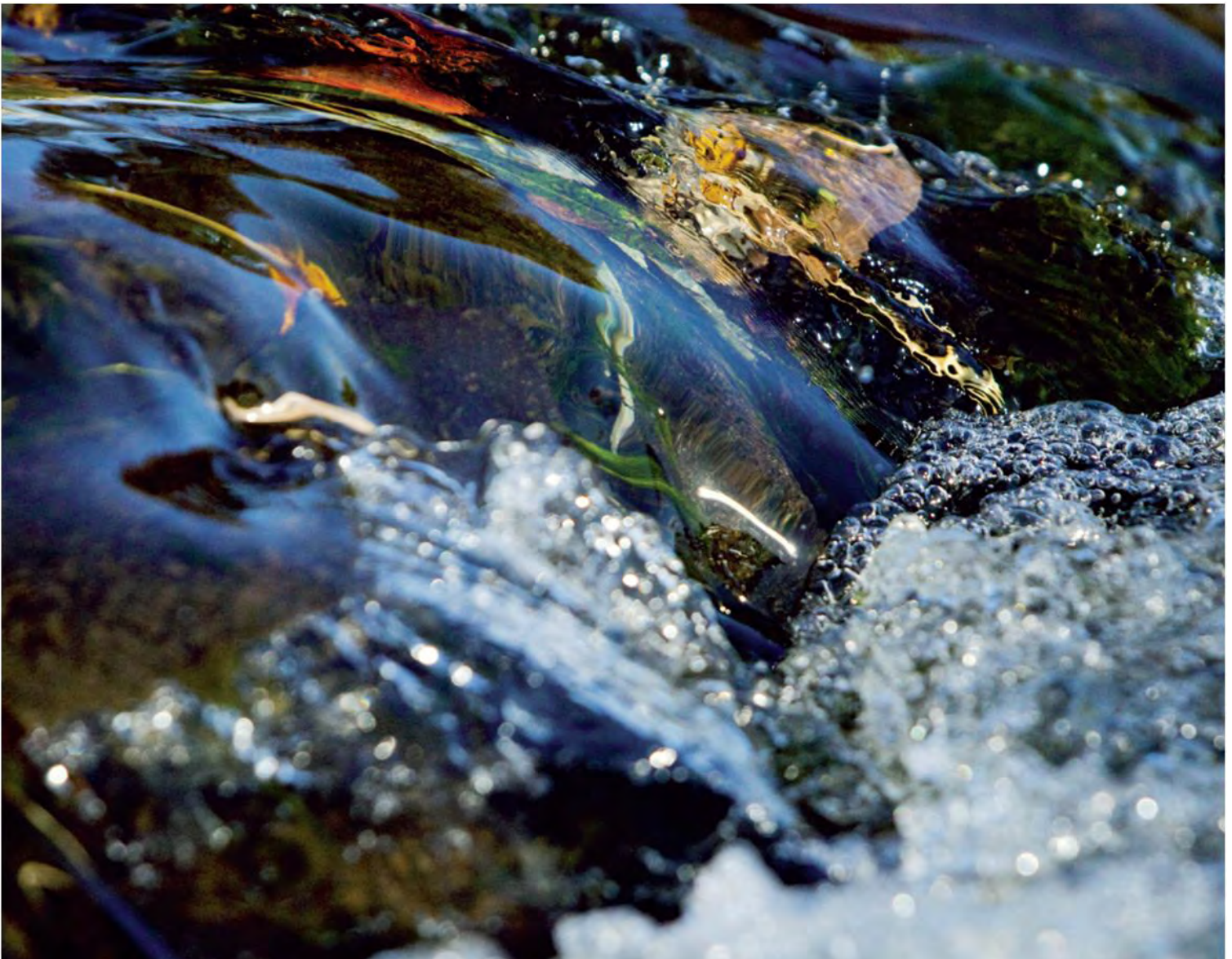




Western Link, Southern Converter Station Flood Consequence Assessment



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1 Introduction

1.1 Proposed Development

AECOM has been commissioned by National Grid Electrical Transmission (NGET) to produce a Flood Consequence Assessment (FCA) for a proposed converter station (Southern Converter Station) at the Deeside Industrial Park in Flintshire. The FCA has been prepared in support of an application for Full Planning Permission (FPP) under the Town and Country Planning Act 1990 to construct and operate the proposed Converter Station.

The proposed Converter Station will form part of the Western Link, a major reinforcement of the UK's electricity transmission system. The proposed Converter Station will convert electricity from the transmission system at 400kV AC to approximately 500kV DC or vice versa depending on the direction of operation. Southern Converter Station will include a mix of building units (which will house specialist electrical equipment) and outdoor electrical equipment all contained within a secure fenced compound. The Converter Station will comprise the following components:

- Converter Transformers: These step AC voltage back up, for onward transmission, following its conversion from DC in the valve hall. The transformer units are sited outdoors immediately adjacent to the valve halls and are contained within fire walls.
- Valve Hall/DC Hall Buildings: These will contain specialist DC electrical equipment including the power electronics equipment that converts electricity from DC to AC. The devices are all located indoors within a controlled environment.
- Outdoor High Voltage Electrical Equipment: This connects the Converter Station to the existing AC transmission system. High voltage AC electrical equipment including harmonic filtration and reactive compensation equipment, circuit breakers, transformers, busbars and insulators will be located outdoors to the north and east of the buildings.
- Control Building: The Converter Station will normally be operated remotely but this building will include control, protection and communication equipment, other auxiliary systems, office and welfare facilities.
- Spare Parts Store: A spare parts store is located in the north west corner of the site. This will contain a range of spare parts so that they are readily available in the event of a breakdown.
- Auxiliary Supplies Substation: A small Regional Electricity substation is located toward the north east corner of the site
- Other Features: The site includes a Sustainable Urban Drainage System (SUDS). This will include filtration trenches, soakaway, oil interceptors and full retention oil dump tanks with valve/penstock shutoffs. In addition the site will also include fire equipment and backup diesel generator

The exact size of the converter station will be subject to detailed design; however the estimated site configuration has a footprint of approximately 22 hectares (Ha). The site also includes an access road which already exists which is shown within Figure 3.

It is understood that the converter station will not be manned during normal operation. Maintenance and/or other personnel who may be required to work at the converter station are expected to be highly trained and fully conversant with the risks and procedures associated with a flood event.

1.2 Proposed Drainage

A Drainage Strategy Statement was produced by WSP during November 2012¹ and has been included within Appendix 5. In summary:

- There are no public or private sewers located within or nearby the boundary of the site, and that there are no recorded land drains crossing the site.
- **Surface water** from the access roads and filter compounds will be drained via infiltration trenches.

¹ WSP (2012) Drainage Strategy Statement – Southern Converter Station.

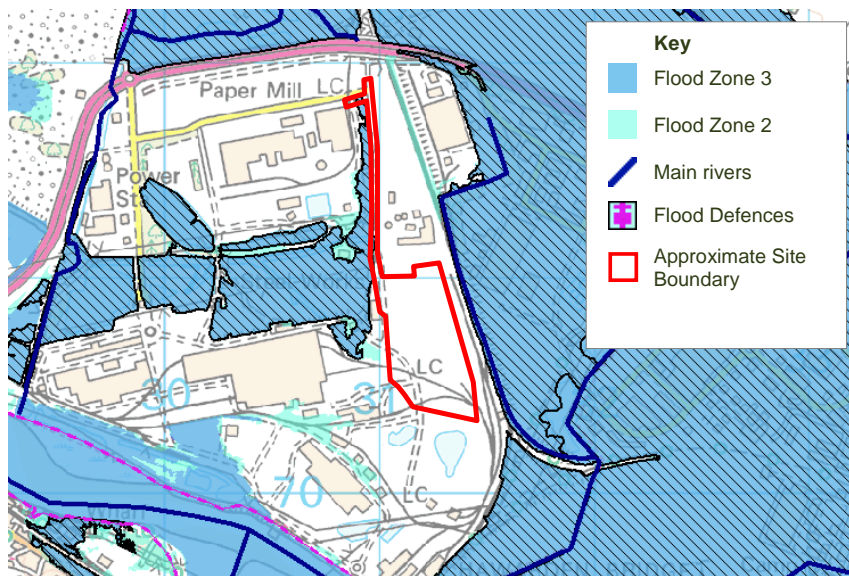
Capabilities on project:
Water

- **Roof water** from the valve hall buildings will be routed via below ground drains to an outfall located to the north of the site. The discharge from this outfall will be accommodated within an area of the site which will be dedicated to use as a pond/wetland feature. This feature will operate as a large soakaway and will only appear as standing water during a large storm event.
- **Oily water** from the transformer bunds area will be routed via a separate system of full retention oil interceptors which will be designed and constructed in accordance with the National Grid's Design Handbook (DH 10 Issue 3), before discharging to a connection with the surface water system within the site boundary.
- Foul water from the development will discharge to a cess tank which will be emptied under a regular maintenance routine.

1.3 Flood Zone – Environment Agency's Risk of Flooding from Rivers and Sea Mapping

The Environment Agency's Risk of Flooding from Rivers and Sea mapping (see Figure 1) shows that the site is located within Flood Zone 1; outside the 0.1% Annual Exceedance probability (AEP)/1 in 1000 year risk of tidal/fluvial flooding. As such, the Environment Agency flood map considers the site to be at low risk of flooding.

Figure 1: Environment Agency's Risk of Flooding from Rivers and Sea Mapping (downloaded 19-11-2012)



1.4 Flood Zone – TAN15 Development Advice Map

The site is shown to be located within Zone C1 based on the TAN15 Development Advice Map (see Figure 2). Zone C1 indicates areas of the floodplain which are developed and served by significant infrastructure, including flood defences.

Capabilities on project:
Water

Figure 2: TAN15 Development Advice Map Extract (downloaded 19-11-2012)



1.5 Justification of Location

Technical Advice Note 15 (TAN15)² is the current planning policy for flood risk in Wales. According to TAN15, the site is considered to be located within Zone C1 and the proposed site is considered to be 'Highly Vulnerable Development'. Based on Figure 1 of TAN15 (see Appendix 1), the development can take place subject to application of the Justification Test which includes acceptability of consequences. The proposed development can be justified as follows:

- i. The proposed converter station is a key part of the Western High Voltage Direct Current (HVDC) Link, which is a major electricity transmission project that reinforces and provides additional capacity on the Great Britain Transmission System. It will connect the high voltage networks in South West Scotland and North Wales by a subsea HVDC cable that will increase the electrical transmission capacity between the north and south of the UK by approximately 2000 Mega Watts (MW). This enhancement to the network is required in part to fully realise the UK's significant renewable energy potential and support the planned development of renewables up to 2015.

and,

- iii. The proposed development is located on land which was formerly part of the steel works and associated railway (see Section 2.1.6); therefore the proposed development will take place on previously developed land.
- iv. This FCA has been prepared in line with TAN15 to consider the flood risks to the proposed development. Section 6 of this report demonstrates that the flood risk to the proposed Area A development can be satisfactorily mitigated.

1.6 Layout of Report

As detailed above, Section 1 provides an introduction to the FCA, and provides an introduction to flood risk and TAN15 which is the latest guidance on development and flood risk in Wales. A summary of TAN15 and other relevant Legislation, Standards and Good Practice documents have been included within Appendix 1.

² <http://wales.gov.uk/docs/desh/publications/040701tan15en.pdf>

Capabilities on project:
Water

Section 2 provides an introduction to the site. The site description is based on a local knowledge, continued involvement in the scheme and publically available information on flood risk.

In order to obtain further information on flood risk, consultation was undertaken with the Environment Agency Wales, and Flintshire County Council. Section 3 of this report details the information gathered through the consultation.

Section 4 considers the tidal flood risk to the site based on hydraulic modelling undertaken as part of this FCA.

Section 5 considers the drainage arrangements for the proposed development. The drainage assessment is based on TAN15, and outlines an indicative foul and surface water drainage strategy.

Section 6 of this report considers the flood risk to site, and the potential for the development proposals to impact on flood risk. The assessment of flood risk is based on TAN15, and uses all the information gathered as part of the FCA including third party consultations and a Landmark Flooding Report.

Section 7 outlines the flood plan requirements as well as mitigation measures which would be applicable to this site in response to flooding issues identified within Section 6.

Based on all the work undertaken as part of the FCA, Section 8 of this report provides a summary and recommendations for further work.

A list of references is provided in Section 9.

Capabilities on project:
Water

2.1.4 Geology

Based on British Geological Survey Solid and Drift Edition Geological mapping, the majority of the site is underlain by superficial deposits comprising Alluvium (tidal flat) deposits of likely to comprise of clay, silt and sand.

The bedrock geology is indicated to comprise Pennine Lower Coal Measures likely to comprise of mudstone, siltstone, sandstone and coal. Due to the historical land uses of the site it is expected that Made Ground will be present across the site.

2.1.5 Hydrogeology

The Environment Agency's Superficial Aquifer Designation map ('What's in Your Backyard' Website)³ indicates that the site is underlain by a Superficial Secondary (undifferentiated) Aquifer associated with marine deposits. Secondary Undifferentiated Aquifers are aquifers where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

The Environment Agency's Bedrock Aquifer Designation map ('What's in Your Backyard' Website) indicates that the site is underlain by a Bedrock Secondary A Aquifer associated with the Upper Carboniferous Coal Measures. Secondary A Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Minor Aquifers.

The Environment Agency's Source Protection Zone (SPZ) map ('What's in Your Backyard' Website) indicates that the site is not located within a source protection zone.

Groundwater at the site is considered to be of Very High Sensitivity as it is providing baseflow to the Dee Estuary, which is a SSSI, SAC, SPA and Ramsar site and is also designated under the Nitrates Directive, Bathing Directive and Shellfish Water Directive⁴.

2.1.6 Ground Contamination

WSP undertook a Desk Top Study during August 2012⁵ which included a Landmark Envirocheck report which in itself contained historical mapping. Based on the use of the site as part of a steel works and associated railway, the site may contain contaminated ground and groundwater. Areas of Made Ground relating to historical land uses on the site may also be potential contamination sources.

2.1.7 Existing Drainage/Water Mains

In preparation of this FCA report, Welsh Water were consulted to obtain sewer asset plans. At the time this report was written, Welsh Water had not provided a response. It is however noted in the WSP (2012) Drainage Strategy Statement that (see Appendix 5) there are no public or private sewers located within or nearby the boundary of the site.

2.2 Watercourses

2.2.1 Main River

Based on the Environment Agency's Risk of Flooding from Rivers and Sea ('What's in Your Backyard' Website) there are no Main Rivers located within the boundary of the site; however, there are numerous Main Rivers located within the general vicinity of the site (see Figure 3). These Main Rivers include:

³ http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

⁴ Environment Agency (2009) Habitats Regulations Assessment of the River Basin Management Plan for the Dee River Basin District.

⁵ WSP (2012) Factual and Interpretive Desk Study Site C Deeside Siemens Energy Limited and National Grid/ Scottish Power Upgrades Limited and National Grid Property Holdings.

Capabilities on project:
Water

- The River Dee flows in a north west direction approximately 950m to the south west of the site;
- An unnamed Drain flows in a southerly direction approximately 60m east from the site, on the eastern side of the bordering railway line. This unnamed Drain joins a network of unnamed Drains (which themselves are Main Rivers) approximately 660m south west from the site. This network of unnamed Drains joins the River Dee approximately 1,090m to the south west of the site.
- An unnamed Drain flows in a southerly direction approximately 1,370m west from the site. This unnamed Drain joins the River Dee approximately 1,740m to the south west from the site.

2.2.2 Ordinary Watercourses

There are no Ordinary Watercourse located within the boundary of the site; however, there is a network of Ordinary Watercourses located to the west of the site (see Figure 3). This network of Ordinary Watercourses flows in a westerly direction away from the site.

2.3 Flood Defences

There are formal flood defences located along the reach of the River Dee approximately 950m south from the site, as well as flood defences known as Broken Bank located along an unnamed Main River approximately 1,570m to the north west of the site (see Figure 1 and 3). It is noted that the Environment Agency's Flood Map identifies flood defences which offer a 1% (1 in 100 year) standard of protection of flooding from the river; or a 0.5% (1 in 200 year) standard of protection of flooding from the sea. Further details regarding flood defence conditions and standard of protection have been included within Section 3.1.6.

2.4 Artificial Waterbodies

There are no artificial waterbodies located within the boundary of the site; however, there are a number of artificial waterbodies (assumed to be attenuation ponds) located within the general vicinity of the site (see Figure 3), which are as follows:

- There are two linked ponds located approximately 190m to the south of the site which are associated with the steel works to the south west of the site.
- There is a network of linked ponds located approximately 260m to the north west of the site which are associated with the steel works to the north west of the site.
- There is a network of linked ponds located approximately 370m to the south east of the site (on the eastern side of the railway line) which is associated with the wider Deeside Industrial Estate.

Capabilities on project:
Water

3 Consultation

During the course of producing this FCA, the Environment Agency Wales and Flintshire City Council were consulted in relation to the proposed development. This section of the report details the information gathered through the consultation.

3.1 Environment Agency Wales

Information regarding flood risk was previously obtained from Environment Agency Wales as part of the broader site discussion. It was agreed with the Environment Agency Wales (see Appendix 3), that the same consultation response and data provided would still apply to this FCA.

3.1.1 DAM Zones

The Environment Agency Wales confirmed that the site is located within DAM Zone C1 and is potentially at risk of tidal flooding during the 0.5% AEP and 0.1% undefended flood event. It is however noted that in Section 4 the site is demonstrated to be largely outside the extent of tidal flooding.

3.1.2 Extreme Sea Levels

In February 2012 as part of Tidal Dee Flood Mapping the Environment Agency Wales updated the Tidal Dee Flood Mapping Report (2007) to incorporate revised extreme sea levels as outlined in the coastal flood boundary conditions for the UK mainland and islands report. The revised extreme sea levels at the mouth of the Dee Estuary are lower than previous estimates, and are shown below in Table 1. The guidance considers these extreme sea levels to be accurate to only one decimal place and these estimates include 95% uncertainty bounds as shown in Table 2 below.

Table 1 - Comparison of Extreme Sea Levels at mouth of Dee Estuary

Study	Return Period / Level (m AOD)			
	75yr 1.33% AEP	100yr 1% AEP	200yr 0.5% AEP	1000yr 0.1% AEP
North Wales Tidal Flood Mapping Study (Levels to 2007 baseline)	6.06	6.17	6.38	6.70
Coastal Flood Boundary Conditions Study (levels to 2008 baseline)	5.84	5.88	5.97	6.19

Table 2 - Tidal Still Water Levels (2011) at mouth of Dee Estuary (m AOD) and Confidence Limits

Scenario	Return Period / Level (m AOD)			
	20yr 5% AEP	75yr 1.33% AEP	200yr 0.5% AEP	1000yr 0.1% AEP
Extreme Sea Level (m AOD)	5.67	5.85	5.98	6.20
Confidence Intervals	±0.1	±0.1	±0.2	±0.3

3.1.3 Historical Flooding

The Environment Agency Wales reported that they hold no records of historical flooding at the site.

3.1.4 Flood Defences

The Environment Agency Wales provided an annotated plan (see Appendix 3) of the flood defence assets located along the River Dee and adjacent to Weighbridge Road (A548) to the north west of the site which is known as 'Broken Bank'. A summary of the flood defences are summarised below.

Capabilities on project:
Water

The River Dee embankments are approximately 200 years old and consist of a mixture of materials derived predominantly from previous river dredging. It is noted that they have not been constructed to a design standard comparable with contemporary engineered embankments. Details of the River Dee flood defences are included within Appendix 3.

The revised River Dee tide levels have raised concerns as to the standard of protection (in terms of levels) offered by the defences. The predicted levels for the 1 in 200 year event plus climate change (0.5% AEP +CC) are shown to overtop or encroach on the typical crest level of the embankments. The likelihood of a breach occurring is significantly increased during such situations.

3.1.5 Site Drainage

The Environment Agency Wales reported that they hold no data in relation to the drainage within the site. The wider Dee Industrial area is understood to drain via a pump controlled and operated by TATA Steel. The private pumping station is located at Grid Reference SJ2958171175 with the outfall approximately 1.5km to the west of the site.

The Environment Agency Wales reported that surface water run-off should be controlled as near to its source as possible. It was noted that SuDS would be the preferable method and if SuDS are not to be used, it will need to be demonstrated why it is not practical at this particular location.

If infiltration is not practicable, then the surface water discharge rate should be limited to the greenfield runoff rate (with on-site attenuation for up to the 1% rainfall event with an appropriate allowance to climate change). However, brownfield sites require a 2/3 surface water discharge reduction (as required by the Environment Agency Wales) in order to improve the existing drainage situation.

3.1.6 Lifetime of Development and Climate Change

The Environment Agency Wales recommend that a value of 100 years is used when considering the lifetime of the residential dwellings and 75 years is used when considering non residential dwellings. It is however noted that lifetime is not currently prescribed in Planning Policy Wales / TAN15, and that the above values have been derived from Planning Policy in England / National Planning Policy Framework (NPPF)^{6&7} which is supported by the latest Climate Change Project Appraisal Guidance which is approved for use in Wales.

3.1.7 Geology and Hydrogeology

The Environment Agency Wales reported that the bedrock of the site is Mudstone, Sandstone and Conglomerate and is classed as a Secondary A aquifer. This in turn is overlain by 'Devensian Till', which is classed as 'unproductive strata'. It is noted that there are no mapped Source Protection Zones within 1km of the site. Furthermore, there are no abstractions noted in the National Abstraction Licence Database (NALD) within 1km of the site, although there are three located within 2km of the site.

3.2 Flintshire County Council

In preparation of this FCA report, Flintshire Council was consulted to obtain flooding data. At the time this report was written, Flintshire County Council had not provided a response to the FCA enquiry.

3.3 Welsh water (Dŵr Cymru)

In preparation of this FCA report, Welsh Water were consulted to obtain sewer asset plans. At the time this report was written, Welsh Water had not provided a response.

⁶ <http://www.communities.gov.uk/publications/planningandbuilding/nppf>

⁷ <http://www.communities.gov.uk/publications/planningandbuilding/nppftechnicalguidance>

Capabilities on project:
Water

3.4 Envirocheck Flood Screening Report

An Envirocheck Screening Report was obtained from Landmark. A copy of the flood screening report has been included within Appendix 2 and summarised below:

- *EA Flood Data Map (1:10,000)* - The EA Flood Data Map shows that the site is located outside the flood zone area.
- *RMS 75, 100 and 1000 Year Return Flood Maps (1:10,000)* - The RMS Flood Maps show that the site is not at risk of pluvial flooding during the 75 year return period, however it is at risk of pluvial flooding during the 100 and 1000 year return periods.
- *EA Detailed River Network Map (1:10,000)* - As noted within Section 2.2, there are numerous Main Rivers and Ordinary Watercourses located within the vicinity of the site. These watercourses are highlighted on the EA Detailed River Network Map.
- *EA Historical Flood Map (1:10,000)* - The Historical Flood Map shows that the site has previously flooded.
- *BGS Geological Indicators of Flooding Map (1:50,000)* - The BGS Geological Indicators of Flooding show that the site is at risk of coastal flooding.
- *BGS Groundwater Flooding Susceptibility Map (1:50,000)* - The site is shown to be highly susceptible to groundwater flooding.
- *National Flood Risk Assessment (NaFRA) Map (1:50,000)* - The site is shown to be at low risk of flooding.

Capabilities on project:
Water

4 Analysis of Tidal-Fluvial Flood Risk

4.1 Data Analysis

4.1.1 Ground Model (DTM)

The Digital Terrain Model (DTM) has been produced using filtered 1m LIDAR data, procured through Emapsite. The date of the LIDAR being flown is unknown; however there have been no significant developments that would influence ground levels within the study area. The filtering process uses algorithms to remove trees, buildings and other structures from the LIDAR. Although the filtering process removed these features, a visual review of the LIDAR data was undertaken.

4.1.2 Extreme Tidal Data

Environment Agency Wales provided data on tidal cycle and extreme tidal levels for the River Dee Estuary. The Environment Agency Wales provided extreme tidal levels for a range of climate change scenarios and confidence levels.

In discussions with the Environment Agency Wales, it was agreed that the tidal data represented the most extreme tidal scenario and would require scaling to match the appropriate return period and the required climate change allowances based on the proposed 75 year development lifetime; shown in Table 3 below.

Table 3 - Tidal Dee Defended Peak Water Levels (m AOD).

Node Point ID	Easting	Northing	Present Day		Climate Change Scenarios			Sensitivity Analysis Scenarios	
			0.5% AEP (2011)	0.1% AEP (2011)	0.5% AEP (2061)	0.5% AEP (2086)	0.5% AEP (2111)	0.1% AEP 2011 Upper Band	0.5% AEP 2111 Upper Band
00010100740	329192	370149	6.67	6.87	7.01	7.27	7.58	7.16	7.71

The proposed development lifetime is 75 years; therefore the extreme tidal level for 2086 climate scenario is the most applicable for the Site.

4.1.3 Analysis of Tidal Data and Ground levels

The ground model of the Site was processed with the extreme tidal levels to produce extents of the Site that were below various levels. These conservative estimates of flood risk do not take into account the presence of tidal defences or the absence of flow routes that could convey water to the Site. It is unlikely that these areas would experience flooding to these levels.

Figure 4 shows ground levels:

- Below the 0.5% AEP fluvial-tidal event (2011).
- Between 0.5% AEP and 0.1% AEP fluvial-tidal levels. (2011).
- Between 0.1% AEP (2011) and 0.5% AEP fluvial-tidal levels with an allowance for climate change (2086).

The results of this analysis indicate that the Site is not at risk of fluvial-tidal flood risk from the River Dee during a present day 0.5% AEP event, 0.1% AEP event and 0.5% AEP event with an allowance for climate change (2086).

Capabilities on project:
Water

5 Flood Consequence Assessment

In accordance with TAN15, flood risk must be assessed for all sources of flooding. The development of any site must also be carried out in such a way as to mitigate any potential flood risk, both on and off site. This section identifies all possible sources of flooding and assesses the flood risk associated with each one.

5.1 Tidal/Fluvial Flooding

The site is shown to be located within Zone C1 based on the TAN15 Development Advice Map (see Figure 2).

As noted in Section 2.1.2, the north of the site is located at approximately 8.5m AOD. The site slopes in a southerly direction to approximately 7.4m AOD along the western boundary and around 7.5m AOD towards the south east corner. There is however a low point located towards the south west corner of the site which is approximately 6.86m AOD. Based on a comparison of the sites topographic level and the Tidal Dee Defended Peak Water Level of 7.27m AOD (during the 2086 scenario), the majority of the site is located outside the 0.5% (1 in 200 year) plus climate change flooding extent. This has been demonstrated by the contour mapping of the modelled flood levels and the ground model, within Figure 4.

Figure 4: Contour mapping of the modelled flood levels and the ground model



It is however noted that the low area towards the south west area of the site is shown to be susceptible to tidal flooding. This is however considered unfeasible given the fact that there are no flow pathways to the site.

Based on the above, the risk of flooding to the site from tidal/fluvial flooding is considered to be low and acceptable. It is however noted that the site access road is at risk of tidal flooding during the 0.5% AEP (1 in 200 year) flooding event. Access and egress is discussed in more detail within Section 6.

5.2 Pluvial Flooding

The Landmark RMS mapping (see Appendix 2) shows that the site is at risk of pluvial flooding during the 100 and 1000 year events.

Capabilities on project:
Water

By adopting a precautionary approach, it is recommended that all finished floor levels should be located at least 150mm above the external site levels to mitigate any risk.

Provided that the surface water drainage system described in Section 1.2 is implemented, and that the above finished floor level recommendation is followed, it is considered that the risk of surface water flooding to the site can be mitigated to a low and acceptable level of risk. Furthermore, the proposed development should have no adverse impact on pluvial flood risk.

5.3 Groundwater Flooding

The Landmark BGS Groundwater Flooding Susceptibility map (see Appendix 2) shows that the site is highly susceptible to groundwater flooding.

Assuming finished floor levels are set at least 150mm above external site levels, the risk of flooding from groundwater for areas considered to be at high risk of groundwater flooding can be mitigated. As such, the risk of groundwater flooding to the developable area of the site would be considered to be low and acceptable, and the proposed development should have no impact on groundwater flood risk.

5.4 Flooding from Public Sewers/Private Sewers

In preparation of this FCA report, Welsh Water was consulted to obtain sewer asset plans. At the time this report was written, Welsh Water had not provided a response. It is however noted in the WSP (2012) Drainage Strategy Statement that (see Appendix 5) there are no public or private sewers located within or nearby the boundary of the site.

Based on the above, the risk of flooding to the site from public/private sewers is considered to be low and acceptable.

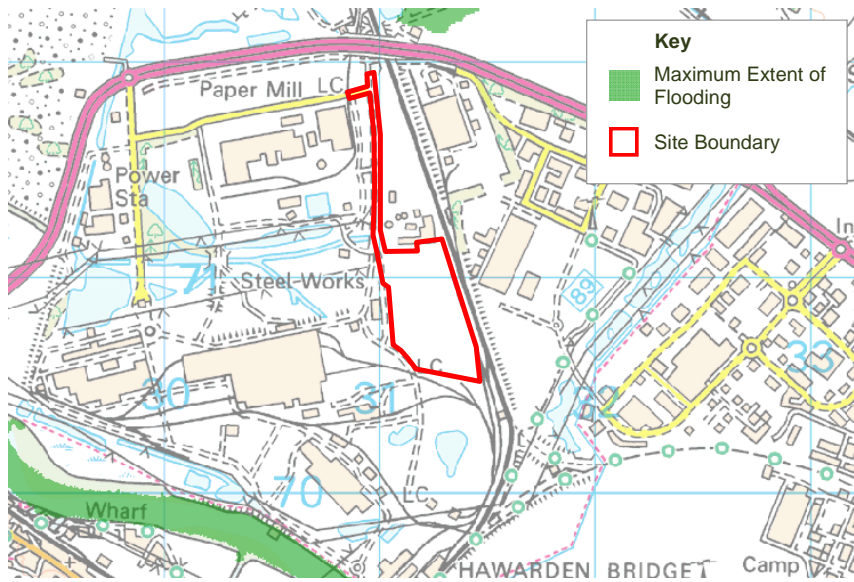
5.5 Flooding from Artificial Sources

As described in Section 2.4, there are no artificial waterbodies located within the boundary of the site; however, there are a number of artificial waterbodies located within the general vicinity of the site. It can be assumed that the attenuation ponds will be maintained by the owners and are designed to an appropriate standard with overflow control. As such the attenuation ponds should not pose a flood risk from breaching (where embanking exists).

The site is not shown to be at risk of flooding from reservoirs based on a review of the Environment Agency's on line Reservoir Flood Risk Map⁸ (see Figure 5).

Based on the above, the risk of flooding from artificial sources on site is considered to be low and acceptable, and the proposed development should have no impact on flood risk from artificial sources.

⁸ <http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=e>



Capabilities on project:
Water

6 Flood Plan

This section of the report outlines the requirements of a suitable flood plan including flood warning arrangements and evacuation plans.

6.1 Flood Plan

6.1.1 Preparing a Flood Plan

It is understood that the converter station will not be manned during normal operation. Maintenance and/or other personnel who may be required to work at the converter station are expected to be highly trained and fully conversant with the risks and procedures associated with a flood event.

It is recommended that National Grid Electrical Transmission prepares a Flood Plan for the proposed Southern Converter Station, or incorporate into a Flood Plan for the wider Deeside Industrial Estate (if one exists), by following advice provided in the Environment Agency's document 'Flooding - Minimising the Risk; Flood Plan Guide for Communities and Groups: Practical Advice to Help You Create a Flood Plan'⁹. The Environment Agency's Flood Plan Guide provides a Flood Plan template which can be filled in and reported to the Floodline. In summary the plan ensures that:

- Flooding mechanisms within the area are understood (i.e. tidal, fluvial, surface water, groundwater and public sewers).
- It is understood who does what during a flood event (i.e. Environment Agency Wales, Flintshire County Council, Emergency Services, Welsh Water, Electric, Gas and Telecommunication Companies etc).
- Registration is made to the Environment Agency Flood Warning Direct Service (if available) and that the flood warning codes are understood. Flood Warning information is provided below.
- Evacuation arrangements are made which include:
 - Choosing a trigger when as to when to activate the flood plan (i.e. a flood depth).
 - Evacuation routes and evacuation centres are known in order to move to a safe place of refuge (see Section 6.1.3).

The above evacuation arrangements could be conducted as part of a local co-ordination (i.e. within the Deeside Industrial Estate) whereby volunteers can carry out actions such as warning other occupants, helping the vulnerable (elderly and disabled) and contacting the external agencies and emergency services etc. It is important to test any flood plan by simulating a flooding evening (by liaising with the Environment Agency Wales) and regularly checking the flood plan to make sure it is kept up to date.

It is also worth noting that National Grid Electrical Transmission must ensure that any future occupiers of the site are aware of the flooding risks and consequences, the development is designed to allow the occupier the facility for rapid movement of goods/possessions to areas away from the floodwaters and that it has been demonstrated that an effective flood warning and flood plans are in place.

6.1.2 Flood Warning

Based on the Environment Agency's Flood Warning Areas mapping (Figure 6), the site is not located within a flood warning area.

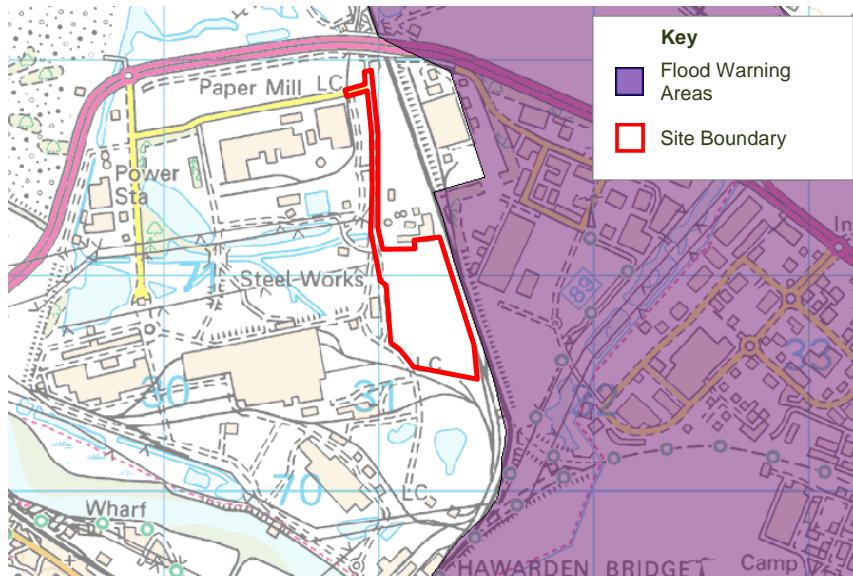
Information regarding flood warnings can be accessed from the Environment Agency Flood Warnings website¹⁰. It is recommended that National Grid registers with the Environment Agency's Floodline Warnings Direct Service by calling Floodline on 0845 9881188. It is noted that the Environment Agency Flood Warnings website provides a three day flood warning forecast which is in force by region and is updated every 15 minutes. The flood warning information above will let you know when to activate the Flood Plan.

⁹ <http://publications.environment-agency.gov.uk/PDF/GEHO0111BTJK-E-E.pdf>

¹⁰ <http://www.environment-agency.gov.uk/homeandleisure/floods/31618.aspx>

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Figure 6: Environment Agency online Flood Warning Areas mapping (downloaded 19-11-2012)



6.1.3 Safe Access/Egress

Based on the Environment Agency Flood Map and Envirocheck flood map, Weighbridge Road (A548) and the access road to the site from Weighbridge Road are shown to be located in Flood Zone 1 (low risk of flooding). Should the site need to be evacuated then Weighbridge Road and associated access roads would provide an adequate evacuation route.

6.1.4 Place of Refuge

Based on the site's location outside the 0.5% AEP (1 in 200 year) plus climate change flooding extent, a place of safe refuge is provided by the proposed development.

7 Summary and Recommendations

7.1 Summary

AECOM has prepared this FCA to assess the flood risk to a proposed converter station development for a site located on land within the Deeside Industrial Estate. An FCA is required because the proposed site is located within Zone C1.

All the appropriate agencies have been consulted in producing this FCA, including; Environment Agency Wales, Flintshire County Council and Welsh Water.

According to Environment Agency Wales Flood Maps, the site is located within Flood Zone 1 (0.1% AEP/outside the 1 in 1000 year flood extent); at low risk of flooding. However, the TAN15 Development Advice Map shows that the site is located within Zone C1; these are considered to be areas of the floodplain which are developed and served by significant infrastructure, including flood defences.

Based on TAN15, the proposed use of the site as a converter station is considered to be 'Highly Vulnerable Development'. Based on TAN15, the development can take place subject to application of the Justification Test which includes acceptability of consequences. As per Section 1.4 of this FCA, the proposed development is considered to pass the Justification Test.

This FCA has considered all the potential sources of flooding to the site. We have identified that the site is at low risk of flooding from all sources including tidal flooding. However access/egress from the site would become an issue during a flooding event, therefore it has been identified that a flood plan would be required.

7.2 Recommendations

- It is recommended that all finished floor levels and vulnerable electrical equipment should be located +150mm above external ground levels in order to mitigate the risk of pluvial and groundwater flooding
- A flood plan should be prepared for the proposed development including flood warning and evacuation plans.
- A Drainage Strategy Statement was produced by WSP which details surface and foul water drainage. As appropriate, the foul and surface water drainage strategy for the proposed site should be designed in liaison with Flintshire County Council, the Environment Agency Wales and Welsh Water in order to establish surface water discharge allowances and discharge points.

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8 References

Ciria (2007) SuDS Manual C697 [online]

http://www.ciria.org/service/AM/ContentManagerNet/Default.aspx?template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=19&ContentID=10559&TPPID=4334&AspNetFlag=1&Section=content_by_themes

Communities and Local Government (2007) Improving the Flood Performance of New Buildings: Flood Resilient Construction [Online] http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

Environment Agency (2012) Flood Warnings [Online] <http://www.environment-agency.gov.uk/homeandleisure/floods/31618.aspx>

Environment Agency (2011) Flooding - Minimising the Risk. Flood Plan Guide for Communities and Groups: Practical Advice to Help You Create a Flood Plan [Online] <http://publications.environment-agency.gov.uk/PDF/GEHO0111BTJK-E-E.pdf>

Environment Agency (2011) What's In Your Backyard – Interactive Maps [online] <http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=e>

Environment Agency (2009) Habitats Regulations Assessment of the River Basin Management Plan for the Dee River Basin District.

Environment Agency (2009) Prepare Your Property for Flooding – A Guide for Householders and Small Businesses [Online] <http://publications.environment-agency.gov.uk/PDF/GEHO1009BRDL-E-E.pdf>

Communities and Local Government (2012) Technical Guidance to the National Planning Policy Framework [Online] <http://www.communities.gov.uk/publications/planningandbuilding/nppftechnicalguidance>

Communities and Local Government (2012) National Planning Policy Framework [Online] <http://www.communities.gov.uk/publications/planningandbuilding/nppf>

Welsh Government (2011) Planning Policy Wales [Online]

<http://wales.gov.uk/topics/planning/policy/ppw/?jsessionid=vYMvPZGVtqvQJBhpFfpJPrycvv0QnvnXwY8Cc3yt2FbSbjgvS2fl-862695484?lang=en>

Welsh Government (2004) Planning Policy Wales. Technical Advice Note 15: Development and Flood Risk [Online] <http://wales.gov.uk/docs/desh/publications/040701tan15en.pdf>

WSP (2012) Drainage Strategy Statement – Southern Converter Station.

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Appendix 1: Legislation, Standards and Good Practice

Technical Advice Note 15 (TAN15)

TAN15 provides technical guidance in relation to development and flooding in Wales. It Advices on development and flood risk in relation to sustainability, and provides a framework within which risks arising from both river and coastal flooding, and from additional run-off from development in any location can be assessed. TAN15 should be read in conjunction with Planning Policy Wales.

A summary of the requirements of TAN15 is provided below.

1. Sources of Flooding

TAN15 makes note to six forms of flooding that should be considered as part of a flood consequence assessment. These forms of flooding are listed in Table 1, along with an explanation of each form of flooding.

Forms of Flooding

Flooding From Rivers (Fluvial Flooding)
Watercourses flood when the amount of water in them exceeds the flow capacity of the river channel. Flooding can either develop gradually or rapidly, depending on the characteristics of the catchment. Land use, topography and the development can have a strong influence on flooding from rivers.
Flooding From the Sea (Tidal Flooding)
Flooding to low-lying land from the sea and tidal estuaries is caused by storm surges and high tides. Where tidal defences exist, they can be overtopped or breached during a severe storm, which may be more likely with climate change.
Flooding from Land (Pluvial Flooding)
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. In developed areas, this flood water can be polluted with domestic sewage where foul sewers surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. Flooding can be exacerbated if development increases the percentage of impervious area.
Flooding from Groundwater
Groundwater flooding occurs when groundwater levels rise above ground levels (i.e. groundwater issues). Groundwater flooding is most is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Chalk is the most extensive source of groundwater flooding.
Flooding from Sewers
In urban areas, rainwater is frequently drained into sewers. Flooding can occur when sewers are overwhelmed by heavy rainfall, and become blocked. Sewer flooding continues until the water drains away.
Flooding from Other Artificial Sources (i.e. reservoirs, canals, lakes and ponds)
Non-natural or artificial sources of flooding can include reservoirs, canals and lakes. Reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure.

2. Development Advice Map

For river and sea flooding, TAN15 defines areas of flood risk as Development Advice Maps (DAMs) in four zones. These DAMs refer to the probability of flooding and are detailed in Table 2.

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DAM Zones (Adapted from TAN15, Figure 1)

Description of Zone	DAM Zone	Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

3. Vulnerability

TAN15 classifies the vulnerability of developments to flooding into three categories. These categories are detailed in Table 3.

Flood Risk Vulnerability Classification (Adapted from TAN15, Figure 2)

Development category	Types
Emergency services	Hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood
Highly vulnerable development	All residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites

4. The Justification Test (Section 6 Assessment)

TAN15 notes that new development should be directed away from Zone C and towards suitable land in Zone A, otherwise to Zone B, where river or coastal flooding will be less of an issue. However, much urban development in Wales has taken place alongside rivers and in the coastal plain. It is therefore inevitable, despite the overall aim to avoid flood risk areas, that some existing development will be vulnerable to flooding and fall within Zone C. Some flexibility is therefore necessary to enable the risks of flooding to be addressed whilst recognising the negative economic and social consequences if policy were to preclude investment in existing urban areas and the benefits of reusing previously developed land.

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In Zone C, the TAN15 Section 6 Justification Test and Flood Consequence Assessment will be applied.

It is noted that highly vulnerable development and Emergency Services in Zone C2 should not be permitted, whilst all other new development should only be permitted within Zones C1 and C2 if determined by the planning authority to be justified in that location. Development (including transport infrastructure) will only be justified if it can be demonstrated that:

- i. Its location in Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or,
- ii. Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;
and,
- iii. It concurs with the aims of Planning Policy Wales and meets the definition of previously developed land (as per Planning Policy Wales Figure 2.1); and,
- iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in TAN15 (i.e. Sections 5 and 7 and Appendix 2 of TAN15) are found to be acceptable.

5. Climate Change

TAN 15 states that there is mounting evidence that the global climate is changing as a result of human activity. The latest Climate Change scenarios for the United Kingdom 2002 produced for the UK Climate Impacts Programme (UKCIP), show how the climate of the UK is already changing, and how this will become more pronounced over the coming decades. These predict that by the 2080's winter precipitation may increase by up to 30%. Heavy winter precipitation is likely to become more frequent, with the precipitation intensities that are currently experienced around once every two years becoming possibly between 5% and 20% higher. Relative sea levels will continue to rise around most of the UK's shoreline, and with these extreme sea levels will be experienced more frequently.

6. Sustainable Drainage

TAN15 notes that development in one part of a catchment may increase run-off and hence flood risk elsewhere, therefore, the aim should be for new development not to create additional run-off when compared with the undeveloped situation, and for redevelopment to reduce run-off where possible. Sustainable Drainage Systems (SuDS) provide an effective way of achieving this objective, and Part H of the Building Regulations (DTLR, 2002) directs developers towards the use of SuDS wherever possible.

Building Regulations Part H (2000)

Buildings Regulations Part H provides guidance in terms of foul drainage, wastewater treatment systems and cesspools, rainwater drainage, building over sewers, separate systems for drainage and solid waste disposal. In relation to flood risk, Buildings Regulations Part H states a hierarchy of where surface water should discharge. This hierarchy should be followed where practicable, and is listed below:

- i. Infiltration
- ii. Watercourses
- iii. Public Sewers

SuDS Manual – Ciria Report C697 (2007)

Ciria Report C697 provides best practice guidance on the planning, design, construction, operation and maintenance of Sustainable Drainage Systems (SUDS) to facilitate their effective implementation within a development.

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The guidance addresses landscaping, biodiversity issues, public perception and community integration as well as water quality treatment and sustainable flood risk management.

The CIRIA Report suggests that one level of treatment is provided for residential developments.

Sewers for Adoption 6th Edition (2006)

Sewers for Adoption is a document which has become the standard for the design and construction of sewers to adoptable standards in England and Wales. It acts as a guide to assist developers in preparing their submission to a sewerage undertaker before they enter into an Adoption Agreement under Section 104 of the Water Industry Act 1991.

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Appendix 2: Site Information

SITE PHOTOGRAPHS

ENVIROCHECK FLOOD SCREENING REPORT

SITE VISIT PHOTOGRAPHS



1. General view looking north east across the site, taken from the south west area of the site.



2. General view looking north east across the site. Evidence of some onsite ponding.



3. General view looking south along the western boundary of the site, taken from the north west area of the site.



4. General view looking north west across the site, taken from the south east area of the site.

Envirocheck[®] Report:

Flood Screening Report Datasheet

Order Details:

Order Number:

38031388_1_1

Customer Reference:

60161093

National Grid Reference:

330560, 370980

Slice:

A

Site Area (Ha):

0.01

Search Buffer (m):

1000

Site Details:

Site at

Connahs Quay

Flintshire

Client Details:

Ms J Belcher

AECOM Ltd

5th Floor, 2 Clty Walk

Leeds

LS11 9AR

Report Section and Details	Page Number
Summary	-
<p>The Summary section provides an overview of the data contained within the report, detailing the number of data set features or the existence of a data set in relation to the buffer(s) selected. For ease of reference, the report is broken down into seven sections of data.</p>	
EA / CEH Flood Data	1
<p>This section details data from the Environment Agency and the Centre for Ecology and Hydrology.</p> <p>The EA data is reported to a distance of 250m from the edge of the site polygon and details both Zone 2 (extreme) and Zone 3 flood extents, as well as flood defences, flood water storage areas and areas benefiting from flood defences.</p> <p>The CEH data is reported to a distance of 250m from the edge of the site polygon and covers flood data for Scotland, divided into levels based on the frequency and magnitude of a predicted 100 year term.</p> <p>All data sets within this section are plotted and feature on the EA / CEH Flood Data (1:10,000) map. For added value, OS Contour data is also plotted, detailing contours, spot heights and air heights.</p>	
RMS Flood Data	2
<p>This section contains the Risk Management Solutions flood data. The data is based upon the likelihood of a flood occurrence for 3 flood return periods; these being 75 years, 100 years and 1000 years.</p> <p>Each return period is depicted on a separate 1:10,000 scale map and reports features to a distance of 250m from the edge of the site polygon.</p> <p>Each return period can detail both defended and/or undefended flood features, with each feature also reporting an associated flood depth. In addition pluvial flood features are also detailed where applicable, but tidal flooding is not included. For added value, OS Contour data is also plotted, detailing contours, spot heights and air heights.</p>	
BGS Flood Data	3
<p>This section contains two BGS data sets; namely Geological Indicators of Flooding and Groundwater Flooding Susceptibility, both of which report features out to a possible 1000m, with coverage in England, Wales and Scotland.</p> <p>Each data set is plotted on a separate BGS Flood Data (1:50,000) map.</p>	
EA Detailed River Network Data	6
<p>This section details 3 sources of data that depict and detail the river network of England and Wales, captured primarily from the water features theme of Ordnance Survey's OS MasterMap Topography Layer.</p> <p>The DRN Lines data set details all the types of rivers, drains and streams which can be found in England and Wales.</p> <p>The DRN Nodes data set details the river, drain and stream node intersections which divide the detailed river network data. All nodes are defined as being one of the following: A source, sink, junction, or pseudo node, interactions or not assigned.</p> <p>The DRN Offline Drainage dataset details water features from OS MasterMap that do not connect into the river network and are generally limited in length.</p> <p>All data sets within this section are plotted and feature on the EA Detailed River Network (1:10,000) map. For added value, OS Contour data is also plotted, detailing contours, spot heights and air heights.</p>	
EA Historic Flood Events Data	16
<p>This section details Historic Flood data sourced from the Environment Agency and from data held by Landmark. The EA Historic Flood Events data is reported to a distance of 1000m from the edge of the site polygon and details recorded historic flood events from 1703 to October 2008. The data also contains information on the source and cause of the flood, and how the flood outline was established.</p> <p>Also included in this section is Landmark's Historical Flood Liabilities data set, which identifies areas that are liable to flood based on systematic analysis of historical mapping dating back to the mid 19th century.</p> <p>Both data sets within this section are plotted and feature on the EA Historical Flood (1:10,000) map. For added value, OS Contour data is also plotted, detailing contours, spot heights and air heights.</p>	

EA NaFRA Data	17
<p>This section details the National Flood Risk Assessment (NaFRA) data sourced from the Environment Agency and is reported to a distance of 1000m from the edge of the site polygon. The NaFRA data provides an indication of flood risk at a national level. The data has been created by calculating the actual likelihood of flooding to areas of land within the flood plain of an extreme flood (0.1% or 1 in 1000 chance in any year).</p> <p>The method considers the probability that the flood defences will overtop or breach, and the distance of the impact cell from the river or the sea. It enables a comparison of the relative risks and their distribution within each of these catchments, rather than a detailed, local assessment of the risk at a specific location. EA do not hold information on properties (including floor levels). NaFRA data can therefore only be assessed if there are properties within the impact cells where EA have assessed the flood risk.</p> <p>The data within this section is plotted and featured on the EA NaFRA Data (1:50,000) map.</p>	
Flood Insurance Risk Data	20
<p>This section contains two sources of flood risk data from Aviva and Crawford and Company. Neither data sets are plotted on any of the associated Flood maps.</p> <p>Aviva has generated a detailed flood risk assessment to accurately evaluate the flood risk for individual customers. The information from this assessment has been used to define a risk model detailing 5 levels of flood risk, based on the individual properties rather than the postcode. The flood risk assessment undertaken by Aviva is for river flooding and coastal flooding only, and does not include groundwater, flash or sewerage flooding. Only the worst case flood risk is reported for the site.</p> <p>Crawford & Co have generated an Insurance Claims rating for Flood Risk. The risk is determined by comparing the number of flood insurance claims made to the number of properties in the postcode sector. The data will also include flood claims from domestic accidents or blocked drains, as well as flooding from river or tidal events. Flood insurance claim ratings are reported for the site only.</p>	
Data Currency	21
Data Suppliers	22
Useful Contacts	23

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Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
EA / CEH Flood Data					
Extreme Flooding from Rivers or Sea without Defences	pg 1	1		n/a	n/a
Flooding from Rivers or Sea without Defences	pg 1	1	1	n/a	n/a
Areas Benefiting from Flood Defences	pg 1	1	1	n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
RMS Flood Data					
RMS 75 year Flood Return	pg 2	1		n/a	n/a
RMS 100 year Flood Return	pg 2	1		n/a	n/a
RMS 1000 year Flood Return	pg 2	1		n/a	n/a
BGS Flood Data					
BGS Geological Indicators of Flooding	pg 3	1			2
BGS Groundwater Flooding Susceptibility	pg 3	1	5	7	31
EA Detailed River Network Data					
Detailed River Network Lines	pg 6		9	9	25
Detailed River Network Nodes	pg 13		6	11	19
Detailed River Network Offline Drainage	pg 14		1	3	17
EA Historic Flood Events Data					
Historic Flood Events					
Historical Flood Liabilities	pg 16		1		2
EA National Flood Risk Assessment Data					
National Flood Risk Assessment	pg 17	1		5	28
Flood Insurance Risk Data					
Property-based Flood Risk			n/a	n/a	n/a
Postcode Sector Flood Insurance Claim Ratings	pg 20	1	n/a	n/a	n/a

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Tidal Models Boundary Accuracy: As Supplied	A13NE (N)	0	1	330558 370976
	Flooding from Rivers or Sea without Defences Type: Extent of Flooding from Rivers or Sea without Defences Flood Plain Type: Tidal Models Boundary Accuracy: As Supplied	A13NE (N)	0	1	330558 370976
	Flooding from Rivers or Sea without Defences Type: Extent of Flooding from Rivers or Sea without Defences Flood Plain Type: Tidal Models Boundary Accuracy: As Supplied	A13NE (N)	176	1	330566 371150
	Areas Benefiting from Flood Defences Type: Area Benefiting from Flood Defences Boundary Accuracy: As Supplied	A13NE (N)	0	1	330558 370976
	Areas Benefiting from Flood Defences Type: Area Benefiting from Flood Defences Boundary Accuracy: As Supplied	A13NE (N)	176	1	330566 371150
	Flood Water Storage Areas None				
	Flood Defences None				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	RMS 75 year Flood Return Flood Type/Depth: 75 year pluvial flood, depth is not applicable Flood Hazard: Pluvial & Minor River Flood Risk	A13NE (N)	0	2	330558 370976
	RMS 100 year Flood Return Flood Type/Depth: 100 year pluvial flood, depth is not applicable Flood Hazard: Pluvial & Minor River Flood Risk	A13NE (N)	0	2	330558 370976
	RMS 1000 year Flood Return Flood Type/Depth: 1000 year pluvial flood, depth is not applicable Flood Hazard: Pluvial & Minor River Flood Risk	A13NE (N)	0	2	330558 370976

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Geological Indicators of Flooding Flooding Type: Coastal Flooding Flood Potential: Higher flood potential from the sea: the first areas to experience the effects of coastal flooding. Code:	A13NE (N)	0	3	330558 370976
	BGS Geological Indicators of Flooding Flooding Type: Coastal Flooding Flood Potential: Higher flood potential from the sea: the first areas to experience the effects of coastal flooding. Code:	A12SE (W)	563	3	330000 370904
	BGS Geological Indicators of Flooding Flooding Type: Coastal Flooding Flood Potential: Higher flood potential from the sea: the first areas to experience the effects of coastal flooding. Code:	A8SE (S)	975	3	330558 370001
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A13NE (N)	0	3	330558 370976
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A13SW (S)	26	3	330550 370951
	BGS Groundwater Flooding Susceptibility Flooding Type: Negligible Susceptibility to Groundwater Flooding	A13NW (NW)	132	3	330450 371051
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A13NE (N)	176	3	330558 371151
	BGS Groundwater Flooding Susceptibility Flooding Type: Negligible Susceptibility to Groundwater Flooding	A13NE (N)	230	3	330600 371201
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A13NE (N)	244	3	330650 371201
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A13NW (W)	260	3	330300 371001
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A13NE (NE)	299	3	330800 371151
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A13NW (W)	309	3	330250 370976
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A13SW (W)	318	3	330250 370901
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A13NE (N)	339	3	330650 371301
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A13SW (SW)	448	3	330250 370651
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A14NW (E)	449	3	331000 371051
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A8NE (S)	512	3	330750 370501
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A12NE (W)	524	3	330050 371101
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A18SE (N)	534	3	330650 371501
	BGS Groundwater Flooding Susceptibility Flooding Type: Negligible Susceptibility to Groundwater Flooding	A18SE (N)	545	3	330700 371501
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A12NE (W)	559	3	330000 370976

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A8NW (S)	565	3	330350 370451
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A12NE (W)	573	3	330000 371101
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A12SE (W)	602	3	330000 370751
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A12NE (W)	603	3	330000 371201
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A12SE (W)	609	3	329950 370951
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A18SE (N)	655	3	330750 371601
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A12NE (W)	659	3	329900 371001
	BGS Groundwater Flooding Susceptibility Flooding Type: Negligible Susceptibility to Groundwater Flooding	A12NE (W)	659	3	329900 370976
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A18NW (N)	724	3	330300 371651
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A17SE (NW)	734	3	330000 371451
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A18NE (N)	751	3	330750 371701
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A17SE (NW)	758	3	329900 371351
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A19SW (NE)	771	3	331200 371401
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A8SE (S)	775	3	330558 370201
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderate Susceptibility to Groundwater Flooding	A7NW (SW)	802	3	329850 370601
	BGS Groundwater Flooding Susceptibility Flooding Type: Negligible Susceptibility to Groundwater Flooding	A7NE (SW)	816	3	330100 370301
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A7SE (SW)	854	3	330200 370201
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A9NW (SE)	866	3	331100 370301
	BGS Groundwater Flooding Susceptibility Flooding Type: Low Susceptibility to Groundwater Flooding	A9SW (SE)	876	3	331050 370251
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A17NE (NW)	877	3	330000 371651
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A7SE (SW)	885	3	330050 370251
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A14SE (E)	920	3	331450 370751

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Negligible Susceptibility to Groundwater Flooding	A7SE (SW)	955	3	330000 370201
	BGS Groundwater Flooding Susceptibility Flooding Type: Moderately High Susceptibility to Groundwater Flooding	A8SE (S)	975	3	330558 370001
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A8SE (S)	985	3	330700 370001
	BGS Groundwater Flooding Susceptibility Flooding Type: High Susceptibility to Groundwater Flooding	A8SW (S)	988	3	330400 370001

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SW (SW)	14	1	330550 370965
2	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NE (NE)	91	1	330604 371054
3	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NE (NE)	99	1	330635 371038
4	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NE (NE)	99	1	330635 371038
5	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NW (N)	123	1	330536 371096
6	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NW (N)	126	1	330520 371095

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
7	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NW (NW)	183	1	330404 371072
8	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SW (S)	221	1	330497 370763
9	Detailed River Network Lines River Type: Extended Culvert (greater than 50m) River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Below Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SE (SE)	223	1	330720 370823
10	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SW (SW)	301	1	330368 370743
11	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SW (SW)	301	1	330368 370743
12	Detailed River Network Lines River Type: Tertiary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SE (SE)	304	1	330787 370776

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
13	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SW (SW)	319	1	330283 370816
14	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13SW (SW)	319	1	330283 370816
15	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NW (W)	333	1	330232 371041
16	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NW (W)	341	1	330231 371072
17	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NE (NE)	375	1	330872 371179
18	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A13NE (NE)	375	1	330872 371179

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
19	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A8NW (S)	645	1	330443 370342
20	Detailed River Network Lines River Type: Tertiary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NE (W)	667	1	329892 370999
21	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NE (W)	675	1	329890 371066
22	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	699	1	329861 371012
23	Detailed River Network Lines River Type: Tertiary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A14NE (E)	798	1	331306 371253
24	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A19SE (NE)	802	1	331261 371361

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
25	Detailed River Network Lines River Type: Primary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Currently Undefined Flood Risk: Flood Risk Management Indicative/Statutory Main River Management Status: Water Course: SHOTWICK BROOK NORTH Name: Water Course: 2099 Reference:	A14NE (E)	806	1	331341 371166
26	Detailed River Network Lines River Type: Primary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Flood Risk Management Indicative/Statutory Main River Management Status: Water Course: SHOTWICK BROOK NORTH Name: Water Course: 2099 Reference:	A14NE (E)	811	1	331319 371256
27	Detailed River Network Lines River Type: Tertiary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A14NE (E)	811	1	331319 371256
28	Detailed River Network Lines River Type: Primary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Currently Undefined Flood Risk: Flood Risk Management Indicative/Statutory Main River Management Status: Water Course: SHOTWICK BROOK NORTH Name: Water Course: 2099 Reference:	A19SE (NE)	830	1	331293 371361
29	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	864	1	329699 371067
30	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Secondary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	864	1	329699 371067

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
31	Detailed River Network Lines River Type: Extended Culvert (greater than 50m) River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Below Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A7SE (SW)	874	1	330008 370297
32	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	881	1	329680 371031
33	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A8SW (S)	924	1	330231 370112
34	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A14SE (E)	941	1	331468 370737
35	Detailed River Network Lines River Type: Primary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Flood Risk Management Indicative/Statutory Main River Management Status: Water Course: FINGERPOST GUTTER WEST Name: Water Course: 2129 Reference:	A12NW (W)	952	1	329612 371073
36	Detailed River Network Lines River Type: Primary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Flood Risk Management Indicative/Statutory Main River Management Status: Water Course: FINGERPOST GUTTER WEST Name: Water Course: 2129 Reference:	A12NW (W)	952	1	329612 371070

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
37	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	954	1	329607 371036
38	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	954	1	329607 371036
39	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	957	1	329604 371049
40	Detailed River Network Lines River Type: Secondary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A12NW (W)	957	1	329604 371049
41	Detailed River Network Lines River Type: Primary River River Name: Not Supplied Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk: Flood Risk Management Indicative/Statutory Main River Management Status: Water Course: FINGERPOST GUTTER WEST Name: Water Course: 2129 Reference:	A12NW (W)	960	1	329603 371063
42	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A14SE (E)	998	1	331499 370644

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
43	Detailed River Network Lines River Type: Secondary River River Name: Drain Hydrographic Area: D010 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Drain (ditch, Reen, Rhyne, Drain) Flood Risk: Other Rivers Management Status: Water Course: Not Supplied Name: Water Course: Not Supplied Reference:	A14SE (E)	998	1	331499 370644
44	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A13NE (NE)	99	1	330635 371038
45	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A13NE (NE)	123	1	330658 371046
46	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A13NW (N)	126	1	330520 371095
47	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A13NW (NW)	183	1	330404 371072
48	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A13SW (S)	221	1	330497 370763
49	Detailed River Network Nodes River Node Type: Pseudo (OS MasterMap polygon boundary) Hydrographic Area: D010	A13SE (SE)	223	1	330720 370823
50	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A13SW (SW)	301	1	330368 370743
51	Detailed River Network Nodes River Node Type: Pseudo (general) Hydrographic Area: D010	A13SE (SE)	304	1	330787 370776
52	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A13SW (SW)	306	1	330371 370734
53	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A13SW (SW)	319	1	330283 370816
54	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A13SE (SE)	335	1	330817 370763
55	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A13NW (W)	341	1	330231 371072
56	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A13NE (E)	362	1	330895 371109
57	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A13SW (SW)	365	1	330300 370719
58	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A13NE (NE)	375	1	330872 371179
59	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A12SE (W)	379	1	330192 370882
60	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A14NW (NE)	445	1	330949 371187

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
61	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A19SW (NE)	504	1	330920 371327
62	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A8NW (S)	655	1	330465 370328
63	Detailed River Network Nodes River Node Type: Pseudo (OS MasterMap polygon boundary) Hydrographic Area: D010	A12NE (W)	667	1	329892 370999
64	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A12NE (W)	675	1	329890 371066
65	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A12NW (W)	699	1	329861 371012
66	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A14NE (E)	798	1	331306 371253
67	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A14NE (E)	811	1	331319 371256
68	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A14NE (E)	829	1	331347 371232
69	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A19SE (NE)	830	1	331293 371361
70	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A12NW (W)	864	1	329699 371067
71	Detailed River Network Nodes River Node Type: Pseudo (OS MasterMap polygon boundary) Hydrographic Area: D010	A7SE (SW)	874	1	330008 370297
72	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A12NW (W)	881	1	329680 371031
73	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A14SE (E)	941	1	331468 370737
74	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A12NW (W)	952	1	329612 371073
75	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A12NW (W)	954	1	329607 371036
76	Detailed River Network Nodes River Node Type: Source Hydrographic Area: D010	A12NW (W)	956	1	329603 371003
77	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A12NW (W)	957	1	329604 371049
78	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A12NW (W)	960	1	329603 371063
79	Detailed River Network Nodes River Node Type: Junction Hydrographic Area: D010	A14SE (E)	998	1	331499 370644
80	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A13SE (S)	178	1	330598 370803
81	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A13NW (W)	271	1	330301 371059

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
82	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A13SW (SW)	300	1	330310 370808
83	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A13NW (W)	346	1	330222 371055
84	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A18SE (NE)	553	1	330875 371429
85	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A19SW (NE)	597	1	330924 371447
86	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A18SE (NE)	599	1	330865 371490
87	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A19SW (NE)	603	1	330934 371447
88	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A19SW (NE)	603	1	330934 371447
89	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A8SE (SE)	780	1	330865 370259
90	Detailed River Network Offline Drainage River Type: Tertiary River Hydrographic Area: D010	A18NW (NW)	789	1	330239 371697
91	Detailed River Network Offline Drainage River Type: Tertiary River Hydrographic Area: D010	A18NW (N)	790	1	330453 371759
92	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A9NW (SE)	800	1	330993 370304
93	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A9NW (SE)	825	1	331100 370354
94	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A9NW (SE)	825	1	331100 370354
95	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A9NW (SE)	828	1	331101 370350
96	Detailed River Network Offline Drainage River Type: Tertiary River Hydrographic Area: D010	A9NW (SE)	844	1	331117 370344
97	Detailed River Network Offline Drainage River Type: Tertiary River Hydrographic Area: D010	A9NW (SE)	887	1	331178 370341
98	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A9SW (SE)	925	1	331105 370230
99	Detailed River Network Offline Drainage River Type: Tertiary River Hydrographic Area: D010	A9NE (SE)	958	1	331240 370304
100	Detailed River Network Offline Drainage River Type: Secondary River Hydrographic Area: D010	A9SW (SE)	988	1	331157 370190

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
101	Historical Flood Liabilities Use: Area liable to flood Date of Mapping: 1900	A13NE (N)	116	4	330579 371089
102	Historical Flood Liabilities Use: Area liable to flood Date of Mapping: 1900	A18NW (N)	931	4	330399 371892
103	Historical Flood Liabilities Use: Area liable to flood Date of Mapping: 1900	A8SW (S)	946	4	330367 370049

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	National Flood Risk Assessment (NaFRA) Flood Risk: Significant Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A13NE (N)	0	4	330558 370976
	National Flood Risk Assessment (NaFRA) Flood Risk: Low Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A13NE (N)	326	4	330558 371301
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A13SE (SE)	335	4	330750 370701
	National Flood Risk Assessment (NaFRA) Flood Risk: Significant Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12NE (W)	352	4	330207 370976
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A14NW (E)	442	4	331000 370976
	National Flood Risk Assessment (NaFRA) Flood Risk: Low Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A14SW (E)	449	4	331000 370901
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A18SE (NE)	539	4	330810 371451
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A14NW (NE)	549	4	331000 371301
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12SE (SW)	562	4	330100 370651
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12NE (W)	573	4	330000 371101
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12SE (SW)	578	4	330050 370701
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12NE (W)	594	4	330000 371176
	National Flood Risk Assessment (NaFRA) Flood Risk: Low Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A7NE (SW)	595	4	330200 370501
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A7NE (SW)	618	4	330100 370561







Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A14NW (NE)	628	4	331095 371301
	National Flood Risk Assessment (NaFRA) Flood Risk: Low Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A18SE (N)	638	4	330725 371591
	National Flood Risk Assessment (NaFRA) Flood Risk: Low Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12SE (W)	649	4	329950 370751
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A18SE (N)	650	4	330750 371596
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12NE (NW)	662	4	329950 371236
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A19SW (NE)	697	4	330950 371551
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A18NE (N)	701	4	330745 371651
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12NE (NW)	733	4	329900 371296
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A17SE (NW)	753	4	329975 371451
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A18NE (N)	765	4	330800 371701
	National Flood Risk Assessment (NaFRA) Flood Risk: Low Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A8SW (S)	775	4	330550 370201
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A17SE (NW)	784	4	329900 371401
	National Flood Risk Assessment (NaFRA) Flood Risk: Low Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12SW (SW)	807	4	329820 370651
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A7NE (SW)	820	4	330000 370376

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	National Flood Risk Assessment (NaFRA) Flood Risk: Significant Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A19NW (NE)	854	4	330915 371751
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A7NE (SW)	890	4	329950 370326
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A19NW (N)	901	4	330900 371809
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A9NE (SE)	906	4	331250 370391
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12NW (W)	908	4	329660 371101
	National Flood Risk Assessment (NaFRA) Flood Risk: Moderate Assessment Code: Source: Environment Agency, Head Office Catchment Area: Dee	A12NW (W)	940	4	329635 371151

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Postcode Sector Flood Insurance Claim Ratings Insurance Rating: Very Low Flood Insurance Claim Rating - No Recorded Claims Postcode Sector: CH5 2	A13NE (N)	0	4	330558 370976

EA / CEH Flood Data	Version	Update Cycle
Extreme Flooding from Rivers or Sea without Defences Environment Agency - Head Office	February 2012	Quarterly
Flooding from Rivers or Sea without Defences Environment Agency - Head Office	February 2012	Quarterly
Areas Benefiting from Flood Defences Environment Agency - Head Office	February 2012	Quarterly
Flood Water Storage Areas Environment Agency - Head Office	February 2012	Quarterly
Flood Defences Environment Agency - Head Office	February 2012	Quarterly
RMS Flood Data	Version	Update Cycle
RMS 75 year Flood Return Risk Management Solutions - Dee Catchment	December 2008	As notified
RMS 100 year Flood Return Risk Management Solutions - Dee Catchment	December 2008	As notified
RMS 1000 year Flood Return Risk Management Solutions - Dee Catchment	December 2008	As notified
BGS Flood Data	Version	Update Cycle
BGS Geological Indicators of Flooding British Geological Survey - National Geoscience Information Service	February 2011	Annually
BGS Groundwater Flooding Susceptibility British Geological Survey - National Geoscience Information Service	February 2011	Annually
EA Detailed River Network Data	Version	Update Cycle
Detailed River Network Lines Environment Agency - Head Office	April 2010	As notified
Detailed River Network Nodes Environment Agency - Head Office	April 2010	As notified
Detailed River Network Offline Drainage Environment Agency - Head Office	April 2010	As notified
EA Historic Flood Events Data	Version	Update Cycle
Historic Flood Events Environment Agency - Head Office	January 2012	Quarterly
Historical Flood Liabilities Landmark Information Group Limited	December 1999	Not Applicable
EA National Flood Risk Assessment Data (NaFRA)	Version	Update Cycle
National Flood Risk Assessment Environment Agency - Head Office	October 2011	Annually
Flood Insurance Risk Data	Version	Update Cycle
Property-based Flood Risk Aviva - Dataservice	January 2010	Not Applicable
Postcode Sector Flood Insurance Claim Ratings Crawford and Company	November 2011	Quarterly

A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	
Environment Agency	
Centre for Ecology and Hydrology	
British Geological Survey	
Aviva	
Risk Management Solutions	

Contact	Name and Address	Contact Details
1	Environment Agency - National Customer Contact Centre (NCCC) PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 08708 506 506 Email: enquiries@environment-agency.gov.uk
2	Landmark Information Group Limited Legal and Financial, The Smith Centre, Fairmile, Henley-on-Thames, Oxon, RG9 6AB	Telephone: 0844 844 9966 Fax: 0844 844 9980 Email: info@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk
3	British Geological Survey - Enquiry Service British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
4	Landmark Information Group Limited 5 - 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Telephone: 01392 441761 Fax: 01392 441709 Email: cssupport@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk
-	Landmark Information Group Limited The Smith Centre, Henley On Thames, Oxfordshire, RG9 6AB	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

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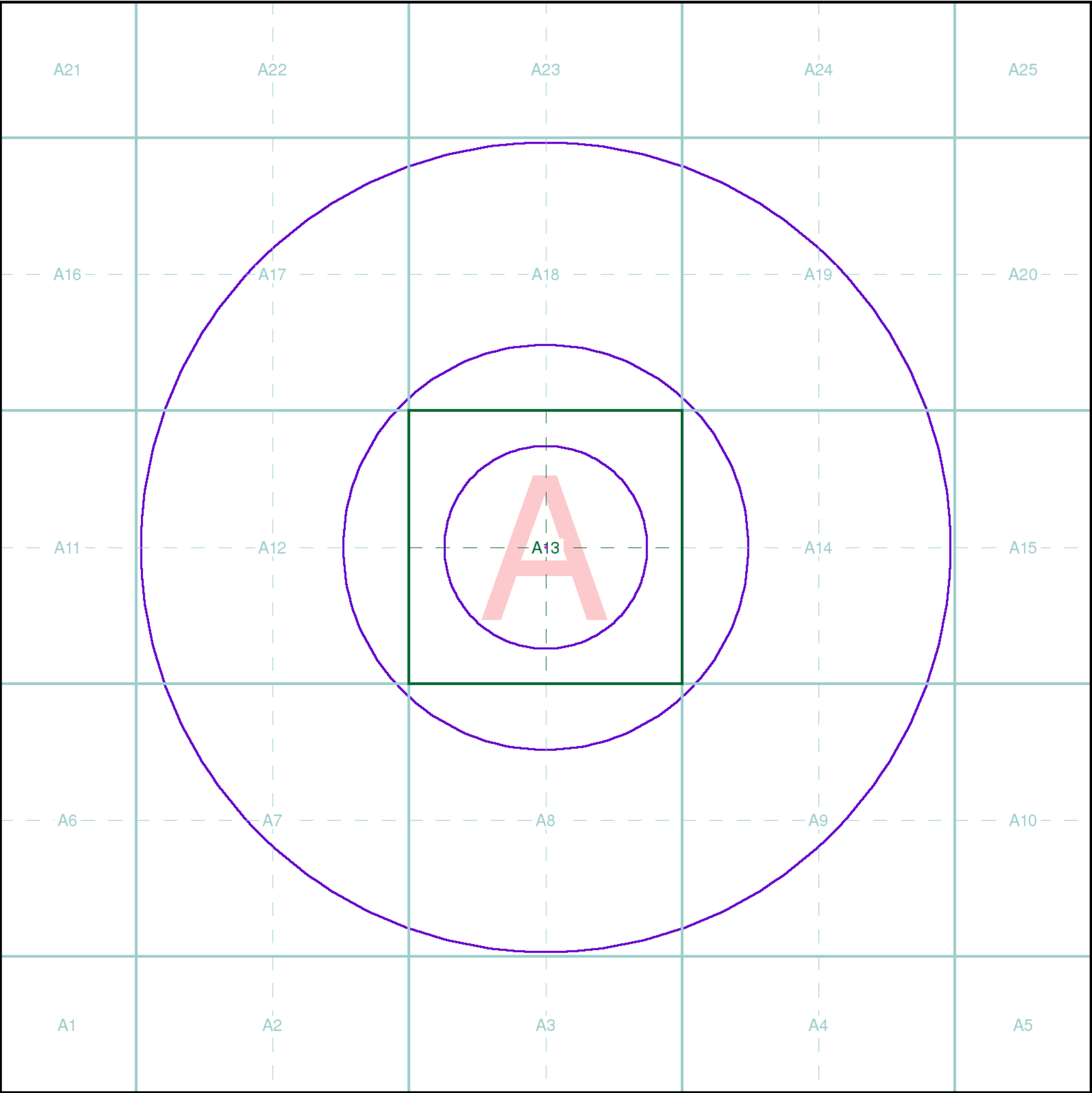
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RMS Flood Data Information

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Index Map

For ease of identification, your site and buffer have been split into Slices, Segments and Quadrants. These are illustrated on the Index Map opposite and explained further below.

Slice
Each slice represents a 1:10,000 plot area (2.7km x 2.7km) for your site and buffer. A large site and buffer may be made up of several slices (represented by a red outline), that are referenced by letters of the alphabet, starting from the bottom left corner of the slice "grid". This grid does not relate to National Grid lines but is designed to give best fit over the site and buffer.

Segment
A segment represents a 1:2,500 plot area. Segments that have plot files associated with them are shown in dark green, others in light blue. These are numbered from the bottom left hand corner within each slice.

Quadrant
A quadrant is a quarter of a segment. These are labelled as NW, NE, SW, SE and are referenced in the datasheet to allow features to be quickly located on plots. Therefore a feature that has a quadrant reference of A7NW will be in Slice A, Segment 7 and the NW Quadrant.

A selection of organisations who provide data within this report:



Envirocheck reports are compiled from 136 different sources of data.

Prepared For

HVDC Site B
Connahs Quay, Flintshire

Client Details

Ms J Belcher, AECOM Ltd, 5th Floor, 2 City Walk, Leeds, LS11 9AR

Order Details

Order Number: 38031388_1_1
Customer Ref: 60161093
National Grid Reference: 330560, 370980
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



LANDMARK STANDARD TERMS AND CONDITIONS

DEFINITIONS

In these Terms, the following terms have the following meanings:
"Agreement" has the meaning set out in clause 1.d.
"Authorised Reseller" means an agent or reseller who We have duly appointed to resell Our Reports and Services.
"Consumer" means a natural person acting for purposes other than his trade, business or profession.
"Content" means any data, computing and information services and software, and other content and documentation or support materials and updates included in and/or supplied by or through the Websites, in Reports or Services or in any other way by Us and shall include both material developed by or on behalf of Us and Third Party Content.
"End User" means either: (i) a Consumer or a Consumer's friend or family member who uses the Services provided to the Consumer; or (ii) where You are not a Consumer, an employee of Yours who uses the Services provided to You; or (iii) a person identified in clause 2.b or their respective employees.
"Fees" means any charges levied by Us or an Authorised Reseller for Services provided to You.
"First Purchaser" means the first person, or legal entity to purchase the Property Site following provision of a Report.
"First Purchaser's Lender" means the funding provider for the First Purchaser.
"Information Pack" means a pack compiled by or on behalf of the owner or prospective buyer of the Property Site, designed to aid the marketing or purchase of the Property Site and containing information provided by or on behalf of the owner or prospective buyer of the Property Site.
"Intellectual Property Rights" means copyright, patent, design right (registered or unregistered), service or trade mark (registered or unregistered), database right or other data right, moral right or know how or any other intellectual property right.
References to "We", "Us" and "Our" are references to Landmark Information Group Limited, whose registered office is 7 Abbey Court, Eagle Way, Exeter, EX2 7HY.
"Order" means the request for Services from Us by You.
"Property Site" means a land site in relation to which We provide a Service.
"Report" includes any information that We supply to You including all reports, services, datasets, software or information contained in them.
"Services" means the provision of any service by Us pursuant to these Terms, including without limitation, any Report.
"Supplier" means any third party organisation that provides services, software, data, information and other content or functionality of any form to Us.
"Terms" means these terms and conditions.
"Third Party Content" means the services, software, data, information and other content or functionality provided by Suppliers and linked to or contained in the Services.
"Website" means any website hosted by Us and includes the Content and any report, service, document, data-set, software or information contained in such websites or derived from them.
References to "You", "Your" and "Yourself"

- refer to the contracting party who accesses the Website or places an Order with Us.
- 1. Basis of Contract**
- a. These Terms govern the relationship between Us and You where You purchase Services from Us. Where these Terms are not expressly accepted by You, they will be deemed to have been accepted by You, and You agree to be bound by these Terms, when You place any Order, or pay for any Services provided to You by Us.
 - b. You shall take all reasonable steps to check that the details that You provide in relation to Your Order are complete, accurate and correct and that the Report has been prepared for the correct location and property type. Neither We nor any Suppliers shall have any liability for errors or omissions in information provided by or on behalf of You or from Your failure to check that the Report relates to the correct location or property.
 - c. We may modify these Terms, and may discontinue or revise any or all other aspects of the Services at Our sole discretion, with immediate effect and without prior notice, including without limitation changing the Services available at any given time. Any amendment or variation to these Terms shall be posted on Our Websites. You acknowledge that it shall remain Your responsibility to check Our Website from time to time for any such amendments or variation to these Terms. Continued Orders of the Services by You shall be deemed an acceptance by You to be bound by any such amendments to the Terms.
 - d. These Terms together with Your Order, the Fees and delivery details in relation to Your Order and Our privacy policy, which is available on the Website, constitute the entire agreement between the parties relating to the supply of Services to You by Us ("Agreement"). You acknowledge that You have not relied on any statement, promise or representation made or given by or on behalf of Us which is not set out in the Agreement or delivery details. Nothing in this clause 1.d shall limit or exclude any liability for fraud.
 - e. These Terms shall prevail at all times to the exclusion of all other terms and conditions including any terms and conditions which You may purport to apply even if such other provisions are submitted in a later document or purport to exclude or override these Terms and neither the course of conduct between parties nor trade practice shall act to modify these Terms.
- 2. Services and Licensed Use**
- a. Subject to clauses 6.d, 6.k and 6.l, We shall use all reasonable skill, care and diligence in the performance of the Services.
 - b. Subject always to these Terms You may, without further charge, make the Services available to:
 - i. the owner of the whole or part of the Property Site at the date of the Report;
 - ii. any person who purchases the whole or part of the Property Site;

- iii. any person who provides funding secured on the whole or part of the Property Site;
- iv. any person for whom You act in a professional or commercial capacity in relation to the Property Site;
- v. any person who acts for You in a professional or commercial capacity in relation to the Property Site; and/or
- vi. prospective buyers of the whole or part of the Property Site as part of an Information Pack but for the avoidance of doubt, We shall have no liability to such prospective buyer unless the prospective buyer subsequently purchases the Property Site, and the prospective (or actual) buyer shall not be entitled to make the Service available to any other third party.
- c. You shall not hold yourself out or describe yourself as Our agent or an agent of any of the Suppliers.
- d. You shall ensure that acknowledgements of copyright and database right ownership are included in a conspicuous position in all copies of the Content. You may not delete any of Our or the Suppliers' intellectual property protection notices (including without limitation copyright notices or trade marks) from the Content.
- e. You shall use Your best endeavours to use adequate technological and security measures, including measures We or Suppliers may reasonably recommend from time to time, to ensure that all Content which You hold or are responsible for is secure from unauthorised use or access.
- f. The Content shall only be used strictly in accordance with these Terms and not for any other purpose; nor shall any use of the Content be made that would or might be deemed to be disparaging to Us, the Suppliers or any of them. You shall not be entitled to resell or rent any Content or otherwise any supply products incorporating such Content for commercial sale or rental.
- g. You shall not reverse engineer, separate or otherwise tamper with the Content so that Content can be extracted and used for any purpose outside the scope of the Agreement.
- h. If You are a Company or public body, You agree that the licensed use of Content pursuant to the Agreement always excludes its use by any of Your subsidiaries, holding companies or subsidiaries of such holding companies (as such terms are defined in section 1159 of the Companies Act 2006) or by any government entity associated with You (in each case as applicable). You agree, and shall procure, that any such company or entity shall enter into a separate agreement with Us.
- i. All other uses of the Content are prohibited. If You wish to use the Content in a manner which is not authorised by the Terms, then You must contact Us to seek the necessary consents or licences (which may include further licences from the Suppliers), for which there may be additional Fees.
- j. You agree to notify Us as soon as You suspect any infringement of Our or any of

- Our Supplier's intellectual property rights and You agree to give Us all reasonably required assistance in pursuing any potential infringement.
- 3. Intellectual Property and Confidentiality**
- a. You acknowledge and agree that all Intellectual Property Rights in Content are and shall continue to be owned by Us or Our Suppliers and nothing in the Agreement shall transfer, assign or grant any rights to You (save for the licence as set out above).
 - b. Subject to any use of the Content in accordance with these Terms, You acknowledge and agree that You shall, and shall procure that any person to whom You provide access to the Content shall, treat as strictly private and confidential the Services, the Content and all information which they obtain from the Services and Content. You agree to indemnify Us against all liabilities, damages, penalties, costs, expenses (including legal expenses on an indemnity basis) or other loss suffered or incurred by Us in relation to any breach or alleged breach of this clause 3.b.
- 4. Termination**
- a. At any time, We may terminate the Agreement with immediate effect by giving You written notice:
 - i. if You are in breach of the Terms and, if such breach is capable of remedy, You fail to remedy the breach within 30 days of written notice from Us specifying the breach and requiring it to be remedied; and
 - ii. if You have a receiver or administrative receiver or administrator appointed over You or any part of Your undertaking or assets or shall pass a resolution for winding up (otherwise than for the purpose of a bona fide scheme of solvent amalgamation or reconstruction) or if a court of competent jurisdiction shall make an order to that effect or if You become subject to an administration order or enter into a voluntary arrangement with Your creditors or shall cease or threaten to cease to carry on business or if You are presented with a bankruptcy petition.
 - b. In the event of the termination or expiry of the Agreement:
 - i. You shall, subject to clause 4.b.iii, immediately cease to use the Report and any Content;
 - ii. You shall, subject to clause 4.b.iii, within 30 days of such termination or expiry, destroy all Content in any media which You hold or for which You are responsible and provide, at Our request, a sworn statement by a duly authorised person that You no longer hold such Content;
 - iii. except in the event of termination by Us under clause 4.a, You may retain Content in an archive following expiry of the Agreement for the sole purpose of addressing a complaint or challenge from a regulator or other third party regarding Your use of such Content during the term of the Agreement. Your rights are on condition that: (a)

- the archive rights do not apply to Content that include third party Intellectual Property Rights (other than Content provided by Ordnance Survey to the extent that the Intellectual Property Rights in such Content are owned by Ordnance Survey); (b) You shall not disclose Content retained under this clause 4.b.iii to any regulator or other third party except strictly to the extent necessary for the relevant purpose of addressing a complaint or challenge from a regulator or other third party and in paper or read-only electronic format only; (c) You must store such Content separately from any other data which You hold; and (d) subject to clause 6.a, We shall have no liability for Your use of it following termination or expiry of the Agreement; and
- iv. the parties shall have no further obligations or rights under the Agreement, without prejudice to those which have accrued to either party prior to termination or expiry save that the "Definitions", clauses 2.c to 2.j (inclusive), this clause 4.b, clauses 5.d, 6, 7, 9, 10 and 11 together with those other clauses the survival of which is necessary for the interpretation or enforcement of the Agreement or which by their nature can be reasonably interpreted as surviving the expiry or termination of the Agreement, shall continue to have effect after such expiry or termination.
- 5. Payments**
- a. An individual or a monthly invoice showing all Orders created by You will be generated subject to these Terms. You will pay the Fees at the rates set out in Our or Our Authorised Reseller's invoice within 30 days of the date of each invoice without deduction, counterclaim or set off. Where Your order comprises a number of Services or severable elements within any one or more Services, any failure by Us or its Authorised Reseller to provide an element or elements of the Services shall not prejudice Our or Our Authorised Reseller's ability to require payment in respect of the Services delivered to You. You acknowledge that time is of the essence with respect to the payment of such invoices.
 - b. VAT shall be due in addition to any Fees. You shall pay any other applicable indirect taxes related to Your use of the Services.
 - c. Neither We nor any Authorised Reseller shall be required to notify You in advance of any amendment to the Fees and the placing of any further Order for Services shall be deemed acceptance of any revisions to the Fees.
 - d. If You fail to pay by the due date any amount due and payable by You under the Agreement, We shall be entitled, but not obliged to, charge You interest on the overdue amount, payable by You immediately on demand, accruing from the due date up to the date of actual payment, after as well as before judgment, at the rate set out in the Late Payment of Commercial Debts (Interest) Act 1998 from time to time and fixed sum compensation

- under the Late Payment of Commercial Debts Regulations 2002. Such interest shall accrue on a daily basis.
- 6. Liability**
- a. Nothing in these Terms excludes or limits either party's liability for death or personal injury caused by that party's negligence or wilful default or for fraud, and the remainder of this clause 6 is subject to this provision. If You are a Consumer, Your statutory rights (which include, for example, that We will provide the Services to a reasonable standard and within a reasonable time) are not affected by anything in these Terms.
 - b. Save as set out in clause 6.a, We shall not be liable to You or to any End User in contract, tort (including negligence) or for breach of statutory duty or in any other way for:
 - i. any indirect or consequential losses (which includes any loss that could not have been reasonably expected by You and Us at the time of entering into these Terms);
 - ii. loss arising from or in connection with loss of revenues, profits, contracts or business or failure to realise anticipated savings; or
 - iii. loss of goodwill or reputation.
 - c. Save as set out in clause 6.a, Our total liability to You and/or any End User in contract or tort (including negligence) or for breach of statutory duty shall not exceed an amount of ten million pounds (£10,000,000) per claim or series of connected claims.
 - d. The Content that Services are based on is derived from third party sources. Therefore, save as set out in clause 6.l in respect of risk assessments and professional opinions, We do not warrant the accuracy or completeness of any information or Content provided, unless We should reasonably have been alerted to any omission, error or inaccuracy in the Content. Such Content is provided specifically from the sources as described by Us and We do not claim that these represent an exhaustive or comprehensive list of all sources that might be consulted.
 - e. You acknowledge and agree that neither You nor any End User shall have any claim or recourse against any Supplier of Third Party Content.
 - f. You acknowledge and agree that We do not warrant that the online supply of Content or Services or any internet ordering service will be: uninterrupted or error free or provide any particular facilities or functions; free from defects; free from software viruses; free of error from computer malfunction, inaccurate processing; free from corruption of data whilst geo-coding, processing by computer or electronic means or in the course of transmission; or similar, although We will use reasonable endeavours to correct any such issues within a reasonable period of them becoming known (which may be limited to notifying the relevant Supplier). Time shall not be of the essence in providing the Content or Services.
 - g. You acknowledge and agree that no physical inspection of the Property Site

- reported on is carried out as part of any Services offered by Us and We do not warrant that all land uses or features whether past or current will be identified in the Services. The Services do not include any information relating to the actual state or condition of any Property Site nor should they be used or taken to indicate or exclude actual fitness or unfitness of a Property Site for any particular purpose nor should it be relied upon for determining saleability or value or used as a substitute for any physical investigation or inspection.
- h. You acknowledge and agree that We will not be held liable in any way if a Report is used otherwise than as provided for in these Terms and/or in the Report.
- i. You acknowledge and agree that the Services have not been prepared to meet Your or anyone else's individual requirements and it is Your responsibility to ensure that the Services ordered are suitable for Your (or the End User's) intended purpose.
- j. You acknowledge and agree that You shall, on receipt of a Report carry out a reasonable inspection to satisfy Yourself that there are no apparent defects or failures with respect to the description and location of the Property Site and shall promptly inform Us if there are any such defects or failures.
- k. All liability for any insurance products purchased by You rests solely with the insurer. We do not endorse any particular product or insurer and no information contained within the Services should be deemed to imply otherwise. You acknowledge that if You Order any such insurance We will deem such as Your consent to forward a copy of the Report to the insurers. Where such policy is purchased, You acknowledge and agree that all liability shall remain with the insurers and that You are entirely responsible for ensuring that the insurance policy offered is suitable for Your needs and should seek independent advice. We do not guarantee that an insurance policy will be available on a Property Site. You acknowledge and agree that all decisions with regard to the offer of insurance policies for any premises will be made solely at the discretion of the insurers and We accept no liability in this regard. The provision of a Report does not constitute any indication by Us that insurance will be available on the Property Site.
- l. We may provide You with professional opinions or a risk assessment in a Report. You acknowledge and agree that We shall carry out (or procure that third parties carry out) such assessment with reasonable skill and care and that We shall be liable where any such risk assessment is carried out negligently. Notwithstanding the foregoing We shall not be liable for any inaccurate statement, opinion or risk rating in a Report which resulted from a reasonable interpretation of the Content.
- m. Neither You, nor any End User or any other person may rely on a Service more than 12 months after it was originally provided.
- n. You shall use all reasonable endeavours to ensure that End Users acknowledge and agree to the limitations and exclusions of liability set out in this clause 6.
- 7. Contribution**
- a. Save where expressly provided, this clause 7 shall apply solely to Envirosearch Residential Reports (regardless of the result of such Report). Nothing in this clause 7 shall operate to override or vary the provisions of clause 6.
- b. We are prepared to offer, without any admission or inference of liability, a contribution towards the costs of any remediation works required under a Notice (as defined below) on the terms of this clause 7 ("the Contribution").
- c. In the event that a Remediation Notice is served on the First Purchaser or First Purchaser's Lender of a Property Site under Part IIA of the Environmental Protection Act 1990 ("the Notice") We shall contribute to the cost of such works as either the First Purchaser or First Purchaser's Lender (but not both) are required to carry out under the Notice subject to the provisions of this clause 7 and on the following terms:
- i. the Contribution shall only apply to contamination or a pollution incident present or having occurred prior to the date of the Report;
- ii. the Contribution shall only apply where the Property Site is a single residential dwelling house or a single residential flat within a block of flats. For the avoidance of doubt, this obligation does not apply to any commercial property, nor to any Property Site being developed or redeveloped whether for residential purposes or otherwise;
- iii. the Contribution is strictly limited to the cost of works at the Property Site and at no other site; and
- iv. the Contribution will not be paid in respect of any of the following: (1) radioactive contamination of whatsoever nature, directly or indirectly caused by or contributed to or arising from ionising radiations or contamination by radioactivity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel or the radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof; (2) asbestos arising out of or related in any way to asbestos or asbestos-containing materials on or in structures or services serving the structures; (3) naturally occurring materials arising from the presence or required removal of naturally occurring materials except in circumstances where such materials are present in concentrations which are in excess of their natural concentration; (4) intentional non-compliance arising from the intentional disregard of or knowing wilful or deliberate non-compliance by any owner or occupier of the Property Site with any statute, regulation, administrative complaint, notice of violation, or notice letter of any Regulatory Authority; (5) any condition which is known or ought reasonably to have been known to the First Purchaser or the First Purchaser's Lender prior to the purchase of the Report; (6) any condition which is caused by acts of war or an act of terrorism; (7) any property belonging to or in the custody or control of the First Purchaser which does not form a fixed part of the Property Site or the structure; (8) any fines liquidated damages punitive or exemplary damages; (9) any bodily injury including without limitation, death, illness or disease, mental injury, anguish or nervous shock; (10) any financial loss in respect of any loss of any rental, profit, revenue, savings or business or any consequential indirect or economic loss damage or expense including the cost of rent of temporary premises or business interruption; and/or (11) any losses incurred following a material change in use of, alteration or development of the Property Site.
- d. Without prejudice to Your other rights and remedies under the Agreement, the maximum sum that shall be contributed by Us in respect of any Contribution shall be limited to £60,000. In the event that more than one Report is purchased on the Property Site the Contribution will only be payable under the first Report purchased by or on behalf of any First Purchaser or First Purchaser's Lender and no Contribution will be made in respect of subsequent Reports purchased by or on behalf of such First Purchaser, First Purchaser's Lender or any person connected to them.
- e. We shall only pay a Contribution where the Notice is served within 36 months of the issue date of the Report.
- f. Any rights to a Contribution under this clause 7 are not assignable in the event of a sale of the Property Site and We shall not make any Contribution after the date of completion of such sale.
- g. In the event the First Purchaser or First Purchaser's Lender wishes to claim any Contribution, it shall notify Us in writing within 3 months of the date of the Notice. The First Purchaser or First Purchaser's Lender (as applicable) shall comply with all Our reasonable requirements with regard to the commission and conduct of the remediation works to be carried out under the Notice, and in the event the First Purchaser or First Purchaser's Lender (as applicable) does not do so, including without limitation, obtaining Our prior written consent to any estimates for such works or complying with any other reasonable request by Us, We shall not be required to pay any Contribution. Notwithstanding the payment of the Contribution by Us the First Purchaser or First Purchaser's Lender as applicable shall take all reasonable steps to mitigate any costs incurred in connection with the conduct of works required under the terms of any Notice.
- h. In the event that the First Purchaser or First Purchaser's Lender receives any communication from a statutory authority to the effect that there is an intent to serve a notice received under Part IIA of the Environmental Protection Act 1990 You shall ensure that they advise Us within a maximum period of two months from receipt of such communication. This clause 7.h and the service of any notice under it shall not affect the provisions of clauses 7.e and 7.g, and any such communications, even if advised to Us will not operate as notice under clause 7.e.
- i. We reserve the right at any time prior to a claim for Contribution being made in accordance with clause 7.g above, to withdraw the offer of payment of Contributions without further notice.
- 8. Assignment and Sub-contracting**
- a. We shall be entitled to assign or transfer the Agreement as We reasonably see fit.
- b. The Agreement is personal to You. You shall not assign, transfer, sub-licence or otherwise deal with any of Your rights and obligations under the Agreement without Our prior written consent.
- c. We may authorise or allow Our contractors and other third parties to provide to Us and/or to You services necessary or related to the Services and to perform Our obligations and exercise Our rights under these Terms, which may include collecting payment on Our behalf.
- 9. Events Beyond Our Control**
- a. Neither party to the Agreement shall be liable for any delay or failure to perform their obligations caused by any circumstance beyond their control, and such party shall be entitled to a reasonable extension of time for the performance of such obligation.
- 10.Complaints and Dispute Resolution**
- a. Any complaints in relation to the Services should, in the first instance, be in writing addressed to the Customer Service Support Manager at Our registered office. We will (or Our agents will) respond to any such complaints in writing as soon as practicably possible.
- b. If any dispute arises out of or in connection with the Terms of the Agreement or their validity ("Dispute") the parties undertake, subject to clause 10.c, that prior to commencement of court proceedings they will negotiate in good faith to settle such Dispute by mediation in accordance with the Centre for Effective Dispute Resolution Model Mediation Procedure as in force from time to time, which Procedure is deemed to be incorporated by reference into this clause. Unless otherwise agreed between the parties, the mediator will be nominated by the Centre for Effective Dispute Resolution. To initiate the mediation a party shall give notice in writing to the other party to the dispute requesting a mediation. The mediation will start not later than 21 days after the date of service of such notice. If the Dispute has not been resolved to the mutual satisfaction of the parties within 60 days (or such other period as they shall agree) after the date of service of such notice then either party may refer the Dispute to the courts in accordance with clause 11.f.
- c. Clause 10.b shall be without prejudice to
- the rights of termination stated in clause 4.a and in addition shall not prevent Us from:
- i. applying for injunctive relief in the case of: (1) breach or threatened breach of confidentiality; or (2) infringement or threatened infringement of Our or Our Suppliers' intellectual property rights; or
- ii. pursuing a debt claim for the payment of the Fees.

11.General

- a. If any provision of the Agreement is found by either a court or other competent authority to be void, invalid, illegal or unenforceable, that provision shall be deemed to be deleted from the Agreement and never to have formed part of the Agreement and the remaining provisions shall continue in full force and effect.
- b. No delay, failure or omission on Our, or any Supplier's, part in enforcing, exercising or pursuing any right, power, privilege, claim or remedy conferred by or arising under the Agreement or by law shall be deemed to be or construed as a waiver of that or any other right, power, privilege, claim or remedy, nor shall any single or partial exercise of any such right, power, privilege, claim or remedy preclude the exercise of that or any other right, power, privilege, claim or remedy.
- c. Our privacy policy as displayed on Our Website and updated from time to time governs the use that We shall make of any information provided by You or an End User.
- d. A person who is not a party to any contract made pursuant to these Terms shall have no right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Agreement and We shall not be liable to any such third party in respect of the Products, save that any Supplier may enforce any of these terms and conditions against You in accordance with the Contracts (Rights of Third Parties) Act 1999. Notwithstanding any other provisions of the Agreement, We may rescind or vary the Agreement in accordance with its terms without the consent of the Suppliers and accordingly section 2(1) of the Contracts (Rights of Third Parties) Act 1999 shall not apply.
- e. You shall ensure that each End User complies with and is bound by the Terms and shall procure that We may in Our own right enforce such terms and conditions against the End User pursuant to the Contracts (Rights of Third Parties) Act 1999. You shall be responsible for End User's compliance with the Terms and You shall be liable for all breaches of the Terms by the End Users as if they were breaches by You.
- f. The Agreement and any non-contractual obligations arising out of or in connection with it shall be governed by and construed in accordance with the laws of England and, subject to clause 10.b, each party irrevocably submits to the exclusive jurisdiction of the courts of England and Wales.



EA Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

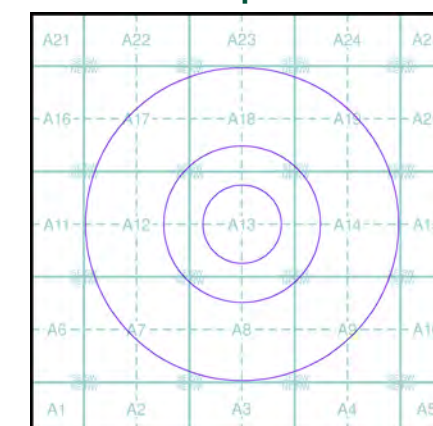
Environment Agency Flood Data

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

- Standard Contour 105
- Index Contour 100
- Spot Height 167.8
- Air Height 45.8

EA Flood Data Map - Slice A



Order Details

Order Number: 38031388_1_1
Customer Ref: 60161093
National Grid Reference: 330560, 370980
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RMS 75 year Return Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

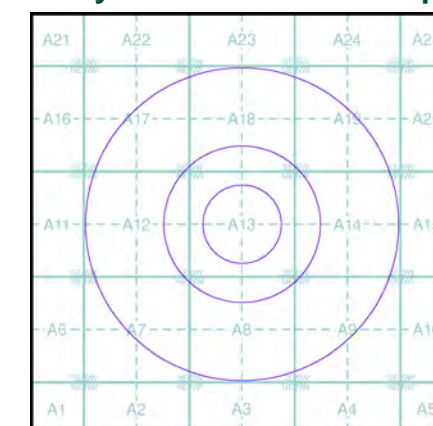
RMS 75 year Return Flood Data

Flood Depth (mm)	Flood Type		Pluvial & Minor River Flood (flood depth n/a)
	Defended Flood	Undefended Flood	
0 - 200			
201 - 500			
501 - 2000			
2001 +			

Contours (height in metres)

Standard Contour			Spot Height
Index Contour			Air Height

RMS 75 year Return Flood Map - Slice A



Order Details

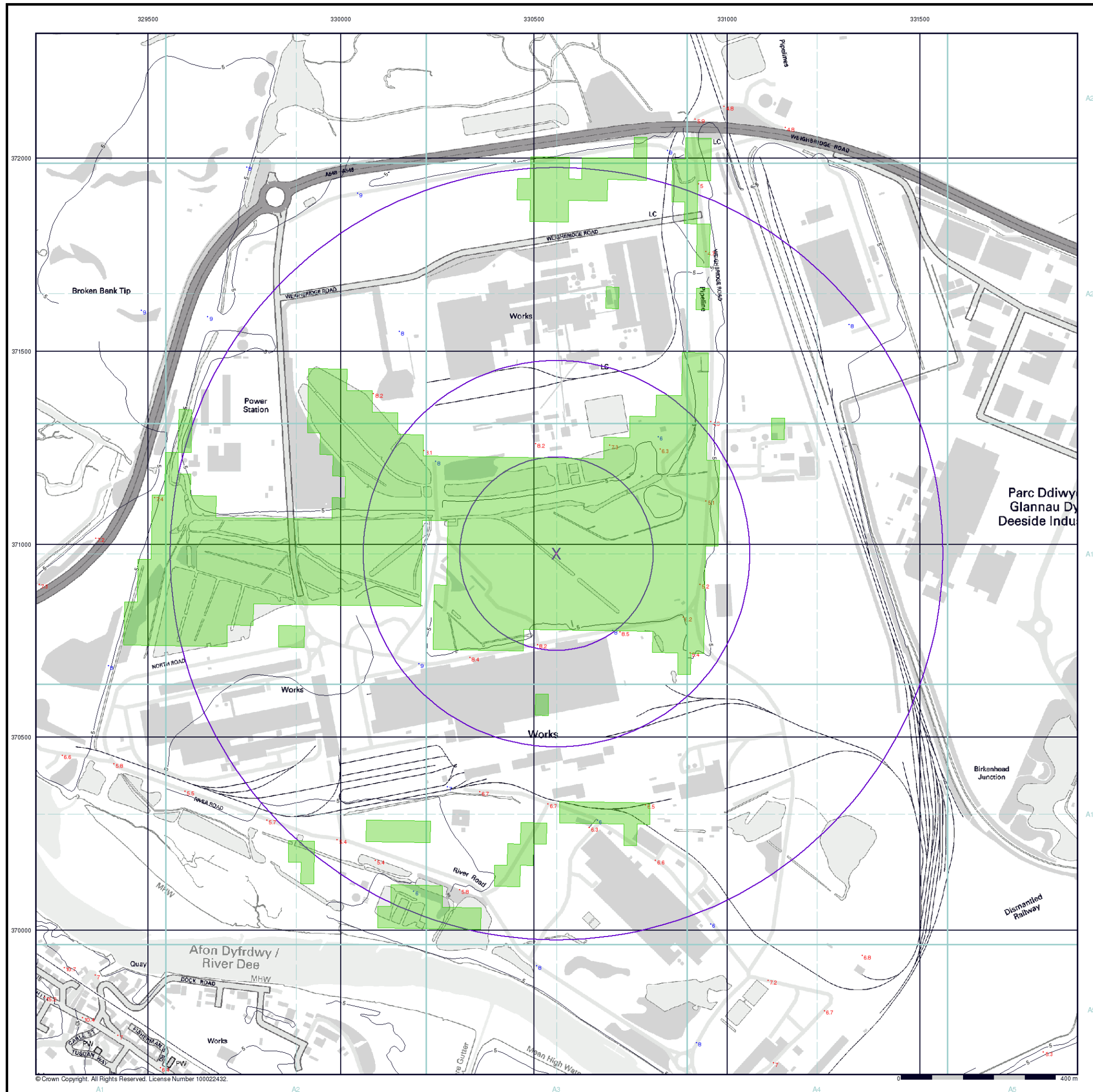
Order Number: 38031388_1_1
Customer Ref: 60161093
National Grid Reference: 330560, 370980
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk





RMS 100 year Return Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

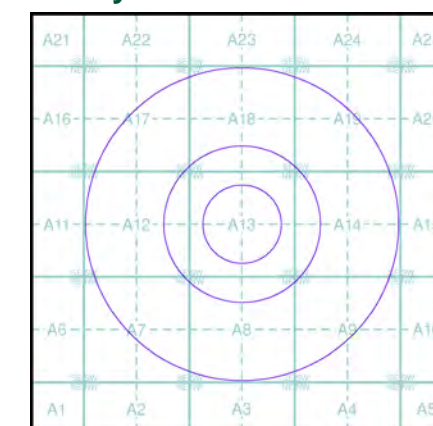
RMS 100 year Return Flood Data

Flood Depth (mm)	Flood Type		Pluvial & Minor River Flood (flood depth n/a)
	Defended Flood	Undefended Flood	
0 - 200			
201 - 500			
501 - 2000			
2001 +			

Contours (height in metres)

Standard Contour				167.3	Spot Height
Index Contour				45.8	Air Height

RMS 100 year Return Flood Map - Slice A



Order Details

Order Number: 38031388_1_1
Customer Ref: 60161093
National Grid Reference: 330560, 370980
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RMS 1000 year Return Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

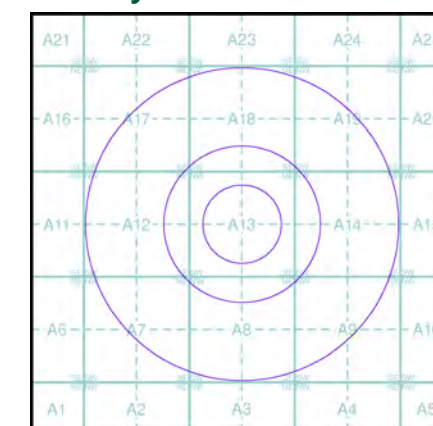
RMS 1000 year Return Flood Data

Flood Depth (mm)	Flood Type		Pluvial & Minor River Flood (flood depth n/a)
	Defended Flood	Undefended Flood	
0 - 200			
201 - 500			
501 - 2000			
2001 +			

Contours (height in metres)

Standard Contour			Spot Height
Index Contour			Air Height

RMS 1000 year Return Flood Map - Slice A



Order Details

Order Number: 38031388_1_1
Customer Ref: 60161093
National Grid Reference: 330560, 370980
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk





EA Detailed River Network Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

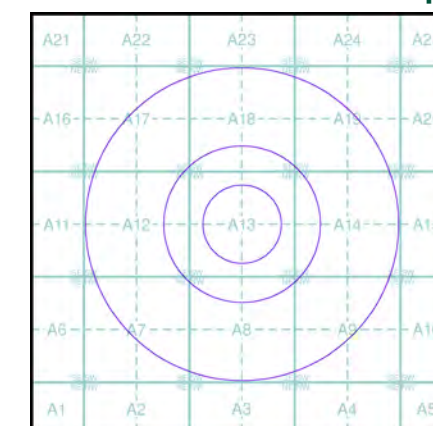
EA Detailed River Network Data

- | | |
|--------------------------|---|
| Primary River | Extended Culvert (greater than 50m) |
| Secondary River | Underground River (inferred) |
| Tertiary River | Underground River (local knowledge) |
| Canal | Downstream of High Water Mark |
| Canal Tunnel | Downstream of Seaward Extension |
| Undefined River | Not assigned River feature |
| Lake/Reservoir | |
| Source | Not assigned River feature |
| Junction | Pseudo Node (general) |
| Sink | Pseudo Node (High Water Mark) |
| Non-interactive Node | Pseudo Node (OS MasterMap polygon boundary) |
| Offline Drainage Feature | |

Contours (height in metres)

- Standard Contour 105 100 95
- Index Contour 105 100 95
- Spot Height 167.3
- Air Height 45.8

EA Detailed River Network Map - Slice A



Order Details

Order Number: 38031388_1_1
Customer Ref: 60161093
National Grid Reference: 330560, 370980
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



EA Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

EA Historic Flood Events Data

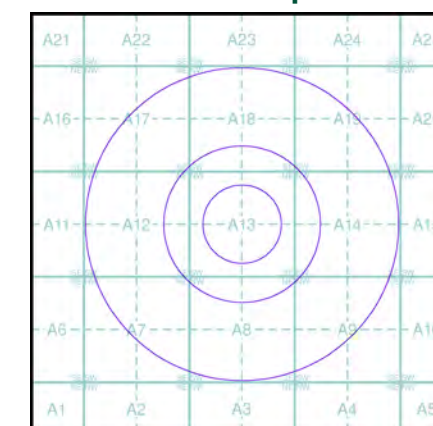
- | | |
|--|---------------------------------------|
| Channel Capacity Exceeded (no raised defences) | Obstruction/Blockage - Culvert |
| Groundwater/High Water Table | Obstruction/Blockage - Debris Screen |
| Local Drainage/Surface Water | Operational Failure/Breach of Defence |
| Mechanical Failure | Other |
| Obstruction/Blockage - Bridge | Overtopping of Defences |
| Obstruction/Blockage - Channel | Unknown |

- Historical Flood Liabilities

Contours (height in metres)

- Standard Contour 105 100 95
- Index Contour
- Spot Height 167.3
- Air Height 45.8

EA Historic Flood Map - Slice A



Order Details

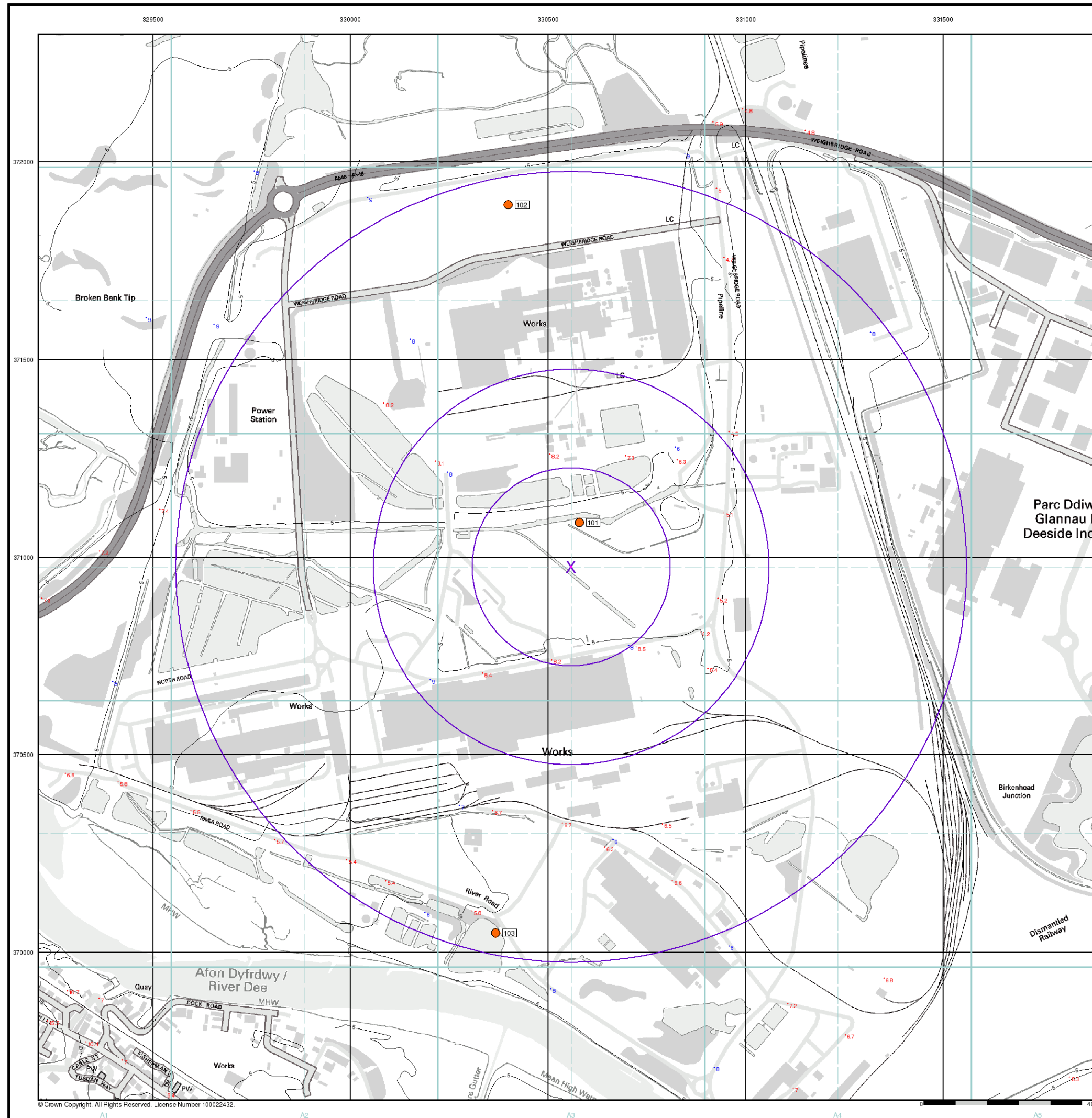
Order Number: 38031388_1_1
Customer Ref: 60161093
National Grid Reference: 330560, 370980
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

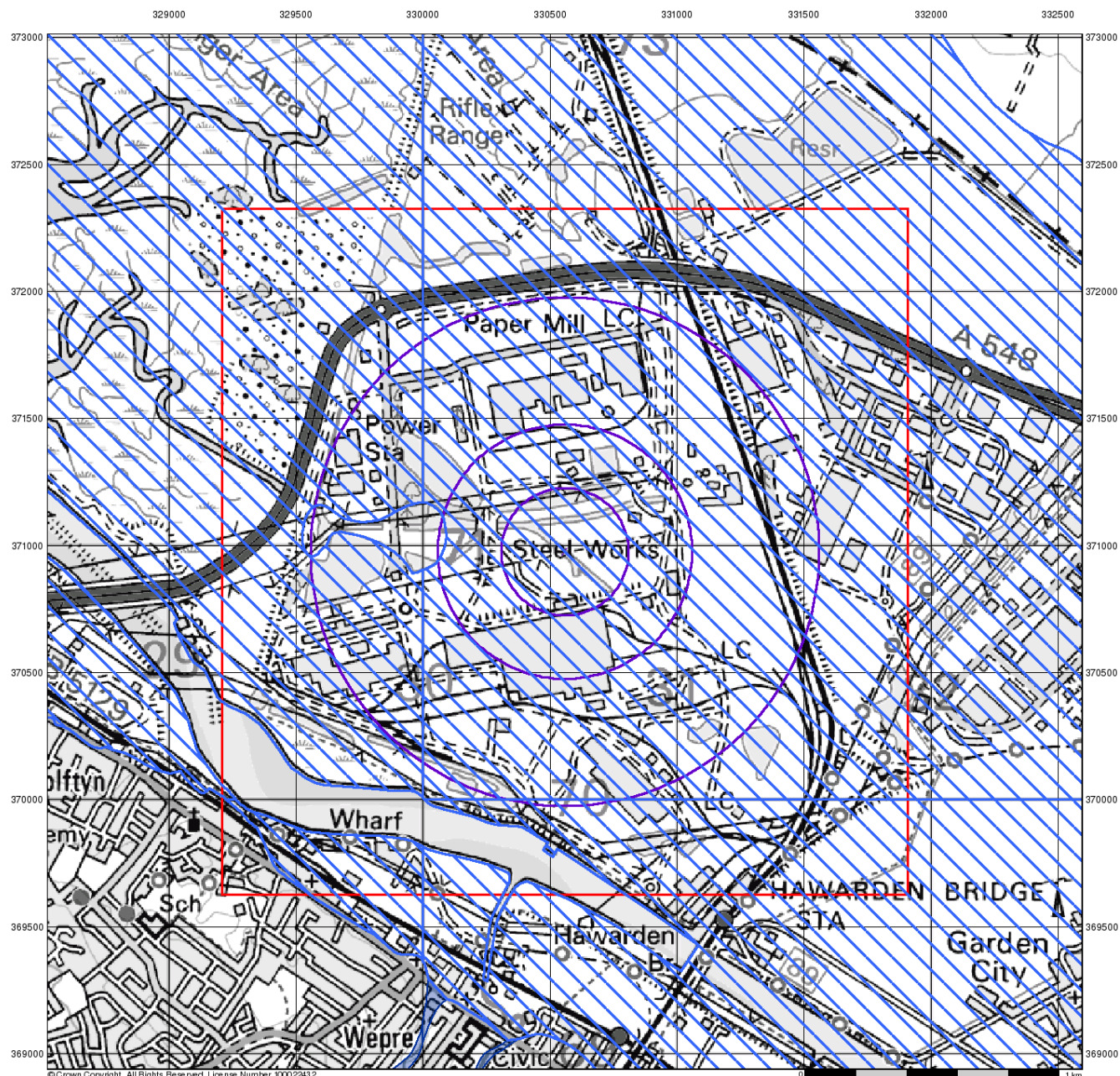
Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk





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BGS Flood Data (1:50,000)

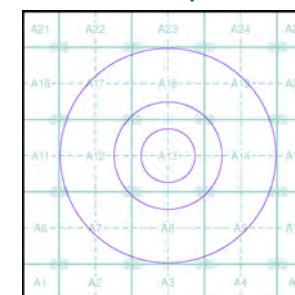
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

BGS Geological Indicators of Flooding

- Coastal
- Inland
- Bodies of Water

BGS Flood Data Map - Slice A



Order Details

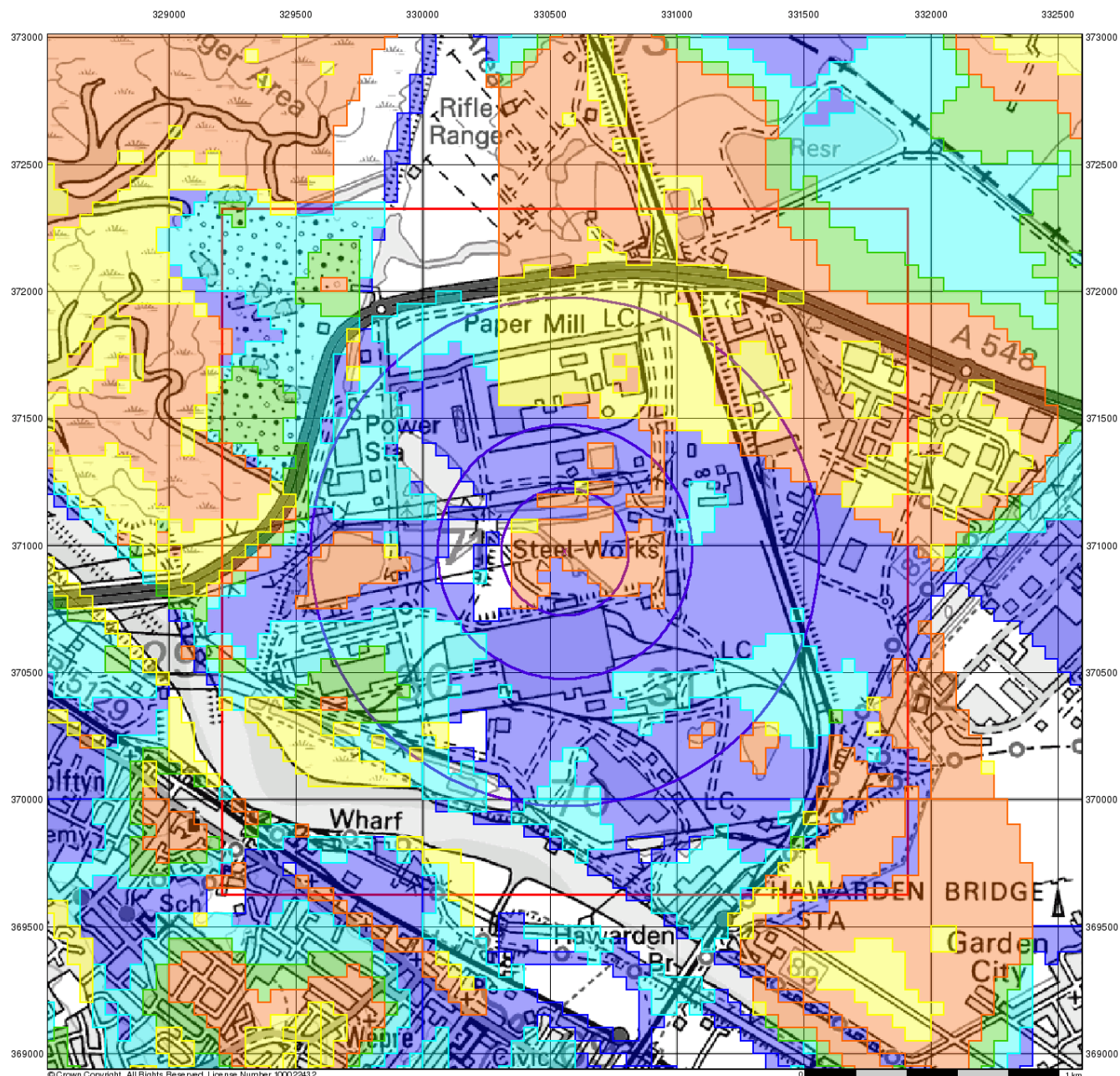
Order Number: 38031388_1_1
 Customer Ref: 60161093
 National Grid Reference: 330560, 370980
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



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BGS Flood Data (1:50,000)

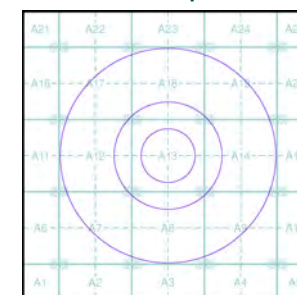
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

BGS Groundwater Flooding Susceptibility

- High Susceptibility
- Moderately High Susceptibility
- Moderate Susceptibility
- Low Susceptibility
- Negligible Susceptibility

BGS Flood Data Map - Slice A



Order Details

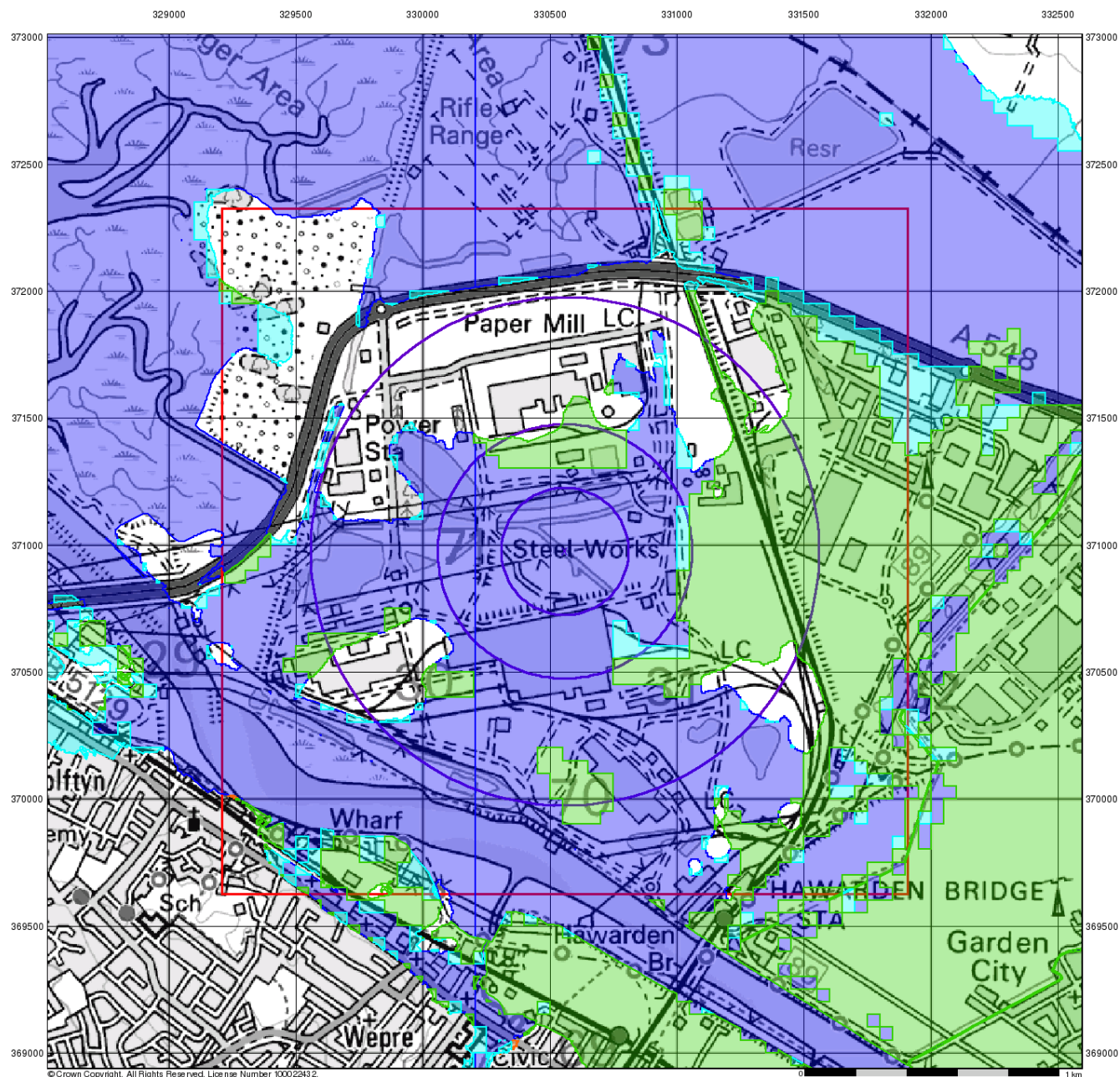
Order Number: 38031388_1.1
 Customer Ref: 60161093
 National Grid Reference: 330560, 370980
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



EA NaFRA Data (1:50,000)

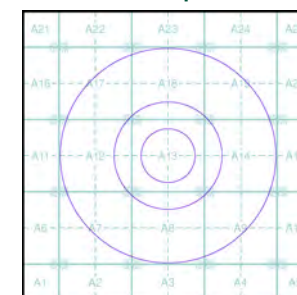
General

- ◇ Specified Site
- Specified Buffer(s)
- X Bearing Reference Point
- Slice
- B Map ID

National Flood Risk Assessment (NaFRA)

- Significant Risk
- Moderate Risk
- Low Risk
- No Result

EA NaFRA Data Map - Slice A



Order Details

Order Number: 38031388_1_1
 Customer Ref: 60161093
 National Grid Reference: 330560, 370980
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at, Connahs Quay, Flintshire



Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk

Capabilities on project:
Water

Appendix 3: Correspondence

ENVIRONMENT AGENCY WALES

Cathryn Spence
Aecom
Aecom House 179 Moss Lane
Hale
ALTRINCHAM
WA15 8FH

Ein cyf/Our ref: NT/2012/114030/01-L01

Eich cyf/Your ref: .

Dyddiad/Date: 04 December 2012

Annwyl Syr/Madam / Dear Sir/Madam

WESTERN LINK ALTERNATIVE CONVERTER STATION WEIGHBRIDGE ROAD, DEESIDE

Thank you for referring the above Technical Assessment of Fluvial-Tidal Flood Risk which was received at our offices 3rd December 2012.

We have considered the details as submitted and based on this information we can advise that we consider the proposal to as outlined to meet the requirements of TAN15. The analysis of site ground levels against the latest predicted flood levels; indicates that the majority of the site is above the 0.5% AEP tidal event (with a 75 year allowance for climate change). Those small areas below this level remain relatively high in comparison with surrounding land. No flood flow routes onto these areas have been established or highlighted by breach modelling undertaken for the nearby alternative HVDC site.

Based on the information submitted we would have no flood risk related objections to the development should a formal consultation be received as part of a planning application.

The details suggest that access and egress to the site (via weighbridge road) may potentially be at risk of flooding under extreme overtopping and/or breach scenarios. We do not normally comment on or approve the adequacy of flood emergency response and evacuation procedures accompanying development proposals, as we do not carry out these roles during a flood. Our involvement with this development during an emergency will be limited to delivering flood warnings to occupants/users. We advise LPAs to consult their Emergency Planners with regard to specific emergency planning issues relating to new development. In all circumstances where warning and evacuation are significant measures in contributing to managing flood risk, we will expect LPAs to formally consider the emergency planning and rescue implications of new development in making their decisions. The modelling work undertaken to date should provide useful and relevant data such as depths, velocities, rates of rise of floodwater along any proposed evacuation routes. This data if provided can be assessed against the 'tolerable conditions' as outlined in table A1.15 of TAN 15.

Please note – We will require conditions to be placed on the development clarifying agreed final finished floor levels in addition to a satisfactory scheme of surface water management as part of the formal planning response.

Please note that these comments do not set a precedent for our response to any formal application for planning permission or other legal consent. Such applications shall be assessed on the information submitted and regulations of relevance at that time. The details contained in this letter are based on the information available to date.

Yn gywir / Yours faithfully

MISS RUTH PRICHARD

Planning Liaison Officer/Swyddog Cydlyn Cynllunio

Deialu uniongyrchol/Direct dial 01248 48 4067

Ffacs uniongyrchol/Direct fax 01248 670561

E-bost uniongyrchol/Direct e-mail Ruth.Prichard@Environment-Agency.gov.uk

Daniel Alstead
AECOM

Ein cyf/Our ref: 2011-12_Q4_665

Eich cyf/Your ref: HDVC Site B

Dyddiad/Date: 5 April 2012

Dear Daniel

**RE: WESTERN HVDC LINK, WEIGHBRIDGE ROAD, CONNAH'S QUAY,
FLINTSHIRE CH5 2LF**

Thank you for your email regarding the above site. Please find below/attached comments.

We have no records of any historic flooding at the site identified on the map.

The site is shown at risk tidally during a 0.5% AEP and 0.1% AEP undefended flood map.

Please find attached:

The Corus Site Embankment, Pre-feasibility Study Jan 2007- **Breaches**

NFCDD data on defences in area. i.e. Corus Embankment-**existing defences**

Tidal Dee FRMS- draft summary available on EA website- **future improvements**

The site is situated within a generally industrialised area. We do not have any information on the specific historical uses of the site or any site investigations that may have been carried out. The Local Authority may hold such information. The bedrock at the site is Mudstone, Sandstone and Conglomerate and is classed as a Secondary A aquifer. This in turn is overlain by 'Devensian Till', that is classed as unproductive strata. There are no mapped Source Protection Zones within 1 Km of the site. There are no abstractions noted in our NALD database within 1 Km of the site, although there appear to be 3 no. within 2Km of the site. The Local Authority may hold additional information on private abstractions.

Biodiversity:

In line with our Data Agreement with COFNOD (the "Local Records Centre") we cannot provide information on sensitive species held in our records.

The developer should contact COFNOD directly for this information, their contact details are:

<http://www.cofnod.org.uk>

Regarding the SSSI / SAC / SPA, please contact the CCW Officer (Paul Day) on 01352 706600 for further guidance on this.

Should you require further information or assistance, then please contact me on the below number.

Yours sincerely

Maggie Logan
Customer Contact Officer

Llinell uniongyrchol/Direct dial: 01248 484162

Ffacs uniongyrchol/Direct fax: 01248 670561

E-bost uniongyrchol/Direct e-mail: margaret.logan@environment-agency.gov.uk

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Based on the Environment Agency's online flood map we are aware that the site is located in Flood Zone 3 (Zone C under TAN15 guidance), at high risk of flooding. As such we would like to purchase Product 4: Detailed FRA Map. We are particularly interested in the following information on the site where available:

Can you confirmation whether the site is located in Zone C1 or C2?

Site is located in zone C1

Do you have any records of historic flooding events on this site, either from fluvial sources and other sources (i.e. sea, surface water, sewers, groundwater, reservoir etc.)? If you are aware of historical flooding at the site, can you please provide us with details of these historical flood events where it is available, including flood levels, estimated return periods, photographs, and other such data as may be relevant to our study?

We have no record of historic flooding at this location

Do you have any Information on drainage within the site and in the local area, including any known drainage problems on site and in the local area?

The Agency holds no data in relation to the drainage within the site. We understand the drainage system to be a pumped scheme controlled and operated by TATA. The private pumping station is located at approx grid ref: SJ2958171175 with the outfall to the west. We advise that you contact TATA directly for additional information on the surface water regime and pumping arrangements.

Please could you provide us with details of the flood defences protecting the site and if possible provide us with any available breach data or information regarding the impact of possible breaches of these defences? Please could you also provide us with information on any proposed improvements to flood defences in this area.

River Dee Embankments Breach Modelling – Corus Site Shotton Sept 2005
Corus Site Embankment Pre-Feasibility Study Report January 2007

I believe these have been provided by ASM. Please note the above Breach Modelling Report is considered outdated in terms of the data and approach used (simple projection modelling) and is unlikely to be of benefit in terms of the Flood Consequences Assessment (FCA). See additional note on FCA requirements.

As required by the Building Regulations, we will need to consider discharge of surface water from the site to soakaway / infiltration as a first option. We would be grateful if you could provide us with any information that you have that may assist in our assessment of this option, such as details of sensitive aquifers in the area, known contamination issues, etc.

Surface water run-off should be controlled as near to its source as possible. Preferably, we would wish to see SuDS** methods utilised if at all practicable – e.g. infiltration / soakaway. If SuDS are not to be used, the developer will need to demonstrate to us why it is not practical at that particular location.

The following scenarios apply if infiltration is not practicable:- if the site is currently undeveloped, we usually require that the discharge rate is limited to the greenfield runoff rate (with on-site attenuation for up to the 1% rainfall event with an appropriate allowance to climate change). For existing developed sites (brownfield), we ask that the developer calculates the existing brownfield runoff rate and, in order to improve the existing situation, the runoff rate should be limited to 2/3 of the existing rate

****If groundwater contamination issues are relevant it may be that a soakaway system is not preferred at this location. Our Groundwater & Contaminated Land Team can advise further in this respect.**

We may need to discharge surface water from this site to watercourse. Please could you confirm the allowable discharge rate? [As above](#)

Please can you also indicate to us whether the Environment Agency is aware of any relevant environmentally sensitive receptors (such as aquatic wildlife in receiving watercourses, etc.) in the area around the site that we should be aware of when preparing this Flood Risk Assessment?

Additional Notes: Flood Consequence Assessment Requirements

The following points have also been raised during the meeting between Agency Officers and AECOM representatives at our Buckley Offices on 28th March 2012.

The primary flood risks identified for the site are considered to be from tidal overtopping and or breach of the flood defences either to the south of the site (Corus Embankments) or to the north of the site (Broken Bank Embankments). See attached map. The proposed development should be demonstrated to be flood free during the 0.5% AEP flood event (+ climate change allowance*) under a breach and/or overtopping conditions of these structures.

*Lifetime of Development & Climate Change:

As part of the FCA process the period of time over which the implications of climate change are considered is required. This is commonly known as the 'lifetime of development'. We currently recommend that a value of 100 years is used when considering residential dwellings and We currently recommend that a value of 75 years is used when considering non residential dwellings*** (Note: As 'lifetime' is not currently prescribed in planning policy in Wales, this value has been derived from planning policy used in England (PPS25 Practice Guide) and is supported by the latest Climate Change Project Appraisal Guidance, approved for use in Wales [FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts])

It is for the Planning Authority to determine/confirm what represents a reasonable period over which climate change should be considered where the above recommendations are not adopted within the FCA.

Note on Embankment Structures and Breach/Overtopping Standard Requirements

The river Dee embankments at this location are some 200 years old and consist of a mixture of materials deriving predominantly from previous river dredgings. They have not been constructed to a design standard comparable with contemporary engineered embankments.

Revised Dee tide levels have raised concerns as to the standard of protection (level-wise) offered by the defences. The predicted levels for the 0.5% event (including a climate change allowance) are shown to overtop or encroach the typical crest level of the embankments. The likelihood of a breach occurring is significantly increased during such situations

The probability of a breach on the Dee embankments by its nature will be uncertain. However in light of the information stated above we consider it a sensible approach that a breach of the defences should be assessed as a potential source of flood risk to new developments located behind the tidal Dee embankments. We regard this approach to be in line with section A1.17 – 17 of TAN 15. At this location where overtopping of an estuarial earthwork embankment is predicted to occur, our standard breach criteria considerations are summarised below:

Assessing the flood risk to this site is complex due to the potential influences of localised flood defences and infrastructure, railway embankment, A548 main road etc.

Location	Defence type	Breach width (m)
Estuary	Earth bank	50
Breach Duration	3 Tide Cycles	
Breach Invert	Ground levels on the landward side of the defence	
Breach Initiation	At the peak of the tide/flood wave or at the point of defence overtopping (whichever occurs first)	

Although we would expect overtopping and breach of the tidal defences to be incorporated into any FCA/model, breach of the railway embankment and A548 would not be requested. However where relevant any potential flow routes through these structures (such as culverts) will need to be considered and incorporated into the FCA/modelling. This approach will ensure that flood risk to the site is better understood and will allow for appropriate mitigation measures to be proposed where appropriate.

It is also worth noting at this stage that should mitigation via land raising or similar measures be necessary then the FCA should address the impact of such measures on flood risk elsewhere.

Prior to undertaking the FCA, the applicant is advised to contact Ruairí Barry (Development & Flood Risk Engineer) at 01244 894582 / Ruairi.Barry@environment-agency.gov.uk for additional advice and information on matters such as the choice of breach locations etc.

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Alstead, Daniel

From: Barry, Ruairi [ruairi.barry@environment-agency.wales.gov.uk]
Sent: 25 April 2012 14:01
To: Alstead, Daniel
Cc: Prichard, Ruth
Subject: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274
Attachments: Breach Note.doc

Thanks Daniel

In addition to our previous comments (attached above), I have discussed this with our Assets and Mapping Teams to get their input.

Breach Location – Onsite (Corus Embankment):



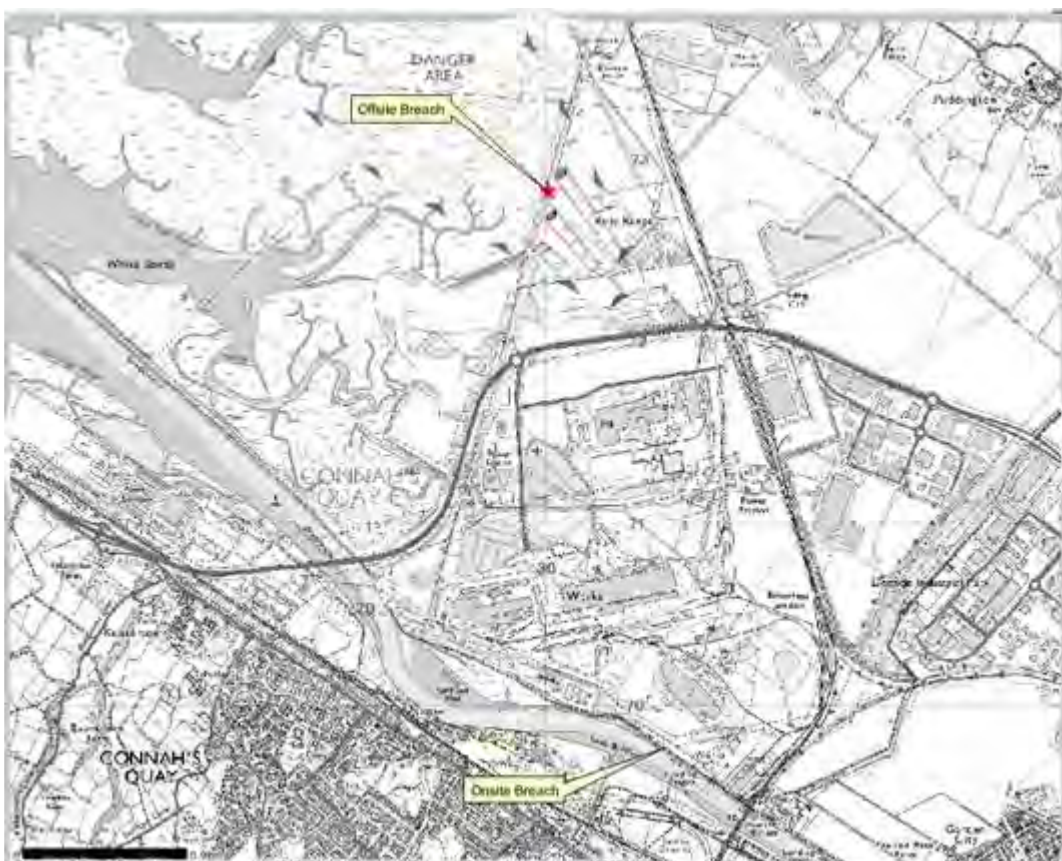
The embankments here are generally in a poor condition, the bank profile varies along the length, with many low spots. Bank is narrow, crest ~ 1m in places. Our last visual inspection indicates some inward face erosion at approximately SJ3066069765, on that basis this seems a reasonable choice of breach location.

Breach Location – Offsite (Broken Bank)



This embankment is more substantial but is more exposed and subject to wave action. I understand from colleagues that there has been at least one historical breach event here. We have a basic crest height survey of the embankment from 2009. It suggests some low spots at approximately SJ3001472822, so again a reasonable choice of breach location.

Given the size of the existing (major) buildings on the site that the model should adopt an appropriate approach to account for these e.g. appropriate Manning's values.



I understand that in addition to the predicted flood levels (including various climate change scenarios) we also now provide the hydrographs which can be used for your modelling. This data should be forthcoming as part of the request that was sent to Maggie Logan in our Customer Contact Team.

Let me know if you have need anything else or to discuss any aspects of the FCA.

Regards

Ruairí

Ruairí Barry
Development & Flood Risk Engineer
Environment Agency Wales
Chester Road
Buckley
Flintshire
CH7 3AJ

Phone: 01244 894582

e-mail: Ruairi.Barry@environment-agency.gov.uk

Ruairi,

As per our phone conversation, please find below the consultation email I originally sent and attached is the site location plan. Please note that I have also included an additional hatched plan which now shows the exact site boundary.

Best Regards,

Daniel Alstead BSc (Hons) MSc
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Gall yr wybodaeth yn y neges hon fod yn gyfrinachol, ac yn gyfreithiol freiniol. Os ydych wedi derbyn y neges hon trwy gamgymeriad, rhoddwch wybod ar unwaith i'r sawl a'i gyrodd, os gwelwch yn dda. Yna dilêwch hi, a pheidiwch â gyrru copi at neb arall.

Bu inni fwrw golwg ar yr e-bost hwn a'i atodiadau, rhag bod feirysau ynddo. Serch hynny, dylech chwilio unrhyw atodiad cyn ei agor.

Efallai bydd rhaid inni ryddhau'r neges hon, ac unrhyw ateb iddi, i sylw'r cyhoedd pe gofynnid inni tan y Ddeddf Rhyddid Gwybodaeth, y Ddeddf Gwarchod Data neu at ddibenion ymglyfreithio. Y mae'n bosib hefyd y darllenir negesau ac atodiadau e-bost a yrrir at unrhyw gyfeiriad Asiantaeth yr Amgylchedd, neu a dderbynnir oddi yno, gan rywun arall na'r gyrrwr a'r derbynnydd. Hynny at ddibenion busnes.

Os ydym wedi gyrru gwybodaeth atoch, a chithau'n dymuno'i defnyddio, yna ddarllenwch ein telerau a'n hamodau, os gwelwch yn dda. Gellir eu cael trwy ein galw ar 08708 506 506. Am ragor o wybodaeth ynghylch Asiantaeth yr Amgylchedd Cymru, ewch at www.asiantaeth-amgylchedd.cymru.gov.uk.

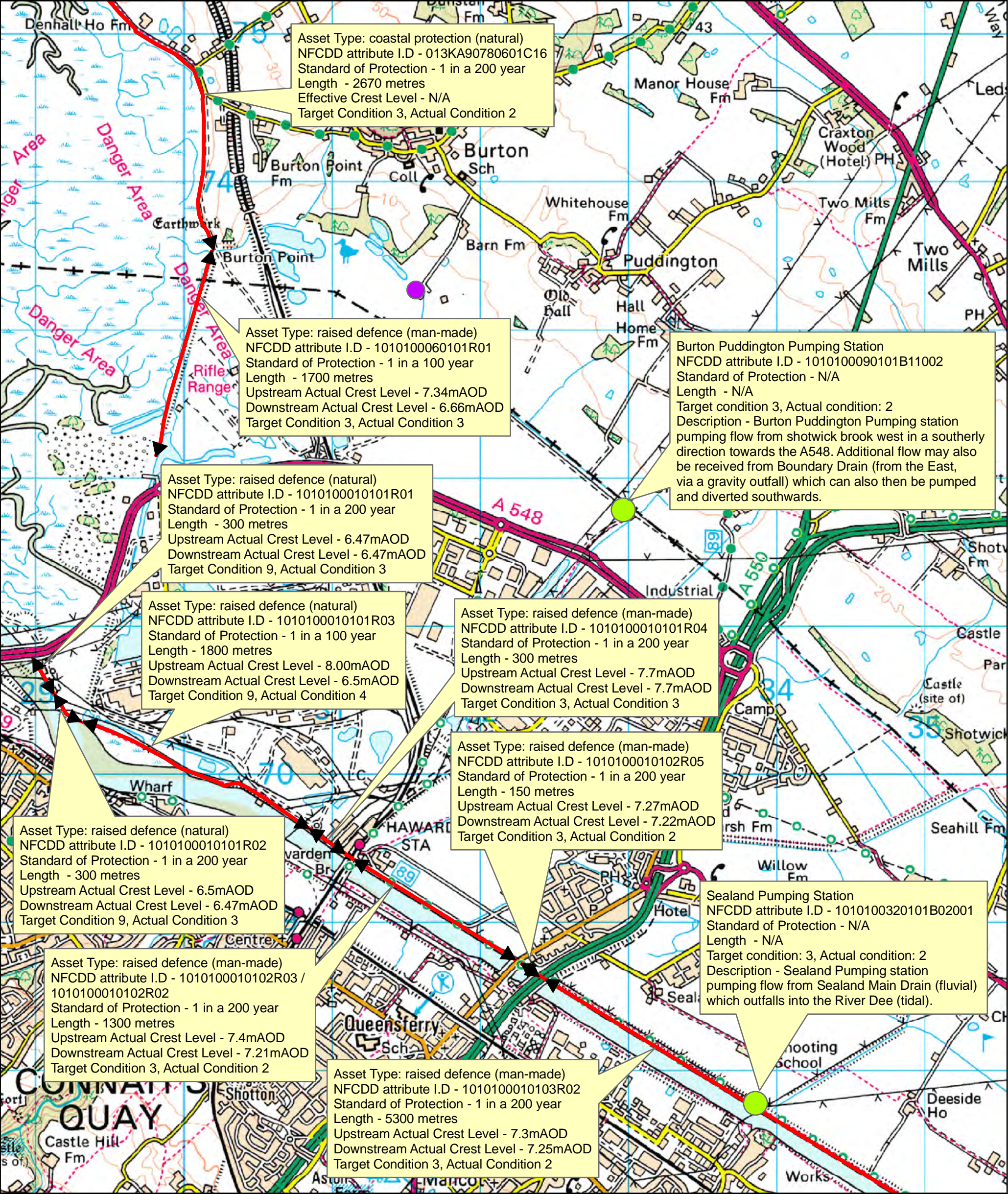
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Data Request - NFCDD Flood Defence Asset Information
Customer Ref - 2011-12_Q4_665, Connah's Quay, Flintshire, CH5 2LF.



Asiantaeth yr
Amgylchedd Cymru
Environment
Agency Wales



Legend

◄► Flood Defence

● Pumping Station

● Site Location

1:25,000

0 345 690 1,380 Meters

PLEASE NOTE:
Actual Condition is based on a visual inspection unless otherwise stated.
Standard of protection (–) is only a best estimate and should be verified prior to use for any future modelling/planning study.

NFCDD Flood defence information plan produced on 29/03/2012 by ASM. EA Wales. All Rights Reserved.

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Alstead, Daniel

From: Hodgson, Jane [Jane.Hodgson@environment-agency.wales.gov.uk]
Sent: 03 May 2012 15:38
To: Alstead, Daniel
Cc: Barry, Ruairi
Subject: FW: HVDC Site B - 2011-12_Q4_665
Attachments: 2011-12_Q4_665 Western HVDC Link, Weighbridge Road, Connah's Quay; Converter Site B - Breach Locations Breach/Overtopping Modelling - NT/2012/113274

Dear Daniel

Sue has passed your query on to me. Please find below answers to your questions.

1. You don't need to look at the effects of both breaches occurring at the same time. We will expect to see modelling of breach scenarios at each of the two points separately.
2. You should model the 200 year plus climate change and the 1000 year (0.1%) events. As Ruairi mentioned (2011_2012_Q4 DFR comments) the proposed development should be demonstrated to be flood free during the 0.5% AEP flood event (+ climate change allowance) under a breach and/or overtopping conditions of the flood defences.
3. The output will need to inform your FCA. Therefore it would be appropriate to map extents, depths, velocity, hazard and duration of flooding following a breach of the defences.

I hope that helps.

Regards

Jane

Jane Hodgson
Development and Flood Risk Engineer

Environment Agency Wales

✉ Llwyn Brain, Ffordd Penlan, Parc Menai, Bangor LL57 4DE
☎ Tel: 01248 484063

From: Alstead, Daniel [mailto:Daniel.Alstead@aecom.com]
Sent: 03 May 2012 13:54
To: Williams, Sue
Cc: Barry, Ruairi
Subject: FW: HVDC Site B - 2011-12_Q4_665

Click [here](#) to report this email as spam.

Susan,

As discussed over the phone, please find the enquiry questions in the email below which I sent to Ruairi earlier today.

I have also attached previous correspondences which I have had from the EAW to help with background information.

If you could answer as many as possible asap that would be a big help as I need to send out a fee proposal today and will be determined by the number of modelling scenarios/iterations we will need to carry out.

Many Thanks

Daniel Alstead BSc (Hons) MSc

Modeller

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www.aecom.com

From: Alstead, Daniel

Sent: 03 May 2012 11:37

To: 'ruairi.barry@environment-agency.gov.uk'

Subject: HVDC Site B - 2011-12_Q4_665

Ruairi,

Just a few questions relating to the HVDC Site B breach modelling (2011-12_Q4_665):

1. We will be looking at the breach scenarios of the two points which you provided us, however will the EAW want us to look at the potential of both breaches occurring at the same time as a worst case scenario (i.e. 3 modelling scenarios in total)?
2. What return events are we modelling? Is it for the 200yr, 200yr +CC only?
3. In relation to the final breach modelling, what sort of model mapping will be required (i.e. extents, depths, velocity, hazard, duration)?

We are hoping to provide a fee proposal to the client by close of play today. Are the above questions something that you will be able to answer yourself immediately or will you need to speak to other departments? I will give you a call to discuss.

Best Regards

Daniel Alstead BSc (Hons) MSc

Modeller

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Daniel.Alstead@aecom.com

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Bu inni fwrw golwg ar yr e-bost hwn a'i atodiadau, rhag bod feirysau ynddo. Serch hynny, dylech chwilio unrhyw atodiad cyn ei agor.

Efallai bydd rhaid inni ryddhau'r neges hon, ac unrhyw ateb iddi, i sylw'r cyhoedd pe gofynnid inni tan y Ddeddf Rhyddid Gwybodaeth, y Ddeddf Gwarchod Data neu at ddibenion ymgyfreithio. Y mae'n bosib hefyd y darllenir negesau ac atodiadau e-bost a yrrir at unrhyw gyfeiriad Asiantaeth yr Amgylchedd, neu a dderbynnir oddi yno, gan rywun arall na'r gyrrwr a'r derbynnydd. Hynny at ddibenion busnes.

Os ydym wedi gyrru gwybodaeth atoch, a chithau'n dymuno'i defnyddio, yna ddarllenwch ein telerau a'n hamodau, os gwelwch yn dda. Gellir eu cael trwy ein galw ar 08708 506 506. Am ragor o wybodaeth ynghylch Asiantaeth yr Amgylchedd Cymru, ewch at www.asiantaeth-amgylchedd.cymru.gov.uk.

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Tidal Level Data Request: Ref: 2012-13_Q1_321_R

Tidal Dee Defended Peak Water level Information

Environment Agency Wales requested an update to the Tidal Dee Flood Mapping Report (2007) to incorporate revised extreme sea levels as outlined in the Coastal flood boundary conditions for UK mainland and islands report (February 2011).

The revised extreme sea levels at the mouth of the Dee Estuary are lower than previous estimates, as shown in Table 1.

Table 1 Comparison of Extreme Sea Levels at mouth of Dee Estuary

Study	Level (mAOD)			
	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
North Wales Tidal Flood Mapping Study (Levels to 2007 baseline)a	6.06	6.17	6.38	6.70
Coastal Flood Boundary Conditions Study (Levels to 2008 baseline)b	5.84	5.88	5.97	6.19

The guidance considers these Extreme Sea Levels to be accurate to only one decimal place and these estimates also now come with associated 95% uncertainty bounds (quoted in Table 2).

Table 2 Tidal Still Water levels (2011) at mouth of Dee Estuary (m AOD) and Confidence Limits

	5% AEP	1.33% AEP	0.5% AEP	0.1% AEP
Extreme Sea Level	5.67	5.85	5.98	6.20
Confidence Intervals	+_0.1	+_0.1	+_0.2	+_0.3

ISIS/TuFLOW hydraulic models of the tidal Dee were updated/developed as part of the Dee Strategy (2010) using new survey data made available for the strategy.

Tidal Dee Peak levels at each node in the 1D model have been extracted for the defended model scenarios. The Tidal Dee defended water levels for the node points closest to the site location are shown in **Table 3** for a range of return periods (events). E.g. The 1 in 200 year return period tide, which is equivalent to the 0.5% AEP (Annual Exceedance Probability).

Table 3- Tidal Dee Defended Peak Water Levels, extracted from the 1D model produced for the Tidal Dee Flood Mapping Update 2011. (mAOD).
The base year used is 2011.

Node Point ID	Eastings	Northings	0.5% AEP (2011)	0.1% AEP (2011)	Climate Change Scenarios			Sensitivity Analysis Scenarios	
					0.5% AEP (2061)	0.5% AEP (2086)	0.5% AEP (2111)	0.1% AEP 2011 Upper Band	0.5% AEP 2111 Upper Band
00010101720	330123	369893	6.64	6.84	6.98	7.25	7.53	7.13	7.64
00010101240	329625	369943	6.65	6.86	6.99	7.26	7.56	7.15	7.69
00010100740	329192	370149	6.67	6.87	7.01	7.27	7.58	7.16	7.71
00010100240	329025	370615	6.64	6.84	6.98	7.23	7.51	7.12	7.62
00010100000	328871	370804	6.64	6.83	6.97	7.21	7.49	7.10	7.61
Est_24000	328069	371550	6.72	6.93	7.06	7.34	7.69	7.21	7.87
Est_23000	327307	372191	6.69	6.90	7.04	7.32	7.66	7.20	7.83
Est_22000	326572	372848	6.68	6.90	7.04	7.31	7.63	7.19	7.80

NB/ The colour coding above relates to nearest hydrograph label to use. (See below diagram)

Figure 1.1- Tidal Hydrographs in the 0.5% AEP event including the Upper Confidence Bound in 2111.

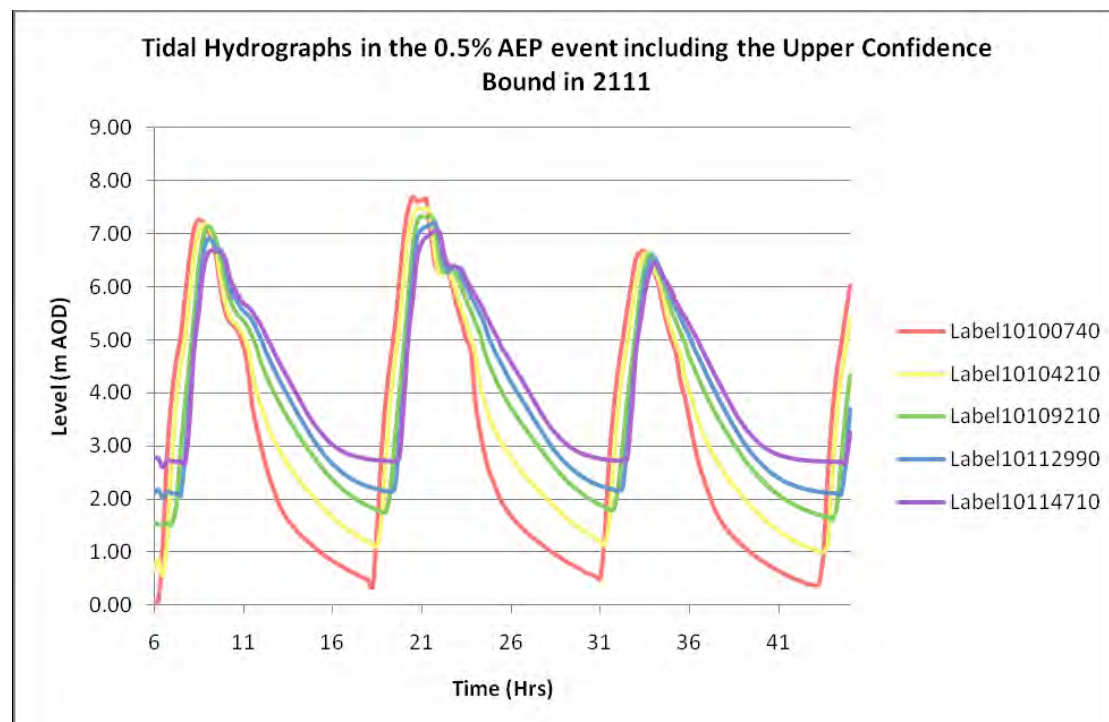
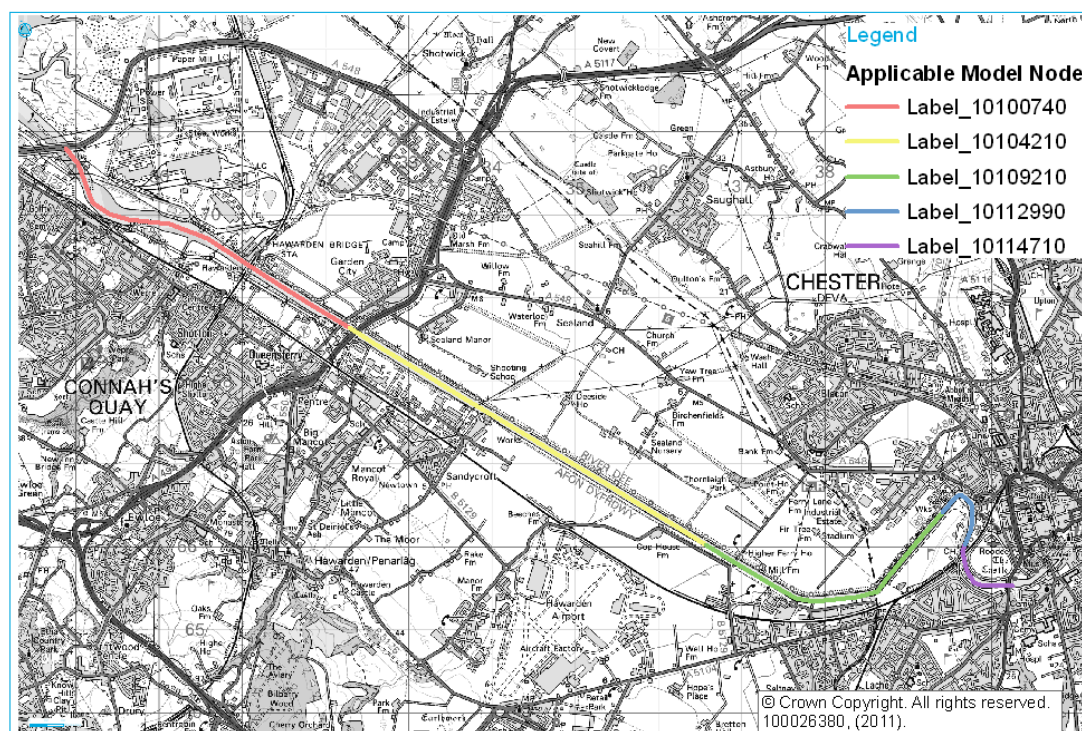


Figure 1.2- Applicable Reaches for the Design Tidal Hydrographs



Additional Information

Please find enclosed the relevant tidal hydrograph data for your site. Namely, the orange stretch 10100740.

For further guidance on its use please speak to our internal Development and Flood Risk Team on 012440894582.

References

- a. North Wales Tidal Flood Mapping Phase II Report, Atkins January 2008
- b. Department for Environment, Food and Rural Affairs, 2011. *Technical Report Design sea levels*. R&D Report SC060064. Defra/Environment Agency

Notes

The information enclosed all relate to the Tidal Dee Defended scenario.

Undefended scenarios are provided as being a possible worst case scenario in the event of defence failure. They are used as the basis of the Flood Map.

The scope of the model is the mapping of flood risk, it is not intended for detailed design. The model should be considered as the starting point for more detailed modelling, commensurate with the consequences of flooding at the site of interest.

EA models are available under licence agreement for the purpose of further development. Contact EA Wales External Relations for details of terms, conditions and pricing.

If the data is used in support of an FRA/FCA, please include the reference number.

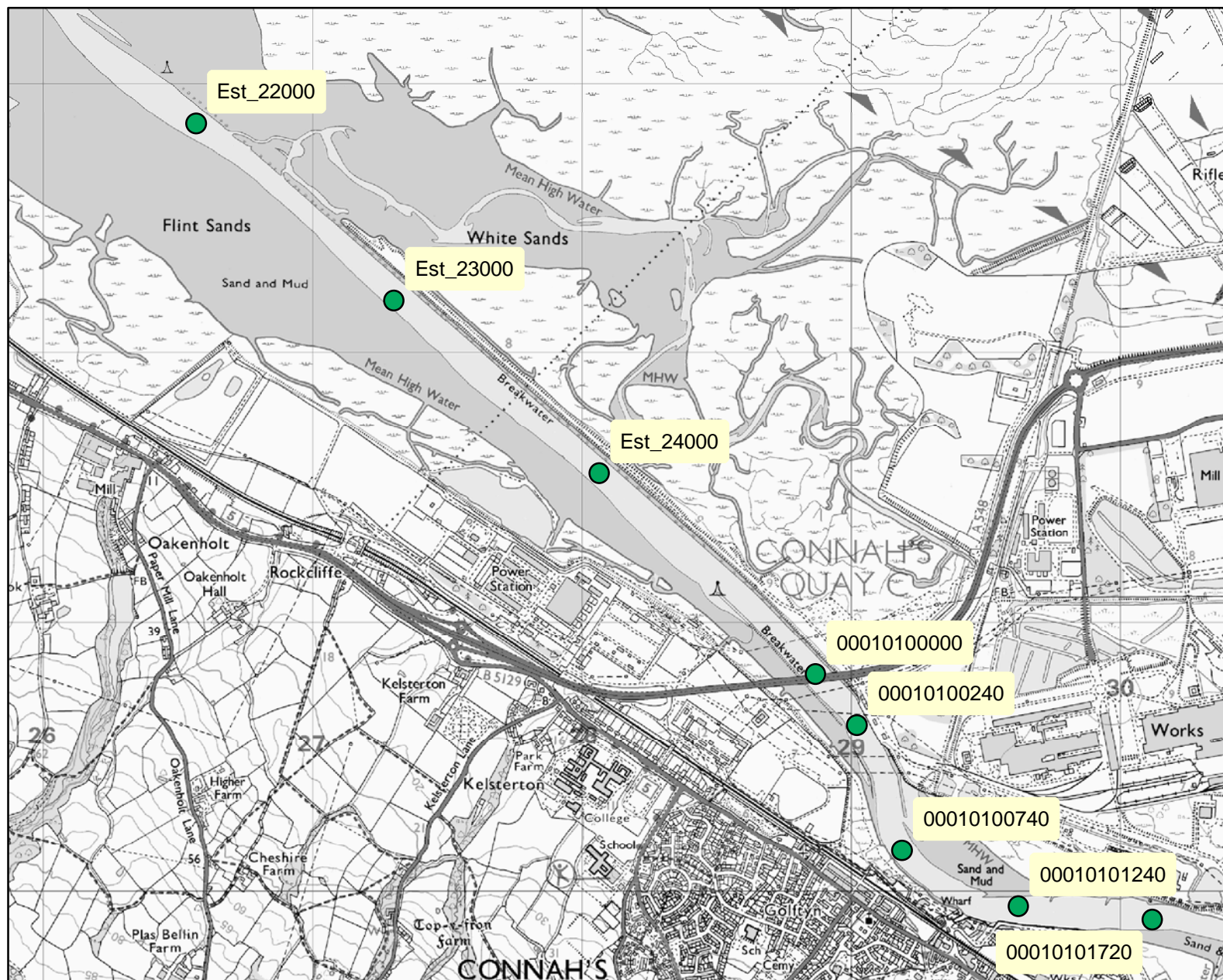
Please refer to EA standard terms and conditions

Flood Risk Mapping
28/05/2012

Tidal Dee Flood Risk Node Information

Created 28th May 2012. (Ref:2012-13_Q1_321_R)

1:21,760



Legend

● Tidal Dee Nodes

Please use this map alongside
the Tidal Request Template Letter

Tidal Dee Flood Risk Node Information

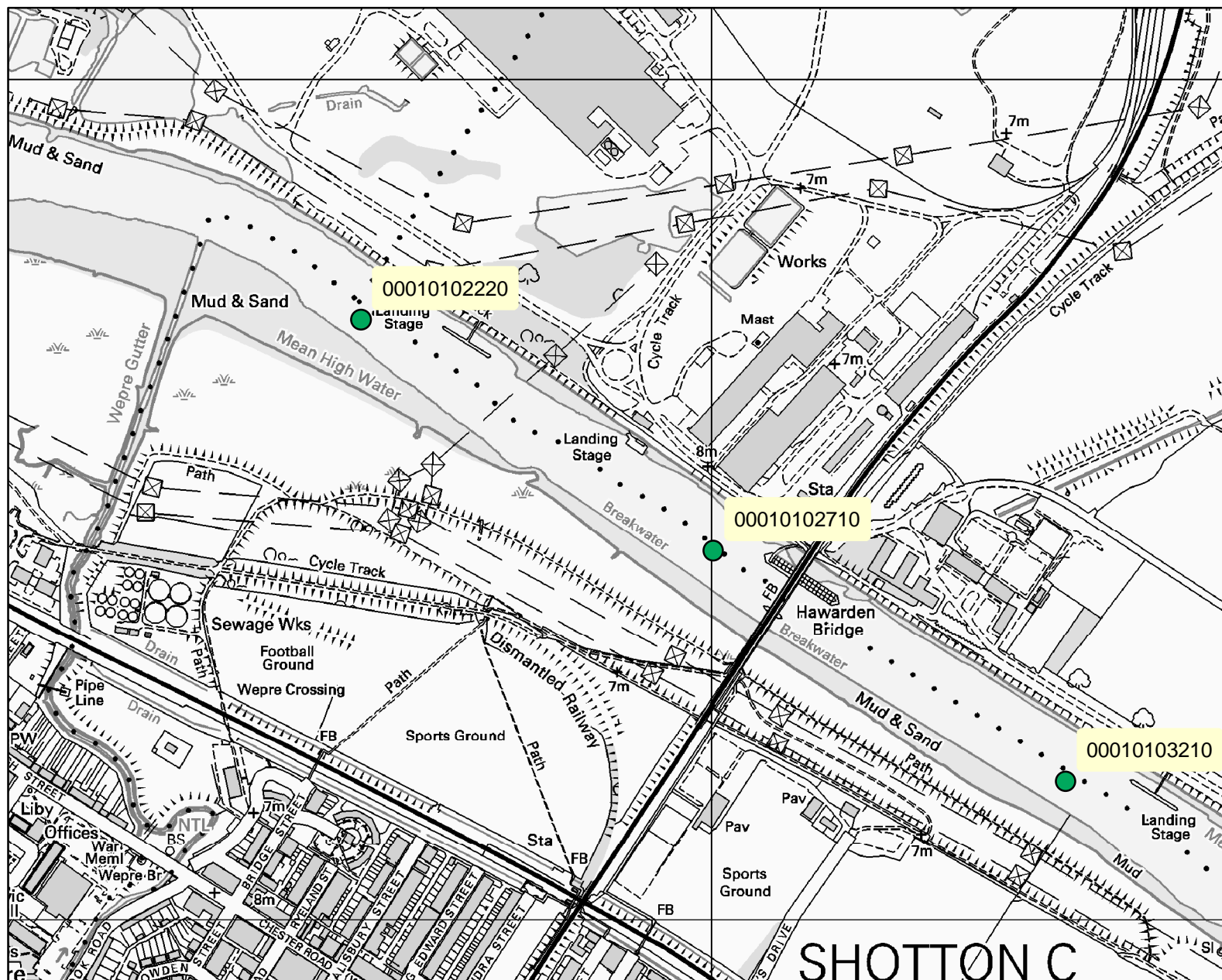
Created 29th May 2012. (Ref: 2012-13_Q1_321)

1:6,965

Legend

● Tidal Dee Nodes

Please use this map alongside
the Tidal Request Template Letter



**Tidal Dee Hydrograph in the 0.5% AEP event including the Upper Confidence Bound in 2111.
Taken from the Tidal Dee Flood Mapping Update, 2011.**

	Stage (m AOD)
Time (hr)	Label10100740
6	0.09
6.083	0.39
6.167	-0.01
6.25	0.09
6.333	0.12
6.417	0.69
6.5	1.12
6.583	1.95
6.667	2.47
6.75	2.88
6.833	3.21
6.917	3.63
7	3.92
7.083	4.20
7.167	4.42
7.25	4.60
7.333	4.79
7.417	4.91
7.5	5.06
7.583	5.30
7.667	5.63
7.75	5.83
7.833	6.07
7.917	6.29
8	6.54
8.083	6.78
8.167	6.98
8.25	7.09
8.333	7.20
8.417	7.23
8.5	7.26
8.583	7.30
8.667	7.27
8.75	7.22
8.833	7.22
8.917	7.15
9	7.06
9.083	7.06
9.167	6.98
9.25	6.91
9.333	6.80
9.417	6.73
9.5	6.54
9.583	6.29
9.667	6.09
9.75	5.93
9.833	5.80
9.917	5.66
10	5.52
10.083	5.43
10.167	5.40
10.25	5.33

10.333	5.32
10.417	5.32
10.5	5.25
10.583	5.21
10.667	5.18
10.75	5.12
10.833	5.03
10.917	4.96
11	4.91
11.083	4.84
11.167	4.77
11.25	4.50
11.333	4.18
11.417	3.99
11.5	3.78
11.583	3.63
11.667	3.50
11.75	3.36
11.833	3.25
11.917	3.13
12	3.00
12.083	2.89
12.167	2.76
12.25	2.66
12.333	2.58
12.417	2.46
12.5	2.38
12.583	2.31
12.667	2.22
12.75	2.14
12.833	2.06
12.917	1.98
13	1.91
13.083	1.85
13.167	1.80
13.25	1.75
13.333	1.70
13.417	1.65
13.5	1.61
13.583	1.57
13.667	1.54
13.75	1.50
13.833	1.47
13.917	1.44
14	1.41
14.083	1.38
14.167	1.35
14.25	1.32
14.333	1.29
14.417	1.26
14.5	1.24
14.583	1.21
14.667	1.19
14.75	1.16
14.833	1.14
14.917	1.12
15	1.09
15.083	1.07

15.167	1.05
15.25	1.03
15.333	1.00
15.417	0.98
15.5	0.96
15.583	0.94
15.667	0.92
15.75	0.90
15.833	0.88
15.917	0.86
16	0.84
16.083	0.82
16.167	0.81
16.25	0.79
16.333	0.77
16.417	0.76
16.5	0.74
16.583	0.73
16.667	0.71
16.75	0.69
16.833	0.68
16.917	0.66
17	0.64
17.083	0.63
17.167	0.61
17.25	0.61
17.333	0.58
17.417	0.59
17.5	0.56
17.583	0.55
17.667	0.54
17.75	0.52
17.833	0.50
17.917	0.50
18	0.47
18.083	0.48
18.167	0.51
18.25	0.34
18.333	0.54
18.417	1.02
18.5	1.44
18.583	1.93
18.667	2.43
18.75	2.86
18.833	3.16
18.917	3.58
19	3.90
19.083	4.17
19.167	4.41
19.25	4.62
19.333	4.85
19.417	5.05
19.5	5.25
19.583	5.56
19.667	5.85
19.75	6.11
19.833	6.40
19.917	6.65

20	6.94
20.083	7.17
20.167	7.31
20.25	7.47
20.333	7.56
20.417	7.61
20.5	7.69
20.583	7.71
20.667	7.66
20.75	7.61
20.833	7.62
20.917	7.61
21	7.63
21.083	7.66
21.167	7.65
21.25	7.66
21.333	7.52
21.417	7.30
21.5	7.04
21.583	6.80
21.667	6.59
21.75	6.41
21.833	6.30
21.917	6.31
22	6.34
22.083	6.349
22.167	6.365
22.25	6.36
22.333	6.308
22.417	6.35
22.5	6.26
22.583	6.152
22.667	6.062
22.75	5.95
22.833	5.822
22.917	5.699
23	5.60
23.083	5.507
23.167	5.417
23.25	5.31
23.333	5.208
23.417	5.111
23.5	5.01
23.583	4.938
23.667	4.845
23.75	4.81
23.833	4.401
23.917	4.113
24	3.86
24.083	3.644
24.167	3.472
24.25	3.32
24.333	3.152
24.417	3.009
24.5	2.89
24.583	2.76
24.667	2.674
24.75	2.55

24.833	2.493
24.917	2.427
25	2.35
25.083	2.266
25.167	2.19
25.25	2.12
25.333	2.052
25.417	1.994
25.5	1.94
25.583	1.892
25.667	1.844
25.75	1.81
25.833	1.763
25.917	1.728
26	1.69
26.083	1.659
26.167	1.627
26.25	1.59
26.333	1.563
26.417	1.531
26.5	1.50
26.583	1.477
26.667	1.448
26.75	1.42
26.833	1.396
26.917	1.37
27	1.35
27.083	1.322
27.167	1.297
27.25	1.28
27.333	1.252
27.417	1.229
27.5	1.21
27.583	1.186
27.667	1.165
27.75	1.14
27.833	1.124
27.917	1.102
28	1.08
28.083	1.058
28.167	1.038
28.25	1.02
28.333	0.995
28.417	0.977
28.5	0.96
28.583	0.938
28.667	0.921
28.75	0.90
28.833	0.882
28.917	0.868
29	0.85
29.083	0.831
29.167	0.816
29.25	0.80
29.333	0.784
29.417	0.768
29.5	0.75
29.583	0.74

29.667	0.721
29.75	0.71
29.833	0.691
29.917	0.669
30	0.66
30.083	0.635
30.167	0.632
30.25	0.61
30.333	0.613
30.417	0.58
30.5	0.58
30.583	0.565
30.667	0.536
30.75	0.55
30.833	0.512
30.917	0.513
31	0.50
31.083	0.342
31.167	0.888
31.25	1.31
31.333	1.79
31.417	2.284
31.5	2.73
31.583	3.041
31.667	3.322
31.75	3.69
31.833	3.966
31.917	4.226
32	4.44
32.083	4.623
32.167	4.833
32.25	4.98
32.333	5.137
32.417	5.364
32.5	5.56
32.583	5.731
32.667	5.909
32.75	6.05
32.833	6.289
32.917	6.43
33	6.53
33.083	6.608
33.167	6.646
33.25	6.65
33.333	6.725
33.417	6.731
33.5	6.67
33.583	6.604
33.667	6.536
33.75	6.47
33.833	6.36
33.917	6.353
34	6.28
34.083	6.199
34.167	6.158
34.25	6.08
34.333	5.953
34.417	5.791

34.5	5.65
34.583	5.504
34.667	5.39
34.75	5.29
34.833	5.162
34.917	5.07
35	4.98
35.083	4.901
35.167	4.833
35.25	4.74
35.333	4.639
35.417	4.366
35.5	4.22
35.583	4.133
35.667	4.019
35.75	3.91
35.833	3.758
35.917	3.615
36	3.50
36.083	3.365
36.167	3.206
36.25	3.06
36.333	2.938
36.417	2.824
36.5	2.71
36.583	2.613
36.667	2.51
36.75	2.42
36.833	2.33
36.917	2.266
37	2.19
37.083	2.109
37.167	2.024
37.25	1.94
37.333	1.868
37.417	1.803
37.5	1.75
37.583	1.694
37.667	1.64
37.75	1.60
37.833	1.553
37.917	1.511
38	1.47
38.083	1.441
38.167	1.403
38.25	1.37
38.333	1.34
38.417	1.308
38.5	1.28
38.583	1.25
38.667	1.222
38.75	1.20
38.833	1.169
38.917	1.143
39	1.12
39.083	1.092
39.167	1.068
39.25	1.04

39.333	1.021
39.417	0.998
39.5	0.98
39.583	0.955
39.667	0.934
39.75	0.91
39.833	0.894
39.917	0.872
40	0.85
40.083	0.835
40.167	0.817
40.25	0.80
40.333	0.78
40.417	0.763
40.5	0.75
40.583	0.728
40.667	0.712
40.75	0.70
40.833	0.68
40.917	0.664
41	0.65
41.083	0.633
41.167	0.619
41.25	0.60
41.333	0.589
41.417	0.576
41.5	0.56
41.583	0.548
41.667	0.537
41.75	0.52
41.833	0.51
41.917	0.496
42	0.48
42.083	0.48
42.167	0.461
42.25	0.46
42.333	0.434
42.417	0.434
42.5	0.41
42.583	0.42
42.667	0.399
42.75	0.39
42.833	0.387
42.917	0.375
43	0.38
43.083	0.35
43.167	0.37
43.25	0.40
43.333	0.217
43.417	0.548
43.5	0.97
43.583	1.45
43.667	2.004
43.75	2.50
43.833	2.903
43.917	3.18
44	3.59
44.083	3.905

44.167	4.188
44.25	4.40
44.333	4.571
44.417	4.759
44.5	4.91
44.583	5.061
44.667	5.283
44.75	5.48
44.833	5.677
44.917	5.872
45	6.03

Alstead, Daniel

From: Barry, Ruairi [ruairi.barry@environment-agency.wales.gov.uk]
Sent: 01 June 2012 12:38
To: Logan, Maggie; Alstead, Daniel; Farrelly, Vicky
Subject: RE: 2012-13_Q1_321: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274
Attachments: Extra node locations.pdf

Hi Daniel,,

Just to follow up yesterday's conversation.

Am I right in thinking that the 0.5% AEP event, including upper confidence bound in 2111, is the 200 year event which accounts for climate change? Yes - The Hydrograph is labelled 0.5 %, which is the 200 year event. 2111 is one of our three climate change scenarios (i.e. 100 years), alongside 2061, 2086. You will need to clarify with the Planning Authority / National Grid what the appropriate lifetime of development (Climate Change) is for this proposal. As previously noted we recommend 75 years.

One question we raised was whether to use the upper band levels. While we have most confidence/certainty in the lower figures, we would expect the model to also run the upper band scenarios as a means of sensitivity analysis. (reflecting the precautionary principle of TAN 15).

Is there a tidal cycle for the 200 year and 1000 year event?

The hydrograph (tidal cycle) provided is for the 2111 upper confidence bound event. It is the shape of the hydrograph that we looking to provide. The hydrograph can be scaled from the sample provided to match the appropriate return events and or climate change requirements e.g. 200yr (0.5%) or 1000yr (0.1%) based on the peak levels provided.

Is node 00010101720 the upper tidal limit are there nodes available further upstream which are located adjacent to the site?

No it's not the upper limit, See attached map for locatiion of these additional nodes listed below:

Table 3- Tidal Dee Defended Peak Water Levels, extracted from the 1D model produced for the Tidal Dee Flood Mapping Update 2011. (mAOD).

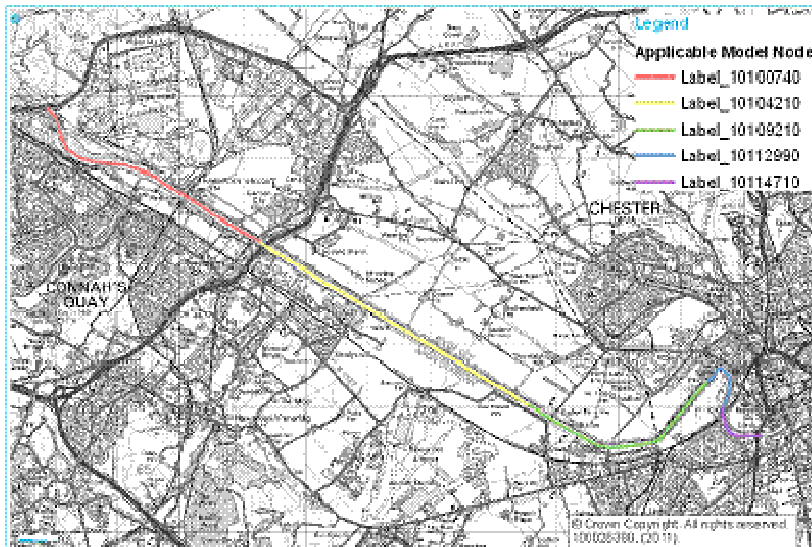
The base

year used is 2011.

					Climate Change Scenarios			Sens
Node Point ID	Eastings	Northings	0.5% AEP (2011)	0.1% AEP (2011)	0.5% AEP (2061)	0.5% AEP (2086)	0.5% AEP (2111)	0.1% AEP (2011) Upper Bar
00010103210	331422	369164	6.62	6.79	6.93	7.19	7.47	7.47
00010102710	331002	369438	6.63	6.82	6.95	7.22	7.49	7.49
00010102220	330583	369713	6.64	6.84	6.97	7.24	7.52	7.52

The tidal cycle was provided at node 00010100740. Can it be confirmed that this is the node from which the tidal cycle is taken from in relation to the breach locations provided by Ruairi?

The hydrographs cover reaches, not specific nodes, as detailed in the template letter sent. Hydrograph 10100740 supplied, covers the whole stretch labelled orange below. These are the only locations we have. Having discussed this with colleagues in our Mapping Team I would suggest in the lack of any better information that the same hydrograph shape (orange reach) be applied to both breaches.



I hope this answers you questions., but feel free to give me a call to go over any of this in more detail.

Regards

Ruairi

Ruairi Barry

Development & Flood Risk Engineer
Environment Agency Wales
Chester Road
Buckley
Flintshire
CH7 3AJ

Phone: 01244 894582

e-mail: Ruairi.Barry@environment-agency.gov.uk

From: Alstead, Daniel [mailto:Daniel.Alstead@aecom.com]

Sent: 29 May 2012 13:55

To: Logan, Maggie; Barry, Ruairi

Subject: RE: 2012-13_Q1_321: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274

Thanks for sending through the data Maggie,

I have a few questions relating to the information you sent through. I have included these questions below but wondered if it would be possible to also speak directly to someone at the EAW with a technical knowledge of the tidal cycles/flood level data provided, or should I discuss this with Ruairi?

- Am I right in thinking that the 0.5% AEP event, including upper confidence bound in 2011, is the 200 year event which accounts for climate change?

- Is there a tidal cycle for the 200 year and 1000 year event?
- Is node 00010101720 the upper tidal limit are there nodes available further upstream which are located adjacent to the site?
- The tidal cycle was provided at node 00010100740. Can it be confirmed that this is the node from which the tidal cycle is taken from in relation to the breach locations provided by Ruairi?

Ruairi, I have linked you into this email as you may be able to advise me on the above. If so are you available to maybe discuss this with myself and my colleague Catherine Spence (who is currently conducting the breach modelling) over a conference call?

Best Regards

Daniel Alstead BSc (Hons) MSc

Modeller

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From: Logan, Maggie [<mailto:margaret.logan@environment-agency.wales.gov.uk>]

Sent: 29 May 2012 11:56

To: Alstead, Daniel

Subject: RE: 2012-13_Q1_321: Converter Site B - Braeac Locations Breach/Overtopping Modelling - NT/2012/113274

Apologies Daniel, please find attached.

Regards

Maggie

From: Alstead, Daniel [<mailto:Daniel.Alstead@aeom.com>]

Sent: 29 May 2012 11:45

To: Logan, Maggie

Subject: RE: 2012-13_Q1_321: Converter Site B - Braeac Locations Breach/Overtopping Modelling - NT/2012/113274

Maggie,

We previously requested this data along with additional notes (from Ruairi) for breach modelling. We have previously made a payment of £60 (as per the attached quotation – Ref:2011-12_Q4_665) to purchase this information but we never received the flood levels and tidal cycles information with the original EA response.

Regards

Daniel Alstead BSc (Hons) MSc

Modeller

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www.aecom.com

From: Logan, Maggie [<mailto:margaret.logan@environment-agency.wales.gov.uk>]
Sent: 29 May 2012 11:35
To: Alstead, Daniel
Subject: 2012-13_Q1_321: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274

Hi Daniel

Please find attached the charge for this request.

Kind Regards

Maggie

From: Alstead, Daniel [<mailto:Daniel.Alstead@aecon.com>]
Sent: 21 May 2012 15:57
To: Logan, Maggie
Subject: FW: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274

Click [here](#) to report this email as spam.

Maggie,

Regarding the consultation response below, are you able to provide predicted flood levels (including various climate change scenarios), as well as the hydrographs as per the last point in Ruairi's email?

Regards

Daniel Alstead BSc (Hons) MSc

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From: Barry, Ruairi [<mailto:ruairi.barry@environment-agency.wales.gov.uk>]
Sent: 25 April 2012 14:01
To: Alstead, Daniel

Cc: Prichard, Ruth

Subject: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274

Thanks Daniel

In additional to our previous comments (attached above), I have discussed this with our Assets and Mapping Teams to get their input.

Breach Location – Onsite (Corus Embankment):



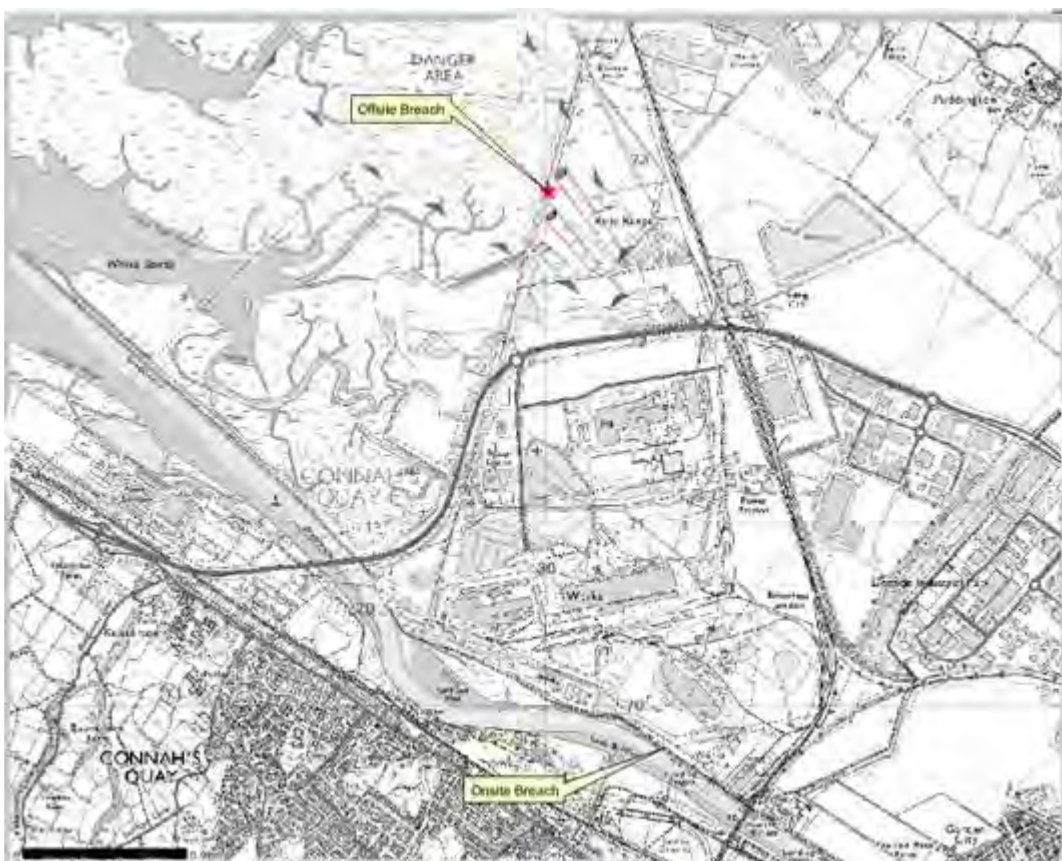
The embankments here are generally in a poor condition, the bank profile varies along the length, with many low spots. Bank is narrow, crest ~ 1m in places. Our last visual inspection indicates some inward face erosion at approximately SJ3066069765, on that basis this seems a reasonable choice of breach location.

Breach Location – Offsite (Broken Bank)



This embankment is more substantial but is more exposed and subject to wave action. I understand from colleagues that there has been at least one historical breach event here. We have a basic crest height survey of the embankment from 2009. It suggests some low spots at approximately SJ3001472822, so again a reasonable choice of breach location.

Given the size of the existing (major) buildings on the site that the model should adopt an appropriate approach to account for these e.g. appropriate Manning's values.



I understand that in addition to the predicted flood levels (including various climate change scenarios) we also now provide the hydrographs which can be used for your modelling. This data should be forthcoming as part of the request that was sent to Maggie Logan in our Customer Contact Team.

Let me know if you have need anything else or to discuss any aspects of the FCA.

Regards

Ruairí

Ruairí Barry
Development & Flood Risk Engineer
Environment Agency Wales
Chester Road
Buckley
Flintshire
CH7 3AJ

Phone: 01244 894582
e-mail: Ruairi.Barry@environment-agency.gov.uk

Ruairi,

As per our phone conversation, please find below the consultation email I originally sent and attached is the site location plan. Please note that I have also included an additional hatched plan which now shows the exact site boundary.

Best Regards,

Daniel Alstead BSc (Hons) MSc
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Gall yr wybodaeth yn y neges hon fod yn gyfrinachol, ac yn gyfreithiol freiniol. Os ydych wedi derbyn y neges hon trwy gamgymeriad, rhoddwch wybod ar unwaith i'r sawl a'i gyrrodd, os gwelwch yn dda. Yna dilëwch hi, a pheidiwch â gyrru copi at neb arall.

Bu inni fwrw golwg ar yr e-bost hwn a'i atodiadau, rhag bod feirysau ynddo. Serch hynny, dylech chwilio unrhyw atodiad cyn ei agor.

Efallai bydd rhaid inni ryddhau'r neges hon, ac unrhyw ateb iddi, i sylw'r cyhoedd pe gofynnid inni tan y Ddeddf Rhyddid Gwybodaeth, y Ddeddf Gwarchod Data neu at ddibenion ymgyfreithio. Y mae'n bosib hefyd y darllenir negesau ac atodiadau e-bost a yrrir at unrhyw gyfeiriad Asiantaeth yr Amgylchedd, neu a dderbynnir oddi yno, gan rywun arall na'r gyrrwr a'r derbynnydd. Hynny at ddibenion busnes.

Os ydym wedi gyrru gwybodaeth atoch, a chithau'n dymuno'i defnyddio, yna ddarllenwch ein telerau a'n hamodau, os gwelwch yn dda. Gellir eu cael trwy ein galw ar 08708 506 506. Am ragor o wybodaeth ynghylch Asiantaeth yr Amgylchedd Cymru, ewch at www.asiantaeth-amgylchedd.cymru.gov.uk.

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Alstead, Daniel

From: Barry, Ruairi [ruairi.barry@environment-agency.wales.gov.uk]
Sent: 07 June 2012 12:28
To: Alstead, Daniel
Cc: Logan, Maggie; Farrelly, Vicky; Prichard, Ruth
Subject: RE: 2012-13_Q1_321: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274
Attachments: Broken Bank_CrestLevels_JBA.pdf; BrokenBankcrestlevels_JBA.xls

Hi Daniel,

Please see attached some limited spot height information from a survey taken using Smartnet GPS in April 2009. While there will be a degree of inaccuracy and error associated with these spot heights, we are satisfied that for the purpose of the FCA (and in the absence of better information) they are considered suitable to represent embankment heights (broken bank) for your modelling needs.

Regards

Ruairi

From: Alstead, Daniel [mailto:Daniel.Alstead@aecom.com]
Sent: 29 May 2012 13:55
To: Logan, Maggie; Barry, Ruairi
Subject: RE: 2012-13_Q1_321: Converter Site B - Braeach Locations Breach/Overtopping Modelling - NT/2012/113274

Thanks for sending through the data Maggie,

I have a few questions relating to the information you sent through. I have included these questions below but wondered if it would be possible to also speak directly to someone at the EAW with a technical knowledge of the tidal cycles/flood level data provided, or should I discuss this with Ruairi?

- Am I right in thinking that the 0.5% AEP event, including upper confidence bound in 2011, is the 200 year event which accounts for climate change?
- Is there a tidal cycle for the 200 year and 1000 year event?
- Is node 00010101720 the upper tidal limit are there nodes available further upstream which are located adjacent to the site?
- The tidal cycle was provided at node 00010100740. Can it be confirmed that this is the node from which the tidal cycle is taken from in relation to the breach locations provided by Ruairi?

Ruairi, I have linked you into this email as you may be able to advise me on the above. If so are you available to maybe discuss this with myself and my colleague Catherine Spence (who is currently conducting the breach modelling) over a conference call?

Best Regards

Daniel Alstead BSc (Hons) MSc

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From: Logan, Maggie [<mailto:margaret.logan@environment-agency.wales.gov.uk>]
Sent: 29 May 2012 11:56
To: Alstead, Daniel
Subject: RE: 2012-13_Q1_321: Converter Site B - Braeac Locations Breach/Overtopping Modelling - NT/2012/113274
[Apologies Daniel, please find attached.](#)
Regards
Maggie

From: Alstead, Daniel [<mailto:Daniel.Alstead@aecom.com>]
Sent: 29 May 2012 11:45
To: Logan, Maggie
Subject: RE: 2012-13_Q1_321: Converter Site B - Braeac Locations Breach/Overtopping Modelling - NT/2012/113274

Maggie,
We previously requested this data along with additional notes (from Ruairi) for breach modelling. We have previously made a payment of £60 (as per the attached quotation – Ref:2011-12_Q4_665) to purchase this information but we never received the flood levels and tidal cycles information with the original EA response.
Regards

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From: Logan, Maggie [<mailto:margaret.logan@environment-agency.wales.gov.uk>]
Sent: 29 May 2012 11:35
To: Alstead, Daniel
Subject: 2012-13_Q1_321: Converter Site B - Braeac Locations Breach/Overtopping Modelling - NT/2012/113274
[Hi Daniel](#)
[Please find attached the charge for this request.](#)
Kind Regards
Maggie

From: Alstead, Daniel [<mailto:Daniel.Alstead@aecom.com>]
Sent: 21 May 2012 15:57
To: Logan, Maggie
Subject: FW: Converter Site B - Braeac Locations Breach/Overtopping Modelling - NT/2012/113274

Click [here](#) to report this email as spam.

Maggie,
Regarding the consultation response below, are you able to provide predicted flood levels (including various climate change scenarios), as well as the hydrographs as per the last point in Ruairi's email?
Regards

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From: Barry, Ruairi [<mailto:ruairi.barry@environment-agency.wales.gov.uk>]

Sent: 25 April 2012 14:01

To: Alstead, Daniel

Cc: Prichard, Ruth

Subject: Converter Site B - Braeacch Locations Breach/Overtopping Modelling - NT/2012/113274

Thanks Daniel

In additional to our previous comments (attached above), I have discussed this with our Assets and Mapping Teams to get their input.

Breach Location – Onsite (Corus Embankment):



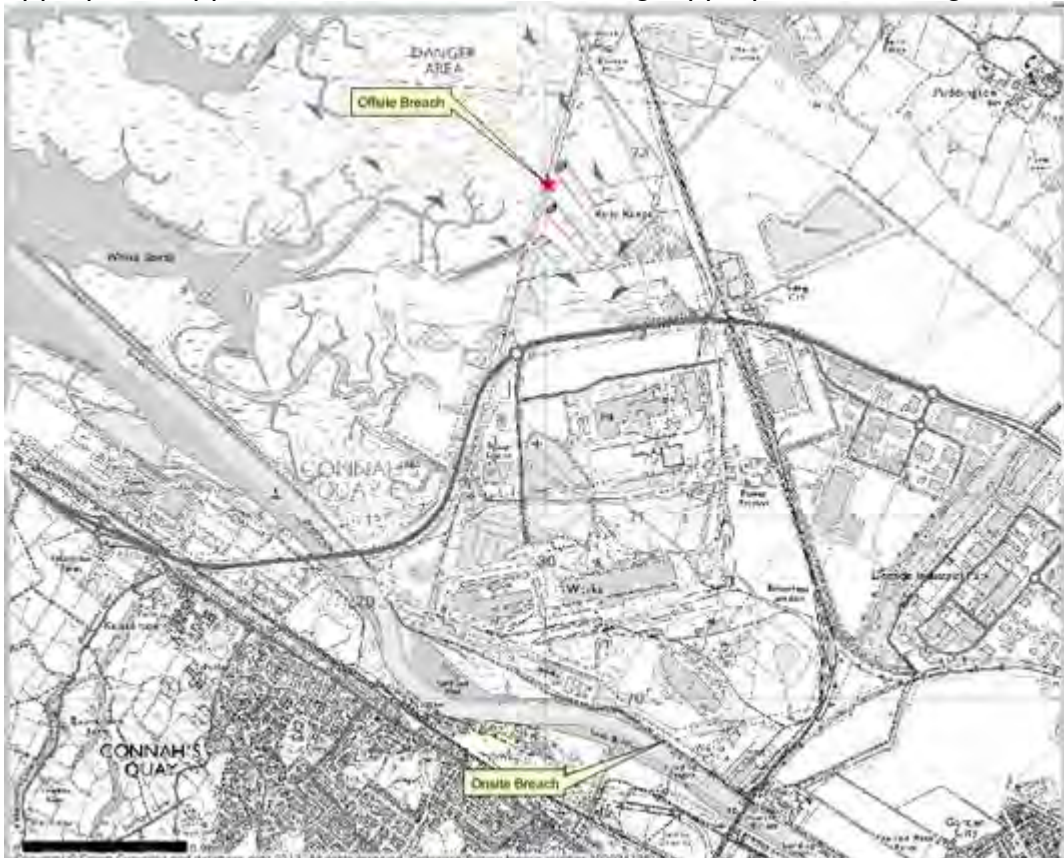
The embankments here are generally in a poor condition, the bank profile varies along the length, with many low spots. Bank is narrow, crest ~ 1m in places. Our last visual inspection indicates some inward face erosion at approximately SJ3066069765, on that basis this seems a reasonable choice of breach location.

Breach Location – Offsite (Broken Bank)



This embankment is more substantial but is more exposed and subject to wave action. I understand from colleagues that there has been at least one historical breach event here. We

have a basic crest height survey of the embankment from 2009. It suggests some low spots at approximately SJ3001472822, so again a reasonable choice of breach location. Given the size of the existing (major) buildings on the site that the model should adopt an appropriate approach to account for these e.g. appropriate Manning's values.



I understand that in addition to the predicted flood levels (including various climate change scenarios) we also now provide the hydrographs which can be used for your modelling. This data should be forthcoming as part of the request that was sent to Maggie Logan in our Customer Contact Team.

Let me know if you have need anything else or to discuss any aspects of the FCA.

Regards

Ruairí

Ruairí Barry

Development & Flood Risk Engineer

Environment Agency Wales

Chester Road

Buckley

Flintshire

CH7 3AJ

Phone: 01244 894582

e-mail: Ruairi.Barry@environment-agency.gov.uk

Ruairi,

As per our phone conversation, please find below the consultation email I originally sent and attached is the site location plan. Please note that I have also included an additional hatched plan which now shows the exact site boundary.

Best Regards,

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Gall yr wybodaeth yn y neges hon fod yn gyfrinachol, ac yn gyfreithiol freiniol. Os ydych wedi derbyn y neges hon trwy gamgymeriad, rhoddwch wybod ar unwaith i'r sawl a'i gyrrodd, os gwelwch yn dda. Yna dilëwch hi, a pheidiwch â gyrru copi at neb arall.

Bu inni fwrw golwg ar yr e-bost hwn a'i atodiadau, rhag bod feirysau ynddo. Serch hynny, dylech chwilio unrhyw atodiad cyn ei agor.

Efallai bydd rhaid inni ryddhau'r neges hon, ac unrhyw ateb iddi, i sylw'r cyhoedd pe gofynnid inni tan y Ddeddf Rhyddid Gwybodaeth, y Ddeddf Gwarchod Data neu at ddibenion ymgyfreithio. Y mae'n bosib hefyd y darllenir negesau ac atodiadau e-bost a yrrir at unrhyw gyfeiriad Asiantaeth yr Amgylchedd, neu a dderbynnir oddi yno, gan rywun arall na'r gyrrwr a'r derbynnydd. Hynny at ddibenion busnes.

Os ydym wedi gyrru gwybodaeth atoch, a chithau'n dymuno'i defnyddio, yna ddarllenwch ein telerau a'n hamodau, os gwelwch yn dda. Gellir eu cael trwy ein galw ar 08708 506 506. Am ragor o wybodaeth ynghylch Asiantaeth yr Amgylchedd Cymru, ewch at www.asiantaeth-amgylchedd.cymru.gov.uk.

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Find out more about [ONE](#), AECOM's global e-magazine

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Surveyed Levels - Shotton

Key

Spot Height

Cross Section 4

Cross Section 3

Cross Section 2

Cross Section 1

0 50 100 200 Meters

1:5,000

**Surveyed Levels Recorded by ABasford
(assisted by ABrisco)
Date: 3rd April 2009**

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Pnt_Ref	Pnt_Type	Easting	Northing	Hght_mAOD
1	Spot Height	329837	372292.9	8.067
2	Spot Height	329848.3	372312.2	7.503
4	Cross Section 1	329859.6	372353.8	7.379
5	Cross Section 1	329851.1	372356.9	4.468
6	Cross Section 1	329854.4	372355.8	5.655
8	Cross Section 1	329863	372353.1	7.011
10	Cross Section 1	329869	372352.5	5.03
11	Spot Height	329872.8	372399.7	7.351
12	Spot Height	329888.9	372455.9	7.356
13	Cross Section 2	329902.1	372508.6	7.189
14	Cross Section 2	329905	372508	7.126
15	Cross Section 2	329907.2	372507.3	6.746
16	Cross Section 2	329909.7	372506.7	5.653
17	Cross Section 2	329911.3	372506.1	5.49
18	Cross Section 2	329899.1	372510.3	6.19
19	Cross Section 2	329895.9	372511.8	5.147
20	Cross Section 2	329893.1	372512.8	4.708
21	Spot Height	329921.3	372570.9	7.165
22	Spot Height	329938.6	372632.4	7.158
23	Spot Height	329956.6	372702.2	7.113
24	Spot Height	329973.2	372756.2	6.97
25	Spot Height	329996.8	372840.6	6.787
26	Spot Height	330014.1	372903.3	6.811
29	Spot Height	330074.6	373120.3	6.889
31	Cross Section 3	330065.8	373126.2	4.746
32	Cross Section 3	330068.7	373125.2	5.392
33	Cross Section 3	330073.2	373123.7	6.799
34	Cross Section 3	330078.2	373122.4	6.7
35	Cross Section 3	330079.8	373122.1	5.778
36	Cross Section 3	330081.4	373121.8	5.021
37	Cross Section 3	330083.5	373121.3	4.951
39	Spot Height	330103.5	373222.3	6.82
40	Spot Height	330115.2	373264.2	6.668
41	Spot Height	330136	373337.6	6.611
42	Spot Height	330147.5	373380.1	6.78
43	Cross Section 4	330161.5	373430.4	6.612
45	Cross Section 4	330155.5	373432.9	5.654
46	Cross Section 4	330159.7	373432.1	6.528
47	Cross Section 4	330163.5	373430.6	6.611
48	Cross Section 4	330166	373430	5.704
49	Spot Height	330171.1	373471	6.662
50	Spot Height	330177.2	373490.2	6.795
51	Spot Height	330185.3	373517	6.943
52	Spot Height	329827.9	372289.8	8.69
53	Spot Height	329806.2	372269.7	9.286

Appendix 4: Technical Assessment of Fluvial-Tidal Flood Risk

Project:	Western HVDC Link Site C	Job No:	60161093
Subject:	Technical Assessment of Fluvial-Tidal Flood Risk		
Prepared by:	Cathryn Spence	Date:	30/11/2012
Checked by:	Alistair Nisbet	Date:	30/11/2012
Approved by:	David Ritchie	Date:	30/11/2012

This technical note sets out the analysis undertaken of potential fluvial-tidal flooding at Site C.

Site Description

The proposed Site is located on land within the Deeside Industrial Estate in Flintshire. The Deeside Industrial Estate is accessed from Weighbridge Road (A548) to the north.

The Site is located approximately 1km north west from the River Dee. The River Dee is a Main River which flows in a north east direction and is influenced by the tidal cycle of the Dee Estuary. The Dee Estuary is located approximately 3.5km downstream from the Site. A site location plan with ground levels (LiDAR data) for the wider study area has been included overleaf in Figure 1.

Local Topography

The ground model was developed from 1m filtered LIDAR data. The analysis of the ground model indicates that the Site is relatively flat and is likely to have been raised above the surrounding land. The ground model indicates that the land within the Site varies between 6.86 m AOD at the southern end to 11.5m AOD at the northern end. Figure 2 overleaf shows ground levels for the Site with a series of spot levels across the Site.

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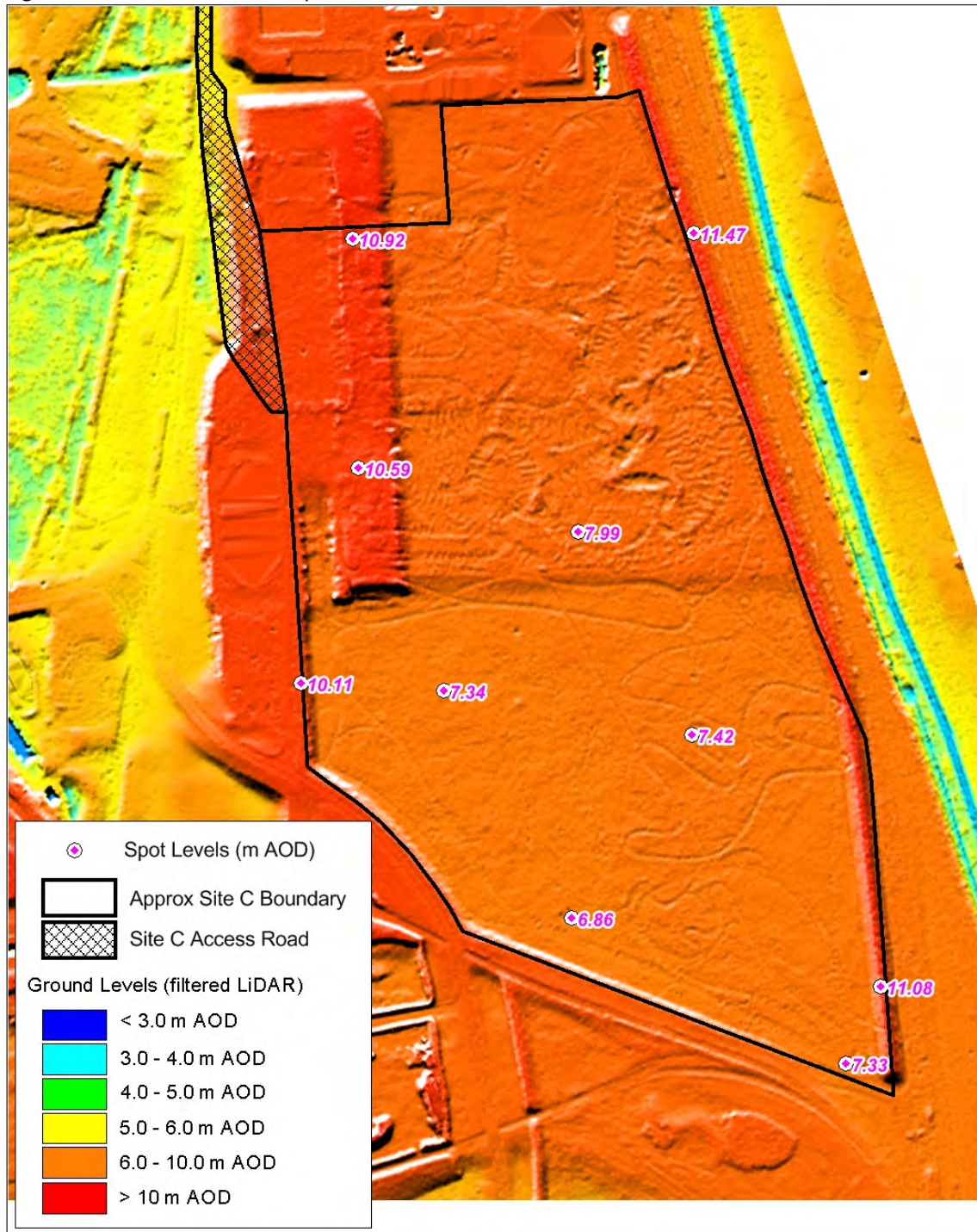
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United Kingdom

Figure 1 - Site Location Plan with ground levels (m AOD)



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Figure 2 – Ground model and spot levels for Site C



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Data and Analysis

Ground Model (DTM)

The Digital Terrain Model (DTM) has been produced using filtered 1m LIDAR data, procured through Emapsite. The date of the LIDAR being flown is unknown, however there have been no significant developments that would influence ground levels within the study area. The filtering process uses algorithms to remove trees, buildings and other structures from the LIDAR. A visual review of the LiDAR data was undertaken to ensure that the filtering process had not removed any significant ground features.

Extreme tidal data

Environment Agency Wales provided data on tidal cycle and extreme tidal levels for the River Dee Estuary. These included extreme tidal levels for a range of climate change scenarios and confidence levels.

In discussions with the Environment Agency Wales, it was agreed that the tidal data represented the most extreme tidal scenario and would require scaling to match the appropriate return period and the required climate change allowances based on the proposed 75 year development lifetime; shown in Table 1 below.

Table 1 - Tidal Dee Defended Peak Water Levels (m AOD).

Node Point ID	Easting	Northing	Present Day		Climate Change Scenarios			Sensitivity Analysis Scenarios	
			0.5% AEP (2011)	0.1% AEP (2011)	0.5% AEP (2061)	0.5% AEP (2086)	0.5% AEP (2111)	0.1% AEP 2011 Upper Band	0.5% AEP 2111 Upper Band
00010100740	329192	370149	6.67	6.87	7.01	7.27	7.58	7.16	7.71

The proposed development lifetime is 75 years, therefore the extreme tidal level for 2086 climate scenario is the most applicable for the Site.

Analysis of tidal data and ground levels

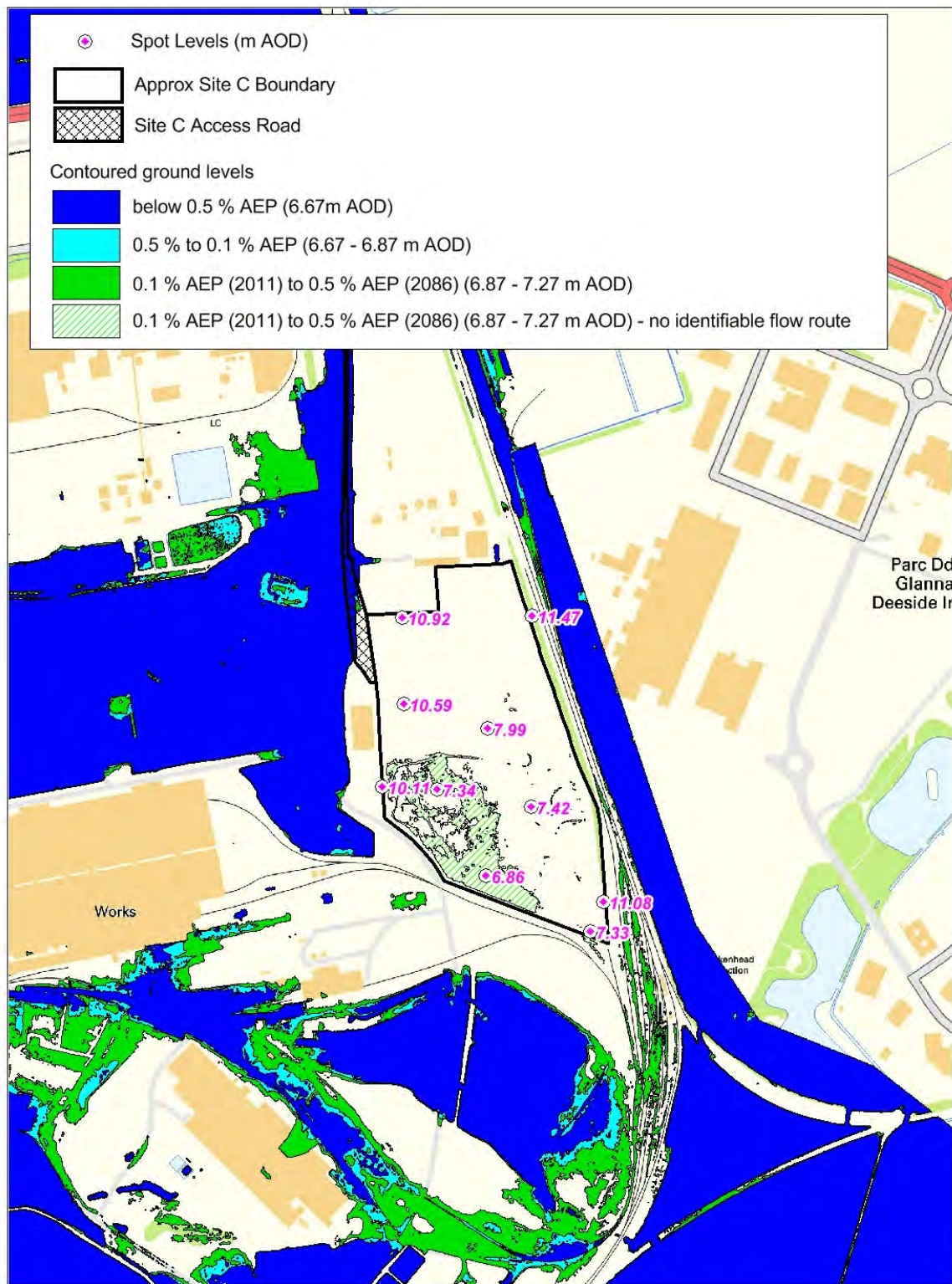
The ground model of the Site was processed with the extreme tidal levels to produce extents of the Site that were below various levels. These conservative estimates of flood risk do not take into account the presence of tidal defences or the absence of flow routes that could convey water to the Site. It is unlikely that these areas would experience flooding to these levels.

Figure 3 shows ground levels:

- Below the 0.5% AEP fluvial-tidal event (2011).
- Between 0.5% AEP and 0.1% AEP fluvial-tidal levels. (2011).
- Between 0.1% AEP (2011) and 0.5% AEP fluvial-tidal levels with an allowance for climate change (2086).

The results of this analysis indicate that the Site is not at risk of fluvial-tidal flood risk from the River Dee during a present day 0.5% AEP event, 0.1% AEP event and 0.5% AEP event with an allowance for climate change (2086).

Figure 3 – Ground levels compared to extreme tidal levels



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Summary

An analysis of the extreme tidal levels within the River Dee and the ground levels of the Site was undertaken to determine if the Site is at risk of flooding and to determine if further analysis such as hydraulic modelling is required. The Site is remote from the River Dee and no direct flood flow routes could be identified. Reviewing the extreme tidal levels within the River Dee against ground levels at the Site provides a conservative assessment of flood risk at the Site and provides an indication if further analysis is required.

Results of the analysis indicate that:

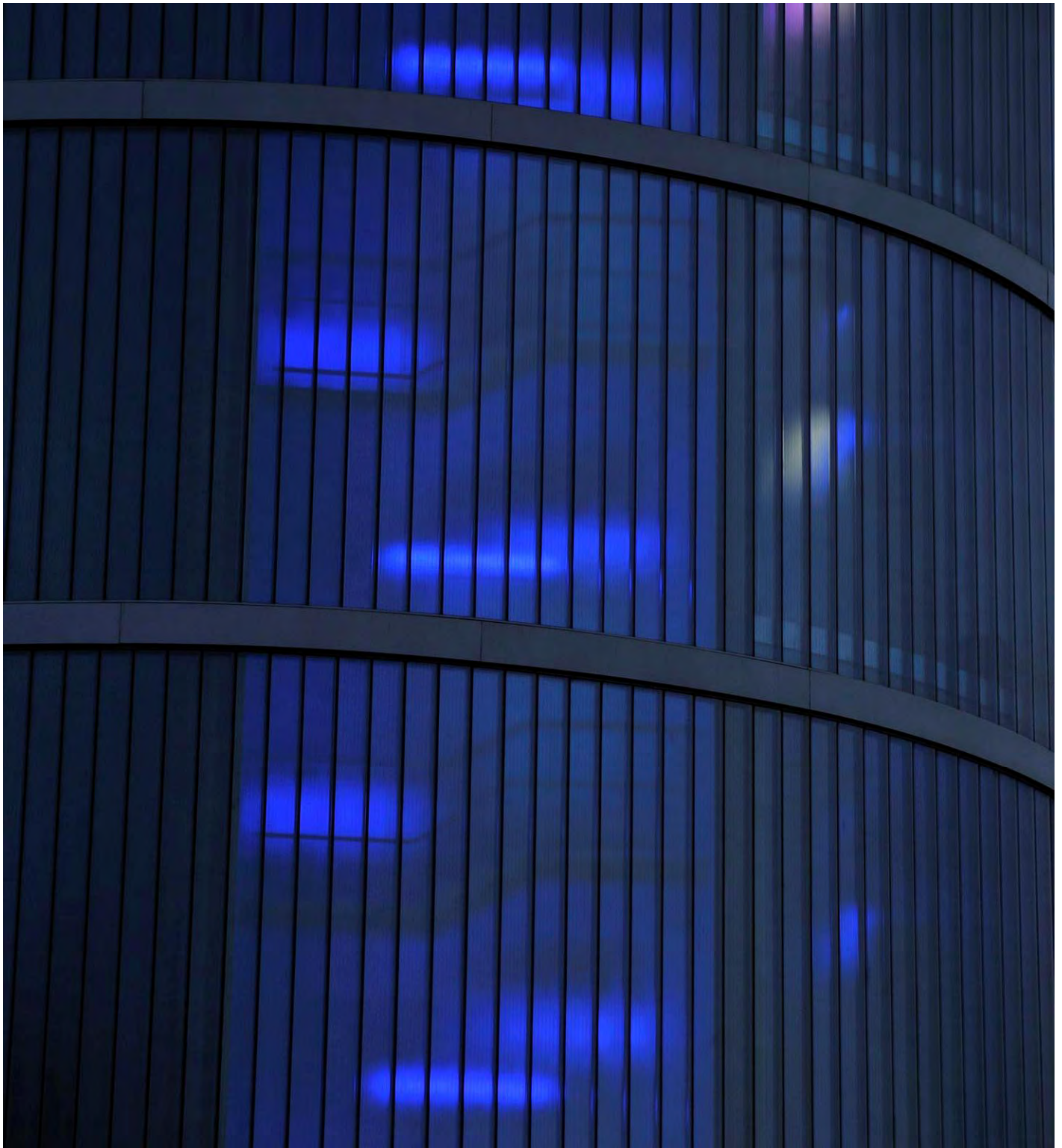
- the Site is above the 0.5% AEP fluvial-tidal levels within the River Dee;
- the Site is above the 0.1% AEP fluvial-tidal levels within the River Dee;
- the majority of the Site is above the 0.5% AEP with an allowance for climate change to 2086 fluvial-tidal level. Small areas of the Site are below this level but no flood routes were identified to this low lying area.

The results indicate that the Site is at low risk of fluvial-tidal flooding during the 0.5% AEP event with an allowance for climate change.

Capabilities on project:
Water

Appendix 5: Proposed Development Information

DRAINAGE STRATEGY



Drainage Strategy Statement
Kelsterton Convertor Station (Site C),
Deeside

21st November 2012

50200104

1. The Project

The proposed Kelsterton Converter Station forms the northern part of the Western Link HVDC (High Voltage Direct Connection) Project, which facilitates the distribution of energy generated by the off-shore wind turbines in the Irish Sea.

The Kelsterton Site C facility is located approximately 1km north of the River Dee near Connagh's Quay (refer to appendix A).

The site is a brownfield area of land which was previously the site of a steel plant which has now been demolished. WSP have been appointed as to undertake the civil, structural, architectural and M&E services in relation to the site.

This statement relates to the strategy which is intended to be employed for the routing and discharge of surface water, foul water and oily water from the site and uses for reference a 3d topographical survey, sewer records and porosity test results. The strategy does not deal with detailed design issues but relates only to a practical and deliverable design solution.

2. Existing drainage

There are no public or private sewers within the site boundary or in the immediate vicinity of the site. There is no evidence of existing land drainage across the site. It is considered to be unlikely that there are any unrecorded drains crossing the site and it is anticipated that any drainage which may have previously serviced the site in its former use have been removed or abandoned is part of the demolition and remediation processes which have been undertaken.

Refer to Welsh Water sewer record plans in Appendix B.

3. Proposed drainage

Surface Water

Due to the highly porous nature of the sub-soils on the site it is intended to make use of wide-spread infiltration drainage on the site. The site has been subject to a detailed site investigation part of which dealt specifically with porosity testing (refer to Appendix C).

The impermeable catchment areas comprise the planned valve hall and control room buildings, the access roads, transformer bunds, and filter compounds.

The access roads and the filter compounds will be drained via infiltration trenches. The locations of these trenches and typical details have been included in the drawings in Appendix D.

Roof water drainage from the Valve Hall buildings will be routed via a system of below ground drains to an outfall to the north of the site. The discharge from this outfall will be accommodated in an area of the site which will be dedicated to use as pond/wetland feature. This feature will operate as a large soakaway and will only appear as a standing water feature during large storm events. The exact size, location and treatment of this feature will be subject to detailed design by a landscape architect and will be subject to ecological considerations.

Oily water

Oily water from the transformer bund areas will be routed via a separate system of full retention oil interceptors which will be designed and constructed in accordance with National Grids Design Handbook DH 10 Issue 3. It will discharge to a connection with the surface water system within the site boundary.

Foul water

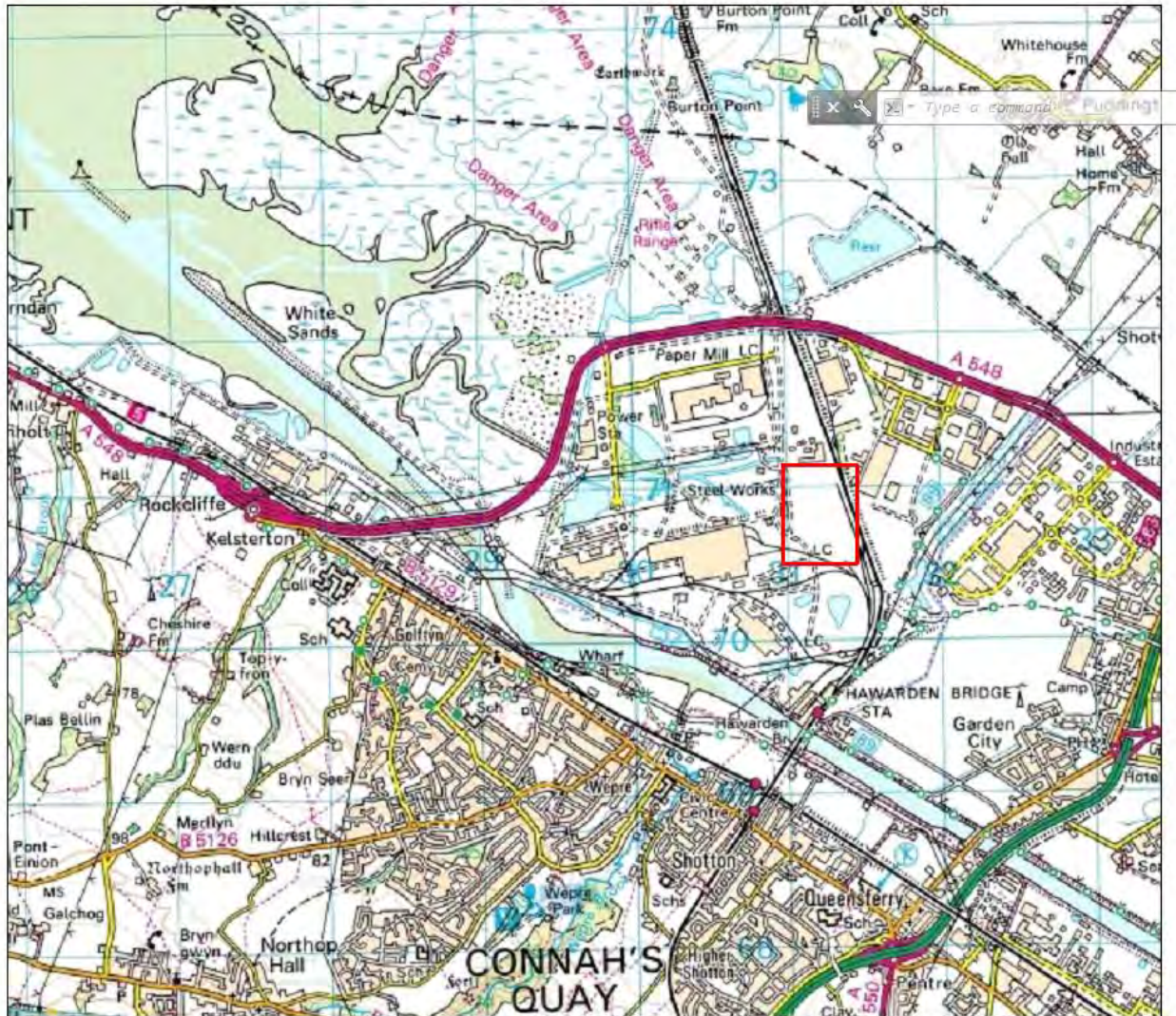
The facility is not permanently manned and is visited on an infrequent basis by maintenance and monitoring staff. As a consequence there is very limited foul drainage usage for this type of facility and the intention is to provide a cess tank which will be constructed in accordance with National Grids Design Handbook DH 10 Issue 3.

4. Summary

The facility will not utilise any drainage connections to the existing surrounding drainage infrastructure. Rather it will discharge all surface water to infiltration systems either within the site boundary or to a new pond/wetland area which will be located immediately outside the northern boundary of the site.

Foul water drainage will be discharged to a cess tank which will be emptied under a regular maintenance routine to be determined.

Appendix A



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Appendix B

Appendix C

[illegible]

Trial Pit Log

PRELIMINARY




Logged SK Checked		Start 16/10/2012 End 16/10/2012	Equipment, Methods and Remarks JCB3CX Machine excavated using toothed bucket Soakaway test carried out	Dimensions and Orientation Width 0.70 m Length 1.90 m <div><div>A B C</div><div>180 (Deg)</div></div>		Ground Level Coordinates National Grid Chainage	
Samples and Tests			Strata				
Depth	Type & No.	Date Records	Description	Depth, Level/ (Thickness)	Legend	Backfill/ Instruments	
			1 MADE GROUND: Light greyish brown slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to medium of mixed lithologies including siltstone, sandstone and slag.	0.25			
			2 MADE GROUND: Light brown slightly gravelly SAND with occasional pockets of brown sandy silt. Gravel is subangular to subrounded fine to coarse of mixed lithologies including siltstone, sandstone and slag.	(2.65)			
			3 Thickly interlaminated grey sandy SILT and brown fine to medium SAND.	2.90			
			EXPLORATORY HOLE ENDS AT 3.00 m	3.00			
Depth	Type & No.	Records Date					
Groundwater Entries No. Struck Post Strike Behaviour (m) None observed (see Key Sheet)			Depth Related Remarks * From to (m)		Stability OK Shoring None Weather Overcast		
Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.			Project Deeside Site C HVDC Converter Station Site Project No. F2038-12 Carried out for WSP Environmental		Trial Pit TPS02 Sheet 1 of 1		



Trial Pit Log

PRELIMINARY

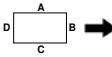
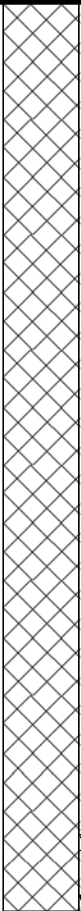




Logged SK Checked		Start 15/10/2012 End 15/10/2012	Equipment, Methods and Remarks JCB 3CX Machine excavated using toothed bucket Soakaway test carried out	Dimensions and Orientation Width 1.00 m Length 1.80 m 		Ground Level Coordinates National Grid Chainage		- - -
Samples and Tests			Strata					
Depth	Type & No.	Date Records	Description			Depth, Level/ (Thickness)	Legend	Backfill/ Instruments
			1 MADE GROUND: Dark brownish grey sandy GRAVEL with medium cobble and low boulder content. Gravel is angular fine to coarse of brick, slag and clinker. Cobbles are angular to subrounded of mixed lithologies including brick and slag. Boulders are subangular of slag.					
			1.60-3.00 m grey.			(3.00)		
			EXPLORATORY HOLE ENDS AT 3.00 m			3.00		
Depth	Type & No.	Records Date						
Groundwater Entries No. Struck Post Strike Behaviour (m) 1 1.90 Seepage 2 2.60 Seepage			Depth Related Remarks * From to (m)			Stability OK Shoring None Weather Overcast		
Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column. Scale 1:25			Project Deeside Site C HVDC Converter Station Site Project No. F2038-12 Carried out for WSP Environmental			Trial Pit TPS03 Sheet 1 of 1		

Trial Pit Log

PRELIMINARY



Logged SK Checked	Start 15/10/2012 End 15/10/2012	Equipment, Methods and Remarks JCB 3CX Machine excavated with toothed bucket Soakaway test carried out	Dimensions and Orientation Width 1.00 m Length 2.00 m 	Ground Level Coordinates National Grid Chainage	- - -	
Samples and Tests			Strata			
Depth	Type & No.	Date Records	Description	Depth, Level/ (Thickness)	Legend	Backfill/ Instruments
			1 MADE GROUND: Greyish brown sandy locally very sandy GRAVEL with medium cobble content and low boulder content. Gravel is angular to subrounded fine to coarse of mixed lithologies including slag, brick, concrete and clinker. Cobbles are angular to subrounded of slag, brick and concrete. Boulders are subangular of concrete and slag.	(3.00)		
			EXPLORATORY HOLE ENDS AT 3.00 m	3.00		
Depth	Type & No.	Records Date				
Groundwater Entries No. Struck Post Strike Behaviour (m) 1 3.00 Rose to 2.80 m after 5 minutes.			Depth Related Remarks * From to (m)		Stability OK Shoring None Weather Drizzly/ sunny spells	
Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column. Scale 1:25 (c) ESG www.esg.co.uk 426.4823/10/2012 14:53:22 			Project Deeside Site C HVDC Converter Station Site Project No. F2038-12 Carried out for WSP Environmental		Trial Pit TPS04 Sheet 1 of 1	

Soakaway Test



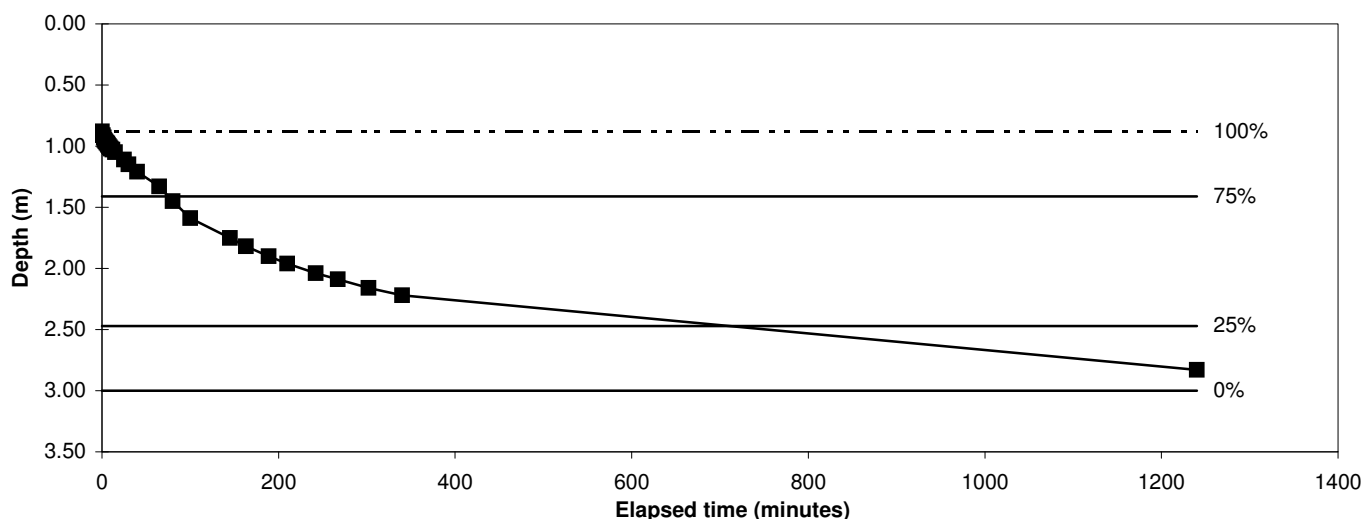
Soil Mechanics

Trial Pit No: TPS02
Length (m): 1.90
Width (m): 0.70
Depth (m): 3.00

Test No: 1
Datum height:
Granular infill: Yes
Porosity of infill: 0.38

Date: 16/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.88	30	1.15
1	0.91	40	1.21
2	0.93	65	1.33
3	0.95	80	1.45
4	0.96	100	1.59
5	0.97	145	1.75
6	0.98	163	1.82
7	0.99	189	1.90
8	1.00	210	1.96
9	1.01	242	2.04
10	1.02	267	2.09
12	1.03	302	2.16
15	1.05	340	2.22
25	1.11	1240	2.83



Start water depth for analysis (mbgl): 0.88
 75% effective depth (mbgl): 1.41 Elapsed time (mins): 75.0
 50% effective depth (mbgl): 1.94
 25% effective depth (mbgl): 2.47 Elapsed time (mins): 708.9
 Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³): 0.536
 Mean surface area of outflow (m²): 6.84
 (side area at 50% effective depth + base area)
 Time for outflow between 75% and 25% effective depth (mins): 633.9

Soil infiltration rate (m/s):

2.1E-6

Remarks Results processed following BRE 365 (2007).

Notes:

Project Deeside Site C HVDC Converter Station Site
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Figure
SKWY/TPS02/1
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Soakaway Test



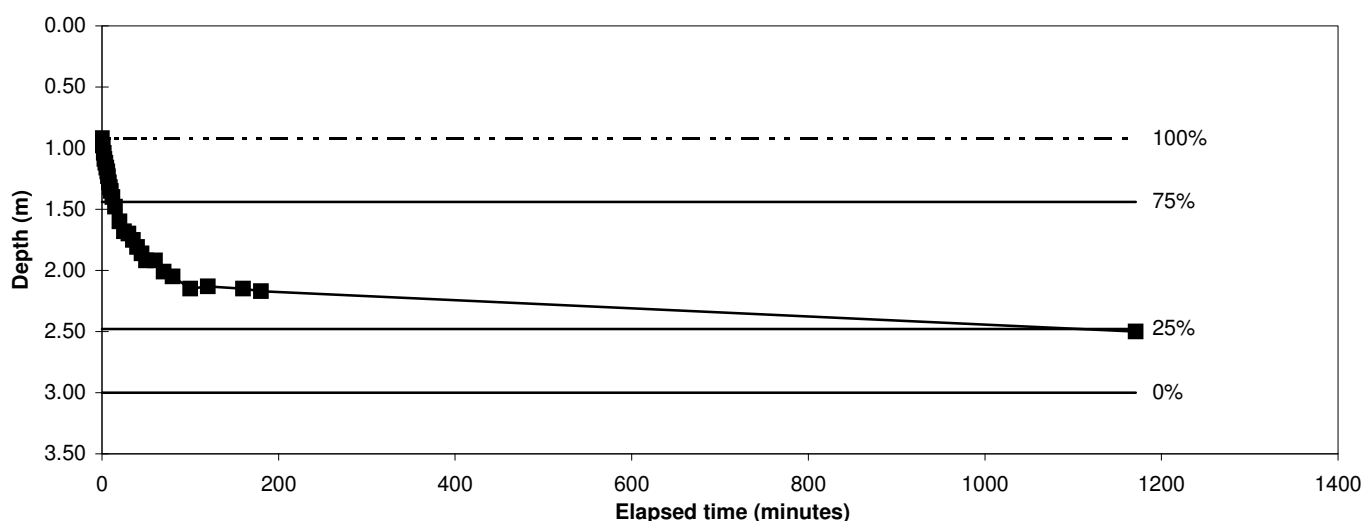
Soil Mechanics

Trial Pit No: TPS03
Length (m): 1.80
Width (m): 1.00
Depth (m): 3.00

Test No: 1
Datum height:
Granular infill: None

Date: 15/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.92	25	1.68
1	0.98	30	1.70
2	1.04	35	1.75
3	1.09	40	1.81
4	1.12	45	1.86
5	1.16	50	1.92
6	1.19	60	1.92
7	1.23	70	2.01
8	1.28	80	2.05
9	1.32	100	2.15
10	1.35	120	2.13
12	1.40	160	2.15
15	1.48	180	2.17
20	1.60	1171	2.50



Start water depth for analysis (mbgl): 0.92
75% effective depth (mbgl): 1.44 Elapsed time (mins): 13.5
50% effective depth (mbgl): 1.96
25% effective depth (mbgl): 2.48 Elapsed time (mins): 1110.9
Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³): 1.872
Mean surface area of outflow (m²): 7.62
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins): 1097.4

Soil infiltration rate (m/s):

3.7E-6

Remarks Results processed following BRE 365 (2007).

Notes:

Project Deeside Site C HVDC Converter Station Site
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Figure
SKWY/TPS03/1
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Soakaway Test



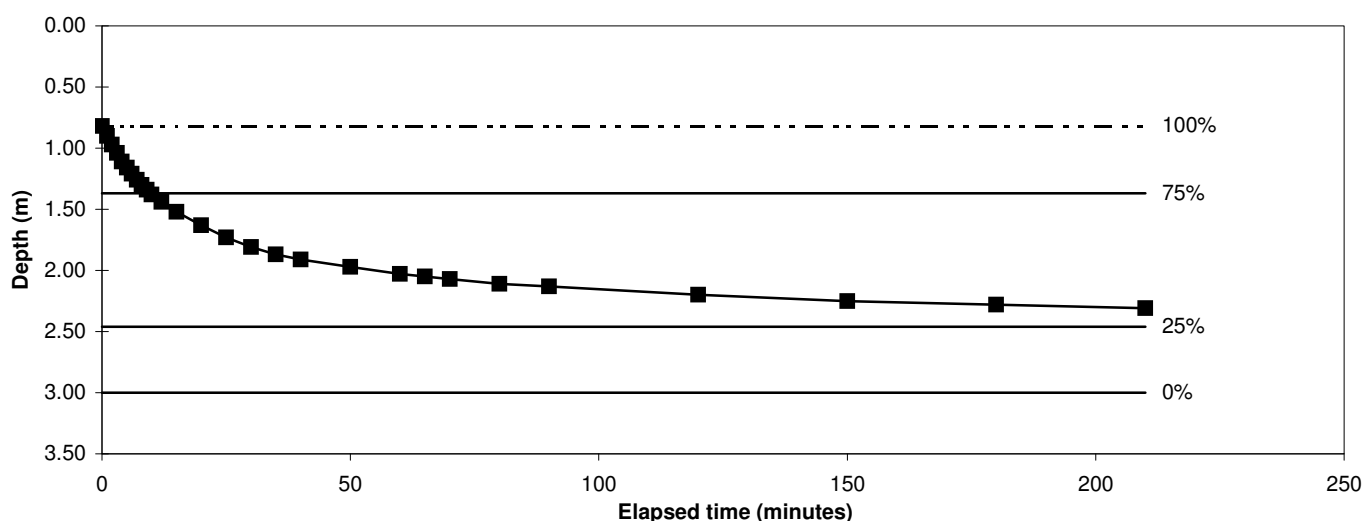
Soil Mechanics

Trial Pit No: TPS04
Length (m): 2.00
Width (m): 1.00
Depth (m): 3.00

Test No: 1
Datum height:
Granular infill: None

Date: 15/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.82	25	1.73
1	0.90	30	1.81
2	0.97	35	1.87
3	1.04	40	1.91
4	1.11	50	1.97
5	1.16	60	2.03
6	1.21	65	2.05
7	1.26	70	2.07
8	1.30	80	2.11
9	1.34	90	2.13
10	1.38	120	2.20
12	1.44	150	2.25
15	1.52	180	2.28
20	1.63	210	2.31



Start water depth for analysis (mbgl): 0.82
75% effective depth (mbgl): 1.37 Elapsed time (mins): 9.8
50% effective depth (mbgl): 1.91
25% effective depth (mbgl): 2.46 Elapsed time (mins): #N/A
Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³):
Mean surface area of outflow (m²): 8.54
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):

Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate

Remarks Results processed following BRE 365 (2007).

Notes:

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Soakaway Test



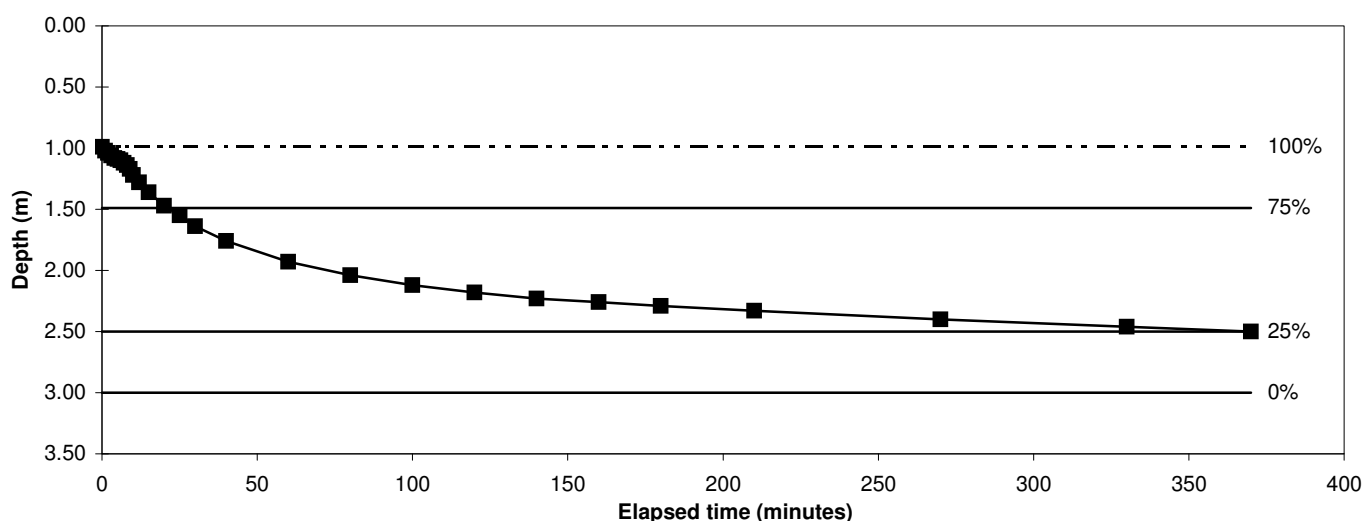
Soil Mechanics

Trial Pit No: TPS01
Length (m): 1.80
Width (m): 0.70
Depth (m): 3.00

Test No: 2
Datum height:
Granular infill: Yes
Porosity of infill: 0.38

Date: 17/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.99	25	1.55
1	1.02	30	1.64
2	1.04	40	1.76
3	1.06	60	1.93
4	1.08	80	2.04
5	1.09	100	2.12
6	1.10	120	2.18
7	1.12	140	2.23
8	1.14	160	2.26
9	1.17	180	2.29
10	1.22	210	2.33
12	1.28	270	2.40
15	1.36	330	2.46
20	1.47	370	2.50



Start water depth for analysis (mbgl): 0.99
75% effective depth (mbgl): 1.49 Elapsed time (mins): 21.3
50% effective depth (mbgl): 2.00
25% effective depth (mbgl): 2.50 Elapsed time (mins): #N/A
Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³):

Mean surface area of outflow (m²): 6.26

(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):

Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate

Remarks Results processed following BRE 365 (2007).
Heavy overnight rain

Notes:

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Soakaway Test



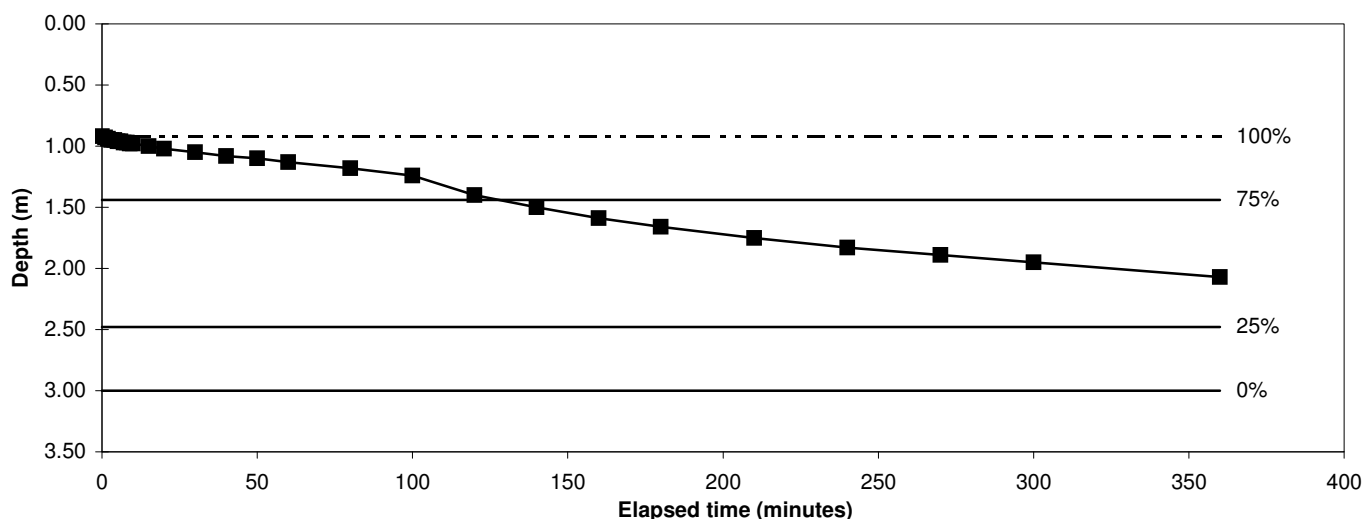
Soil Mechanics

Trial Pit No: TPS02
Length (m): 1.90
Width (m): 0.70
Depth (m): 3.00

Test No: 2
Datum height:
Granular infill: Yes
Porosity of infill: 0.38

Date: 17/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.92	40	1.08
1	0.93	50	1.10
2	0.94	60	1.13
3	0.95	80	1.18
4	0.95	100	1.24
5	0.96	120	1.40
6	0.96	140	1.50
7	0.97	160	1.59
8	0.97	180	1.66
9	0.98	210	1.75
10	0.98	240	1.83
15	1.00	270	1.89
20	1.02	300	1.95
30	1.05	360	2.07



Start water depth for analysis (mbgl): 0.92
 75% effective depth (mbgl): 1.44 Elapsed time (mins): 128.0
 50% effective depth (mbgl): 1.96
 25% effective depth (mbgl): 2.48 Elapsed time (mins): #N/A
 Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³):
 Mean surface area of outflow (m²): 6.74
 (side area at 50% effective depth + base area)
 Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):

Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate

Remarks Results processed following BRE 365 (2007).

Notes:

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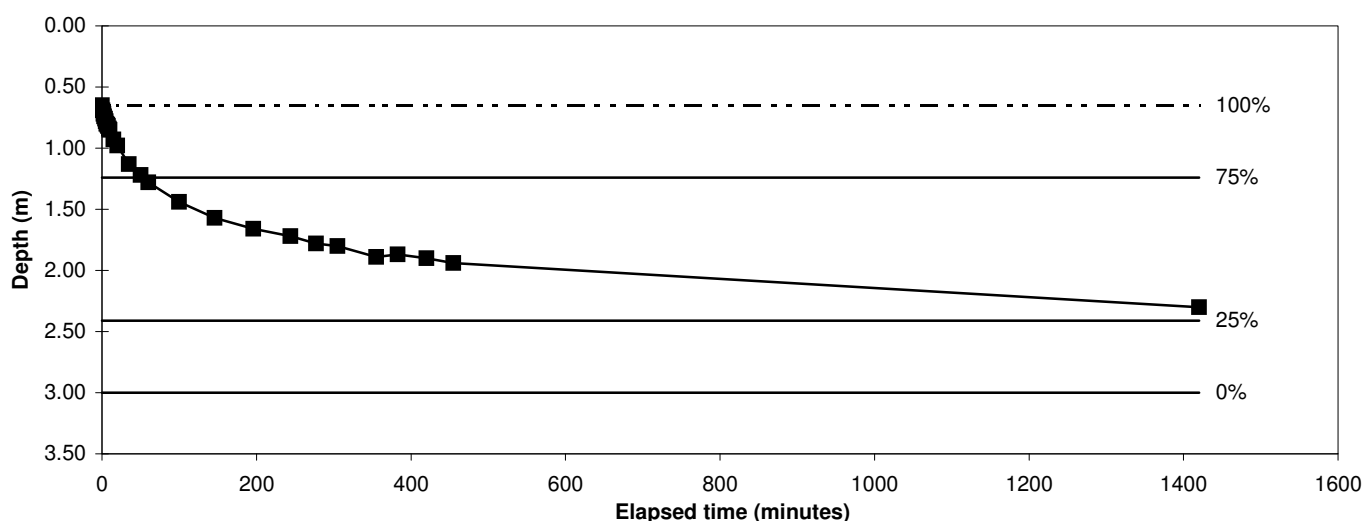
Soil Mechanics

Trial Pit No: TPS03
Length (m): 1.80
Width (m): 1.00
Depth (m): 3.00

Test No: 2
Datum height:
Granular infill: None

Date: 17/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.65	50	1.22
1	0.69	60	1.28
2	0.72	100	1.44
3	0.74	146	1.57
4	0.76	196	1.66
5	0.78	244	1.72
6	0.80	277	1.78
7	0.81	305	1.80
8	0.82	355	1.89
9	0.84	383	1.87
10	0.85	420	1.90
15	0.93	455	1.94
20	0.98	1420	2.30
35	1.13		



Start water depth for analysis (mbgl): 0.65
 75% effective depth (mbgl): 1.24 Elapsed time (mins): 53.3
 50% effective depth (mbgl): 1.83
 25% effective depth (mbgl): 2.41 Elapsed time (mins): #N/A
 Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³):
 Mean surface area of outflow (m²): 8.35
 (side area at 50% effective depth + base area)
 Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):

Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate

Remarks Results processed following BRE 365 (2007).

Notes:

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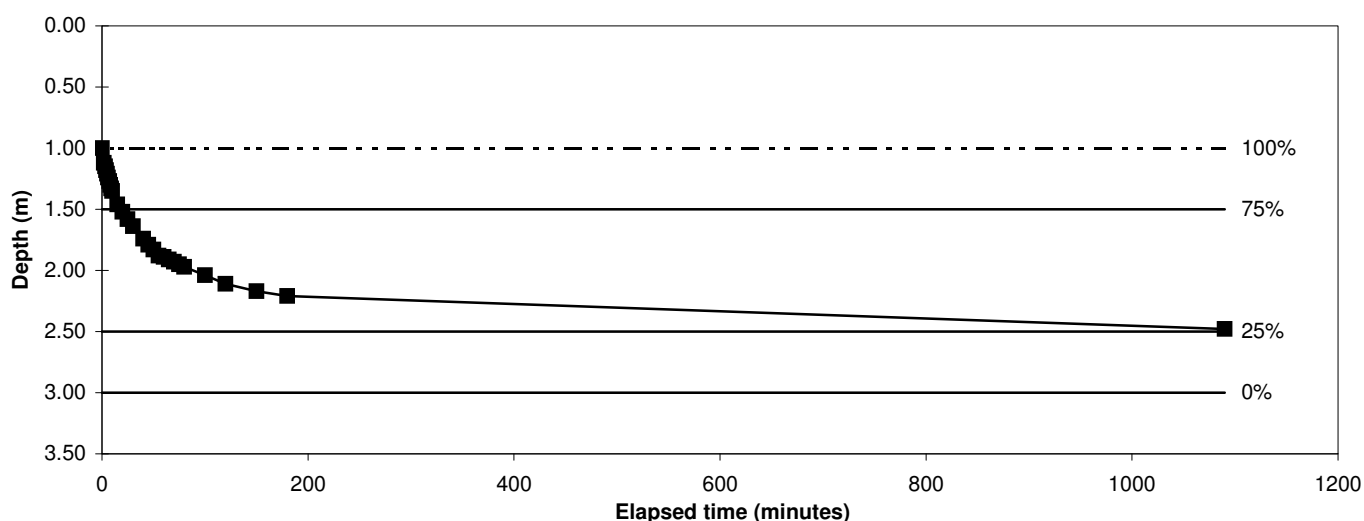
Soil Mechanics

Trial Pit No: TPS04
Length (m): 2.00
Width (m): 1.00
Depth (m): 3.00

Test No: 2
Datum height:
Granular infill: None

Date: 15/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.00	40	1.74
2	1.12	45	1.79
3	1.15	50	1.83
4	1.18	55	1.88
5	1.21	60	1.89
6	1.24	65	1.91
7	1.27	70	1.93
8	1.30	75	1.95
9	1.33	80	1.97
10	1.35	100	2.04
15	1.46	120	2.11
20	1.52	150	2.17
25	1.58	180	2.21
30	1.64	1090	2.48



Start water depth for analysis (mbgl): 1.00
75% effective depth (mbgl): 1.50 Elapsed time (mins): 18.3
50% effective depth (mbgl): 2.00
25% effective depth (mbgl): 2.50 Elapsed time (mins): #N/A
Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³):
Mean surface area of outflow (m²): 8.00
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):

Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate

Remarks Results processed following BRE 365 (2007).

Notes:

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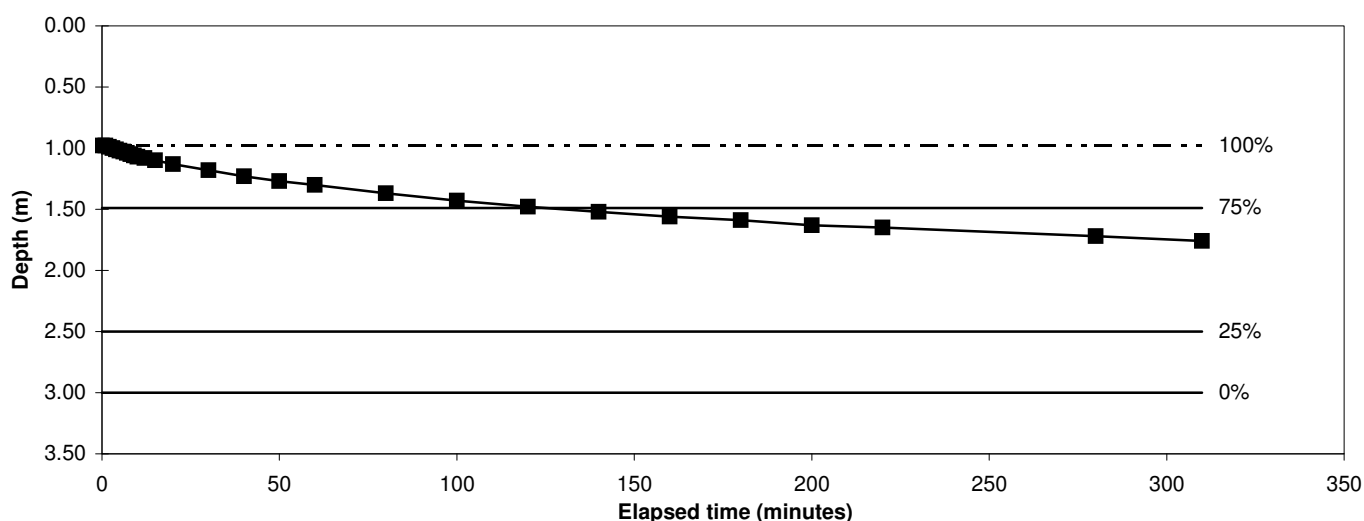
Soil Mechanics

Trial Pit No: TPS03
Length (m): 1.80
Width (m): 1.00
Depth (m): 3.00

Test No: 3
Datum height:
Granular infill: None

Date: 17/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.98	30	1.18
1	0.98	40	1.23
2	0.99	50	1.27
3	1.00	60	1.30
4	1.01	80	1.37
5	1.02	100	1.43
6	1.03	120	1.48
7	1.04	140	1.52
8	1.05	160	1.56
9	1.06	180	1.59
10	1.07	200	1.63
12	1.08	220	1.65
15	1.10	280	1.72
20	1.13	310	1.76



Start water depth for analysis (mbgl): 0.98
 75% effective depth (mbgl): 1.49 Elapsed time (mins): 125.0
 50% effective depth (mbgl): 1.99
 25% effective depth (mbgl): 2.50 Elapsed time (mins): #N/A
 Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³):
 Mean surface area of outflow (m²): 7.46
 (side area at 50% effective depth + base area)
 Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):

Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate

Remarks Results processed following BRE 365 (2007).

Notes:

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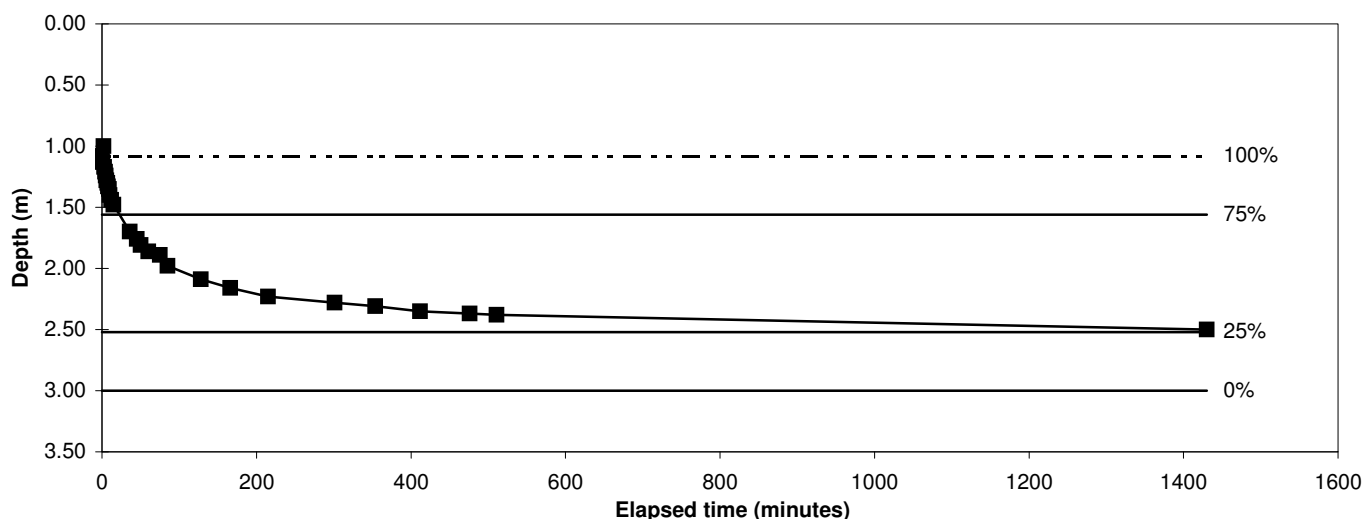
Soil Mechanics

Trial Pit No: TPS04
Length (m): 2.00
Width (m): 1.00
Depth (m): 3.00

Test No: 3
Datum height:
Granular infill: None

Date: 16/10/2012
0.00 m agl

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.08	45	1.76
1	1.13	50	1.81
2	1.00	60	1.86
3	1.17	75	1.89
4	1.21	85	1.98
5	1.24	128	2.09
6	1.28	166	2.16
7	1.30	215	2.23
8	1.33	301	2.28
9	1.35	354	2.31
10	1.40	412	2.35
12	1.44	476	2.37
15	1.48	511	2.38
36	1.70	1430	2.50



Start water depth for analysis (mbgl): 1.08
75% effective depth (mbgl): 1.56 Elapsed time (mins): 22.6
50% effective depth (mbgl): 2.04
25% effective depth (mbgl): 2.52 Elapsed time (mins): #N/A
Base of soakage zone (mbgl): 3.00

Volume outflow between 75% and 25% effective depth (m³):
Mean surface area of outflow (m²): 7.76
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):

Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate

Remarks Results processed following BRE 365 (2007).

Notes:

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Appendix D

