

Chapter Eleven

GROUND CONDITIONS, DRAINAGE AND FLOOD RISK

INTRODUCTION

11.1 This chapter is divided into two main sections. The first, Section A, details the status of the ground conditions with consideration to historical activities and pollution. It then goes on to describe the proposed development of the site and assesses the future potential impacts. Section B of the chapter presents the details of the current water resources across the site. A flood risk assessment has been produced for the site and considers the present and future flood risk to the site as well and the potential hydrological characteristics of the subject area resulting from the proposed development. This chapter will need to be read with reference to the original assessment carried out within the 2008 ES which supported the Enviroparks Phase 1 planning application.

SECTION A: GROUND CONDITIONS AND LAND CONTAMINATION

INTRODUCTION

11.2 Section A of chapter eleven assesses the likely significant effects of the proposed development in terms of ground conditions and land contamination. The assessment incorporates the findings of the following studies and reports:

- Phase 1 Environmental Desk Study, Hirwaun Ecopark, ERM Report, October 2007;
- Hirwaun Industrial Estate Development, Interpretive Report On Site investigation, Soil Mechanics, Report No. H8076, January 2009;
- Enviroparks, Hirwaun – Phase 1, Contaminated Land Risk Assessment in Support of Planning Conditions, Report No. G345/Phase 1, April 2015;
- Pell Frischmann report RQ80023G001 - Geo-environmental Assessment, Phase 2 Development, Enviroparks Wales, Hirwaun (presented in Appendix 11.1) and hereafter referred to as ‘the PF GA Report’; and
- Pell Frischmann Letter LQ80023G001 - Supplementary Soil Sampling, Phase 2 Development, Enviroparks Wales, Hirwaun (presented in Appendix 11.2) and hereafter referred to as ‘the PF SSS Letter’;

11.3 This chapter describes the assessment methodology; the baseline conditions at the Application Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after the measures have been employed.

POLICY CONTEXT

European directives

Groundwater Directive dangerous substances (consolidated) (1979)

11.4 The Groundwater Directive (GD) aims to protect groundwater from pollution by controlling discharges and disposals of certain dangerous substances to groundwater. In the UK, the GD is implemented through the Environmental Permitting Regulations (EPR) 2010.

11.5 NRW protects groundwater under the EPR by preventing or limiting the inputs of polluting substances into groundwater. Substances controlled under the regulations fall into two categories:

- *Hazardous substances* – These are the most toxic and must be prevented from entering groundwater. Substances in this list may be disposed of to the ground under a permit but must not reach groundwater. Hazardous substances replace the ‘List 1’ substances which came under the 1998 Groundwater Regulations.
- *Non-hazardous substances* – These are less dangerous and can be discharged to groundwater under a permit, but must not cause pollution. Non-hazardous pollutants include any substance capable of causing pollution and the list is much wider than the previous ‘List 2’ substances.

UK law

Environmental Protection Act (1990)

11.6 Specific UK legislation and guidance on the assessment of contaminated land is principally provided under Part IIA of the Environmental Protection Act (EPA) 1990, as introduced by Section 57 of the Environment Act 1995. The legislation supports a systematic approach to the identification and remediation of land affected by historical contamination. The principle of a ‘suitable for use’ approach to contaminated land is endorsed by the legislation, where remedial action is required only if there are unacceptable risks to human health and / or the environment, taking into account the use of the land and its environmental setting.

Contaminated Land Statutory Guidance - 2012

11.7 Part 2A of the EPA (1990) is currently administered by The Contaminated Land Statutory Guidance 2012 - WG19243. The statutory guidance describes a risk assessment methodology in terms of the identification of ‘significant pollutants’ and ‘significant pollutant linkages’, within a source-pathway-receptor conceptual model.

11.8 Local Planning Authorities (LPAs) rely on the advice of Natural Resource Wales (NRW) in relation to environmental matters, in particular in their approach to the assessment of pollution of 'Controlled Waters'.

Water Recourses Act 1991 (Amendment) Regulations (2009)

11.9 The 2009 amendment to the Water Resources Act (WRA) extends the use of Water Protection Zones and Works Notices to deal with harm to aquatic ecosystems caused by the physical characteristics of a water course such as the condition of river banks.

National Planning Policy

Planning Policy Wales (2016)

11.10 Specifically relating to Ground Conditions and Contamination is Chapter 13 of the National Planning Policy Edition 9, November 2016, Minimising and Managing Environmental Risks and Pollution, which states the objectives of the Welsh Governments are to:

- maximise environmental protection for people, natural and cultural resources, property and infrastructure; and;
- prevent or manage pollution and promote good environmental practice.

11.11 In preparing development plans the local planning authorities must ensure that:

- new development is not undertaken without an understanding of risks, including those associated with the previous land use, mine and landfill gas emissions, and rising groundwater from abandoned mines;
- development does not take place without appropriate remediation;
- consideration is given to potential impacts which remediation of land might have upon natural and historic environments.

11.12 Planning policies and decisions should ensure that:

- The potential hazard that contamination presents to the development itself, its occupants and the local environment; and
- The results of a specialist investigation and assessment by the developer to determine the contamination of the ground and to identify any remedial measures required to deal with any contamination.

Other guidance

11.13 Another key piece of guidance is the EA's Model Procedures; Contaminated Land Report 11 (CLR 11) September 2004, which indicates that a Conceptual Site Model (CSM) should identify those contamination sources, pathways and receptors which are 'likely' to represent an 'unacceptable' risk either to human health or the surrounding environment.

11.14 With regard to the methodology for the investigation for contaminated land, British Standard BS10175:2011 Investigation of potentially contaminated sites – Code of practice is the primary guidance.

ASSESSMENT METHODOLOGY

11.15 In connection with this chapter, a risk assessment has been undertaken by Pell Frischmann to establish the potential for significant ground contamination to exist at the Assessment Site and the likely risks posed to a range of sensitive receptors, including humans, controlled waters and flora and fauna. The findings of this risk assessment are presented in PF GA report RQ80023G001 - Geo-environmental Assessment, Phase 2 Development, Enviroparks Wales, Hirwaun, January 2017), a copy of which can be found in Appendix 11.1. The PF GA Report was informed by the following earlier studies and reports:

- Phase 1 Environmental Desk Study, Hirwaun Ecopark, ERM Report, October 2007
- Hirwaun Industrial Estate Development, Interpretive Report On Site investigation, Soil Mechanics, Report No. H8076, January 2009;
- Enviroparks, Hirwaun – Phase 1, Contaminated Land Risk Assessment in Support of Planning Conditions, Report No. G345/Phase 1, April 2015

11.16 The PF SSS Letter LQ80023G001 - Supplementary Soil Sampling, Phase 2 Development, Enviroparks Wales, Hirwaun (Appendix 11.2) incorporates a recommendation for further investigation that was made in the PF GA report. The conclusions of the PF SSS Letter supersede the conclusions of the PF GA report with respect to risk to human health from soil contamination.

Significance criteria

11.17 There are no published criteria for assessing the significance of potential impacts from ground conditions and contamination within the context of an EIA. Significance criteria have therefore been developed using the criteria outlined in contaminated land guidance, and professional judgement.

11.18 Environmental effects associated with the proposed development have the potential to be adverse, beneficial or negligible. For example, in terms of beneficial effects, the proposed development might remove the source of contamination or it might break a pathway that currently links a source of contamination to a receptor. Conversely, in terms of adverse effects the proposed

development might introduce a more sensitive receptor to a contamination source existing at the site. The significance of an impact partly depends on the timescales involved - i.e. short, medium or long term - and the extent of the area affected.

Sensitivity

11.19 The sensitivity of a receptor depends on the nature of the receptor and how sensitive the receptor is with respect to potential impacts from an identified source.

11.20 In terms of ground conditions, sensitive receptors are defined Table 11.1 for the purpose of this ES.

Table 11.1 – Sensitive receptors

Scale	Receptor Sensitivity Guidance/Example
High	Very sensitive receptor: from a particularly vulnerable group e.g. children, elderly; a highly sensitive environment e.g. legally designated site such as a Principal Aquifer; a receptor where the exposure to a contamination source is likely to be more significant/direct e.g. construction workers; where contamination is more likely to result in a severe or permanent effect.
Medium	Sensitive receptor, though not from a particularly vulnerable group and/or where the impact is likely to result is a less significant and/or shorter term effect e.g. adults visiting a site for a short period of time with little direct contact with any contamination areas, perched/shallow ground water that is not currently being extracted/used.
Low	Receptor which may have some or only limited sensitivity to impacts and where the limited impacts are anticipated to be short term not considered significant (e.g. buildings or unproductive strata with little to no sensitivity to most contaminants).

Magnitude of impacts

11.21 The magnitude of impacts associated with the proposed development is determined by the baseline conditions of the Application Site, how far the conditions will deviate from the baseline condition during the construction and operational phases of the proposed development (i.e. the magnitude of the change) and by assessing the impact that this change in condition may have on the source-pathway-receptor model with respect to each pollution linkage. A qualitative assessment of the potential magnitude of the impacts is undertaken prior to the consideration of mitigation measures. The qualitative criteria used to assess how far an impact deviates from the baseline condition (i.e. the magnitude of change) are summarised in Table 11.2. This assumes that worst-case scenarios with respect to potential negative effects on identified pollution linkages occur during both the construction and operational phases of the Proposed Development.

Table 11.2 – Magnitude of Impacts

Magnitude	Criteria
Negligible	Results in no discernible change or effect to the receptor. Change is of insufficient magnitude to significantly affect the use/integrity of the receptor. No pollution linkages present i.e. source, pathway or receptor is not present.
Minor	Results in minor effect on receptor but affect does not present significant possibility of significant harm/pollution, if site investigation data is available then Generic Assessment Criteria (GACs) / Environmental Quality Standards (EQS) would not be exceeded.
Moderate	Potentially complete pollution linkage identified, contamination source has the potential to affect the receptor, if investigation information is available generic assessment criteria likely to be exceeded.
Major	Complete pollution linkage identified and significant possibility of significant harm/pollution of water course is considered likely. Therefore, land has the potential to be classified as 'Contaminated' under Part IIA of the EPA 1990.

Significance of effects

11.22 The assessment of significance of environmental effects is based on both the sensitivity of the identified receptors and the magnitude of the impact as set out above. In order to predict the significance of the effects, sensitivity and magnitude are assessed as a function of one another. The significance of the effects has therefore been considered within a Significance Matrix, outlined in Table 11.3.

11.23 While assessing the significance of effects associated with the proposed development, it may be appropriate/necessary to take into account the potential duration and scale of the effect. The duration and scale may be considered as follows:

- The duration of the potential effect i.e. short term (less than 3 years), medium-term (between 3 -10 years) or long term (in excess of 10 years); and
- The extent of the receptor and/or the scale on which the receptor may be affected i.e. local (on-site and within the vicinity of the site, e.g. site users and local residents); regional (i.e. borough, counties e.g. a groundwater body that is utilised as a regional source of potable water); or national/international (e.g. sites with national/international environmental designations).

11.24 In terms of significance, effects also have the potential to be beneficial (+), adverse (-) or neutral as indicated in Table 11.3.

Table 11.3 – Significance Matrix

		Magnitude of Impacts			
		Major	Moderate	Minor	Negligible
Sensitivity	High	Major (+/-)	Major (+/-)	Moderate (+/-)	Negligible
	Medium	Major (+/-)	Moderate (+/-)	Minor (+/-)	Negligible
	Low	Moderate (+/-)	Minor (+/-)	Minor (+/-)	Negligible

11.25 The significance of environmental effects (hereafter referred to the ‘Significance Criteria’) that result from the Proposed Development are summarised in Table 11.4 below.

Table 1.4 – Significance Criteria

Significance of environmental effects – significance criteria (from the significance matrix)						
Major Adverse	Moderate Adverse	Minor Adverse	Negligible	Minor Beneficial	Moderate Beneficial	Major Beneficial

11.26 As explained previously (paragraph 11.12 above), the CSM is developed as part of an iterative process. In the case of this chapter, the CSM was initially produced as part of the desk study which is based on a review of the readily available desk based information. The CSM was then updated following the completion of the ground investigation (GI) and the associated Phase 2 Development Geo-environmental Assessment Report.

11.27 The CSM identifies potential pollution linkages that reflect the findings of the desk study, the GI and the associated risk assessments. Where no pollution linkage is identified, an environmental effect is unlikely to exist and therefore no further assessment is undertaken.

11.28 Where potentially complete pollution linkages are identified an environmental effect may exist. The Significance Criteria have been applied to the assessment and the CSM after the results of the assessments have been considered. The Significance Criteria are initially applied before any mitigation measures are taken into account.

11.29 Following the application of the Significance Criteria, the incorporation of mitigation measures can be considered and the effects are updated to reflect any potential benefits/changes that the proposed development may have on the Application Site. With respect to pollution linkages, mitigation measures tend to aim to tackle/reduce the potential contamination source and/or break pathways between a source and receptor.

11.30 Residual Effects are those risks and/or potential effects which remain following the incorporation of appropriate mitigation measures. These are summarised in the residual effects text at the end of this chapter.

BASELINE CONDITIONS

11.31 The geology, land use history and ground conditions of the site are discussed in detail in the separate desk study, ground investigation and ground condition risk assessment reports which have been produced for the site (below). The baseline conditions have been established from the PF GA Report (Appendix 11.1) and PF SSS Letter (Appendix 11.2). The following sections present a summary of the current baseline conditions. The following sections summarise the geology, history and ground conditions detailed in the following:

- Phase 1 Environmental Desk Study, Hirwaun Ecopark, ERM Report, October 2007;
- Hirwaun Industrial Estate Development, Interpretive Report on Site investigation, Soil Mechanics, Report No. H8076, January 2009;
- Enviroparks, Hirwaun – Phase 1, Contaminated Land Risk Assessment in Support of Planning Conditions, Report No. G345/Phase 1, April 2015; and
- PF report RQ80023G001 - Geo-environmental Assessment, Phase 2 Development, Enviroparks Wales, Hirwaun (presented in Appendix 11.1)
- PF letter LQ80023G001 - Supplementary Soil Sampling, Phase 2 Development, Enviroparks Wales, Hirwaun (presented in Appendix 11.2)

Site location and description

11.32 Chapter two of the 2008 ES and chapter two of the current ES addendum provide a more detailed site description. The site is located to the north-west of Hirwaun on the edge of Hirwaun Industrial Estate. The approximate centre of the site is located at OS GB National Grid Reference 293880, 206790N. Access to the site is via Ninth Avenue to the east of the site.

11.33 The entire development site comprised an area of approximately level ground that was prepared by the Welsh Development Agency as a development platform by regrading the site. The site is approximately rectangular in shape and covers an area of approximately eight hectares and is approximately 250m to 300m at its widest.

11.34 The site boundary is defined by a track at the lower edge of the Penderyn Reservoir embankment in the north, Ninth Avenue in the east, Fifth Avenue in the south and an unnamed stream in the west. The area surrounding the site is used for the Penderyn Reservoir and farm fields to the north, farm fields and woodland to the west and by industrial units in the south and east.

11.35 The Phase 1 Enviroparks building (Fuel Preparation Hall) has been built in the south-eastern portion of the site. A concrete apron is located to the north of the building and joins a concrete access road that runs from east to west across the middle of the site before turning to the south along the western site boundary and joining Fifth Avenue.

Historical land uses of the Application Site and surrounding area

11.36 The desk study collated historical mapping information and revealed that the history of land use on and around the site was largely industrial.

11.37 The mapping indicates the site was formally used as an ordnance factory during the Second World War, although all buildings associated with the plant were demolished in the late 1960s and early 1970s and it is confirmed in the desk study that no munitions were used on the site. The site remained vacant until the late 1990s when the Welsh Development Agency (WDA) re-profiled the site creating the current site profile and installed the associated herring bone drainage and open ditches.

11.38 A small refuse tip was recorded on the 1964 mapping to be associated with the Ordnance factory. This refuse tip is recorded outside of the Phase 2 development area.

Hydrology

11.39 An unnamed stream flows from north to south along the western site boundary. This unnamed stream flows into the Camnant stream approximately 50 m to the south-west of the site. The Camnant stream joins the River Sychryd approximately 500 m to the west of the site.

Geology

11.40 The general geology of the Application Site area is shown on the 1:50,000 geological map of Merthyr Tydfil (Sheet 231). Further geological information has been obtained from the British Geological Survey (BGS). The PF Report indicates that the majority of the Application Site is shown to be underlain by superficial deposits of Glacial Till, with Alluvium to the south-west.

11.41 The Application Site is shown to be underlain by bedrock of the Lower Coal Measures. The Lower Coal Measures is a sequence of mainly mudstones and sandstones with rare coal seams. The Lower Coal Measures is described as grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones.

Hydrogeology

11.42 The desk study indicates that the Lower Coal Measures are classified as a Secondary A Aquifer.

Ground conditions

11.43 Three phases of ground investigation have been undertaken for the Enviroparks development. The first phase was undertaken by Soil Mechanics in 2008 (reported 2009) and covered the whole scheme area (Phase 1, Phase 2 and Phase 3 development areas). The second phase of ground investigation was undertaken by Quantum Geotechnical in 2013 and primarily targeted the Phase 1 development area. The final phase was undertaken by Quantum Geotechnical in late 2016 early 2017 and targeted the Phase 2 development area.

11.44 The ground investigation generally encountered a sequence of Made Ground, above Glacial Till or Alluvium (in the southwest of the site). Below the superficial deposits, solid geology of the Lower Coal Measures was encountered.

11.45 The Made Ground was located in all of the exploratory holes undertaken in the Phase 2 development area. The thickness of the Made Ground varied from 0.3m to 3.6m with nine of the trial pits terminating within the Made Ground. In general, the Made Ground was granular and was described as medium dense to dense red, brown and grey very clayey sandy gravel with low cobble content.

11.46 The Alluvium was only encountered in a single trial pit (TP6), and was recorded between 3.0m and 3.5m bg. The Alluvium was described as soft to firm grey brown to black clayey SILT with rare small pockets of woody peat and many roots and rootlets.

11.47 The Glacial Till varied in depth between 3.8m and 11.7m. The Glacial Till was generally described as loose to dense dark grey and brown clayey sandy gravel with low cobble content.

11.48 Below the Glacial Till the Lower Coal Measures was encountered. The Lower Coal Measures were described as very strong grey fine grained sandstone with orange brown staining on discontinuity surfaces.

Soil contamination

11.49 The chemical analysis undertaken on soil samples from the Phase 2 development area were compared against the Category 4 Screen Levels (C4SL) and Suitable for Use Levels (S4UL) commercial (with 1% SOM) thresholds. Following statistical analysis of the samples obtained during the site investigation, no potentially pervasive risks to human health was identified within the soils.

11.50 The concentrations of hydrocarbons in the soils exceeded the UK Water Industry Research (UKWIR) thresholds for Polyethylene (PE) and Polyvinylchloride (PVC) water supply pipework on brown field sites. Organic contaminants such as hydrocarbons have the potential to permeate PE and PVC water supply pipe and potentially pose a risk to the future site users.

Ground gas

11.51 Gas monitoring was undertaken on the wells in the Phase 2 development area on four occasions. The monitoring recorded maximum concentrations of 1.2% for methane and 1.4% for carbon dioxide. The minimum oxygen concentration was 17%. The maximum gas flow was recorded

at 0.3l/hr. The ground gas assessment was undertaken in accordance with BS 8485:2015 and on the basis that the proposed development would comprise Type D (industrial) buildings. In general accordance with BS 8485:2015 and based on the calculated GSVs, the site was classified as Characteristic Situation 1 (CS1).

11.52 BS 8485:2015 suggests that consideration should be given to upgrading to Characteristic Situation 2 (CS2) if the methane concentration exceeds 1%.

11.53 If the Characteristic Situation was to be raised to CS2 then gas protection measures with at least a minimum gas protection score of 1.5 points would be required. A cast *in situ* monolithic reinforced concrete slab with minimum penetrations, such as the one proposed for the structures would provide the necessary 1.5 gas protection points.

11.54 In the PF GA report, the risk to future users of the site from ground gas was classified as 'low'. This is based on the low gas concentrations, low flow rates, the proposed floor construction and intrinsic gas control measures that will be included within the internal spaces of the proposed development (waste recovery and energy production).

Controlled waters

11.55 Groundwater was encountered during the ground investigation. Groundwater samples were obtained from three monitoring wells and were subjected to chemical analysis that included a suite of metals, polycyclic aromatic hydrocarbons (PAHs) and petroleum hydrocarbons.

11.56 The results of the chemical analysis were compared against the water quality targets. Acceptable water quality targets (WQT) were defined for protection of human health (based on drinking water standards (DWS)) and for protection of aquatic ecosystems (environmental quality standards (EQS)). After review, five chemicals of potential concern were recorded to exceed the assessment criteria, these being chromium VI, mercury, phenols, cyanide and total petroleum hydrocarbons. However, the exceedance for chromium VI, mercury, phenols and cyanide is only apparent because the laboratory method detection limit (MDL) is above the relevant EQS value used.

11.57 On this basis the PF GA report concluded that the overall risk posed to Controlled Waters by the ground conditions at the site is low. This is based on the site setting and the development context (i.e. the lack of human abstractors and the low contaminant concentrations).

11.58 Further groundwater monitoring, analysis and assessment has been recommended within the PF GA report. This analysis is in the process of being undertaken. It has been recommended that the analysis should target chromium VI, mercury, phenols, cyanide and hydrocarbons. The analysis should be undertaken to current standards with a MDL below the relevant threshold value. The results of this analysis will then be assessed to establish if a risk to controlled waters is present.

POTENTIAL SIGNIFICANT EFFECTS

11.59 The potential impact of the ground conditions on the proposed development have been segregated into impacts that relate to the construction phase and operational phase of the proposed development.

11.60 Where a potential pollution linkage is incomplete, or a geotechnical risk is considered to be very low, an environmental impact is unlikely to exist. Where potential pollution linkages or significant geotechnical risks have been identified it is considered likely that an environmental impact may exist. The significance of the effect has been quantified (as described in paragraphs 11.17 to 11.30) and the Significance Criteria have been applied. All of these potential effects are described in the absence of mitigation. The mitigating measures that could be applied in the event that the potential effects described below should actually arise are described in the next section of this chapter.

Construction

Potential effects upon human health from land contamination

11.61 During construction works, workers on the Application Site would be the principal receptor. Construction works, particularly any earthworks associated with the excavation of foundations and service routes could disturb and expose construction workers to ground contamination. These activities could create plausible pollutant linkages through dermal contact, inhalation and / or ingestion pathways. The likely magnitude of Impact is Major but considered at worst, to be short-term. This would result in an effect with a **Major Adverse significance**.

11.62 In areas of bulk excavation and stockpiled materials, dust could be generated during dry and windy conditions. Under these conditions, users of the Proposed Development and the general public using footpaths adjacent to the Application Site could temporarily be exposed through inhalation of potentially contaminated dust. The magnitude of this Impact would be considered Moderate (potential impact) and the Sensitivity of the receptor would be Medium. This would result in a short-term effect with a **Moderate Adverse significance**.

Potential effects upon controlled waters from land contamination

11.63 To facilitate construction works, it is anticipated that new potential sources of contamination would be introduced and stored on the Assessment Site in the form of, for example, diesel fuel, oils, chemicals and construction materials. As a result, there would be a risk of leakages or spillages directly or indirectly (for example, via the surface water drainage systems) into the ground, although the likelihood and frequency of occurrence is considered to be low. For the Phase 2 development the magnitude of this Impact would be considered Minor and the Sensitivity of the receptor would be Medium. This would result in an effect with a **Minor Adverse significance**.

11.64 Construction works could disturb contamination within the Made Ground and shallow soils, potentially creating a pollutant linkage through downward leaching and migration between near surface soils to groundwater beneath the Application Site. Piled foundations might create a preferential pathway for contaminants to migrate to the principal aquifer below. For the Phase 2

development area the magnitude of this Impact would be considered Minor and the Sensitivity of the receptor would be Medium. This would result in an effect with a **Minor Adverse significance**.

Effects to the proposed development from potential geotechnical risks

11.65 The site is known to have a high groundwater table. If groundwater is not properly controlled during the construction, excavations can become unstable and spall, run or collapse. This might result in construction workers working in unsupported excavations that have the potential to collapse. This Impact would be considered Major and the Sensitivity of the receptor would be High. This would result in an effect with a **Major Adverse significance**.

Operation

Potential Risk to Future Users from Land Contamination

11.66 The site investigations undertaken at the Application Site have identified minor concentrations of organic contaminants in the soils. These concentrations that exceed the UKWIR thresholds for Polyethylene (PE) and Polyvinylchloride (PVC) water supply pipework on brown field sites.

11.67 There is a potential risk to the future site occupants or site users If PE or PVC water supply pipework is laid at the site. Organic contaminants may permeate the water supply pipe and may be ingested by future site occupants or site users. The magnitude of this Impact would be Minor and the receptor sensitivity is High. Therefore, the effect would be of **Moderate Adverse significance**.

Potential Contamination of Controlled Waters

11.68 Site investigation undertaken at the Application Site indicates that the groundwater quality beneath the site is generally good.

11.69 Minor exceedances of threshold values were observed due to laboratory MDL and possibly due to method of analysis. The risks from these chemical cannot yet be discounted.

11.70 Based on the groundwater analysis recovered from the Application Site, the magnitude of Impact is Moderate Adverse and the receptor sensitivity is considered to be Low. Therefore, the effect would be of **Minor Adverse significance**.

Risk to future users from ground gas

11.71 The gas monitoring data indicates the ground gas regime at the Application Site would be Characteristic Situation 1 or 2.

11.72 Without mitigation the magnitude of the Impact from ground gases from the site accumulating in buildings would be considered Minor Adverse and the Sensitivity of the receptor (future site users) would be High. This would result in the effect with a **Moderate Adverse significance**.

Potential geotechnical risks to proposed development

11.73 Buildings associated with the Proposed Development might be susceptible to damage particularly associated with foundation failure due to poor underlying ground conditions. Made Ground and soft compressible Alluvium and Glacial Till are present at the Application Site, and hence there is potential for foundations to fail and compromise the structural integrity of the proposed buildings. Consequently, it would be expected that the magnitude of Impact from geotechnical risks would be Major and the Sensitivity of the receptor would be High. This would result in an effect with a **Major Adverse** significance.

Table 11.5: Summary of potential effects in the absence of mitigation

Aspect	Identified Risks	Receptor Sensitivity	Impact Magnitude	Effect Significance
Construction				
Effects upon Human Health from Land Contamination	Health impacts upon construction workers	High	Moderate Adverse	Major Adverse
	Health impacts upon general public	Medium	Moderate Adverse	Moderate Adverse
Effects upon Controlled Waters from Land Contamination	Impacts from construction works	Medium	Minor Adverse	Minor Adverse
	Storage of chemicals, fuels and construction materials	Medium	Minor Adverse	Minor Adverse
Geotechnical Risks	High groundwater, risk of excavation collapse	High	Major Adverse	Major Adverse
Operation				
Effects upon Human Health from Land Contamination	Risks to future site users	High	Minor Adverse	Moderate Adverse
Effects upon Controlled Waters from Land Contamination	Risks to Controlled waters from potentially contaminated groundwater within the Application Site area.	Medium	Minor Adverse	Minor Adverse
Ground Gas Effects	Risks to future site users.	High	Minor Adverse	Moderate Adverse
Geotechnical Risks	Risks to the Proposed Development	High	Major Adverse	Major Adverse

MITIGATION

11.74 Mitigation measures with respect to previously highlighted risks for the Application Site and Proposed Development have been segregated into effects that relate to the construction phase and the operational phase.

Construction

Risks to site users from contamination

11.75 For all construction activities, all workers and site visitors will be issued with appropriate Personal Protective Equipment (PPE) and wear it accordingly. Users will be trained how to use the appropriate PPE properly and effectively. The appropriate PPE necessary to keep personnel on site safe will be determined prior to those activities that require them.

11.76 During construction, precautions will be taken to minimise the exposure of workers and the general public to potentially harmful substances. Appropriate Health and Safety Plans will need to be developed as required under the Construction (Design and Management) Regulations 2015. Attention will also need to be paid to restricting possible off-site dust emissions. Specific protection is likely to include:

- use of dust suppression techniques, including water spraying of access roads and stockpiled in dry weather;
- provision of wheel washing facilities for vehicles leaving the Application Site;
- avoiding the stockpiling of contaminated materials, where possible;
- covering of stockpiled materials on the Application Site; and
- vehicles used to transport materials and aggregates will be enclosed.

Risks to controlled waters

11.77 Temporary vehicle parking and storage areas will be established with measures to prevent uncontrolled discharges to drains. The temporary drainage solution will be designed to incorporate interceptors and silt traps to prevent the discharge of any fuels, oils or silt to Controlled Waters. The temporary drainage system would be maintained regularly to ensure it remains functional.

11.78 The PF GA Report has recommended further groundwater sampling and analysis. The results of this analysis will then be assessed to establish if a risk to Controlled Waters is present.

11.79 Should a risk to Controlled Waters be confirmed (post further groundwater sampling and analysis), then a foundation works risk assessment may need to be undertaken to determine if any risks to Controlled Waters exist due to construction of foundations for the proposed development.

11.80 Measures to minimise the potential risk to Controlled Waters during the construction works will be included in a Construction Management Plan prepared for the Proposed Development. Measures will be likely to include:

- the provision of adequate drainage to manage surface water run-off and minimise contaminated water reaching surrounding surface waters;
- handling and storage of any potential hazard liquids / materials in accordance with NRW requirements;
- use of appropriately tanked and bunded areas for storage of fuels, oils and other chemicals; and
- procedures for the management of materials, spillage and spill clean-up and use of best practice construction methods and monitoring.

Geotechnical risks

11.81 In order to avoid the sides of excavations spalling, running or collapsing during construction, a safe system if work will be required. This may involve groundwater control measures such as dewatering, well pointing or sump pumping. The contractor may also need to employ excavation shoring methods such as trench sheets or trench boxes.

Operation

Potential risk to future site users from ground contamination

11.82 Services including potable water supply pipes would be selected and designed using the results of the ground investigations. Based on the current level of information barrier pipe has been recommended for water supply pipes in accordance with The UK Water Industry Research guidance.

Contamination to controlled waters

11.83 A Detailed Quantitate Risk Assessment (DQRA) for Controlled Waters may be required.

11.84 Car parking and hardstanding areas will be designed to prevent uncontrolled discharges to drains. The drainage system will be designed to incorporate interceptors, filters and silt traps to avoid the discharge of any fuels or oils that have entered the system into the underlying groundwater. The interceptor system should be regularly maintained to ensure it remains functional.

Risks to site users from ground gas

11.85 The limited ground gas risk would be mitigated by the construction of a cast in situ monolithic reinforced slab with minimum penetrations. This would provide the necessary 1.5 gas protection points to satisfy the requirements under BS 8485:2015 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, guidelines*.

11.86 It is also highlighted within the PF GA Report that the proposed development is designed to accept and process methane producing waste. In order to be compliant with Dangerous Substances and Explosive Atmospheres Regulations (DESEAR), the proposed scheme will have to be designed with appropriate gas control measures to mitigate the risks from methane, carbon dioxide and depleted oxygen.

Geotechnical risks

11.87 Two phases of ground investigation have been undertaken for the Application Site and another phase of development specific GI is programmed.

11.88 The combined GI information will enable the selection of an appropriate foundation solution and also inform other aspects of the engineering design of the scheme. The development specific investigation may also identify any other mitigation measures required, for example associated with any abnormal ground conditions which might be revealed.

RESIDUAL EFFECTS

11.89 Following the implementation of mitigation measures, the source-pathway receptor model has been re-applied to the previously identified Effects. Tables 11.6 and 11.7 summarise the effects, mitigation measures and residual effects during both construction and operational phases.

Table 11.6: Residual effects during the construction phase

Aspect	Identified Risks	Pre-Mitigation Effect Significance	Description of Mitigation Measure	Receptor Sensitivity	Residual Impact Magnitude	Residual Effects Significance
Effects to Human Health from Land Contamination	Health impacts upon construction workers	Major Adverse Effect. Short-term	Mitigation to be developed in line with published guidance and best practice. Appropriate PPE Safe systems of work	High	Negligible	Negligible
	Health impacts upon general public	Moderate Adverse Effect.	Mitigation to be developed in line with published guidance and best practice. Use of any dust suppression techniques Avoid stockpiling contaminated soils.	Medium	Negligible	Negligible
Effects to Controlled Waters from Land Contamination	Impacts from construction works	Minor Adverse Effect	Further groundwater sampling with appropriate modern analysis and assessment. Possible Controlled Waters DQRA Possible foundation works risk assessment	Medium	Minor Adverse	Minor Adverse Effect Risk may be reduced post groundwater sampling, analysis and assessment.
	Storage of chemicals, fuels and construction materials	Minor Adverse Effect	Apply appropriate working procedures such as: Handling and storage of any potential hazardous liquids / materials in accordance with NRW/EA requirements. Use of appropriately tanked and bunded areas for storage of fuels, oils and other chemicals	Medium	Negligible	Negligible
Geotechnical Risks	High ground water, risk of excavation collapse	Major Adverse Effect	Safe system of work. Groundwater control. Excavation support.	High	Negligible	Negligible

Table 11.7: Residual effects during the operation phase

Aspect	Identified Risk	Pre-Mitigation Effect Significance	Description of Mitigation Measure	Receptor Sensitivity	Residual Impact Magnitude	Residual Effects Significance
Effects to Human Health from Land Contamination	Risks to future site users	Moderate Adverse	Barrier pipe should be used for all water supply pipes.	High	Negligible	Negligible
Effects to Controlled Waters from Land Contamination	Risks to Controlled Waters from potentially contaminated groundwater within the Application Site area.	Minor Adverse	Further groundwater sampling with appropriate modern analysis and assessment. Possible Controlled Waters DQRA Possible foundation works risk assessment Mitigation to be developed in line with published guidance and best practice	Medium	Minor Adverse	Minor Adverse Effect Risk may be reduced post groundwater sampling, analysis and assessment.
Ground Gas Effects	Risks to future site users	Moderate Adverse	Cast in situ monolithic reinforced slab Intrinsic monitoring, ventilation and gas control measures within the structure	High	Negligible	Negligible
Geotechnical Risks	Risks to the Proposed Development	Major Adverse Long-term	Further development-specific ground investigation. Selection of an appropriate foundation solution.	High	Negligible	Negligible

Chapter Eleven

SECTION B: DRAINAGE AND FLOOD RISK

INTRODUCTION

11.90 Section B of chapter eleven of this ES addendum assesses the likely significant effects of the proposed development in terms of drainage and flood risk. This section follows on from the ground conditions and land contamination assessment which forms section A of chapter eleven. This drainage and flood risk section incorporates the findings of the following studies and reports:

- Flood Risk Assessment for Enviroparks Hirwaun Ltd. Report Issue 1, October 2008;
- Flood Consequence Assessment : Enviroparks Phase 2. Pell Frischmann Report No.RQ80023/PH2/R002. January 2017. (Presented in Appendix 11.3).
- Enviroparks Hirwaun Environmental Statement: Volume one, October 2008;
- Hirwaun Industrial Estate Development, Interpretive Report On Site investigation. Soil Mechanics Report No. H8076, January 2009;
- Geo-environmental Assessment, Phase 2 Development, Enviroparks Wales, Hirwaun. Pell Frischmann Report No. RQ80023G001.

11.91 This chapter describes the assessment methodology; the baseline conditions at the Application Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after the measures have been employed.

11.92 The following section will review national and local policy specific to drainage and flood risk.

POLICY CONTEXT

European policy

Water Framework Directive (2000)

11.93 The Water Framework Directive (WFD) (2000) ensures 'a framework for community action in the field of water policy'. The purpose of the Directive is to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It will ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' by 2015. The WFD was transposed into Welsh Law by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.

EU Floods Directive (2007)

11.94 The EU Floods Directive (2007) aims to provide a consistent approach to flood risk management across of Europe and is implemented in the UK through the Flood Risk Regulations (2009). The EU Flood Directive requires that:

- Preliminary Flood Risk Assessments published by December 2011
- maps showing flood risks by December 2013
- plans for managing flood risks by December 2015

Groundwater Directive dangerous substances (consolidated) (1979)

11.95 The Groundwater Directive (GD) aims to protect groundwater from pollution by controlling discharges and disposals of certain dangerous substances to groundwater. In the UK, the GD is implemented through the Environmental Permitting Regulations (EPR) 2010.

11.96 NRW protects groundwater under the EPR by preventing or limiting the inputs of polluting substances into groundwater. Substances controlled under the regulations fall into two categories:

- *Hazardous substances* – These are the most toxic and must be prevented from entering groundwater. Substances in this list may be disposed of to the ground under a permit but must not reach groundwater. Hazardous substances replace the ‘List 1’ substances which came under the 1998 Groundwater Regulations.
- *Non-hazardous substances* – These are less dangerous and can be discharged to groundwater under a permit, but must not cause pollution. Non-hazardous pollutants include any substance capable of causing pollution and the list is much wider than the previous ‘List 2’ substances.

Groundwater Daughter Directive to WFD (2006)

11.97 This Directive is designed to prevent and combat groundwater pollution and deterioration. Its provisions include:

- criteria for assessing the chemical status of groundwater;
- criteria for identifying significant and sustained upward trends in groundwater pollution levels, and for defining starting points for reversing these trends;
- preventing and limiting indirect discharges (after percolation through soil or subsoil) of pollutants into groundwater.

UK Law

Flood Risk Regulations (2009)

11.98 The EU Floods Directive (2009) is transposed into English law through the Flood Risk Regulations (2009) which complement the Flood and Water Management Act (2010). The EU Floods Directive (2009) aims to provide a consistent approach to flood risk management across all of Europe. Under the Flood Risk Regulations (2009), NRW and Local Planning Authorities, have to publish preliminary flood risk assessments (PFRAs) by December 2011.

Contaminated Land Statutory Guidance - 2012

11.99 Part 2A of the EPA (1990) is currently administered by The Contaminated Land Statutory Guidance 2012 - WG19243. The statutory guidance describes a risk assessment methodology in terms of the identification of 'significant pollutants' and 'significant pollutant linkages', within a source-pathway-receptor conceptual model.

11.100 Local Planning Authorities Local Planning Authorities (LPAs) rely on the advice of NRW in relation to environmental matters, in particular in their approach to the assessment of pollution of 'Controlled Waters'.

Flood and Water Management Act 2010

11.101 The Flood and Water Management Act 2010 complements the Flood Risk Regulation (2009) and ensures a framework to:

- provides for better, more comprehensive management of flood risk
- helps safeguard community groups from unaffordable rises in surface water drainage charges
- protects water supplies to the customer

National Planning Policy

Planning Policy Wales (2016)

11.102 Specifically relating to drainage and flood risk is Chapter 13 of the National Planning Policy Edition 9, November 2016, Minimising and Managing Environmental Risks and Pollution, which states the objectives of the Welsh Government are to:

- sustainable development requires action through the planning system to ensure that new developments avoid areas defined as being of flood hazard;
- local planning authorities should take strategic approach to flood risk and consider catchments as a whole and ensure that new development is not exposed unnecessarily to flooding;

11.103 In preparing development plans the local planning authorities must ensure that:

- in areas of flood plan currently unobstructed, where water flows in times of flood, built development should be wholly exceptional and limited to essential transport and utility infrastructure;
- Developers and planning authorities should seek advice from NRW who have a key role in terms of understanding causes and effects of flooding within a river catchment;
- Developers recognise Planning Policy Wales (2016) as a framework, and should consult supporting advisory notes such as Technical Advice Note 15.

Technical Advice Note 15 (2004)

11.104 Specifically relating to drainage and flood risk, the Technical Advice Note (TAN) 15: Development and Flood Risk, highlights the need for the planning system to contribute to and enhance the natural and local environment. TAN 15 provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding.

- ‘And provides a framework within which risks arising from both river and coastal flooding and from additional runoff from development in any location, can be assessed’;
- This framework can then draw upon supporting information such as the Development Advance Maps and subsequent advisory guidance set down by Welsh Government; refer to the following two points below:

Update of TAN 15 Development Advice Maps and approval of shoreline management plans (2015)

11.105 Welsh Government’s supplementary guidance on TAN 15 is provided in an update to Development Advice Maps dated March 2015. The updated Development Advice Maps shall be used alongside the Planning Policy Wales and Technical Advice Note 15 in assessing development sites. The updated Development Advice Maps indicate the latest information regarding flood outlines within Wales.

Guidance on climate change allowances for planning purposes (2016)

11.106 Welsh Government’s supplementary guidance referenced CL-03-16, a further advisory note dated August 2016 to TAN 15, sets out revised allowances for climate change for use in Flood Consequence Assessments (FCAs). Flooding is a serious risk to the people, economy and environment in Wales and climate change is expected to increase this risk. This supplementary guidance sets out recommended climate change provision in respects of three river basin district boundaries identified as ‘Western Wales’, ‘Severn’ and ‘Dee’. The drainage catchment for the Enviroparks site falls within the Western Wales river basin district.

Local policy

Strategic Flood Risk Assessment September (2011)

11.107 The Brecon Beacons National Park Authority's (BBNPA) Strategic Flood Risk Assessment (2011) states that:

'With the Environment Agency surface water data and the Welsh Government's Development Advice Map flood data (Zones C1 and C2), maps were created for all defined settlements so as to provide a consideration of flooding impacts. Sites or part of sites, that fell within a Zone C2 Flood Risk area, were ruled out from further consideration. Allocations have been flagged where the flood risk of surface water flooding requires mitigation through the use of Sustainable Drainage systems (SuDS).'

The Welsh Government's Development Advice Maps demonstrate however that the Enviroparks site is located within flood outline Zone A or B and not Zones C1 or C2.

Flood Risk Management Plan November (2015)

11.108 The Rhondda Cynon Taf- County Borough Council (RCTCBC) Local Flood Risk Management Strategy Summary (2011) includes the following objectives:

- To utilise a risk based approach to managing flood risk, recognising that drainage and structural defences may not always be the most appropriate solution;
- To develop greater strategic understanding of flood risk from all sources within RCTCBC and at a wider 'catchment scale';
- Use of local planning policy to ensure that no new flood risk is created and where possible, opportunities to reduce flood risk are taken.

Rhondda Cynon Taf Local Development Plan up to 2021 (2011)

11.109 The RCTCBC's 'Rhondda Cynon Taf Local Development Plan up to 2021' adopted March 2011 states that the development area within their boundary measures 4.17ha and there are no existing flooding issues. Furthermore permitted waste management processes shall be in-building only to minimise visual and ecological impact.

Brecon Beacons National Park Local Development Plan 2007-2022 (2013)

11.110 The BBNPA's adopted Brecon Beacons National Park Local Development Plan for 2007-2022 adopted December 2013 states that the development area within their boundary measures 5ha. Furthermore it is stated that 'the vacant part of the site within the National Park boundary is allocated as employment in order to ensure that the use remains consistent over the boundary'.

11.111 This drainage and flood risk section examines the potential effects of the proposed development on local water resources and flood risk. A desk study assessment of the potential influences of the proposed development was undertaken to consider the likely effects upon water resources throughout the phasing of the development and ongoing operation of the Enviroparks site.

11.112 To support this analysis, a Flood Consequence Assessment (FCA) 'Enviroparks Phase 2' and dated January 2017 has been undertaken by Pell Frischmann to establish the potential impact on downstream watercourses given the proposed development, and to determine the flood attenuation measures and associated surface water strategy including preliminary drainage proposals. This 2017 FCA is presented as an appendix to this chapter (Appendix 11.3), but the results of the study are also summarised throughout this section B of chapter eleven. The FCA has been prepared in line with the requirements of the Welsh Government's Technical Advice Note (TAN) 15: Development and Flood Risk (1). The overall aim of the FCA is to ensure that appropriate consideration is given to flooding issues by applying a precautionary approach.

11.113 In preparation for Enviroparks' Phase 1 development an earlier Flood Risk Assessment for Enviroparks Hirwaun Limited (Report Issue 1) dated October 2008 informed the initial Environmental Statement dated October 2008. This Flood Risk Assessment remains relevant and will form the basis for the ongoing surface water strategy and flood management for the Enviroparks site. However, the Enviroparks Phase 2 FCA will also seek to recognise the latest advisory notes, associated regulations and also works completed in the Enviroparks Phase 1 development.

11.114 Once the current baseline of water quality and flood risk has been described, the potential impact of the development as a whole will be considered. This will include assessment of the effects of the development itself and on downstream receptors of flood waters.

11.115 To evaluate the potential impacts on the site and determine whether or not there are any residual effects which should be considered, the following matrices have been applied:

Table 11.8: Significance matrix for Inherent Flood Risk from the Proposed Development

Significance	Description
High	Significant flood potential at the site
Medium	Flooding likely at the site
Low	Some evidence of historical flooding at the site
Negligible	No risk of flooding at the site

Table 11.9: Significance matrix for the Assessment of Water Movement and Water Quality from the proposed development

Positive	Significance	Description of Impact
Negative	High	A significant deterioration in the water or drainage quality of resource on/around the site and/or a significant potential to increase flood risk down gradient of the site.
Negative	Medium	A moderate deterioration in the water or drainage quality of resource on/around the site and/or a moderate potential to increase flood risk down gradient of the site.
Negative	Low	A small deterioration in the water or drainage quality of resource on/around the site and/or some potential to increase flood risk down gradient of the site.
Either	Negligible	Minimal modification to the flow or quality of water around the site.
Positive	Low	A small improvement in the water or drainage quality of resource on/around the site and/or some potential to reduce the risk of flooding down gradient of the site.
Positive	Medium	A moderate improvement in the water or drainage quality of resource on/around the site and/or a moderate potential to reduce the risk of flooding down gradient of the site.

11.116 The proposed mitigation measures will be described with consideration to any additional requirements identified by any potential significant adverse effects likely to be caused.

11.117 The relationship between the mitigation measures now proposed and the works already completed under Enviroparks Phase 1 will also be explained.

11.118 Finally, any residual risk will be detailed and suitable management plan adopted to ensure that these are managed appropriately.

BASELINE CONDITIONS

11.119 This section considers the baseline water resources and water quality conditions of the development site and the existing flood risk conditions.

Location

11.120 The Location of the site is described in chapter two of the 2008 Enviroparks ES, with an update provided in chapter two of this ES addendum.

Phase 1 consents and permissions

11.121 Under Enviroparks Phase 1 a large amount of roads, hardstandings and drainage were constructed for the site. This advanced infrastructure included works interfacing with Dwr Cymru Welsh Water (DCWW) apparatus, namely the foul water sewers along the southern boundary of the site.

11.122 In March 2016 DCWW consented a single trade effluent discharge pursuant to Section 204 of the Water Industry Act (1991). The Trade Effluent Consent (reference TE692) stipulates a maximum 4m³ volume per day at a maximum rate of two litres per second. The full chemical properties of the consent are set out under the second schedule of Consent TE692 (Appendix 11.4). The consent does not apply to the whole site because the consented discharge relates to the 150mm diameter foul water sewer only serving the west side of the Fuel Preparation Hall. The primary flows constituting the consented discharge to be generated by a future wash down facility adjacent the Fuel Preparation Hall with the corresponding consent point located on a downstream manhole owned by DCWW located on the public 300mm diameter foul water sewer adjacent Fifth Avenue. The connection itself (to the public manhole) was authorised by DCWW and constructed in accordance with S106 of the Water Industry Act (1991).

11.123 In addition to the trade effluent consent, a further three foul water connections were made to the downstream DCWW owned foul water sewers under S106 of the Water Industry Act (1991). These three connections were authorised by DCWW and constructed in accordance with S106 to serve the onsite foul water network for the whole Enviroparks site. The associated foul sewer systems are not presently assigned a prescribed flow other than to collect domestic foul flows from welfare facilities. There is a single 225mm diameter foul water sewer connection to the public 300mm diameter foul water sewer in the south west corner of the site and a further two connections (150mm and 225mm diameter) to the existing 225mm diameter foul water sewer running parallel to Ninth Avenue which is considered to be public pursuant to the Private Sewer Transfer Regulations (2011). As indicated above, these foul water sewers are not presently assigned to carry trade effluent discharge however this may be considered as part of Phase 2 detailed design proposals or future phases.

Water resources and water quality

11.124 Hirwaun is located in the Cynon Valley thus approximately 20 km from the nearest coastal waters (to the south-west). Water features are numerous in the area in the form of brooks, rivers, reservoirs and ponds. The site is located over Lower Coal Measures and this is classified as a minor aquifer. Above the Lower Coal Measures are Glacial Till stratum with intermittent areas of Alluvium. The Glacial Till is described as clayey gravel and overall the soils provide a moderately impervious layer, ensuring some protection of the minor aquifer. The resulting likely prevention of downward migratory movement by groundwater promotes its lateral movement and could increase the risk of water or pollution flowing off site or to the local surface waters.

11.125 The principal sensitive ecological features in the area are described in Table 11.12 of chapter eleven of the 2008 ES; the nearest Designated Site to the proposed Enviroparks development is located within 500m to the east.

Ground water

11.126 Based on the 2008 Enviroparks ES all identified groundwater abstraction points are located either to the north, north east or directly to the east; the full licence holder details are identified within Table 11.11 of chapter eleven of the 2008 ES. A surface water abstraction point is identified near the Enviroparks site, however this upstream of the site and directly to the north located at the Penderyn Reservoir. This is a source of potable water and is operated by Dwr Cymru Welsh Water.

11.127 The borehole data available within the 2009 Soil Mechanics' Geotechnical Interpretative Report indicate the groundwater levels to be ranging from 0.1m to 2.13m below ground level. A subsequent 2013 Supplementary Geotechnical Report by Quantum Geotechnical considers groundwater levels to be '*subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions or other causes*'.

11.128 The water table in the Enviroparks Phase 2 development area is considered to be sub-artesian in nature in other words rising naturally sometimes above the surrounding water table. In terms of the final Enviroparks development solution, the majority of the site would be ultimately paved, and therefore the associated flood risk from groundwater is considered to be limited.

Surface water

11.129 Hirwaun is located within the Cynon Valley, and the River Cynon passes through the town heading in an easterly direction. However, the Hirwaun Industrial Estate is located on the boundary of two main river catchments; the River Cynon to the east and the River Neath to the west. A stream on the western boundary of the Enviroparks site flows into the river Camnant south of Fifth Avenue. At the confluence, further downstream and south of the A465, of the Nant Wyrfa and Camnant, the Sychryd drains to the north and discharges into the Afon Mellte, a tributary of the River Neath. Based on this the surface water runoff from the Enviroparks site will flow to the Ogmore to Tawe Catchment.

11.130 A section of an existing 225mm diameter surface water sewer runs adjacent to Ninth Avenue within the Enviroparks site, but presently does not affect any development proposals. It shall remain in place and will not be diverted. It is assumed to outfall into the culverted ditchcourse on the southern side of Fifth Avenue and flow towards the Sychryd.

11.131 Private surface water sewers have been constructed as part of Enviroparks Phase 1. These were designed and built to adoptable standards. These drainage works were completed in April 2016. This drainage serves the newly constructed Fuel Preparation Hall building (formerly referred to as the material recovery facility within Enviroparks Phase 1), associated forecourt, access roads and also areas where future development is planned. A number of bypass separators are included within the surface water drainage network, providing the means to intercept hydrocarbons and detritus thus improving the water quality. These surface water flows are piped to the swale and balancing pond arrangement to the southern boundary of the Enviroparks site. Managed surface water flows are then discharged to the stream located adjacent to the western boundary of the site, which flows downstream into the river Camnant.

11.132 The proposed Enviroparks Phase 2 flood risk mitigation measures and associated surface water drainage will be integrated with the existing Enviroparks Phase 1 surface water drainage network completed in April 2016. The Enviroparks Phase 2 proposals will need to provide means to

militate against the increase in surface water runoff from the increased area of impermeability from roofs and hardstandings. This increase shall necessitate enhancements to the existing swale and balancing pond arrangement. At present, due to the location of an existing 300mm diameter foul water sewer located along the southern boundary of the Application Site, the Enviroparks Phase 1 development delivered a reduced swale and balancing pond arrangement and resulting storage provision.

Wastewater

11.133 The existing 300mm diameter foul water sewer running parallel and slightly to the north of Fifth Avenue will require diverting to within the adjacent public highway in order to fully develop the SuDS. This diversion will enable the provision of a wider and larger swale, thus providing greater surface water storage volume on site.

11.134 Private foul water sewers have been constructed as part of Enviroparks Phase 1; these were designed and built to adoptable standards. This drainage serves the existing Fuel Preparation Hall and other developed areas of the site.

In March 2016 and under Enviroparks Phase 1 a trade effluent discharge has been consented by Dwr Cymru Welsh Water; pursuant to Section 204 of the Water Industry Act 1991. The Trade Effluent Consent (reference TE692) stipulates a maximum 4m³ volume per day at a maximum rate of two litres per second. The full chemical properties of the consent are set out under the second schedule of Consent TE692. A copy of the consent, which seeks to address flows from a combination of conventional foul waste, wash-down facilities and other likely industrial activities at the site, is provided in Appendix 11.4. In addition to Total Suspended Solids and Biological Oxygen Demand attributes, the consent TE692 also includes Anionic Detergent, Total Sulphide and Total Phosphate with permissible levels presently set at 100.0, 1.0 and 5.0 milligrams per litre. Alternative arrangements may be considered under Enviroparks Phase 2 or future phases whereby EWL treats wastewater using appropriate technologies prior to discharge in order to minimise the loading on downstream public foul water apparatus. Anecdotal evidence from Dwr Cymru Welsh Water suggests the downstream wastewater treatment works is nearing capacity.

Flood Risk

11.135 Consideration has been given to the natural aspects of the area that might affect the water resources or contribute to flooding, through the provision of a 2017 Flood Consequence Assessment (Appendix 11.3).

11.136 This chapter seeks to explain the relationship between the Enviroparks Phase 1 and proposed Phase 2 developments in respect of the surface water strategy and associated flood risk mitigation measures. This Flood Consequence Assessment will form an update to the existing surface water strategy set out within the original Flood Risk Assessment (dated 2008) completed as part of the Enviroparks Phase 1 planning permission. The full Enviroparks development shall require the conversion of about 77% of the approximately 8.5 hectare site to impermeable areas (i.e. roads, hardstandings or roofs). The full Enviroparks development constitutes the completion of all phases, nevertheless there is likely to be reduced risk to downstream receptors of flood waters. This is achieved by the proposed collection and storage of large quantities of surface water runoff, and the controlled discharge of surface water from the Enviroparks site. The overall risk of flooding at the site is believed to be less than 0.1%. Key elements of the strategy are explained below.

11.137 The surface water flows from the Enviroparks development will discharge via an existing outfall adjacent to the stream running along the western boundary of the site. This outfall structure, constructed as part of Enviroparks Phase 1, will be maintained and will restrict the development surface water flows to the agreed greenfield rate based upon the final level of development hardstandings and roofs (impermeability). Modelling of the surface water network to determine indicative attenuation storage requirements for the full Enviroparks development are based upon a 1 in 100 year return period plus 30 % allowance for climate change. This allowance is pursuant to Planning Policy Wales' supplementary guidance on TAN 15, which sets out climate change allowances for FCAs: 'Table 1 : Total potential change anticipated by the 2080s'. As stated previously the Enviroparks site drainage which is east flowing to the Ogmere to Tawe Catchment is within the Western Wales river basin district.

PREDICTION OF POTENTIAL IMPACTS

11.138 This section describes the proposed development and its potential significant effects on water resources, their quality and the potential for flooding at and around the site.

Water resources and water quality

11.139 The proposed development includes a combination of tarmacadam or concrete hardstandings, roofs and landscaped areas with swales and balancing ponds. Approximately 6.5 hectares of the site will be impermeable. The surface water runoff generated from these impermeable areas will be collected and stored on site, and the resulting controlled discharge and balancing of flows will result in reduced downstream risk to receptors of flood waters. Moreover, with the construction of roofs and hardstandings, less of the permeable ground will be absorbing water and therefore contributing to the ground water levels, reducing the risk of saturation to the ground.

11.140 The positive surface water drainage system constructed under Enviroparks Phase 1 and completed in April 2016 provides the primary outfall locations for this system. An existing outfall constructed for Enviroparks Phase 1 discharges to the existing stream running along the western boundary of the site which flows in turn into the river Camnant. This will be maintained and will restrict the development surface water flows to the agreed greenfield rate based upon the final level of development hardstandings and roofs.

11.141 Attenuation storage requirements are based upon a 1 in 100 year return period plus a greater allowance for climate change of 30%, in line with Planning Policy Wales' supplementary guidance on TAN 15, which sets out climate change allowances for FCAs up to 2080s. The use of infiltration systems within the SuDS which form part of the flood risk mitigation is not deemed to be feasible due to the varying ground conditions and high water table. The collected surface water will be stored and discharged at a controlled rate which has been agreed with the Environment Agency prior to NRW taking over the responsibility for protecting of rivers and coastline. Details of the agreed greenfield discharge rate and October 2012 correspondence from the Environment Agency are contained within the 2017 Flood Consequence Assessment within Appendix 11.3 of the ES addendum.

11.142 The final methods of storage will be determined through the detailed design and will be integrated with storage apparatus already constructed under Enviroparks Phase 1. It is expected that

approximately 2,420m³ of storage will be required to accommodate the controlled discharge for full Enviroparks development (i.e. all phases), supplementing the storage already provided within the piped system constructed under Enviroparks Phase 1. The primary means of storage is achieved through the enhanced swale and balancing pond feature on the Fifth Avenue frontage of the Enviroparks site. This SuDS feature will be confined to a gentle gradient given the natural topography and set within the large landscaped area located at the low part of the site.

11.143 It is anticipated that the development of the full Enviroparks site will proceed under three phases. The management of surface water overall is thus dependent on phasing characteristics. As part of the Enviroparks Phase 2 proposals it is expected that approximately 1,900m³ of surface water storage will be required in accordance with the modelling set out within the 2017 Flood Consequence Assessment. The majority of this surface water storage shall be provided within the enhanced swale and balancing pond arrangement located within the landscaped area along the southern boundary of the site. This volume excludes supplementary storage that may be contained within existing oversized pipework constructed in Phase 1. And in a future phase the additional circa 500m³ balance shall be provided.

11.144 Despite the conversion of approximately 6.5 hectares of the site to buildings and hardstandings, the measures proposed will benefit the site and wider area. The positioning of the swale and balancing pond to the southern boundary of the site which is topographically lower shall assist by intercepting any groundwater flows or errant surface water runoff thus mitigate potential water logging of the site.

11.145 Domestic effluent and potentially trade effluent, as part of the Enviroparks Phase 2 proposal will be sent to the local wastewater treatment works and thereon after, following treatment, will re-join the river Camnant downstream of the wastewater treatment works. Domestic effluent in this context is considered foul waste derived from welfare facilities only.

11.146 In the absence of mitigation and safeguards, water flow or water quality could be affected by:

Wastewater discharges to the controlled waters or sewers

Modification of flows and increased potential of pollution from discharges

Accidental release of other harmful substances

Pollution to ground or surface waters through accidental release

11.147 It is acknowledged that the Enviroparks site will require a mains water supply and plan to discharge effluent into the nearby public wastewater treatment works off Fifth Avenue. Approvals have been granted by Dwr Cymru Welsh Water under the completed Enviroparks Phase 1 for the four connections to the public foul water sewer network located off Fifth and Ninth Avenue. These sewer connection approvals were obtained for the Enviroparks Phase 1 works; along with the trade effluent consent TE692. These are all in accordance with the requirements set out under the Water Industry Act (1991). However, EWL will seek to extend the current consent to accommodate their requirements under Phase 2 of the scheme.

11.148 The current Abstraction Licence holders in the area are all located either to the north, north east or east of the Enviroparks site. The controlled discharge of surface water is, on the other hand, directed to the upper reaches of the river Camnant which heads to the west; forming part of the

Upper Neath River catchment. Moreover as groundwater is moving in a south westerly direction, any potential impact on groundwater caused by accidental pollution from the site would not affect these abstraction points. The current list of Abstraction Licence holders is derived from Table 11.11 within the 2008 Enviroparks ES.

11.149 Key sensitive features within 2km of the proposed development site are listed in Chapter 11, Table 11.12 of the Enviroparks Hirwaun Environmental Statement (2008). The Designated Sites located within 2km of the site are all located to the north and east of the site. The nearest identified Dedicated Site is Cors Bryn-y-Gaer lowland bog, located approximately 500m to the east of the Enviroparks development site. Given the direction of any groundwater flows will follow the natural topography of the site which is to the south-west corner, towards the existing stream and away from the above stated Dedicated Site, any effect on the groundwater beneath the site is unlikely to have an impact on this or any other Designated Sites in the vicinity of the development.

Construction effects

11.150 Due to the close relationship between the Enviroparks site and the nearby upper reaches of the Camnant, the potential impacts to the water environment during construction phase have the potential to be significant.

11.151 The primary potential impacts are related to:

- site drainage and the potential to silt surface waters;
- delivery and storage of construction materials;
- storage and handling of materials/oils/chemicals, including material preparation (concrete) and refuelling of plant and vehicles;
- contamination of groundwater and geological strata during piling and excavation;
- other temporary dewatering or general water management process during construction;
- site staff rest and welfare facilities.

11.152 During construction the associated risks likely to be experienced will either be in a controlled environment during excavation or piling when dewatering will be required. Risks might also arise in areas where no positive drainage system is in place, where uncontrolled waters in the form of surface water runoff or groundwater might arise. Sudden rainfall events can mobilise silt and material within the site and if not controlled these could be conveyed to the local surface waters. Some of the earliest activities on site will thus involve the protection of the local watercourses these are covered within the mitigation sector.

Wastewater

11.153 Site water will be controlled in a number of ways. Roof water runoff will be captured and stored in holding tanks and either discharged at a controlled rate or re-used around the site, in processes and washroom facilities. Runoff from hardstandings will pass through appropriate interceptors or reed bed systems and into the swale or balancing ponds forming the sustainable urban drainage system. Should the roof water holding tanks reach full capacity, they will overflow to the swale or balancing ponds. This system will contain clean and treated surface water runoff which will be discharged in a controlled manner to the upper reaches of the river Camnant. If required this water resource maybe utilised as process water across the site.

11.154 Industrial and domestic wastewater derived from activities within the Enviroparks site will pass directly to the public foul water sewer. In terms of industrial wastewater a consented outfall has been constructed under Enviroparks Phase 1 referenced TE692. This is a single DCWW consented trade effluent discharge pursuant to Section 204 of the Water Industry Act (1991).

Accidental release

11.155 As an operational industrial facility which and treats incoming waste material in order to generate energy, the Enviroparks site at Hirwaun Industrial Estate has the potential to affect ground and surface water quality through accidental release of polluting materials to land or directly to watercourses.

11.156 A 'Source, Pathway, Receptor' summary is presented in Table 11.10 below. This table summarises the predicted residual effects of the proposed development on the flow and effect of water following the implantation of mitigation measures under the Enviroparks Phase 2 proposals.

Table 11.10: Impacts of Proposed Development on Water Resources and Quality and Flood Potential

Aspect	Current Pathway	Current Receptor	Modifications and Mitigation	Likely pathway	Likely receptors	Increase or reduction in impact
Groundwater	There are areas of the site that are developed under Enviroparks Phase 1 however parts remain without impermeable area or hardstanding. Within these pockets site drainage remains limited.	In areas of uncontrolled ground water movement, where site drainage is limited, there is a risk of inundation during periods of heavy rainfall overspilling to downstream areas.	The downstream areas now contain the swale system constructed under Enviroparks Phase 1; further infrastructure to be constructed under Phase 2 is located to the south west which includes increasing the swale capacity. Potential overland flows from groundwater or pluvial sources will be intercepted by this swale system thus preventing silt entering the receptor.	Pathway is typically in a south westerly direction. However the swale is at the southern boundary of the site.	Receptors remain unchanged. But the site has a greater level of impermeable surfacing and a well-constructed drainage system.	The likelihood of flooding either at the site or at the local receptors from groundwater sources is greatly reduced now that development of the site has commenced.
Stream to the west	The stream receives overland flows and drainage from French drains associated with the reservoir.	The stream flows to the Camnant.	The stream accepts flows from the newly constructed swale system under Enviroparks Phase 1 plus limited flows from overland flows from the northern part of the site. As part of Phase 2, the swale will be increased in capacity. A penstock is also available at the downstream end, in the event that a critical event occurs this can be closed.	The proposed Enviroparks site will have approximately 6.5ha impermeable area and a gross area of 8.5ha. The permitted discharge is based upon a greenfield rate of 17.8l/sec/ha based upon 1 in 1 year return period. The discharge to receptors is via the swale system.	The River Camnant remains a receptor for the stream. But attenuation by way of the swale and balancing pond; the restricted discharge based upon greenfield rates results in reduced flows to receptors.	Creation of SuDS by way of swales and balancing ponds and possible underground storage will reduce the flow to the downstream receptor. There is also a control penstock which can isolate flows to the downstream receptor in an emergency. As part of Phase 2, the existing swale will be increased in capacity.

Aspect	Current Pathway	Current Receptor	Modifications and Mitigation	Likely pathway	Likely receptors	Increase or reduction in impact
Penderyn Reservoir	Penderyn reservoir is subject to minimal impact.	Penderyn reservoir supplies the Hirwaun Water Treatment Works which will supply the site with potable water. French drains serve the reservoir; these discharge to the stream.	None.	No change.	No change.	No change in impact.
River Camnant	The River Camnant receives flows from the stream to the western boundary of the site and also treated water from the Hirwaun STW.	The River Camnant flows to the River Sychryd.	With the construction of Enviroparks Phase 1 and subsequent Phase 2 works, surface water runoff water will be intercepted by drainage serving hardstandings and roofs. These flows will be diverted from the stream which flows to the Camnant, reducing the flows from the source. However diverted surface water flows outfalling to the swale system will discharge at a controlled rate at a greenfield rate of 17.8l/sec/ha. This rate is based on a 1 in 1 year return period.	The surface water runoff from the site flows via underground pipe drainage, through the swale system outfalling to the stream to the west of the site. River Camnant will receive flows from the stream which will not be greater than existing. Treated effluent will be discharged from the Hirwaun STW to the Camnant according to the DCWW consent.	There are no change to receptors.	There shall be a reduction in surface water runoff flows given the provision under Phase 1 of the controlled outfall to the south west corner. Greenfield rates of 17.8l/sec/ha according to 1 in 1 year rainfall events ensures a reduction in overall flood waters downstream. There is a potential for marginal increase of foul water flows directed to the Hirwaun STW from the development once fully operational; these flows will be treated and discharged to the Camnant according to the DCWW consent.

Aspect	Current Pathway	Current Receptor	Modifications and Mitigation	Likely pathway	Likely receptors	Increase or reduction in impact
Rainfall	Rainfall across the site is partly intercepted by the newly constructed infrastructure (roads, roofs and drainage) and in areas where future development will occur runoff will occur in an uncontrolled manner. The vast majority of the site will drain to the swale and balancing pond arrangement to the south boundary. A limited runoff may enter the stream to the west via drainage channels.	Limited groundwater will enter the stream and River Camnant. Likewise a restricted flow will the stream via a control structure to the south west corner.	The final state of the site is approximately 77% impermeable; this equates to about 6.5ha. Runoff from the hardstandings and roofs will be intercepted and stored primarily within the swale and balancing pond to the southern boundary. As part of Phase 2, the swale will be increased in size; further underground storage will provide attenuation where landscaping is limited. And these may be used to store recycled rainwater water for re-use within processes of the site. The site will be required to discharge surface water at greenfield rates to the stream to the western boundary.	Pathway of rainfall from landscaped areas remains unchanged. Pathway of rainfall from hardstandings and roofs is diverted to storage areas comprising swales, balancing ponds and underground storage tanks. The swale and balancing pond constructed at a gentle gradient allows for settlement of silts; during periods of construction when silts increase due to excessive construction traffic, the control penstock may be closed.	Receptors remain unchanged. The amount of rainwater contributing to groundwater has reduced following construction of Enviroparks Phase 1 works. With completion of Phase 2 including the enlargement to the swale system. The overall groundwater over the site will decrease when	Discharges to the groundwater and stream to the west will reduce thereby reducing likelihood of flooding. Discharge will be uncontaminated rainwater. Overall flow to the Camnant should not increase given that the restricted discharge is based on a 17.8l/sec/ha determined from 1 in 1 year events. There should be a marginal reduction of flooding potential to the downstream River Camnant.
Construction	None	None	Construction activities can impact on watercourse directly or through groundwater. A site management plan will be implemented. Mitigation measures will include the use of bunding, temporary filtration systems, emergency response equipment and use of control penstock at outfall.	Release to the stream or to permeable ground – this can be exacerbated through piling or excavations.	The stream and River Camnant and downstream River Sychryd or the groundwater and minor aquifer.	The potential impact from the construction process increases however comprehensive control measures will be implemented to minimise risk of pollution (primarily groundwater/silt). Local surface waters will be inspected regularly.

Aspect	Current Pathway	Current Receptor	Modifications and Mitigation	Likely pathway	Likely receptors	Increase or reduction in impact
Site Effluent/water	None	None	Phase 2 works may make provision for onsite storage of recycled surface water runoff intercepted by building roofs.	Any water stored within underground tanks providing the recycled surface water will require an overflow to the swale system.	Discharge to the stream to the west boundary is via the enlarged swale system constructed under Phase 2.	Under Phase 2 works treatment of onsite recycled surface water is dependent upon the final design process. Storage and treatment shall comply with current regulations. There shall be no change to the potential impact.
Wastewater	None	None	The Phase 1 development provides for a trade effluent consent discharge to the DCWW dia300mm foul water sewer. The domestic type foul water is discharged to the dia300 sewer at two different locations constructed under Phase 1.	All foul flows will drain southwards to the DCWW dia300 foul water sewer. There are three outfall locations permitted by DCWW. The dia300 sewer will drain west to the nearby Hirwaun STW.	The foul flows (trade effluent or domestic) discharged to the DCWW dia300 sewer will outfall to the Hirwaun STW which will be treated and discharged to the River Camnant.	Discharge of trade effluent will be to the prescribed DCWW consent TE692. There shall be no change to the potential impact.
Accidental Release	None	None	Site process and storage areas to consist of impermeable hardstanding. Secondary containment measures provided at cortical locations and spills managed immediately. In an emergency isolation of site drainage by use of penstock on surface water outfall.	None	None	Potential for an accidental impact is presently low considering the site is not operational. During the construction of the Phase 2 works the potential for accidental release increases and the contractor shall adopt suitable management systems for control, in accordance with regulations and best guidance.

MITIGATION

11.157 Mitigation measures with respect to previously highlighted risks for the Application Site and Proposed Development have been segregated into effects that relate to the construction phase and the operational phase.

11.158 During the construction the of Enviroparks Phase 2, precautions considered to mitigate the risk of flooding or contamination of downstream receptors include:

- provision of impermeable hardstandings delivered as part of Enviroparks Phase 1 in operational areas, positively drained with inclusion of trapped gullies or appropriate interceptor as required, whilst retaining landscaping in non-operational areas;
- provision of adequate storage (provided as part of the full Enviroparks development) for surface water runoff which will serve both runoff from building roofs and development hardstandings; the storage will be formed primarily of the swale and balancing pond arrangement along the southern boundary of the Enviroparks site;
- recirculation of groundwater during excavation or similar activities to naturally filter using either percolation through subsoils or naturally occurring flora within the Enviroparks site prior to discharge to the swale and balancing pond arrangement;
- during the construction of Enviroparks Phase 2 or future phases, EWL will seek Dwr Cymru Welsh Water's approval for temporary discharge occurring from dewatering or other activities, possibly requiring a connection to the public foul water sewer;
- utilisation of secondary containment methods either by way of temporary earth bunds, the installed penstock located at the existing outfall point at south west corner or existing oil interceptors installed under Phase 1;
- a regular visual assessment of the adjacent stream along the western boundary and the river Camnant will be undertaken; emergency equipment such as booms will be maintained on site for use as required.

11.159 At the operational stage of Enviroparks Phase 2, precautions considered to mitigate the risk of flooding or contamination of downstream receptors include:

- provision of impermeable hardstandings through implementation of Enviroparks Phases 1 and 2 in operational areas, positively drained with inclusion of trapped gullies or appropriate interceptor as required, whilst retaining landscaping in non-operational areas;
- provision of adequate storage for surface water runoff primarily within the swale and balancing pond which will serve both building roofs and development hardstandings and ensure a controlled discharge to the stream at the southern boundary of the Enviroparks site;

- the Enviroparks site works will endeavour to always meet the limits of discharge placed on it by Dwr Cymru Welsh Water thereby ensuring that the proposed Enviroparks development will have no negative impact on the river Camnant during normal operating conditions;
- use of abatement techniques including trapped gullies, oil interceptors or stilling basins to clean dirty runoff water prior to entering the swale and balancing pond arrangement;
- provision of suitable surface water runoff isolation methods such as penstock controls thus isolating flows through the surface water drainage network prior to entering the stream to the south west boundary of the site;
- management system shall be in place to manage spillages effectively, being contained and cleared away promptly, and the structural integrity of the hardstandings will be inspected to ensure any potential damage is identified at an early stage;
- waste materials shall only be handled within an area considered to be impermeable and strictly controlled in accordance with environmental legislation;
- regular visual assessment of the adjacent stream along the western boundary and the river Camnant will be undertaken; emergency equipment such as booms will be maintained on site for use as required;
- in terms of permitted operations, waste management processes shall be in-building only to minimise visual and ecological impact.

RESIDUAL EFFECTS

11.160 The development of Enviroparks site covers approximately 8.5 ha with the full Enviroparks development being 6.5ha of impermeable area (i.e. roofs and hardstandings). The development is phased with Phase 1 having been completed in April 2016.

11.161 The implementation of Enviroparks Phase 1 has delivered a large portion of the advanced civil infrastructure required for the full development proposals (i.e. all phases). A large portion of drainage has been constructed along with roads, buildings and hardstandings. The Enviroparks Phase 1 advanced civil infrastructure works have improved the drainage of the site. These works include attenuation in the form of SuDS which also implements a process of filtration.

11.162 The topography is described as falling to the south west corner of the site and as such is in hydraulic continuity with the majority of environmental sensitive areas in the vicinity of the site which are located to the north or east, effectively positioned upstream of the Enviroparks development. The River Camnant remains the only environmentally sensitive feature that may be affected through the discharge of surface water runoff or potentially groundwater. The implementation of a number of mitigation and containment measures through both Enviroparks Phase 1 and 2 seek to reduce the associated risk of contamination. In addition to the ongoing construction of hard surfacing as part of the Phase 2 proposed works, the site has areas of Glacial Till which comprises clayey gravel, providing some protection of the minor aquifer below.

11.163 Once the full Enviroparks development has been constructed (i.e. all phases) the site will become 77% impermeable; this will be in the form of roads, hardstandings and roofs. The current Phase 2 proposals will deliver about 2.5ha of hard surfacing (roofs and hardstandings) equating to approximately 29% of the final Enviroparks development works according to the 2017 Enviroparks Phase 2 FCA. Furthermore the majority of site's total requirement for surface water attenuation shall be provided as part of Phase 2 in the form of enhanced swale and balancing arrangements along the site's southern boundary. Provision of a large part of the positive drainage system along with attenuation provides the means to control the surface water runoff and discharge at an agreed greenfield rate, based on a 1 in 1 year return period and applied to all 1 in 100 year storm events. This includes a 30% climate change allowance, thereby reducing the flood potential of downstream or down gradient sources. There will be a nominal reduction in surface water runoff to the stream to the western boundary of the site. The reduction in flows will assist in protecting downstream receptors. The development proposals are considered to have a **medium positive** impact on the site.

11.164 In times of drought the reduction in surface water flows to the stream caused by the controlled discharge at greenfield rates will potentially affect flows to the river Camnant, thus affecting the water quality downstream of the Hirwaun sewage treatment works. The increased operational activities will necessitate the some use of potable water thereby ensuring a greater flow to the Hirwaun wastewater treatment works. EWL have not however finalised the operational activities for Enviroparks Phase 2 and as such any further potential agreements with DCWW have not been determined. The overall impact is presently considered to range from **low positive** impact to **low negative** impact.

CONCLUSION

11.165 In terms of drainage and flood risk, the Enviroparks Phase 2 proposals shall integrate with the existing Phase 1 works already constructed. The implementation of Enviroparks Phase 2 proposals shall introduce a number of additional and enhanced features which shall provide additional and more substantial mitigation against contamination and flooding of downstream receptors.

11.166 The Phase 2 proposals introduces a further 2.5ha of hard surfacing in the form of building roofs or hardstanding with associated drainage systems which provides an improved foul and surface water positive drainage system for the site and also introduces a large impervious layer preventing pathways to the principal aquifer. These both mitigate the potential movement and extent of groundwater within the site.

11.167 The Phase 2 proposal require the diversion of the existing DCWW 300mm diameter foul water sewer into the Fifth Avenue and the enlargement of the swale and balancing pond arrangement within the landscape area along the southern boundary. This enhanced SuDS feature will provide a significant portion of the overall surface water storage for the full Enviroparks development. The maintenance of the drainage and attenuation features (i.e. swale and balancing pond arrangement) will need to be carried out along with regular inspections of key apparatus to ensure the stream adjacent the western site boundary is protected.

11.168 The swale and balancing pond arrangement with a gentle longitudinal gradient and located to the southern landscaped area of the site will receive surface water flows from the drainage

network and also intercepting groundwater. The downstream penstock will ensure a final isolation system on the swale in the event of an accidental spillage thereby protecting downstream receptors.

REFERENCES

The following is a list of key references that are considered to be common to be both sections of chapter eleven of this ES addendum.

1. Planning Policy Wales. November 2016. Welsh Assembly Government. ISBN 978-1-4734-7437-6.
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