

## **7. WATER: HYDROGEOLOGY & HYDROLOGY**

### **7.1 Introduction**

This chapter of the EIAR comprises of an assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments, as well as identifying proposed mitigation measure to minimise any impacts.

Refer to Chapter 2.0 (Site Description) and Chapter 3.0 (Description of Development) for a detailed site and development description.

### **7.2 Characteristics of the Proposed Development**

#### **7.2.1 Hydrology**

The development works include the attenuation of surface water flows to greenfield runoff rates. The proposed development will be attenuated using vortex flow control devices (Hydrobrake or equivalent) at the outfall, limiting the discharge rate to greenfield runoff rates in accordance with the Greater Dublin Strategic Drainage Strategy (GDSDS).

In order to adhere to this requirement, the calculated allowable surface water runoff for the entire development has been calculated as 25.65 l/s. It has been determined that a total attenuation volume of 3,064 m<sup>3</sup> will therefore be required on site to accommodate for the 100-year storm event (provision for climate change included), as required by the GDSDS.

This information is used as the basis for the design of the surface water drainage network discussed in Chapter 13.0 (Material Assets).

The surface water drainage network, attenuation storage and site levels are designed to accommodate a 100-year storm event (provision for climate change included). Floor levels of houses are set above the 100-year flood levels by a minimum of 0.5m. For storms in excess of 100 years, the development has been designed to provide overland flood routes along the various development roads towards the surface water drainage outfall. This overland flood route also reduces the development's vulnerability to climate change.

#### **7.2.2 Hydrogeology**

At soakaway test locations and trial pits locations from a site investigation carried out in 2018 (Appendix 6.A), excavations were carried out to depths ranging from 0.5m to 4.2m below existing ground level. Groundwater was encountered in TP03, TP04, TP12, TP13, TP15, TP20, TP30 at a depths of 2.4m, 0.8m, 0.5m, 2.20m, 2m, 1.20m and 2.20m below ground level respectively.

During construction, the deepest excavations are expected to be required for installation of surface water drainage lines and attenuation tanks (up to approximately 4.0m deep).

Therefore, it is possible that there may be infiltration of groundwater into excavations on site.

### 7.2.3 Flood Risk

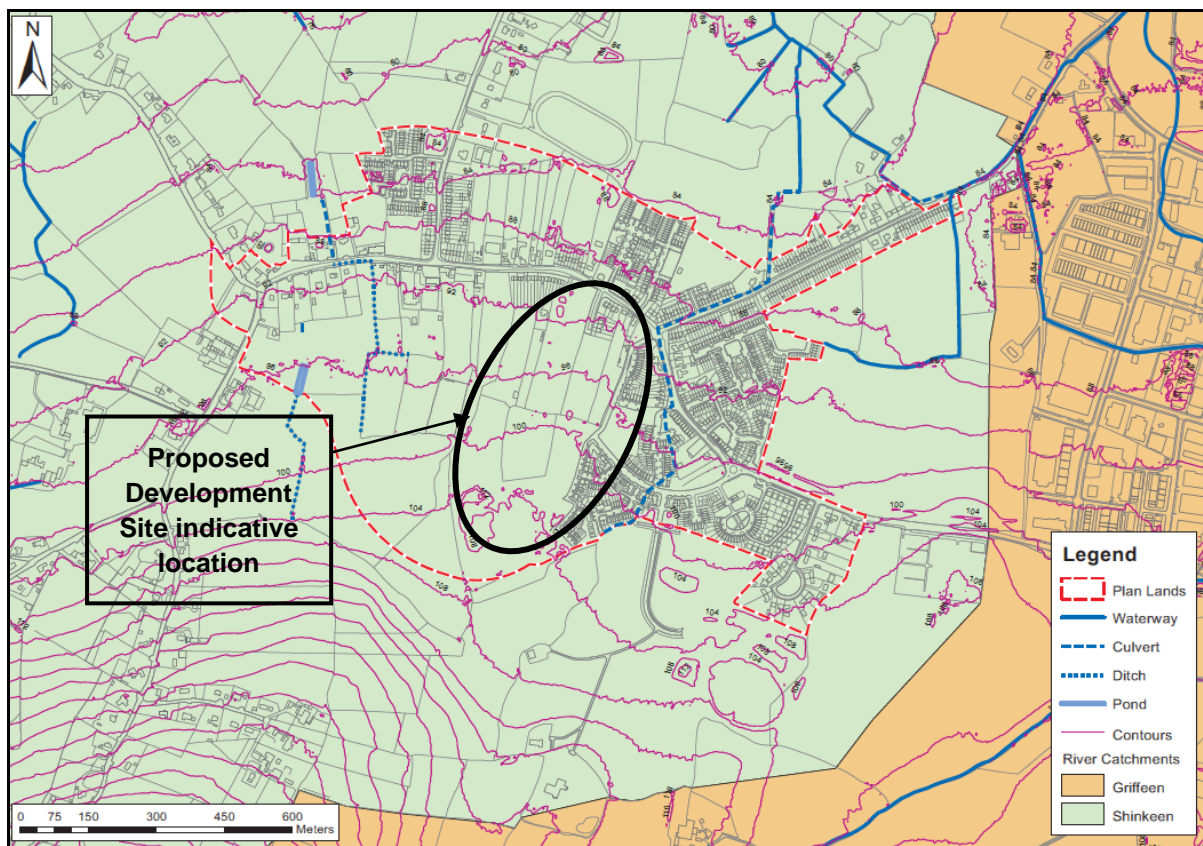
The site is considered to have a low probability of flooding based on our review of OPW's Flood Hazard Mapping, the Eastern CFRAM Study and the Newcastle LAP, 2012. Refer to Section 7.3.3 below, which outlines that the Site is within Flood Zone C.

## 7.3 Receiving Environment

### 7.3.1 Hydrology

The proposed development site is within the Shinkeen Stream Catchment which is a tributary of the River Liffey located approximately 2.2 km to the northwest of the proposed development site (refer to Figure 7.1 below, extract from Newcastle Local Area Plan 2012).

Figure 7.1 Extract from Newcastle Local Area Plan (LAP) 2012 (not to scale)



The nearest Environmental Protection Agency (EPA) designated watercourse is a tributary of the River Liffey, referred to as 'Cornerpark' by the EPA, which is shown running through the residential developments to the east of the proposed development site and flowing in a north-easterly direction (refer to Figure 7.2 below). It appears the watercourse was diverted and culverted to discharge into the existing 450mm diameter culvert in Main Street as part of the residential developments under planning permission reg. ref SD05A/0344, The EPA records or South Dublin County Council records do not reflect this culverting.

The site is within the Liffey and Dublin Bay Catchment Area. The Leixlip hydroelectric dam is located approximately 3.5km upstream from where the “Cornerpark” watercourse enters the River Liffey, and the coast is approximately 20km to the east of the site.

A topographical survey of the site indicates that the site slopes towards the R120 Main Street to the north of the site. Therefore, it can be assumed that the site is part of a single surface water catchment as shown in Figure 7.1 above and is currently drained via a network of drainage ditches, which drain to the existing surface water sewers to the north and east of the site.

**Figure 7.2** Extract from EPA Online Mapping Service



### 7.3.2 Hydrogeology

The Geological Survey Ireland (GSI) Online Data Services classifies the aquifer at the proposed development site as “Locally Important Aquifer – Bedrock which is moderately productive only in local zones”.

GSI classifies the site’s groundwater vulnerability from low to high. Low vulnerability is located in the central area, and moderate vulnerability is located to the north and south of the proposed development site. High vulnerability is present in small areas at the north-western and southern end of the site.

Figure 7.3 Extract from GSI Online Mapping Service (Groundwater Vulnerability)

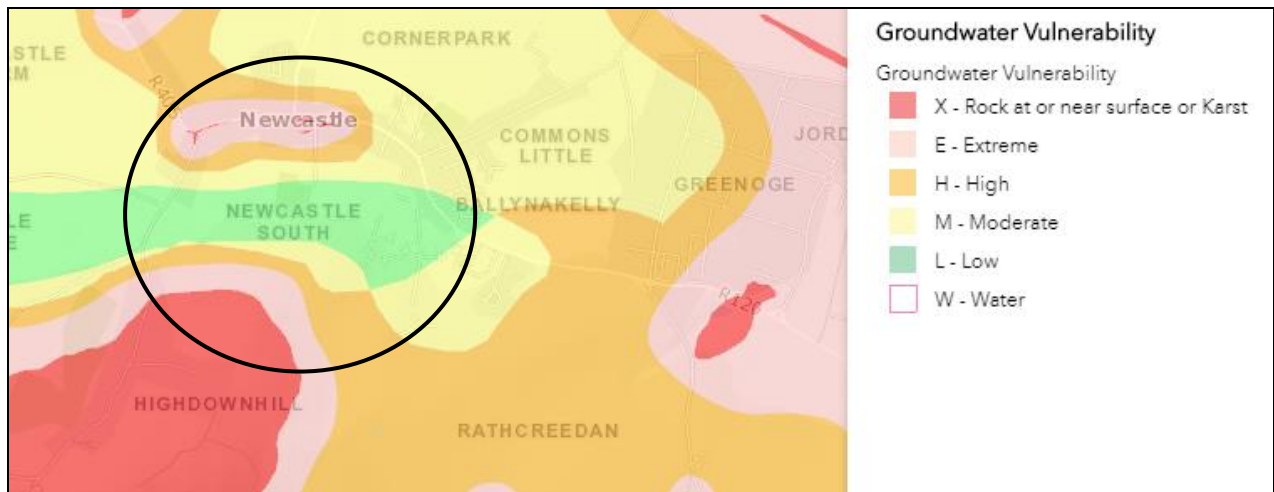
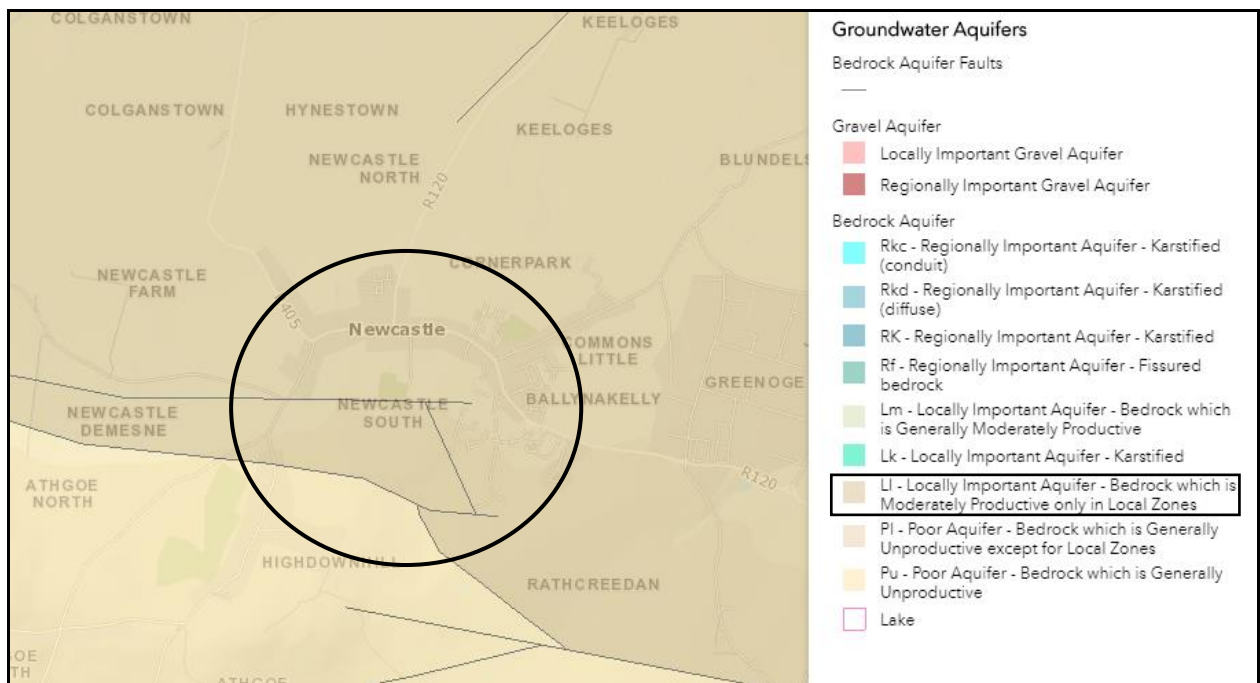


Figure 7.4 Extract from GSI Online Mapping Service (Groundwater Aquifers)



### 7.3.3 Flood Risk

DBFL Consulting Engineers has undertaken a flood hazard assessment by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping ([www.floods.ie](http://www.floods.ie)), the Eastern CFRAM Study and the Newcastle Local Area Plan (LAP) 2012. This assessment has been carried out in accordance with the procedure for a "Stage 1 Flood Risk Identification" as outlined in the OPW's Guidelines for Planning Authorities – The Planning System and Flood Risk Management (November 2009).

A review of the data available on the proposed development site showed no sign of fluvial flood risk on the site. In addition, the proposed drainage is designed to provide good protection against a possible pluvial flooding up to the 100 year return event. Should extreme pluvial flooding occur that is in excess of the

development's drainage capacity then overland flood routes to the drainage outfall can protect the development and houses with lower floor levels.

Following the flood risk assessment stages it was determined that the Site is within Flood Zone C as defined by the Guidelines, and therefore the residential development proposed is appropriate for the Site's flood zone category.

#### OPW Flood Hazard Mapping

OPW's Summary Local Area Report summarises all flood events within 2.5 km of the site. Nine previous flood events were highlighted within 2.5km of the site however none of these flood events were identified as having caused flooding within or in the immediate vicinity of the site.

#### Eastern CFRAM Study

As part of the EU Floods Directive, the OPW is undertaking a Catchment Flood Risk Assessment and Management (CFRAM) Study. An initial part of this Study was a national Preliminary Flood Risk Assessment (PFRA) to identify areas at risk of significant flooding.

The PFRA Flood Extents Maps show no risk of fluvial, coastal or pluvial flooding in the proposed development site up to the 1% AEP (Annual Exceedance Probability) event. The Rathcoole, Saggart and Baldonnel area was highlighted in the PFRA as a 'Probable Area for Further Assessment' which includes the eastern area of the proposed development site.

The CFRAM study provided further assessment of areas identified in the PFRA for further investigation and confirmed that the proposed development site is in Flood Zone C and is not affected by fluvial flooding.

#### Newcastle Local Area Plan 2012

The Newcastle Local Area Plan 2012 was adopted on the 7<sup>th</sup> December 2012. The Newcastle LAP 2012 includes a brief analysis of the provisional flood risk assessment data and flood events recorded by the OPW.

The LAP identifies a number of areas around Newcastle Village that could be at risk of potential flooding. The areas identified are located within the catchment of the River Griffeen and along Main Street. In addition, a number of flood events were recorded by the OPW along Aylmer Road and along Main Street. However, no flooding events or risks were identified within the proposed development site.

## **7.4 Assessment Methodology**

Assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments included the following activities:

- Site inspection / walkover.
- Review of existing topographic survey information.
- Preliminary ground investigation carried out by Ground Investigations Ireland Limited between May and June 2018 which included 25 No. trial pits and 4 No. infiltration tests.

- Review of utility records obtained from South Dublin County Council (SDCC).
- Review of information available on the SDCC Online Planning Applications Service.
- Review of information available on the Environmental Protection Agency (EPA) online mapping service.
- Review of information available on the Geological Survey of Ireland (GSI) online mapping service.
- Review of Office of Public Works (OPW) National Flood Hazard Mapping and Catchment Flood Risk Assessment and Management Studies (CFRAM Studies).
- Review of Newcastle Local Area Plan 2012.

As part of assessing the likely impact of the proposed development, surface water runoff calculations were carried out in accordance with the following guidelines:

- Greater Dublin Strategic Drainage Study (GSDSDS)

## **7.5 Identification of Likely Significant Impacts**

### **7.5.1 Construction Phase**

Potential impacts that may arise during the construction phase are noted below:

- Surface water runoff during the construction phase may contain increased silt levels (e.g. runoff across areas stripped of topsoil) or become polluted by construction activities.
- Discharge of rain water pumped from excavations.
- Accidental spills and leaks associated with storage of oils and fuels, leaks from construction machinery and spillage during refuelling and maintenance contaminating the surrounding surface water and hydrogeological environments.
- Concrete runoff, particularly discharge of wash water from concrete trucks.
- Discharge of vehicle wheel wash water.
- Infiltration of groundwater into excavations.

### **7.5.2 Operational Phase**

Potential operational phase impacts are noted below:

- Increased impermeable surface area will reduce local groundwater recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate).
- Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network (e.g. along roads and in driveway areas).



### 7.5.3 Risks to Human Health

A risk to human health from water, hydrology and hydrogeology can be linked to the potential for contamination of the potable water supply. The ground water and supply network would present possible pathways. The risk is considered below.

#### Groundwater Supply

As noted above the underlying receiving groundwater is a locally important aquifer. The risk to the contamination of this water supply source from surface water run-off from the development during construction and operation is considered to be low given the low infiltration rates obtained as part of the preliminary site investigation undertaken by Ground Investigations Ireland.

#### Network Supply

As noted above surface water outflow from the site ultimately discharges to the River Liffey which is the water source for the greater Dublin region. If surface water is not adequately treated and managed in accordance with the GDSDS it has the potential to impact human health.

Surface water drainage for the development has been designed in accordance with the GDSDS therefore the risk to human health has been mitigated.

### 7.5.4 Unplanned events

The following unplanned events could potentially give rise to impact on the receiving water and hydrology:

- Road traffic accident involving tanker carrying hazardous chemicals during construction or operational Phases.
- Flooding of the road network, preventing access to safe areas or prevention of emergency services from accessing buildings during the incident. The drainage network for the site is designed to accommodate flood events up to 1% AEP. In events above this risk level, the surface water network is designed to provide overland flood routes along the various development roads towards the surface water drainage outfall therefore mitigating the risk.

### 7.5.5 Potential Cumulative Impacts

The proposed surface water drainage infrastructure has been designed in accordance with the relevant guidelines. Any other future development in the vicinity of the site would have to be similarly designed in relation to permitted surface water discharge, surface water attenuation and SuDS, therefore, no potential cumulative impacts are anticipated in relation to surface water and flooding.

## 7.6 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

## 7.7 Mitigation Measures

### 7.7.1 Construction Phase

- A site-specific Construction Management Plan will be developed and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Construction Management Plan.
- Rainwater pumped from excavations is to be directed to on-site settlement ponds.
- Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site settlement ponds where measures will be implemented to capture and treat sediment laden runoff prior to discharge of surface water at a controlled rate.
- Weather conditions and seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations, with an objective of minimizing soil erosion.
- In order to mitigate against spillages contaminating the surrounding surface water and hydrogeological environments, all oils, fuels, paints and other chemicals shall be stored in a secure bunded hardstand area. Refuelling and servicing of construction machinery will take place in a designated hardstand area which is also remote from any surface water inlets (where not possible to carry out such activities off site).
- Concrete batching will take place off site and wash out of concrete trucks will take place off site.
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds.
- Groundwater pumped from excavations is to be directed to on-site settlement ponds.

### 7.7.2 Operational Phase

The design of proposed site levels (roads, finished floor levels etc.) has been carried out in such a way as to replicate existing surface contours, break lines etc., therefore replicating existing overland flow paths, and not concentrating additional surface water flow in a particular location.

Surface water runoff from the site will be attenuated to the greenfield runoff rate as outlined in the Greater Dublin Strategic Drainage Study (GSDSDS). Surface water discharge rates will be controlled by a Hydrobrake type vortex control device in conjunction with attenuation storage.

The following methodologies are being implemented as part of a SuDS surface water treatment train approach:

- Permeable paving in driveway areas.
- Surface water runoff from roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways.
- Surface water runoff from greenlinks will drain to swales for treatment and runoff reduction.
- Attenuation of the 100-year return event storms.



- Installation of a Hydrobrake limiting surface water discharge from the site to greenfield runoff rates.
- Surface water discharge to pass via a Class 1 fuel / oil separator (sized in accordance with permitted discharge from the site).

## 7.8 Residual Impacts

### 7.8.1 Construction Phase

Implementation of the measures outlined in Section 7.7.1 will ensure that the potential impacts of the proposed development on water and the hydrogeological environment do not occur during the construction phase and that any residual impacts will be short term.

### 7.8.2 Operational Phase

As surface water drainage design has been carried out in accordance with the GSDSDS, and SuDS methodologies are being implemented as part of a treatment train approach, there are no predicted residual impacts on the water and hydrogeological environment arising from the operational phase.

## 7.9 Interactions Arising

### 7.9.1 Soil and Geology

Quality of Effect: Negative.

Significance of Effect: Slight.

Surface water runoff during the construction phase may lead to erosion and contain increased silt levels (e.g. runoff across areas stripped of topsoil) or become polluted by construction activities.

Increased impermeable surface area will reduce local groundwater recharge and may potentially increase surface water runoff (if not attenuated to greenfield runoff rate).

Implementation of the mitigation measures described under section 7.7 will prevent and minimize the potential impacts of this interaction.

### 7.9.2 Flora and Fauna

Quality of Effect: Negative.

Significance of Effect: Slight.

Potential contamination of the surface water runoff during the construction and operational phase may cause chemical alterations that can impact on the flora and fauna of the site.

Implementation of the mitigation measures described under section 7.7 will prevent and minimize the potential impacts of this interaction.

### **7.10 Monitoring**

Proposed monitoring during the construction phase in relation to the water and hydrogeological environment are as follows:

- Adherence to Construction Management Plan.
- Inspection of fuel / oil storage areas.
- Monitoring cleanliness of adjacent road network, implementation of dust suppression and vehicle wheel wash facilities.
- Monitoring sediment control measures (sediment retention ponds, surface water inlet protection etc.).
- Monitoring of discharge from sediment retention ponds (e.g. pH, sediment content).

During the operational phase an inspection and maintenance contract is to be implemented in relation to the proposed Class 1 fuel / oil separators, hydrobrakes and attenuation facilities.

### **7.11 Reinstatement**

Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from site and disposed of at an appropriate licenced facility. South Dublin County Council's Environmental Control Section is to be notified of the proposed destination for disposal of any liquid fuels.

All sediment control measures (e.g. sediment retention ponds) are to be decommissioned on completion of the construction phase. Such areas are to be reinstated in accordance with the landscape architects plan and engineer's drawings.

### **7.12 References**

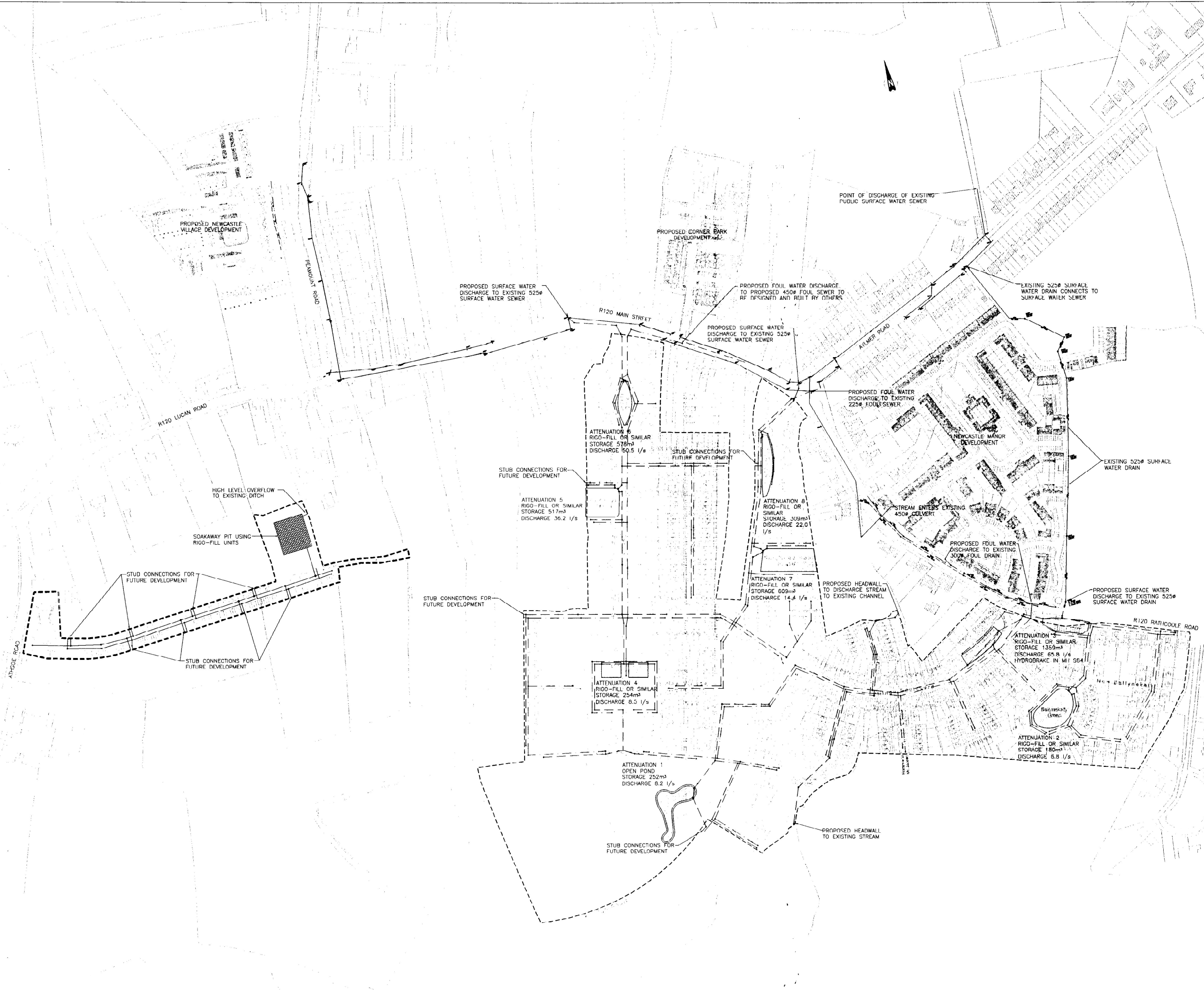
The baseline environment and the assessment of the development in this chapter was described based on the information collected from the sources mentioned under the Section 7.4.

## APPENDIX 7.A SD05A-0344 Drainage Layout

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**DRAINAGE NOTES:**


1. ALL WORKS SHALL BE CARRIED OUT IN A SAFE MANNER AND IN ACCORDANCE WITH CURRENT STATUTORY LEGISLATION INCLUDING THE SAFETY, HEALTH AND WELFARE AT WORK ACT, 1989, AND THE SAFETY, HEALTH AND WELFARE (CONSTRUCTION) REGULATIONS, 2001.
2. ALL WORKS IN CONFINED SPACES SHALL BE CARRIED OUT IN ACCORDANCE WITH THE PROVISIONS OF "SAFE WORK IN CONFINED SPACES" CODE OF PRACTICE FOR WORKING IN CONFINED SPACES, PUBLISHED BY THE SAFETY & SAFETY AUTHORITY.
3. ALL SITE DEVELOPMENT WORKS SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH THE CONSTRUCTION DRAWINGS.
4. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY AND THE DEPARTMENT OF THE ENVIRONMENT "RECOMMENDATIONS FOR SITE DEVELOPMENT WORKS IN HUMAN MADE", S.S. 8008:1987 "SEWERAGE" & S.S. 8301:1985 "BUILDING DRAINAGE".
5. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER CONTRACT DOCUMENTATION, INCLUDING DRAWINGS AND SPECIFICATIONS.
6. DO NOT SCALE FROM THIS DRAWING - USE STATED DIMENSIONS ONLY, IF IN DOUBT ASK THE ENGINEER.
7. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR LOCATING, PROTECTING AND MAINTAINING ALL EXISTING SERVICES WITHIN THE SITE BOUNDARY AND IN THE AREAS AFFECTED BY THE WORKS. THE ENGINEER HAS PROVIDED INFORMATION ON OTHER SERVICES BUT DOES NOT GUARANTEE THAT THIS INFORMATION, PROVIDED BY THIRD PARTIES, IS CORRECT OR THAT THESE ARE THE ONLY SERVICES ON THE SITE.
8. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CORRECT AND ACCURATE SETTING OUT OF THE WORKS ON SITE.
9. PRIOR TO THE COMMENCEMENT OF THE WORKS THE CONTRACTOR SHALL SURVEY AND SURVEY (AS REQUIRED) ALL EXISTING PIPES AND MANHOLES WHICH ARE TO BE PROTECTED AND MAINTAINED. CLEANING, WHERE INSTRUCTED, SHALL BE CARRIED OUT USING A METHOD WITH A MINIMUM PRESSURE OF NOT LESS THAN 2000psi. ALL BRANCH CONNECTIONS RECOVERED SHALL BE TRACED AND LOCATED ON SITE. ALL DETAILS OF COMPLETED INSPECTIONS / SURVEYS SHALL BE FORWARDED TO THE ENGINEER FOR CONSIDERATION AS SOON AS THE INFORMATION IS AVAILABLE.
10. THE CONTRACTOR SHALL CARRY OUT A CITY SURVEY OF THE NEWLY CONSTRUCTED SEWERS AND MANHOLES ON COMPLETION OF THE WORKS. WHERE DEFECTS ARE DISCOVERED THE CONTRACTOR SHALL CARRY OUT THE NECESSARY REPAIRS, AS SPECIFIED BY THE ENGINEER, AT HIS ADDITIONAL COST TO THE CLIENT.
11. ALL PRIVATE DRAINS SHALL BE LAID AT A GRADIENT OF 1 IN 80 UNLESS SPECIFIED OTHERWISE ELSEWHERE.
12. ALL PRIVATE SEWERS (EXCEPT TO BE TAKEN-IN-CHARGE) SHALL BE PRECAST CONCRETE PIPES WITH FLEXIBLE JOINTS TO BS 811, UNLESS STATED OTHERWISE ELSEWHERE, AND SHALL BE LAID AT THE GRADIENT SPECIFIED ON THE DRAINAGE PLAN AND SECTION DRAWINGS.
13. PRECAST MANHOLE RINGS, COVER SLABS AND REDUCING SLABS SHALL COMPLY WITH I.S. 400 SERIES.
14. PRECAST MANHOLE RINGS, COVER SLABS AND REDUCING SLABS SHALL BE INSTALLED COMPLETE WITH TYPE 2 RUBBER GASKETS AND JOINTING RINGS WHICH COMPLY WITH S.S. 345:1.
15. CONCRETE TO MANHOLE BASES AND SURROUNDS SHALL BE GRADE C30. SURROUNDING SHALL BE A MINIMUM OF 120MM THICK AND CONTAIN ONE LAYER OF A142 REINFORCEMENT WIRE.
16. BLENDING CONCRETE SHALL BE GRADE C15. BLENDING SHALL BE A MINIMUM THICKNESS OF 100MM.
17. SAND CEMENT RENDER 20MM THICK SHALL BE APPLIED TO THE BENCHING AND CHAMFER, WITH A STEEL TROWEL FINISH.
18. LADDER RINGS SHALL BE P.V.C. COATED STEEL FOR MANHOLES WITH A DEPTH TO INVERT GREATER THAN 4.0M USE GRADE 316 STAINLESS STEEL LADDERS OR GALVANIZED MILD STEEL.
19. LADDER COVERS AND FRAMES SHALL COMPLY WITH I.S. E.H. 132 AND SHALL BE CLASS B400 WITH A CIRCULAR OPENING OF 900MM MINIMUM AND A SQUARE FRAME.
20. SUITABLE SHORT LENGTHS OF PIPE OR ROCKER PIPES SHALL BE INSTALLED TO PROVIDE A FLEXIBLE JOINT WITHIN 100MM OF THE INVERT OF THE MANHOLE ON ALL SEWERS AND BRANCHES.
21. SLOPE ENGINEERING BRICK SHALL BE GRADE 47H/4M2.
22. FOR ALL INLETS, OUTLETS AND BRANCHES MATCH CROWN LEVELS UNLESS INDICATED OTHERWISE ELSEWHERE.
23. HYDRORAKE FLOW CONTROL SYSTEM SHALL BE SUPPLIED BY HYDRO INTERNATIONAL/PRING DUBLIN LIMITED OR SIMILAR APPROVED. THE SYSTEM SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
24. WHERE ROOM IS SET IN TRENCHES IT SHALL BE EXCAVATED AND FINISHED TO 300MM BELOW THE UNDERSIDE OF PIPES.
25. GRANULAR MATERIAL SAND - 20MM NOMINAL SIZE GRADE APPROX. (TO COMPLY WITH TABLE 1 OF BS) TO BE USED FOR BEDDING, HAUNCHING AND SURROUNDING TO PIPES WHERE SPECIFIED.
26. CONCRETE AND C30 TO BE USED FOR BEDDING, HAUNCHING AND SURROUNDING WHERE SPECIFIED.
27. WHERE RIGID PIPES WITH FLEXIBLE JOINTS ARE USED WITH CONCRETE BEDS FOR DRAINS AND WATERWAYS, VERTICAL JOINTS SHALL BE PROVIDED IN THE BEDS AT MAX INTERVALS OF 5.0m AND ALIGNED WITH FACE OF THE JOINTS TO BE MINIMUM 15mm WIDE AND FILLED WITH FLEXIBLE OR SIMILAR APPROVED MATERIAL.
28. SURFACE WATER AND Foul DRAINS SHALL BE SURROUNDED BY 150 THICKNESS OF C30 CONCRETE IF COVER TO PIPE IS LESS THAN:
  - 1.2m IN ROADS AND DRIVEWAYS
  - 0.9m IN OPEN SPACES AND PATHS NOT NEAR CARRIAGEWAYS.
29. ALL PIPE RINGS SHALL BE LAID IN STRAIGHT LINES BOTH VERTICALLY AND HORIZONTALLY TO THE SPECIFIED GRADIENTS BETWEEN MANHOLES. NO DEVIATIONS OR BENDS SHALL BE PERMITTED.




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Revision	Date	Drn By	Chkd By

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ISO 9001

Client	TENBURY DEVELOPMENTS		
Project	NEWCASTLE MASTERPLAN PHASE 1		
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Scale	1:2000	DRN BY	NMM
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