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CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

Environmental Impact Assessment Report
Development at Waterford Airport

Volume 2 – Chapter 7 – Hydrology and Water Quality

Prepared for: Waterford City & County Council in Partnership with Waterford Regional Airport PLC

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

Waterford Airport
Serving the Southeast for 30 years

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Core House, Pouladuff Road, Cork
T12 D773, Ireland

T: +353 21 496 4133 E: info@ftco.ie

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7. HYDROLOGY AND WATER QUALITY

7.1 Introduction

This chapter addresses hydrology and water quality in the existing environment, identifies potential impacts of the proposed development and outlines measures to mitigate potential impacts.

The drainage of new hard standing areas and extended runway is considered, taking account of mitigation measures to reduce or eliminate any potential impacts. The wastewater treatment plant associated with the terminal building extensions, installation of navigation lights, extension to car parking is also considered.

The existing hydrological environment is summarised below. The catchments are described as well as information on the Water Framework Directive status of the waterbodies related to the proposed development.

The outline drainage proposal for this project has been designed by Frank Fox Consulting Engineers in conjunction with Waterford Airport.

7.2 Methodology

7.2.1 Consultation

This chapter considers the responses, with particular regard to concerns relating to hydrology and water quality.

7.2.2 Desktop study

The desktop study involved an examination of the hydrological aspects and water quality aspects of the following sources of information:

- Current and historic Ordnance Survey Ireland mapping, and ortho-photography.
- OPW Indicative Flood Maps.
- Catchment Flood Risk Assessment and Management (CFRAM) Study Maps.
- Study of existing surface water/drainage features in the vicinity.
- Review of the Water Framework Directive online mapping and data.
- Review of the EPA online mapping.
- Study of the proposed layout of the development.
- Liaison with geotechnical specialists for details on soil conditions on the site.
- Review of designated areas within 15km of the proposed development site.
- Study of planning documents for adjacent developments.
- History of flooding and status of drainage in the vicinity of the proposed development.
- Waterford County Development Plan 2011-2017.
- Waterford City Development Plan 2013-2019.
- River Basement Management Plan for Ireland 2018-2021.

- South Eastern River Basin District (SWRBD) – River Basin Management Plan and Water Maps (wfdireland.ie)
- Rainfall data obtained from Met Éireann.

The assessment is carried out in accordance with the following guidance:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Draft August 2017 (EPA)
- Guidelines on the information to be contained in EIS (EPA, 2002);
- Advice Notes on Current Practice in the Preparation of EIS (EPA, 2003); and
- Advice Notes for Preparing Environmental Impact Statements Draft September (EPA, 2015).

Other reference documents used in the preparation of this section include the following:

- National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016); and
- Department of Environment, Heritage and Local Government, The Planning System and Flood Risk Management Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government, 2009).

7.2.3 Evaluation Criteria

During each phase (construction and operation) of the proposed runway extension, a number of activities will take place, some of which will have the potential to cause impacts on the hydrological regime within the runway catchment and the quality of waters draining from the site.

7.2.4 Assessment of Significance of Impact on the Receiving Environment

An impact rating has been developed for each of the phases of development of the runway extension. The sensitivity of the receiving environment was first identified. Then the magnitude of the potential impact was estimated. The sensitivity rating, together with the magnitude of the potential impact, provides an overall rating of the significance of the impact prior to application of mitigation measures.

7.2.5 Sensitivity of Receptors

The sensitivity of an environmental receptor is based on its ability to absorb an impact without perceptible change. The hydrological environment is considered to be of **moderate** sensitivity due to the proximity of a number of the European protected environmentally designated sites.

The runway extension does not traverse any Special Protection Area (SPA). The south end of the runway is approximately 1.6km north of the Tramore Back Strand SPA (004027). The Tramore Back Strand SPA (00427) lies between Tramore Strand and the lands south of the R685. The next closest SPA is the Mid-Waterford Coast SPA which is approximately 7km from the south runway extension. There is a Special Area of Conservation also located at the Tramore Back Strand (Tramore Dunes and Back Strand SAC (000671)) which is approximately 1.2km from the southern runway extension.

There is a hydrological link from the proposed development to the environmentally designated site (closest point is 1.6km upstream – south east corner of Waterford Airport site) via the watercourses which the runway connects with. The runway drainage discharges directly a French drain incorporating a perforated pipe. The surface water percolates to groundwater through the French drain and discharge directly to the watercourses via land drains. The pathways are via the Kilmacleague West watercourse and the Ballygunnermore watercourse. Any other designated sites in the vicinity are in different waterbody catchments or are not hydrologically connected.

7.2.6 Assessment of Magnitude and Significance of Hydrological Impact

The assessment of the magnitude of an impact incorporates the timing, scale, size and duration of the potential impact. The magnitude criteria for hydrological impacts are defined as set out in Table 7.1.

Table 7-1: Assessment of Magnitude of Hydrological Impact

Magnitude	Criterion	Description and Example
major	loss of attribute	long term changes to the hydrology and water quality e.g., loss of EU-designated salmonid fishery: • change in water quality status of river reach • loss of flood storage/increased flood risk • pollution of potable source of abstraction
moderate	impact on integrity of attribute or loss of part of attribute	• short to medium term changes to the hydrology and water quality: • loss in productivity of a fishery • contribution of significant sediment and nutrient quantities in the receiving water, but insufficient to change its water quality status
minor	minor impact on attribute	detectable but non-material and transitory changes to the hydrology and water quality - measurable change in attribute, but of limited size and/or proportion
negligible	impact on attribute but of insufficient magnitude to affect the use/integrity	no perceptible changes to the hydrology and water quality: • discharges to watercourse but no loss in quality, fishery productivity or biodiversity • no increase in flood risk

Potential impacts are assessed as being of major, moderate, minor or negligible significance. The shaded boxes in Table 7.2 represent impacts considered to be significant in terms of the impact assessment.

Table 7-2: Significance of Criteria

Magnitude	Sensitivity			
	Very high	High	Medium	Low
Major	major	major	moderate	minor
Moderate	moderate	moderate	moderate	minor
Minor	minor	minor	minor	negligible
Negligible	negligible	negligible	negligible	negligible

As part of the evaluation of the runway extension, a flood risk identification and assessment were carried out. As the development comprises already existing infrastructure and is deemed to be a Less Vulnerable Development, as interpreted from Table 3.1 and Table 3.2 of the guidelines produced by the Department of Environment, Heritage and Local Government (DoEHLG) – "The Planning System and Flood Risk Management Guidelines for Planning Authorities" (November 2009), the flood risk 'to the development' need not be examined and a Justification Test is deemed not to be required.

However, any potential increase in surface water run-off due to the development in areas deemed to be already at risk of flooding will be examined as part of the impact evaluation in this chapter and mitigation measures will be proposed where required.

In all cases where required, a cumulative flood risk assessment will be undertaken. It should be noted that according to the PFRA the proposed runway extension route and ancillary works associated with extension of the existing infrastructure are not located within in Flood Zone A or B and is therefore classed as being Flood Zone C.

- Flood Zone A - a probability of fluvial flooding greater than 1 in 100 years and of tidal flooding of 1 in 200 years);
- Flood Zone B – a probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding);
- Flood Zone C – a probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas not in Flood Zone A or B.

7.3 Existing Environment

7.3.1 Topography and Soils

The proposed runway extensions to the north and south of the existing runway are located in till derived from acidic volcanic rocks soils with a fall to the south east. The high elevation point is approximately 39mOD to the west of the runway, falling to the alluvium deposits which form the Kilmacleague West watercourse and the Ballygunnermore watercourse.

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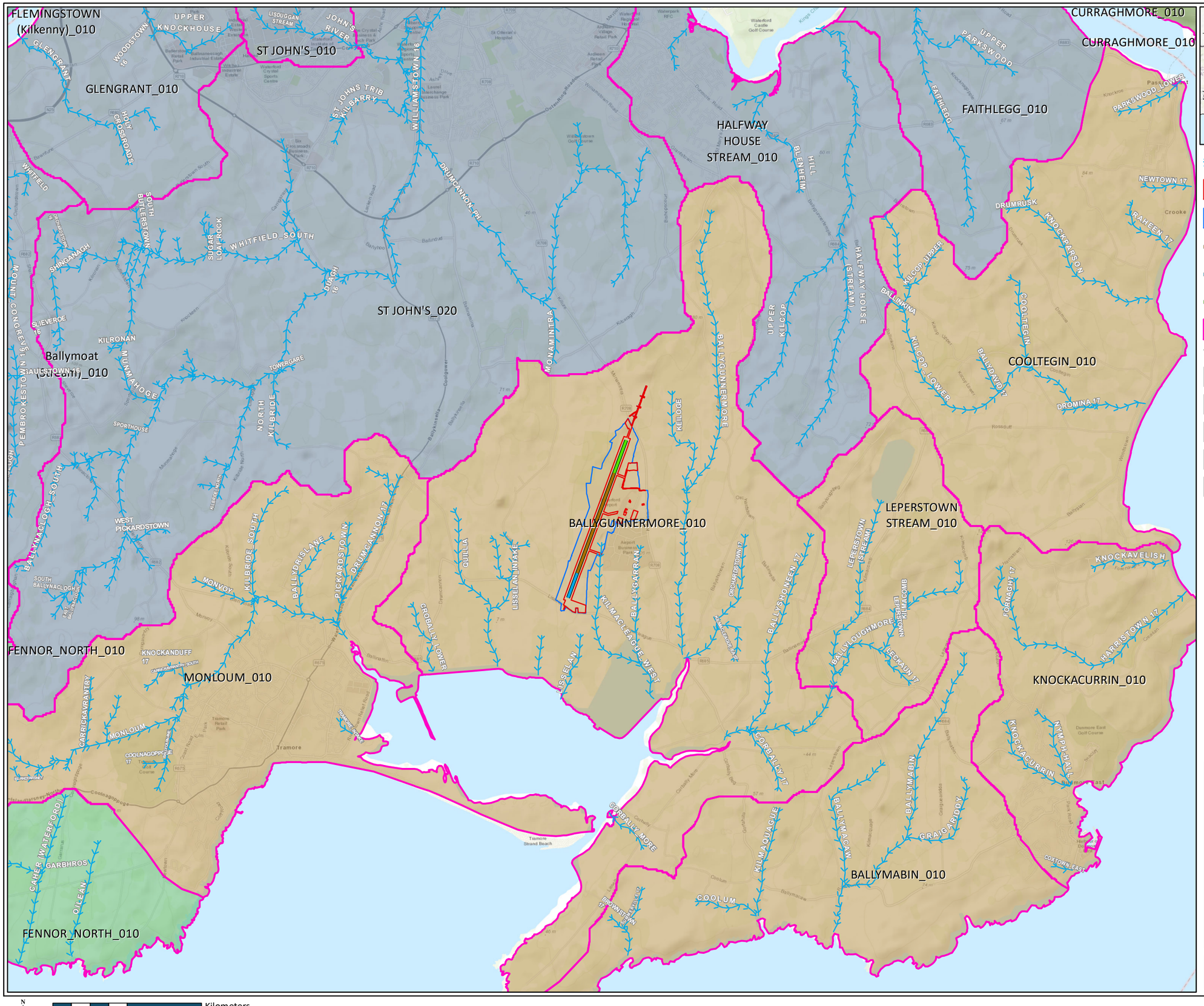

TITLE:	River Sub-Basins
PROJECT:	Waterford Airport Runway Extension
FIGURE NO:	7.1
CLIENT:	Waterford Airport
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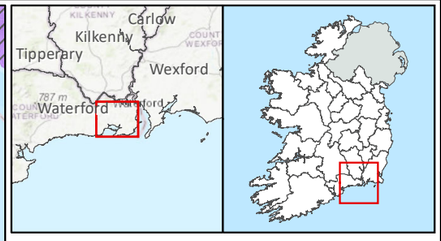

Site Boundary

Land under SERA (South East Regional Airport) and Waterford City and Council Ownership

Existing Runway

Permitted South Extension

Proposed North Extension

Irish Soil Information System - Soil Type

Blown sand/Dune

Coarse loamy drift with siliceous stones

Fine loamy drift with igneous & metamorphic stones

Fine loamy drift with limestones

Fine loamy drift with sillceous stones

Fine loamy drift with siliceous stones

Island

Lake alluvium

Marine alluvium

Peat

River alluvium

Rock

Tidal marsh

Urban

Water body

TITLE: Soils			
PROJECT: Waterford Airport Runway Extension			
FIGURE NO:	7.2		
CLIENT:	Waterford Airport		
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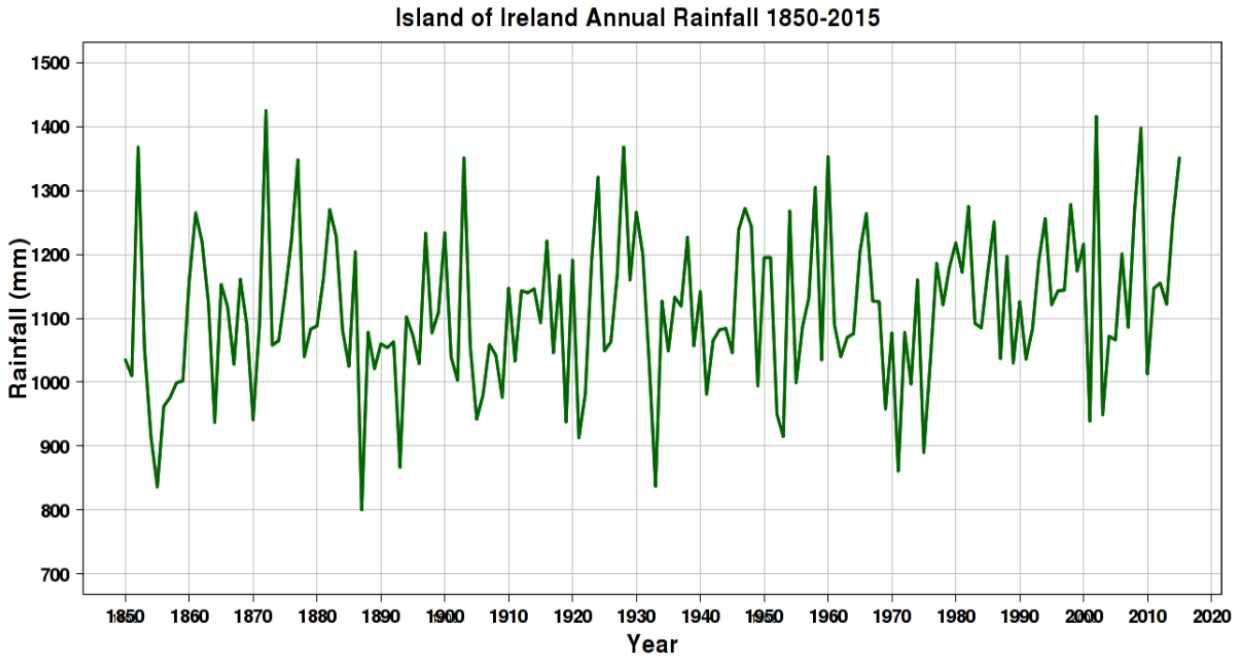
7.3.2 Meteorology

Waterford Airport receives on average 976mm of rainfall per year falling at the high end for the east and low end for the west of Ireland. The east of Ireland typically gets between 750mm and 1000mm of rain per annum, while west of Ireland receives between 1000mm and 1400mm. Table 7.3 below details the annual average rainfall data recorded at Met Éireann rain gauges in the vicinity of the study area, while Figure 7.3 shows their location in the sub-catchment.

Table 7-3: Local Rainfall Data

Station No.	Station Name	Year Range	Annual Average Rainfall (mm)
-	All Ireland Combined	1850-2010	1089mm
1307	Waterford Airport	1981-2010	976mm
707	Belle Lake	1981-2010	992mm
908	Duncannon	1981-2010	1109mm
1812	Waterford (TYCOR)	1981-2010	1029mm
1107	Fenor (Island Tarsney)	1981-2010	991mm
1707	Fenor (Tramore)	1981-2010	903mm
7412	Adamstown	1981-2010	1150mm



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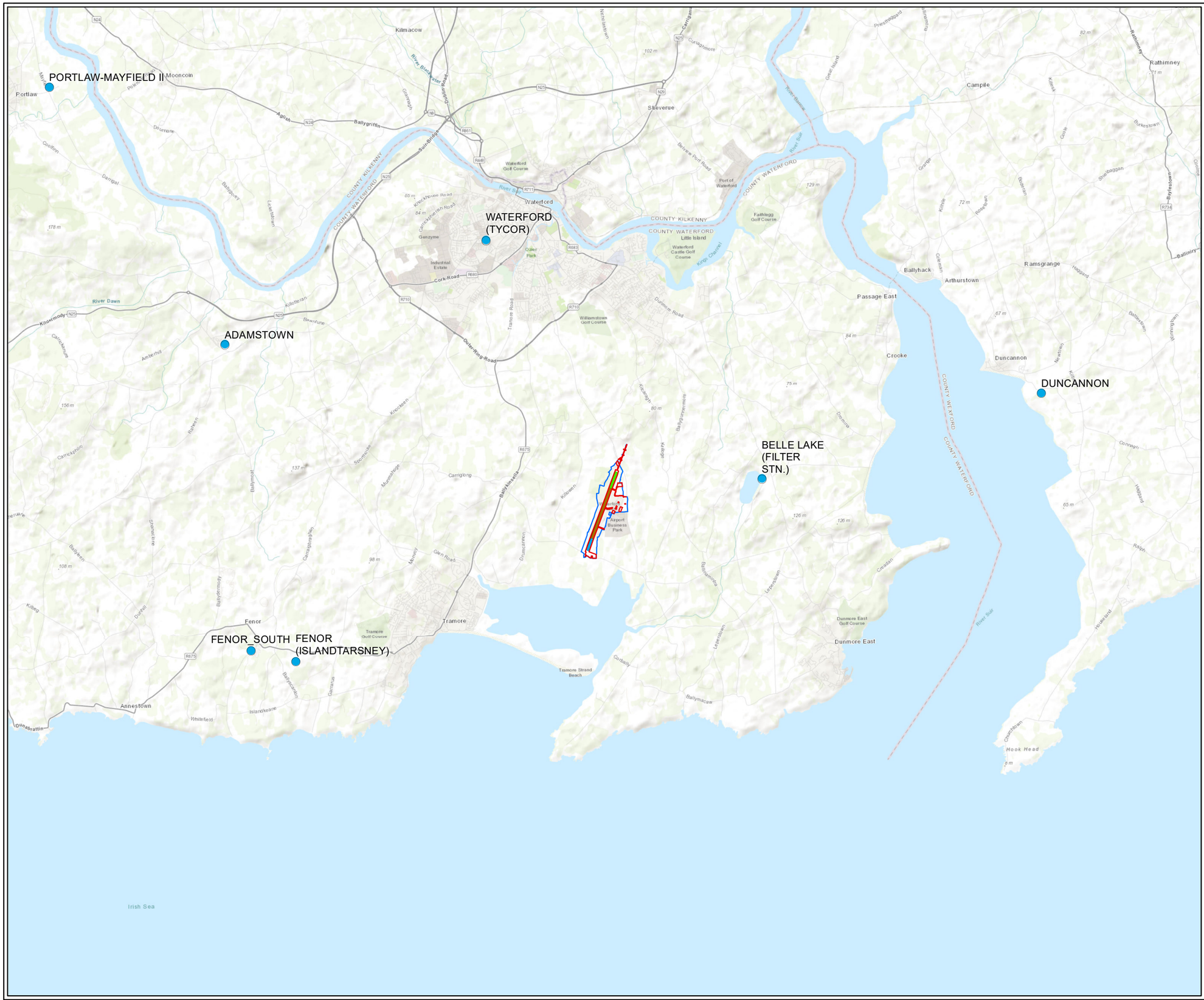

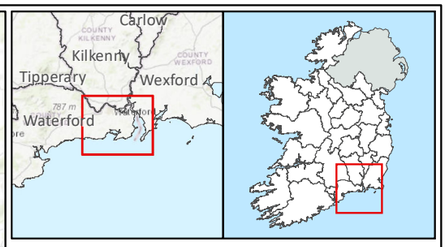

Rainfall Stations

Site Boundary

Land under SERA (South East Regional Airport) and Waterford City and Council Ownership

Existing Runway

Permitted South Extension

Proposed North Extension

TITLE:	Rain Observation Stations		
PROJECT:	Waterford Airport Runway Extension		
FIGURE NO:	7.3		
CLIENT:	Waterford Airport		
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7.3.3 Regional Hydrology

The proposed runway extension development lies within Hydrometric Area HA 17 known as Colligan-Mahon which is under the responsibility of the Irish River Basin District, previously this area was part of the South-Eastern River Basin District (SERBD).

7.3.4 Water Quality

The South-Eastern River Basin District (SERBD) management plan and the River Basin Management Plan for Ireland 2018-2021 were consulted during the preparation of this chapter. The main objectives of the River Basin Management Plan for Ireland 2018-2021 are to:

- Ensure full compliance with relevant EU legislation
- Prevent deterioration
- Meet the objectives for designated protected areas
- Protect high-status waters
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objective and (2) addressing more complex issues that will build knowledge for the third cycle plan

The programme of measures designed to achieve these objectives outlined in the management plan, include the following:

- An Agricultural Sustainability Support and Advisory Programme will be established.
- Local Authorities are putting in place Support and Advisory Teams to carry out scientific assessments to drive the implementation of mitigation measures at a local level.
- Agri-environmental schemes will be implemented
- Compliance with Good Agriculture Practice Regulations will be improved through enhanced Nitrates Action Programme for 2018-2021
- Knowledge transfer programmes will be used within the agriculture sector
- The National Inspection Plan 2018-2021 for domestic waste water treatment systems will use outputs of the catchment characterisation work to further improve the inspection of septic tanks
- Investment in urban wastewater collection and treatment programmes and asset maintenance
- Forestry regulations and policy have been re-aligned to contribute to achieving water quality objectives, and these will be fully implemented
- New legislation is to be introduces for peat extraction to improve environmental regulation
- EU regulation with regard to invasive species will be developed
- Work to address significant pressures arising from hydromorphology, the EPA and Inland Fisheries will improve assessment methods in relation to physical condition of rivers, lakes and marine coastal waters
- The feasibility of implementing measures to improve fish connectivity in the Lower Shannon catchment will be assessed
- The DPHLG will establish a register of water abstractions and will consult on a proportionate and risk-based framework for the regulation of abstraction
- To protect and restore high-water status and establish a ‘Blue Dot Catchments Programme’ and working group. This is to ensure that high-water status waters are prioritised for the implementation of supporting measures

- For protected areas:
    - Around 350 public drinking water source risk assessments completed by 2021
    - Urban wastewater pressures in four of the currently non-compliant bathing waters will be addressed through Irish Water Investment Plan
    - Urban wastewater discharges in the vicinity of shellfish waters will continue to be assessed to determine whether they are contributing to failures in shellfish water objectives and whether additional wastewater treatment is required
    - More stringent treatment will be provided for eight currently non-compliant urban areas discharging to designated nutrient sensitive areas

The site is situated in the MONLOUM_SC_010 sub-catchment which lies entirely within the Colligan-Mahon catchment, which drains into the back strand and sea at Tramore.

The proposed site is located on groundwater waterbody Dunmore East (IE_SE_G_057) which is currently 'Not at Risk' and is of 'Good' status for period 2013-2018.

The proposed site at its closest is 1.6km upstream of the water dependant habitat, Tramore Back Strand SPA (004027).

The Tramore Back Strand SAC extends from Tramore to Kilmacleague. The boundary of the SAC is directly south of the proposed development and 1km south of the R685. The proposed site boundary does not encroach into the SAC at any point. No works are planned to take place in or at the SAC.

The Middle Suir Estuary, which is approximately 6km away, is the only nutrient sensitive area within a 15km buffer of the site. There are no Salmonid Rivers within a 15km buffer of the site.

The nearest EPA water quality monitoring point is at Ballygunnermore River Station, 1.7km south-east of the proposed development.

Details of water quality monitoring of the relevant rivers are outlined in the table below. The following table shows the river water quality status of the closest monitoring stations to the proposed development.

Table 7-4: River Water Quality Monitoring Points

Type	Waterbody	Station Name	Status (2013 – 2018)
River Water Quality	Kilmacleague West	Ballygunnermore (RS17B290990)	Unassigned
River Water Quality	Drumcannon	Monloum (RS17M060970)	Unassigned

The table below provides an overview of the land use and soil present at the site from GSI and CORINE datasets.

Table 7-5: EPA Land Data

	Land Data
Soil (Teagasc Soils)	Shallow well drained mineral - Derived from mainly acidic parent materials
Subsoil	Irish Sea Till derived from acidic volcanic rocks
CORINE 2018 Land Use	Agricultural Areas, Pastures, Artificial Surfaces, Industrial

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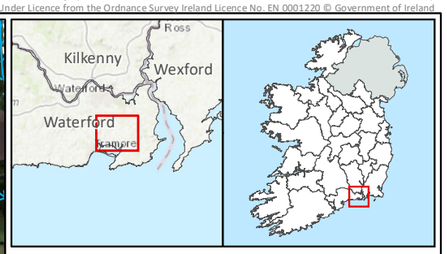

Rivers

WFD Coastal Water Bodies

Site Boundary

Land under SERA (South East Regional Airport) and Waterford City and Council Ownership

Existing Runway

Permitted South Extension

Proposed North Extension

TITLE: Hydrological Features			
PROJECT: Waterford Airport Runway Extension			
FIGURE NO:	7.4		
CLIENT:	Waterford Airport		
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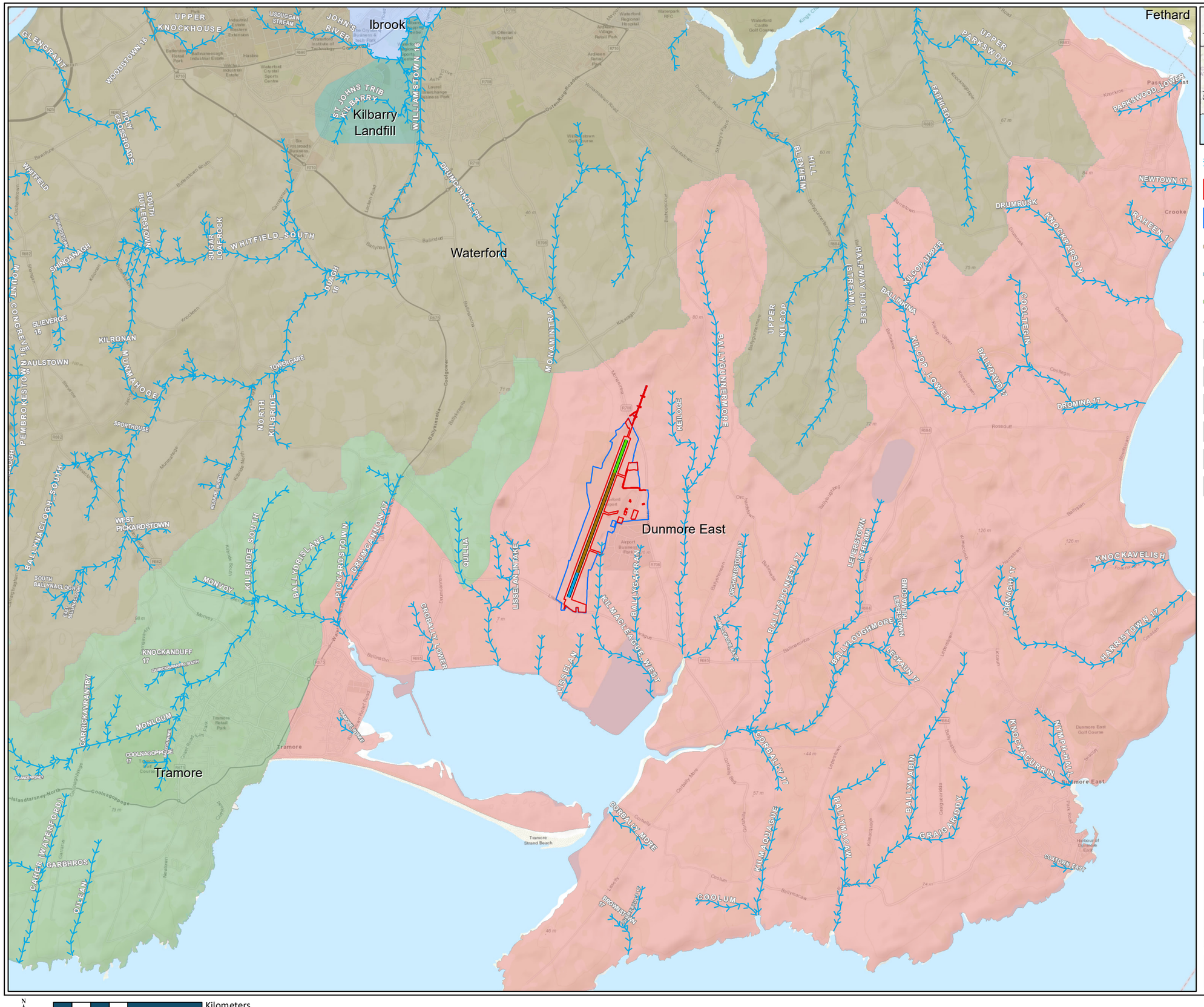

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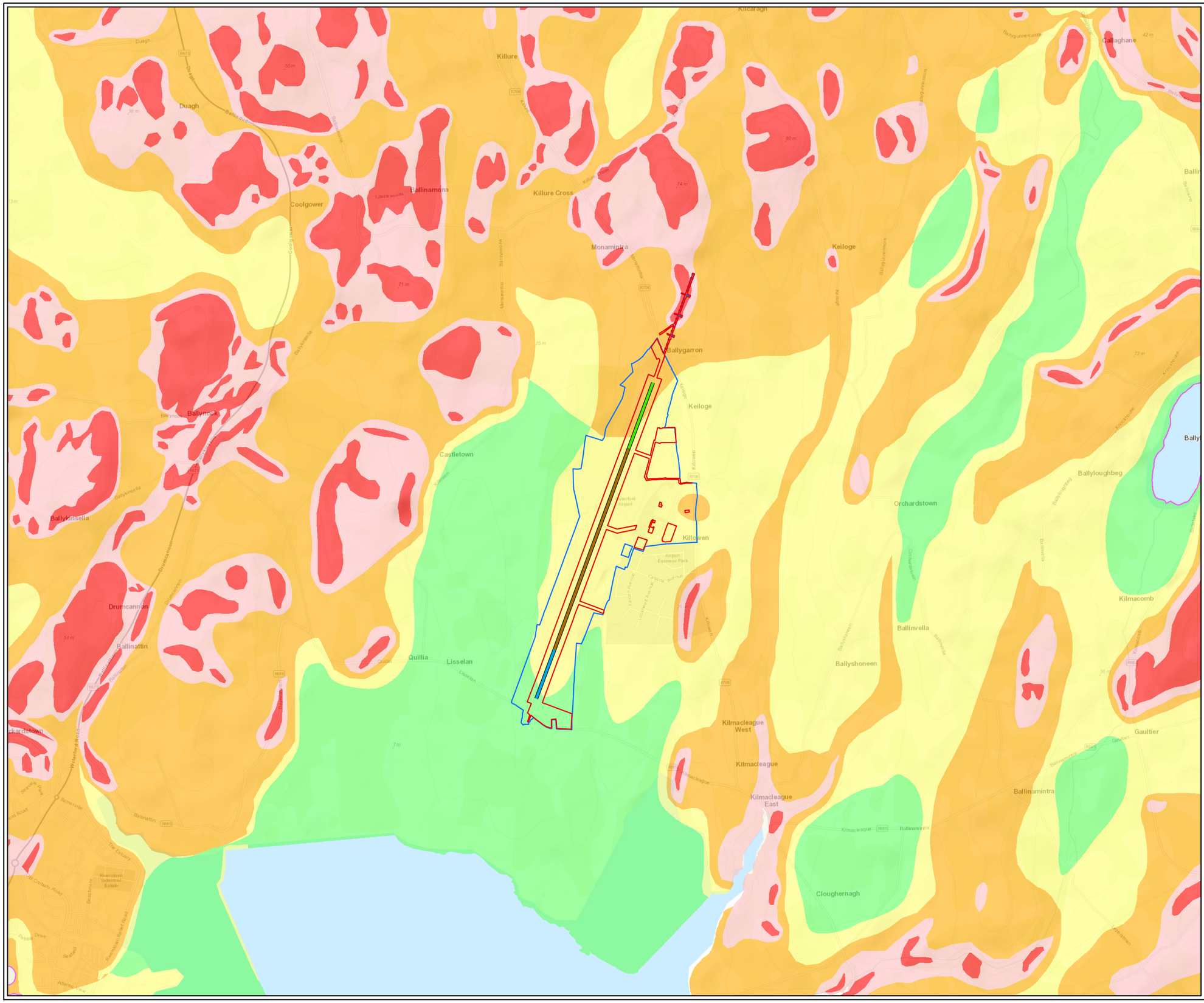

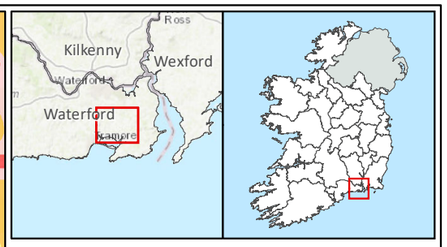

- Site Boundary
- Land under SERA (South East Regional Airport) and Waterford City and Council Ownership
- Existing Runway
- Permitted South Extension
- Proposed North Extension

Groundwater Vulnerability

- E - Extreme
- H - High
- M - Moderate
- L - Low
- Water
- X - Rock Near Surface or Karst

N W E S

0 0.5 1 2 Kilometers

TITLE:	Groundwater Vulnerability		
PROJECT:	Waterford Airport Runway Extension		
FIGURE NO:	7.6		
CLIENT:	Waterford Airport		
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7.4 Existing Site Drainage and Hydrological Features

A site visit was undertaken on 25th June 2018 to examine the existing drainage and any hydrological features at the site. The visit involved a detailed walkover of the site by FT staff, recording existing drainage features and noting their locations to ensure that the design of the runway extension did not adversely impact on the site's existing drainage patterns.

The existing land is grassland and is unused lands to facilitate the runway approach and take-off. The development site is fenced off for security and is bound by natural field hedgerows and ditches. Existing fields are well drained by natural field drainage in the undeveloped areas.

The existing runway falls across two natural drainage catchments, with the northern end (c350m) of the existing runway within the Ballygunnermore catchment and the remaining element of the existing runway in the Kilmacleague West catchment.

Existing catchment drainage travels to the Kilmacleague West watercourse for the southern part of the site (at its closest is 1.6km from the Tramore Back Strand) and the Ballygarran to the east. A drainage channel takes the surface water drainage from the northern part of the site to the Ballygunnermore, which drains to the Tramore Back Strand, 2.4km to the south.

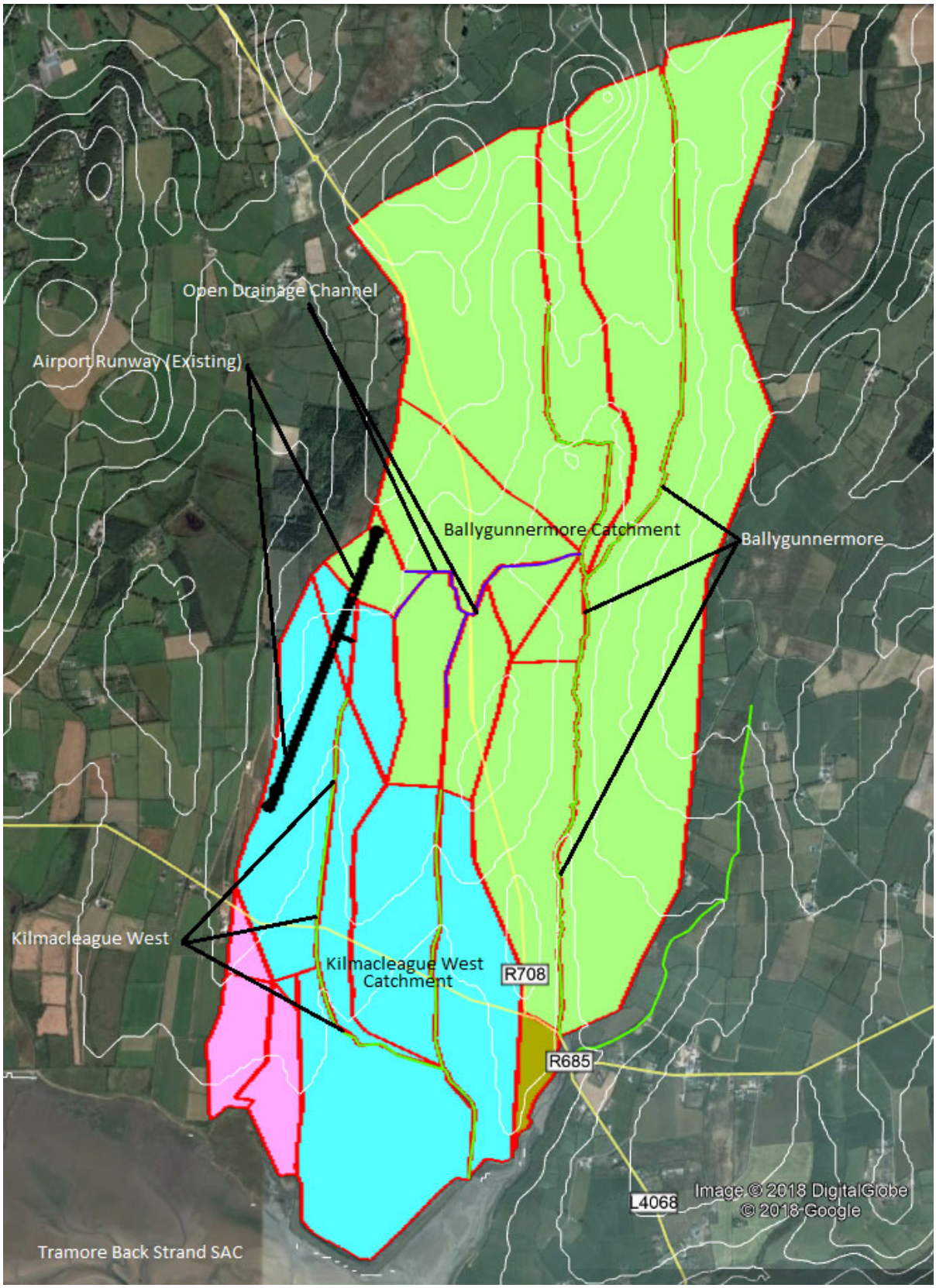

Figure 7-7: Natural Drainage Catchments

7.4.1 Runway Drainage

The existing runway is currently drained by a French drain style drain which runs parallel to the runway on both sides. The drain is approximately 650mm deep and includes a perforated pipe along with single sized stone.

As there are no existing as-built drawings and the exact nature of the drainage outfall from the French drains is not known, the drainage of the runway is assumed to be draining in one of two ways. The first of these would be that the runway French drain is percolating the surface run off directly to ground water beneath. The second is that the perforated pipe within the French drain is connected to land drainage which discharges to the Kilmacleague West at the south-east corner of the airport and to the Ballygunnermore via the open drainage ditch to the north of the airport terminal building.

Site permeability tests (falling head), conducted in June 2018, show that the permeability of the ground surrounding the airport runway does not allow for natural percolation (in the uppermost clay layer) of surface water to groundwater. It is therefore assumed that the perforated pipe within the French drain is conveying the surface water to the Kilmacleague West for the southern part of the runway and to the Ballygunnermore for the northern part of the runway. Both of these watercourses discharge into the Tramore Back Strand to the south east.

There is no historical evidence or records in the OPW database of flooding resulting from the surface water events associated with the runway drainage.

Groundwater sampling and soil sampling conducted as part of the EIAR study do not show signs of residual pollution or contamination in the grounds surrounding the runway drainage.

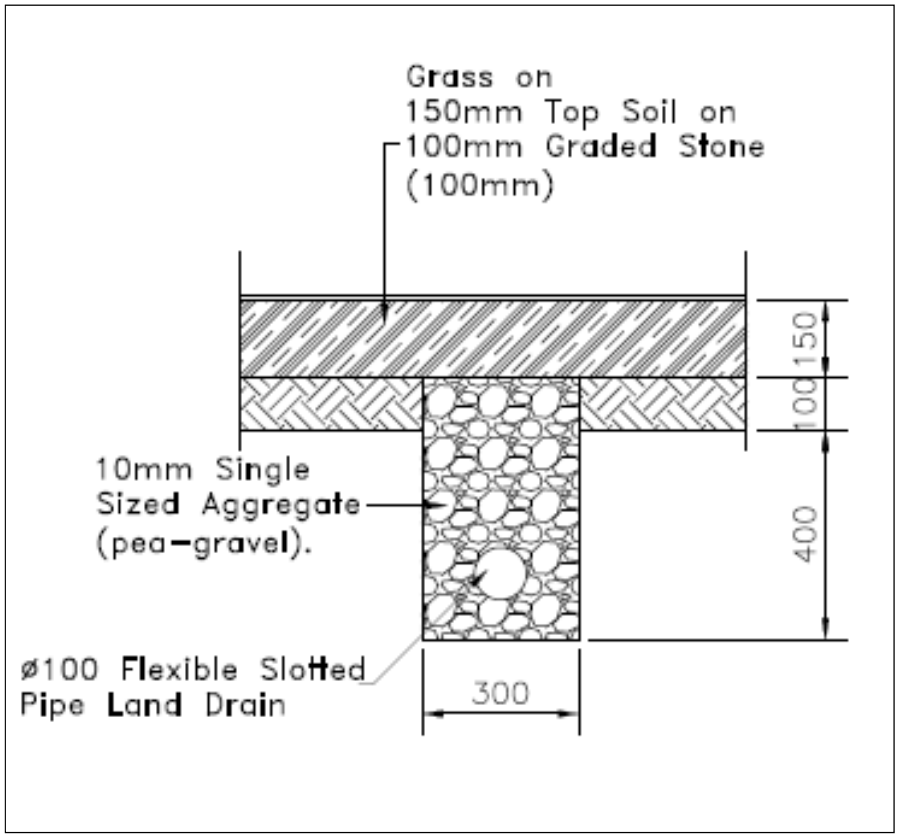

Figure 7-8: Existing runway drainage cross section

7.4.2 Airport Surface Water Drainage

CHC Coastguard (Rescue Hangar) Surface Water Drainage

There is an existing surface water drainage system which serves the CHC Coastguard building and apron to the north of this building, this is where the coastguard helicopter is kept. The drainage branch collecting surface water from the apron (S13 to S12 of figure 7-9) picks up surface water through gullies and then conveys it to an interceptor. The surface water drainage from the CHC building joins this line downstream of the interceptor at S10 and extends to a manhole (S2) where is then discharges to an open drain at S1 to the north.

Hangar Surface Water Drainage

There is existing surface water drainage picking up surface water from the apron outside the airport hangar and takes the surface water from here at S20 to an interceptor at S5. The building surface water also joins this line between S5 and S20 (see figure 7-9).

Existing Car Park Surface Water Drainage

Currently the car park is served by gullies and surface water is drained, along with the roadway in front of the terminal. This surface water drainage is conveyed to the surface water manhole S20 which then picks up the hangar drainage and conveys it to the interceptor at S5 and on to S1 and discharges to the open drain to the north (see figure 7-9).

Airport Apron Drainage

Currently the surface water drainage of the apron in front of the terminal building picks up surface water from three branches S47, S45 and S24 (see figure 7-9).

- S47 picks up gullies along the front of the terminal building and conveys the surface water to the manhole S21 which then conveys it to S20 in front of the hangar building.
- S45 picks up surface water from the south end of the apron in front of the terminal building and joins the S47 branch at S43 before being conveyed to S20 in front of the hangar building.
- S24 conveys surface water from the north end of the parking/apron area in front of the terminal and conveys the surface water to an interceptor at S23 before joining the other lines and being conveyed to S20 in front of the hangar building.

Taxiway Surface Water Drainage

There is currently a French drain running parallel to the taxiway which conveys surface water to the open drain to the north. A surface water drain is also connected to augment the French drain and takes surface water from manhole S52 to S51 and into the open drain at S50 (see figure 7-9).

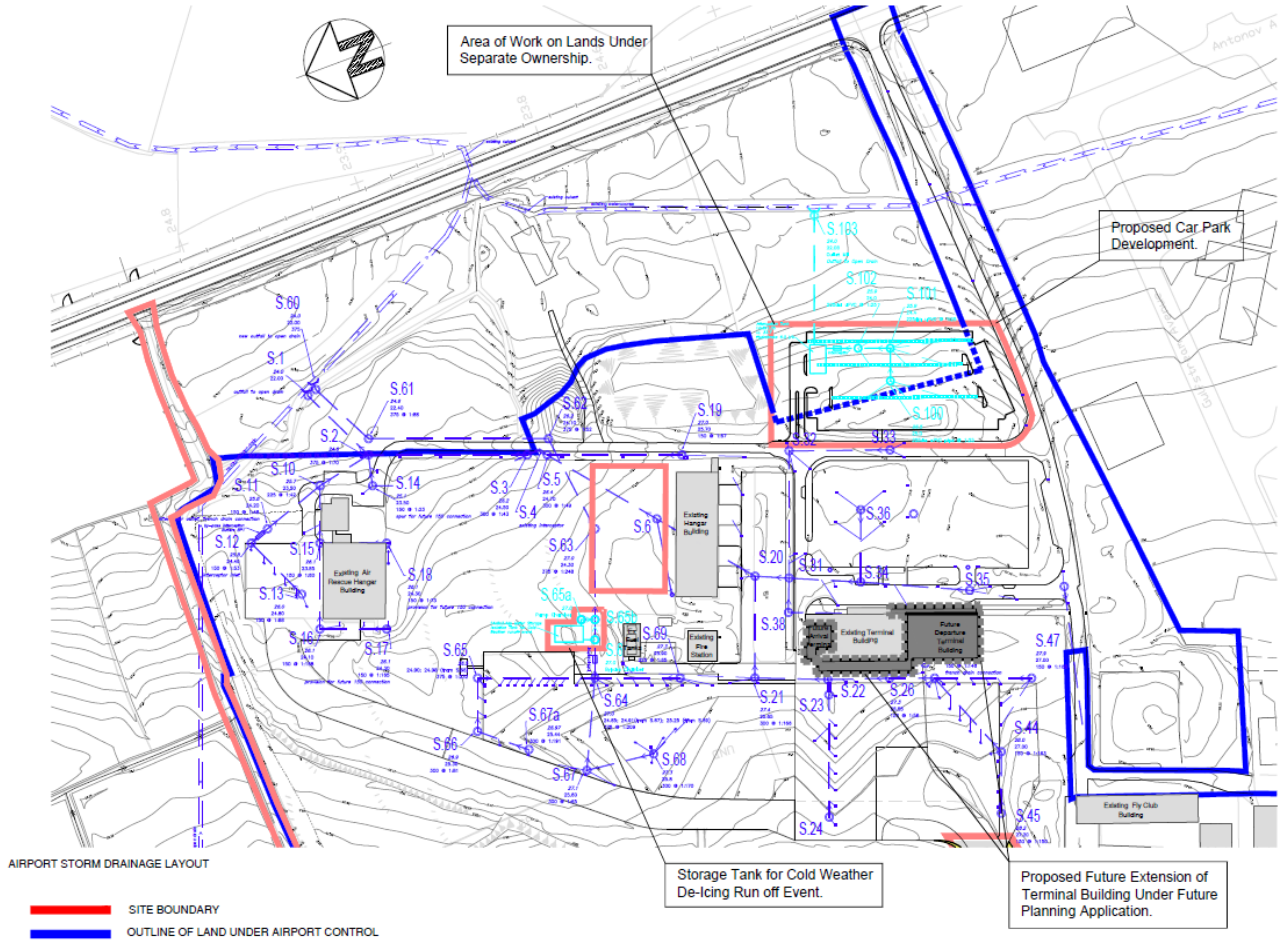

Figure 7-9: Surface water drainage at airport (extract from planning drawing DP/02)

7.4.3 Foul Water Drainage

The existing foul sewer network extends from the treatment plan to the terminal building. There are two branches of foul sewer, one extending along the front of the terminal building and one extending along the airside of the terminal building. This conveys all foul sewer from the terminal building including toilets and foul sewer outlets from the main building.

The two branches of the foul network serving the terminal building join at foul sewer manhole F10 which is located to the east of the fire station building. The foul sewer then extends alongside the existing hanger to manhole F9 which is located to the north of the hanger building. These then extend to inlet manhole F5 where it discharges to the wastewater treatment plant (WWTP) at F1.

The inlet manhole F1 picks up the other branch of foul sewer which begins in the CHC (Coastguard) building and travels to the CHC access roadway (manhole F31); it then extends from F31 to the inlet manhole F1.

The foul sewerage is currently treated using a Butlers Manufacturing Services (BMS) Blivet 1000. This is a package treatment plant which treats foul sewerage by way of a rotating biological contactor. The sewerage is then discharged to an outlet tank before discharging to the open drain. The treatment plant is capable of treating a population equivalent (PE) of 125PE to a standard of 25/35. This treats effluent to the standard of 25mg/l BOD and 35mg/l SS.

Plate 7-1: Blivet BL1000 Rotating Biological Contactor WWTP

Plate 7-2: Outlet Tank

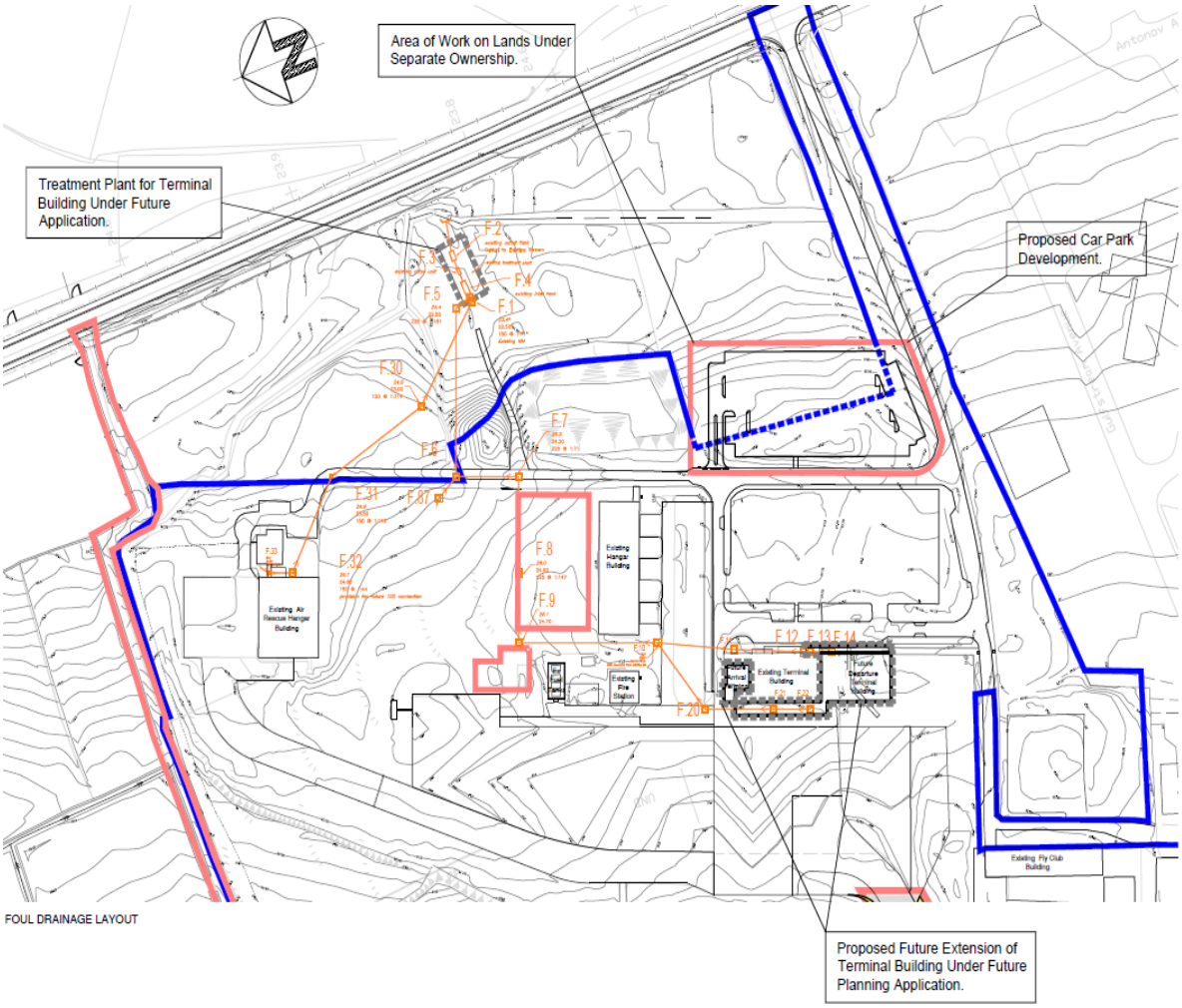

Figure 7-10: Foul water drainage at airport

7.5 Proposed Surface Water Management

7.5.1 Drainage of Development

The catchment of the site is currently well-drained by the natural existing drainage network leading Kilmacleague West, Barrgarran and Ballygunnermore watercourses. The extension does not propose to redirect drainage to different catchments.

7.5.2 Drainage of Runway Extensions

The drainage at Waterford Airport runway is proposed to be extended to incorporate the new extensions either end of the runway. An additional stone area, for drainage and to cater for emergency run off by aircraft, will be constructed with a width of 25m either side of the runway.

The drainage proposal for the new arrangement at the runway is to create percolation zones either side of the runway. The overlying clay layer, which has proven to be impermeable is to be removed and the layers of gravel and weathered rock beneath are to be exposed and a single sized permeable stone fill placed above this. Fox Associates along with IGSL have identified that there are gravel layers and weathered bedrock beneath the clay layer some 2-3m below ground level which will be exposed and used to percolate surface run-off to groundwater, should the permeability tests allow.

Adding to this proposal, a land drain from the percolation stone areas will be installed to allow water to flow directly from the percolation zone to each watercourse for the existing catchments. Should the permeability of the ground not be achieved through the proposal of exposing underlying gravel and weathered bedrock layers, a pathway for draining the percolation zones would exist through the drainage directly to the watercourses.

The existing ground levels on site will not be modified extensively and the infrastructure extension to the north will be drained within the Ballygunnermore catchment, with the southern extension drained within the Kilmacleague West catchment. This will allow the existing drainage regime at the site to be maintained as much as possible.

Currently there is no evidence or OPW recorded flooding as a result of the runway drainage to either watercourse. As outlined in Section 7.5.7, the additional runoff from the runway extensions would cause a worst case of 0.75% additional runoff to the Ballygunnermore catchment and 1.3% additional runoff to the Kilmacleague West catchment. As the proposal by Waterford Airport is to percolate to groundwater, should the suitable pathway be installed, then the above additional run-off is unlikely to be achieved.

Previously de-icing was conducted during cold weather periods on the runway. Soil and groundwater samples have been taken and there is no residual contamination or residue around the runway. It is noted that de-icing the runway was infrequent and the most recent de-icing event was in November 2015.

7.5.3 Drainage of Temporary Site Compounds

A main temporary compound will be provided on site for the proposed development with two satellite compounds provided at the north and south of the runway. The location of the main site compound will be to the north of the hangar building and the satellite compounds will be places to the north and south ends of the runway.

Drains around the hard-standing areas of the site compounds will be in the form of shallow grassed swales to minimise the disturbance to sub-soils.

The swales will drain to temporary stilling ponds with diffuse outfalls, to ensure that no silt-laden runoff drains directly from the temporary compounds during the construction period. The stilling ponds will be backfilled following the construction period and the vacation of the temporary site compounds.

Refuelling of plant during construction will be carried out at a dedicated refuelling station on site, which will be a minimum of 100m from any ditch or watercourse. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site. Only emergency breakdown maintenance will be carried out on site and appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site.

Any diesel or fuel oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110 % of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110 % of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines).

Portaloos and/or containerised toilets and welfare units with storage tanks will be used to provide toilet facilities for site personnel during construction. The sanitary waste will be removed from site by a licensed waste disposal contractor. All Portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions and will be serviced under contract with the supplier. All such units will be removed from site following completion of the construction phase.

Temporary petrol and oil interceptors will be installed at the temporary site compound at the locations dedicated for plant repairs/storage of fuel/temporary generator installation. Surface water run-off from the temporary site compound will be directed through a Class 1 Full Retention Oil Interceptor before discharge to the dirty water drainage system for the site.

A trained and dedicated environmental and fuel spill emergency response team will be set up on site before commencement of construction on-site.

7.5.4 Drainage of Extended Terminal Buildings

The extended terminal buildings will be drained using the existing network of surface water sewers. These convey surface water sewer to the front and to the rear of the building before traveling through an interceptor and in to the open drain to the north which drains to the Ballygunnermore Stream some 900m away.

Foul drainage from the building will be drained through the existing foul sewer network to the front and rear of the terminal building. A large increase in passenger numbers will increase the load being conveyed to the wastewater treatment plant, from the terminal building. The wastewater treatment plant will be upgraded to accommodate this additional load and an assimilative capacity study will be required to determine the level of treatment required by the upgraded wastewater treatment plant. Details of the proposed wastewater treatment plant upgrade were not available at the time of writing.

7.5.5 Drainage of New Car Park

The extended car park will be drained using a network of surface water gullies. These will take the form of three 'eco drain' style drains. These will then be conveyed by a newly installed surface water sewer before traveling through an interceptor and in to an attenuation tank. The attenuation tank has been sized at 14mx8mx1.35m and will then discharge to the open drain to the east which drains to the Ballygunnermore some 900m away. This attenuation tank will be controlled with an outflow restriction of 6.0l/s to the open drain. The outflow of the attenuation tank was determined as part of the car park design by Frank Fox & Associates.

7.5.6 Wastewater Treatment Plant Upgrade

As the passenger numbers increase and the terminal buildings expanded, the wastewater treatment plant will need to be upgraded. In assessing this, the assimilative capacity of the outfall will need to be considered and the treatment upgrade will need to be such that the assimilative capacity of the receiving waters will not be adversely impacted by the increased flow from the upgraded wastewater treatment plant.

7.5.7 Additional run-off

The additional run-off produced by the development are summarised in Table 7-6 below.

The additional run-off to the catchment draining through the Kilmacleague West watercourse is 1.3% and the increased run-off to the catchment draining to the Ballygunnermore is 0.75%.

Table 7-6: Run-off Calculations

South Runway	Catchment	Overland flow area x 0.3 Imp. Factor	x 0.3 Imp. Factor	Imper meable Area	x 1.0 Imp. Factor	Total Run-off Imp. Area	Q flow coefficient Mod. Rational Method	Rainfall Intensity for 1 in 100 yr storm of 30 mins. X 1.1 for Climate Change, Met Eireann*	Run-off	Increase in Run-off	% Increase in Run-off
Scenario	ha		ha	ha		ha		mm/hr	m3/s	m3/s	
Existing Catchment	258.5	0.30	74.38			74.38	2.78	35.09			
Exiting Development	10.56			10.56	1.00	10.56	2.78	35.09			
						84.94	2.78	35.09	8.286		
South Runway Extension	1.1			1.10	1.00	1.10	2.78	35.09	0.107	0.107	
% Increase in Run-off											1.30%

North Runway	Catchment	Overland flow area x 0.3 Imp. Factor	x 0.3 Imp. Factor	Imper meable Area	x 1.0 Imp. Factor	Total Run-off Imp. Area	Q flow coefficient Mod. Rational Method	Rainfall Intensity for 1 in 100 yr storm of 30 mins. X 1.1 for Climate Change, Met Eireann*	Run-off	Increase in Run-off	% Increase in Run-off
Scenario	ha		ha	ha		ha		mm/hr	m3/s	m3/s	
Existing Catchment	613.15	0.30	176.93			176.93	2.78	35.09			
Exiting Development	23.4			23.40	1.00	23.40	2.78	35.09			
						200.33	2.78	35.09	19.542		
North Runway Extension	1.5			1.50	1.00	1.50	2.78	35.09	0.146	0.146	
% Increase in Run-off											0.75%

7.6 Flood Risk Identification and Assessment

7.6.1 OSI Historic 6inch Mapping

The OSI historic mapping was examined for indication of historically, frequently flooded areas. Relevant map symbology identified in each sub-site is listed below.

Table 7-7: Evidence of Historical Flooding

Area	Feature
North	None
South	Cloghernagh Back Strand Tramore in December 1989
West	Killowen Castletown recurring
East	None

National Flood Hazard Mapping Website

The National Flood Hazard Mapping website operated by OPW (www.floodmaps.ie) has collated records of historic flooding events throughout Ireland. The website (www.floodmaps.ie), indicates that there are no records of flooding within the site.

There are two locations within a 5km buffer of the site with a recorded flood history. The nearest report of recurring flooding is Cloghernagh at Tramore Back Strand, which is circa 2km southeast of the proposed site. The other reporting is of recurring flooding at Killowen which is 1.2km west of the proposed site, this is in a different catchment to that of the airport. It should be noted that an absence of recorded flood history does not conclusively mean that the site has never flooded, only that no flooding at the site has been recorded. The OPW historic flooding points are included on Figure 7-11 of this report.

The OPW mapping available at www.floodmaps.ie indicates that there are no areas in or around the site designated as 'benefitting Lands'[1], and no areas of land designated as a Drainage District[2] as defined by the OPW.

[1] Benefitting Lands are defined by the OPW is a dataset prepared by the Office of Public Works identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land subject to flooding or poor drainage.

[2] A dataset prepared on behalf of the Drainage Districts (Local Authorities with statutory responsibility for maintenance under the Arterial Drainage Act, 1925). These maps identify land that might benefit from the implementation of Arterial (Major) Drainage Schemes and indicate areas of land subject to flooding or poor drainage.

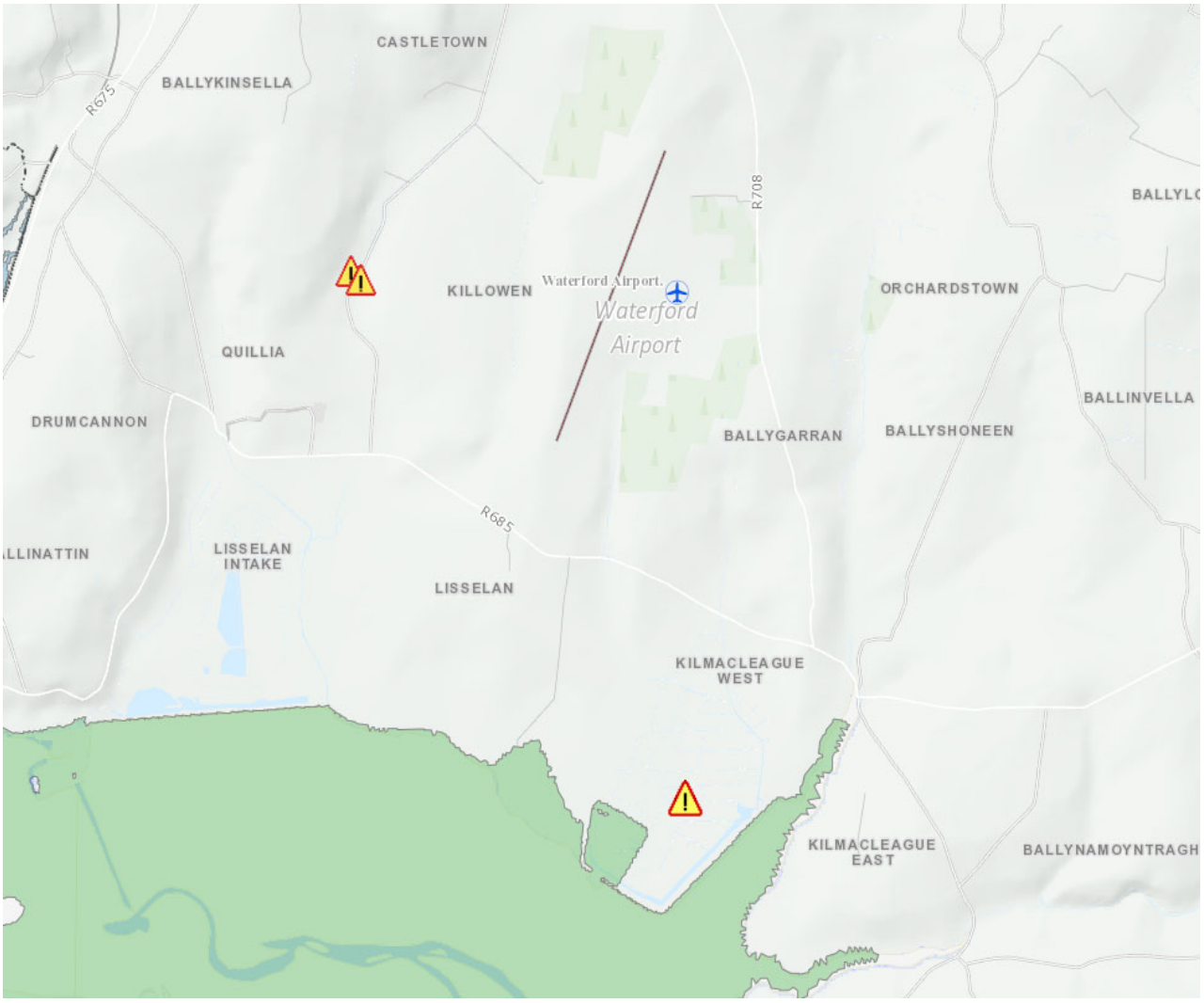

Figure 7-11: Historical Flooding Locations

Preliminary Flood Risk Assessment (PFRA)

The OPW prepared indicative flood mapping, a preliminary flood risk assessment (PFRA) which considers fluvial, pluvial, coastal and groundwater flood risk. The PFRA is a high-level screening exercise at a national scale to assist in identifying areas at potential flood risk, for further assessment. The mapping is crude and developed using several sources of information. The mapping comes heavily caveated, as it is not suitable to use as the sole basis for a site-specific flood risk assessment, however it is useful in providing an indication as to whether the study area may be subject to flooding.

As there is no known history of fluvial flooding at the site and as it was not identified as an area for further assessment as part of the National Catchment Flood Risk Assessment and Management (CFRAM) Programme, there is no further, publicly available, existing flood mapping of the site. The best available indication of flood risk at the proposed site is the PFRA and historic mapping.

The PFRA does not show any groundwater flooding in the study area.

The PFRA identifies three small areas of pluvial flooding near the terminal building, one of these is within grassland to the south of the terminal building, this is outside the development areas. Two more small areas have been identified as areas of pluvial flooding along the taxiway to the CHC Coastguard building. Refer to Figure 7-12 which contains the PFRA flood extents. These areas were inspected on site and were noted as shallow dry depressions.

There is no coastal PFRA flood extent encroaching onto the site.

There is no other part of the study area subject to a coastal flood risk.

The OPWs heavy caveating of the PFRA flood mapping for site specific flood risk assessments is acknowledged and therefore is only used as supporting information.

The ground on site falls in a south-easterly direction towards the Ballygunnermore with the high point on site being approximately 39mOD elevation with the Ballygunnermore river at approximately 15mOD. Site visits recorded no evidence of recent flooding within the site.

Summary

Informed by historic mapping and records, the indicative PFRA, site visits and a desktop assessment, only three small areas have been identified as being at risk of localised pluvial flooding. These areas are not being disturbed as part of the development works and therefore are not of significance in the assessment of the development.

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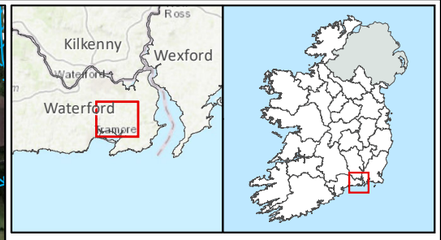

- Rivers
- Site Boundary
- Land under SERA (South East Regional Airport) and Waterford City and Council Ownership
- Existing Runway
- Permitted South Extension
- Proposed North Extension
- PFRA/CFRAMS 1% AEP Pluvial Flood
- PFRA/CFRAMS 1% AEP Fluvial Flood

N W E S

Kilometers
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TITLE: Flooding Extents			
PROJECT: Waterford Airport Runway Extension			
FIGURE NO:	7.12		
CLIENT:	Waterford Airport		
SCALE:	1:25000	**REVISION:**	0
DATE:	13/05/2020	**PAGE SIZE:**	A3

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7.7 Potential Impacts

7.7.1 Do Nothing Scenario

If the proposed runway extension does not proceed, it is likely that the land will continue to be grassland and unused to facilitate the runway approach and take-off and there will be no change to the existing hydrological regime or water quality.

7.7.2 Potential Impacts – Construction

The runway extension will require stripping existing topsoil and conducting some preparatory earthworks to prepare a sound footing for the new sections of runway before constructing the running surface in layers. The construction will require the excavation of additional drainage channels to ensure continuity of the existing surface water drainage regime.

According to Section 7.5.7 there will be increase in runoff due to construction of new surfaces. Navigation lighting will be provided on steel frames, mounted on concrete plinths. Usage of wet concrete could lead to contamination of receiving waters and groundwaters.

Trenching for drainage should be undertaken using controlled methods, with excavation and backfilling taking place over short lengths. There will be no permanent spoil heaps at the site of the proposed development. Temporary spoil heaps will be used in the backfilling of trenches or removed off-site to an appropriate facility. Silt fencing will be erected where required adjacent to drains in advance of any excavations taking place.

The existing ground levels on site will not be altered extensively as the extended runway sections will keep the existing profile with a minimal change in gradient. This will allow the existing drainage regime at the site to be maintained as far as possible.

There will be increased trafficking during the construction phase. During the operational phase traffic volumes within the runway extension sites will be frequent. Traffic movements to the extended runways will be limited to flights and inspections by maintenance workers.

Possible potential indirect impacts on surface water quality during construction, operation and maintenance activities include:

- Increased sediment loading of drains due to increased traffic;
- Haul roads passing close to ditches could allow the migration of silt laden run-off into ditches and ultimately the watercourse;
- Silt carried on the wheels of vehicles leaving the site could be carried onto the public road.
- Poorly constructed drainage could lead to blockages and consequent flooding and concentration of surface water flows.
- Suspended solids could potentially lead to siltation and physical effects on flora and fauna in aquatic habitats.
- Refuelling activities could result in fuel spillages.
- Sanitary waste could lead to contamination of groundwater.
- Excavation of soils could lead to an increase in suspended solids in the surface water run-off and from minor quantities of exposed mineral soils.

- The removal of the vegetated material will also lead to an increase in the rate of run-off along the route of the site access roads and hard-standing areas. This increase in the rate of run-off could lead to a minor increase in flooding downstream.
- Inappropriate site management of excavations could lead to loss of suspended solids to surface waters.
- Inappropriate management of the excavated material could lead to loss of suspended solids to surface waters.
- Cable trenches could act as a conduit for surface water flows.
- Flows from the new drainage system could be impeded, should blockages occur in the existing perimeter drains.
- Ditches and saturated ground present a risk to the safety of site personnel and the public.
- A blockage in the proposed roadside drains could allow a break out of silt laden run-off to reach adjacent watercourses.
- Inappropriate management of spoil heaps could result in accidental break outs of silt on site leading to the loss of suspended solids to surface waters

It is not envisaged that the maintenance activities taking place on the runway, involving general maintenance and including maintenance of the drainage system and reinstated areas, will give rise to any significant impacts on the hydrological regime of the area.

There would be increased trafficking and an increased risk of disturbance to underlying soils at the development, leading to the potential for silt laden run-off entering receiving watercourses from the wheels of vehicles. If unmitigated, the potential impacts to hydrology and water quality have potential to be significant and temporary.

7.7.3 Potential Impacts – Operation

The hydrological impact of the extended runway to the north and south has been estimated to produce additional runoff of 0.75% to the Ballygunnermore watercourse catchment and 1.3% additional runoff to the Kilmacleague West watercourse catchment, this is a worst-case scenario and would be deemed to be imperceptible[3].

De-icing the runway during cold weather periods has the potential to contaminate the soil surrounding the runway and pollute the groundwaters beneath. Soil and groundwater samples were taken in June 2018 and there is no residual contamination or residue around the runway at present. It is noted that de-icing the runway was infrequent and the most recent de-icing event was in November 2015, 31 months before the soil and groundwater sampling. It is proposed to use 'Clearway' de-icing agents, a biodegradable product that is a market leader in bio-degradable de-icing operations. The product has attained the 'Blue Angle' environmental label and is classified on the WGK system as a Class 1 product – 'Low hazard to water'.

In the event of a major incident on the runway, which may involve a fuel spill from an aircraft, there is potential for the surface water drainage to be polluted by hydrocarbons and other toxins.

De-icing on the airport apron of aircraft could have the potential for contaminants to enter the surface water sewer network at the airport apron.

[3] Imperceptible – An effect capable of measurement but without significant consequences.

A cold water holding tank is proposed to be installed beneath ground under the airport apron. This can divert storm water for discharge at a later date and can be used to attenuate heavy rainfall events. Should a pollutant be spilled on the airport apron and be washed into the storm drainage network a cut off valve can be activated, and this cold-water storage tank can attenuate the discharge. A chamber will be installed to allow this to be tested and/or taken off site if required.

As the passenger numbers increase and the terminal buildings are expanded, the wastewater treatment plant has the potential to become overloaded and not provide sufficient treatment prior to discharge to the receiving waters. An assimilative capacity which proves that there is sufficient capacity for the outfall will need to be conducted and the treatment upgrade will need to be such that the receiving waters will not be adversely impacted by the increased flow from the upgraded wastewater treatment plant.

The airport drainage will need to be inspected and maintained to ensure it is working to its designed capacity. The airport will need to implement a maintenance schedule to ensure that gullies are cleared regularly and that interceptors are cleaned, and attenuation tanks are maintained.

If unmitigated the potential impacts on hydrology and water quality have potential to be significant and long-term.

7.8 Cumulative Impacts

7.8.1 Solar farm

A planning application lodged with An Bord Pleanála for a Solar Farm to the north east of the site has recently been granted planning consent (PL93.248487). The solar farm is called Keiloge Solar Farm and is located in the catchment of Keiloge watercourse. The Environmental Report submitted as part of the application concludes that the additional run-off is expected to be 'negligible' and is not expected to have an adverse impact on hydrological features in the area. Therefore, significant cumulative impacts will not occur.

7.9 Mitigation Measures

Any temporary or permanent drains constructed as part of these works, which ultimately discharge to the downstream watercourse will include silt protection controls such as silt traps and silt fencing as construction progresses across the site.

The mitigation measures proposed to reduce potential direct and indirect impacts are outlined below:

- The increase in the rate of run-off from the runway will be mitigated by the proposed drainage system which includes the provision of a large area for percolation, with a connection to the watercourse in the event that the percolation is blocked or not achievable. This percolation zone will provide additional storage in the event of a large rainfall event.
- The new car parking area to the front of the terminal, and the extension of the existing car parking area is drained using surface water gullies in the form of 'eco drain' style drainage. This drainage is directed through an interceptor which will remove any hydrocarbons which may enter the system from vehicles and is also directed through an attenuation tank prior to discharge to the open drain/watercourse.

- De-icing the runway and aircraft will uses only recognised 'low water hazard' 'Clearway products and would be undertaken after an assimilative capacity assessment is conducted on the receiving environment, to demonstrate to the satisfaction of the appropriate authorities that de-icing activity would not exceed the assimilative capacity for all relevant pollutants in the receiving waters.
- The airport will deploy a suitable emergency response protocol to a fuel spill or potentially polluting incident on the runway from an aircraft. This protocol will include the provision of equipment to ensure pollutants do not enter the surface water drainage system.
- The surface water apron drainage proposal includes an interceptor drain and a cold-water storage tank to capture any pollutants which enter the system. It is proposed to have a control system on this line which would shut the system in the event of a pollution incident and direct all of the surface water to the holding tank where it can be tested and/or taken off site if required. This control system will be designed to the satisfaction of the appropriate authorities, to ensure that contaminated waters are detected and retained. This would remove the possibility of any pollutants from the system getting to the watercourse.
- An assimilative capacity assessment of the WWTP discharge will need to be undertaken, which proves to the satisfaction of the appropriate authorities that the assimilative capacity of the receiving waters will not be exceeded by the increased flow from the upgraded wastewater treatment plant
- A buffer zone of 10m is required from drainage ditches to the temporary compounds.
- No construction-stage drainage will be allowed to discharge directly to the watercourses or its tributaries. Construction-stage drainage will be treated in settlement ponds prior to being discharged over vegetated land before draining towards the watercourse;
- Excavated subsoil material will be used for backfill or removed off site to an appropriate facility.
- Temporary spoil heaps will be surrounded by silt fencing to filter sediment from the surface water run-off from excavated material.
- Drains around hard-standing areas will be shallow to minimise the disturbance to sub-soils.
- Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within the trenches at regular intervals.
- All ditches and streams adjacent to proposed construction areas will be protected by fencing, including the proposed stilling ponds.
- The conceptual site drainage has been designed to complement existing overland flow and existing drainage. The drainage design will be developed in full at the detailed design stage.
- All personnel working on site will be trained in pollution incident control response. Emergency Silt Control and Spillage Response Procedures contained within the Site Drainage Management Plan of the Construction Environmental Management Plan (CEMP) will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. Adequate security will be provided to prevent spillage as a result of vandalism. A regular review of weather forecasts of heavy rainfall is required, and a contingency plan will be prepared for before and after such events.

  A record will be kept of daily visual examinations of watercourses which receive flows from the proposed development, during and for an agreed period after the installation phase.
- The developer will ensure that erosion control measures, namely silt-traps, silt fencing and swales are regularly maintained during the construction phase.
- During the construction period, an emergency facility will be provided to control the discharge from stilling ponds. This will mitigate the risk of any accidental spillage on site affecting watercourses.

- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the new runway will include regular monitoring of the drainage system and maintenance as required.
- Where haul roads pass close to ditches, silt fencing will be used to protect the ditch at locations where runoff from the tracks flows towards existing ditches. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.
- Self-contained, wheel washing facilities will be provided at the temporary site compounds near each of the site entrances. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.
- Silt traps and silt fencing will be put in place in advance as construction progresses across the site.
- Wet concrete operations shall not take place within 10m of ditches and streams.
- if wet concrete operations are required, a suitable risk assessment will be completed prior to works being carried out and strategically located concrete washout areas will be provided.
- Refuelling of plant during construction will only be carried out at designated refuelling station locations on site. Namely at the temporary construction compounds. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site.
- Portaloos and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor. No permanent sanitary facilities will be constructed on site.

The conceptual drainage has been designed by Frank Fox Consulting Engineers to operate effectively during the construction and operation periods.

Subject to ongoing mitigation measures being undertaken as described above, it is not expected that the operational period will involve any significant impacts on the hydrological regime of the area. Further, the maintenance and monitoring of the new extended runway will incorporate effective maintenance of the drainage system.

The maintenance regime will include inspecting the following:

- Ditches and cross-drains for any blockages;
- Outfalls to vegetated areas of the site;
- Existing roadside swales for any obstructions; and
- Swales and stilling ponds.
- Water Sampling and Ground Testing

The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections.

Maintenance will be in accordance with CIRIA C753 (The SuDS Manual). Daily visual inspections will be undertaken during the construction period, followed by fortnightly visual inspections until the vegetation has been re-established satisfactorily.

7.10 Residual Impacts

The significance of residual impacts of the development of the runway extension on sensitive downstream receptors, taking account of mitigation measures and monitoring measures as outlined above is expected to be slight[4].

The proposed development is not expected to contribute to any significant, negative cumulative impacts with other existing or proposed developments in the vicinity, as there are no other significant developments within the same waterbody catchment as the proposed runway extension. In circumstances where the proposed mitigation measures are implemented in full, a high degree of confidence can be assured that any potential cumulative impacts on the receiving environment will be imperceptible and temporary.

7.11 References

1. **Department of the Environment (IRE).** *Sustainable Development: A Strategy for Ireland.* Dublin: Government Publications Office, 1997.

2. **Offaly County Council.** *Waterford County Development Plan 2011-2017.*

3. **European Parliament, Council.** *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.* 2000.

4. **Office of Public Works (IRE).** Flood Maps. [Online] 2013. http://www.floodmaps.ie.

5. — Interactive Mapping. *Catchment Flood Risk Assessment and Management.* [Online] http://www.cfram.ie.

6. **Dublin Regional Authorities.** *Greater Dublin Strategic Drainage Study (GDSDS): Technical Documents of Regional Drainage Policies.* Dublin: Dublin City Council, 2005.

7. **Inland Fisheries Ireland.** *Guidelines on protection of fisheries during construction works in and adjacent to waters.* Dublin: Inland Fisheries Ireland, 2016.

8. **Department of Environment, Heritage and Local Government (IRE) and the Office of Public Works (IRE).** *The Planning System and Flood Risk Management - Guidelines for Planning Authorities.* Dublin: Government Stationary Office, 2009.

9. **FRAM Section Engineering Services - Office of Public Works (IRE).** *Tullamore Flood Risk Assessment and Management Study.* Dublin: Office of Public Works, 2008.

10. **Charles, P. Connolly, S. (Eds.).** *Environmental good practice on site.* London: Construction Industry research and Information Association, 2005. ISBN 086-17-650-9.

[4] Slight – An effect which causes noticeable changes to the character of the environment without affecting its sensitivities.

11. **Enterprise Ireland.** Best Practice Guide BPGCS005 Oil Storage Guidelines. *www.envirocentre.ie.* [Online]

12. **Construction Industry Research and Information Association (UK).** *Control of Water Pollution from Linear Construction Sites: Technical Guidance (C648).* London: Construction Industry Research and Information Association, 2006.

13. **Construction Industry Research and Information Association (UK).** *Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532).* London: Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532) - Construction Industry Research and Information Association (UK), 2001.

14. **(UK), Construction Industry Research and Information Association.** *Sustainable Construction Procurement. A Guide to Delivering Environmentally Responsible Projects (C571).* London: Construction Industry Research and Information Association, 2001.

15. **UK Environmental Agency, Northern Ireland Environmental Agency and Scottish Environment Protection Agency.** *Pollution Prevention Guidelines - PPG1: Understanding Your Environmental Responsibilities - Good Environmental Practices.* s.l.: Environmental Agency, 2013.

16. **UK Environmental Agency, Northern Ireland Environmental Agency and Scottish Environment Protection Agency.** *Pollution Prevention Guidelines - PPG2: Above ground oil storage tanks.* s.l.: Environment Agency, 2011.

17. **UK Environmental Agency, Environment and heritage Service and Scottish Environment Protection Agency Pollution Prevention Guidelines.** *Pollution Prevention Guidelines - PPG3: Use and design of oil separators in surface water drainage systems.* s.l.: Environment Agency, 2006.

18. **UK Environmental Agency, Environment and Heritage Service and Scottish Environment Protection Agency.** *Pollution Prevention Guidelines - PPG4:*

19. **UK Environmental Agency, Environment and Heritage Service and Scottish Environment Protection Agency Pollution.** *Pollution Prevention Guidelines - PPG5: Works and maintenance in or near water.*

20. **UK Environmental Agency, Northern Ireland Environmental Agency and Scottish Environment Protection Agency.** *Pollution Prevention Guidelines - PPG6: Working at construction and demolition sites.* s.l.: Environment Agency, 2012.

21. **UK Environmental Agency, Environment and Heritage Service and Scottish Environment Protection Agency.** *Pollution Prevention Guidelines - PPG8: Safe storage and disposal of used oils.* s.l.: Environment Agency, 2004.

22. **UK Environmental Agency, Northern Ireland Environmental Agency and Scottish Environment Protection Agency.** *Pollution Prevention Guidelines - PPG21: Incident Response Planning.* s.l.: Environment Agency, 2009.

23. *— Pollution Prevention Guidelines - PPG26: Drums and intermediate containers.* s.l.: Environment Agency, 2011.

24. **National Roads Authority.** *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes.* Dublin: National Roads Authority, 2008.

25. — *Design Manual for Roads and Bridges.* Dublin: National Roads Authority, 2013.

26. **South Eastern River Basin District.** *South Eastern River Basin Management Plan 2009-2015.* 2008.

27. **Department of Housing, Planning and Local Government.** River Basin Management Plan for Ireland 2018-2021**.**

28. **Environmental Protection Agency (IRE).** Biological River Water Quality Data. *Data extracted from Aquarius database for Fehily Timoney by Peter Webster 9/5/2013.* Cork: Environmental Protection Agency, 2013.

29. **Forest Service (IRE).** *Code of Best Forest Practice – Ireland.* Dublin: Department of Marine and Natural Resources, 2000. ISBN 0-9538874-1-3.

30. **Forest Service.** *Forestry and Water Quality Guidelines.* Dublin: Department of Marine and Natural Resources, 2000.

31. **Ryan T, Philips H, Ramsay J, Dempsey J.** *Road Manual - Guidelines for the Design, Construction and Management of Forest Roads.* Dublin: COFORD, National Council for Forest Research and Development, 2004. ISBN 1 902696 32 8.

32. **(IRE), Environmental Protection Agency.** *Draft River Basin Management Plan for Ireland 2018-2021.*

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www.fehilytimoney.ie

CORK OFFICE
Core House
Pouladuff Road,
Cork, T12 D773,
Ireland
+353 21 496 4133

Dublin Office
J5 Plaza,
North Park Business Park,
North Road, Dublin 11, D11 PXT0,
Ireland
+353 1 658 3500

Carlow Office
The Grain Store
Singleton's Lane, Bagenalstown
Co. Carlow, R21 XA66,
Ireland
+353 59 972 3800