10 DRAINAGE AND FLOOD RISK

10.1 INTRODUCTION

10.1.1 This chapter of the Environmental Statement (ES) addresses the identification of the potential impacts to the site and the surrounding area, in a flood risk and drainage context, based on the site's flood risk and conceptual drainage strategy (TerraConsult Report 3484R07-01) enclosed at **Appendix 10.1**. The purpose of this chapter in the ES is not to reproduce the report but rather discuss the outcomes of the report in the context of identifying potential likely significant impacts to the site and the surrounding area which are related to flooding and drainage. This chapter qualifies the identified potential impacts associated with the flood risk and drainage and provides mitigation measures to reduce the potential impact to an acceptable impact within the development and the area adjacent to it.

10.2 ASSESMENT APPROACH

Methodology

10.2.1 The potential flood and drainage risks associated with the site will be identified based on the information provided in the Flood Consequence Assessment (FCA) and Drainage report (TerraConsult Report 3484R07-01) within **Appendix 10.1**.

10.2.2 A risk based matrix approach will be used to define the significance of the identified hazards associated with flood risk and drainage relating to the development. This will be discussed in the context of sensitivity (i.e. probability), magnitude (i.e. severity), with and without mitigation measures, for the construction and operation phases and cumulative effects.

Assessment of Significance

10.2.3 To assess the significance of identified flood risks and effects, the definitions presented in Table 10.1 of severity/magnitude have been used. The probability of the potential impact occurring is classified according to the criteria given Table 10.2. The criteria are based upon those presented within DETR Document 'A Guide to Risk Assessment and Risk Management for Environmental Protection' and TAN 15.

Table 10.1: Severity of Impact

Severity of Impact	
Severe	Acute (short term) risks to human health. Complete inundation of the site, flood levels above 1m. Maximum velocity of flood waters exceeds 0.45m/s. Catastrophic damage to buildings / property (i.e. collapse). Major pollution of controlled waters (surface watercourse or groundwater).
Medium	Chronic (long-term) risk to human health. Complete inundation of the site, flood levels between 0.6 m and 1m. Maximum velocity of flood waters between 0.15m/s and 0.45m/s. Major structural damage to buildings or structures. Pollution of sensitive controlled waters (surface waters or groundwater).
Mild	Mild (short-term) risk to human health. Partial inundation of the site, flood levels between 0.45m and 0.6m Maximum velocity of flood waters less than 0.15m/s

Severity of Impact	
	Mild structural damage to buildings or structures (mild cracks which do not affect the affect structural integrity). Mild Pollution of non-selective waters.
Minor	Minor/no risk to human health. Minor / no inundation of site, flood levels less than 0.45 m. Minor / no damage to buildings or structures (i.e. superficial damage to building / structure). Minor damage to non-selective ecosystems or species e.g. existing poor quality surface water bodies.

Table 10.2: Probability of Impact Occurring

Probability of Impact Occurring	
High Likelihood	The development is located high flood risk zone – Zone C2. Pollutant linkage may be present and impact is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	The development is located medium flood risk zone – Zone C2. Pollutant linkage may be present and it is probable that the impact would occur over the long term.
Low Likelihood	The development is located in a low flood risk zone – zone B. Pollutant linkage may be present and there is a possibility of the impact occurring although there is no certainty that it would do so.
Unlikely	The development is located in a very low flood risk zone – zone A. Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

10.2.4 An overall evaluation of the level of significance has been gained from a comparison of the magnitude and probability as shown in Table 10.3

Table 10.3: Significance of Impact

		Severity / Magnitude			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High likelihood**	Severe	Major	Moderate/ minor	Negligible
	Medium / Reasonably Foreseeable	Major	Moderate	Minor	Not significant
	Low/Unlikely	Major/ moderate	Moderate/ minor	Minor	Not significant
	Negligible	Moderate/minor	Minor	Minor	Not significant

Legislative and Policy Framework

10.2.5 The Flood Consequence Assessment (FCA) and Drainage report (TerraConsult Report 3484R07-01) for the proposed development has been prepared in accordance with relevant legislation, Policies and guidelines outlined below:

- CIRIA C753 The SUDS Manual (2015);
- Sewers for Adoption 7th Edition (2012);
- Flintshire Preliminary Flood Risk Management Assessment (2011);

- BS 8533 2011 Assessing & Managing Flood Risk in Development Code of Practice (2011);
- BS EN 752 2008 Drain and Sewer Systems Outside Buildings;
- Pollution Prevention Guidelines – Use and design of oil separators in surface water drainage systems: PPG3 (April 2006);
- British Water Code of Practice – Flows and Loads, Sizing Criteria, Treatment Capacity for Sewage Treatment Systems;
- The Welsh Ministers standards for new gravity foul sewers and lateral drains – October 2012;
- Guidance on the mandatory adoption of sewers and lateral drains and on the Welsh Ministers' Standards for gravity foul sewers and lateral drains – July 2012;
- The Building regulations 2010: Drainage and Waste Disposal (2015)
- Planning Policy Wales (9th edition, November 2016);
- Planning Policy Wales - Technical Advice Note (TAN) 15;
- Flood Risk Regulations (2009); and
- Flood and Water Management Act (2010).

National Planning Policy

10.2.6 Planning Policy Wales (9th Edition) outline key policies pertaining to minimising and managing Environmental Risks and Pollution. In particular, chapter 13, paragraphs 13.2 – 13.4 address Flood Risk and Climate, Development plans and Flood Risk and Development management and Flood Risk. For a further breakdown of the relevant policies, the reader is referred to the Planning Policy Wales document (http://gov.wales/docs/desh/publications/161117planning-policy-wales-edition-9-en.pdf).

10.2.7 Additional planning policy includes the Technical Advice Note 15 - Development and Flood Risk (TAN15), which provides guidance for new development planning. The overarching aim of this document includes framework to:

> **"Direct new development away from those areas which are at high risk of flooding. Where development has to be considered in high risk areas (zone C) only those developments which can be justified on the basis of the tests outlined in section 6 and section 7 are located within such areas".**

10.2.8 Further information contained within the TAN 15 document is available on this web link (http://gov.wales/docs/desh/publications/040701tan15en.pdf), describing the steps and requirements to include for a FCA for a proposed development.

Consultations

10.2.9 The FCA and Drainage report has been sent to North Wales Councils Regional Emergency Planning Service for comment and review – their response is still pending. The local water and sewer utility Dwr Cymru Welsh Water has been contact to assess the feasibility of discharging foul water (Domestic and Treated Trade Effluent) into their local sewer asset located along the eastern boundary of the site. The domestic and treated trade effluent flows can be accommodated by the local utility sewer, however the treated trade effluent requires Consent to Discharge prior to any agreement with the local utility.

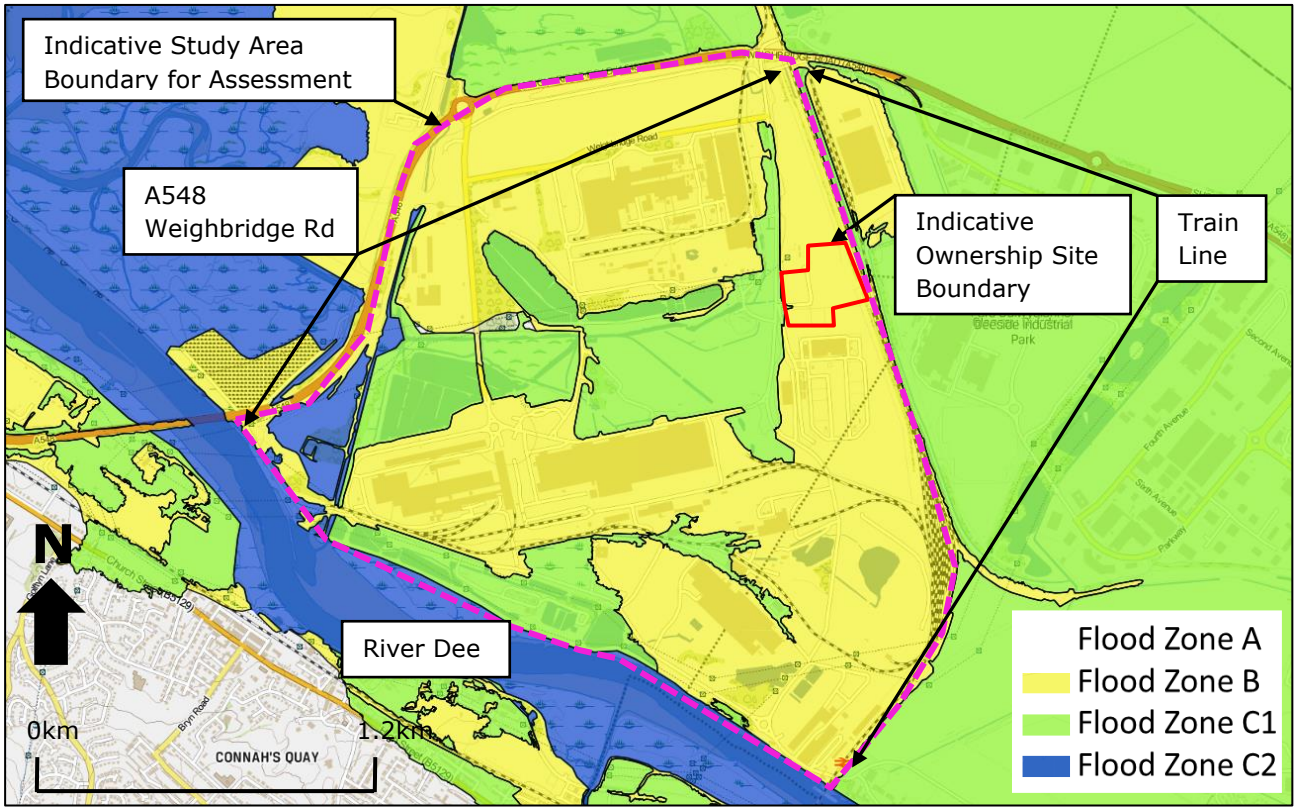
Scoping Criteria

10.2.10 The scope of this chapter's assessment will be limited to the site area and the area adjacent to it. The assessment will only consider the potential effects relevant to the potential flood risk and drainage, during the construction and operational phases of the development.

Extent of Study Area

10.2.11 The extent of the study area for this assessment will largely be defined by the extent of the potential flooding within and around the site; the area be confined to the natural and artificial flood water boundaries of the River Dee, A548 Weighbridge Rd and the train line running alongside the eastern boundary of the site. The extent of this study area (Approximately 415 ha) is depicted in CYMRU Welsh Water's Development Advice Map (DAM) as Figure 10.1 below.

Figure 10.1: Extent of study area (Source: CYMRU Natural Resources Wales, base map Ordance Survey)



Limitations to the Assessment

10.2.12 This chapter of the ES has been limited to the site boundary and the area adjacent to it. It has not taken into account post development or decommissioning of the site. Furthermore, this assessment is limited to the potential significant impacts relating to flooding and drainage within the site, and not the internal processes of the plant relating to the production of Bio gas.

10.2.13 The information used in this chapter of the ES are limited to readably available flood risk mapping and modelling information provided by NRW, online mapping resources (e.g. MAGIC – Nature on the map) and information provided by the client (i.e. site topographic levels and the conceptual development plan layout).

10.3 BASELINE CONDITIONS

Site Description and Context

10.3.1 The site is situated in an industrialised area of Deeside, in the county of Flintshire, North Wales. The site is located approximately 1.3 km north-east of the site boundary and 10.2 km northwest of Chester City Centre. Access to the site is off the Weighbridge Road which connects to the A548 motorway located approximately 0.9 km north of the site boundary. The nearest post code of the site is CH5 2LF and it has national grid reference coordinates of SJ311711.

10.3.2 Industrial activities surrounding the site include A sub-station, Flintshire Bridge Site C Convertor Station, UPM Shotton, Toyota Motor Manufacturing UK, Great Bear Distribution and Tata Steel UK Ltd. The open grassed area adjacent to the northern boundary of the site is currently under development for the Deeside Energy from Waste (EfW) Facility. Several open water bodies and vegetated areas are present around the site.

10.3.3 The site was previously used as the Shotton CHP Power Station which has currently been demolished to accommodate the proposed Arrow Bio Plant. The proposed site planning application boundary will cover an approximate area of 5.57 ha. The current layout for the plant along with the proposed surface and foul water drainage is depicted in TerraConsult Drawing 3484/01/001 within **Appendix 10.1**. This will include a car park area, internal roads and loading/off-loading zones, offices, RDF hall, Waste Reception and Sorting Halls, and Biological Plant area including waste water treatment area, digestate tanks, acetogenic tanks and bio gas Methargenic tanks.

Baseline Survey Information

10.3.4 Prior to any development of the site area (i.e. approx. before 1938), the land was originally a salt marsh boarding on the River Dee Estuary. A review of the Cranfields Soilscapes website (http://www.landis.org.uk/soilscapes/) describes the natural soil for the site area as loamy and clayey soils of coastal flats with naturally high groundwater. Based on the British Geological Survey (BGS) geological maps, the superficial geology comprise of 'Tidal Flat Deposits' of Clay, Silt and Sand. The underlying bedrock belongs to the 'Pennine Lower Coal Measures Formation' of mudstone, siltstone and sandstone.

10.3.5 Between the 1938 and 1956 the site area was developed as part of the Shotton Steelworks, which included the infilling of natural sand from the region to raise up the finished surface levels by 4 m; the melting shop in the south-western corner of the site was raised above the remainder of the development area. Site Condition Report (EAME Report No. 012-1142 Rev – 02) describes the history of the site in more detail.

10.3.6 A recent (October 2017) topographical survey for the site area, as provided by the Pegasus Group revealed that the area within the application boundary has two distinct surface levels, viz. an upper and lower level. The upper level covers a majority of the site (approximately 92 % of the total surface area) which stretches from the north, eastern and southern boundaries up to the top of site access ramp and the embankment along the western edge of the site. The surface level with this area lies between 8.3 and 10.3 mAOD, with a subtle gently gradient of 1:137 declining from the north towards the south of the site. The lower level account for approximately 8 % of the site area, and is confined to the embankment along the western edge of the site boundary and site access ramp. The surface level within this area lies between 8.3 and 5.2 mAOD.

10.3.7 LIDAR data of the area around the site (i.e. Indicative Study Area Boundary for Assessment in Figure 10.1) indicates a current surface elevation of 0.0 mAOD along the bank of the River Dee, which increases to no more than 12.5 mAOD in a northward direction along the A548 Weighbridge Rd.

10.3.8 A review of the Site Condition Report (EAME Report No. 012-1142 Rev – 02) for the former Shotton CHP Power Station (i.e. the former land use of the site) indicates that the surface water from the former power station discharged into the un-named land drain located approximately 85 m away from the eastern boundary of the site. The majority of the previous site drainage was demolished during the decommissioning of the former Shotton CHP power station. There is limited surface water drainage within the car parking area and the site entrance ramp which is conveyed to a culvert located opposite the site entrance along the Weighbridge Road.

10.4 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

10.4.1 During the construction and operational phases of the development, there will be numerous potential hazards associated with typical earth works and construction operations, and the storage of potentially hazardous liquids and materials within the site. In this chapter, the potential hazards associated with the proposed development is limited to the consequences of the site flooding or the foul water systems failing and the impact it will have within the site and to the area immediately adjacent to it.

10.4.2 These foreseeable effects, without the inclusion of mitigation measures, include the following:

Loss of Life And Or Injury – Major Effect

10.4.3 Based on the long term flood risk maps for wales (NRW) the lower level area of the site (i.e. a small portion of the site located along the western boundary of the site and the site access ramp) resides within the 1 in 200 years (0.5%) and 1 in 1000 years (0.1%) annual exceedance probability flood zones for river and sea. However, the site is located within an area benefiting from flood defence structures along the River Dee. Based on Tidal flood modelling scenarios for the River Dee, the site is not located within the flood extent for the undefended scenarios for the River Dee. Furthermore, the majority of the site area (i.e. the upper level) resides at least 0.6 m above the extreme 1 in 1000 + climate change AEP flood event.

10.4.4 In the unlikely event that the lower level area of the site is subjected to flooding, any personnel present within this zone may sustain injury of loss of life. This applies during the construction and operational phases of the development.

10.4.5 Furthermore, during the construction phase of the development, voids and trenches will be excavated to install the required storm water and foul water drainage, which will create potential risk hazards to personnel walking or operating machinery on-site.

Damage to Property – Minor Effect

10.4.6 Similar to the above, any machinery, materials or assets utilised for construction and operations of the development that are located within the high flood risk zone of the lower level area (i.e. 1 in 200 and 1 in 1000) may be damaged, broken and lost during an extreme flood event in the area. Furthermore, the excavated voids and trenches created during the construction phase, will create a potential risk for damages to any machinery, materials or assets utilised for construction of the development.

Visual Impact and Aesthetics – Not Significant Effect

10.4.7 During the construction phase there will be excavations, machinery and the stockpile of building materials used in the construction of the drainage for the development. This will result in a change of the visual landscape of the site and the Aesthetics.

Water Quality and Quantity – Minor Effect

10.4.8 Lastly, the two primary effects of the development that relates to the site's flood risk and drainage is the surface water quantity and quality of the site. As the site stands in its current state, is has a relatively low overall flood risk as described in further detail in the FCA and SWMP TerraConsult report (3484R07-1). However during the construction and the finished operational phases of the development, the surface impermeability and topography will be altered which may result in an increased flood risk within the site. Moreover, this may lead to increased runoff leaving the site and increasing the flood risk to adjacent properties and people in the immediate vicinity.

10.4.9 The building works involved during the construction of the development will expose the soil surface and the stockpile of various materials that maybe potentially impact natural environment (e.g. building sand and sediments, fuels and oils stores). During periods of high intensity or prolonged rainfall events, there is a potential that these materials may become entrained in the runoff from the site and proceed off-site into the adjacent receiving watercourses.

10.4.10 Furthermore, there is the potential risk of the site's domestic waste (toilets and showers- during construction and operational phases) and treated effluent (during the operational phase) leaving the site and entering adjacent surface water resources, through leakages, spillage, or overtopping of the foul water systems on the site.

10.5 MITIGATION, ENHANCEMENT AND RESIDUAL EFFECTS

10.5.1 The risk of the potential effects outlined above (section 10.4) may be reduced through various mitigation measures which should include the following:

Mitigation by Design

10.5.2 The finished surface levels of the development should not sit below the current surface levels of the site, as this should provide at least 0.6 m of freeboard for the site (excluding the lower level area located along the western boundary of the site) above the 1 in 1000 year event + climate change Tidal level. Infrastructure and systems of the development that is vulnerable to flood damage (including offices) should not be built in the low level area along the western boundary of the site that has been identified with a high flood risk. Instead only water compatible infrastructure (i.e. roads, pipes, manholes, swales and other similar drainage systems) should be constructed in this area of the site.

10.5.3 The proposed surface water drainage should be designed to accommodate (i.e. no unacceptable level of surface water ponding within the site) the 1 in 100 year + 20% climate change storm events. Any storm water storage or attenuating structures should be located in area of the site that permits any overflow from the structure to proceed away from vulnerable infrastructure and people, and towards flood water compatible areas.

10.5.4 Under typical operational conditions, the storm water drainage for the development should limit the off-site discharge of the storm water to the Qbar value for the site area, up to the 1 in 100 year storm event.

10.5.5 Whilst the site is not located in a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Special Protected Area (SPA) or historic significance, in order to minimise the potential impact on the water quality of receiving water resources adjacent to the site, the use of SuDS features such as Bio-remediation channel system, grass lined ditches and geocelllular attenuation features should be included in the final storm water drainage. In addition, bypass separators should be sized up and included in the storm water drainage to intercept potential silt, oils and debris entrained in the runoff within the site area.

10.5.6 Lastly the storm water and foul water drainage systems should be designed in accordance with the Welsh Government Building Regulation (2010) and Sewers for Adoption (7th edition), to ensure the relevant design standards of the system are met and the optimal functioning of the system. This should be carried out by suitably qualified and experienced individuals.

Mitigation by Condition

10.5.7 During the construction and operational phases of the development, personnel on-site should refrain from entering the low-lying area along the western boundary of the site that has been identified with a high flood risk. This should be mandatory under prolong or high rainfall events where a flood risk warning has been issued for the area or region. In addition, personnel onsite should be made aware for the potential flood risk for the site, through the consultation of the site's FCA and Flood Evacuation Plan.

10.5.8 In addition to standard health and safety procedures and practice for construction sites (i.e. induction, high visibility and protection gear, demarcation of potentially dangerous areas within the site through warning signs / lights, permit system, etc) any potentially dangerous ponded bodies of water that have developed within the site (after a significant rainfall event(s)) should be pumped off-site at a rate no more than the Qbar value for the site area; provided that the quality of the water is at an acceptable standard that would not compromise the receiving environment.

10.5.9 Regular maintenance of the surface and foul water drainage infrastructure should be carried out by suitable and trained personnel. The surface water management system (including the foul water component) shall be inspected regularly (minimum 12 months between inspections) and after periods of heavy rain. The inspection must be carried out and recorded by a suitability qualified/experienced person. In particular the following shall be recorded:

- The condition of the grassed ditch linings, head and tail walls. This should include identification of any excessive erosion at the inlet and outlet of the grassed ditches;
- Any siltation within the drainage network, including flow control devices, manholes and the inlets and outlets of the attenuation structures;
- The structural condition of the attenuation structures, manholes, inspection chamber and pipe
- network;
- Remove any unwanted debris and accumulated material within the drainage network;
- Any repairs or maintenance required to the system shall be undertaken as soon as is reasonably practical, by a suitably qualified and experienced contractor;
- Operational maintenance regimes as recommended through CIRIA C 753 – SUDS Manual are provided in Table 11 in the FCA and SWMP TerraConsult Report (3484R07-1). This should also include regular cleaning and removal of any debris scattered on the internal roads, carpark and other hardstand surfaces within the development.

10.5.10 During the construction phase of the development, temporary construction screens should be placed around the site to limit the visual impact to the area adjacent to the site; this includes areas used for the stock pile of building materials. During the operational phase of the development, the surface and foul water drainage will sit at and below the surface level, thus ensuring minimal exposure of the drainage to surface.

10.5.11 The mitigation measures for the identified potential effects have been summarised in Table 10.5 below:

Table 10.5 Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Condition
Loss of Life And Or Injury	See paragraphs 10.5.2, 10.5.3, 10.5.4, 10.5.6, 10.5.7, 10.5.8	X		X
Damage to Property	See paragraphs 10.5.2, 10.5.3, 10.5.4, 10.5.6, 10.5.9	X		X
Visual Impact and Aesthetics	See paragraph 10.5.10	X		X
Water Quality and Quantity	See paragraphs 10.5.3, 10.5.4, 10.5.5, 10.5.6, 10.5.8, 10.5.9	X		X

Enhancements

10.5.12 In addition to the mitigation measures outlined above, additional benefits to the proposed development are not limited to but should include the following:

- Regular cleaning and removal of any debris scattered on the internal roads, carpark and other hardstand surfaces within the development. This can fall under the regular maintenance operation for the site; and
- Individuals on-site should report any identified potential risks to the drainage (i.e. sagging road surfaces or potholes above the drainage infrastructure, or evidence of overflowing/ overtopping at manholes / junction boxes) to relevant management personnel of the site. This should be reported as soon as practically possible and addressed promptly to avoid potential risk.

Residual Effects

10.5.13 The effects of the identified potential impacts associated with the site's flood risk and drainage will be reduced through the implementation of the mitigation and enhancement measures outlined in the above section. The extent and degree to which these mitigation and enhancement measures reduced the risk varies at different phases of the development, as outlined in Table 10.6 below.

10.6 CUMULATIVE AND IN-COMBINATION EFFECTS

10.6.1 The cumulative and in-combination effects which pertain to the site's flood risk and drainage are discussed in this section of the chapter; these are summarised as follows:

Flooding of the site – Major Effect

10.6.2 Should the drainage on the site fail in some form or another that results in an unacceptable discharge of surface water to the area adjacent to the site, there is possibility that receiving environment will flood which may result in injury, loss of life and damages to property.

Impact to Water Quality – Moderate Effect

10.6.3 Should the foul water drainage fail in some form or another, or the bypass separators for the surface water drainage prove incapable or retaining the necessary oil and silt loads from the site, there is the probability that off-site discharge of the polluted runoff may enter adjacent water bodies and have a negative impact on the receiving environment, affecting the local ecology and aesthetics and possibly odour for the area.

10.7 MITIGATION AND ENHANCEMENT EFFECTS

10.7.1 The potential cumulative effects of the proposed development can be addressed through adopting the mitigation and enhancement measures pertaining to the site, as outlined under section 10.5. If the individual negative effects of the site's flood risk and drainage is addressed within the proposed development, then the cumulative effects within and beyond the site should be mitigated to an acceptable level.

10.8 SUMMARY

Introduction

10.8.1 This chapter has addressed the identification of the potential impacts to the site and the surrounding area, in a flood risk and drainage context. This chapter has qualified the identified potential impacts and has provided mitigation measures to reduce the potential impact to an acceptable level.

10.8.2 Further information regarding the site's flood risk and conceptual drainage strategy, is contained in TerraConsult report 3484R07-01 Flood Consequence Assessment and Surface and Foul Water Management Plan (FCA and S&FWMP) contained within **Appendix 10.1**.

Baseline Conditions

10.8.3 According to Development Advice Maps (DAM's) produced by NRW, the site in its current state site mostly (i.e. upper level area) in flood zone B (area known to have been flooded in the past evidenced by sedimentary deposits and has an annual chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%) for river flooding, or between 1 in 1000 (0.1%) and 1 in 200 (0.5%) for sea flooding). A minor portion along the western boundary of the site (i.e. lower level area) sits within flood zone C (area is likely to be affected by a major flood and has an annual chance of flooding of 1 in 100 (1%) or more from rivers and 1 in 200 (0.5%) or more from the sea, but benefits from flood defence structures).

10.8.4 A recent (October 2017) topographical survey for the site area, as provided by the Pegasus Group revealed that the area within the application boundary has two distinct surface levels, viz. an upper and lower level. The upper level covers a majority of the site (approximately 92 % of the total surface area) which stretches from the north, eastern and southern boundaries up to the top of site access ramp and the embankment along the western edge of the site. The surface level with this area lies between 8.3 and 10.3 mAOD, with a subtle gently gradient of 1:137 declining from the north towards the south of the site. The lower level account for approximately 8 % of the site area, and is confined to the embankment along the western edge of the site boundary and site access ramp. The surface level within this area lies between 8.3 and 5.2 mAOD.

10.8.5 In the site's current state there are no surface water resources identified within the site's planning boundary. The rainfall falling on to the site area infiltrates to the underlying made ground of building rubble and soil material (Hardcore). The rainfall which falls onto the car parking area and site access ramp located near the site's western boundary is conveyed through the existing surface water drainage to a culvert located opposite the site entrance along the Weighbridge Road.

10.8.6 The calculated Greenfield Q_{bar} (i.e. mean annual maximum flow rate) flow value for the site is 27.5 l/s; this is not reflective of the site's current brownfield condition.

Likely Significant Effects

10.8.7 The majority of the site is defined by a low overall flood risk, however it is acknowledged that during the construction and operational phases of the development, there could be a number of potential hazards associated with typical earth works and construction operations, and the storage of potentially hazardous liquids and materials within the site.

10.8.8 The potential hazards associated with the proposed development, without mitigation, are limited to the consequences of the site flooding or the foul water systems failing and the impact it will have within the site and to the area immediately adjacent to it. In the unlikely event that the lower level area of the site is subjected to flooding, any personnel present within this zone may sustain injury or loss of life, with potential damage to property along the western edge of the site, adjacent to Weighbridge Rd. Potential impacts in relation to water quality may also occur during construction if standard mitigation measures are not followed.

Mitigation and Residual Impacts

10.8.9 Where appropriate, the risk of identified potential effects outlined may be reduced through various mitigation measures, including

- Occupants and construction operations of the site should avoid areas (i.e. western boundary of the site) identified with a potentially high flood risk, where practically possible;
- The drainage system should be installed as a priority after the earthworks of the site and before any major construction takes place at the site (where practical and in relation to relevant phase development of the site), so as to ensure minimal impact to the site and surface water receptors adjacent to the site;
- Adequate health and safety measures and policies must be developed and followed during the construction and operational phases of the development, at all times. Furthermore, the detailed design and installation of the drainage for the site should be performed by suitable qualified and experienced individuals. This should include regular quality control checks throughout the construction phase;

- Lastly, regular maintenance of recording of the drainage system for the development must be carried out on a regular basis. Any identified problems or concerns pertaining to the system must be addressed as soon as reasonably possible.

10.8.10 Should the mitigation measures and enhancement effects outlined in this chapter of the ES be followed adequately, the residual effects of the development from a flood risk and drainage perspective should not be significant.

Conclusion

10.8.11 From a flood risk and drainage perspective, the proposed development is not subjected to an unacceptable flood risk, nor will it increase the flood risk to an unacceptable level to the adjacent area should the mitigation measures and drainage strategy proposed in the TerraConsult FCA and Conceptual Surface and Foul Water Management Plan report (3484R07-01) and in this chapter of the ES, are followed. Furthermore it is unlikely to impact the water quality of the neighbouring aquatic ecosystems, provided the mitigation measures and drainage strategy are also followed.

10.8.12 From a flood risk and drainage perspective the proposed development is unlikely to have residual risk greater than not significant, and can be constructed and operate (under normal conditions) with the mitigation measures identified.

Table 10.6: Summary of Effects, Mitigation and Residual Effects.

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value (Probability)	Magnitude of Effect (Severity)	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Construction								
People	Loss of life and or injury as a result of flooding	Direct	Low Likelihood	Severe	Local	Major	See section 10.5	Not Significant
Property	Damages to buildings, materials and plant hire as a result of flooding	Direct	Low Likelihood	Mild	Local	Minor	See section 10.5	Not Significant
Aquatic Ecosystem / Downstream Waterbodies	Compromise of the water quality in downstream receiving aquatic environments as a result of off-site discharge of polluted runoff	Direct	Low Likelihood	Mild	Local	Minor	See section 10.5	Not Significant
People	Visual impact of construction site including earth works, plant machinery and stockpile of materials.	Direct	Low Likelihood	Minor	Local	Not Significant	See section 10.5	Not Significant

Operation								
People	Loss of life and or injury as a result of flooding	Direct	Low Likelihood	Severe	Local	Major	See section 10.5	Not Significant
Property	Damages to vehicles, buildings, roads and other similar infrastructure within the development as a result of flooding	Direct	Low Likelihood	Mild	Local	Minor	See section 10.5	Not Significant
Aquatic Ecosystem / Downstream Waterbodies	Compromise of the water quality in downstream receiving aquatic environments as a result of off-site discharge of polluted runoff	Direct	Low Likelihood	Mild	Local	Minor	See section 10.5	Not Significant
People	Visual impact of the completed development	Direct	Low Likelihood	Minor	Local	Not Significant	See section 10.5	Not Significant
Cumulative and In-combination								
The area adjacent to the site	Uncontrolled storm water from the site resulting in the flooding of the area adjacent to the development	Direct	Low Likelihood	Mild	Local	Minor	See section 10.5	Not Significant

The area adjacent to the site	Uncontrolled polluted runoff from the site which enters downstream waterbodies adjacent to the development, compromising the integrity of the receiving aquatic ecosystem	Direct	Low Likelihood	Mild	Local	Minor	See section 10.5	Not Significant