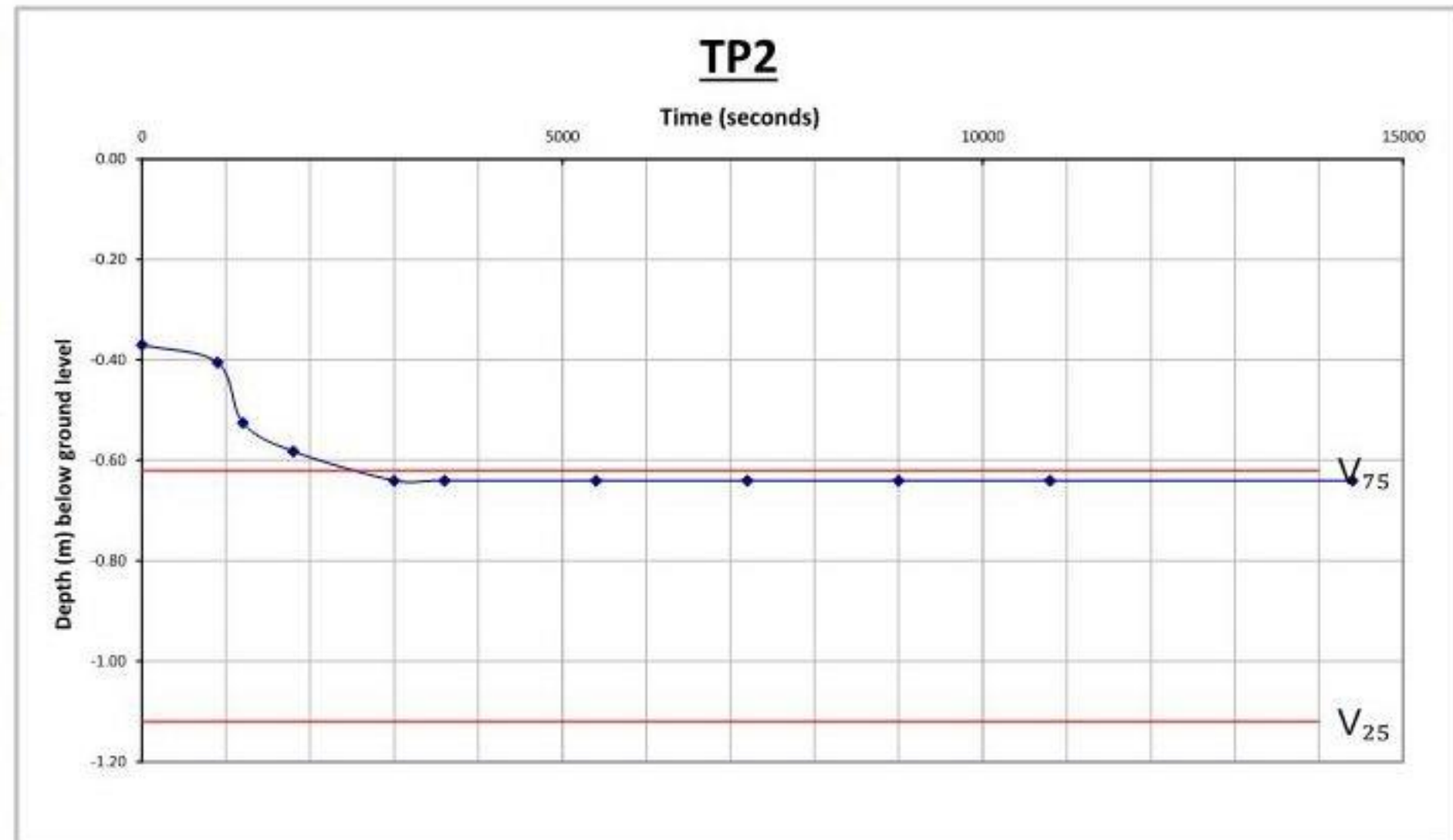
Soil Infiltration Rate (m/sec)

$< 10^{-6}$

Location	TP2
Length (m)	2
Width (m)	0.3
Depth (m)	1.4
Surface Area (m ²)	7.04
Depth of Water Added (m)	1.00
Effective Storage Volume (Vp75-Vp25)	0.3

Time (s)	Depth to Water (m)
0	-0.37
900	-0.41
1200	-0.53
1800	-0.58
3000	-0.64
3600	-0.64
5400	-0.64
7200	-0.64
9000	-0.64
10800	-0.64
14400	-0.64

ap50	2.900
V ₇₅	2500
V ₂₅	14400
tp75 - 25	11900



Comments:

Test concluded at 4 hours due to poor drainage. Failed to drain 75% of water added.

Vp	Amount of Water Lost	DTW bgl
75%	0.75	-0.62
25%	0.25	-1.12

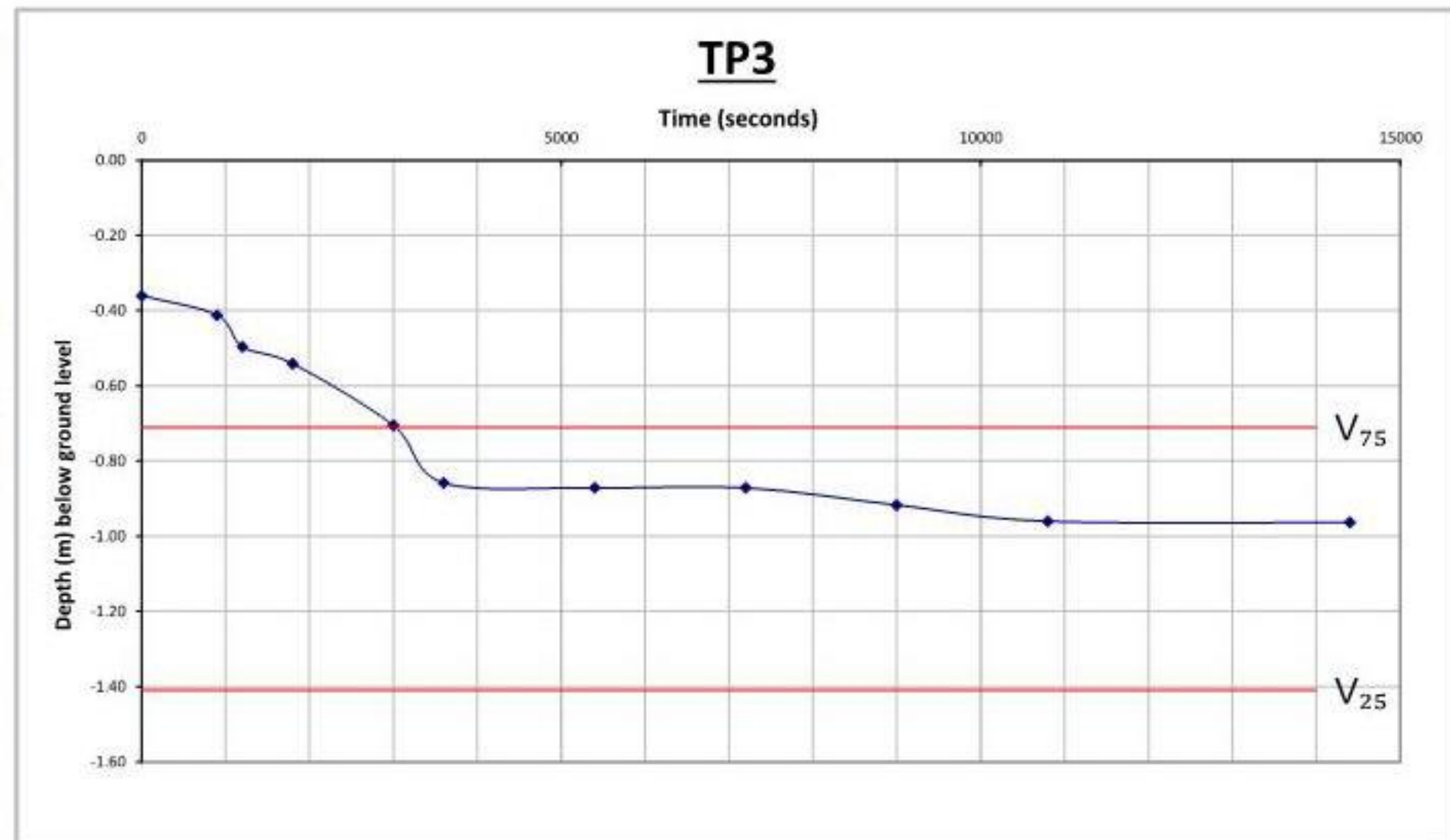
Soil Infiltration Rate (m/sec)

8.69E-06

Location	TP3
Length (m)	2
Width (m)	0.3
Depth (m)	1.6
Surface Area (m ²)	7.96
Depth of Water Added (m)	1.40
Effective Storage Volume (Vp75-Vp25)	0.42

Time (s)	Depth to Water (m)
0	-0.36
900	-0.41
1200	-0.50
1800	-0.54
3000	-0.71
3600	-0.86
5400	-0.87
7200	-0.87
9000	-0.92
10800	-0.96
14400	-0.96

ap50	3.820
V ₇₅	3000
V ₂₅	14400
tp75 - 25	11400



Comments:

Test concluded at 4 hours due to poor drainage. Failed to drain 75% of water added.

Vp	Amount of Water Lost	DTW bgl
75%	1.05	-0.71
25%	0.35	-1.41

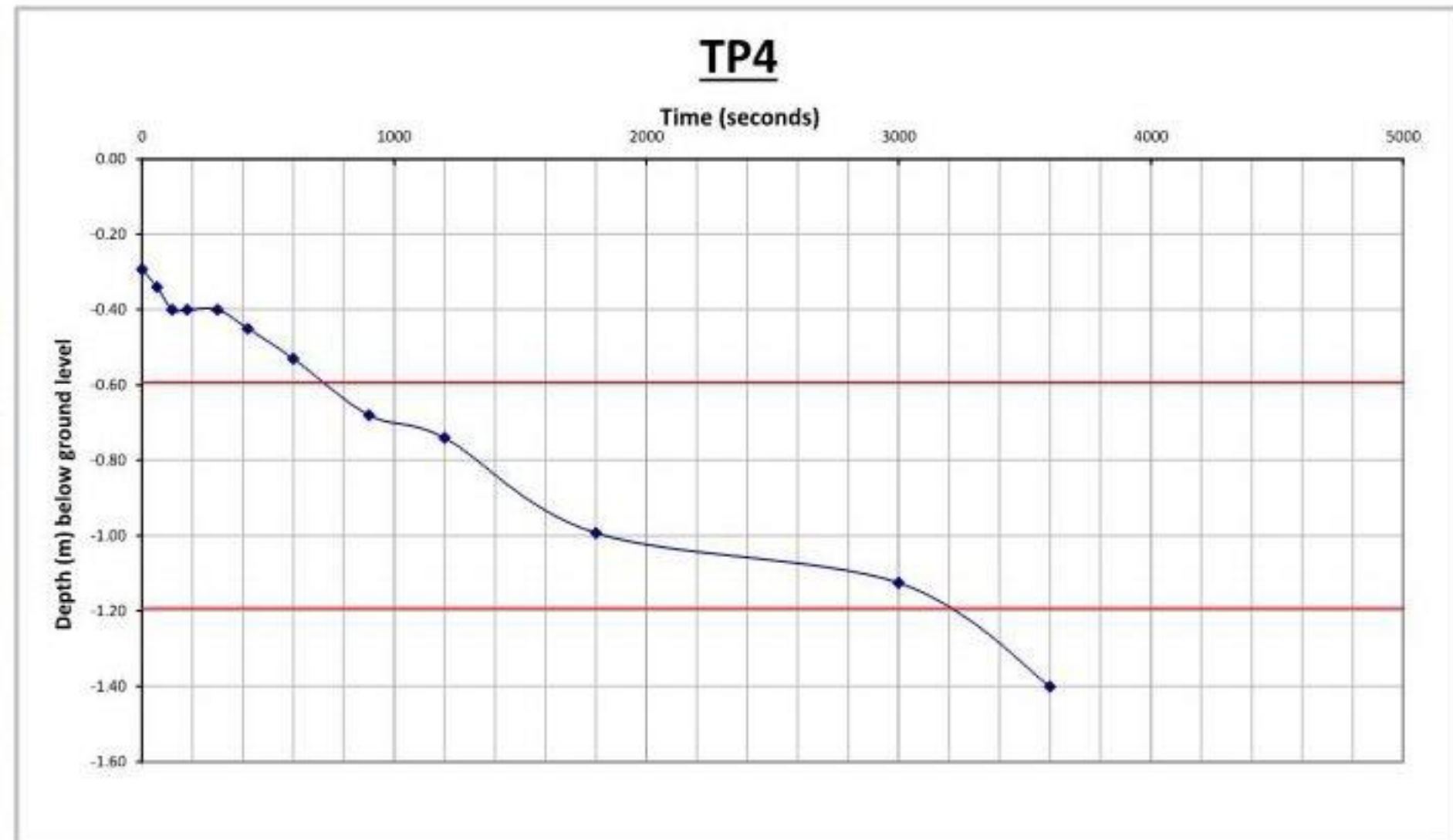
Soil Infiltration Rate (m/sec)

9.64E-06

Location	TP4
Length (m)	2
Width (m)	0.3
Depth (m)	1.4
Surface Area (m ²)	7.04
Depth of Water Added (m)	1.20
Effective Storage Volume (Vp75-Vp25)	0.36

Time (s)	Depth to Water (m)
0	-0.29
60	-0.34
120	-0.40
180	-0.40
300	-0.40
420	-0.45
600	-0.53
900	-0.68
1200	-0.74
1800	-0.99
3000	-1.13
3600	-1.40

ap50	3.360
V ₇₅	700
V ₂₅	3200
tp75 - 25	2500



Comments:

Vp	Amount of Water Lost	DTW bgl
75%	0.9	-0.593
25%	0.3	-1.193

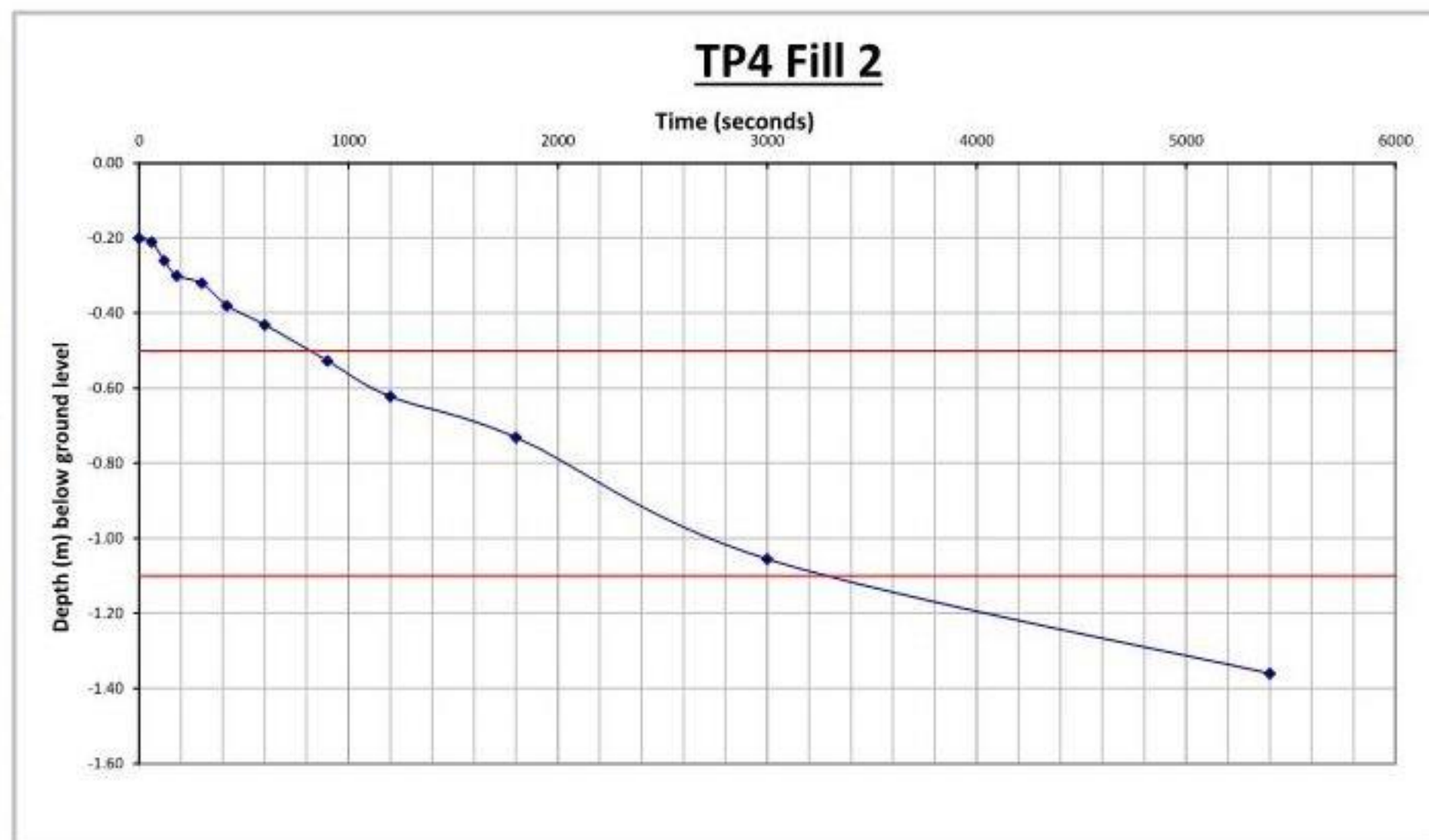
Soil Infiltration Rate (m/sec)

4.29E-05

Location	TP4 Fill 2
Length (m)	2
Width (m)	0.3
Depth (m)	1.4
Surface Area (m ²)	7.04
Depth of Water Added (m)	1.20
Effective Storage Volume (Vp75-Vp25)	0.36

Time (s)	Depth to Water (m)
0	-0.20
60	-0.21
120	-0.26
180	-0.30
300	-0.32
420	-0.38
600	-0.43
900	-0.53
1200	-0.62
1800	-0.73
3000	-1.06
5400	-1.36

ap50	3.360
V ₇₅	800
V ₂₅	3250
tp75 - 25	2450



Comments:

Vp	Amount of Water Lost	DTW bgl
75%	0.9	-0.5
25%	0.3	-1.1

Soil Infiltration Rate (m/sec)

4.37E-05

Appendix (E)

EA Correspondence

From: [Maskell, Jon](#)
To: [Terry Seymour](#)
Cc: [Ian Wallace](#); [Bryan Jezeph \(bryan@jezeph.co.uk\)](#)
Subject: RE: Programme of Works & Offer Letter Westwood Close PAC/SLTSDN/00192
Date: 07 June 2018 15:54:06
Attachments: [image003.png](#)
[image004.png](#)
[image005.png](#)

Hi Terry

Thanks for your email, apologies for the delay in response. I hope that the following information answers your questions.

In terms of the timescales for the River Ems modelling, we are unlikely to have any outputs before the end of this year and the flood map is unlikely to be updated until after Christmas.

With regard to your question about the information that we would use to provide comment on an application, our position is that we would use the best available information at the time of consultation. We would be unable to delay making a response as once we are consulted we have a statutory duty to respond to the Local Authority within 21 days.

It should be noted however that we only provide comments on fluvial and coastal flooding, it will still be for the lead local flood authority and/or the local authority to consider other sources of flooding such as surface water and this should also take account of climate change.

I hope that this helps

Thanks
Jon

Jon Maskell

Team Leader | Sustainable Places

Solent & South Downs | Environment Agency

Email: PlanningSSD@environment-agency.gov.uk

Telephone: [020 8474 5888](tel:02084745888)

Environment Agency | Romsey Office

Canal Walk | Romsey | SO51 7LP



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From: Terry Seymour [<mailto:Terry@rcpconsultants.co.uk>]

Sent: 31 May 2018 19:36

To: Maskell, Jon <jon.maskell@environment-agency.gov.uk>

Cc: Ian Wallace <iwallace@hampshirehomesgroup.com>; Bryan Jezeph (bryan@jezeph.co.uk) <bryan@jezeph.co.uk>

Subject: RE: Programme of Works & Offer Letter Westwood Close PAC/SLTSDN/00192

Hi Jon

Thank you for your email and for the explanation.

Our Client is still looking to proceed with a planning application on this site, but due to their timescales cannot wait until elements of funding for the completion of the modelling exercise is resolved.

What we would like to understand is should the application be submitted now, will the EA, as statutory consultees, provide a response on the best available information (i.e. current flood maps with fluvial flood levels) at the time of consultation or will such consultation response be delayed until resolution of the updated modelling exercise?

Many Thanks

Terry Seymour CEng MICE
Engineering Director



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Architectural & Civil Consultants

The Old School Old School Road
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From: Maskell, Jon <jon.maskell@environment-agency.gov.uk>

Sent: 25 May 2018 15:25

To: Terry Seymour <Terry@rcpconsultants.co.uk>

Cc: Ian Wallace <iwallace@hampshirehomesgroup.com>; Bryan Jezeph (bryan@jezeph.co.uk) <bryan@jezeph.co.uk>

Subject: RE: Programme of Works & Offer Letter Westwood Close PAC/SLTSDN/00192 [Filed 11 May 2018 11:08]

Hi Terry

Thanks for the email. Apologies for the delay in response.

The River Ems model has been built and the hydrology is being reviewed. However, we have not yet got to the point where we have usable modelling outputs to update the flood maps.

The project team are having to get some further funding approval which means that work has stopped temporarily. My colleague from the project team has committed to giving me a further update in the next couple of weeks on the progress, she hopes that they will then have a better idea of when the information will be available.

Once this has been resolved and is fully completed we can inform & provide you with any updates so that you can use the data as you chose to. Just to confirm, we would not wait for the flood map to be updated on our external website before we would be in a position to share this information with yourselves and Havant Borough Council.

In terms of a meeting, currently we feel that we have explained our position regarding this issues and provided an update on the modelling to both yourselves and the council. As you will appreciate, we are all very busy at the moment and as we wouldn't have any additional information to discuss or updates to provide, a meeting would be more effective when we have something further to add. Please note that any meeting is likely to be chargeable. We will of course be in touch with you and Havant BC as soon we have more to add.

Kind Regards

Jon

Jon Maskell

Team Leader | Sustainable Places

Solent & South Downs | Environment Agency

From: Terry Seymour [redacted]

Sent: 22 May 2018 07:36

To: Maskell, Jon [redacted]

Cc: Ian Wallace [redacted] Bryan Jezeph [redacted]

Subject: Re: Programme of Works & Offer Letter Westwood Close PAC/SLTSDN/00192 [Filed 11 May 2018 11:08]

Morning Jon

Following our discussion last week can you please advise if you have managed to review with Laura?

We urgently need to arrange a meeting please to fully understand the current position.

Kind regards

Terry Seymour

Sent from my Samsung Galaxy smartphone.

----- Original message -----

From: Terry Seymour <[REDACTED]>

Date: 11/05/2018 11:07 (GMT+00:00)

To: "Maskell, Jon" <[REDACTED]>

Cc: Ian Wallace <[REDACTED]> Bryan Jezeph <[REDACTED]>

Subject: RE: Programme of Works & Offer Letter Westwood Close PAC/SLTSDN/00192
[Filed 11 May 2018 11:08]

Hi Jon

I hope you are well

I have left a voicemail to discuss,

Can you please give me a call when you get a chance as I would like to set up a meeting with yourself Laura Lax (who I believe works at the Romsey Office?) and John Denman regarding the current fluvial modelling study on the River Ems catchment.

I spoke with John Denman a few weeks ago regarding the updated modelling exercise and understand this was yet to be concluded and anticipated to be completed in the next few months and after that point the formal process of updating the Flood Maps would be undertaken and expected this to be completed by around January 2018.

Further to this I understand that Havant Borough Council have been in consultation with Laura who has raised concern over our site and advised they the EA feels that the area currently shown as Flood Zone 1 (which is where we are proposing to develop) will become Flood Zone 2 and 3 as a result of the updated modelling exercise. This is obviously very concerning for us as we have based all our work, design and development principles on the basis of developing within Flood Zone 1 and are now at a point of looking to submit the planning application, only to be advised that there is concerns over the flood mapping changing over the next few months.

I would clearly like to understand the current status of the modelling exercise and timescales for the updates for the EA maps which I feel we need to have a meeting with both John and Laura to ensure we have a consistent response from the EA please. If there is a speculative change then we need to be provided with the anticipated fluvial level information so we can review these against the actual site topographic survey and ensure we are not prejudiced by the LiDAR level assessment being used by the modelling exercise.

Can you please look to set up a meeting as early as possible (next week if possible?) and happy that the extra costs associated with this is attributed the pre-app charging services offer which

was set up last year.

I look forward to hearing from you

Kind Regards

Terry Seymour CEng MICE
Engineering Director



Rogers Cory Partnership Ltd
Architectural & Civil Consultants

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From: Maskell, Jon [REDACTED]
Sent: 03 April 2017 15:37
To: Terry Seymour [REDACTED]
Subject: Programme of Works & Offer Letter Westwood Close PAC/SLTSDN/00192

Dear Mr Seymour,

Please find attached the Environment Agency's revised Offer Letter & Programme of Works for the Westwood Close site as discussed.

Please can you confirm, via email, that you are happy to accept this offer and the terms and conditions also attached to this email.

If you are happy with the offer please can you confirm the name and address of the relevant person/company to address the invoice to, by filling in the Payment Proforma attached.

Feel free to contact me should you have any questions.

Many Thanks

Jon

Jon Maskell | Sustainable Places Advisor | Solent and South Downs Area | Environment Planning and Engagement
Environment Agency | Romsey District Office | Canal Walk | Romsey | Hampshire | SO51 7LP

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Flood Risk Standing Advice was updated on 15 April 2015. For more information please follow the links below:

For developers: [FRSA developers page](#)

For councils: [FRSA council's page](#)



Our **climate change allowances** for planning were updated on 19 February 2016. The guidance is accessible here: [Flood risk assessment: Climate change allowances](#)

From: Terry Seymour [redacted]

Sent: 30 March 2017 13:32

To: Maskell, Jon [redacted]

Subject: RE: Westwood Close

Hi Jon

Whilst we are going through the initial call for sites process with Havant it would be really great if we could get some form or written response from the EA in terms of the support/ agreement in principle of the proposals on how we are seeking to take forward the development outside of the Flood zones 2 and 3.

Is this something you could provide based on our drainage and flood risk pre-app note?

Kind Regards

Terry Seymour CEng MICE
Engineering Director



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From: Maskell, Jon [<mailto:jon.maskell@environment-agency.gov.uk>]

Sent: 28 February 2017 14:25

To: Terry Seymour <Terry@rcpconsultants.co.uk>

Subject: RE: Westwood Close

Hi Terry,

Sorry no, not the 1 in 1000 levels, just JFLOW.

Thanks

Jon

From: Terry Seymour [<mailto:Terry@rcpconsultants.co.uk>]

Sent: 16 February 2017 16:41

To: Maskell, Jon <jon.maskell@environment-agency.gov.uk>

Subject: RE: Westwood Close

Hi Jon

Thank you for sending this through, do you by any chance have the 1 in 1000 year levels for these same sections?

Terry Seymour CEng MICE
Engineering Director



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From: Maskell, Jon [<mailto:jon.maskell@environment-agency.gov.uk>]

Sent: 16 February 2017 16:38

To: Terry Seymour [REDACTED]

Subject: Westwood Close

Hi Terry,

Good to catch up.

As discussed, please find attached a revised Levels map for the Westwood Close site in Havant.

Thought that this might give you a bit more info to go on.

Give me a shout if you need anything else.

Thanks

Jon

Jon Maskell | Sustainable Places Advisor | Solent and South Downs Area | Environment Planning and Engagement
Environment Agency | Romsey District Office | Canal Walk | Romsey | Hampshire | SO51 7LP

[REDACTED]

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