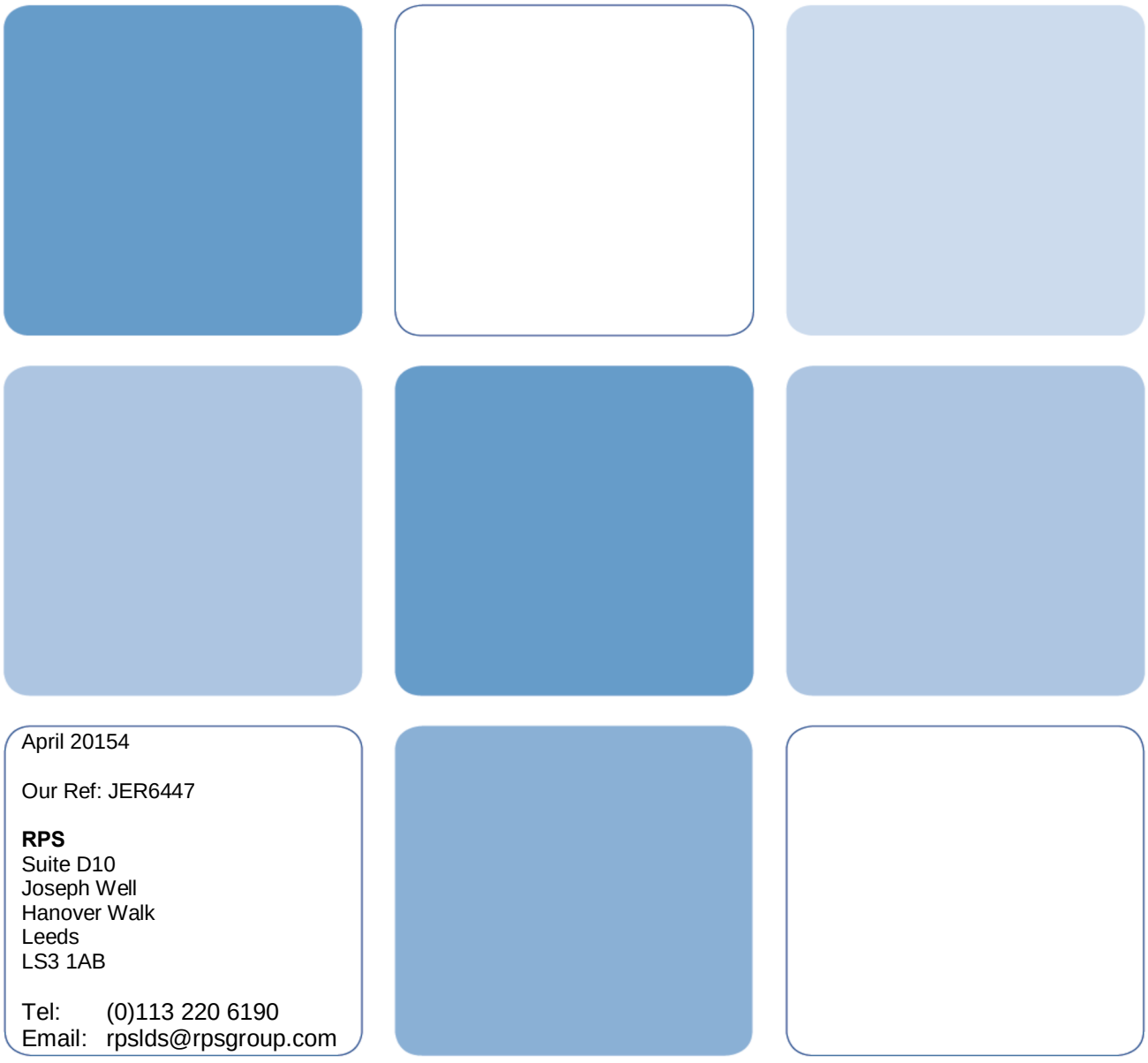
Newport Depot, Esperanto Way.

Flood Consequences Assessment

On Behalf of

WRAP



April 20154

Our Ref: JER6447

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Date:	April 2015	
Revision:		
Project Number:	JER6447	
Document Reference:	JER6447 - Newport Depot FCA_FINAL	

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1 This report contains only that available factual data for the Site which was obtained from the sources described in the text. These data were related to the Site on the basis of the location information made available to RPS and its sub-consultants by the client.

2 The assessment of the Site is based on information supplied by the client and on-site inspections undertaken by RPS and its sub-consultants. Relevant information was also obtained from other sources.

3 The report reflects both the information provided to RPS and its sub-consultants in documents made available for review and the results of observations and consultations by RPS staff and its sub-consultants.

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Amendment Record

Revision No.	Date	Reason for Change	Authors Initials

Executive Summary

S1 RPS has undertaken a Flood Consequences Assessment (FCA) in accordance with the requirements of Planning Policy Wales, TAN15 and the Newport Local Development Plan for the proposed development at Esperanto Way, Newport.

S2 The development site to be located within DAM Flood Zone C1 ómediumôprobability of flooding extents. EA mapping shows the site to be located in undefended Flood Zone 3. Detailed hydraulic modelling produced as part of the Newport SFRM indicates that the site is located beyond the present day (2011) 1 in 200 year tidal flood extents. However, NRW has confirmed that during events greater than the present day 1 in 200 year event the Site is potentially at risk of flooding to depths of 2.02m for a 1 in 200 year event plus climate change and 1.58m for a 1 in 1,000 year event. Therefore the site has been determined to be at high risk of tidal flooding.

S3 There is no historical evidence of flooding at the site.

S4 The site is at negligible to very low susceptibility to surface water flooding.

S5 The susceptibility to groundwater flooding is low.

S6 The risk of flooding from infrastructure failure is considered to be low.

S7 The risk of flooding from reservoir failure has been assessed as low to negligible.

S8 The proposed development is defined as less vulnerable in TAN15, and an extension to an existing development, therefore deemed appropriate for the present flood zone.

S9 There will be a 3,043 m^2 (35%) increase in low permeability cover, surface runoff will be controlled at the current rate and discharged via the existing drainage network.

S10 The attenuation volume required to restrict runoff to the 1 in 1 year (100% annual probability) current runoff rate of 3.8 l/s from a 1 in 100 year storm event plus 20% for climate change has been determined to be approximately 192 m^3 for the Site.

S11 The outline drainage scheme indicates that run-off would run-off into a new drainage network, passing through an interceptor and 192 m^3 storm water retention tank prior to discharging into the existing surface water system.

S12 This FCA and supporting documentation shows that the proposed development at this location meets the requirements of PPW, TAN15 and the Newport Local Development Plan policies.

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Appendix 2	Topographical Survey
Appendix 3	WinDes Calculations
Appendix 4	Outline Drainage Plan

1 Scope of Work

1.1 Background

1.1.1 At the request of WRAP, RPS Planning and Development Ltd (RPS) has carried out a site-specific Flood Consequences Assessment (FCA) for a proposed development off Esperanto Way, Newport. The FCA was prepared in accordance with Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15).

1.1.2 This FCA report will form part of the planning application for the development.

1.1.3 The key objectives of the FCA are:

- To assess the flood risk to the proposed development and to demonstrate the feasibility of appropriately designing the development such that any residual flood risk to the development and users would be acceptable;
- To assess the potential impact of the proposed development on flood risk elsewhere and to demonstrate the feasibility of appropriately designing the development such that the development would not increase flood risk elsewhere; and
- To satisfy the requirements of PPW and TAN15 which require FCAs to be submitted in support of planning applications for development in areas of flood risk.

1.1.4 Current guidance on development and flood risk identifies several key aims for a development to ensure that it is sustainable in flood risk terms. These aims are as follows:

- The development should not be at a significant risk of flooding and should not be susceptible to damage due to flooding;
- The development should not be exposed to flood risk such that the health, safety and welfare of the users of the development, or the population elsewhere, is threatened;
- Normal operation of the development should not be susceptible to disruption as a result of flooding;
- Safe access to and from the development should be possible during flood events;
- The development should not increase flood risk elsewhere;
- The development should not prevent safe maintenance of watercourses or maintenance and operation of flood defences;
- The development should not be associated with an onerous or difficult operation and maintenance regime to manage flood risk. The responsibility for any operation and maintenance required should be clearly defined;
- Future users of the development should be made aware of any flood risk issues relating to the development;
- The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues;

- The development should not lead to degradation of the environment; and
- The development should meet all of the above criteria for its entire lifetime, including consideration of the potential effects of climate change.

1.1.5 The FCA was undertaken with due consideration of these sustainability aims.

1.2 Project Scope

1.2.1 This FCA report is structured as follows:

- Section 2 identifies the sources of information that have been consulted in preparation of the report.
- Section 3 provides a review off the Site and immediate surrounding area.
- Section 4 reviews publicly available hydrological data and undertakes a flood consequences assessment of the proposed development scheme.
- Section 5 describes the sites vulnerability status in line with PPW and TAN15.
- Section 6 describes the flood risk management measures that should be applied to the Site, where required.
- Section 7 provides a summary and conclusion to the report.

2 Sources of Information

2.1 Introduction

2.1.1 Table 1 below lists the information sources consulted during preparation of this report.

Table 1- Information sources consulted during preparation of the report

Data	Source	Notes
Site setting and hydrology.	Natural Resources Wales and OS Mapping 1: 50 000 Sheet 171: Cardiff and Newport.	Area information, rivers and other watercourses, general site environs, built environment, catchment Information.
Geology.	Natural Resources Wales and BGS 1: 50 000: Sheet 249: Newport.	Site and area geology.
Natural Resources Wales.	Natural Resources Wales data holdings, customer service and engagement team.	Current flood risk, local flood defences, flood levels, supplementary geology and groundwater information.
Local Planning Authority (LPA).	Newport City Council.	Flood Zoning Local Development Plan.
Water Utility Company.	Welsh Water.	Public sewer assets in the vicinity of the site.
Flood Risk Assessment and Planning Guidance.	Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15).	Flood zoning for the site as used by NRW in Wales.
Reports.	Capita Symonds August 2009	River Usk 2D Joint Probability model. Environment Agency Wales SFRM Framework Commission, River Usk SFRM Hazard Mapping, Final.
	JBA December 2011	JBA, Newport SFRM Modelling Update of Newport Tidal Model, Final report, December 2011.
	Newport SFCA, 2012	Newport City Council, January 2012. Stage 2 SFCA Addendum.
	Newport SFCA, 2012	Newport City Council, January 2012. Stage 2 SFCA Addendum.
	Newport SFCA, 2013.	Newport City Council, March 2013. Stage 3 SFCA.

2.2 Legislation and Guidance

Regional Planning Policy

2.2.1 PPW Chapter 13 ôMinimising and Managing Environmental Risk and Pollutionô outlines the Welsh Governmentôs objectives to address flood risk.

Paragraph 13.4 states:

Development proposals in areas defined as being of high flood hazard should only be considered where:

- *new development can be justified in that location, even though it is likely to be at risk from flooding; and*
- *the development proposal would not result in the intensification of existing development which may itself be at risk; and*
- *new development would not increase the potential adverse impacts of a flood event.*

2.2.2 PPW is supplemented by a series of Technical Advice Notes (TAN). Technical guidance on development and flood risk is provided by TAN 15.

Newport Local Development Plan 2011 to 2026, revised deposit plan June 2013.

2.2.3 The Local Development Plan (LDP) document sets out detailed planning policies and proposals for Newport City Council.

2.2.4 The LDP policies relevant to hydrology and flood risk are:

Policy SP1 Sustainability

2.2.5 Proposals will be required to make a positive contribution to sustainable development by concentrating development in sustainable locations on brownfield land within the settlement boundary. They will be assessed as to their potential contribution to:

- Minimising the risk of and from flood risk, sea level rise and the impact of climate change;

Policy SP3 Flood Risk

2.2.6 *Newport's coastal and riverside location necessitates that development be directed away from areas where flood risk is identified as a constraint and ensure that the risk of flooding is not increased elsewhere. Development will only be permitted in flood risk areas in accordance with national guidance. Where appropriate a detailed technical assessment will be required to ensure that the development is designed to cope with the threat and consequences of flooding over its lifetime. Sustainable solutions to manage flood risk should be prioritised.*

Policy SP4 Water Resources

2.2.7 *Development proposals should, protect water quality during and after construction and result in no net increase in surface water run-off through the sustainable management of water resources by:*

- *The use of sustainable drainage systems;*
- *The reuse of water and reduction of surface water run-off through high quality designed developments;*
- *Careful consideration of the impact upon finite water resources, particularly in terms of increased pressures on abstraction and the impact of climate change.*
- *Ensuring development is appropriately located and phased so that there is capacity in the waste water, sewerage and water supply as well as the protection of water quality.*

Policy GP1 General Development Principles – Climate Change

2.2.8 *Development proposals should:*

- *Be designed to withstand the predicted changes in the local climate and to reduce the risk of flooding on site and elsewhere, unless the risk and consequences of flooding are demonstrated as being acceptably managed, including the avoidance of non-permeable hard surfaces.*

Policy GP6 General Development Principles – Quality of Design

2.2.9 *Good quality design will be sought in all forms of development. The aim is to create a safe, accessible, attractive and convenient environment. in considering development proposals the following fundamental design principles should be addressed:*

- *Sustainability: new development should be inherently robust, energy and water efficient, flood resilient and adaptable, thereby facilitating the flexible reuse of the building.*

GP7 General Development Principles – Environmental Protection and Public Health

2.2.10 *Development will not be permitted which would cause or result in unacceptable harm to health because of land contamination, dust, instability or subsidence, air, heat, noise or light pollution, flooding, water pollution, or any other identified risk to environment, local amenity or public health and safety.*

Policy CE10 Coastal Zone

2.2.11 *Development will not be permitted in the coastal area or adjoining the tidal river unless:*

- *In the undeveloped coastal area such development is required to be on the coast to meet an exceptional need which cannot reasonably be accommodated elsewhere;*

- *The area is not itself at risk nor will the proposed development exacerbate risks from erosion, flooding or land instability development which requires a coastal location should be sited within the developed coastal zone.*

2.3 Climate Change

2.3.1 The effects of future climate change over the next few decades are predicted to result in milder wetter winters and hotter drier summers in the UK. The UK Meteorological Office Climate Projections Report UKCP09 indicates that the predicted increased frequency of heavy, intense precipitation will lead to increased peak river flows in combination with rising sea levels and will have a major impact on the potential for future flooding. UKCP09 provides advice on indicative sensitivity ranges for the predicted impacts of climate change. Based on a high emissions scenario for Wales, sea levels may be up to 0.433 m higher in 2080 than in 1990, and winter mean precipitation intensity could be up to 26% higher than current levels in 2080.

2.3.2 In addition, TAN15 notes that peak river flow could be 20% higher than current levels.

2.3.3 For the purposes of this report the TAN15 20% climate change allowance has been adopted for use in the development attenuation calculations.

3 Site Setting

3.1 Site Location

3.1.1 The application area is located c.1.8 km southeast of Newport City Centre and c.50 m east of the River Usk at National Grid Reference 332012, 186231 (Drawing 1). The area is bordered to the immediate west by the River Usk, to the north and east by commercial and industrial units, and to the south by Stephenson Street with a recreation area, Coronation Park beyond.

3.1.2 Access to the site is via Esperanto Way, off Stephenson Street.

3.2 Existing Development

3.2.1 The site (Drawing 2) consists of a rectangular parcel of land covering c.0.88 ha encompassing the existing Wastesavers facility, associated car parking and areas of hardstanding, with small areas of soft landscaping. The site is characterised by the following footprints:

- Wastesavers building (1,224 m²) (low permeability footprint)
- Car parking and hardstanding areas (3,446 m^2) (low permeability footprint)
- Soft landscaping and gravel areas (4,093 m^2) (permeable footprint)

3.2.2 Site levels are generally above 7m Above Ordnance Datum (AOD), with the built footprint at c.7.2mAOD. A topographical survey of the site is included as Appendix 2.

3.3 Proposed Development

3.3.1 The proposed development is an extension to the Wastesavers facility (Drawing 3) to incorporate the following:

- 4 No. covered storage bays;
- 2 No. open storage bays;
- 19 No. new staff parking spaces;
- Hardstanding area for external storage; and
- Redesign of internal traffic flow.

3.3.2 The low permeability footprint will increase by 3,043 m^2 from 4,670 m² to 7,713 m².

3.3.3 Ground floor levels within the development will be set at 7.2 mAOD to match those of the existing built footprint.

3.3.4 Table 2 below illustrates the area and percentage change alteration in low permeable surfacing types for the existing site and proposed extension.

Table 2 - Land Use Types for the Existing Site and Proposed Development.

Land Use Type	Total Land Use Area			
	Existing Site		**Proposed Development**	
	m²	%	m²	%
Built area	1,224	14	1,743	20
Hard standing	3,446	39	5,970	68
Gravel	802	9	536	6
Soft landscaping	3,291	38	514	6
Total	8,763	100	8,763	100

4 Flood risk

4.1 Introduction

4.1.1 This section outlines the potential flood risk to the proposed development site.

4.2 Fluvial and Tidal Flooding

4.2.1 TAN15 Development Advice Mapping (DAM) (Drawing 4) shows that the Site is located within Zone C1, defined as areas at risk of flooding during a 1 in 1,000 year event and protected by flood defences.

4.2.2 The Environment Agency (EA) flood map of April 2015 (Drawing 5) which assumes there are no flood defences, indicates that the majority of the site lies within Flood Zone 3, and is at ôhigh probabilityô(1 in 200 or greater annual probability of flooding from the sea) of flooding.

4.2.3 The closest water features to the proposed development is the tidally influenced River Usk located immediately to the west of the application area.

4.2.4 The River Usk is one of the largest rivers in Wales being over 120 km long from its source to mouth. It rises in the mountains of mid-Wales then flows southeast through Abergavenny and Usk and through the centre of Newport to the Severn estuary. Newport has the highest tidal range of any city centre in the world and the tidal reach extends upstream as far as Newbridge-on-Usk.

4.2.5 There are no other significant water features within 500 m of the proposed development.

4.2.6 Joint probability hydrological modelling undertaken by JBA as part of the Newport Strategic Flood Risk Management Framework (SFRM) provided 2 Dimensional modelled flood extents for the River Usk for a range of return periods, including flood defences. The 1 in 200 year combined tidal and fluvial present day (2011) modelled outputs for the application area indicate that the site is not at risk of flooding (Drawing 3).

4.2.7 NRW has confirmed that that defended model extents including an allowance for Climate Change and greater than 1 in 200 year indicate that the Site could be at risk of flooding to a levels of:

- 9.22m AOD during a 1 in 200 year plus climate change (75 year lifetime of development):
- 8.78m AOD during a 1 in 1000 year current day:

4.2.8 Therefore, based on a 7.2m AOD floor level the Site is potentially at risk of flooding to depths of 2.02m for the 1 in 200 year plus climate change and 1.58 m for the 1 in 1,000 year event.

4.2.9 Taking all of the above information into account the application area is assessed to be at high risk of tidal flooding.

Flood Defences

4.2.10 NRW has supplied information on flood defences to the immediate west of the site (Drawing 6), which comprise a privately owned and maintained flood embankment. No further information relating to the crest level or state of the defences has been provided.

4.3 Flooding from rising / high groundwater

4.3.1 BGS online mapping (accessed April 2015) indicates that the site is underlain by Superficial Deposits comprising Made Ground and Tidal Flat Deposits (sands, silts and clays). British Geological Survey (BGS) mapping (sheet 263 Cardiff) shows that the superficial deposits are underlain by Triassic Mercia Mudstone bedrock comprising metamorphosed sedimentary mudstones and subordinate sandstones and siltstones.

4.3.2 The Mercia Mudstone is classified under the Water Framework Directive as a Secondary B Aquifer, which may store and yield limited amounts of groundwater in localised features such as fissures, thin permeable horizons and weathered zones.

4.3.3 Although there are considerable granular deposits the NRW/EA note that there is no evidence of groundwater issuing at the surface in the area around the site, although the watercourse that runs adjacent to the site is likely to be in hydraulic continuity with groundwater in the bedrock.

4.3.4 The Newport SFCA Stage 1 (2011) states that *"Groundwater levels are believed to rise and fall slowly within Newport. Therefore, groundwater levels are not a significant flood risk on a strategic scale within Newport. In addition, the local geology (predominantly mudstone, siltstone and sandstone) is not believed to yield significant quantities of groundwater."*

4.3.5 Based on the information above and the elevated area in which the site is located the potential for groundwater flooding is considered to be low.

4.4 Groundwater Source Protection Zones

4.4.1 The British Geological Survey Aquifer data accessed from the Environment Agency's website indicates that the site is not located within a Source Protection Zone.

4.5 Reservoir Failure Assessment

4.5.1 NRW mapping on the EA website (Figure 1) shows the Site may be impacted should the Llandegfedd reservoir completely fail. However, NRW acknowledges that reservoir failure is very unlikely to happen given UK safety legislation pertaining to reservoir maintenance and inspection.

4.5.2 Based on the above the risk of flooding from a reservoir failure has been assessed as negligible to low.

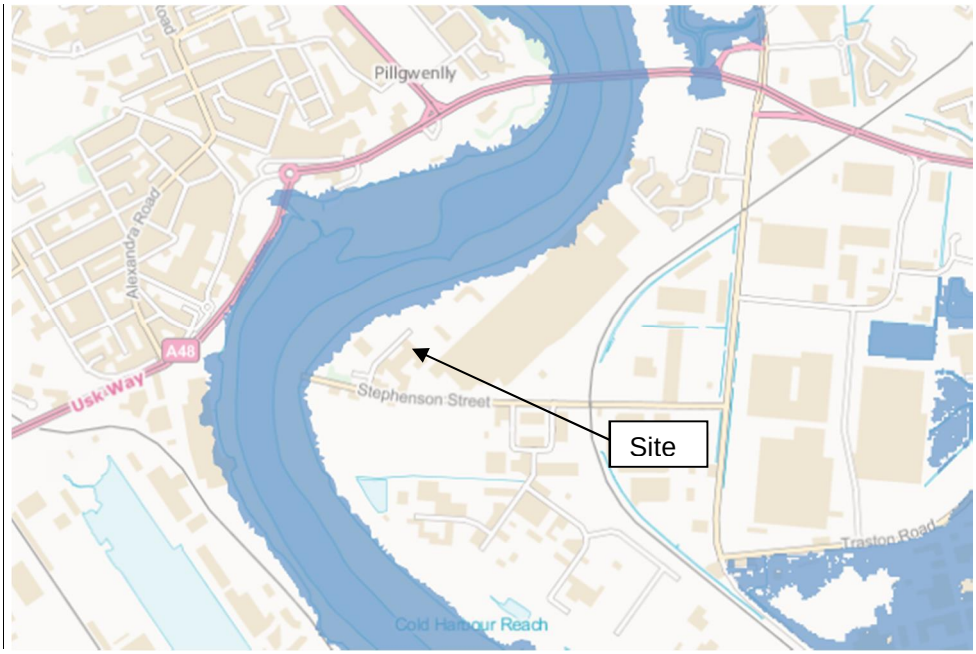


Figure 1 - EA reservoir failure flood map.

4.6 Sewer/Water Main Failure Assessment

4.6.1 A formal drainage system was noted to be present within the application area during the site walkover. This comprised roof guttering systems and external car park areas that are served by gully pots. These are assumed to discharge to the local surface water sewer system. The site's foul water drainage currently drains to the foul sewer, under an existing agreement with Welsh Water. No water quality treatment measures were observed on the existing site.

4.6.2 Sewers would have been designed to industry standards (Sewers for Adoption). However; the most common causes of flooding from sewers are; inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats/greases, and sewer collapse. Should any of these events occur there is a risk of flooding by surcharge where the flood is in excess of the sewer capacity (usually 1 in 30 year event or greater).

4.6.3 Under the DG5 register requirements all water companies are obliged to keep a record of properties that have been affected by sewer flooding. The Newport SFCA does not provide any information pertaining to historical sewer flooding within the site or immediate surrounding area.

4.6.4 Taking into account the above, the elevation of the site and absence of any historical sewer flooding, the overall risk of flooding to the site via artificial drainage system failure is assessed to be low.

4.7 Surface water flooding

4.7.1 Surface water flooding happens when rainwater cannot drain away through the normal drainage systems or soak into the ground, and either lies on or flows over the ground instead.

4.7.2 EA online surface water flood mapping (accessed April 2015) indicates that the site is at very low risk of surface water flooding.

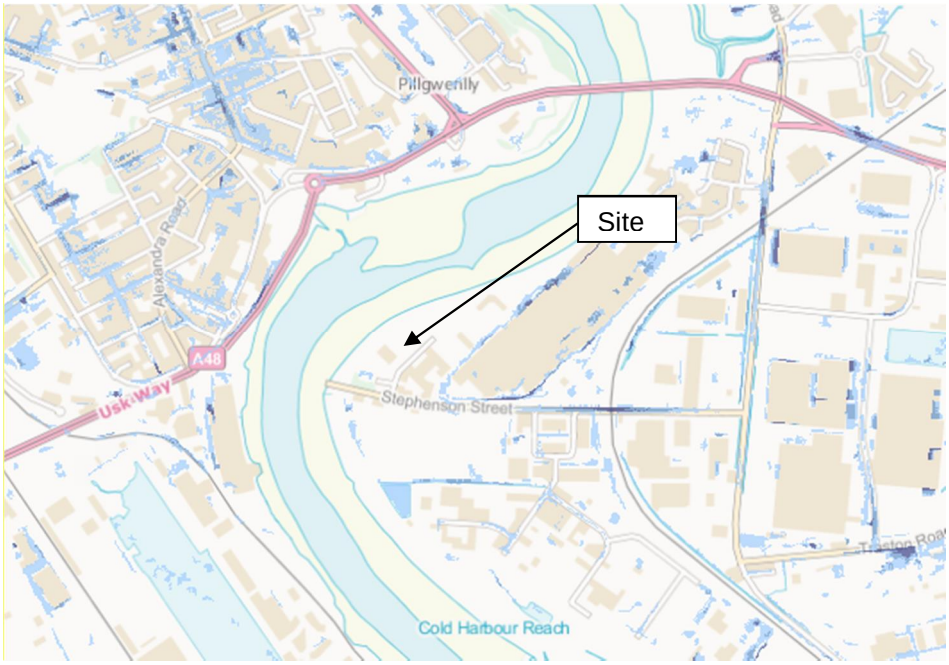


Figure 2 - EA surface water map.

4.8 Historical flood events

4.8.1 No historical flood information was provided by NRW in their information request response (Appendix 2).

4.8.2 The Newport SFCA Stage 1 notes that there have been a number of recorded incidents during flood events that occurred in the Decembers of 1979, 1981, 1989 and 1999. No information has been provided to indicate that the Site was impacted by any of the historical flood events.

5 Flood Risk Vulnerability Classification

5.1.1 In accordance with the Flood Risk Vulnerability Classification in Figure 2 of TAN15 a waste transfer facilities are classified as 'Less Vulnerable' development.

5.1.2 'Less Vulnerable' uses are appropriate for locations in Flood Zone C1 (TAN15 Section 9) subject to the following:

- Application of the Justification Test; and
- Management of surface water.

5.1.3 In addition the application should demonstrate:

- The flood risk is an acceptable consequence for nature of use;
- Flood defences are adequate;
- That an agreement for construction and maintenance costs is in place;
- Future occupiers are aware of the flood risk;
- Safe escape/evacuation routes are present;
- An effective flood warning system is in place;
- The development has incorporated flood resilience where appropriate; and
- The development would not increase flooding elsewhere.

5.2 Current Flood Risk

5.2.1 DAM and EA mapping shows that the application site is at medium to high risk of tidal flooding from the River Usk.

5.2.2 Newport SFRM Modelling Update indicates that the application area is beyond the flood extents associated with the present day combined 1 in 200 year tidal and 1 in 2 year fluvial event. However, NRW has confirmed that during events greater than the present day 1 in 200 year event the Site is potentially at risk of flooding to depths of 2.02m for a 1 in 200 year event plus climate change and 1.58 m for a 1 in 1,000 year event.

5.2.3 Therefore the site has been determined to be at high risk of tidal flooding

6 Drainage

6.1 Surface Water and Drainage

6.1.1 The sustainable management of surface water is an essential element of reducing future flood risk to the site and its surroundings.

6.1.2 Undeveloped sites generally rely on natural drainage to convey or absorb rainfall, the water soaking into the ground or flowing across the surface into watercourses.

6.1.3 The effect of development is generally to reduce the permeability of at least part of the site, which markedly changes the site's response to rainfall. Without specific measures to manage surface water the volume of water and peak flow rate are likely to increase. Inadequate surface water drainage arrangements can threaten the development itself and increase the risk of flooding to others.

6.1.4 Surface water arising from a developed site should as far as is practicable be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development while reducing the risk of flooding at the site and elsewhere, taking climate change into account.

6.2 Legislative background

6.2.1 Following the implementation of the Flood and Water Management Act 2010 local flood risk has become the responsibility of the Local Planning Authority. The Act places new duties on upper tier Councils, by designating them as Lead Local Flood Authorities (LLFAs) for the coordination of local flood risk management in their respective administrative areas.

6.2.2 The Act establishes a SuDS Approving Body (the SAB) at county or unitary local authority levels. The SAB has responsibility for the approval of proposed drainage systems in new developments and redevelopments. Approval must be given before any developer can commence construction. In order to be approved, the proposed drainage system would have to meet national standards for sustainable drainage.

6.2.3 The SAB is also responsible for adopting and maintaining SuDS which serve more than one property, which they have approved. The Highways Authorities will be responsible for maintaining SuDS in public roads to National Standards.

6.2.4 The National Standards set out the criteria by which the form of drainage appropriate to any particular site or development can be determined, as well as requirements for the design, construction, operation and maintenance of SuDS.

6.2.5 Additional guidance for the use of SuDS is provided via CIRIA and BRE in the following:

- C522 Sustainable Drainage Systems- Design Manual for England and Wales
- C523 Sustainable Drainage Systems- Best practice

- C156 Infiltration Drainage ï Manual of Good practice
- BRE365 Soakaway design

6.3 Existing Drainage System

6.3.1 Details of the current on site drainage system and discharge locations have not been made available.

6.4 Current Runoff Rate

6.4.1 The site is presently covered by a mix of low permeability hardstanding and buildings.

6.5 Proposed Runoff Rate

6.5.1 The C522 Sustainable Drainage Systems- Design Manual for England and Wales indicates that for previously developed sites the flow rate discharged from the site must not exceed that prior to the proposed development for the:

- 1 in 1 year event;
- 1 in 30 year event; and
- 1 in 100 year event.

6.6 Runoff Calculations

6.6.1 An assessment of the current and proposed runoff rates was undertaken to determine the surface water attenuation requirements for the site.

6.6.2 The rates of runoff were determined using the current óindustry best practiceô guidelines as outlined in the Interim Code of Practice for SuDS. The Defra/EA recommended methodology for sites up to 50 hectares in area is the Institute of Hydrology Report 124 method (IoH 124). The runoff rates were calculated using the Micro Drainage WinDes software suite.

6.6.3 The following parameters were incorporated into the existing site runoff calculations:

- Catchment Area: 0.88ha (assume 47% permeable (landscaping) and 53% low permeable surfacing (hardstanding/buildings);
- Average Annual Rainfall (SAAR): 981 mm/year;
- Soil: 0.300;
- Region No: 9

6.6.4 The following parameters were incorporated into the proposed development runoff calculations:

- Catchment Area: 0.88 ha (assume 12% permeable (landscaping) and 88% low permeable surfacing (hardstanding/buildings));
- Average Annual Rainfall (SAAR FEH CD-ROM 3): 981 mm/year;
- Soil: 0.300; and
- Region No: 9.

6.6.5 Table 3 summarises the results of the runoff calculations and shows that following the construction of the proposed development that there will no alteration to the existing surface water runoff regime.

Table 3 - Runoff characteristics.

Annual Probability (Return Period, years)	Current Runoff (l/s)	Proposed Runoff (l/s)	Increase in Runoff (l/s)
100% (1)	3.8	5.3	1.5
QBAR urban	4.4	6.0	1.6
3.33% (30)	7.0	9.1	2.1
1% (100)	7.9	10.0	2.1
1% + Climate	9.5	12.0	2.5

Note: 20% added to rainfall data to account for long-term climate change

6.6.6 WinDes calculations (Appendix 3) demonstrate that the 3,043 m^2 increase in low permeability area surfacing for the proposed development would increase the runoff from the Site by up to 2.5 l/s.

6.6.7 Surface water runoff from the proposed low permeable extension area would be directed to the existing surface water drainage systems via a series of new drainage gutters and collection pots located within the perimeter of the built footprint (Appendix 4).

7 Flood Mitigation

7.1 Surface Water Attenuation

7.1.1 PPW, TAN15 and Newport LDP promote sustainable water management through the use of SuDS, in line with CIRIA C697 (2007) A hierarchy of techniques is identified:

- Prevention ï the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
- Source Control ï control of runoff at or very near its source (such as the use of rainwater harvesting).
- Site Control ï management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site).
- Regional Control ï management of runoff from several sites, typically in a detention pond or wetland.

7.1.2 To demonstrate that the application can provide attenuation for the óworst-caseô scenario the attenuation storage volume requirement has been calculated using the industry standard Micro Drainage WinDes software incorporating the following parameters:

- FEH CD ROM 3 Catchment descriptors.
- Return period: 100 years plus climate change (+ 20%).
- Cv (proportion of rainfall forming surface water runoff): assume a factor of 75% for the development in summer, and 84% in winter (weighted average based on proposed land use).
- Catchment Area: 0.3 ha (the increased area of low permeable surfacing).
- 1 in 1 year runoff Rate: 3.8 l/s.
- No infiltration losses to the ground (e.g. through the use of a lined pond or tank).

7.1.3 The system was modelled within WinDes as a tank/pond with controlled discharge via an orifice outflow control. The WinDes calculation sheets are included within Appendix 3.

7.1.4 The attenuation volume required to restrict runoff to the 1 in 1 year (100% annual probability) current runoff rate of 3.8 l/s from a 1 in 100 year storm event plus 20% for climate change has been determined to be approximately 192 m^3 for the Site.

7.1.5 The proposed outline drainage scheme conveys run-off into a new drainage network, passing through a 192 m^3 storm water retention tank and oil interceptor to ensure water quality is maintained prior to discharging into the public sewer system at the design rate (Appendix 4).

8 Justification Test

8.1.1 TAN15 states 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. In Zone C2, highly vulnerable development and emergency services should not be permitted. All other new development should only be permitted within Zone C1 and C2 if determined by the local planning authority to be justified in that location.

8.1.2 Development 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 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; 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 sections 5 and 7 and appendix 1 of TAN 15 is found to be acceptable.

8.1.3 Paragraph A1.14 of TAN 15 states that industrial developments should remain flood free in up to the 1 in 200 year tidal event. Beyond this threshold frequency, development would be expected to flood under extreme conditions. As the proposed development is an extension to aid the existing development, and additional car parking is for staff and collection vehicles only the proposed satisfying criteria iv.

8.1.4 Overall, it has been demonstrated that the development of the Site is justified and would be safe, without increasing flood risk elsewhere.

9 Summary and Conclusions

9.1 Summary

9.1.1 A site-specific Flood Consequences Assessment (FCA) in accordance with PPW and TAN15 has been undertaken for the proposed c.0.88 ha industrial development of Esperanto Way, Newport.

9.2 Flood Risk

9.2.1 DAM and NRW mapping shows that the site is located within an area defined as at medium risk flooding Flood Zone C1. Newport SFRM modelling outputs indicate that the site is located beyond the 1 in 200 year tidal flood extents. However, NRW has confirmed that during events greater than the present day 1 in 200 year event the Site is potentially at risk of flooding to depths of 2.02m for a 1 in 200 year event plus climate change and 1.58 m for a 1 in 1,000 year event. Therefore the site has been determined to be at high risk of tidal flooding.

9.2.2 There is no historical evidence of flooding at the site.

9.2.3 The site is at negligible to very low susceptibility to surface water flooding.

9.2.4 The susceptibility to groundwater flooding is low.

9.2.5 The risk of flooding from infrastructure failure is considered to be low.

9.2.6 The risk of flooding from reservoir failure has been assessed as low to negligible.

9.2.7 The proposed development is appropriate for the present flood zone and the zone.

9.2.8 There will be a 3,043 m^2 increase in low permeability cover, with surface runoff to be controlled at an agreed rate.

9.2.9 The attenuation volume required to restrict runoff to the 1 in 1 year (100% annual probability) current runoff rate of 3.8 l/s from a 1 in 100 year storm event plus 20% for climate change has been determined to be approximately 192 m^3 for the Site.

9.2.10 The outline drainage scheme indicates that run-off would run-off into a new drainage network, passing through an interceptor and 192 m^3 storm water retention tank prior to discharging into the existing surface water system.

9.2.11 It is advised that Welsh Water is consulted to ascertain available capacity and any recommendation incorporated into the development drainage design scheme.

9.3 Conclusion

9.3.1 This FCA and supporting documentation illustrates that the proposed development is at low risk of flooding and appropriate to the location, meeting the requirements of PPW and TAN15.

References

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DEFRA, October 2006. Flood and Coastal Defence Appraisal Guidance FCDPAG4 Economic Appraisal Supplementary, Note to Operating Authorities ï Climate Change Impacts.

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Environment Agency, July 2009. Fluvial Design Guide.

JBA, December 2011. Newport SFRM Modelling Update of Newport Tidal Model, Final Report.

Ordnance Survey Explorer (2012) 1:50,000 Map 171: Cardiff and Newport.

Ordnance Survey 1:10,000 Scale Electronic Data Mapping for assessment area.

UK Climate Projections science report: Climate change projections, Version 3, updated December 2010.

URS, August 2011. Stage 1 Strategic Flood Consequences Assessment, Final Report.

URS, January 2012. Stage 2 Strategic Flood Consequences Assessment Addendum Prepared for: Newport City Council.

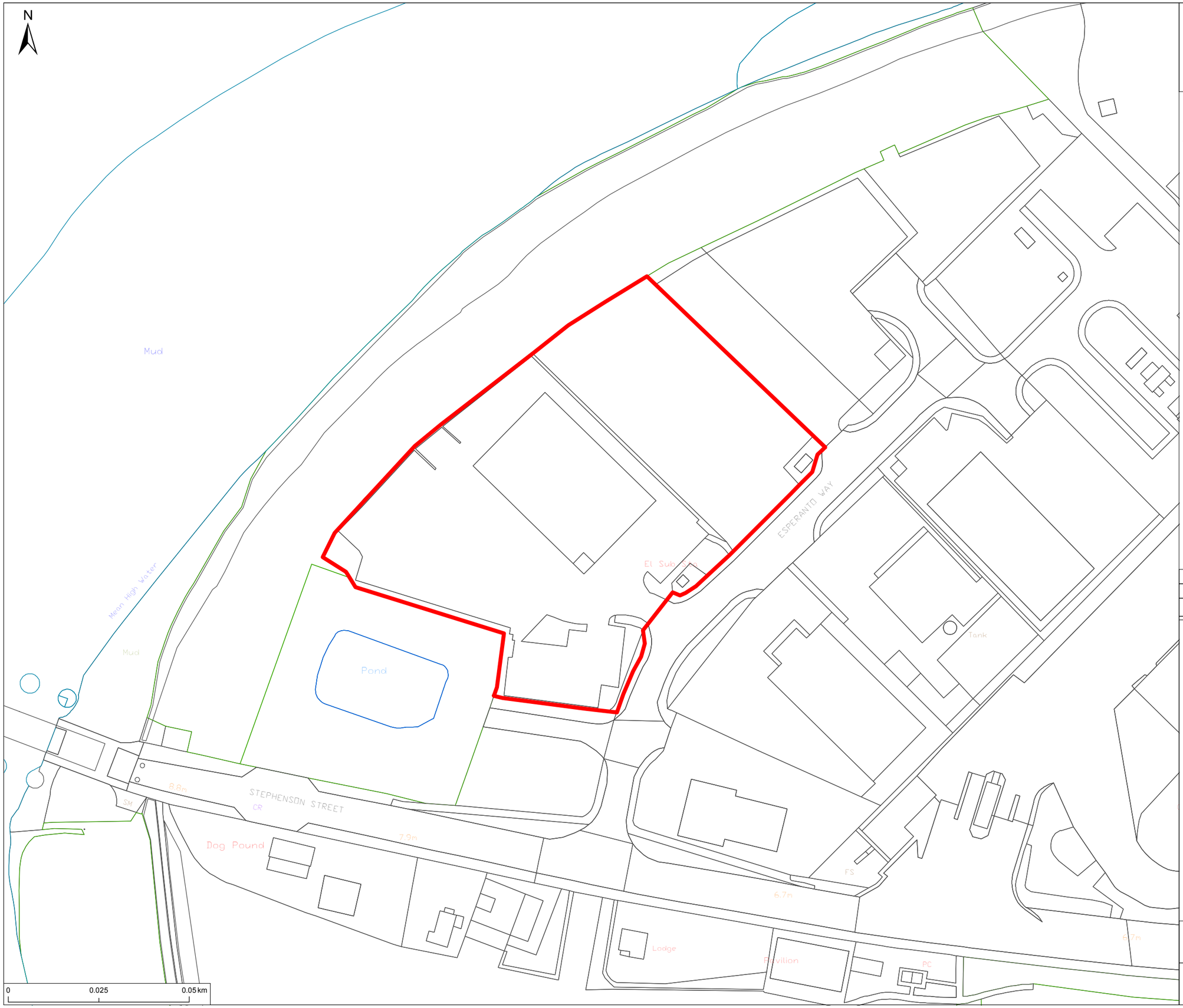
URS, December 2012. Stage 2 Strategic Flood Consequences Assessment Addendum Update Prepared for: Newport City Council.

URS, March 2013. Stage 3 Strategic Flood Consequences Assessment Stage 3 Report Prepared for: Newport City Council.

Welsh Government, February 2014. Planning Policy Wales, Edition 6.

Welsh Government, July 2004. Planning Policy Wales, Technical Advice Note 15: Development and Flood Risk.

Drawings



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Legend

Site Boundary

Rev	Description	Date	Initial	Checked
A	Revised Red Line Boundary	18-03-15	GG	TP

RPS

Park House
Greyfriars Road
Cardiff
CF10 3AQ

T: +44(0)2920 668 662 E: rpssw@rpsgroup.com F: +44(0)2920 668 622

Client WRAP

Project ESPERANTO WAY

Title SITE BOUNDARY PLAN

Status	Drawn By	PM/Checked By
FINAL	GG	TP
Job Ref	**Scale @ A3**	**Date Created**
JPW0557	1:1,000	MAR 15

Drawing Number **JPW0557-004** Rev **A**

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STORM MANHOLE SCHEDULE

CHAMBER REFERENCE	COVER LEVEL * m (A.O.D.)	INVERT LEVEL m (A.O.D.)	DEPTH m	CHAMBER TYPE	GRADIENT DOWN SREAM 1 IN .....
S1	49.95	49.11	0.84	C	100
S2	49.95	48.80	1.15	B	100
S3	49.95	48.56	1.39	B	100
S4	49.95	48.37	1.58	C	100
S5	49.95	48.28	1.67	B	To Be Confirmed
S6	49.88	48.90	0.98	B	50
S7	49.95	48.60	1.35	B	50
S8	49.96	48.42	1.54	B	100
S9	49.96	48.91	1.05	B	100
S10	Omitted				
S11	49.95	49.31	0.64	C	100
S12	Omitted				
S13	49.95	49.29	0.66	C	-
S14	49.95	To Suit Extg Spur	To Be Confirmed	C	-

NOTE: ALL PIPES TO BE 100Ø UNLESS OTHERWISE NOTED

FOUL MANHOLE SCHEDULE

CHAMBER REFERENCE	COVER LEVEL * m (A.O.D.)	INVERT LEVEL m (A.O.D.)	DEPTH m	CHAMBER TYPE	GRADIENT DOWN SREAM 1 IN .....
F1	50.10	49.50	0.60	B	100
F2	50.10	49.30	0.80	B	50
F3	50.10	49.20	0.90	B	100
F4	50.10	49.30	0.80	B	50
F5	50.02	48.90	1.12	B	100
F6	50.10	48.80	1.30	C	100
F7	50.10	48.65	1.45	C	100
F8	50.15	To Suit Extg Spur	To Be Confirmed	C	-

NOTE: ALL PIPES TO BE 100Ø UNLESS OTHERWISE NOTED

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2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS ENGINEERS AND ARCHITECTS DRAWINGS.
3. REFER TO DRAWING E20082-203 FOR DRAINAGE STANDARD DETAILS.
4. ALL PIPES TO BE 100Ø UNLESS OTHERWISE NOTED.
5. INTERCEPTORS AND RAINWATER TANKS TO BE INSTALLED IN STRICT ACCORDANCE WITH SUPPLIERS GUIDELINES.

NO DRAINAGE PROVISION IN THIS AREA AS FREE DRAINING PAVED SURFACE PROVIDED.

EXISTING FOUL AND SURFACE WATER MANHOLES AND SPURS TO BE LOCATED ON SITE AND INVERT LEVELS TO BE CONFIRMED

6000 LITRE RAINWATER STORAGE TANK

FILTER BASKET

NS6 CLASS 1

W1/030

150mmØ Acces point 300mm deep

150mmØ Acces point 600mm deep

DISABLED BAY MARKING TO MATCH EXISTING

50.000m A.O.D.

01.06.04	UNDERSLAB DRAINAGE ADDED	JH
D		JH
20.05.04	UNDERSLAB DRAINAGE ADDED	LHG
C		JH
11.05.04	UPDATED TO SHOW ARCHITECTS RWP POSITIONS	LHG
B		JH
04.03.04	DRAINAGE LAYOUT UPDATED TO LATEST ARCHITECTS PLANS	LHG
A		JH
Date		Drawn
Rev		Checked

Revisions

CLIENT

NEWPORT WASTE SAVERS

THIS IS THE ..... REFERRED TO IN THE CONTRACT DATED .....
BETWEEN
EMPLOYER .....
WITNESS .....
CONTRACTOR .....
WITNESS .....

CONTRACT

NEWPORT WASTE SAVERS

DRAWING TITLE

DRAINAGE LAYOUT

KIER WESTERN NEWPORT
24 JUN 2004
RECEIVED

HCD Eng. Limited
20 Cathedral Road
Cardiff
CF11 9LJ
Tel: 029 2030 1166
Fax: 029 2030 1168
E-mail: @hcdgroup.co.uk
HCDENG
HCD GROUP LIMITED

DRAWN	CHECKED
LHG	JH
SCALES	DATE
AS SHOWN	29/09/03

STATUS: CONSTRUCTION

DRAWING No.	Rev.
E20082/202	D



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Legend

- Application Boudary
- Covered Storage Bays (Concrete Surface)
- Storage (Concrete Surface)
- Concrete Surface Other
- Proposed Flood Light (Pole Mounted)
- Proposed Flood Light (Wall Mounted)
- Existing Flood Light (Pole Mounted)
- Existing Flood Light (Wall Mounted)

Rev	Description	Date	Initial	Checked

RPS

20 Western Avenue, Milton Park, Abingdon, Oxfordshire, OX14 4SH
T: +44(0)1235 821888 **E:** rpsox@rpsgroup.com **F:** +44(0)1235 834698

Client WRAP

Project Newport Waste Depot Extension

Title Site Layout Plan

Status	Drawn By	PM/Checked by
Draft	AJC	TP
Job Ref	**Scale @ A3**	**Date Created**
JPW0557	1:500	July-15

Drawing Number 0557-0004-06

Rev .

rpsgroup.com

0557-0004-06.vwx

Llywodraeth Cymru
Welsh Government

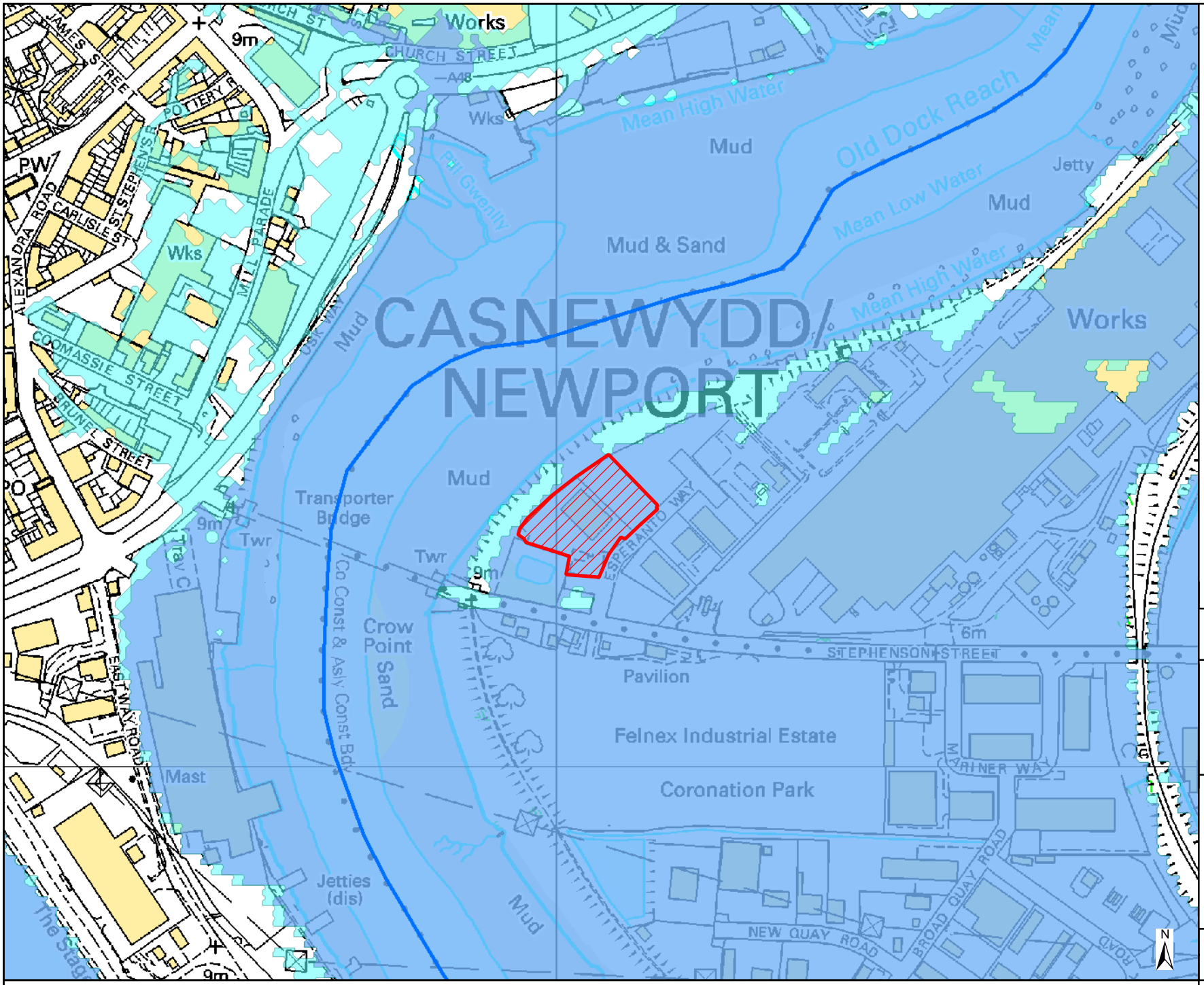
TAN 15 Development and Flood Risk

Development Advice Map



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Developed by Cartographics, Welsh Government



Legend

- Site Location
- Flood Zone 3 (1 in 100 year undefended fluvial and 1 in 200 year undefended tidal extents)
- Flood Zone 2 (1 in 1000 year undefended fluvial and tidal extents)
- Areas benefiting from defences
- Defences
- Flood Storage Area
- Main Rivers

Cyfoeth Naturiol Cymru
Natural Resources Wales

Project

Esperanton Way,
Newport
[Ref: ATI-07105a]

Drawing

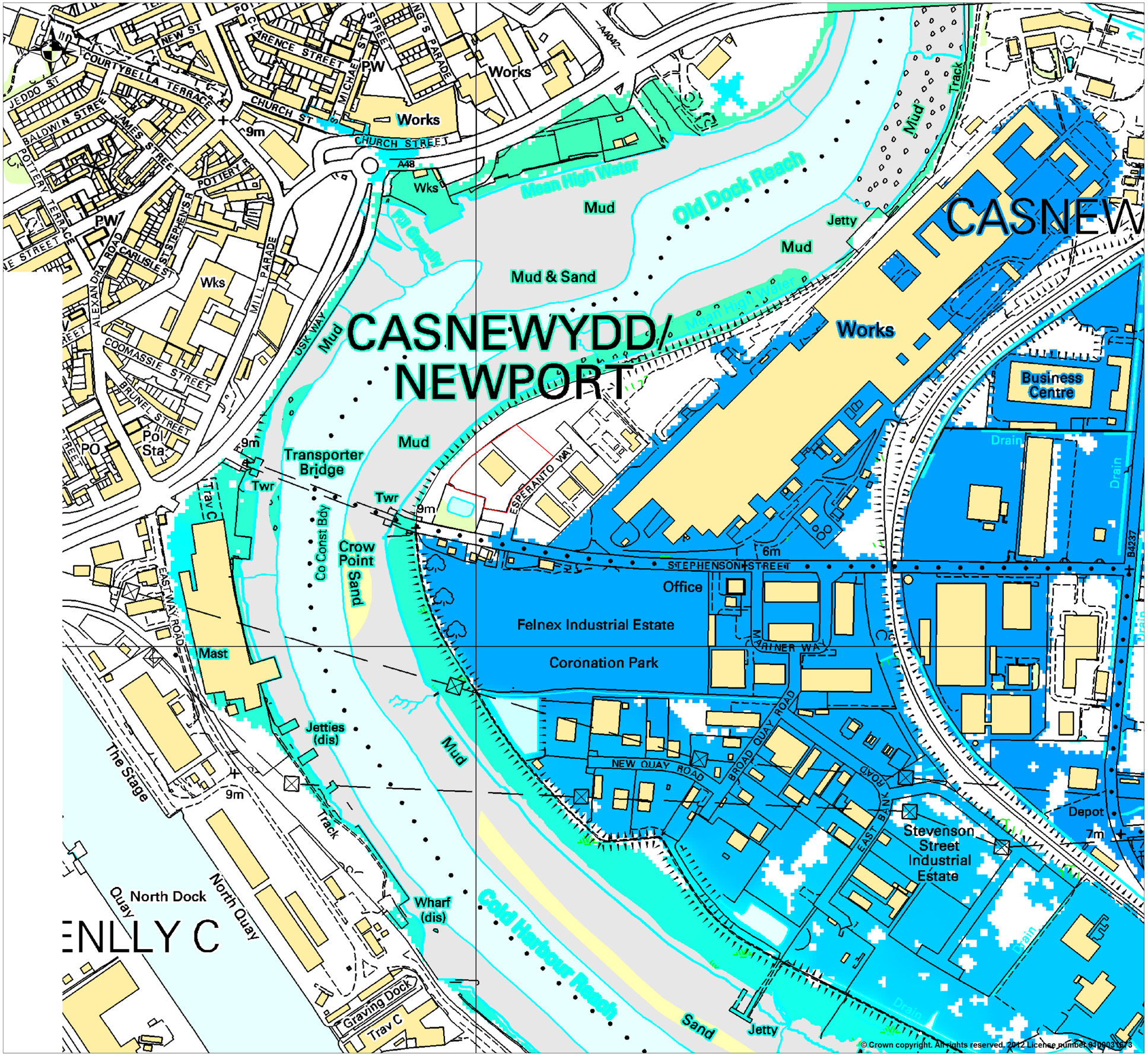
Figure 1:
Current Floodmap
[v201411]

Date

22nd April 2015

Scale 1:5,000

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Legend

Site Boundary

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T: +44(0)113 220 6190 E:rpssw@rpsgroup.com F:+44(0)113 243 9161

Client: WRAP

Project: Flood Consequence Assessment
Esperanto Way, Newport

Title: NRW (EA Wales) 1 in 200 year modelled flood levels

Status	Drawn By	Checked By
DRAFT	JM	PH

Job Ref	Scale @ A3	Date Created
JER6447	1: 5,000 @ A3	April 2015

Drawing Number	Rev
***	A

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Appendices

Appendix 1

Correspondence

Jonathan Morley

From: South Wales Information <swinformation@cyfoethnaturiolcymru.gov.uk>
Sent: 23 April 2015 14:41
To: Jonathan Morley
Subject: ATI-07105a Environmental Information Request - Esperanton Way
Attachments: ATI-07105a - Esperanton Way, Newport.zip; Chainbridge Flow Data.xlsx; Standard_Notice.pdf; 2011s4895 Newport Tidal Model Rerun - Final Report v3.pdf; 150422_ATI-07105a - Esperanton Way, NP19 0RD..doc.pdf; ATI-07105a NRW VAT Receipt RPS.pdf

Dear Mr Morley

Our ref: ATI-07105a
Environmental Information - Esperanton Way

Thank you for your recent payment.

§ *Details of any recorded groundwater levels in the area, and groundwater vulnerability of the area;*
§ *Details of any groundwater flooding issues in the area, including flood levels, flood extents and any available anecdotal information;*

- Natural Resources Wales do not have any monitoring points recording groundwater levels in the vicinity of the site. We do not hold any records on groundwater flooding in this location. The Local Authority as Lead Local Flood Authority should be contacted for information on groundwater flooding

- The superficial deposits beneath the site have been classed as unproductive. These overlie Mercia Mudstone which has been classed as a Secondary B aquifer.

§ *Details of flood alleviation and defences in this area;*

- Please find attached the requested defence information. NRW does not own any flood defences in this area, they are either in Local Authority or Private ownership as such we do not have any standard of protection or crest level information for them.

- Newport CBC hold topographical survey data for the embankment which runs downstream from the transporter bridge.

Any gauged flow records for river networks in close proximity to the site, with associated estimated return periods;

- Please find attached the full period of record for day max and day mean flow data at Chainbridge. This is the closest flow site we have to the area requested. Some of the data has not been validated so please treat with caution.

Confirmation of Flood Zone;

Confirmation of the most recent SFCA;

Strategic Flood Consequence Assessment (SFCA) Flood zone extents for the area (electronic MapInfo Version if possible);

Flood Hazard, surface water and reservoir risk mapping for the area;

A online link to or copy of the most recent SFCA, including associated drawings, maps and appendices.

Mapping and records for any surface water assets owned or maintained.

Any existing river levels/modelled levels for nearby watercourses, for the 100 year, 100 year with climate change, 200 year, 200 year with climate change, 1000 year, and 1000 year with climate change flood events;

Any other flooding related data and/or reports held in relation to the site and immediate area.

Details of any historical flood events;

Details of any flooding due to drainage problems associated with the site, including flood levels, flood extents and any available anecdotal information;

- Any surface water models please contact the local authority who may be able to provide this information.
- All other information please see attached document.

Also attached is our Standard Notice, which outlines the Terms and Conditions of the uses of our information/data.

I hope you find the attached documents helpful. Please don't hesitate to contact us if you require any further information.

Kind regards
Carol

Carol Williams
Sywddog Ymholiadau Allanol
External Relations Officer
Cyfoeth Naturiol Cymru / Natural Resources Wales
Ffôn/Tel: 03000 653 153
E-bost/E-mail: accesstoinformationteam@naturalresourceswales.gov.uk
Gwefan/Website: www.cyfoethnaturiolcymru.gov.uk/www.naturalresourceswales.gov.uk

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.
Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

From: South Wales Information
Sent: 16 April 2015 15:31
To: 'Jonathan Morley'
Cc: James, Natalie
Subject: ATI-07105a Environmental Information Request

Dear Mr Morley

Our ref: ATI-07105a
Esperanton Way, Newport.

Payment by BACS is acceptable. And the information quoted in your email below is correct.
Please ensure you add the reference number **ATI-07105a** to help us identify your payment.

Please could you confirm which Product you are requesting:

I can confirm that we can provide you with a Product 4 for this site. This product is subject to a charge of £50.00 + VAT @ 20% = £60.00

We can provide the latest report which would contain the drawings, maps and appendices for the SFCA but this would have an additional fee of £50.00 + VAT @ 20% = £60.00

Once your payment is received the flood risk team will process the data.

Thanking you in advance
Carol

Carol Williams
Sywddog Ymholiadau Allanol
External Relations Officer
Cyfoeth Naturiol Cymru / Natural Resources Wales
Ffôn/Tel: 03000 653 153
Ebost/Email: carol.williams@cyfoethnaturiolcymru.gov.uk carol.williams@naturalresourceswales.gov.uk
Gwefan /Website:
http://www.cyfoethnaturiolcymru.gov.uk/ www.naturalresourceswales.gov.uk

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.
Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

From: Jonathan Morley [mailto:jonathan.morley@rpsgroup.com]
Sent: 16 April 2015 14:22
To: South Wales Information
Subject: RE: ATI-07105a Environmental Information Request

Good afternoon Carol,

Is it possible to pay via BACS for the data?

I have the below information for your northern office.

The BACS details are:

Account name: Natural Resources Wales
Account no: 12800 578
Sort Code: 08-33-00
Bank details: Citigroup Centre
Canada Square
London
E14 5LB

Kind regards

Jonathan

Jonathan Morley BSc (Hons)
Senior Geoenvironmental Engineer - RPS Planning & Development
Suite D10, Josephs Well, Hanover Walk,
Leeds, West Yorkshire, LS3 1AB.
United Kingdom
Tel: +44 (0) 113 220 6190
Direct: +44 (0) 113 2204427
Mobile: +44 (0) 7920 566017
Email: jonathan.morley@rpsgroup.com
www: www.rpsgroup.com

From: South Wales Information [mailto:swinformation@cyfoethnaturiolcymru.gov.uk]
Sent: 15 April 2015 10:05
To: Jonathan Morley
Subject: ATI-07105a Environmental Information Request

Dear Jonathan

Our ref: ATI-07105a

Your request has been logged with the above reference. Please note that under the Legislation we have up to 20 working days to respond to requests for information and data. We always endeavour to respond sooner that this whenever we can.

I can confirm that we can provide you with a Product 4 for this site. This product is subject to a charge of £50.00 + VAT @ 20% = £60.00

We can provide the latest report which would contain the drawings, maps and appendices for the SFCA but this would have an additional fee of £50.00 + VAT @ 20% = £60.00

This charge is not for the supply of information but to issue a copyright licence as set out in the Standard Notice; this will allow commercial re-use of the information.

In order to make this payment by credit / debit card please contact Carol Williams on 03000 653 153. Please note that for security reasons the cardholder will need to be present to authorise the transaction.

If you would rather send a cheque please make it payable to 'Natural Resources Wales' and send it to me at: External Relations, Natural Resources Wales, Rivers House, St Mellons Business Park, Cardiff, CF3 0EY

Please could you let me know how you wish to proceed with this request. Your request will be put on hold until I hear from you further

Kind regards
Carol

Carol Williams
Sywddog Ymholiadau Allanol
External Relations Officer
Cyfoeth Naturiol Cymru / Natural Resources Wales
Ffôn/Tel: 03000 653 153
Ebost/Email: carol.williams@cyfoethnaturiolcymru.gov.uk carol.williams@naturalresourceswales.gov.uk
Gwefan /Website:
http://www.cyfoethnaturiolcymru.gov.uk/ www.naturalresourceswales.gov.uk

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.
Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

---------- Original Message ----------
From: jonathan.morley@rpsgroup.com
Received: 10/04/2015 13:26
To: Enquiries Queue; info@newport.gov.uk
Subject: Environmental Information Request

Our Ref: JER6447
Email:Jonathan.morley@rpsgroup.com
Tel: 0113 220 6190
Date: 10th April 2015

Dear Sirs,

Environmental Information Request: Esperanton Way, Newport.

We are currently conducting a hydrological assessment for a parcel of land at Esperanton Way, Newport, NP19 0RD, NGR 332029, 186253 (site outlined in red on the attached plan).

To undertake the assessment RPS wish to obtain the following information:

Hydrology and Flooding

- Confirmation of Flood Zone;
- Confirmation of the most recent SFCA;
- Strategic Flood Consequence Assessment (SFCA) Flood zone extents for the area (electronic MapInfo Version if possible);

- Flood Hazard, surface water and reservoir risk mapping for the area;
- A online link to or copy of the most recent SFCA, including associated drawings, maps and appendices.
- Mapping and records for any surface water assets owned or maintained.
- Any existing river levels/modelled levels for nearby watercourses, for the 100 year, 100 year with climate change, 200 year, 200 year with climate change, 1000 year, and 1000 year with climate change flood events;
- Any gauged flow records for river networks in close proximity to the site, with associated estimated return periods;
- Details of any historical flood events;
- Details of any flooding due to drainage problems associated with the site, including flood levels, flood extents and any available anecdotal information;
- Records of any surface and groundwater discharges, abstractions including private licences and pollution incidents;
- Details of any recorded groundwater levels in the area, and groundwater vulnerability of the area;
- Details of flood alleviation and defences in this area;
- Details of any groundwater flooding issues in the area, including flood levels, flood extents and any available anecdotal information;
- Details of aquifer designation, soil classification, and Source Protection Zones in this area;
- Any other flooding related data and/or reports held in relation to the site and immediate area.

Please would you inform me of any data costs that may be incurred as soon as possible.

Should you have any queries please do not hesitate to contact me.

Yours faithfully
for RPS

Jonathan Morley

Jonathan Morley BSc (Hons)
Senior Engineer - RPS Planning & Development
3rd Floor, 34 Lisbon Street,
Leeds, West Yorkshire, LS1 4LX.
United Kingdom
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www: www.rpsgroup.com

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ATI-07105a – Esperanton Way, Newport

E: 332029 N: 186253

1.0 Current Flood Map

Figure 1 shows the current Flood Map (version 201411) at this location. The Flood Map represents a combination of the undefended fluvial and tidal flood extents derived from a combination of detailed local modelled and nationally generalised modelled data.

The current Flood Map in this area is derived from the Newport SFRM Modelling – Update of Newport Tidal Model study v3.1 & v3.2 undertaken by JBA Consulting in December 2012 (*ref 5*).
The current tidal flood data in this area was updated by NRW in 2013. This study uses sea level nodes within the Severn Estuary, based on a set of extreme sea levels generated by the EA in 2011 (*ref 2*) for current day (2008). The levels were projected in-land over a digital terrain model to produce depth and elevation grids as well as tidal mapped outlines for both the 0.5% (1 in 200) AEP (annual exceedance probability) and the 0.1% (1 in 1000) AEP; including climate change and upper confidence intervals (+/-95%).

More information on the Flood Map can be obtained from the Environment Agency website https://www.gov.uk/government/organisations/environment-agency

2.0 Local Flood Risk Mapping Study

Model Summary
The results summarised below are taken from the Newport SFRM Modelling – Update of Newport Tidal Model v3.1& v3.2 study. This study was commissioned to update the tidal flood model in the area. This study incorporates extreme tidal level prediction datasets together with new LiDAR data and information on changes to landforms in the area.

The baseline model also includes the improved Riverside tidal defences which were completed in summer 2012.

The final design model was run for defended and undefended tidal flood events (including defended with climate change) whilst QMED is used for fluvial inflows for all design runs.

Results:
The results from this study relate purely to tidal levels in the River Usk. The section 3.0 – 'Extreme Sea Levels & Climate Change Guidance' and associated tables below, relate to tidal levels from the Severn Estuary.

The polygon shown in the figures has been used to query the height, depth, velocity and hazard grids to provide the results in **Tables 1-6**. These represent the current day (2011) defended and undefended levels. Due to the sea level rise increments indicated in Table 6 the model will be run periodically (as opposed to annually). We do not expect significant changes to the data in the short term. We recommend that you interpolate the data between each column to achieve the appropriate figures for the timescales in question.

Example depth grids for the defended tidal 1 in 200 (2111) excluding confidence intervals and 1 in 200 (2111) including confidence intervals, are reproduced in **Figures 2 and 3.**

The defended 1 in 200 year (2086) including Confidence Interval hazard grid is represented in **Figure 4**. The hazard rating below relates to the Hazard to People Classification using the hazard matrix (***ref 6***).

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification
Less than 0.75		Very low hazard – Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.0		Danger for most – includes the general public
More than 2.0		Danger for all – includes the emergency services

Model Results - the Site

*Null values show that the site is flood free for that return period.

Table 1: Defended with Climate Change (excluding upper confidence interval)

	1 in 200 (2011)	1 in 1000 (2011)	1 in 200 (2061)	1 in 200 (2086)	1 in 200 (2111)
Model Grid Size (m)	5	5	5	5	5
Wet Cells	0	334	334	334	334
Elevation, mean (mAOD)	NULL	8.78	8.89	9.22	9.54
Elevation, max (mAOD)	NULL	8.78	8.89	9.22	9.54
Depth, mean (m)	NULL	1.09	1.20	1.53	1.85
Depth, max (m)	NULL	1.56	1.67	2.00	2.32
Velocity, mean (m/s)	NULL	0.68	0.70	0.65	0.88
Velocity, max (m/s)	NULL	2.07	1.99	1.89	2.18
Hazard, mean	NULL	1.65	1.72	1.89	2.15
Hazard, max	NULL	2.88	3.00	2.90	3.41

Table 2: Defended with Climate Change (including upper confidence interval)

	1 in 200 (2011)	1 in 1000 (2011)	1 in 200 (2061)	1 in 200 (2086)	1 in 200 (2111)
Model Grid Size (m)	5	5	5	5	5
Wet Cells	334	334	334	334	334
Elevation, mean (mAOD)	8.95	9.43	9.31	9.56	9.92
Elevation, max (mAOD)	8.95	9.44	9.31	9.56	9.92
Depth, mean (m)	1.26	1.75	1.62	1.87	2.23
Depth, max (m)	1.73	2.22	2.09	2.35	2.70
Velocity, mean (m/s)	0.74	0.86	0.78	0.92	1.00
Velocity, max (m/s)	2.11	2.15	2.11	2.38	2.61
Hazard, mean	1.76	2.05	1.97	2.14	2.32
Hazard, max	3.07	3.30	3.11	3.49	3.78

Table 3: Undefended Level Data (2011)

	1 in 200	1 in 1000
Model Grid Size (m)	5	5
Wet Cells	334	334
Elevation, mean (mAOD)	8.53	8.85
Elevation, max (mAOD)	8.53	8.85
Depth, mean (m)	0.84	1.16
Depth, max (m)	1.32	1.63
Velocity, mean (m/s)	0.23	0.26
Velocity, max (m/s)	1.83	1.82
Hazard, mean	1.48	1.68
Hazard, max	2.08	2.19

Model Results – Emergency Access to Site

An access route has not been provided.

Table 4: Defended with Climate Change (excluding upper confidence interval)

	1 in 200 (2011)	1 in 1000 (2011)	1 in 200 (2061)	1 in 200 (2086)	1 in 200 (2111)
Model Grid Size (m)					
Wet Cells					
Elevation, mean (mAOD)					
Elevation, max (mAOD)					
Depth, mean (m)					
Depth, max (m)					
Velocity, mean (m/s)					
Velocity, max (m/s)					
Hazard, mean					
Hazard, max					

Table 5: Defended with Climate Change (including upper confidence interval)

	1 in 200 (2011)	1 in 1000 (2011)	1 in 200 (2061)	1 in 200 (2086)	1 in 200 (2111)
Model Grid Size (m)					
Wet Cells					
Elevation, mean (mAOD)					
Elevation, max (mAOD)					
Depth, mean (m)					
Depth, max (m)					
Velocity, mean (m/s)					
Velocity, max (m/s)					
Hazard, mean					
Hazard, max					

Table 6: Undefended Level Data (2011)

	1 in 200	1 in 1000
Model Grid Size (m)		
Wet Cells		
Elevation, mean (mAOD)		
Elevation, max (mAOD)		
Depth, mean (m)		
Depth, max (m)		
Velocity, mean (m/s)		
Velocity, max (m/s)		
Hazard, mean		
Hazard, max		

3.0 Extreme Sea Levels & Climate Change Guidance

In February 2011, new extreme sea levels were derived for England and Wales (*ref 2*), which supersede previous estimates for the Caldicot and Wentlooge Levels. These levels were derived using a tidal model calibrated to UK tidal gauge data. The model output is provided for node locations spaced at approximately 2km. 95% confidence bounds for these values were also derived using the confidence intervals for each node location. The extreme sea levels comprise still water level including storm surge, however they do not account for local wave action. The baseline estimations are for the year 2008, so climate change is calculated relative to this year, for example add 10.5mm for the year 2011.

Extreme sea levels for the node points closest to the site location are included in **Table 7** for a range of return periods (events) e.g. T100 is the 1 in 100 year return period tide, which is equivalent to the 1% AEP (Annual Exceedance Probability). The node locations are shown in **Figure 5**.

Table 7: 2008 Baseline Extreme Sea Levels for adjacent nodes

Node	Easting	Northing	Extreme Event Sea Level (mAOD)					
			T25	T50	T75	T100	T200	T1000
396	333517	182371	8.11	8.23	8.30	8.35	8.48	8.79
398	331070	182628	8.04	8.16	8.23	8.28	8.41	8.72

To provide the estimate of extreme sea levels for the site (**Table 8**), levels were interpolated from the adjacent nodes.

Table 8: 2008 Baseline Extreme Sea Levels interpolated between adjacent nodes

Node	Easting	Northing	Extreme Event Sea Level (mAOD)					
			T25	T50	T75	T100	T200	T1000
Site	333065	182714	8.09	8.21	8.28	8.33	8.46	8.77
95% Confidence Bound (+/- m):			*0.20*	*0.20*	*0.30*	*0.30*	*0.40*	*0.60*

The current guidance on climate change from DEFRA is as follows:

Table 9: Sea level rise, mm per year

Assumed vertical land movement	1990-2025	2025-2055	2055-2085	2085-2115
-0.5	3.5	8.0	11.5	14.5

The calculated future extreme sea levels are shown in **Table 10.** Adopting a precautionary approach as advised by Environment Agency guidance *(ref 4)*, these levels include the upper level 95% confidence bound.

Table 10: Extreme sea levels for the site (including 95% Confidence Bound)

Year	Sea level rise(m)	Extreme Event Sea Level (mAOD)					
		T25	T50	T75	T100	T200	T1000
2015	0.025	8.3	8.4	8.6	8.7	8.9	9.4
2065	0.415	8.7	8.8	9.0	9.0	9.3	9.8
2090	0.717	9.0	9.1	9.3	9.4	9.6	10.1
2115	1.080	9.4	9.5	9.7	9.7	9.9	10.5

4.0 Additional Information

We hold no historic flooding information in this area.

The local authority may be able to provide information on issues such as localised flooding from sewers, drains and culverts.

5.0 References

1. Tidal Flood Mapping Study (Penarth and Chepstow), Study report Issue 1, Atkins July 2008
2. Department for Environment, Food and Rural Affairs, 2011. *Technical Report Design sea levels*. R&D Report SC060064. Defra/Environment Agency
3. Flood and Coastal Defence Appraisal Guidance: FCDPAG3 Economic Appraisal. Supplementary Note to Operating Authorities – Climate Change Impacts; October 2006; Department for Environment, Food and Rural Affairs.
4. Using the national coastal flood boundary data for England and Wales, Environment Agency Operational Instruction 490_11, Issued 4/2/2011
5. Newport SFRM Modelling: Update of Newport Tidal Model v3.2, JBA, December 2012.
6. Supplementary note on flood hazard ratings and thresholds for development planning and control purpose, May 2008

6.0 Notes

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.

Extreme sea levels provided as part of this project are accurate to one decimal place (**Table 10**). Two decimal places have been provided to show the gradual change between nodes seen in the model, however, this does not imply greater accuracy.

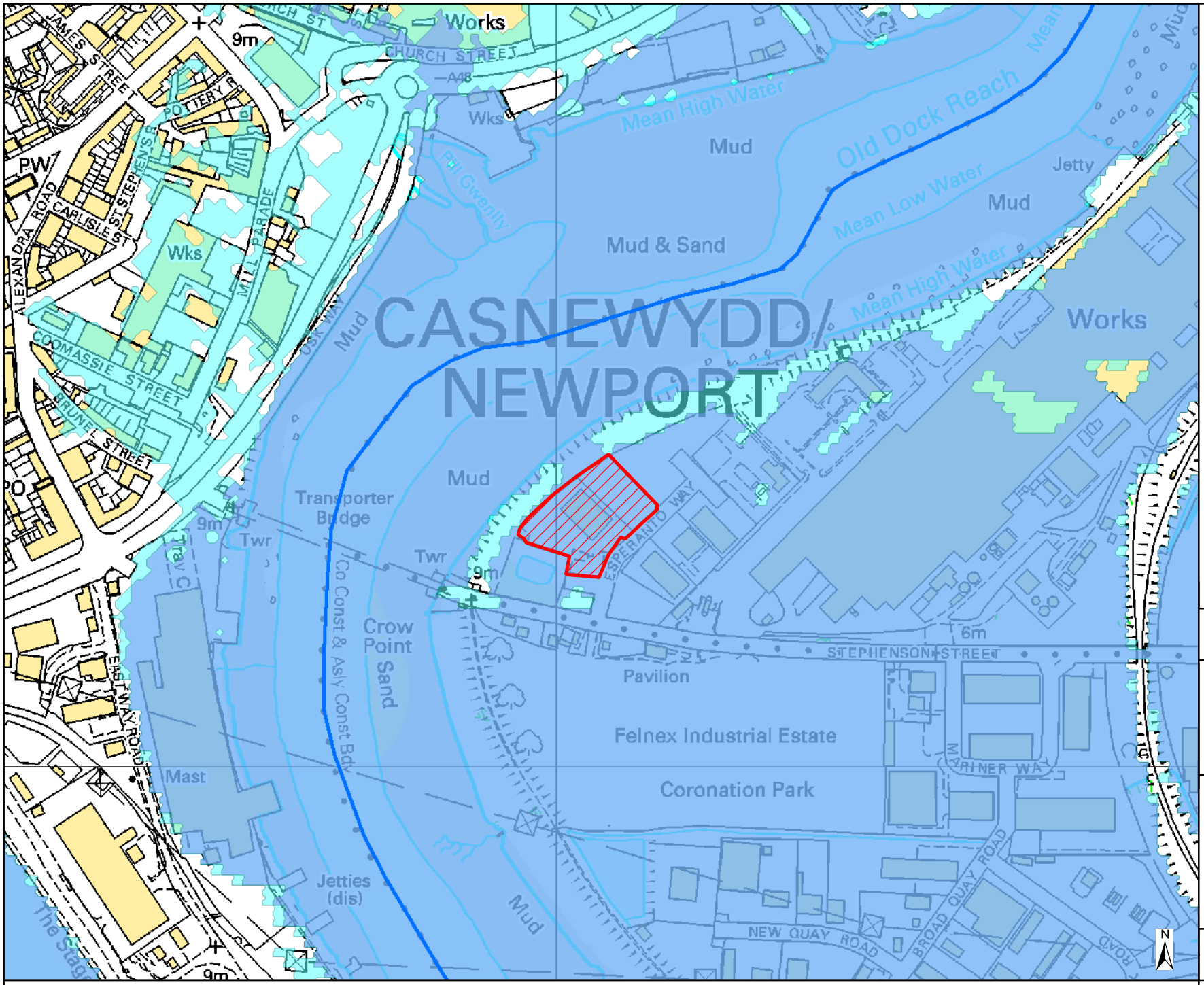
The scope of the model is the mapping of flood risk, it is not intended for detailed design. The model should be considered as the starting point for more detailed modelling, commensurate with the consequences of flooding at the site of interest.

NRW models are available under licence agreement for the purpose of further development. Contact Natural Resources Wales Access to Information team for details of terms, conditions and pricing.

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

Please refer to NRW standard terms and conditions.

Flood Risk Analysis
22/04/2015



Legend

- Site Location
- Flood Zone 3 (1 in 100 year undefended fluvial and 1 in 200 year undefended tidal extents)
- Flood Zone 2 (1 in 1000 year undefended fluvial and tidal extents)
- Areas benefiting from defences
- Defences
- Flood Storage Area
- Main Rivers

Cyfoeth Naturiol Cymru
Natural Resources Wales

Project

Esperanton Way,
Newport
[Ref: ATI-07105a]

Drawing

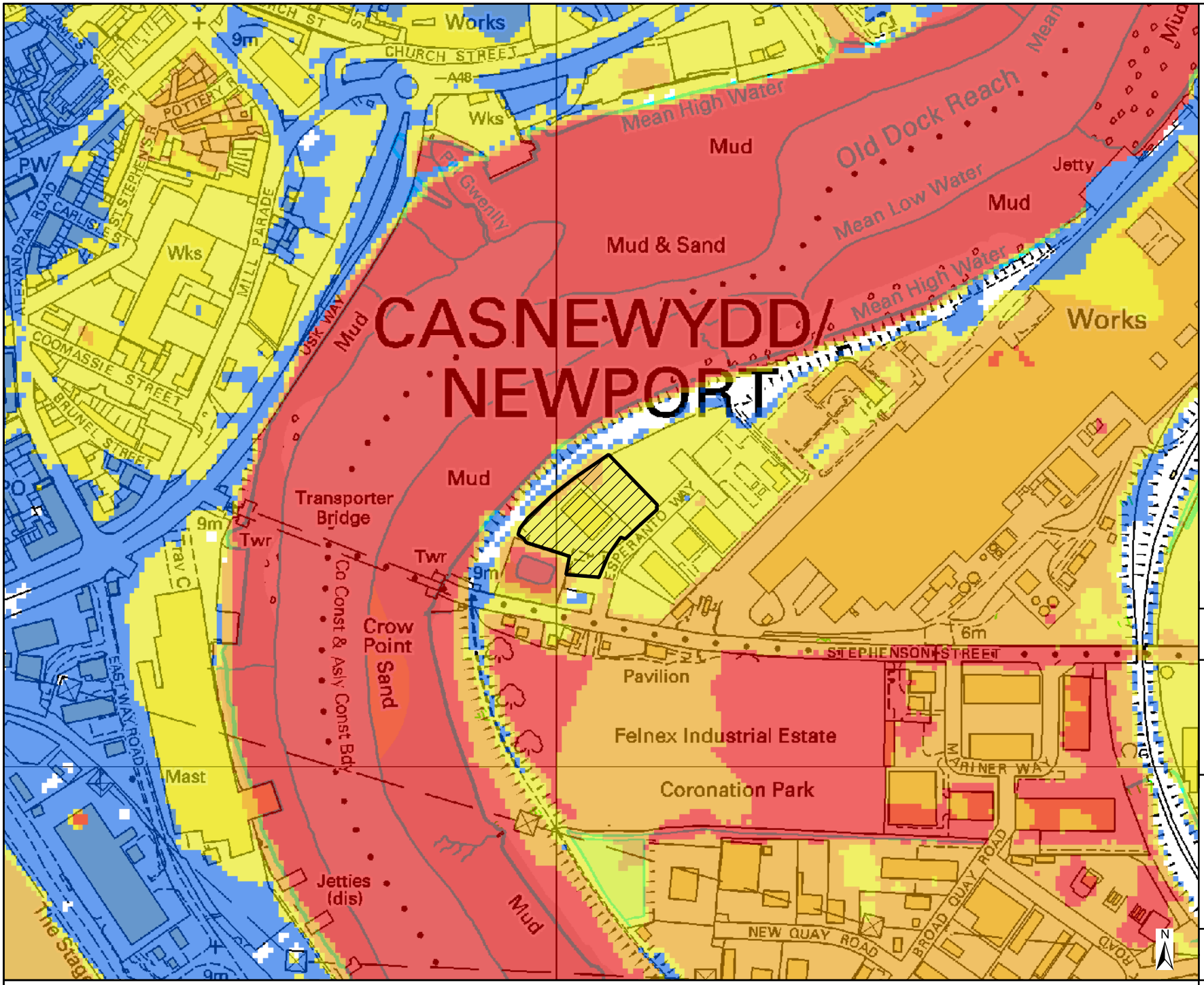
Figure 1:
Current Floodmap
[v201411]

Date

22nd April 2015

Scale 1:5,000

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Legend

Site Location

Flood Depth (m)

- 0.0 - 0.3
- >0.3
- >0.6
- >1.0
- >2.0

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Natural Resources Wales

Project

Esperanton Way,
Newport
[Ref: ATI-07105a]

Drawing

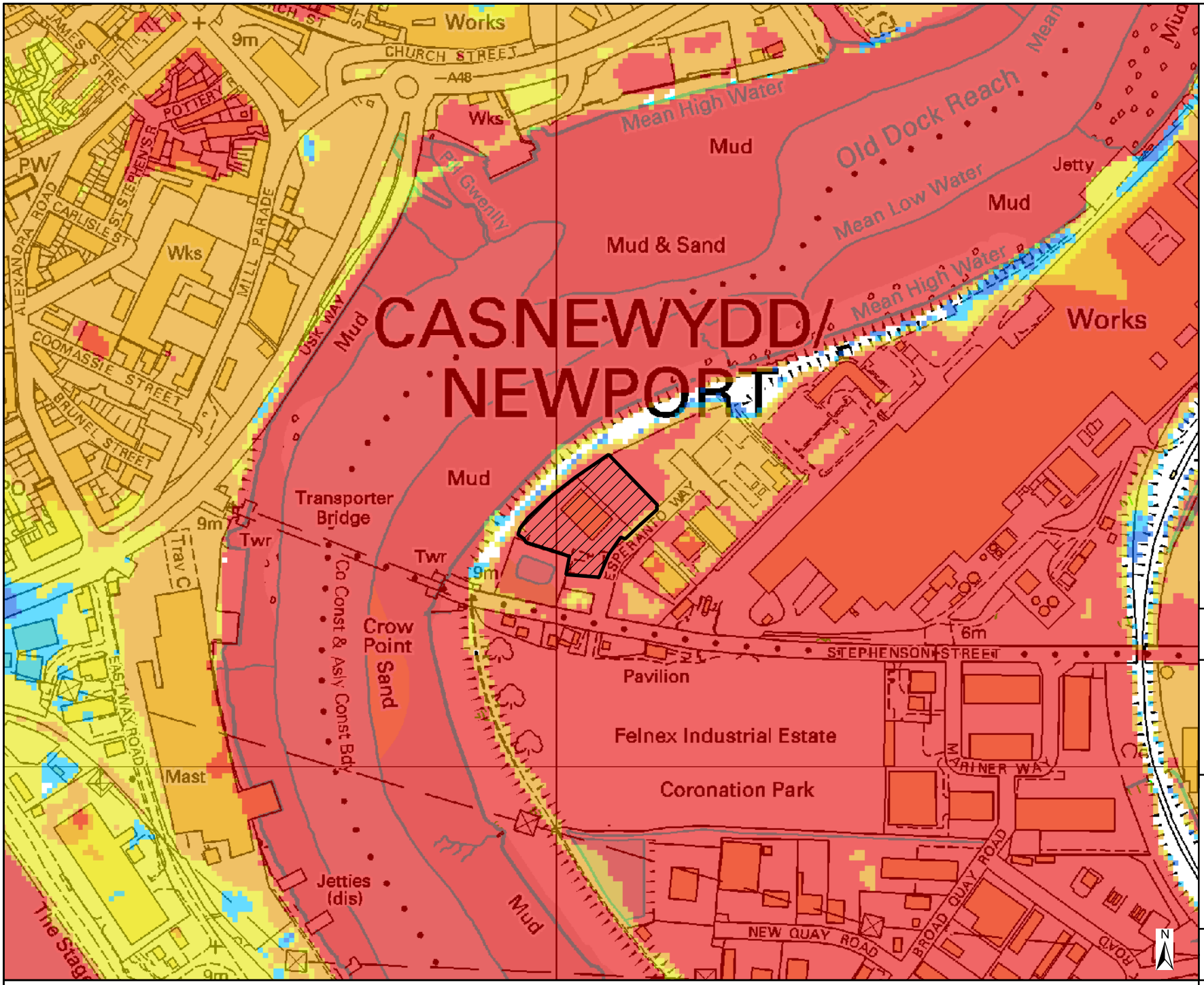
Figure 2:
Depth Grid for 0.5% AEP
(1 in 200) year event -
defended excluding upper
confidence intervals (2111)

Date

22nd April 2015

Scale 1:5,000

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Legend

Site Location

Flood Depth (m)

- 0.0 - 0.3
- >0.3
- >0.6
- >1.0
- >2.0

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Natural Resources Wales

Project

Esperanton Way,
Newport
[Ref: ATI-07105a]

Drawing

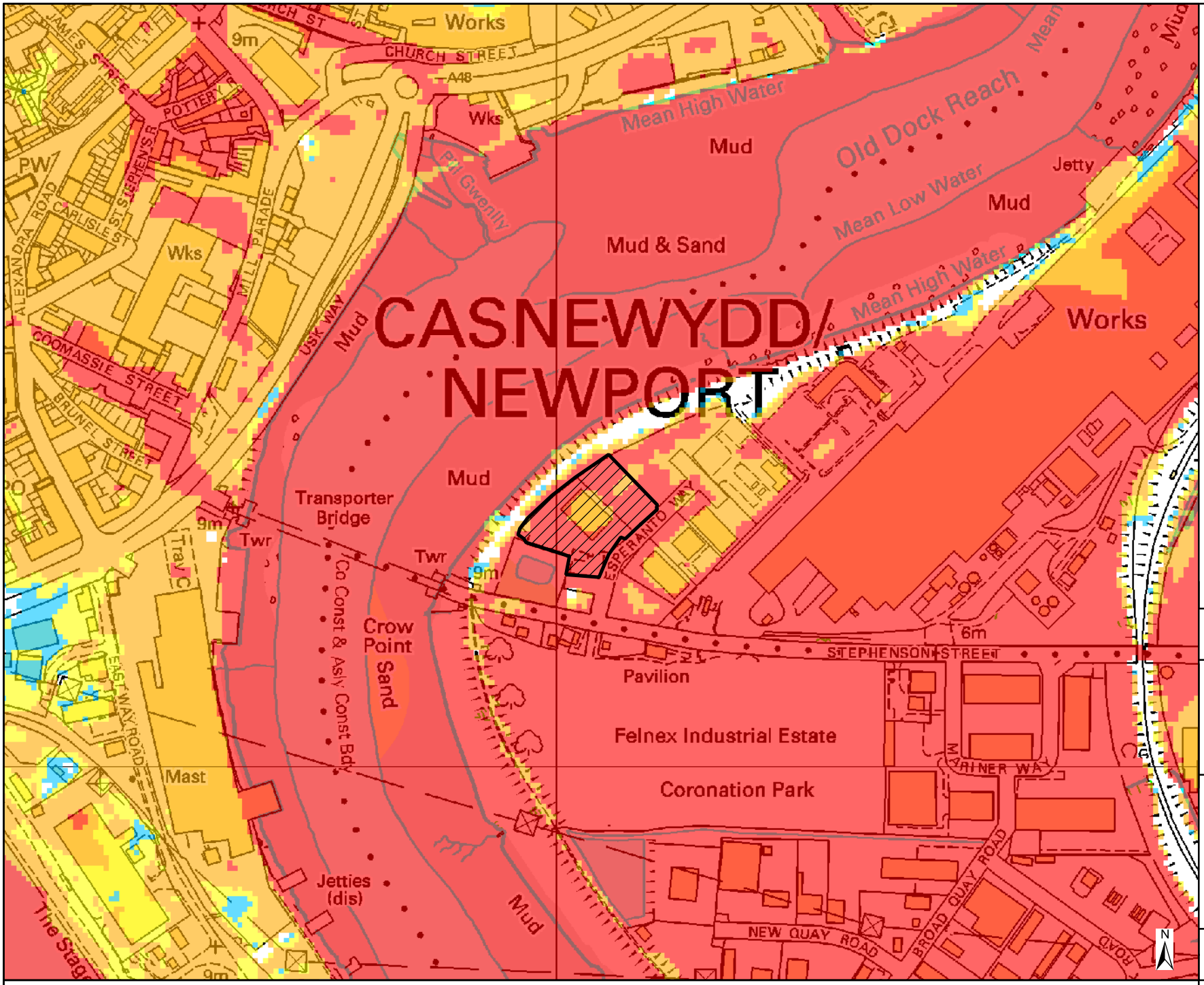
Figure 3:
Depth Grid for 0.5% AEP
(1 in 200) year event -
defended including upper
confidence intervals (2111)

Date

22nd April 2015

Scale 1:5,000

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Legend

Site Location

Flood Hazard

- < 0.75
- 0.75 - 1.25
- 1.25 - 2.00
- > 2.0

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Natural Resources Wales

Project

Esperanton Way,
Newport
[Ref: ATI-07105a]

Drawing

Figure 4:
Hazard Grid for 0.5% AEP
(1 in 200) year event -
defended including upper
confidence intervals (2086)

Date

22nd April 2015

Scale 1:5,000

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Legend

- Site Location
- Projection Lines
- Extreme Sea Level Node

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Project

Esperanton Way,
Newport
[Ref: ATI-07105a]

Drawing

Figure 5:
Extreme Sea Level
Node Locations

Date

22nd April 2015

Scale 1:50,000

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Appendix 2

Topographic Survey

Scale 1:200

2 0 2 4 6 8 10 20

Distances in metres

N

332000.0E 332050.0E 332100.0E

186300.0N 186250.0N 186200.0N 186150.0N

WASTE SAVERS NEWPORT

ESPERANTO WAY

STEPHENSONS STREET

Abbreviations:

B/BW	brick retaining wall	FFL	finished floor level	RE	rodding eye	ht	height (of feature)
BB	Belisha beacon	FS	flagstaff	RG	road gully		arrow indicates up (unless otherwise stated)
BI	bollard (illuminated)	G/W	gallon wall	RP	reflector post		
BL	bollard	GP	gate post	RS	road sign	▲9002	survey control point
BM	benchmark inspection cover	GV	gas valve	RSJ	rolled steel joint		
BW	brick wall	HR	hand-rail	RWP	rain water pipe	Drainage features:	
C/RW	concrete retaining wall	IC	inspection chamber	S/RW	stone retaining wall	CL	cover level
CATV	cable television cover	IR	metal railings	SP	asphalt	CH	chamber depth
CB	close boarded	Iwn	interwoven wood slat	SP	sign post	IL	invert level
CM	corrugated metal	JB	junction box	SPS	stone paving slabs	FWS	foul water sewer
CO	concrete	KO	kerb outlet	stay	stay wire	SWS	storm water sewer
CP/BW	concrete post & barbed wire	LP	lamp post	STN	survey control station	CWS	combined water sewer
CP/CL	concrete post & chain link	MI	manhole	SV	water stop valve	UTD	unable to determine
CP/CP	concrete post & panel	MK	marker	TAC	tactile paving	UTL	unable to lift
CP/W	concrete post & wire mesh	MM	metal mesh	TAL	tactile slab	ø	pipe diameter (mm)
CPS	concrete paving slabs	MP	mile post	THL	threshold level	SL	slope level
DC	drainage channel	NB	name board	TL	traffic light	←	arrow indicates direction of flow
DK	drop kerb	OH	overhead	TP	telephone pole		
DR	drain	O/H	overhead cable/wire	VP	vent pipe		
EP	electricity pole	P/C	post & chain fence	Wap	wood lap		
ER	earthing rod	PA	paddy	WM	water meter		
FB	flower bed	PO	post	WP/BW	wood post & barbed wire		
				WP/R	wood post & rail		
				WP/W	wood post & wire		

Notes:

Revisions:

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Waste Savers, Esperanto Way Newport

Topographical Survey

Client	RPS						
Coord Grid	Plane Grid related to National Grid			Level Datum	OSBM 9.09m, Newport Transporter Bridge		
Scale	1:200@A0	Date	Jan. 2015	Status	Final	Job No.	RP2815
Surveyed	A. Jolliffe	Drawn	R. Williams	Checked	R. Williams	Dwg. No.	RP2815-01

Appendix 3

WinDes Calculations

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.680	0.680	2.1	0.0	2.1	78.2	O K
30 min Summer	8.824	0.824	2.3	0.0	2.3	94.7	O K
60 min Summer	8.988	0.988	2.5	0.0	2.5	113.6	O K
120 min Summer	9.165	1.165	2.7	0.0	2.7	133.9	O K
180 min Summer	9.264	1.264	2.9	0.0	2.9	145.4	O K
240 min Summer	9.327	1.327	2.9	0.0	2.9	152.6	O K
360 min Summer	9.395	1.395	3.0	0.0	3.0	160.5	O K
480 min Summer	9.430	1.430	3.0	0.0	3.0	164.5	O K
600 min Summer	9.455	1.455	3.1	0.0	3.1	167.3	O K
720 min Summer	9.471	1.471	3.1	0.0	3.1	169.2	O K
960 min Summer	9.462	1.462	3.1	0.0	3.1	168.1	O K
1440 min Summer	9.418	1.418	3.0	0.0	3.0	163.1	O K
2160 min Summer	9.331	1.331	2.9	0.0	2.9	153.0	O K
2880 min Summer	9.241	1.241	2.8	0.0	2.8	142.7	O K
4320 min Summer	9.076	1.076	2.6	0.0	2.6	123.8	O K
5760 min Summer	8.942	0.942	2.5	0.0	2.5	108.3	O K
7200 min Summer	8.833	0.833	2.3	0.0	2.3	95.8	O K
8640 min Summer	8.742	0.742	2.2	0.0	2.2	85.4	O K
10080 min Summer	8.667	0.667	2.1	0.0	2.1	76.7	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	141.447	0.0	19
30 min Summer	86.673	0.0	33
60 min Summer	53.110	0.0	64
120 min Summer	32.544	0.0	122
180 min Summer	24.437	0.0	182
240 min Summer	19.942	0.0	242
360 min Summer	14.974	0.0	360
480 min Summer	12.219	0.0	414
600 min Summer	10.437	0.0	476
720 min Summer	9.175	0.0	540
960 min Summer	7.374	0.0	674
1440 min Summer	5.420	0.0	952
2160 min Summer	3.983	0.0	1364
2880 min Summer	3.201	0.0	1760
4320 min Summer	2.344	0.0	2552
5760 min Summer	1.879	0.0	3296
7200 min Summer	1.583	0.0	4040
8640 min Summer	1.376	0.0	4760
10080 min Summer	1.222	0.0	5544

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	8.762	0.762	2.2	0.0	2.2	87.6	O K
30 min Winter	8.924	0.924	2.4	0.0	2.4	106.3	O K
60 min Winter	9.111	1.111	2.7	0.0	2.7	127.7	O K
120 min Winter	9.313	1.313	2.9	0.0	2.9	151.0	O K
180 min Winter	9.429	1.429	3.0	0.0	3.0	164.4	O K
240 min Winter	9.505	1.505	3.1	0.0	3.1	173.1	O K
360 min Winter	9.594	1.594	3.2	0.0	3.2	183.3	O K
480 min Winter	9.635	1.635	3.3	0.0	3.3	188.0	O K
600 min Winter	9.653	1.653	3.3	0.0	3.3	190.1	O K
720 min Winter	9.670	1.670	3.3	0.0	3.3	192.0	O K
960 min Winter	9.651	1.651	3.3	0.0	3.3	189.9	O K
1440 min Winter	9.577	1.577	3.2	0.0	3.2	181.4	O K
2160 min Winter	9.440	1.440	3.0	0.0	3.0	165.6	O K
2880 min Winter	9.305	1.305	2.9	0.0	2.9	150.1	O K
4320 min Winter	9.069	1.069	2.6	0.0	2.6	122.9	O K
5760 min Winter	8.887	0.887	2.4	0.0	2.4	102.0	O K
7200 min Winter	8.746	0.746	2.2	0.0	2.2	85.8	O K
8640 min Winter	8.636	0.636	2.0	0.0	2.0	73.1	O K
10080 min Winter	8.548	0.548	1.9	0.0	1.9	63.0	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Winter	141.447	0.0	19
30 min Winter	86.673	0.0	33
60 min Winter	53.110	0.0	62
120 min Winter	32.544	0.0	120
180 min Winter	24.437	0.0	178
240 min Winter	19.942	0.0	236
360 min Winter	14.974	0.0	346
480 min Winter	12.219	0.0	452
600 min Winter	10.437	0.0	502
720 min Winter	9.175	0.0	566
960 min Winter	7.374	0.0	722
1440 min Winter	5.420	0.0	1024
2160 min Winter	3.983	0.0	1468
2880 min Winter	3.201	0.0	1876
4320 min Winter	2.344	0.0	2684
5760 min Winter	1.879	0.0	3464
7200 min Winter	1.583	0.0	4248
8640 min Winter	1.376	0.0	4936
10080 min Winter	1.222	0.0	5656

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Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.351	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.295	Shortest Storm (mins)	15
Site Location		F (1km)	2.433	Longest Storm (mins)	10080
C (1km)	-0.026	Summer Storms	Yes	Climate Change %	+20
D1 (1km)	0.413	Winter Storms	Yes		
D2 (1km)	0.360	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 0.300

Time (mins)	Area (ha)
0-4	0.300

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Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 8.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	115.0	2.800	115.0	5.600	115.0	8.400	115.0
0.400	115.0	3.200	115.0	6.000	115.0	8.800	115.0
0.800	115.0	3.600	115.0	6.400	115.0	9.200	115.0
1.200	115.0	4.000	115.0	6.800	115.0	9.600	115.0
1.600	115.0	4.400	115.0	7.200	115.0	10.000	115.0
2.000	115.0	4.800	115.0	7.600	115.0		
2.400	115.0	5.200	115.0	8.000	115.0		

Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 8.000

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 10.000

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Appendix 4

Outline Drainage Plan