

**LAND AT CHANNEL VIEW, GRANGETOWN
CARDIFF**

ENVIRONMENTAL STATEMENT

VOLUME 2

CHAPTER 10: FLOOD RISK & DRAINAGE

INTRODUCTION

- 10.1 This chapter of the ES has been prepared by Cambria Consulting to assess the drainage and flooding characteristics of the proposed development of the land east of Channel View Road, Cardiff.
- 10.2 This chapter has been compiled by Ben Whyman, a Senior Associate at Cambria Consulting. Ben holds a MEng (Hons) in Civil Engineering from the Cardiff University, is a Graduate Member of the Institute of Civil Engineering (GMICE) and member of the Chartered Institute of Highways & Transportation (MCIHT). Ben has over 14 years' experience in the Civil Engineering consultancy sector.
- 10.3 This Chapter describes the baseline conditions currently existing at the Site; the mitigation measures required to prevent, reduce or offset any significant negative impacts; and the likely residual impacts after these measures have been adopted. This chapter refers to the Flood Consequence Assessment (hereafter referred to as the FCA) (Appendix 10.1) and Drainage Strategy Report (Appendix 10.2). These studies were based on the principles of the scheme as it stood at the time and are included in this chapter's appendices.

LEGISLATIVE AND POLICY CONTEXT

10.4 Environmental legislation which is relevant to drainage, flood risk & potable water is summarised below.

Legislation

10.5 The relevant legislation is as follows:

- **Environmental Protection Act 1990** and **Environment Act 1995**: provides fundamental structure and authority for waste management and control of emissions into the environment.
- **European Union (EU) Water Framework Directive (WFD) 2000/60/EC** (as amended in 2008): commitment by the European Union to achieve good qualitative and quantitative status of all water bodies
- The **Water Environment (Water Framework Directive) (England and Wales) Regulations 2003** which implement **Water Framework Directive (2000/60/EC)**.
- **Water Resources Act 1991**: regulates water resources, water quality and pollution, and flood defence.
- **Flood and Water Management Act 2010**: better management of flood risk from various sources, creating safeguards against rises in surface water drainage charges and protects water supplies for consumers.

National Planning Policy

10.6 Relevant national planning policies is as follows:

- **Future Wales: The National Plan 2040**
- **Planning Policy Wales, Edition 11**: provides guidance on the preparation and content of development plans and advice on development control decisions and appeals.
- **Technical Advice Note 15 (TAN15, October 2019) Development and Flood Risk**: provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding.

Local Planning Policy

10.7 Local planning policy which relates to water resources is set out in the Cardiff Council adopted Local Development Plan (LDP). The following Key Policies apply:

- **KP4: Masterplanning Approach** – Innovative and creative energy, management of surface water and waste management solutions are adopted to make new developments more environmentally sustainable
- **KP5: Good quality and sustainable design** – Promoting the efficient use of land, developing at highest practicable densities and where appropriate achieving the remediation of

contaminated land. Ensuring no undue effect on the amenity of neighbouring occupiers and connecting positively to surrounding communities.

- **KP15: Climate Change** – To mitigate against the effects of climate change and adapt to its impacts, development proposals should take into account the following factors: (v) Avoiding unnecessary flood risk by assessing the implications of development proposals within areas susceptible to flooding and preventing development that unacceptably increases risk. [Other non-water-based infrastructure items are not listed here].
- **KP16: Green Infrastructure** – Cardiff’s distinctive natural heritage provides a network of green infrastructure which will be protected, enhanced, created and managed to ensure the integrity and connectivity of this multi-functional green resource is maintained. Protection and conservation of natural heritage network needs to be reconciled with the benefits of development. Proposed development should therefore demonstrate how green infrastructure has been considered and integrated into the proposals. If development results in overall loss of green infrastructure, appropriate compensation will be required. Natural heritage assets are key to Cardiff’s character, value, distinctiveness and sense of place. They include the city’s strategically important river valleys of the Ely, Taff, Nant Fawr and Rhymney (EN4); (ix) Holistic integrated surface water management systems (EN10). [Other non-water-based infrastructure items are not listed here].
- **KP18: Natural Resources** – In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city’s natural resources and minimise pollution, in particular the following elements: Protecting the quality and quantity of water resources, including underground surface and coastal waters. Remediating contaminated land through the redevelopment of contaminated sites.

10.8 In relation to flood and drainage the following relevant detailed policies have been proposed within the LDP:

- **EN4: River Valleys** - The Natural Heritage, character and other key features of Cardiff’s river corridors will be protected, promoted and enhanced, together with facilitating sustainable access and recreation.
- **EN10: Water Sensitive Design** – Development should apply water sensitive urban design solutions (the process of integrating water cycle management with the built environment through planning and urban design). To include the management of:
 - Water demand and supply
 - Wastewater and pollution
 - Rainfall and runoff
 - Watercourses and water resource
 - Flooding
 - Water pathways
- **EN11: Protection of Water Resource** – Development will not be permitted that would cause unacceptable harm to the quality or quantity of underground, surface or coastal waters.

- **EN14: Flood Risk** – Development will not be permitted:
 - Within tidal or fluvial floodplains unless existing or proposed flood prevention and/or protection measures are acceptable;
 - Where it would increase the risk of flooding;
 - Where it would hinder future maintenance or improvement schemes of flood defences and watercourses
 - Where it would cause adverse effects on the integrity of tidal or fluvial defences;
 - Where ground floor bedrooms are proposed in areas at high risk of flooding.

Relevant Guidance

10.9 The advice and recommendations of the following guidance documents have been followed in preparing this chapter:

- **Statutory standards for sustainable drainage systems-** designing, constructing, operating and maintaining surface water drainage systems – Welsh Government, 2018;
- **The SUDs Manual (C753) – CIRIA, 2015**

ASSESSMENT METHODOLOGY

10.10 This assessment has been carried out using qualitative analysis and is based on the test results obtained, statutory guidance, approved methods of practice and professional judgement. The methodology includes the following:

- A review of the relevant legislation;
- Consultation with local statutory consultees/authorities;
- A desk study to identify existing information;
- A review of the Development Advice Maps (DAM)
- A review of the Envirocheck Flood Screening Report inclusive of EA/NRW & JBA Flood Data Maps at 1:10,000 scale maps and British Geology Survey (BGS) Maps at 1:50,000 scale
- A review of the Flood Risk Assessment Wales Map
- Site visits/surveys to identify baseline conditions;
- Assessment of the likely impact on the hydrology and drainage arising from both construction and operation;
- An Assessment of the likely significance of those impacts and the identification of mitigation measures; and
- An Assessment of any residual impact.

Significance Criteria

10.11 This assessment considers the classification of impact (Table 10.1) and the classification of sensitivity (Table 10.2). The significance of an environmental impact is determined by the interaction of the sensitivity of the receptor and the magnitude of the impact, whereby the impact can be beneficial or adverse.

Table 10.1 Classification of impact

1	Substantial beneficial	The proposals would remove/replace all elements or features that are inconsistent or lead to flooding of existing, surrounding areas.
2	Moderate beneficial	The proposals would remove/replace some elements or features that are inconsistent or lead to flooding of existing, surrounding areas.
3	Minor beneficial	The proposals would remove/replace minor elements or features that are inconsistent or lead to flooding of existing, surrounding areas.
4	Neutral/negligible	No effects or those which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
5	Minor adverse	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in the detailed design of the project and consideration of mitigation or compensation measures.

6	Moderate adverse	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area of on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected communities or interests.
7	Substantial adverse	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites and features of national importance and resources/features which are unique and which, if lost, cannot be replaced or relocated. These effects are likely to be important considerations at a regional or district scale but, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.

Table 10.2 - Classification of sensitivity of receptors

Significance	Definition
Substantial	The receptor is generally, but not exclusively, sites of national importance and resource/features which are unique and if lost cannot be replaced or relocated.
Moderate	The receptor is an important at a regional or district scale.
Minor	The receptor is an important at a local scale.
Negligible	The receptor is not designated or protected and is not important at a local scale.

Table 10.3 – Overall Significance of the effects

Sensitivity of Receptor	Magnitude of Impact			
	Substantial	Moderate	Minor	Negligible
Substantial	Substantial	Substantial	Moderate	Minor
Moderate	Substantial	Moderate	Minor	Negligible
Minor	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

10.12 For the purposes of undertaking this EIA the receptors likely to be impacted by the proposed development are identified as:

- Housing to the west of site
- Ferry Road park to the west of site
- River Taff to the east
- The Marl to the north

10.13 All of these are in the immediate vicinity of the proposed development site. The sensitivity of the identified receptors is considered to be Moderate.

10.14 The receptors likely to be impacted by any potential changes to the hydrology of the site arising from the proposed developments are the River Taff and the water body in Cardiff Bay which could also potentially be impacted by any changes in the quality and quantity of surface water run-off from the development. The River Taff is designated a Site of Importance for Nature Conservation (SINC) and is important for migratory fish, otters, wildfowl and its bankside vegetation acts as a major wildlife corridor.

Consultation

10.15 Pre-planning consultation has been undertaken with both Dwr Cymru Welsh Water (hereafter DCWW) and the Cardiff Council SAB team. DCWW have confirmed there is sufficient capacity within the sewerage network to accommodate the foul flows generated from the development. A pre application SAB application has been submitted to Cardiff Council and a formal response is yet to be received.

Assumptions and Limitations

10.16 The drainage strategy is subject to further survey works of the existing drainage network. The design strategy is currently based on topographical and manhole surveys and Welsh Water record plans. Utility and drainage CCTV surveys will be needed to confirm exact routing and connectivity of the drainage systems and verify assumptions made from the topographical manhole survey information & Welsh Water records. Welsh Water records can be inaccurate and proving connectivity of the system is challenging where buried chambers are encountered within the topographical survey.

BASELINE CONDITIONS

Existing Baseline

- 10.17 The development is located mainly on a brownfield site accessed off Channel View Road in Cardiff. The site boundary consists of the Marl to north, the Taff Trail & Cardiff Bay to the east, residential properties fronting Channel View road to the west and residential dwellings to the south. The site boundary extends to South Clive Street to the south west and Ferry Road Park and Beecher Avenue to the north west. The site centres on an approximate National Grid Reference of 318010 174030 occupying a plan area of approximately 6.01 hectares and is irregular in shape. The site is generally level with an elevation of between 7-8mAOD. The northern and central sections of Channel View Road are relatively flat and are between 9.5m AOD – 9.8m AOD.

Flood Risk

- 10.18 The TAN15 Development Advice Map shown in Figure 3 of the FCA (Appendix 10.1 to this ES) demonstrates that the site is within 'Zone B' with small pockets of Flood Zone C1 present on the site along the western boundary through to the north western corner of the Marl, and small sections within the south eastern corner of the site. The residential development is classified as 'highly vulnerable' development within TAN 15 and an FCA has been produced for the site outlining justification for developing in this area.
- 10.19 There are no known historic flooding incidents on the site. The Natural Resources Wales (hereafter NRW) Historic Flood information shows the only recorded flood incident is approximately 1km north west of the site, along North Clive Street.

Watercourses

- 10.20 The nearest watercourse to the site is the River Taff which is approximately 16m away from the south eastern boundary of the site. The River Taff enters Cardiff Bay approximately 200m downstream. The River Taff is a designated SINCR and is important for migratory fish, otters, wildfowl and its bankside vegetation acts as a major wildlife corridor. The water quality of the lower parts of the River Taff and Cardiff Bay are variable, the Harbour Authority currently monitors the water quality of both Water bodies with the data publicly available.

Surface Water Drainage

- 10.21 DCWW sewerage records shows a 450mm diameter Surface Water sewer running north to south, east of the Channel View Road kerblin. The sewer moves into Channel View Road near the tower block and outfalls into Cardiff Bay in the south eastern corner of the site.

Foul Water Drainage

- 10.22 DCWW sewerage records shows a 225mm combined sewer which runs north south, within the western portion of the Marl. Properties to the north west of Channel View Road are served by a

separate 225mm diameter public combined sewer which runs within the front gardens of the properties and heads west along Beecher Avenue.

Potable Water

- 10.23 DCWW record maps show a 4" main running within the eastern and western footway of Channel View Road. Initial Welsh Water pre-planning advice indicates that a connection can be made from the existing watermain located on site.

Future Baseline

Flood Risk

- 10.24 Should the proposed development not progress the site would remain a combination of existing housing and open field (The Marl) with flood and drainage risks associated continuing to be present.
- 10.25 The site will remain vulnerable to the future effects of climate change with the increase to sea levels, rainfall intensity etc.

Watercourses

- 10.26 The nearest watercourse to the site is the River Taff which is approximately 16m away from the south eastern boundary of the site. The River Taff enters Cardiff Bay approximately 200m downstream. This would remain unaffected by the future baseline of the site.

Surface and Foul Water Drainage

- 10.27 Storm and Foul drainage would remain as per baseline conditions with no alterations to existing drainage envisaged.

Potable Water

- 10.28 Welsh Water record maps show a 4" main running within the eastern and western footway of Channel View Road. This would remain unaffected by the future baseline of the site.

POTENTIAL IMPACTS

During Construction

Flood Risk

- 10.29 Construction activities on site will include earthworks and sections of impermeable surfaces. The earthworks could potentially alter the existing surface water flow paths across the site. The creation of impermeable surfaces is likely to result in increased runoff during rainfall events. The receptors in the vicinity of the site that have the potential to be affected by flood risk are considered to be of Moderate sensitivity. However, as demonstrated on the TAN15 Development Advice and NRW Flood Risk maps, the site is generally to be at low risk of tidal/coastal flooding. Therefore, the construction impacts on flood risk are considered to be negligible and the significance of these impacts is also considered to be **negligible**.
- 10.30 NRW 1 in 100 Year Surface Water Hazard Rating Map shows there are some small areas that are at moderate risk of surface water flooding. However, these areas are very small and are not impacted by the development proposals. The 1 in 200-year JBA flood map indicates that there is no major increase in pluvial flooding on site with the range of depths remaining the same. The 1 in 1000-year flood map shows that pluvial flooding occurs in other areas of the site as opposed to just the north eastern boundary. Pluvial flooding occurs near the southern boundary with a depth varying from 0.1m – 0.3m. There is pluvial flooding ranging in depth from 0.3m-1m on Seager Drive which is adjacent to the southern boundary of the site. Surface water flood risk mapping further indicates that generally indicates the site is at low risk of pluvial flooding. The construction impacts on surface water flooding are considered to be **minor adverse**.
- 10.31 BGS groundwater flood susceptibility maps indicate there is potential for flooding of properties that are below ground level however the proposed development does not include lowering of ground levels or the installation of basements. The construction impacts on groundwater flooding are therefore deemed to be **negligible**.

Watercourses

- 10.32 The River Taff, adjacent the site, will be subject to the following risks during the construction activities:
- Contamination resulting from sediment escaping through surface water runoff during the earthworks operations and stock piling of materials.
 - Contamination resulting from the leachate of potentially harmful substances that may be used as binders for soil stabilisation.
 - Contamination resulting from accidental spillages of oil, fuel or chemicals, refuelling activities or leaks in hydraulic systems.
 - Alteration of surface water flow paths resulting from on-site storage and stock piling of materials.

- Increased surface water runoff resulting from increased impermeable area or alteration of existing catchments.
- The sensitivity of the nearby watercourse is considered to be moderate. In the absence of any mitigation measures, the impact arising from construction activities albeit temporary is considered to be moderate adverse.

10.33 The magnitude of impacts detailed above are considered to be **moderate adverse**.

Surface Water Drainage

10.34 The receptors likely to be impacted by the drainage of surface water from the proposed developments are the existing storm and the combined sewers on site, the proposed storm drainage and the River Taff, into which it is proposed to discharge the storm drainage. The sensitivity of the existing and proposed combined sewers, is considered to be Moderate. The sensitivity of the River Taff, a designated SINC, is considered to be moderate in relation to Water Quality.

10.35 Construction activities will result in a small reduction in the quantity of surface water runoff entering the combined sewer. The construction activities will be temporary and any potential changes to the hydrological regime of the site will be minor. The surface water system is designed such that the peak surface water discharge from the site is reduced by 30%. This will provide a betterment to predevelopment hydraulic conditions. Therefore, the significance of the impact is considered to be **minor adverse**.

Foul Water Drainage

10.36 The receptor that will be impacted by the foul drainage associated with the development is the existing public foul sewer network. This includes both the combined sewer and the foul sewers. The sensitivity of these receptors is considered to be Moderate.

10.37 Construction activities will generate a limited quantity of wastewater which if not conveyed appropriately, may cause pollution of existing drainage systems and watercourses on site and pose a risk to human health. Temporary additional discharges may be necessary into the combined sewer on site if discharge consent is approved.

10.38 Prior to construction, the contractor will discuss and agree the details of any temporary discharges with DCWW. In the absence of any mitigation measures, the impact arising from construction activities on the existing foul sewers in the vicinity of the site is considered to be moderate adverse. The impact will become more beneficial as more of the site becomes developed, reaching its peak once the site has been fully developed. The significance of the impact on the existing foul drainage network arising from construction activities is therefore considered to be **moderate adverse**.

Potable Water

- 10.39 Welsh Water record maps show a 4" main running within the eastern and western footway of Channel View Road. Initial DCWW pre planning advice indicates that a connection can be made from the existing watermain located on site.
- 10.40 The sensitivity of the existing water main network in the vicinity of the site is considered to be Minor.
- 10.41 The contractor will discuss and agree temporary supplies with DCWW with the impact of construction on potable water network considered to be minor. The significance of the impact on the existing water supply network arising from construction activities is therefore considered to be **minor adverse**.

During Operation

Flood Risk

- 10.42 The majority of the site is at low risk of tidal/coastal flooding. Therefore, the likely impact of flooding on the development once operational is considered to be **negligible**.
- 10.43 As the site is considered to be at very low risk of fluvial or tidal/coastal flooding and the site footprint is broadly similar comparing pre to post development, it is unlikely to have any adverse impact on existing flood risk in the vicinity of the site. Therefore, the operational impact on flood risk arising from the proposed development is therefore considered **negligible**. Consequently, the significance of the impact is also considered to be **negligible**. The development proposals will assist in alleviating the risk of pluvial flooding from the existing public sewers on site.

Watercourses

- 10.44 The sensitivity of the nearby watercourse, the River Taff which is a designated SINC is considered to be moderate. During operation the existing surface outfall will continue to be used by the site with no structures to be formed within the banks of the watercourse. The operational impact on nearby watercourses is considered minor.

In the absence of any mitigation measures, the impact arising during operation is considered to be **minor adverse**.

Surface water Drainage

- 10.45 The proposed surface water system on site will include numerous SUDS features which will reduce the speed of runoff and peak discharges from the site. The drainage network will reduce the peak runoff exiting the site by 30% and provide attenuation storage for the 1 in 100 year +40% storm event. The combined sewer will be diverted further into the Marl and any existing surface water miss-connections from the existing properties are to be demolished and removed.
- 10.46 During the operational phase of the proposed development, the River Taff will be subjected to the potential contamination resulting from sediment escaping through surface water runoff and/or contamination from hydrocarbons entering the runoff from highway and car parking areas. The

impermeable area of the development will increase, however, the discharge rate of surface water run-off will decrease by 30%. The run-off from the developed area will be discharged directly to the River Taff, rather than a proportion discharging to the combined sewer. The resulting increase in the volume of discharge into the River Taff will be negligible in relation to the overall flow in the River Taff. In the absence of mitigation measures, the impact arising from the operational phase on the hydrology of on the River Taff is likely to be negligible. The significance of the impact on the hydrology is therefore considered to be **negligible**.

Foul Water Drainage

- 10.47 DCWW have confirmed there is sufficient capacity within the sewerage network to accommodate the foul flows from the development. Post construction the development will contain a new serviceable foul line diversion running within The Marl, along the eastern side of the proposed residential development. The proposed development will generate an additional volume of foul sewage however as the foul line discharges into the existing combined sewer running North out of site, the impact arising after construction from the proposed development is considered to be minor adverse. The significance associated with this impact is considered to be **minor adverse**.

Potable Water

- 10.48 New water supply connections will be made following necessary applications through Welsh Water.
- 10.49 The sensitivity of the existing water main network in the vicinity of the site is considered to be Minor.
- 10.50 Welsh Water will advise of suitable connection points and pipe materials will be specified based on the anticipated ground conditions. The impact of the operational phase on the potable water supply is considered negligible. The significance of the impact on the existing water supply network arising during operation is therefore considered to be **Negligible**.

MITIGATION AND MONITORING

During construction

Flood Risk

- 10.51 The method of discharging flood waters during construction will be ground infiltration and if necessary, pumping to the appropriate sewer network or into the River Taff with prior approval from DCWW and NRW. The earthwork activities, handling and storage of materials will take account of the existing flow paths across the site to minimise the impact on the existing hydrology.

Watercourses

- 10.52 Standard good practice would be followed during construction. Contractors would be required to follow the guidance set out in Pollution Prevention Guidelines (PPG) for Working at Construction and Demolition Sites – PPG 6 as well as their environmental plan. These guidelines are aimed at preventing pollution of the adjacent water environment.
- 10.53 To control the surface water runoff and the risk of sediment contaminated runoff entering the adjacent watercourses, careful phasing of the earthworks is required so that controlling the runoff from areas of open excavation at any one time is manageable.
- 10.54 Temporary drainage channels to collect runoff may be required and spillages/leaks of fuel and oil will need to be prevented by appropriate bunding of fuel storage facilities, with proper controls and management on vehicle maintenance.
- 10.55 The temporary storage of large quantities of material during earthworks would need to take account of the extent and patterns of existing flow paths. This will minimise the risk of altering the existing hydrology of the site and therefore minimise any increase in flood risk, as well as managing sediment run off.
- 10.56 The surface water runoff from the proposed construction works will be managed by the contractor in line with procedures in the Construction Environmental Management Plan (hereafter referred to as the CEMP) which are to be agreed with NRW, SAB & DCWW prior to any excavations works.

Surface Water Drainage

- 10.57 Surface water runoff from the proposed construction works will be disposed of by means to be agreed in the CEMP. This will include measures for management of silt, or any other contaminants prior to discharge. It may be possible to discharge to the public sewer network or watercourse.

Foul Water Drainage

- 10.58 During construction, toilet and welfare facilities will need to be provided for the construction workforce in line with the Health and Safety at Work Act 1974. A foul strategy will need to be agreed

with DCWW by the contractor and it is anticipated that it will be based on the proposed foul strategy for the permanent development and will involve either:

- A temporary/permanent connection to the existing foul sewers in the vicinity of the site.
- or collection of the foul sewage on-site and dispose of it at an appropriate treatment facility.

Potable Water

10.59 It has been assumed that a potable water supply can be made available from existing DCWW public water supply networks. Further clarification of this will be required in order to determine parameters for incoming potable water for temporary and permanent systems.

During Operation

Flood Risk

10.60 The site and the area in its vicinity are at little or no risk of fluvial or tidal/coastal flooding. The surface water runoff from the proposed development will be discharged into the River Taff, thereby minimising any impact on the existing hydrology of the catchment. Considering the existing discharge of the River Taff, it is thought that the relatively small volume of additional discharge created by the storm sewer will have minimal impact with regard to flood implications. The storm drainage network will be designed to contain storm events with return periods of up to the 1 in 100 year +40% event in accordance with the National SUDS standards for Wales.

10.61 To mitigate the residual flood risks resulting from the proposals, the following mitigation measures are recommended:

- The occupiers of the site should sign up to the NRW flood warning service.
- A Flood Action Plan should be developed and implemented during a flood alert.
- Flood Resilient design measures should be considered during the detailed design of the development.
- A SUDS design solution should be progressed and detailed in consultation with the SAB
- Exceedance Overland Flow flood route plans shall be produced and agreed with the SAB.
- Proposed properties shall not be lowered below existing ground levels.

Surface Water Drainage

10.62 The majority of storm drainage is proposed to be discharged to the River Taff via a proposed storm drainage network. Sewers will be designed in line with Sewers for Adoption 7th edition & National SUDS standards for Wales. The proposed storm drainage network will be adopted and maintained by the SAB. The surface water network, including SUDS features which subject to a regular maintenance

plan to ensure effective operation. Appendix H to the Drainage Strategy Report (Appendix 10.2 to this ES) illustrates the proposed drainage strategy in principle.

- 10.63 Where achievable, a minimum finished floor level of 8.8m AOD is to be adopted through the site to provide a 600mm freeboard above extreme flood levels.

Foul Water Drainage

- 10.64 The development will include a network of adoptable sewers which will convey the foul water from the development to the diverted 225mm diameter combined sewer within The Marl. Appendix H to the Drainage Strategy Report (Appendix 10.2 to this ES) illustrates the proposed drainage strategy in principle.

Potable Water

- 10.65 On-going discussions with DCWW will clarify whether modifications will need to be made to the existing water system in order to cope with the demands of the new development. Initial DCWW pre-planning advice indicates that a connection can be made from the existing watermain located on site.

RESIDUAL EFFECTS

During Construction

- 10.66 Following the application of appropriate mitigation measures all residual effects during the construction phase of the development will **negligible**. All mitigation measures will be approved by the regulatory authorities and once construction is complete the identified potential effects will be considered to have been mitigated. Mitigation measures are outlined in Table 10.4.

During Operation

- 10.67 Following the application of appropriate mitigation measures all residual effects during the operational phase of the development will **negligible**. Mitigation measures are outlined in Table 10.4.

SUMMARY AND CONCLUSIONS

- 10.68 The impact of the development on Drainage, Flood Risk & Potable Water during the construction phase of development is summarised in table 10.4 below. Without the suggested mitigation measures the impacts during construction and operation have the potential to be minor - moderately adverse.
- 10.69 Following incorporation of the proposed mitigation measures, the impact of the residual risk of the proposed development during the construction is negligible. No residual effects are expected during the operational phase.

Table 10.4 Summary of mitigation measures

Receptor	Effect	Mitigation	Residual Effect
During Construction			
Highly Vulnerable Development Existing neighbouring residential dwellings.	Flood Risk Sensitivity: Moderate Impact: Negligible Significance of impacts: Negligible	The method of discharging flood waters during construction will be gravitating or pumping flows to the existing surface water sewer network or into the River Taff. The earthwork activities, handling and storage of materials will take account of the existing flow paths across the site to minimise the impact on the existing hydrology. Flood Resilient design measures should be considered during the detailed design of the development. A SUDS design solution should be progressed and detailed in consultation with the SAB. Exceedance Overland Flow flood route plans shall be produced and agreed with the SAB. Proposed properties shall not be lowered below existing ground levels.	Sensitivity: Moderate Impacts: Negligible Significance of impacts: Negligible
Existing Watercourses	Changes in quantity and quality of surface water runoff Sensitivity: Moderate Impact:	Phasing the earthworks such that controlling the runoff from areas of open excavation at any one time is manageable. Temporary drainage channels to collect runoff; Temporary settlement channels and storage lagoons to intercept and contain sediment and to attenuate runoff. Prevention of spillages or leaks of fuel and oil by bunding and vehicle maintenance. Following PPG 6. Capping layer to provide clean barrier.	Sensitivity: Moderate Impacts: Negligible

		Moderate Adverse		Significance of impacts: Negligible
		Significant of impacts: Moderate Adverse		
Existing Storm Sewers	Flooding.	Sensitivity: Moderate	Surface water runoff from the proposed construction works will be disposed of by means to be agreed in the CEMP. Possible discharge to the public sewer network, watercourse or discharge to ground.	Sensitivity: Moderate
		Impacts: Minor Adverse		Impacts: Negligible
		Significance of impacts: Minor Adverse		Significance of impacts: Negligible
Existing Foul Sewers	Flooding.	Sensitivity: Moderate	A temporary/permanent connection to the existing foul sewers in the vicinity of the site; or Collection of the foul sewage on-site and dispose of it at an appropriate treatment facility.	Sensitivity: Moderate
		Impacts: Moderate adverse		Impacts: Negligible
		Significance of impacts: Moderate adverse		Significance of impacts: Negligible
Potable Water	Water Supply	Sensitivity: Minor	A temporary connection to the water supply network on site will be made. The point of connection will be confirmed with DCWW.	Sensitivity: Minor
		Impacts: Negligible		Impacts: Negligible
		Significance of impacts: Negligible		Significance of impacts: Negligible

During Operation			
Highly Vulnerable Development	<p>Flood Risk.</p> <p>Sensitivity: Moderate</p> <p>Impacts: Negligible</p> <p>Significance of impacts: Negligible</p>	<p>The occupiers of the site should sign up to the NRW flood warning service.</p> <p>A Flood Action Plan should be developed and implemented during a flood alert. FFL's shall be raised above extreme flood levels inclusive of a 600mm freeboard.</p>	<p>Sensitivity: Moderate</p> <p>Impacts: Negligible</p> <p>Significance of impacts: Negligible</p>
Existing Watercourses	<p>Changes in quantity and quality of surface water runoff.</p> <p>Sensitivity: Moderate</p> <p>Impacts: Minor Adverse</p> <p>Significance of impacts: Minor adverse</p>	<p>600mm capping layer and double "NO DIG" barrier to avoid pollution pathways between the proposed works and the adjacent watercourse.</p> <p>Reduction in peak surface runoff discharging into the River Taff and multiple SUDS features included to improve the quality of surface water runoff.</p>	<p>Sensitivity: Moderate</p> <p>Impacts: Negligible</p> <p>Significance of impacts: Negligible</p>
Existing and proposed storm drainage	<p>Flooding.</p> <p>Sensitivity: Moderate</p> <p>Impacts: Minor Adverse</p> <p>Significance of impacts: Minor Adverse</p>	<p>30% reduction in pre-development flows within a 1 in 30-year return period - no mitigation measure required due to decreased flow as a result of discharging surface water into River Taff.</p>	<p>Flooding.</p> <p>Sensitivity: Moderate</p> <p>Impacts: Negligible</p> <p>Significance of impacts: Negligible</p>

Existing and proposed Foul drainage	<p>Flooding.</p> <p>Sensitivity: Moderate</p> <p>Impacts: Moderate adverse</p> <p>Significance of impacts: Moderate Adverse</p>	<p>Regular Maintenance of foul drainage network. Sufficient capacity confirmed within the Public sewerage network. Surface water miss connections removed from public combined sewer.</p>	<p>Sensitivity: Moderate</p> <p>Impacts: Negligible</p> <p>Significance of impacts: Negligible</p>
Potable Water	<p>Water Supply</p> <p>Sensitivity: Minor</p> <p>Impacts: Negligible</p> <p>Significance of impacts: Negligible</p>	<p>A pre-development response from Welsh Water has indicated that a connection can be made on site. Water supply pipe materials will be specified to take of the ground conditions on site.</p>	<p>Sensitivity: Minor</p> <p>Impacts: Negligible</p> <p>Significance of impacts: Negligible</p>

Abbreviations and definitions

- EIA – Environmental Impact Assessment
- DETR – Department of the Environment Transport and the Regions
- LDP – Local Development Plan
- NRW – Natural Resources Wales
- OD – Ordnance Datum
- OS – Ordnance Survey
- SPZ – Source Protection Zone
- EMP – Environmental Management Plan
- CEMP – Construction Environmental Management Plan
- PPG – Pollution Prevention Guidelines
- DCWW – Dwr Cymru Welsh Water
- ES – Environmental Statement
- TAN15 – Technical Advice Note 15
- FCA – Flood Consequences Assessment
- SAB – SUDS Approval Body
- SUDS – Sustainable Drainage System