Tionscadal Soláthair Uisce
Water Supply Project

Environmental Impact Assessment Report (EIAR)

Volume 6 of 6: Appendices

(Appendix A9.4) Flood Risk Assessment

Document no: 32105801/EIARA9.4
Version: Final

December 2025

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TOBIN

Contents

Acronyms and Abbreviations

Acronym	Meaning
AEP	Annual Exceedance Probability
BPS	Booster Pumping Station
BPT	Break Pressure Tank
CFRAM	Catchment Flood Risk Assessment and Management
CIRIA	Construction Industry Research and Information Association
EIAR	Environmental Impact Assessment Report
ESB	Electricity Supply Board
FCV	Flow Control Valve
FRA	Flood Risk Assessment
FRM Guidelines	The Planning System and Flood Risk Management – Guidelines for Planning Authorities
GDA WRZ	Greater Dublin Area Water Resource Zone
GIS	Gas Insulated Switchgear
GSI	Geological Survey Ireland
Ha	Hectare
HEFS	High-End Future Scenario
HLPS	High Lift Pumping Station
kV	Kilovolt
LiDAR	Light Detection and Ranging
Mld	Million litres per day
mAOD	Metres Above Ordnance Datum
MRFS	Mid-Range Future Scenario
NIFM	National Indicative Fluvial Mapping
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
QMED (or Index Flood)	Median Annual Flood Flow
RWI&PS	Raw Water Intake and Pumping Station
RWRM	Raw Water Rising Main
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
TPR	Termination Point Reservoir
WTP	Water Treatment Plant

1. Introduction

1.1 Introduction and Background

1. The Proposed Project would involve the abstraction and pumping of raw water from the Lower River Shannon at Parteen Basin, treatment of the water nearby at Birdhill (County Tipperary) and pumping of the treated water to a high point in Knockanacree near Cloughjordan (County Tipperary). From this high point near Cloughjordan, the treated water would flow generally by gravity through the Midlands to a termination point at Peamount in County Dublin (within the administrative area of South Dublin County Council), where it would connect into the existing Greater Dublin Area Water Resource Zone network.

2. The Proposed Project would comprise various elements of water supply infrastructure, which collectively would extend from Parteen Basin in County Tipperary, through the Midlands, to Peamount in County Dublin. The Proposed Project consists of the following main features:

    - Abstraction of raw water from Parteen Basin on the Lower River Shannon downstream of Lough Derg and the towns of Ballina and Killaloe
    - Raw Water Intake and Pumping Station (RWI&PS) on the eastern shore of Parteen Basin, County Tipperary, and pumping from there via twin two kilometre (km) long, 1,500 millimetre (mm) diameter Raw Water Rising Mains (RWRMs) to a Water Treatment Plant (WTP) near Birdhill, County Tipperary, which includes a High Lift Pumping Station (HLPS)
    - Approximately 170km of 1,600mm diameter treated water steel pipeline, comprising 37km of Treated Water Pipeline from the WTP to a Break Pressure Tank (BPT) near Cloughjordan, County Tipperary, and 133km of Treated Water Pipeline[1] extending from the BPT to a Termination Point Reservoir (TPR) at Peamount, County Dublin, which would have a capacity of 75 megalitres (Ml)
    - A Booster Pumping Station (BPS) east of Birr, County Offaly, and valves and other ancillary apparatus along the length of the pipeline
    - A Flow Control Valve (FCV), south of Newtown in County Kildare, approximately 5km west of the TPR
    - Power connections to the infrastructure sites[2] and Line Valves, including uprating of the existing Ardnacrusha – Birdhill 38 kilovolt (kV) overhead line to deliver adequate electrical power to the RWI&PS and WTP.

3. The Proposed Project has been developed to deliver a long-term, sustainable and resilient water supply for the Eastern and Midlands Region, to meet the water demand from residential, commercial and industrial development to the year 2050 and beyond. Ultimately, it is anticipated that the Proposed Project infrastructure would deliver water to meet the projected peak deficit of 300Mld of treated water in 2050. A raw water abstraction consent of 300Mld is being sought to cover the operational requirements of providing the 300Mld of treated water required in 2050.

4. The extents of the Proposed Project, along with the locations of the infrastructure sites along its length, are presented in A9.4 Figure 1. Table 1.1 provides a summary of the principal project infrastructure. A full description is provided in Chapter 4 (Proposed Project Description) of this Environmental Impact Assessment Report (EIAR).

[1] A combination of pumping and gravity would be used to transfer water through the pipeline. Water would be pumped from the RWI&PS to the WTP and from the WTP to the BPT which is the high point along the pipeline. From the BPT, the water would usually flow by gravity along the remaining 133km to the TPR. However, at times when the volume of water needed is higher, the water would be pumped through the whole length of the pipeline. The BPS provides the capacity to do this additional pumping when it is required.

[2] For the purpose of this report, 'infrastructure sites' is the collective term that has been used for the RWI&PS, WTP, BPT, BPS, FCV and TPR.

Table 1.1: Summary of Principal Project Infrastructure

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Permanent Infrastructure	
Raw Water Intake and Pumping Station (RWI&PS) (Infrastructure Site) County Tipperary	• The RWI&PS would be located on a permanent site of approximately 4ha on the eastern shore of Parteen Basin in the townland of Garrynatineel, County Tipperary. In addition, approximately 1ha of land would be required on a temporary basis during construction. • The RWI&PS has been designed to abstract enough raw water from the River Shannon at Parteen Basin to provide up to 300Mld of treated water by 2050. • The RWI&PS site would include a bankside Inlet Chamber, the Raw Water Pumping Station Building, two Microfiltration Buildings, an Electricity Substation and Power Distribution Building, and Dewatering Settlement Basins. The tallest building on the RWI&PS site would be the Microfiltration Buildings which would be 10.9m above finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level. • Power for the RWI&PS would be supplied via an underground connection to the existing Birdhill 38 kV electricity substation. • A new permanent access road from the R494 would be constructed to access the proposed RWI&PS site. This access road would be 5m in width and 670m in length. • The RWI&PS site boundary would be fenced with a stock proof fence and a 2.4m high paladin security fence 5m inside the boundary. The site would be landscaped in line with the surrounding environment to reduce its visual impact.
Raw Water Rising Mains (RWRMs) (Pipeline) County Tipperary	• The RWRMs would consist of two 1,500mm underground pipelines made from steel that would carry the raw water approximately 2km from the RWI&PS to the Water Treatment Plant (WTP) at Incha Beg, County Tipperary. The water would be pumped from the pumping station at the RWI&PS to the WTP. • Twin RWRMs have been proposed so that one RWRM can be taken out of service for cleaning and maintenance while still providing an uninterrupted flow of raw water through the other RWRM. • The RWRMs would include Line Valves, a Lay-By, Air Valves and Cathodic Protection. • A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the RWRMs.
Water Treatment Plant (WTP) (Infrastructure Site) County Tipperary	• The WTP would be located on a permanent site of approximately 31ha at Incha Beg, County Tipperary, 2.6km north-east of the village of Birdhill, and 2km east of the proposed RWI&PS. In addition, approximately 2.5ha of land would be required on a temporary basis during construction. • The WTP would treat the raw water received from the RWI&PS via the RWRMs. Once treated, the High Lift Pumping Station (HLPS) would deliver the treated water onwards from the WTP to the Break Pressure Tank (BPT) at Knockanacree, County Tipperary, via the Treated Water Pipeline. • The WTP would comprise of a series of tanks and buildings including the Raw Water Balancing Tanks, Water Treatment Module Buildings, Sludge Dewatering Buildings, Sludge Storage Buildings, Clear Water Storage Tanks and HLPS, an Electricity Substation and Power Distribution Building, and the Control Building. The tallest building on the WTP site would be the Water Treatment Module Buildings which would be up to 15.6m above finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level. • There would also be a potential future water supply connection point at the junction between the permanent access road and the R445. • Power for the WTP would be supplied via an underground connection to the existing Birdhill 38 kV electricity substation. Solar panels would be placed on the roofs of the Chemical Dosing Manifold Building, the Water Treatment Module Buildings, Clear Water Storage Tanks and Sludge Storage Buildings, and at a number of locations on the ground to supplement the mains power supply. • A new permanent access road from the R445 would be constructed and would be 6m in width and 640m in length. • The WTP site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence 5m inside the boundary. The site would be landscaped in line with the surrounding environment to reduce its visual impact.

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Treated Water Pipeline from the WTP to the BPT (Pipeline) County Tipperary	• The Treated Water Pipeline from the WTP to the BPT would consist of a single 1,600mm underground steel pipeline which would be approximately 37km long. The water would be pumped through this section of the Treated Water Pipeline by the HLPS. • The Treated Water Pipeline would include Line Valves, Washout Valves, Air Valves, Manways, Cathodic Protection and Lay-Bys. • A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the pipeline (this Wayleave has been extended to approximately 30m at some Line Valves to provide access between the Lay-Bys and Line Valves). There would be an additional 10m wide Permanent Wayleave at certain locations for operational access to smaller pipes connecting Washout Valves with permanent discharge locations.
Break Pressure Tank (BPT) (Infrastructure Site) County Tipperary	• The BPT would be located on a permanent site of approximately 7ha in the townland of Knockanacree, County Tipperary. In addition, approximately 0.8ha of land would be required on a temporary basis during construction. • The BPT would be located at the highest point of the pipeline. It marks the end of the Treated Water Pipeline from the WTP to the BPT and the start of the Treated Water Pipeline from the BPT to the Termination Point Reservoir (TPR) in the townland of Loughtown Upper, at Peamount, County Dublin. It would act as a balancing tank and would be required to manage the water pressures in the entire Treated Water Pipeline during flow changes, particularly during start-up and shut-down. • The BPT site would include the BPT and a Control Building. The BPT would be a concrete tank divided into three cells covered with an earth embankment. The BPT tanks would be 5m in height and partially buried below finished ground levels. The Control Building would be 7.5m over finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level. • Access to the BPT site would be via a new permanent access road from the L1064 which would be 5m wide and 794m in length. • Power for the BPT would be supplied via an underground connection from the existing overhead power line. Solar panels would be placed on the south facing side of the control building roof, on the BPT and at ground level to the south of the site to supplement the mains power supply. • The BPT site boundary would be bounded by the existing hedgerow / tree line with a 2.4m high palisade security fence around the permanent infrastructure. The site would be landscaped in line with the surrounding environment to reduce its visual impact.
Treated Water Pipeline from the BPT to the TPR (Pipeline) Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)	• The Treated Water Pipeline from the BPT to the TPR would consist of a single 1,600mm underground steel pipeline, approximately 133km long. • The water would normally travel through the Treated Water Pipeline by gravity; however, flows greater than approximately 165Mld would require additional pumping from the Booster Pumping Station (BPS) in the townland of Coagh Upper, County Offaly. • The Treated Water Pipeline would include Line Valves, Washout Valves, Air Valves, Manways, Cathodic Protection, Lay-Bys and potential future connection points. • A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the pipeline (this Wayleave has been extended to approximately 30m at some Line Valves to provide access between the Lay-Bys and Line Valves). There would be an additional 10m wide Permanent Wayleave at certain locations for operational access to smaller pipes connecting Washout Valves with permanent discharge locations.
Booster Pumping Station (BPS) (Infrastructure Site) County Offaly	• The BPS would be located on a permanent site of approximately 2.6ha in the townland of Coagh Upper, County Offaly. It would be located approximately 30km downstream from the BPT. In addition, approximately 3ha of land would be required on a temporary basis during construction. • The BPS would be required when the demand for water causes the flow through the pipeline to exceed approximately 165Mld. • The BPS site would consist of a single-storey Control Building with a basement below. It would have a finished height of 7.6m above finished ground level. There would also be a separate Electricity Substation and Power Distribution Building. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level. • Power to the BPS would be supplied from an existing 38 kV electricity substation at Birr, through cable ducting laid within the public road network. There would be ground mounted solar panels on the southern side of the BPS site to supplement the mains power supply. • The site would be accessed directly from the L3003. • The BPS site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence between 5m -12m inside the boundary. The site itself would be landscaped in line with the surrounding environment to reduce its visual impact.

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Flow Control Valve (FCV) (Infrastructure Site) County Kildare	• The FCV controls the flows in the Treated Water Pipeline from the BPT to the TPR. It would be a small permanent site of approximately 0.5ha in the townland of Commons Upper in County Kildare. In addition, approximately 0.6ha of land would be required on a temporary basis during construction. • It would consist of three 700mm diameter FCVs and three flow meters installed in parallel with the Line Valve and housed within an underground chamber. • Access to the FCV site would be directly off the L1016 Commons Road Upper. • Power supply to the FCV site would be provided from the existing low voltage network via a combination of overhead lines and buried cables. There would be ground mounted solar panels on the north-eastern side of the site to supplement the mains power supply. • Kiosks at the FCV site would house the Programmable Logic Controller, telemetry and power supply for the Line Valve. There would also be a telemetry mast, the top of which would be 14m above finished ground level. • The site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence 5m inside the boundary.
Termination Point Reservoir (TPR) (Infrastructure Site) County Dublin (within the administrative area of South Dublin County Council)	• The TPR would be located on a permanent site of approximately 8.3ha adjacent to an existing treated water reservoir in the townland of Loughtown Upper, at Peamount, County Dublin (within the administrative area of South Dublin County Council) and would have capacity for 75Ml of treated water supply. In addition, approximately 1.1ha of land would be required on a temporary basis during construction. • It would be located at the downstream end of the Treated Water Pipeline from the BPT to the TPR and would be the termination point for the Proposed Project. It would be at this location that the Proposed Project would connect to the existing water supply network of the Greater Dublin Area Water Resource Zone (GDA WRZ). • The TPR would consist of an above-ground storage structure, associated underground Scour Water and Overflow Water tanks and a Chlorine Dosing Control Building. The TPR would be a concrete tank divided into three cells and covered with an earth embankment. The top of the TPR would be 11.2m above finished ground level. The Chlorine Dosing Control Building would be 8.4m over finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level. • Power for the TPR would be supplied via an underground connection to the existing electricity substation at Peamount Reservoir. There would be solar panels on top of a portion of the northern cell of the TPR to supplement the mains power supply. • A new permanent access road from the R120 would be constructed and would be 5m wide and 342m in length. • The TPR site would be bounded by the existing hedgerow to the west and existing fence to the east with a 2.4m high palisade security fence around the permanent infrastructure. The site itself would be landscaped in line with the surrounding environment to reduce its visual impact.
Proposed 38 kV Uprate Works – Power Supply to RWI&PS and WTP	
Proposed 38 kV Uprate Works Ardnacrusha – Birdhill (Power Supply) Counties Clare, Limerick and Tipperary	• The proposed 38 kV Uprate Works would be necessary to deliver adequate electrical power to the RWI&PS and WTP. • The proposed works would include the uprating of the existing Ardnacrusha – Birdhill Line and the replacement of polesets/structures with an underground cable along a section of the Ardnacrusha – Birdhill – Nenagh Line. • There would also be works at the existing Birdhill 38 kV electricity substation including the provision of a new 38 kV modular Gas Insulated Switchgear Modular Building, new electrical equipment and lighting, together with new fencing and associated works.
Temporary Infrastructure – Required for Construction Phase Only	
Construction Working Width Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)	• A Construction Working Width would be temporarily required for the construction of the RWRMs and the Treated Water Pipeline, and the subsequent reinstatement of the land. • The Construction Working Width would generally be 50m in width but would be locally wider near features such as crossings, access and egress points from the public road network, Construction Compounds and Pipe Storage Depots.

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Construction Compounds Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)	• Eight Construction Compounds would be temporarily required to facilitate the works to construct the Proposed Project. Five Construction Compounds would be located along the route of the Treated Water Pipeline at the following Infrastructure Sites: RWI&PS, WTP, BPT, BPS and TPR, with an additional three Construction Compounds located at Lisgarriff (County Tipperary), Killananny (County Offaly) and Drummond (County Kildare). Construction Compounds would act as a hub for managing the works including plant/material/worker movement, general storage, administration and logistical support. • The Principal Construction Compound at the WTP would require 30ha of land during construction. • The other three Principal Construction Compounds would require land temporarily during construction ranging between approximately 12ha and 16ha. • The four Satellite Construction Compounds at the other permanent Infrastructure Sites (excluding the FCV) would require land during construction ranging between approximately 3ha and 12ha.
Pipe Storage Depots Counties Tipperary, Offaly and Kildare	• Nine Pipe Storage Depots would be temporarily required to supplement the Construction Compounds and would serve the installation of pipe between the WTP and the TPR. • Pipe Storage Depots would take direct delivery of the pipe for storage before onward journey to the required location along the Construction Working Width. • The Pipe Storage Depots would vary in size and require land temporarily during construction generally ranging between approximately 2ha and 7ha but with one site being larger at 11ha.

* Note all land take numbers in this table are affected by rounding to one decimal place.

5. This report describes the Flood Risk Assessment (FRA) that has been prepared in accordance with best practice and following The Planning System and Flood Risk Management – Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government (DEHLG) and the Office of Public Works (OPW) 2009) (referred to herein as the 'FRM Guidelines') and the Circular PL 2/2014 Flooding Guidelines (Department of Environment, Community and Local Government 2014).

6. It should be noted that Uisce Éireann has been assigned by OPW as a responsible authority for management of flood risk from artificial water bearing infrastructure.

1.2 Scope of the Flood Risk Assessment

7. The FRA has been prepared principally to consider the flood risk to, and arising from, the infrastructure sites of the Proposed Project, namely (see A9.4 Figure 1 for locations):
    - RWI&PS
    - WTP
    - BPT
    - BPS
    - FCV
    - TPR.

8. Operation of these infrastructure sites is critical to the overall operation of the Proposed Project and could fail if subject to flooding. Furthermore, the FRM Guidelines (DEHLG and OPW 2009) classify the infrastructure sites as 'highly vulnerable development' meaning they should be constructed on sites that are at a low risk of flooding (Flood Zone C in the FRM Guidelines). Further details of the works at each infrastructure site are provided in Section 1.3.

9. The potential flood risk effects of and to the pipeline sections, which are proposed to convey water from the RWI&PS to the TPR, via the WTP, BPT and BPS, have also been considered. The three sections of pipeline are:
    - Twin 1,500mm diameter RWRMs extending for approximately 2km from the RWI&PS to WTP

- A single 1,600mm Treated Water Pipeline, approximately 37km in length, between the WTP and BPT
- A single 1,600mm Treated water Pipeline, approximately 133km in length, between the BPT and TPR.

10. In operation, the RWRMs and Treated Water Pipelines:
    - Comprise sealed pipeline sections that would be buried below ground and their operation would not be affected by overland (fluvial/pluvial) or groundwater flooding
    - Do not cross any watercourses as a 'pipe bridge' or similar above the ground surface. Any watercourse crossings that are made would be laid beneath the watercourse bed level, so they would not impact in-channel or floodplain flow conveyance
    - Do not require permanent changes in ground level to install any of the sections, and following completion, neither the RWRMs or the Treated Water Pipelines would have any impact on existing overland flood conveyance routes or in areas which are currently prone to the accumulation of ground or pluvial flood water
    - Would be buried a minimum of 1.2m below the ground surface and would not form an impenetrable barrier to flows between ground surface and underlying bedrock, enabling sub-surface and groundwater flows to pass by the sections. However, additional local drainage measures would be applied, as necessary, where these is a perceived risk of impaired drainage from installation of the pipeline sections.

11. It is therefore concluded that during normal operation, the flood risk impact to and arising from the RWRMs and Treated Water Pipelines would be neutral. Stage 1 to Stage 3 Flood Risk Assessment (as outlined in the FRM Guidelines) for the normal operation of the RWRMs and Treated Water Pipelines is therefore not required.

12. It is acknowledged that planned maintenance procedures, such as washout of the Treated Water Pipeline, could involve a discharge of water into a stream or watercourse. While such an activity would be executed using a controlled procedure, the principles to ensure there is no increase in flood risk include only discharging during periods of lower river flows, using watercourses with sufficient capacity, staging draindown to avoid concurrent discharges, controlling discharges per Environmental Protection Agency and OPW requirements, and managing the release rate to prevent scour or increased sediment loads, as detailed in Section 6.

13. Following the pressure testing of the Treated Water Pipeline there will be the need to discharge the hydrostatic test water. This is not on the critical path of the construction and the rate and timing of discharges can be selected to suit environmental conditions so as not to create additional flood risk.

14. The initial filling of the Treated Water Pipeline will take several months, filling the pipeline from west to east in a controlled fashion. To prevent stagnation in sections of the pipeline already filled, a sweetening flow will be maintained through carefully selected washouts. Those with permanent outfalls to the major rivers will be used in preference to other washouts and the additional flow added by the discharge will be very low compared to the normal river flow. The discharge can be temporarily halted if a flood risk is present. There is also the potential for a temporary increase in flood risk during construction of the various pipeline sections, e.g. from the construction of temporary dams to permit works in a watercourse. The approach that would be applied in construction to ensure no increase in flood risk is also discussed in Section 6 of this FRA.

1.3 Description of the Proposed Project: Infrastructure Sites

15. The works at the infrastructure sites of the Proposed Project that are considered in this FRA, are summarised in Section 1.3.1 to Section 1.3.5. Full details of the works at these sites are provided in Chapter 4 (Proposed Project Description) in Volume 2 of the EIAR.

1.3.1 Raw Water Intake and Pumping Station (RWI&PS)

16. The proposed RWI&PS would be located on the banks of the Parteen Basin, County Tipperary. It would occupy a greenfield site and cover an area of approximately 4 hectares (ha).

17. A9.4 Figure 2 shows that the RWI&PS comprises an intake structure at the east side of the Parteen Basin, downstream of Lough Derg. The intake structure is designed to be 'water compatible'[3] so would not be impacted by flooding. The Raw Pumping Station Building and its associated infrastructure would be located up-slope from the intake and would pump water to a WTP approximately 2km east of the intake, through two RWRMs.

18. A new access road from the R494 to the proposed RWI&PS site would be built. The road would be 5m wide and approximately 670m long. This access road is crossing an unnamed watercourse, associated with a tributary of the Shannon (Lower)_050 watercourse detailed on EPA Maps. The flood risk to and arising from the proposed access road has been assessed in Section 7.1.

1.3.2 Water Treatment Plant (WTP)

19. The proposed WTP would be located on a site at Incha Beg, County Tipperary. It would occupy a greenfield site covering an area of approximately 31ha and be capable of providing 300Mld of treated water.

20. A9.4 Figure 3 shows the Planning Application Boundary for the WTP. The main works comprise the construction of new buildings containing water treatment facilities, sludge treatment and storage silos, office buildings, storage areas, paved (impervious) access routes and car parking. From the WTP, the treated water would then be pumped to the BPT.

21. The proposed WTP would be accessed by a new road, which is to be built between the site and R445. The access road would need to cross the Roran watercourse, tributary of the Kilmastulla River and its associated floodplain. The flood risk to and arising from the proposed access road has been assessed in Section 7.2 of this report, as well as in Annex B (WTP Access Road Flood Risk Assessment).

1.3.3 Break Pressure Tank (BPT)

22. The proposed BPT would be located at the highest point on the route of the Proposed Project at a site at Knockanacree, Cloughjordan, County Tipperary. The proposed works would occupy a greenfield site and cover an area of 7ha.

23. A9.4 Figure 4 shows the Planning Application Boundary for the BPT. The proposed BPT comprises three cells with a total capacity of 16,267m^3. The treated water would then flow generally by gravity from the BPT through the Midlands in the Treated Water Pipeline, to the TPR in County Dublin.

24. The site would be accessed by a new road which would be constructed from the L1058 to the BPT. This road would be 5m wide and approximately 794m long.

[3] Water-compatible development as defined in Table 3.1 of the FRM Guidelines (DEHLG and OPW 2009) comprising activities/users that are not impacted by flooding or requiring a waterside location for operation. By its nature, an abstraction requires a waterside location in order to successfully draw water from the source.

1.3.4 Booster Pumping Station (BPS)

25. The proposed BPS would be located on a site at Coagh Upper Townland, County Offaly. It would occupy a greenfield site covering an area of 2.6ha. The BPS would boost the flow on the Treated Water Pipeline from the BPT to the TPR and would be required when the demand for water increases above approximately 165Mld.

26. A9.4 Figure 5 shows the Planning Application Boundary for the BPS. The main works would comprise the construction of a new building containing six water pumps, control equipment, operational areas and office space.

27. The site would be accessed directly from the L3003.

1.3.5 Flow Control Valve (FCV)

28. The FCV would be approximately 5km west of the TPR. It would be located next to the FCV south of Newtown in County Kildare.

29. A9.4 Figure 6 shows the Planning Application Boundary for the FCV. The FCV would consist of three 700mm diameter FCVs and three flow meters installed in parallel with the Line Valve, housed within an underground chamber. Above ground there would be a small compound, drainage pond, kiosks, solar panels and parking.

30. Access to the FCV site would be directly off the L1016 Commons Road Upper.

1.3.6 Termination Point Reservoir (TPR)

31. The proposed TPR would be located adjacent to the existing treated water reservoir site at Loughtown Upper, Peamount, County Dublin. The proposed works would occupy a greenfield site and cover an area of 8.3ha.

32. A9.4 Figure 7 shows the Planning Application Boundary for the TPR. The TPR would comprise three cells with a total water storage capacity of 75Ml. From the TPR, the treated water would enter the existing water distribution system in the GDA WRZ.

33. The TPR site would be accessed by a new access road from the R120, located adjacent to the western and northern perimeter of Peamount Hospital. The road would be 5m wide and approximately 342m long.

1.4 Report Structure

34. This FRA is structured as follows:

- Section 2: Outlines the method
- Section 3: Contains data collection and the Stage 1 flood risk identification
- Section 4: Provides the Stage 2 Initial FRA
- Section 5: Details the potential flood risk impacts arising from the work on the proposed infrastructure sites
- Section 6: Outlines the principles to be applied to ensure no short-term increase in flood risk during construction, commissioning and from maintenance of the pipeline sections
- Section 7: Summarises the Stage 3 Detailed FRA of the RWI&PS and WTP access roads
- Section 8: Details the flood risk management and evaluation and the Justification Test
- Section 9: Presents the conclusions.

2. FRA Method

2.1 Methodology

35. The FRM Guidelines (DEHLG and OPW 2009) require the planning system at national, regional and local levels to:

    - Avoid development in areas at risk from flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify development. Where this is the case, development must be appropriate and flood risks must be effectively managed to reduce the level of risk
    - Adopt a sequential approach to flood risk management when assessing the locations for new development based on avoidance, reduction, and mitigation of flood risk
    - Incorporate FRA into planning application decisions and appeals.

36. Section 8.3 describes the application of the Justification Test to the Proposed Project, which shows that all infrastructure has been located appropriately with respect to flood risk.

37. The FRM Guidelines outline the key principles that should be used to assess flood risk to Proposed Project sites. It recommends that a staged approach to FRA should be used:

    - Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the Proposed Project site that may warrant further investigation
    - Stage 2: Initial FRA – to confirm sources of flooding that may affect the Proposed Project site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of existing studies to assess flood risk and to assist with the development of flood risk management measures
    - Stage 3: Detailed FRA – to assess flood risk issues in sufficient detail to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a new hydraulic model across a wide enough area to appreciate the catchment-wide impacts and hydrological process involved.

38. This report contains Stage 1 (flood risk identification) and Stage 2 (Initial FRA) assessments, providing an overview of the potential flood risks to, and arising from, the proposed works at the infrastructure sites along with proposed mitigation. For completeness, the flood risk impacts arising from the Construction Phase and maintenance of the RWRMs and Treated Water Pipelines are also considered along with the principles for any flood risk mitigation.

39. For the infrastructure sites and the pipeline, the outcomes from the Stage 1 and Stage 2 assessments indicated that a Stage 3 Detailed FRA was not necessary. However, a Stage 3 Detailed FRA is required for the proposed RWI and WTP access roads. The assessment for the RWI&PS access road has been assessed in Section 7. A separate assessment for the WTP access road has been included in Annex B (WTP Access Road Flood Risk Assessment) and summarised in Section 7.

2.2 Tipperary County Development Plan – Strategic Flood Risk Assessment (2022-2028)

40. The Strategic Flood Risk Assessment (SFRA) provides ‘an area wide assessment of all types of significant flood risk to inform strategic land use planning decisions’.

41. The Proposed Project will need to demonstrate compliance with the overarching objective and recommendation of the Tipperary SFRA, which are presented in Table 2.1.

Table 2.1: Objectives and Recommendations of the Tipperary SFRA

Objectives and Recommendations	Project Response
Section 1.4.4.2 of the SFRA states: '*Development in areas that have the highest flood risk should be avoided and/or only considered in exceptional circumstances (through a prescribed Justification Test) if adequate land or sites are not available in areas that have lower flood risk. Most types of development would be considered inappropriate in areas that have the highest flood risk.'*	The proposed culverts for the WTP and RWI access roads are classed as water-compatible development. According to the FRM Guidelines, water compatible developments are considered appropriate within Flood Zone A, Flood Zone B and Flood Zone C, hence those types of developments would not be required to meet the criteria of the Justification Test. For technical and health and safety reasons, the WTP and RWI access roads are not possible to be located elsewhere, as indicated in the Alternatives Chapter. **The Proposed Project therefore meets this objective.**
Section 3.4 of the SFRA states that two climate change scenarios should be considered. These are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a 'likely' future scenario based on the wide range of future predictions available. The HEFS represents a more 'extreme' future scenario at the upper boundaries of future projections. Based on these two scenarios, the OPW has recommended allowances for climate change in relation to river flows and sea levels (20% increase in rainfall depths and flood flows and/or 0.5m increase in sea level for MRFS, and 30% increase in rainfall depths and flood flows and/or 1m increase in sea level for HEFS). These climate change allowances are particularly important at the development management stage of planning and will ensure that the Proposed Project is designed and constructed to take into account best current knowledge.	MRFS and HEFS climate change scenarios have been considered and accounted for as part of this FRA. The proposed WTP and RWI access roads meet acceptable target water levels as shown in the Stages 2 and Stage 3 assessments (refer to Sections 4 and 7 of this report). The flood risk over the rest of infrastructure within County Tipperary (RWI&PS, WTP and the BTP) has been assessed in Section 4. **The Proposed Project therefore meets this objective.**

2.3 Offaly County Development Plan – Strategic Flood Risk Assessment (2021-2027)

42. The Offaly SFRA provides a number of recommendations which have been integrated into the Offaly County Development Plan. All of the recommendations give effect to guidance set out in the FRM Guidelines (DEHLG and OPW 2009), adopting them *verbatim*, which will be adhered to in carrying out this FRA as set out in Section 2.1.

2.4 Kildare County Development Plan – Strategic Flood Risk Assessment (2023-2029)

43. The Kildare SFRA requires FRAs to be carried out in accordance with the FRM Guidelines and Circular PL 2/2014 Flooding Guidelines (Department of Environment, Community and Local Government 2014). The Kildare SFRA states that the FRA '*should present in sufficient detail the potential flood risk to a proposed development, the potential increase in flood risk elsewhere, any proposed mitigation measures and proposals for sustainable surface water management*'. The Kildare SFRA requires the FRA to demonstrate that there would be no adverse impacts to the Proposed Project itself or to the surrounding area and requires the FRA to meet the requirements listed in Table 2.2.

Table 2.2: Objectives and Recommendations of the Kildare SFRA

Objectives and Recommendations	Project Response
The sequential approach should be applied through site planning and should avoid encroachment onto, or loss of, the floodplain.	There is not any element of the design located in the floodplain in County Kildare. **The Proposed Project therefore meets this objective.**
Highly Vulnerable Development shall not be permitted in Flood Zone A or B.	There is not any element of the design located in Flood Zone A or B in County Kildare. **The Proposed Project therefore meets this objective.**
Proposals should not impede existing flow paths or cause flood risk impacts to the surrounding areas.	There is not any element of the design which impedes existing flow paths or causes flood risk impacts to the surrounding areas in County Kildare. **The Proposed Project therefore meets this objective.**

2.5 South Dublin County Development Plan – Strategic Flood Risk Assessment (2022-2028)

44. The Proposed Project will need to demonstrate compliance with the overarching objective and recommendation of the SFRA stated in Table 2.3.

Table 2.3: Objectives and Recommendations of the South Dublin SFRA

Objectives and Recommendations	Project Response
Undertake site-specific FRAs for all new developments in accordance with the FRM Guidelines.	**The Proposed Project meets this objective.**
Ensure that future developments are designed and constructed in accordance with the “Precautionary Approach” detailed in the FRM Guidelines.	**The Proposed Project meets this objective.**

3. Stage 1: Flood Risk Identification

3.1 Introduction

45. The FRM Guidelines (DEHLG and OPW 2009) identify the following potential sources that should be considered as part of an FRA:

- Coastal – flooding from the sea
- Fluvial – flooding from rivers and watercourses
- Estuarine – flooding from a combination of fluvial and coastal sources
- Pluvial – flooding that is caused by runoff during high rainfall events
- Artificial drainage systems – flooding that occurs as a result of surcharging or blocking of piped drainage networks
- Groundwater – flooding when water normally stored below the ground rises above surface level or into below ground spaces (such as basements).

46. The available flood information for the infrastructure sites is listed in Table 3.1 and Annex A (Information Sources Checklist). As part of the Stage 1 flood risk identification, this information was reviewed to identify whether there may be any flood risk issues relating to the infrastructure sites that warranted further investigation.

Table 3.1: Flood Risk Information

Data Source	Details	Project Coverage
OPW National Flood Hazard Mapping	Identifies previous flood events and includes flood reports, photographs, newspaper articles and other information about reported floods.	All the infrastructure sites
Ordnance Survey Ireland Historic 6" maps	Historic records of areas 'liable to flooding'.	All the infrastructure sites
Studies executed under the National Catchment FRA and Management (CFRAM) Programme	Predictive fluvial flood risk mapping obtained under the National CFRAM Programme for the following scenarios: • 1% Annual Exceedance Probability (AEP) (1 in 100-year) flood extent • 0.1% AEP (1 in 1,000-year) flood extent • 1% MRFS and HEFS flood extents, where 'MRFS 'and 'HEFS' refer to mid-range and high-end forecast impacts for future climate change. Coastal flood risk mapping was not obtained as the locations of the infrastructure sites mean they are not at risk from coastal (and therefore estuarine) flooding.	RWI&PS, WTP and FCV. No CFRAM coverage is available for the BPT, BPS or TPR.
National Indicative Fluvial Mapping (NIFM)	In those locations where CFRAM maps are not available, fluvial flood risk mapping could be identified from the NIFM, considering that the maps may be used in the Stage 1 flood risk identification to determine which areas need further assessment. NIFM maps are available for the following scenarios: • 1% AEP (1 in 100-year) flood extent • 0.1% AEP (1 in 1,000-year) flood extent • 1% MRFS and HEFS flood extents, where 'MRFS 'and 'HEFS' refer to mid-range and high-end forecast impacts for future climate change.	WTP and RWI&PS only. No NIFM coverage is available for the BPT, BPS, FCV or TPR.
OPW Preliminary Flood Risk Assessment (PFRA) Mapping	PFRA flood maps have been withdrawn and substituted by the NIFM maps, but where there is no other available source, they have been considered to identify the existing flood risk. Since PFRAs are only preliminary assessments, based on readily available information, they must be used with significant caution.	All the infrastructure sites

Data Source	Details	Project Coverage
Geological Survey Ireland (GSI) Flooding Probability Maps	The Groundwater Flooding Probability maps show the expected flood extent of groundwater flooding in limestone regions for annual exceedance probabilities (AEP's) of 10%, 1% and 0.1%. The maps were created using groundwater levels measured in the field, satellite images and hydrological models. These maps are to the scale 1:20,000. This means it should be viewed at that scale. The maps are vector datasets. The floods are shown as polygons. Each polygon has info on the data source, and the area of the flood. The flood extents were calculated using remote sensing data and hydrological modelling techniques with various precision levels. As such, it should be used with caution.	All the infrastructure sites

47. The outputs from the Stage 1 assessment are presented for each of the infrastructure sites in Sections 3.2 to 3.7 and summarised in Section 3.8. It should be noted that the Ordnance Survey Ireland Historic 6" maps did not show any of the infrastructure sites to be 'liable to flooding' and so are not considered any further in this assessment.

3.2 RWI&PS Site

3.2.1 OPW National Flood Hazard Mapping

48. The OPW National Flood Hazard Mapping is presented in A9.4 Figure 2. Additionally, there are a number of recorded flooding incidents near the proposed RWI&PS site. These incidents were of varying levels of severity. Notable floods include the January 1925, December 1954, Winter 1959/1960, February 1990, Winter 1994/1995, and Winter 1999/2000 events. Detailed information for the two most recent events is available and provided in Table 3.2.

Table 3.2: Historic Flood Events Identified at RWI&PS Site

Location	Type	Date	Description
Lough Derg	Fluvial – River Shannon	Winter 1994/1995	The effects of the flood were at their most severe around Lough Derg. The highest levels since records began occurred at both Killaloe Pier Head and Portumna. These levels, which both occurred on 01/02/95, were 34.01mAOD at Killaloe and 34.40mAOD at Portumna. The maximum estimated daily inflow to Lough Derg was 809m³/s on 31/01/95. This is the second highest daily inflow on record.
Lough Derg	Fluvial – River Shannon	Winter 1999/2000	The effects of the flood were not quite so severe around Lough Derg compared to the previous flood events in February 1990 and Winter 1994/1995.

3.2.2 Shannon CFRAM Mapping

49. The outputs from the Shannon CFRAM Study are presented in A9.4 Figure 2. This shows a risk of fluvial flooding along the western edge of the RWI&PS site. This to be expected as it is necessary for the intake associated with the raw water abstraction to be located next to a watercourse.

3.2.3 National Indicative Fluvial Mapping

50. The NIFM shows a potential risk of fluvial flooding over the RWI&PS access road, as could be observed in A9.4 Figure 2. Therefore, Stage 2 initial flood risk assessment is required.

3.3 WTP Site

3.3.1 OPW National Flood Hazard Mapping

51. The OPW National Flood Hazard Mapping for the WTP site is presented in A9.4 Figure 3 and shows no record of historic flooding from any source at the WTP site. However, flooding has been reported at the Kilmastulla River, to the east of the proposed WTP access road (see Table 3.3).

Table 3.3: Historic Flood Events Identified at the WTP Access Road

Location	Type	Date	Description
River Kilmastulla	Fluvial	Recurring	River Kilmastulla floods annually. Sometimes flows across N7. Houses (four or five) impacted. Kilmastulla/Shearies Road (L6030) impassable. Flooded in January 2005 after two days rain.

3.3.2 OPW PFRA Mapping

52. PFRA pluvial flood risk maps show one area within the main WTP site to be at risk of pluvial flooding (see A9.4 Figure 3).

3.3.3 OPW CFRAM Mapping

53. The detailed flood maps produced under the Shannon CFRAM Study are presented in A9.4 Figure 3. The maps also show that there is no risk of fluvial flooding to the main WTP site. However, the proposed access road is located in an area of fluvial flood risk.

3.4 BPT Site

3.4.1 OPW National Flood Hazard Mapping

54. The location of the BPT is shown in A9.4 Figure 4. There are no records of flooding from any source recorded in the OPW National Flood Hazard Mapping for the BPT site or along the route of its proposed access road.

3.4.2 OPW PFRA Mapping

55. The maps published under the PFRA for the BPT site are provided in A9.4 Figure 4. There are no parts of the site, including the proposed access road, at risk of flooding from any source. As OPW determined during PFRA that this site was not at risk of flooding, no further flood risk data are available.

3.5 BPS Site

3.5.1 OPW National Flood Hazard Mapping

56. The location of the BPS site is shown in A9.4 Figure 5. There are no records of flooding from any source recorded in the OPW National Flood Hazard Mapping for the BPS site or its access road.

3.5.2 OPW PFRA Mapping

57. The maps published under the PFRA for the BPS site are provided in A9.4 Figure 5. An area of fluvial flooding is shown to the east of the BPS site. No part of the BPS site or its access road is in the flood risk zone. As OPW determined during PFRA that this site was not at risk of flooding, no further flood risk data are available.

3.6 FCV Site

3.6.1 OPW National Flood Hazard Mapping

58. The OPW National Flood Hazard Mapping is presented in A9.4 Figure 6 and shows a recurrent flooding incident near the proposed FCV site. The major recent event happened in November 2000. Detailed information for this event is available and provided in Table 3.4.

Table 3.4: Historic Flood Events Identified at FCV Site

Location	Type	Date	Description
Ardclough Commons Upper	Fluvial - stream which discharges to the River Liffey	Recurring	As the OPW CFRAM mapping shows, during flood events the stream located close to the FCV site is unable to discharge to the River Liffey when the water levels in the Liffey are high and hence backs up along the ditch and floods the area around the Road L2008.

3.6.2 OPW CFRAM Mapping

59. The outputs from the Shannon CFRAM Study are presented in A9.4 Figure 6. This shows that the FCV is located outside the area at risk of fluvial flooding already identified and described in Table 3.4.

3.7 TPR Site

3.7.1 OPW National Flood Hazard Mapping

60. The OPW National Flood Hazard Mapping for the TPR site is presented in A9.4 Figure 7. No flooding incidents are identified within the boundary of the TPR site or along the route of its proposed access road.

3.7.2 OPW PFRA Mapping

61. The maps published under the PFRA for the TPR site are provided in A9.4 Figure 7. There are no parts of the site at risk of fluvial flooding. As OPW determined during PFRA that this site was not at risk of fluvial flooding, no further fluvial flood risk data are available.

62. Regarding pluvial flooding, a very localised area is shown along the western boundary of the site. Inspection of Light Detection and Ranging (LiDAR) data indicates this could be due to a localised depression or dry ditch present at the site boundary. An isolated area of pluvial flooding is shown near the TPR access road at its proposed junction with the R120. It is also likely that this is due to a local depression in the area.

3.8 Stage 1 Summary

63. Table 3.5 summarises the results of the Stage 1 assessment across the infrastructure sites. It shows the following:

- The RWI&PS site at the Parteen Basin is at a potential risk of fluvial flooding. Parts of this site appear to have a history of fluvial flooding with reported incidents in 1925, 1954, 1959/1960, 1990, 1994/1995 and 1999/2000. Also, there is a potential risk of fluvial flooding over the access road. Therefore, Stage 2 initial flood risk assessment is required
- The WTP access road across the Kilmastulla River floodplain is at risk of fluvial flooding, but the main WTP site is not at risk of fluvial flooding
- The WTP and TPR sites are at risk of pluvial flooding
- The BPT site is not at risk from flooding from any source

- The BPS site is at potential risk of fluvial flooding from a tributary of the River Camcor. There is no recorded history of flooding at the BPS site
- There are no historic records of flooding at the WTP, BPT, BPS or TPR sites
- None of the sites are at risk from groundwater flooding
- Coastal flood risk mapping was not obtained as the locations of the infrastructure sites mean they are not at risk from coastal (and therefore estuarine) flooding.

Table 3.5: Stage 1 Assessment Results Summary

Site	Stage 1 Flood Risk Identified				
	Fluvial	Pluvial	Coastal	Groundwater	Other/Historic
RWI&PS	**At Risk**	Not At Risk	Not At Risk	Not At Risk	**Historic flooding**
WTP	Not At Risk	**At Risk**	Not At Risk	Not At Risk	Not At Risk
WTP access road	**At Risk**	Not At Risk	Not At Risk	Not At Risk	Not At Risk
BPT	Not At Risk	Not At Risk	Not At Risk	Not At Risk	Not At Risk
BPS	**At Risk**	Not At Risk	Not At Risk	Not At Risk	Not At Risk
FCV	Not At Risk	Not At Risk	Not At Risk	Not At Risk	Not At Risk
TPR	Not At Risk	**At Risk**	Not At Risk	Not At Risk	Not At Risk

4. Stage 2: Initial FRA

64. This section assesses the risk of flooding to the infrastructure sites, in normal operation, from a range of different sources.

4.1 Potential Sources of Flooding

65. The potential sources of flooding have been outlined in Section 3.1.

66. Following the Stage 1 assessment, the following flood risk sources were screened out across all the infrastructure sites:

- Coastal and estuarine: the inland location and elevations of all the infrastructure sites mean that there is no flood risk from coastal or estuarine sources. The lowest ground levels across any of the infrastructure sites are for the RWI&PS at around 35mAOD
- Artificial drainage systems: with the exception of the TPR, the infrastructure sites are bounded by greenfield sites; there are no known existing artificial (piped) drainage systems present on these neighbouring lands which could give rise to a risk of flooding. Flooding to or from artificial drainage networks is therefore not considered for the RWI&PS, WTP, BPS and BPT.

67. The existing treated water reservoir at Peamount, to the west of Dublin, is adjacent to the proposed TPR site. The potential impacts of flooding from artificial drainage networks on the TPR are considered in Section 4.7.

68. Flood risk from the remaining sources to each of the infrastructure sites is outlined on a site-by-site basis in Sections 4.2 to 4.7.

4.2 RWI&PS Site

4.2.1 Fluvial Flood Risk

69. Outputs from the Shannon CFRAM Study (A9.4 Figure 2) showed that the western boundary of the RWI&PS site is at a high risk of fluvial flooding. This is to be expected as it is necessary for the RWI&PS to be located adjacent to the Parteen Basin to draw water for the Proposed Project. All elements of the RWI&PS that are adjacent to the Parteen Basin are designed to be water compatible and so would not be impacted by flooding.

70. Most of the RWI&PS, including all flood vulnerable infrastructure (e.g. the Electricity Substation and Power Distribution Building), would be located on the raised ground which covers much of the site to ensure that operation of the abstraction is not affected by flooding. Table 4.1 shows that the 0.1% AEP flood level in Parteen Basin is 0.63m below the minimum level for the flood vulnerable infrastructure associated with the RWI&PS.

Table 4.1: Parteen Basin Flood Levels

Design Flood/Condition	Parteen Basin Flood Level (mAOD)	Minimum Level of RWI&PS Flood Vulnerable Infrastructure (mAOD)	Difference (m)
1% AEP & Climate Change	30.47	31.10	0.63
0.1% AEP & Climate Change	30.47		0.63
Parteen Basin ESB lower and upper levels	30.00 to 30.86		0.24 to 1.10

71. Water levels in Lough Derg and Parteen Basin are controlled for the operation of the Ardnacrusha Generating Station. Further details of ESB's Operating Principles for the control of water levels and flows in the Lough Derg and Parteen Basin system are provided in Appendix A9.1 Annex A Hydrological Modelling Report. This means:

    - There is no difference in the 1% AEP and 0.1% AEP levels within Parteen Basin
    - During flood flows, when the ESB can no longer keep the water level below the top of the Lough Derg Normal Operating Band, the ESB can operate Ardnacrusha at full capacity as they have done in the past, and the proposed WSP abstraction flow would be provided from a minor depletion in the simulated lake storage
    - Table 4.1 shows that the upper and lower levels that ESB applies to Parteen Basin are between 0.24m and 1.10m below the minimum level for the flood vulnerable infrastructure associated with the RWI&PS. A higher water level is maintained during normal operation, to ensure a sufficient upstream head and flow for power generation. There is no risk of flooding during normal operation as the water level is tightly controlled for the operation of Ardnacrusha Generating Station and upstream incoming flows are not sufficient to generate flooding
    - When water levels are higher than the top of the Lough Derg Normal Operating Band (30.86mAOD) and inflow is greater than the maximum capacity of Ardnacrusha (400m^3/s), excess water is released downstream, while maintaining a minimum level of 30mAOD.

72. As the Shannon Catchment-based Flood Risk Assessment and Management (CFRAM) Study states:

    - ESB manages the three lakes on the Shannon in accordance with the Regulations and Guidelines for the Control of the River Shannon (Water Management Document). These Regulations and Guidelines do not have any statutory basis but take account of dam safety and reflect the outcomes of longstanding consultation with key affected parties
    - The Water Management Document contains ESB's day to day operational Guidelines in Part 2, which is more discretionary in application than the Regulations in Part 1. Specifically, the Regulations and Guidelines together include the main objective of ensuring dam safety at both Lough Allen and at the Lower Shannon Dams (i.e. the embankments plus Parteen Weir and Ardnacrusha Dam). In this regard the Lower Shannon Dams are required to pass a flood event with an Annual Exceedance Probability (AEP) of 0.01% (1 in 10,000) while Bellantra Sluice structure and associated embankment dam at the outlet of Lough Allen is required to pass a 0.1% (1 in 1,000) AEP flood event.

73. It is reasonable to assume that the continued control of water levels in the Parteen Basin means a relatively high degree of confidence can be attached to the flood levels predicted adjacent to the RWI&PS as they are not affected by significant changes in flow. During flood events the abstracted flows reduce the volume going downstream. In all other instances there would be no change as a result of the Proposed Project.

74. For the RWI&PS, the design of the proposed access road in the floodplain can mitigate the potential flood risk impacts. The access road has been designed with a minimum surface level higher than the 1% AEP considering climate change impact (HEFS) and the 0.1% AEP flood levels of the unnamed watercourse, to minimise the risk of flooding. The access road also includes a flood relief culvert where it crosses the watercourse, to ensure that there is enough capacity to convey the peak flows for those flood events without producing a risk over the RWI&PS site.

75. Given the potential flood risk issues associated with the RWI&PS access road, a Stage 3 assessment of the proposed access road is required and has been undertaken as reported in Section 7.1 of this report.

4.2.2 Pluvial Flood Risk

76. The Stage 1 assessment showed no risk of pluvial flooding to the RWI&PS site. Image 4.1 shows the existing overland flow paths on the site. These were derived from an existing site survey and follow the relatively steep slopes falling in north–south and east–west directions. The site slopes fall from around 33.5mAOD to 29.5mAOD and would allow rainfall falling on the site to runoff, as there are no locations where deep accumulations of surface water could occur. This assessment is also consistent with the finding that there are no historical records of the site being subjected to pluvial flooding.

77. Construction of the RWI&PS would also include the installation of a new drainage system to receive rainfall and reduce the risk of flooding during large storm events. Further details for the design of this system are provided in Section 5.1.4.1 of this FRA.

78. The overall risk of pluvial flooding to the RWI&PS site can therefore be considered to be low.

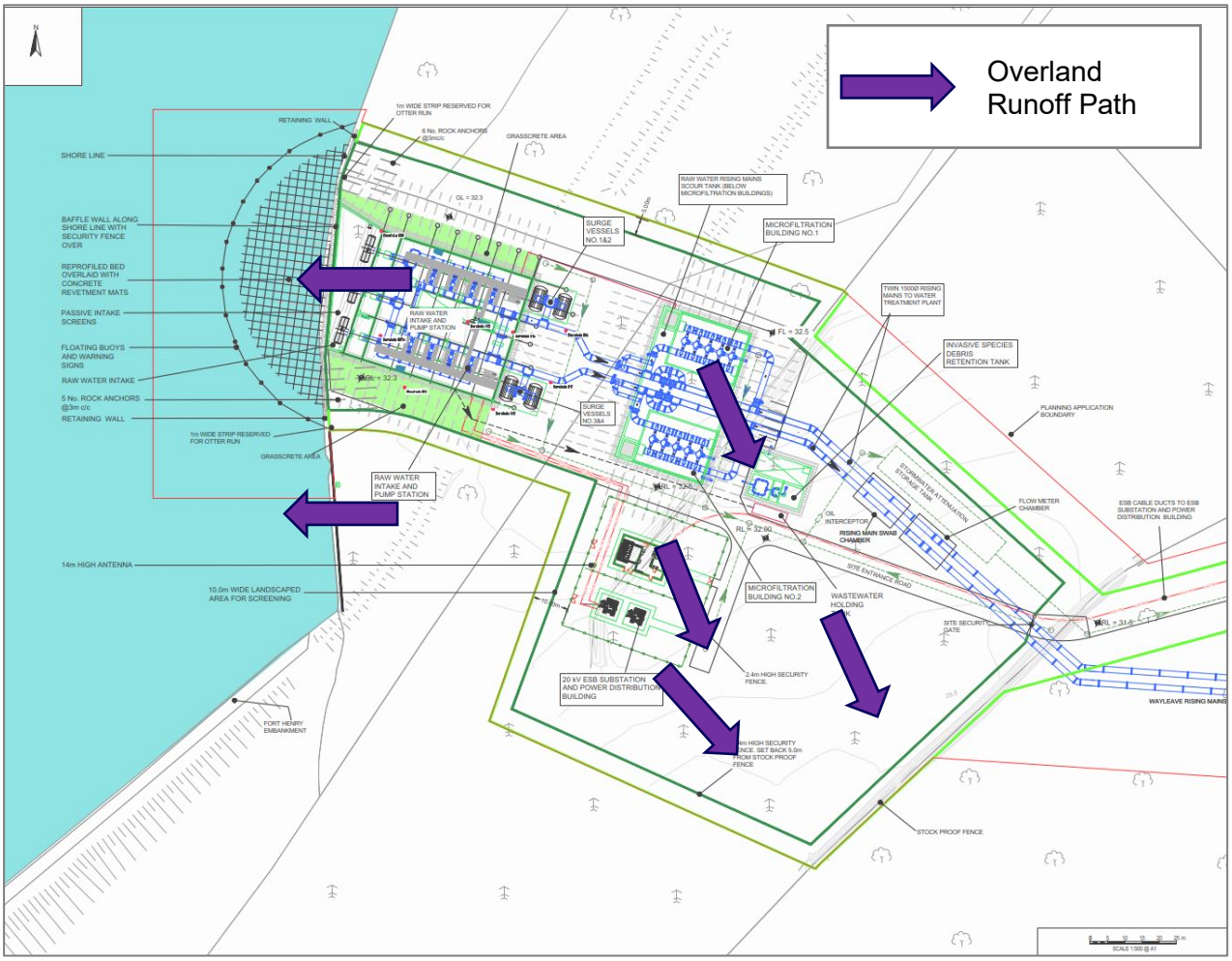


Image 4.1: Overland Runoff Paths for RWI&PS Site

79. A9.4 Figure 2 shows the potential for localised pluvial flooding of the proposed RWI&PS access road at its junction with the R494 (based on the PFRA outputs, drainage from the new access road to the RWI&PS site from the R494 would be 'over the edge' to a hardcore longitudinal soakaway along both edges of the road. The overall risk of pluvial flooding to the RWI&PS site access road can therefore be considered to be low.

4.2.3 Groundwater Flood Risk

80. Given its location, groundwater levels across the RWI&PS site would be closely linked to the water level within the Parteen Basin. As noted above and shown in Table 4.1, water levels in the Parteen Basin are controlled for the operation of the Ardnacrusha Generating Station to be typically between 0.24m and 1.10m below the level of the flood vulnerable infrastructure associated with the RWI&PS. The GSI Flooding Probability Maps (A9.4 Figure 2) also do not indicate any risk of groundwater flooding to the RWI&PS. The risk of groundwater flooding to the site can therefore be considered to be low.

4.3 WTP Site

4.3.1 Fluvial Flood Risk

81. The Kilmastulla River is the nearest watercourse to the proposed WTP site. The WTP site is about 5m above the 0.1% AEP flood level of the Kilmastulla River. The Stage 1 assessment did not identify any risk of fluvial flooding to the main WTP site. A9.4 Figure 3 shows that the site is located on raised ground at a level of around 45mAOD.

82. The location of the WTP access road in the floodplain was subject to a route selection assessment, which is reported in EIAR Chapter 3 Consideration of Reasonable Alternatives. The route selection assessment considered four potential access routes to the WTP from the north, south, east and west. The proposed route was selected for the access route as safe access to this site could be achieved and it was the least constrained alternative. Technical and environmental factors were taken into account in the selection for the access route, with no archaeological features nearby, no special protected flora species in evidence and no suitable areas for breeding or wintering birds. It was noted that the route is partially within the Kilmastulla River flood plain and there is some risk of contaminated soil at the former petrol station at the entrance to the public road, however, these could be managed and mitigated through the design process.

83. The design of the road in the floodplain can mitigate the potential flood risk impacts. The access road has been designed with a minimum surface level higher than the 1% AEP considering climate change impact (HEFS) and the 0.1% AEP flood levels of the Kilmastulla River, to minimise the risk of flooding to the access road. The designed access road also includes flood relief culverts along its length where it crosses the Kilmastulla River floodplain, to ensure that there is no obstruction to water flowing across the floodplain for those flood events.

84. However, given the potential flood risk issues associated with the WTP access road, a Stage 3 assessment of the proposed access road is required and has been undertaken as reported in Annex B (WTP Access Road Flood Risk Assessment) and summarised in Section 7.2.

4.3.2 Pluvial Flood Risk

85. A9.4 Figure 3 shows the PFRA mapping, which highlighted one area within the main WTP site to be at risk of pluvial flooding. An analysis of Light Detecting and Ranging (LiDAR) information for the site indicated that this was likely to be due to a localised depression in which surface water runoff could accumulate during large storm events. Construction of the WTP site would remove this depression and also include the installation of a new drainage system, reducing the risk of this potential accumulation of runoff. Building roofs and tank covers account for approximately 55% of the impervious area of the WTP site. Rainfall runoff from these particular surfaces is considered to be of sufficiently consistent quality to be harvested as a source of raw water. Roof and tank cover runoff would be collected in a dedicated, separate pipe network which would outfall into the commissioning lagoons and would ultimately be pumped to the Raw Water Balancing Tanks. It is expected that approximately 145,160m^3 per year of runoff from roofs and tank covers would be harvested and treated to produce water for reuse. General site runoff from internal roads would be taken to an attenuation pond in the south-eastern corner of the WTP site in order to reduce site runoff under heavy rainfall conditions.

86. A9.4 Figure 3 also highlights an area of woodland with potential pluvial flooding, located to the south of the site along the proposed WTP access road. This area of flooding is caused by a localised depression with a level of around 40.8mAOD, which compares to typical adjacent ground, including that of the proposed WTP, at around 44mAOD to 45mAOD. The access road would be constructed at a level which will elevate it above the area of potential pluvial flooding. New drainage infrastructure would also be provided for both the WTP and its access road to minimise the risk of pluvial flooding.

87. It can therefore be concluded that following construction of the Proposed Project, the overall risk of pluvial flooding to the WTP site and its access road would be low. This is also consistent with the finding that there are no historical records of the site being subjected to pluvial flooding.

4.3.3 Groundwater Flood Risk

88. There are no records, or apparent potential sources, of groundwater flooding to the WTP site. The GSI Flooding Probability Maps (A9.4 Figure 3) do not indicate any risk of groundwater flooding to the WTP site. The risk of groundwater flooding to the site can therefore be concluded to be low.

4.4 BPT Site

4.4.1 Fluvial Flood Risk

89. There are no watercourses adjacent to the BPT site. Fluvial flood risk to the site can therefore be concluded to be low.

4.4.2 Pluvial Flood Risk

90. A9.4 Figure 4 shows that the BPT site is situated near the peak elevation along the Proposed Project, with an elevation at around 145.80mAOD. The ground surrounding the site is at 135mAOD or lower; surface water would therefore flow away from the site during extreme rainfall. The BPT would also include the installation of a new drainage system as described in Section 5.1.4.3 of this FRA to receive rainfall and minimise the risk of flooding of the site during large storm events. Therefore, the potential risk of pluvial flooding to the BPT site is low.

4.4.3 Groundwater Flood Risk

91. There are no historic records of groundwater flooding affecting the BPT site. This is to be expected as the site conditions mean it is very unlikely to be subject to accumulations of groundwater. The GSI Flooding Probability Maps also do not indicate any risk of groundwater flooding to the BPT (A9.4 Figure 4). The risk of groundwater flooding to the BPT site is considered to be low.

4.5 BPS Site

4.5.1 Fluvial Flood Risk

92. The BPS is located adjacent to a tributary of the River Camcor. There is no historic record of flooding at the BPS site. Flood modelling of the tributary of the River Camcor was carried out as part of the National Preliminary Flood Risk Assessment (PFRA) (OPW 2012). The fluvial flood modelling shows the site is located in Flood Zone C – Low risk of flooding. The risk of fluvial flooding to the proposed BPS site can be concluded to be low.

4.5.2 Pluvial Flood Risk

93. The PFRA mapping does not indicate a risk of surface water (pluvial) flooding to the BPS site. The BPS site ground levels fall from north-west to south-east towards the tributary of the River Camcor. There are few localised low spots identified which cause ponding of water and pluvial flooding. The construction of the BPS would also include the installation of a new drainage system as described in Section 5.1.4.4 of this FRA to receive rainfall and minimise the risk of flooding on the site during large storm events. Therefore, the potential risk of pluvial flooding to the BPS site is low.

4.5.3 Groundwater Flood Risk

94. There are no historic records of groundwater flooding affecting the BPS site. This is to be expected as the site conditions, including its elevation above the adjacent watercourse, mean it is very unlikely to be subject to accumulations of groundwater. The GSI Flooding Probability Maps also do not indicate any risk of groundwater flooding to the BPS site (A9.4 Figure 5). The risk of groundwater flooding to the BPS site is considered to be low.

4.6 FCV Site

4.6.1 Fluvial Flood Risk

95. The FCV is located adjacent to a tributary of the River Liffey. There is no historic record of flooding at the FCV site. Flood modelling of the tributary of the River Liffey was carried out as part of the National Catchment-based Flood Risk Assessment and Management (CFRAM). The fluvial flood modelling shows the site is located in Flood Zone C – Low risk of flooding. The risk of fluvial flooding to the proposed FCV site can be concluded to be low.

4.6.2 Pluvial Flood Risk

96. The PFRA mapping does not indicate a risk of surface water (pluvial) flooding to the FCV site.

97. Drainage from the FCV site paved areas has been designed to incorporate Sustainable Drainage Systems (SuDS) principles to limit discharges from the site to the equivalent greenfield site flow rate. This would include provision of filter drains to act as attenuation/infiltration devices and would disperse surface and stormwater in a controlled manner to the soakaway located to the north-west of the site. This would have a capacity of 46m^3.

98. The overall risk of pluvial flooding to the FCV site can therefore be considered to be low.

4.6.3 Groundwater Flood Risk

99. There are no historic records of groundwater flooding affecting the FCV site. This is to be expected as the site conditions mean it is very unlikely to be subject to accumulations of groundwater. The GSI Flooding Probability Maps also do not indicate any risk of groundwater flooding to the FCV (A9.4 Figure 6). The risk of groundwater flooding to the FCV site is considered to be low.

4.7 TPR Site

4.7.1 Fluvial Flood Risk

100. There are no permanent watercourses adjacent to the TPR site; there is a drainage ditch, but this is seasonally dry. The risk of fluvial flooding to the proposed TPR site can therefore be concluded to be low.

4.7.2 Pluvial Flood Risk

101. The PFRA mapping indicated a potential risk of pluvial flooding to the TPR site at its boundary. A review of the ground levels across the site indicates this could be due to a localised low spot along the TPR site boundary. A9.4 Figure 7 shows that the site is elevated above surrounding lands with ground levels falling in an east–west direction from 89.1mAOD to around 79.7mAOD. Therefore, during extreme storm events, rainfall falling on the site would be able to flow away as there are no barriers present that could cause flood water to accumulate. The construction of the TPR would also include the installation of a new drainage system as described in Section 5.1.4.6 of this FRA to receive rainfall and minimise the risk of flooding on the site during large storm events. The risk of pluvial flooding to the TPR site is therefore considered to be low.

102. A9.4 Figure 7 also shows a localised area of pluvial flood risk near to the TPR access road. This is likely to be due to a local depression which would be removed following construction of the new access road. The new access road would also include a new drainage system that would be designed to contain a 1 in 100-year storm with an allowance for climate change. The risk of pluvial flooding to the TPR access road is therefore considered to be low.

4.7.3 Groundwater Flood Risk

103. There are no historic records of groundwater flooding affecting the TPR site. This is to be expected as the site conditions, including its elevation above surrounding lands, mean it is very unlikely to be subject to accumulations of groundwater. The GSI Flooding Probability Maps (A9.4 Figure 7) also do not indicate any risk of groundwater flooding to the TPR site. The risk of groundwater flooding to the TPR site is considered to be low.

4.7.4 Artificial Drainage Flood Risk

104. The TPR site is located adjacent to the Peamount Reservoir site. Peamount Reservoir has its own drainage system which includes on-site attenuation that discharges to a nearby dry ditch. There are no reported incidents of flooding from this drainage system.

105. There is no significant flow risk increase associated with pumping to Peamount.

106. As Chapter 4 indicates, stormwater from the attenuation basins would be discharged at greenfield runoff rates via 200mm diameter underground pipework to the network of field ditches/drains located to the north and west of the site. The head manhole on the discharge pipework would contain a flow control device which would control discharge from the system, limiting it to the maximum flow that would be expected from the greenfield site.

107. The basis of this review would be to ensure that, in combination, the Peamount Reservoir and TPR drainage networks can contain a 1 in 100-year storm with an allowance for future climate change. Any upgrades that are recommended following this review would be implemented as part of the Proposed Project.

4.8 Summary

108. A summary of the Stage 2 assessment across the infrastructure sites is provided in Table 4.2. It can be concluded that:

- The RWI&PS site is at a low risk of flooding from all sources. Because of its location on the banks of the Parteen Basin, the RWI&PS is designed so that all flood vulnerable infrastructure is located a minimum of 0.63m above the 0.1% AEP fluvial flood water levels. The topographic profile of the site also ensures that it would naturally shed rainfall and not give rise to deep accumulations of surface water runoff

- The proposed RWI&PS access road is at potential risk of fluvial flooding. A Stage 3 assessment was therefore required to verify its potential impacts on flood risk, which is presented in Section 7.1
- The WTP site is at a low risk of flooding from all sources. Ground levels across the site allow for the discharge of surface water runoff and a new drainage system would also be installed to reduce the risk of flooding from extreme rainfall
- The key pluvial flood risk area near the WTP site is located to the south in an area of woodland, which is crossed by the WTP access road. Ground levels would be raised in this location and a new drainage system provided to minimise the risk of flooding to the access road
- The proposed WTP access road is at potential risk of fluvial flooding. A Stage 3 assessment was therefore required to verify its potential impacts on flood risk, which is presented in Annex B (WTP Access Road Flood Risk Assessment) and summarised in Section 7.2
- The BPT site occupies an elevated position relative to surrounding lands meaning the site is very unlikely to be prone to flooding from any source. There are also no watercourses near to the BPT site
- The BPS site is at a low risk of flooding from all sources. Ground levels across the site allow for the discharge of surface water runoff and a new drainage system would also be installed to reduce the risk of flooding from extreme rainfall
- The TPR site occupies an elevated position relative to surrounding lands meaning the site is unlikely to be prone to flooding from any source. There are also no permanent watercourses near to the TPR site. Stormwater from the attenuation basins would be discharged at greenfield runoff rates to the network of field ditches/drains
- The GSI Flooding Probability Maps do not show any risk of groundwater flooding to any of the sites.

Table 4.2: Stage 2 Flood Risk Summary

Site	Stage 2 Flood Risk				Notes
	Fluvial	Pluvial	Groundwater	Other	
RWI&PS	Low (excludes access road)	Low	Low	Low	All flood vulnerable infrastructure is at an elevation that is 0.24m above controlled operational water levels in the Parteen Basin. The RWI&PS access road is at potential risk of fluvial flooding.
WTP	Low (excludes access road)	Low	Low	Low	The site occupies relatively raised ground with the nearest watercourse approximately 5m below the level of the site. The WTP access road is at potential risk of fluvial flooding.
BPT	Low	Low	Low	Low	The site occupies raised ground and there are no watercourses near to the site.
BPS	Low	Low	Low	Low	The site is located adjacent to a tributary of the River Camcor. PFRA flood modelling shows the BPS site is located outside Flood Zone A and B. The is no recorded history of flooding at the site.
FCV	Low	Low	Low	Low	The site is located adjacent to a tributary of the River Liffey, but the CFRAM maps show it is located in Flood Zone C – Low risk of flooding. Drainage from the site paved areas has been designed to incorporate SuDS principles to limit discharges from the site to the equivalent greenfield site flow rate.
TPR	Low	Low	Low	Low	The site occupies relatively raised ground and there are no watercourses near to the site. Stormwater from the attenuation basins would be discharged at greenfield runoff rates to the network of field ditches/drains.

4.9 Flood Risk Due to Climate Change

109. Future climate change is predicted to give rise to an increased risk of flooding through rising sea levels, an increase in river flows and the frequency and intensity of extreme rainfall. The OPW has identified two potential scenarios for the impacts of climate change on pluvial, fluvial and coastal flooding in the FRM Guidelines (DEHLG and OPW 2009) that are known as the Mid-Range Future Scenario (MRFS) and High-End Future Scenario (HEFS). Table 4.3 summarises the predicted impacts of both scenarios on predicted sea levels, peak river flows and rainfall depths over the next 100 years.

Table 4.3: Climate Change Forecasts

Parameter	MRFS	HEFS
Mean sea level rise	+500mm	+1,000mm
River flows	+20%	+30%
Extreme rainfall depths	+20%	+30%

110. The MRFS scenario is intended to represent the 'likely' future scenario based on a range of forecasts. The HEFS represents a more extreme forecast that is at the upper end of accepted projections. For the purposes of this FRA, the potential impact of climate change on flood risk to the infrastructure sites (see Table 4.4) has been assessed relative to the HEFS as the accepted most unfavourable future scenario with respect to the impacts of climate change.

Table 4.4: Climate Change Impacts

Source of Flooding	Sites Potentially Affected	Likely Impacts of Climate Change	Discussion
Coastal and estuarine	None	No Impact	No change. The locations and elevations of all the critical infrastructure sites mean they would still not be at risk from coastal and estuarine flooding despite the predicted increase in sea level of 0.5m over the next 100 years.
Fluvial	RWI&PS, BPS, WTP access road	Low	RWI&PS The effects of future climate change on peak water levels in the Parteen Basin were assessed as part of the Shannon CFRAM Study. While future climate change would result in an increase in river flows, this would not give rise to an increase in the risk of fluvial flooding to the RWI&PS, given the effect of the Ardnacrusha Generating Station in controlling water levels. The design of the access road to the RWI&PS will consider the impact of climate change on the unnamed watercourse from increased flows, which would be expected to result in higher flood levels. A detailed climate change impact assessment has been undertaken (included in Section 7 of this report). BPS The BPS site is located adjacent to a tributary of the River Camcor. To create a level site, the BPS site would be raised above the existing ground level. The BPS site level is 4.18m above the upstream level of the River Camcor. Given the elevation of the BPS site above the adjacent river, it is considered the increase in water level due to climate change would not impact the existing flood risk to the BPS site. WTP access road The design of the access road to the WTP will consider the impact of climate change on the Kilmastulla River from increased flows, which would be expected to result in higher flood levels. A detailed climate change impact assessment has been undertaken (included in Section 7 of this report and Annex B (WTP Access Road Flood Risk Assessment)).

Source of Flooding	Sites Potentially Affected	Likely Impacts of Climate Change	Discussion
Pluvial	All	No change	While future climate change would result in increased rainfall depths over the sites, this would not result in an increase in the risk of pluvial flooding to the sites as: • All new drainage systems would be designed to allow for the effects of future climate change • The existing topography across the infrastructure sites would still be unlikely to give rise to accumulations of surface water.
Artificial drainage systems	RWI&PS, BPS, WTP, BPT (with external development) and TPR	No change	RWI&PS, BPS, WTP and BPT No change. There are no existing artificial drainage systems present in close proximity to any of these sites. It is also reasonable to assume that any new artificial drainage systems that are installed near the sites by other developments would be subject to an FRA which complies with the FRM Guidelines, as this is required by the Development Plan, and so would be designed to allow for the effects of future climate change. TPR The new drainage for the TPR site would be connected to the existing network on the Peamount Reservoir site. An assessment would be undertaken during detailed design to ensure that the Peamount Reservoir drainage network is sufficient to account for the effects of future climate change with the addition of the TPR. Any upgrades that are identified as necessary would be implemented as part of the Proposed Project.
Groundwater	None	No Impact	None of the sites have a history of groundwater flooding. Their topography and elevation ensure a continued low risk to groundwater flooding even with the effects of future climate change.

111. It can therefore be concluded that future climate change would not significantly change the risk of flooding to any of the infrastructure sites. This is because the proposed site locations have been shown to be at a low risk of flooding from all sources and this is not changed as a consequence of the predicted effects of climate change.

5. Potential Flood Risk Impacts from the Infrastructure Sites

112. This section considers the potential change in flood risk to the surrounding areas arising from the Proposed Project across the infrastructure sites and outlines the necessary mitigation to ensure no increase in the risk of flooding.

5.1 Impacts from the Infrastructure Sites

5.1.1 Impacts on Coastal and Estuarine Flooding

113. In Section 4 it was noted that, due to the inland locations and the elevations of the infrastructure sites, there is no risk of coastal or estuarine flooding. For these same reasons, the proposed works would have no impact on either coastal or estuarine flood risk elsewhere as there would be no interaction between the Proposed Project and coastal or estuarine processes.

5.1.2 Impacts on Artificial Drainage

114. It was also noted that, with the exception of the TPR site, the infrastructure sites would be located on greenfield sites, meaning there would be no risk of flooding from piped artificial drainage networks. For these same reasons, the proposed works would have no impact on flooding from existing artificial drainage networks elsewhere.

5.1.3 Impacts on Fluvial Flooding

115. During the Operational Phase, the infrastructure sites could potentially result in an increased risk of fluvial flooding if they:

- Reduced the conveyance of the existing watercourse and floodplain network
- Reduced the volume of flood storage available on the watercourse floodplains
- Increased site runoff rates and volume.

116. The RWI&PS was the only one of the infrastructure sites to be at potential risk of fluvial flooding, but any flood sensitive infrastructure associated with the RWI&PS has been designed so that it is elevated above the floodplain and at a low risk of fluvial flooding.

117. The proposed RWI&PS access road involves a new crossing of an unnamed watercourse. Therefore, the infrastructure may have an impact on the conveyance of this watercourse. In Section 7.1 of this report, a Stage 3 Flood Risk Assessment will be carried out at this crossing to confirm if there is an increase in flood risk in other receptors due to the proposed access road's construction. It is assumed that the designed culvert has enough capacity to convey the peak flows and does not increase the risk in the adjacent areas, nevertheless that this is assessed at Stage 3.

118. Water levels in Lough Derg and Parteen Basin are controlled by ESB for the operation of Ardnacrusha Generating Station. During flood flows, when the ESB can no longer keep the water level below the top of the Lough Derg Normal Operating Band, the ESB can operate Ardnacrusha at full capacity as they have done in the past, and the proposed WSP abstraction flow would be provided from a minor depletion in the simulated lake storage.

119. Given the localised nature of the RWI&PS works in the context of the Parteen Basin and effect of the Ardnacrusha Generating Station in controlling water levels, it can be concluded that the RWI&PS would not impact on fluvial flood risk. This is because normal and flood levels in the Parteen Basin are controlled solely by the operation of Ardnacrusha Generating Station and would not be affected by the construction of the RWI&PS.

120. The proposed WTP access road would be at risk from fluvial flooding. An assessment of its flood risk impacts on the Kilmastulla River has been undertaken and is included in Section 7.2 and Annex B (WTP Access Road Flood Risk Assessment).

5.1.4 Impacts on Pluvial Flooding

121. In order to assess the increase in pluvial flood risk, the following points were considered:

- Whether the Proposed Project would increase the runoff rate
- Whether the Proposed Project would alter existing flow paths
- Whether the Proposed Project would alter existing drainage routes.

122. All the infrastructure sites would be located on greenfield sites and therefore have the potential to result in an increase in the rate of runoff from the creation of additional impermeable surfaces. To ensure that there would be no increase from existing greenfield runoff rates for any of the infrastructure sites, the design includes a variety of SuDS to store and/or attenuate any additional runoff generated by the Proposed Project. The drainage has been designed with reference to recognised industry best practice guidance such as the Construction Industry Research and Information Association (CIRIA) SuDS Manual (C753) (CIRIA 2015).

123. The specific measures that would be implemented at each of the infrastructure sites to ensure no increase in runoff as a consequence of the permanent works are described in Sections 5.1.4.1 to 5.1.4.6.

5.1.4.1 RWI&PS

124. The RWI&PS includes a new access road connecting to the R494. Drainage from this access road would be 'over the edge' to a longitudinal soakaway located along either edge of the road. The soakaways would be designed to ensure they provide sufficient storage for highway runoff to percolate into the underlying ground.

125. On the RWI&PS site itself, rainwater from the roof of the Raw Water Pumping Station Building and the two Microfiltration Buildings would be harvested and taken to the site intake. This would then be transferred via the RWRMs to the WTP for treatment and onward supply. This would ensure no increase in existing greenfield runoff rates from rainfall falling on these elements of the site.

5.1.4.2 WTP

126. Two separate drainage networks would be installed to receive runoff from the WTP:

- Network 1 would receive runoff from the building roofs and tank covers. These features would account for approximately 55% of the total site runoff. This network would divert the runoff to the two Tank Draindown Management and Commissioning Lagoons (ID 20 on Image 5.1) from where it would be harvested and pumped to the Raw Water Balancing Tanks for treatment to produce potable water. The commissioning lagoons are designed to ensure sufficient capacity to contain runoff during a 100-year storm with an allowance for future climate change, while not impacting on operational requirements

- Network 2 would receive general runoff from the site including roads and hardstanding areas. A gully and pipe system would receive runoff and convey it to the Stormwater Attenuation Pond at the south-east corner of the site (ID 21 on Image 5.1), adjacent to the access road. The Stormwater Attenuation Pond would be designed following the guidance in the CIRIA SuDS Manual (CIRIA 2015) to attenuate runoff to existing greenfield runoff rates. The pond would be designed to contain a 100-year storm with an allowance for future climate change. Stormwater from the attenuation pond would be discharged into a manhole at the head of the WTP Access Road. This manhole would contain a flow control device which would control discharge from the system, limiting it to the maximum flow that would be expected from the greenfield site. Stormwater runoff would be conveyed by a 600mm diameter stormwater drain running along the route of the WTP Access Road to discharge into the stream crossed by the proposed access road immediately north of its junction with the R445 public road.

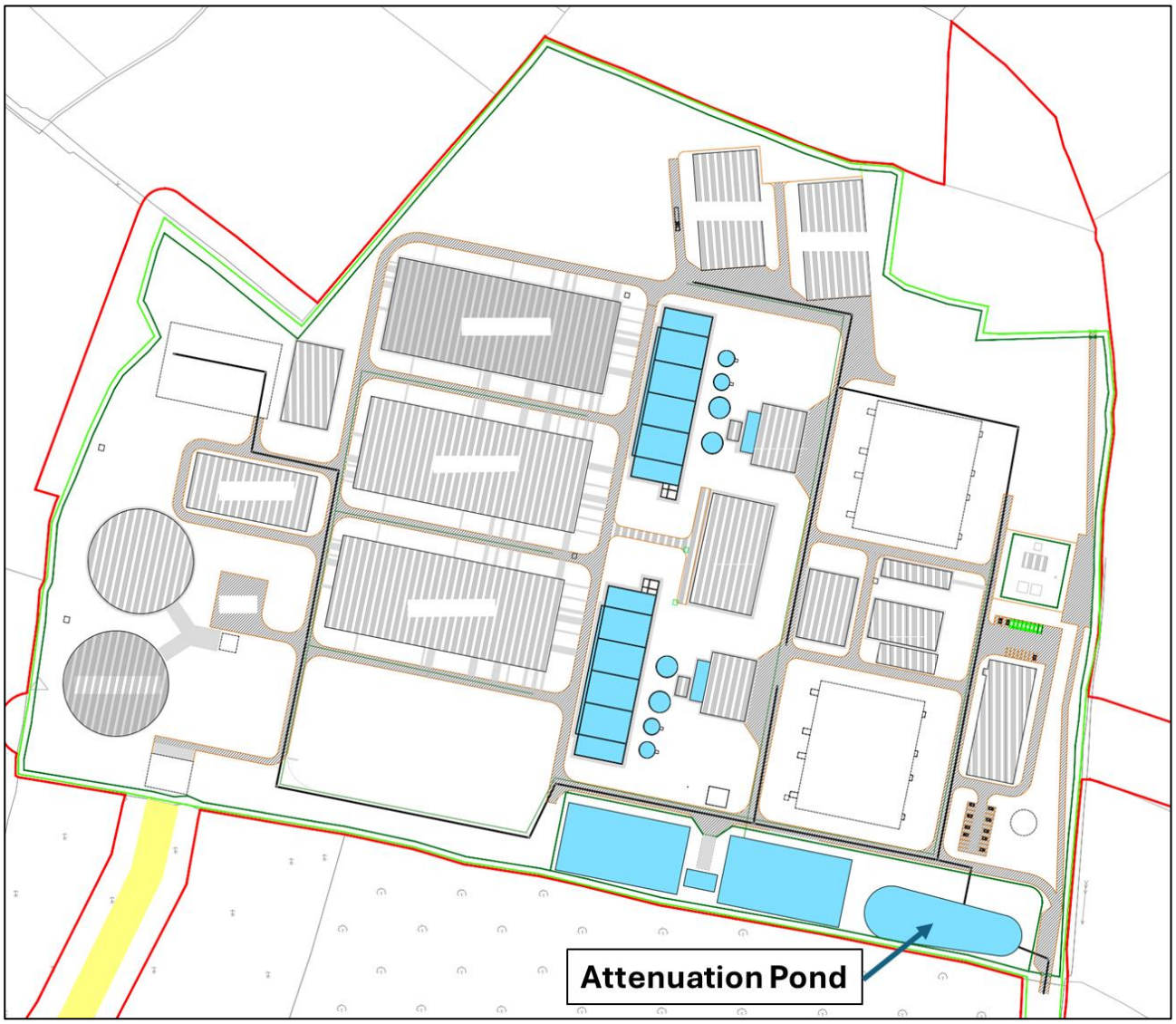


Image 5.1: Proposed Attenuation Pond for the WTP Site

127. Some of the road and hardstanding working areas would also be allowed to drain to pea-gravel beds distributed throughout the site. These beds would be designed to store excess rainwater and provide a pathway for it to infiltrate into the subsoil.

128. Implementation of the two networks, runoff harvesting, gravel beds and attenuation would ensure no net increase in runoff from the WTP site.

5.1.4.3 BPT

129. The BPT access road and other paved areas would be designed to incorporate SuDS principles, to reduce discharges from the BPT site to the existing greenfield runoff rate. The roof of the BPT would be grassed to reduce surface water runoff. Filter drains would receive surface water runoff from paved areas and would disperse surface and storm water in a controlled manner to either the infiltration basin at the site or to a soakaway chamber alongside the access road. Runoff from the roof of the Control Building would be directed to the infiltration basin.

5.1.4.4 BPS

130. The BPS access road and paved areas would be designed to incorporate SuDS principles to reduce discharges from the BPS site to existing greenfield runoff rate. Rainfall from new impermeable areas would be collected by a piped drainage network. This would drain to an attenuation pond, which would discharge to the adjacent watercourse via a flow control device.

5.1.4.5 FCV

131. Drainage from the FCV site paved areas has been designed to incorporate SuDS principles to limit discharges from the site to the equivalent greenfield site flow rate. This would include provision of filter drains to act as attenuation/infiltration devices and would disperse surface and stormwater in a controlled manner to the attenuation pond located to the north-west of the site. This would have a capacity of 46m^3.

5.1.4.6 TPR

132. The TPR access road, and other paved areas, will be designed to incorporate SuDS principles to limit discharges from the TPR site to the equivalent greenfield site flow rate. Filter drains would disperse surface water to attenuation ponds. Surface water from the attenuation basins would be discharged via a 200mm diameter underground pipe to the network of field drains and ditches located to the north and west of the site via a discharge point at the north-west point of the site.

5.1.5 Impacts on Groundwater Flooding

133. There would be no impacts on groundwater flooding as none of the infrastructure sites are located in areas that are prone to flooding from this source.

6. Construction Phase and Operational Phase Considerations for the Pipeline Sections

134. The methodology employed in the initial siting of the pipeline involved the application of Geographical Information System (GIS) sifting and evaluation techniques. The GIS enabled map-based analysis of environmental constraints, including location and extent of floodplains. Also, collateral flood damage was a consideration in respect of the choice of pipeline material.

135. The primary flood risk impact to, and arising from, the RWRMs and Treated Water Pipeline sections was assessed as neutral as they would be buried below ground and would not affect overland or groundwater flooding processes. It is acknowledged however that there are potential Construction Phase and Operational Phase activities for these pipeline sections, such as the location of material stockpiles or planned washouts, which warrant further consideration with respect to flood risk. This section outlines the measures that would be applied as part of the Proposed Project to ensure there is no increase in flood risk.

6.1 Construction Phase Impacts

136. The construction methodology for the Proposed Project is described in detail in Chapter 5 (Construction & Commissioning) of the EIAR. The paragraphs below outline the measures that are planned to be taken during construction and commissioning to address potential issues that are specifically associated with flood risk.

6.1.1 Construction Compounds

137. Given the extent of the Proposed Project, a number of Construction Compounds would be required to serve the works. Four Principal Construction Compounds are proposed to service each of the proposed construction contracts, which would be located as follows (see also A9.4 Figures 1-8):

- Construction Compound CC1 (Chapter 5 Figure 5.1) – In the townland of Incha Beg, County Tipperary, within the WTP site, to serve the RWI&PS, RWRMs and WTP
- Construction Compound CC2 (Chapter 5 Figure 5.3) – In the townland of Lisgarriff, County Tipperary, to serve the Treated Water Pipeline from the WTP to the BPT, and BPT
- Construction Compound CC5 (Chapter 5 Figure 5.6) – In the townland of Killananny, County Offaly, to serve the upstream 66km section of the Treated Water Pipeline
- Construction Compound CC6 (Chapter 5 Figure 5.7) – In the townland of Drummond, County Kildare, to serve the remaining section of the Treated Water Pipeline to the TPR.

138. In addition to these four Principal Construction Compounds, there would be four secondary Satellite Construction Compounds located at specific centres of works, namely the RWI&PS, BPT, BPS and TPR. Pipe Storage Depots are also required to augment the three Principal Construction Compounds that would serve construction of the Treated Water Pipelines (i.e. CC2, CC5 and CC6).

139. A9.4 Figure 8.1 to A9.4 Figure 8.59 show that to minimise flood risk to, and ensure no increase in flood risk arising from, the Principal and Satellite Construction Compounds and Pipe Storage Depots, they have all been located in areas that are at a low risk of flooding based on the PFRA flood extents.

140. Exceptions to this are Pipe Storage Depot PSD4 and Construction Compound CC4 located at the BPS. In A9.4 Figure 8.24), the PFRA shows an approximate flood extent, and the PSD4 depot layout would be adjusted to suit local flood risk conditions to ensure it is at low risk of flooding. For Construction Compound CC4, A9.4 Figure 8.26 shows it is located inside the PFRA map fluvial flood zone, but outside of land affected by fluvial flood risk.

141. Generally, the Construction Compounds and Pipe Storage Depots would be pervious as they would be overlain in stone, which would permit the percolation of surface water through to the underlying subsoil, as happens currently, and maintain the existing drainage pattern. Those areas with impervious pavement would be graded to a fuel/oil separator to collect any surface water runoff contaminants.

142. The Satellite Construction Compound (CC0) for the RWI&PS would also require the construction of lined Dewatering Settlement Basins, initially for the purposes of groundwater management and site runoff but subsequently to act as permanent infiltration basins.

6.1.2 RWRMs and Treated Water Pipeline Construction

143. A Construction Working Width would be required for construction of the RWRMs and Treated Water Pipelines. Image 6.1 shows a typical cross section of the temporary Construction Working Width for the pipeline between the WTP and the TPR. Similar arrangements would be in place for the RWRMs. The corridor would comprise an open-cut trench, with the width of the corridor determined to provide sufficient space for plant, materials and stockpiles of topsoil and material excavated from the trench.

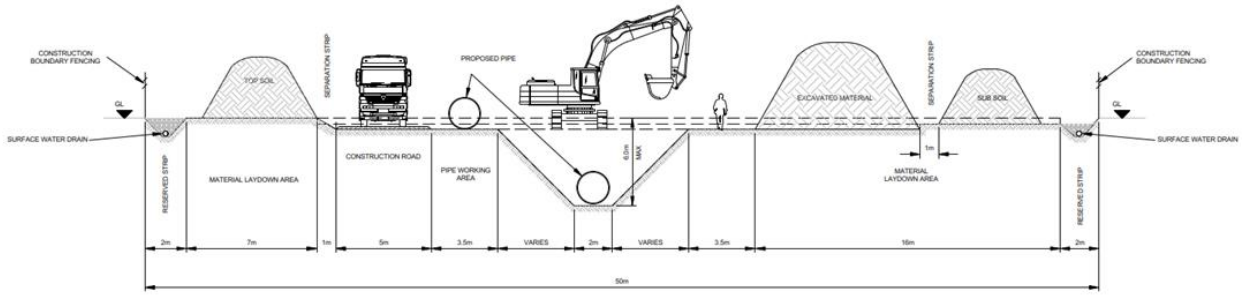


Image 6.1: Indicative Construction Working Width Cross Section

144. Construction of the Proposed Project is planned to occur from 2028 and is expected to last for approximately five years. Construction of the pipeline would be conducted in a number of sections of manageable lengths to ensure that disruption to individual landowners would be minimised. Portions of the Construction Working Width would be 'opened up' (i.e. the trench would be excavated or 'opened') to create a new construction area once works in the previous construction area are suitably progressed and nearing completion. The length of Construction Working Width that would be opened up would vary depending on the location and access points from the public road but would typically be between 5km and 15km. Construction may not always occur in sequence along the Construction Working Width. The order in which each portion is opened for construction would be selected based on operational constraints such as weather, ground conditions, resource availability and other constructional needs. This would minimise the risk of opening a portion of the Construction Working Width for construction and not being able to complete the construction of that portion in a reasonable timeframe due to construction constraints.

145. Table 6.1 identifies how construction of the RWRMs and Treated Water Pipelines could give rise to a temporary increase in flood risk from a number of sources. As shown, primarily, these reflect the potential increase in pluvial and fluvial flooding from a temporary increase in surface water runoff or interception of overland flow paths.

146. To ensure full mitigation of the potential Construction Phase impacts on flood risk during the works, the construction methodology also includes mitigation measures such as the following (see Table 6.1 for further details):

- Temporary runoff storage and attenuation features will be implemented within all active working areas, including the infrastructure sites, to store and attenuate any additional runoff that is generated during construction

- Use of combined filter drains, soakaways or similar to receive and attenuate site runoff within active working areas
- Careful placement of excavated fill to avoid stockpiles in areas prone to flooding or overland runoff
- Where material stockpiles need to be built in the floodplain, the following measures will be implemented to ensure there is no increase in the risk of flooding:
  - Minimise the length of stockpiles so they can be bypassed by overland flows
  - Provide culverts through them so they do not block overland flows
  - Sequence works to avoid lands subject to seasonal flooding
  - Provide runoff attenuation and control along the Treated Water Pipeline trench to prevent it from acting as a flow conveyance route.

Table 6.1: Construction Impacts of the RWRMs and Treated Water Pipeline

Detail	Flood Risk Impact	Mitigation
Construction of Temporary Construction Roads and ground compaction	Pluvial – potential increase in net runoff from reduced infiltration or creation of impermeable temporary road surfaces	A combination of measures will be applied, where necessary, to ensure no increase in runoff from any new impermeable temporary road surfaces. These measures will include runoff attenuation by strategically located attenuation ponds or lagoons or the implementation of filter drains. The design for these measures will be developed by the appointed Contractor and will ensure no temporary increase in runoff from Temporary Construction Roads along the length of the Proposed Project during the Construction Phase.
Construction of Temporary Construction Roads including temporary bridge crossings	Fluvial – potential increase in flood risk from reduced channel conveyance	Section 6.1.3 outlines the proposed methodology for temporary bridge crossings of watercourses by the Proposed Project. The design of these crossings will be further developed by the appointed Contractor prior to construction. Any such, temporary works design will be subject to Section 50 consent (Arterial Drainage Act 1945) to ensure no increase in flood risk.
Removal of topsoil and vegetation clearance	Pluvial – potential increase in net runoff from reduced infiltration	Construction of runoff attenuation areas to store and attenuate any excess runoff generated during construction of the works. These attenuation areas will need to be maintained while vegetation along the Construction Working Width re-establishes.
Stockpiling of topsoil and excavated fill	Fluvial and pluvial – potential increase from intercepting overland runoff routes and increasing flood risk	Material stockpiles to be located outside of active floodplains and flow path routes where practicable. Where material is stockpiled in the floodplain, provisions shall be made for flows to pass through (culverts) or around it and the temporary loss of floodplain shown to have no impact on flood risk. The position and extent of the Construction Working Width with respect to the PFRA flood risk extents is provided in A9.4 Figure 8.1 to A9.4 Figure 8.59.
Construction of cofferdams and other in-channel controls to permit pipe crossings of watercourses	Fluvial – increase in flood risk from flows being backed-up by temporary in-channel structures	Pipe crossings will be tunnelled beneath large watercourses to eliminate the need for in-channel structures. Where the size of the watercourse permits installation by open-cut, a temporary works design will be developed and subject to the appropriate consent to ensure no increase in flood risk. This will include the provision for fluming/diversion in the working area and overpumping.

Detail	Flood Risk Impact	Mitigation
Flooding from conveyance of surface water by the open-cut trench	Pluvial – potential increase in flood risk from surface water flowing along the trench leading to flooding	RWRMs The RWRMs will be laid uphill from the RWI&PS site to an Air Valve and then downhill to the WTP. Surface water entering the trench will be conveyed to settlement lagoons located within the RWI&PS and WTP sites to ensure no increase in flood risk. Treated Water Pipeline Impermeable clay barriers will be formed across the trench at strategic locations to prevent unintended longitudinal drainage along the trench. These will be aligned with settlement/attenuation lagoons to receive and store excess runoff.

147. These measures will be designed and implemented during construction by the appointed Contractor and will be subject to all applicable consents.

6.1.3 Watercourse Crossings

148. The RWRMs and Treated Water Pipelines would cross a number of watercourses; see A9.4 Figure 8.1 to A9.4 Figure 8.59. The proposed methods for crossing the watercourses are as follows:

- Trenchless crossing – this would apply to the crossings of the Nenagh River and Kilmastulla River by the Treated Water Pipeline from the WTP to the BPT and a number of watercourse crossings by the Treated Water Pipeline from the BPT to the TPR (31 in total, see Table 6.2). Trenchless crossings would involve tunnelling under the watercourse or canal so as not to disrupt the flow, meaning there would be no impact on flood risk. No in-channel works of any form are required as part of these works
- Open trench crossing – this would apply to all other watercourse crossings (481 in total) and would be achieved by either ‘damming and fluming’ or ‘damming and pumping’.

Table 6.2: Pipeline Water Body Crossings by Trenchless Construction Techniques

Crossing ID	Chainage	Infrastructure Element	WFD Water Body Name	Sensitivity
WBX003	RW – 1000	Treated Water Pipeline from RWI&PS to WTP	Unnamed Watercourse	Medium
WBX008, WBX009	TW – 3600	Treated Water Pipeline from WTP to BPT	Unnamed Watercourse	Very High
WCX016	TW – 19500	Treated Water Pipeline from WTP to BPT	Nenagh_070	Very High
WCX026	TWA – 12900	Treated Water Pipeline from BPT to BPS	Little Brosna_030	High
WCX031	TWA – 26000	Treated Water Pipeline from BPT to BPS	Camcor_030	High
WCX032, WBP257, WBP210, WBP258, WBP259, WBX035, WBX036	TWA – 27600	Treated Water Pipeline from BPT to BPS	Camcor_030 and unnamed watercourses	High
WCX036	TWB – 12600	Treated Water Pipeline from BPS to FCV	Silver (Kilcormac)_020	High
WCX039	TWB – 24800	Treated Water Pipeline from BPS to FCV	Clodiagh (Tullamore)_020	High
WBX096	TWC – 100	Treated Water Pipeline from BPS to FCV	Unnamed Watercourse	Low

Crossing ID	Chainage	Infrastructure Element	WFD Water Body Name	Sensitivity
WBP147	TWC – 4800	Treated Water Pipeline from BPS to FCV	Unnamed Watercourse	High
WCX056	TWD – 4100	Treated Water Pipeline from BPS to FCV	Figile_030	High
WCX057	TWD – 6400	Treated Water Pipeline from BPS to FCV	Figile_030	High
WBX078, WBP094, WBP095	TWD – 15000	Treated Water Pipeline from BPS to FCV	Grand Canal Main Line East (Barrow)	Very High
WCX076, WCX073	TWE – 9600	Treated Water Pipeline from BPS to FCV	Liffey_140	Very High
WBX088, WBP212	TWE – 14100	Treated Water Pipeline from FCV to TPR	Grand Canal Main Line (Liffey and Dublin Bay)	Very High
WBP216, WBP254	TWE – 15300	Treated Water Pipeline from FCV to TPR	Unnamed Watercourses	High
Directional Drilling for Power Connections				
WCX001	Power connection along R445		Kilmastulla	Very High
WCX077	Power connection along R494		Kilmastulla	Very High

149. Image 6.2 shows the proposed method for ‘damming and fluming’. In-channel dams are formed using sandbags or cohesive fill and a flume is used to divert flows around the working area that needs to be kept dry during installation of the pipe. A trench is then dug across the watercourse to receive the pipeline section. The arrangement for ‘damming and overpumping’ is similar to that shown in Image 6.2 but with pumps used instead of the flume to divert flows around the working area to permit installation of the pipeline section.

150. The flume or pumps would be designed to maintain flow conveyance so there is no temporary increase in water levels upstream or downstream of the in-channel working area. These designs would be developed by the appointed Contractor and subject to all applicable consents. A detailed Emergency Response Plan and Method Statements would also be produced by the appointed Contractor in agreement with the OPW and Inland Fisheries Ireland that allow for the removal of any temporary in-channel works if high river levels or potential flooding is forecast.

151. Once the pipeline section has been installed across a watercourse, the trench would be backfilled and the temporary works removed to return the channel to its original form. In some instances, it would be necessary to install a temporary bridge at the watercourse crossing to maintain the movement of construction traffic along the construction corridor.

152. Typically, these bridge crossings would be modular flat-pack bridges which are available to span crossings of up to 12m. These bridge crossings would be designed to ensure flow conveyance is maintained in the watercourse and that there is no impact on upstream river levels. Section 50 consent will also be obtained as necessary for the works.

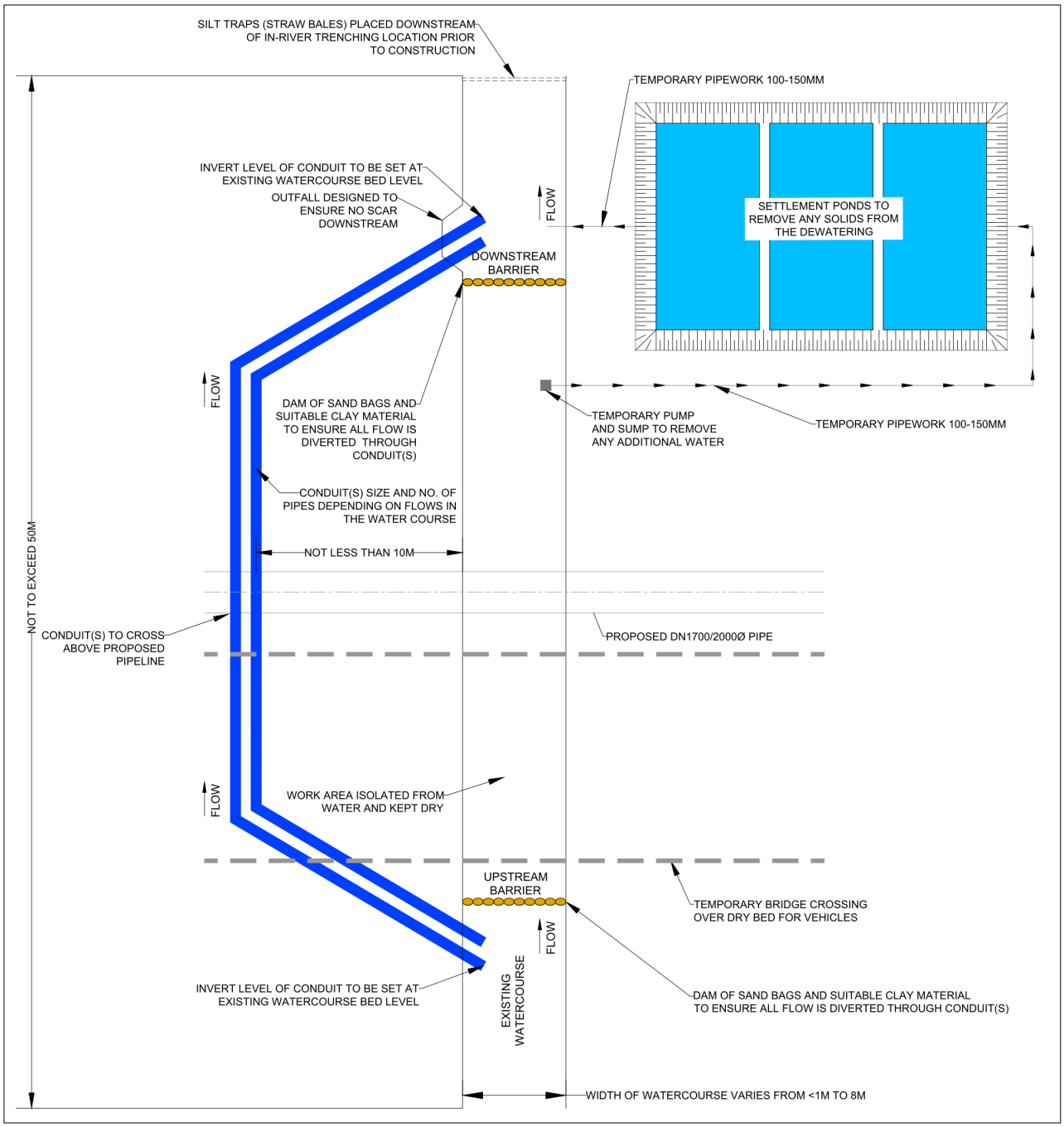


Image 6.2: 'Damming and Fluming' Arrangement for a Watercourse Crossing

6.1.4 Additional areas of Land Raising

153. There would be 51 Line Valves located along the pipeline (excluding valves at the Infrastructure Sites). Line Valves would be installed within the RWRMs and Treated Water Pipelines to enable all sections to be isolated, drained and recharged during the Commissioning Phase and for maintenance purposes during the Operational Phase.

154. The spacing of Line Valves is a function of the topography and the capacity and suitability of the nearby watercourses to receive water from Washouts. The Line Valves would be sited where possible adjacent to public roads to facilitate plant access and maintenance. Access to the Line Valves for safe operation and maintenance would be facilitated by the construction of Lay-Bys at the road edge.

155. For four of the Line Valves, as listed in Table 4.19 of Chapter 4 Proposed Project Description, it is proposed that the surrounding land would need to be raised, using suitably graded embankments to match the ground levels of the adjacent road for future access during the Operational Phase. A fence would be required at the top of these embankments for safety.

Table 6.3: Line Valves Where Their Surrounding Land Would be Raised

Line Valve	Line Valve Reference	Approximate Chainage	Approximate Embankment Height (m)
WO-61	LV-RDX044-01	TWA – 14155	1.5
WO-137	LV-RDX077-01	TWC – 9020	1.5
WO-188	LV-RDX088-01	TWD – 8110	1.5
WO-229	LV-RDX100-01	TWE – 120	1

156. Line Valves WO-61, WO-137 and WO-229 are not located in land affected by any source of flood risk.

157. WO-188 is located on the edge of the NIFM low probability scenario flood extents. As the proposed embankments for the access road to that valve would be at the same height as the adjacent existing road, which is not affected by flood risk, it could be considered that those embankments would not be affected by flood risk, and they would not produce a significant increase in flood risk over the nearby areas.

6.2 Maintenance Activities

158. This section outlines the principles that would apply to maintenance activities that might be undertaken on the RWRMs and Treated Water Pipelines to ensure no increase in flood risk.

6.2.1 Raw Water Rising Mains

159. The RWRMs are designed to be cross-connected so that either main can be taken out of service for cleaning. A 2,860m^3 capacity Raw Water Rising Mains Scour Tank would be provided at the RWI&PS to allow the RWRMs to be emptied for cleaning or in an emergency.

160. The Raw Water Rising Mains Scour Tank would be located below the Microfiltration Buildings and can drain back to the Inlet Chambers for re-pumping to the WTP. This approach would ensure that the RWRMs do not need to be discharged into the Parteen Basin for cleaning or in the event of an emergency.

6.2.2 Treated Water Pipeline Planned Discharges

161. A bulk water transmission main would operate for many years with relatively little maintenance. During commissioning of the Treated Water Pipeline, planned discharges via Washout Valves would be undertaken as required to remove silt and sediment which may have accumulated during the construction process. Following commissioning, the Washout Valves would be used infrequently, as planned discharges would only be required for maintenance or cleaning of the pipeline after a period of 20 to 30 years. The Washouts may be used for unplanned discharges due to operational requirements between the planned maintenance use.

162. The Washouts would be located at low points along the pipeline. When they are used, they would only be required to drain short sections of the pipe that cannot be drained to either end of the pipeline due to the topography.

163. If required, discharges from Washouts would be piped to nearby open watercourses or discharge to land using flexible hoses. Permanent outfalls would be provided where high flows would preclude the use of temporary pipework.

164. The number of Washouts required is a function of the topography and capacity of receiving streams to accept the discharge. It is proposed to restrict any single discharge from a Washout to a stream/watercourse to 20% of the QMED/Index Flood[4] flow. QMED was selected as the reference flow as it is widely accepted that, for the majority of rivers, QMED flows are contained in-bank.

165. For the purposes of this FRA, the following principles will be ensured for a release from a Washout:

- Discharges would only occur during periods when river flows are lower than the mean flow (typically June to September)
- Discharges would only occur to receiving watercourses that have sufficient capacity to receive flows from the pipeline without increasing flood risk
- Any draindown would be staged to ensure that multiple discharges to a single receiving watercourse do not happen concurrently
- Discharges would be controlled in accordance with Environmental Protection Agency and OPW requirements and would be subject to the applicable permitting regime at the time of release
- The rate of release would be managed to prevent scour from, or increased sediment loads to, the receiving watercourses.

166. An indicative arrangement for a Washout is provided in Image 6.3. The measures described above, including the minimum QMED flow for the potential receiving watercourses, the limitations on the discharge rate and the arrangement of the permanent outfall, would assure that the risk of flooding during Washout operations would be low.

[4] QMED/Index Flood is taken as the median flow of a series of gauged annual maximum flows. It approximately equates to a 50% AEP or 1 in 2 annual chance flow

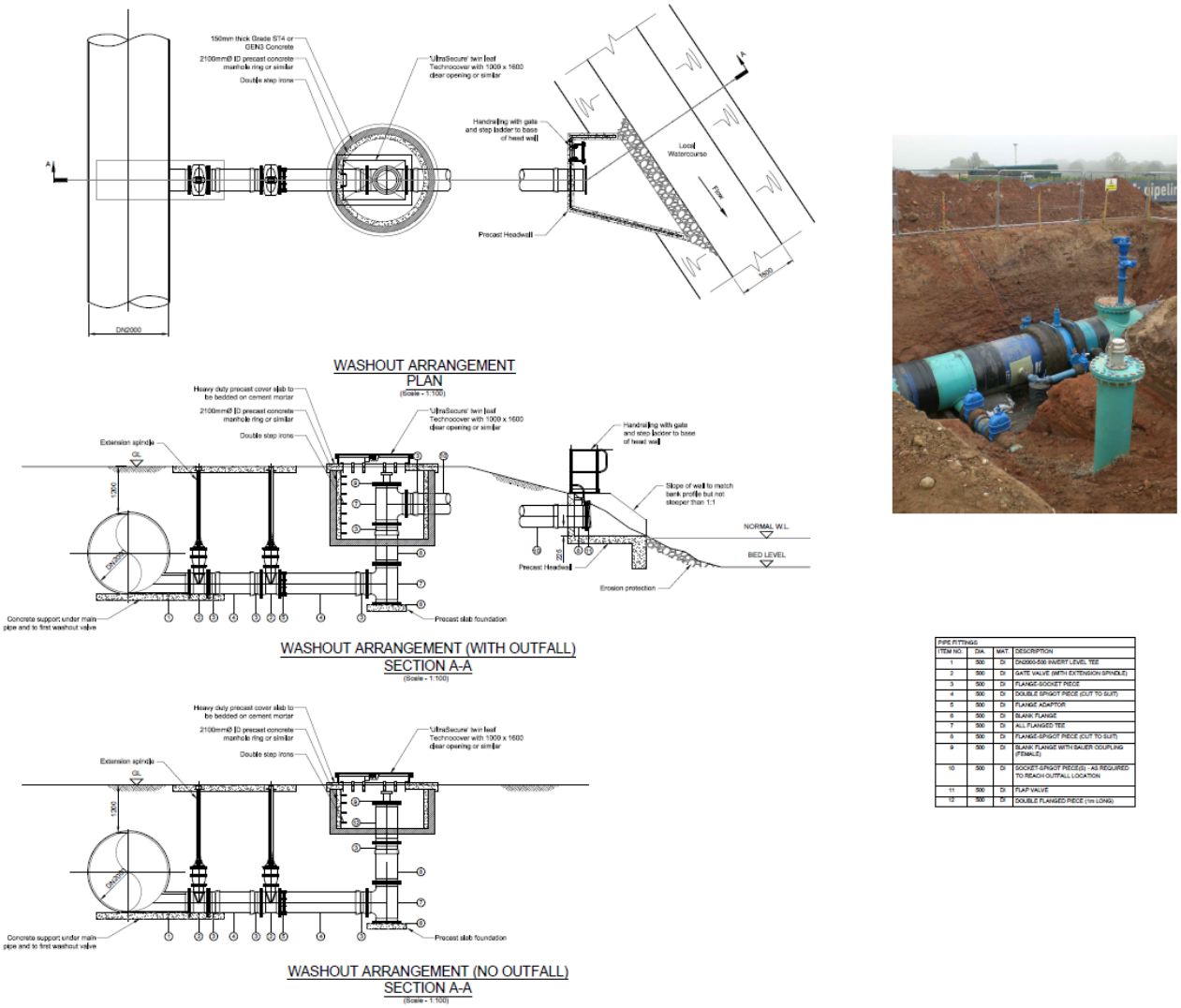


Image 6.3: Typical Washout Valve Arrangement

6.2.3 Treated Water Pipeline Unplanned Discharges

167. It is acknowledged that a failure of the Treated Water Pipeline infrastructure, including Washout Valves, could result in an unplanned release of water which has the potential to cause localised flooding.

168. The risk of a failure would be reduced by using steel to construct the pipeline, as opposed to concrete. In addition, this risk is very low as the Treated Water Pipeline would be designed and built to all applicable Uisce Éireann standards. This would include maintaining a minimum depth of cover over the pipeline so that it is not subject to temperature extremes. The pipeline would also be fully pressure tested during the Commissioning Phase when any potential defects would be identified along its length and rectified before it is brought into operation.

169. The pipeline would be fitted with telemetry and flow gauges to monitor for any sudden changes in flow that would be indicative of a failure along its length. A burst main would be identified and responded to automatically through hydraulic burst main control valves. An alarm to operators would also allow for human intervention to evaluate any sudden pressure drops and check concurrence with flow rate increase and pump current overload, if any, and then to remotely shutdown valves as required.

170. Repairs would require contingency planning with a store of spare parts for flange bolts and gaskets, short pipe lengths and couplings held on stock. For larger components, special contracts would be set up with suppliers for short notice delivery of key items.

7. Stage 3: Detailed Flood Risk Assessment

171. A Stage 3 Detailed FRA has been undertaken to ensure that the RWI&PS and WTP access roads would not be at risk from fluvial flooding and would not result in an increase in the fluvial flood risk over the surrounding areas.

7.1 RWI&PS Access Road

7.1.1 Introduction

172. This section follows on from the findings in the Stage 2 Initial FRA that the land surrounding the RWI&PS access road over an unnamed watercourse (associated with a tributary of the Shannon (Lower)_050 watercourse) be subject to a Stage 3 Detailed FRA to assess the fluvial flood risk at the road and identify the requirement for any mitigation measures.

173. A quantitative appraisal of potential flood risk to the proposed RWI&PS access road is provided, assessing its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. In this case, the aim of this section is to evaluate the potential flood risk impacts to and from the proposed RWI&PS access road, where it crosses the unnamed watercourse.

174. The proposed RWI&PS access road includes a double box culvert under it, aligning with the primary flow path within the floodplain.

7.1.2 Potential Flood Risk Analysis from the Proposed RWI&PS Access Road

175. Using the IH 124 method for the 100-year return period flood, including a 30% increase due to climate change, it is possible to determine the peak flow for sizing the culvert under the proposed RWI&PS access road.

176. The culvert has been designed in order to have enough capacity to convey the design flow, considering a freeboard of 300mm.

177. Final dimensions of the proposed double culvert and principal parameters for design are provided in Table 7.1.

Table 7.1: Designed Culvert Proposed Dimensions and Design Flow

ID	Watercourse Name	Chainage	Q100+30% Adjustment for Climate Change (m^3/s)	Slope	Type Culvert	Size Opening		Final Size	
						Width (m)	Depth (m)	Width (m)	Depth (m)
1	Unnamed watercourse	0+340	6.257	-0.04	Double culvert	6.0	1.50	**6.00**	**1.50**

7.1.3 Potential Flood Risk Analysis on the Proposed RWI&PS Access Road

178. The proposed culvert under the RWI&PS access road has been designed with sufficient capacity to convey the design flow and the minimum recommended road level above it has been calculated to ensure that there is enough clearance between the water level and the road profile.

179. In Table 7.2, the minimum recommended road level has been calculated as the sum of the invert level, the culvert depth, the wall thickness and the cover depth above the culvert.

180. To determine the distance between the road profile and the water surface elevation in order to quantify the risk over the development, the difference between the minimum recommended road level and the height of water level has been calculated, with an additional 0.3m of freeboard as a safety factor.

181. As the height of water level is below the minimum recommended road level for the culvert, once this recommendation is taken into consideration, it ensures that flood risk over the proposed RWI&PS site is low.

Table 7.2: Designed Culvert Proposed Dimensions and Design Flow

ID	Watercourse Name	Chainage	HWL (100yr +30% Climate Change) (mAOD)	HWL + SF (mAOD)	IL (mAOD)	Culvert depth (m)	Wall Thickness + Cover depth (m)	Min. Recom. Road level	Road Level (m)	Flood Risk to RWI&PS Access Road
1	Unnamed watercourse	0+340	29.76	30.06	27.79	1.50	0.15 + 1	30.44	30.55	Low

7.1.4 Results

182. After the Stage 3 Assessment, regarding potential Fluvial Flood Risk Impacts on the proposed RWI&PS access road, it is concluded that there is no risk impact, as the crossing structure has been designed to convey the peak flow without generating a risk over the site.

7.2 WTP Access Road

7.2.1 Introduction

183. This section follows on from the findings in the Stage 2 Initial FRA that the land surrounding the WTP access road over a tributary of Kilmastulla River (Roran watercourse) be subject to a Stage 3 Detailed FRA to assess the fluvial flood risk at the road and identify the requirement for any mitigation measures.

184. A quantitative appraisal of potential flood risk to the proposed WTP access road is provided, assessing its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This was analysed using an existing OPW hydraulic model from the CFRAM Study, which has been improved and updated to ensure accuracy for conducting a detailed flood risk analysis around the WTP access road.

185. The proposed WTP access road includes a clear span bridge over the Roran watercourse and two pairs of double culverts, aligning with the two primary flow paths within the floodplain, the dimensions of which are set out in Table 7.3.

Table 7.3: Designed Structures Included and Analysed in the Hydraulic Model

Structure	Dimensions
Clear span bridge	Beam bridge without piers 41.06mAOD soffit level
Double culvert	Rectangular cross-section; 6m width x 1m height 37.38mAOD invert level 40m length
Double culvert	Rectangular cross-section; 6m width x 1m height 37.09mAOD invert level 40m length

7.2.2 Model Build

186. To undertake an assessment of flood risk for existing (baseline) conditions and post-development conditions after the construction of the WTP access road, a hydraulic model was developed for the proposed scheme study area. The model uses a linked one-dimensional/two-dimensional (1D/2D) approach. The river channel is represented as a 1D component within Flood Modeller (VER=7.1.0.10375), an industry-standard tool for assessing flood risk, dynamically linked to the floodplain, which is modelled in 2D using the same software package.

187. The hydraulic model includes a representation of River Kilmastulla and Roran watercourse. Minor tributaries, such as ditches and drainage features, were included as lateral inflows without geometric representation. The software has a numerical convergence tolerance of +/- 10mm on water levels, and there are additional uncertainties within the survey data and hydrological and hydraulic parameters used to construct the model.

188. The model has been built from the OPW's existing 1D model, previously developed for a catchment-scale flood risk assessment (FRA). To meet Uisce Éireann's requirement for a more detailed resolution for site-specific flood risk assessment, the model was upgraded to include a 2D modelling approach, enabling a more detailed analysis of bidirectional flows through the floodplain. A topographic survey was also conducted to improve the characterisation of the 1D cross-sections, reducing the distance between them and improving the representation of the banks. These upgrades enhanced the precision of the model, improving the simulation of overflows from the watercourse to the floodplain, which was critical for designing the culverts under the road and assessing flood risk in the Proposed Project area.

189. Image 7.1 provides an overview of the extent of the Kilmastulla River and Roran watercourse at the Proposed Project location as well as the cross sections incorporated into the model. A summary of the structures included in the model is provided in Table 7.4 below.

Table 7.4: Summary of Structures in Kilmastulla Model

Type	Number	Summary
Bridges	12	11 existing bridges and one more included in design scenario. Structures modelled using BRIDGE; ARCH.
Culverts	4	Two double culverts considered in design scenario. Structure modelled using 2D embedded structure unit.
Spill units	12	11 spills associated with each bridge unit (the designed bridge has been designed to not overtop) and one spill representing a step. Structures modelled using SPILL.
Reservoirs	5	Five existing reservoirs. Previously modelled floodplains as reservoir units are now an active 2D area.

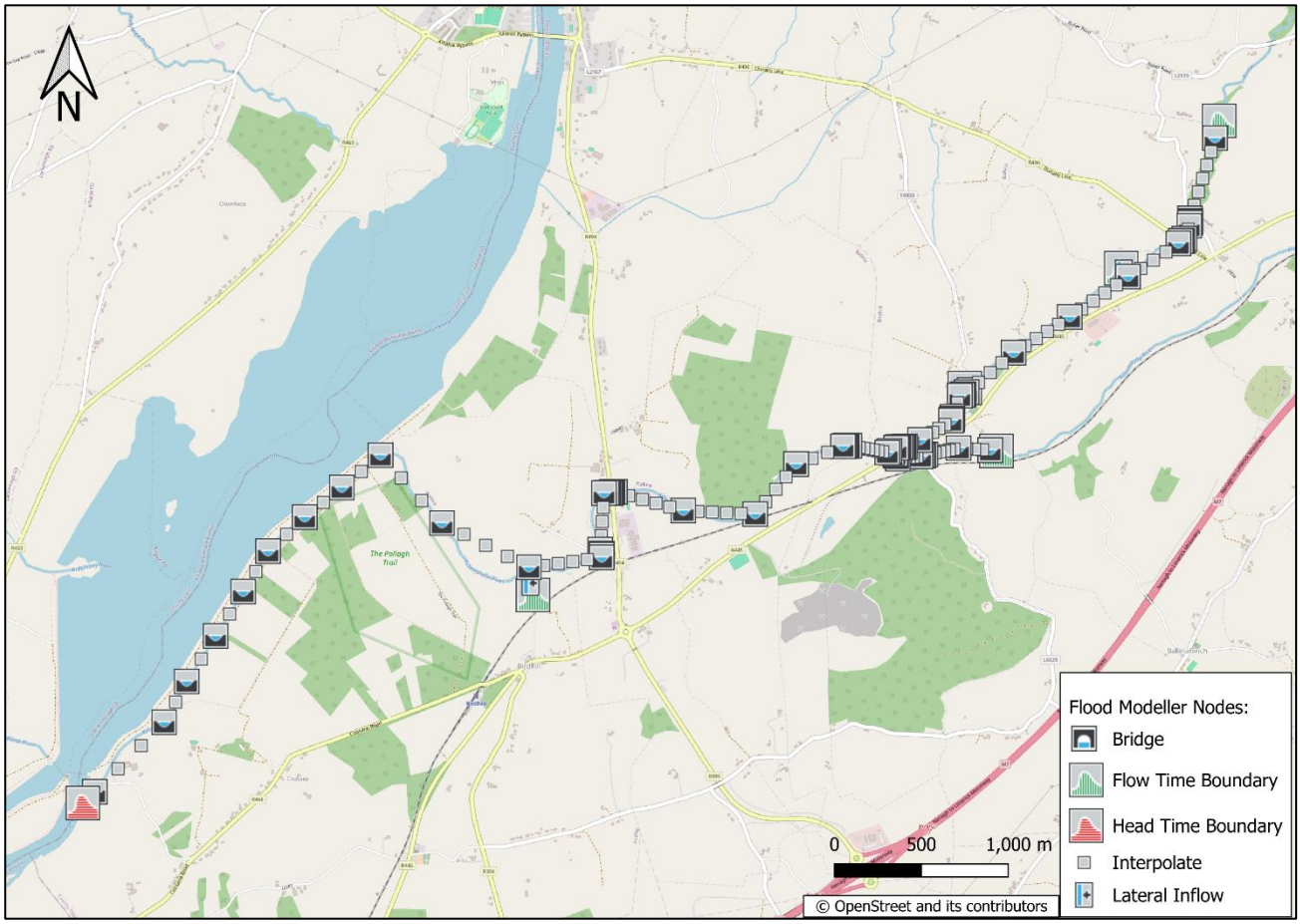


Image 7.1: Flood Modeller 1D Domain Schematisation, Including Cross Sections, Interpolates and Structures

190. Regarding boundary conditions, all inflows are represented as hydrograph units. These include two upstream inflows: RR_2909 for the Roran watercourse and KR_7234 for the Kilmastulla River, as well as three lateral inflows: RR_1854_lat, RR_0613_lat, and KR_3878_lat. The downstream water level is fully controlled by the dam structure and is therefore set as a constant water level of 23.6 mAOD.

191. The flow hydrographs were already incorporated into the 1D OPW model. The events modelled include T100, T100+30% Climate Change, and T1000. T1000 flow hydrographs are shown in Image 7.2.

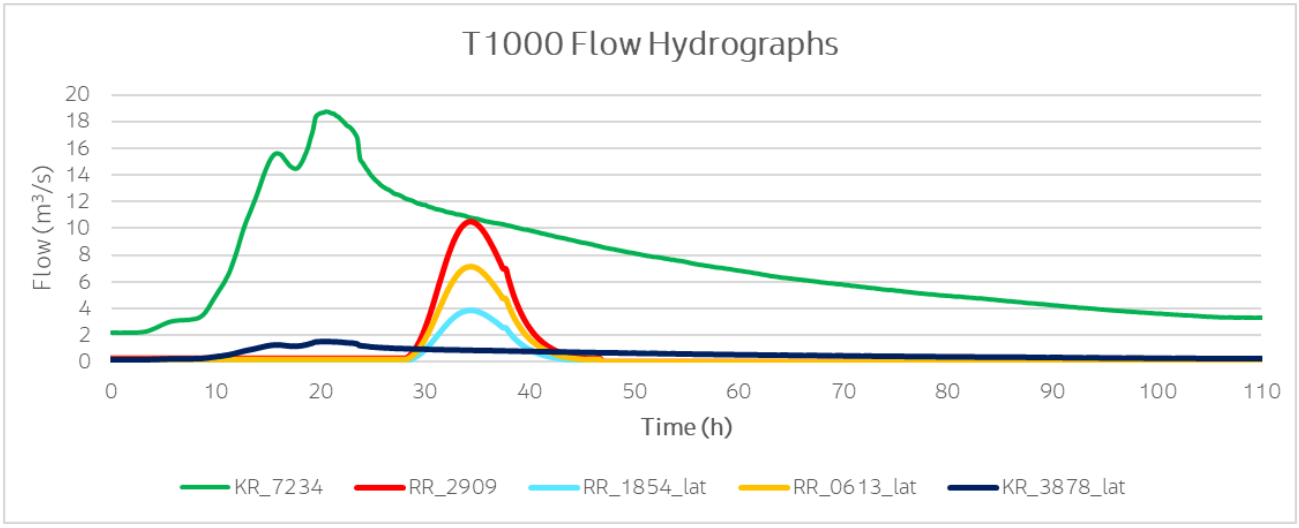


Image 7.2: T1000 Input Flow Hydrographs

192. Hydraulic roughness, or friction, is represented by Manning's coefficient, 'n', in hydraulic models. The value of 'n' reflects various factors that influence overall roughness, either within the channel or across the floodplain. These factors include bed material and particle size, vegetation, surface irregularities, channel bed forms, erosional and depositional features, channel sinuosity, and obstructions. Manning's n values typically range from 0.025 for relatively smooth, uniform, and unvegetated channels to 0.090 for overbank flows through densely wooded areas. Table 7.5 below presents the Manning's n values used in the model, which were derived from the National Land Cover Map.

Table 7.5: Summary of Roughness Values in Kilmastulla Model

Land Cover	Manning's n Value
1D Channel	0.04
1D Banks	0.06
Buildings	0.1
Roads	0.015
Artificial surfaces	0.020
Exposed surfaces	0.025
Forest, woodland and scrub	0.060 to 0.085
Grassland, saltmarsh and swamp	0.05 to 0.06
Heath and bracken	0.07
Waterbodies	0.05

7.2.3 Model Results

193. The aim of this section is to evaluate the potential flood risk impacts from the Proposed Project and on the Proposed Project, where the proposed access road crosses the Roran watercourse and floodplain.

7.2.3.1 Potential Flood Risk Impact from the Proposed Project

194. In order to analyse the impact produced by the Proposed Project, baseline and design scenarios have been compared for the 1% AEP, 1% AEP +30% HEFS Climate Change (Section 4.9) and 0.1% AEP events, to assess if there is a significant increase in the water levels that could be attributed to the WTP access road. This comparison is shown in Table 7.6.

Table 7.6: Potential Flood Risk Impact Analysis from the Proposed Project

Location	1% AEP Baseline (mAOD)	1% AEP Design (mAOD)	1% AEP Water Level Change (WLC) (m)	1% AEP +30% Climate Change Baseline (mAOD)	1% AEP +30% Climate Change Design (mAOD)	1% AEP +30% Climate Change WLC (m)	0.1% AEP Baseline (mAOD)	0.1% AEP Design (mAOD)	0.1% AEP WLC (m)
Bridge	39.14	39.14	0.00	39.29	39.29	0.00	39.29	39.29	0.00
Double Culvert 1 (37.09 mAOD)	37.34	37.34	0.00	37.42	37.42	0.00	37.43	37.43	0.00
Double Culvert 2 (37.38 mAOD)	37.54	37.54	0.00	37.67	37.67	0.00	37.69	37.69	0.00

195. To evaluate the existence of a flood risk increase due to the proposed WTP access road, water elevations have been measured in the watercourse, 1D results at the RR_0096ds cross section located 29m upstream of the crossing, as well as in the floodplain, 2D results upstream of the designed culverts.

196. Table 7.6 shows that water levels in the design scenario are the same as that in the baseline scenario. Therefore, it can be concluded that the proposed crossing structures in the watercourse and the floodplain do not produce an increase in the flood risk for the analysed events.

7.2.3.2 Potential Flood Risk Impact on the Proposed Project

197. In the previous section, the crossing structures design has been confirmed to not produce a significant increase in flood risk to the adjacent areas. In this section, the flood risk over the Proposed Project is analysed, as shown in Table 7.7.

Table 7.7: Potential Flood Risk Impact Analysis on the Proposed Project

Location	0.1% AEP Water Level Height (mAOD)	Water Level Height + Freeboard (mAOD)	Minimum Recommended Road Level (mAOD)	Road Level (m)	Flood Risk to Proposed Project
Bridge	38.90	39.20	40.20	40.20	Low
Double Culvert 1 (37.09 mAOD)	37.34	37.64	39.04	39.46	Low
Double Culvert 2 (37.38 mAOD)	37.54	37.84	39.24	39.79	Low

198. To determine the minimum recommended road level, a 300mm freeboard above the 0.1% AEP water level height immediately upstream of the bridge and the culverts has been considered, along with a 700mm thickness for the beam and road package in the bridge, as well as a 400mm cross-section thickness and 1,000mm cover depth for the culverts.

199. It can be concluded from the analysis shown in Table 7.7 that fluvial flood risk to the WTP access road is low. As with any project, there will always remain a very low residual flood risk from potential flood events which are more extreme than the 1%AEP and 0.1%AEP events assessed herein, however this risk is considered acceptable and is in line OPW guidelines for a project of this nature.

8. Flood Risk Management and Evaluation

200. The sequential approach identified in the FRM Guidelines (DEHLG and OPW 2009) provides a three-step approach to confirm the appropriateness of a development or project to a particular location with respect to flood risk. The process has been applied to the locations of the infrastructure sites of the Proposed Project with the findings outlined in this section.

8.1 Step 1 – Identification of the Flood Zone

201. Flood Zones are defined using the following methodology from the FRM Guidelines:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding)
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1,000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1,000-year and 0.5% or 1 in 200 for coastal flooding)
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1,000 for both river and coastal flooding).

202. The Stage 2 assessment showed that all the infrastructure sites can be assigned as Flood Zone C. This is because the flood-vulnerable infrastructure of the RWI&PS and the proposed sites of the WTP, BPT, BPS and TPR would all be located outside of the 0.1% AEP flood extent.

8.2 Step 2 – Identification of Vulnerability

203. Table 3.1 in the FRM Guidelines (DEHLG and OPW 2009) defines the vulnerability of different types of development to flooding. The vulnerability classes are used to steer development whose operation or use would be severely impacted by flooding towards land at a low risk of flooding (i.e. Flood Zone C).

204. Table 3.1 from the FRM Guidelines is reproduced below in Table 8.1. As shown, the RWI&PS, BPS, WTP, BPT and TPR are all categorised as ‘highly vulnerable development (including essential infrastructure)’ meaning they should be located on land at a low risk of flooding.

Table 8.1: Reproduction of Table 3.1 from the FRM Guidelines Showing Vulnerability Classifications

Vulnerability Class	Land Uses and Types of Development Which Include:
Highly vulnerable development (including essential infrastructure)	• Garda, ambulance and fire stations and command centres required to be operational during flooding • Hospitals • Emergency access and egress points • Schools • Dwelling houses, student halls of residence and hostels • Residential institutions such as residential care homes, children's homes and social services homes • Caravan and mobile home parks • Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility • Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential sources of pollution (Seveso sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	• Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions • Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans • Land and buildings used for agriculture and forestry • Waste treatment (except landfill and hazardous waste) • Mineral working and processing • Local transport infrastructure.
Water-compatible development	• Flood control infrastructure • Docks, marinas and wharves • Navigation facilities • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location • Water-based recreation and tourism (excluding sleeping accommodation) • Lifeguard and coastguard stations • Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms • Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

8.3 Step 3 – Justification Test

205. Table 8.2, reproduced from the FRM Guidelines (DEHLG and OPW 2009), illustrates the types of development that are considered appropriate to each flood zone and those that are required to meet the Justification Test. All the infrastructure sites are classified as highly vulnerable and located in Flood Zone C, except for the RWI&PS and WTP access roads, which are situated in Flood Zone A.

206. With reference to Table 8.2 and in accordance with the FRM Guidelines, the infrastructure sites are located in the appropriate Flood Zone meaning a Justification Test is not required.

207. The access roads would be located in Flood Zone A (high probability of flooding), therefore a Justification Test is required.

Table 8.2: Matrix of Vulnerability Versus Flood Zone

Development Classification	Flood Zone A (High Probability of Flooding)	Flood Zone B (Moderate Probability of Flooding)	Flood Zone C (Low Probability of Flooding)
Highly vulnerable development	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

208. Section 5.15 (Box 5.1) of the FRM Guidelines, as amended by Circular PL 2/2014 (Department of Environment, Community and Local Government 2014), sets out the criteria for the Justification Test. An assessment of the Proposed Project against these criteria is presented in Table 8.3.

Table 8.3: Assessment Against Justification Test Criteria for RWI&PS and WTP Access Roads

Criteria to be Satisfied	Justification	Criteria Met?
The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of the FRM Guidelines.	As critical infrastructure required for the Proposed Project, the proposed access road meets the objectives set out in the Tipperary County Development Plan (2022-2028) to cooperate with Uisce Éireann in the delivery of the Proposed Project and to ensure the maximum benefit from the Proposed Project to County Tipperary, in particular with respect to economic development potential and security of supply.	Yes
The development would not increase flood risk elsewhere, and, if practicable, would reduce overall flood risk.	It has been demonstrated that there is no notable increase in flood risk in the area as a result of the Proposed Project.	Yes
The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably practicable.	The Proposed Project would incorporate: • WTP Access: An open-span bridge over the Roran watercourse and four culverts located in its adjacent floodplain • RWI&PS Access: A rectangular culvert over the unnamed watercourse with enough capacity to convey its peak flow plus 30% climate change. This would reduce flood risk to the local community as far as reasonably practicable. SuDS measures implemented as part of the Proposed Project would also improve the quality of runoff, delivering a net benefit to the environment.	Yes
The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.	As stated in Section 5, the Proposed Project would incorporate SuDS to ensure there is no increase in runoff rates as a consequence of the works. Therefore, there would be no increase in flood risk from an increase in the area of impermeable surfaces as part of the works.	Yes
The development proposed addresses the above criteria in a manner that is compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.	This requirement is not relevant to this project due to its typology.	N/A

209. On completion of the Justification Test above, the WTP access road is considered appropriate as it meets each of the criteria from Section 5.15 (Box 5.1) of the FRM Guidelines.

9. Conclusions and Recommendations

9.1 Conclusions

210. This FRA included desktop investigations into the potential flood risks to the Proposed Project and assessed the potential impacts on flood risk for the infrastructure sites – the RWI&PS, WTP, BPT, BPS, FCV and TPR – that are located along its length and are considered critical to its operation.

211. The connecting pipeline sections between the RWI&PS and TPR, namely the RWRMs and Treated Water Pipelines, were not subject to a detailed assessment as the flood risk to, and arising from, the pipeline sections was considered to be neutral. This is because they would be buried below ground with no potential to impact overground or groundwater flooding processes. No significant changes in ground level are proposed along the length of the pipeline sections and all watercourse crossings would be below the bed level.

212. The potential short-term flood risk effects from the pipeline sections during the Construction Phase and from maintenance activities were considered at a high level. The principles outlined in Section 6 would be applied to ensure there is no increase in flood risk.

9.1.1 Flood Risk to the Infrastructure Sites

213. As summarised in Table 9.1, the FRA found that all the infrastructure sites are at a low risk of flooding from fluvial, pluvial, groundwater, estuarine, drainage and coastal sources. The exception to this is the intake structure associated with the RWI&PS which, by necessity, is located adjacent to the Parteen Basin and is at risk of fluvial flooding. However, this is considered in its design with all elements of the intake that could be subject to flooding designed to be water compatible. Water levels within the Parteen Basin are also tightly controlled due to the operation of Ardnacrusha Generating Station.

214. The overall risk of flooding to the Proposed Project is therefore considered to be low. This conclusion is not affected by the potential effects of future climate change due to the existing low overall risk of flooding.

Table 9.1: Summary of Flood Risk to the Infrastructure Sites of the Proposed Project

Site	Stage 2 Flood Risk				Notes
	Fluvial	Pluvial	Groundwater	Other	
RWI&PS	Low	Low	Low	Low	All flood vulnerable infrastructure is at an elevation that is 0.63m above 1% AEP fluvial flood water levels in the Parteen Basin. The RWI&PS access road is at risk of fluvial flooding, but this risk has been assessed as being low.
WTP	Low	Low	Low	Low	The site occupies relatively raised ground with the nearest watercourse approximately 5m below the level of the site. The WTP access road is at risk of fluvial flooding, but this risk has been assessed as being low.
BPT	Low	Low	Low	Low	The site occupies raised ground and there are no watercourses near to the site.
BPS	Low	Low	Low	Low	The site occupies relatively raised ground with the nearest watercourse approximately 4m below the level of the site.
FCV	Low	Low	Low	Low	The site is located outside the River Liffey tributary flood extent.
TPR	Low	Low	Low	Low	The site occupies relatively raised ground and there are no watercourses near to the site. The drainage network on the adjacent Peamount Reservoir site would be upgraded, as required, to ensure it does not place the TPR site at an unacceptable level of flood risk.

215. The infrastructure sites for the Proposed Project are all located in Flood Zone C, except for the WTP access road, which is located in Flood Zone A. For those located in Flood Zone C, a Justification Test is not required. For the WTP access road a Justification Test has been undertaken, and the design has been considered appropriate.

216. It is acknowledged that the proposed WTP access road crossing the Roran watercourse floodplain and the proposed RWI&PS access road are at potential risk of fluvial flooding. Detailed flood risk assessment has concluded that the risk to the access road is low.

9.1.2 Flood Risk Impacts from the Infrastructure Sites

217. The construction and operation of the infrastructure sites for the Proposed Project would result in the creation of additional impermeable surfaces. This could result in an increase in stormwater runoff, thereby increasing the risk of pluvial and/or fluvial flooding elsewhere. SuDS and other measures to attenuate additional runoff generated by the works would form part of the design and ensure that there would be no increase in runoff rates from the sites. These measures include:

- RWI&PS – rainwater harvesting and the construction of swales to control the release of runoff from the site
- WTP – rainwater harvesting and the provision of an attenuation pond to attenuate surface water runoff
- BPT – an infiltration basin to attenuate runoff
- BPS – an attenuation pond to attenuate runoff
- FCV – an attenuation pond to attenuate runoff
- TPR – two attenuation ponds with discharge at greenfield rates.

218. There would be no impact from the works at the infrastructure sites on fluvial flood risk as the works would be located outside of the 0.1% AEP flood extent and so would not give rise to a change in channel or floodplain conveyance and storage.

219. The construction of the RWI&PS access road and the WTP access road crossing the Roran watercourse floodplain have the potential to increase the risk of fluvial flooding, which was assessed in Stage 3 (Section 7 of this report). It has been concluded that there will not be an increase in the flood risk over the adjacent areas due to the Proposed Project.

220. The location and elevation of the proposed infrastructure means it would not impact on coastal or estuarine flooding.

9.1.3 Construction and Maintenance of the Proposed Pipeline Sections

221. Construction of the RWRMs and Treated Water Pipelines has the potential to give rise to a short-term increase in flood risk from a number of sources including additional runoff, the interception of overland flood flowpaths and temporary in-channel works for watercourse crossings. All such activities would be subject to a specific consent at the time they are undertaken. Section 6 outlined a number of key principles to ensure no short-term increase in flood risk from these works, including:

- Provision of runoff attenuation, e.g. swales or ponds, along the length of the proposed works
- Interceptor drains along the length of the proposed works
- Material stockpiles to avoid flood risk areas where practicable
- Appropriate design of in-channel flow diversion or pumps to maintain flow conveyance
- Trenchless construction across watercourses deemed to be too large or too sensitive for open-cut techniques (11 locations).

222. A bulk transmission water pipeline would operate for many years with minimal maintenance. Where maintenance works are required, this could include emptying of the pipe to washout debris. Watercourses with the capacity to receive washout flows were identified based on QMED flows, restricting any single discharge from a Washout to a stream/watercourse to 20% of the QMED/Index Flood flow. This would ensure flood risk from maintenance would be low, as set out in Section 6.2.

223. The FRA has demonstrated that, based on the design of the Proposed Project developed to date, there is a low overall risk of flooding to, and arising from, the Proposed Project.

10. References

Construction Industry Research and Information Association (CIRIA) (2015). The SuDS Manual (C753).

Department of Environment, Community and Local Government (2014). Circular PL 2/2014 Flooding Guidelines.

Department of Environment, Heritage and Local Government (DEHLG) and the Office of Public Works (OPW) (2009). The Planning System and Flood Risk Management – Guidelines for Planning Authorities.

Kildare County Council (2023). Strategic Flood Risk Assessment of the Kildare County Development Plan 2023-2029.

Offaly County Council (2021). Strategic Flood Risk Assessment for the Offaly County Development Plan 2021-2027.

Office of Public Works (OPW) (2006). OPW National Flood Hazard Mapping (www.floodmaps.ie).

Office of Public Works (OPW) (2012). The National Preliminary Flood Risk Assessment (PFRA) – Overview Report.

Office of Public Works (OPW) (2016). National Catchment Flood Risk Assessment and Management (CFRAM) Studies.

Office of Public Works (OPW) (2020). National Indicative Fluvial Mapping (NIFM).

South Dublin County Council (2022). South Dublin County Development Plan – Strategic Flood Risk Assessment (2022-2028).

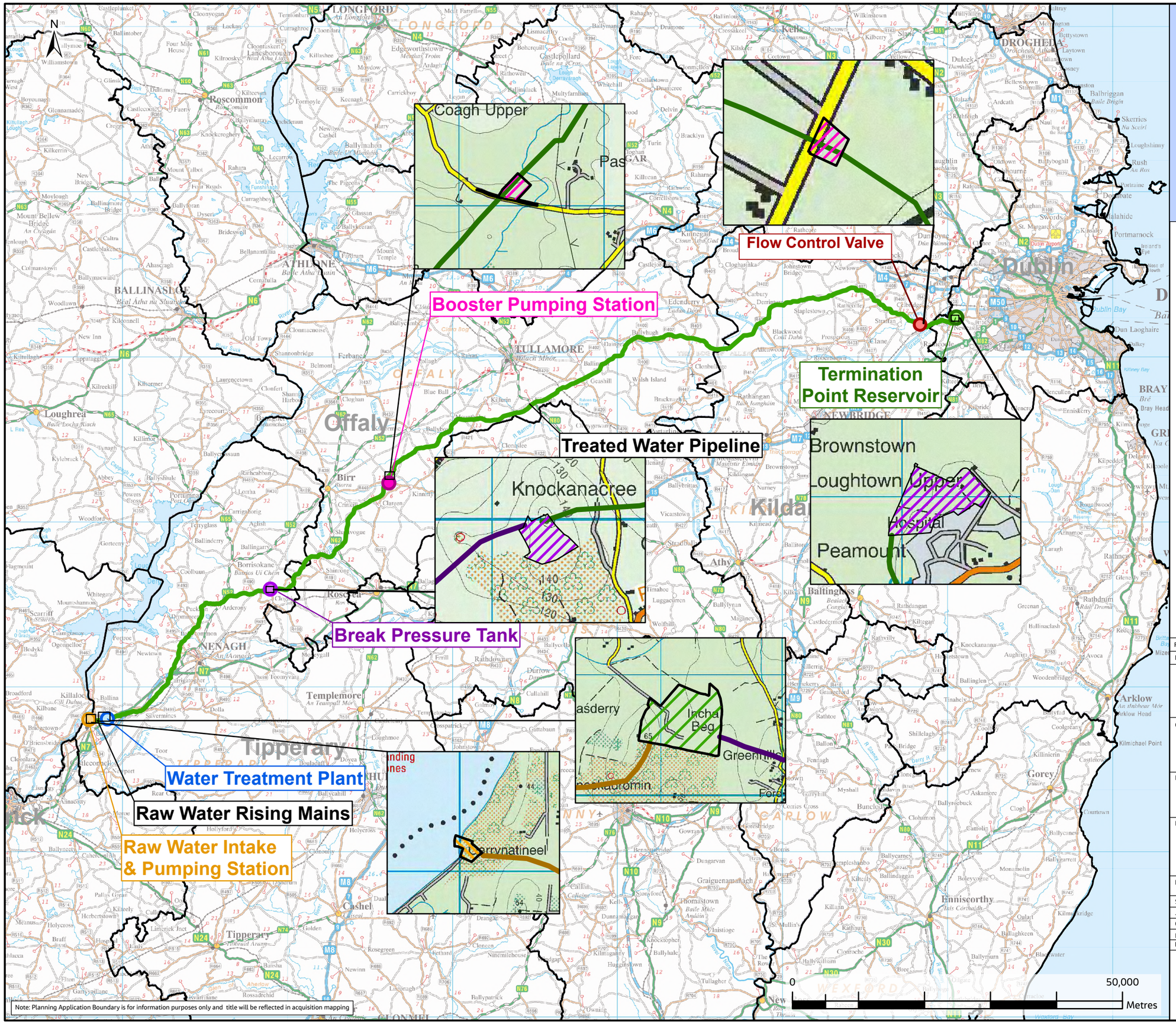
Tipperary County Council (2022). Tipperary County Development Plan 2022 – 2028 – Consolidated Strategic Flood Risk Assessment.

Annex A. Information Sources Checklist

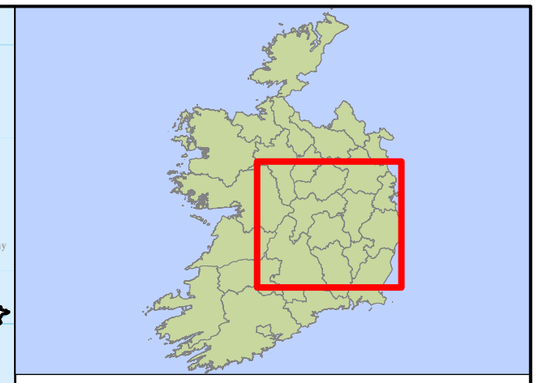
No.	Information Source	Status	Reference/Comments
1	OPW PFRA indicative integrated flood maps	√	Shannon, Eastern, and South Eastern CFRAM Study PFRA Maps
2	National Coastal Protection Strategy Study flood and coastal erosion risk maps	N/A	No part of the scheme is at a coastal or estuarine flood risk
3	Predictive and historic flood maps, and Benefiting Lands Map	√	OPW National Flood Hazard Mapping
4	Predictive flood maps produced under the CFRAM Studies	√	Shannon, Eastern, and South Eastern CFRAM Study Flood Risk Maps (partial scheme coverage only)
5	River Basin Management Plans and reports	√	Shannon, Eastern, and South Eastern River Basin Management Plans 2010
6	Indicative assessment of existing flood risk under PFRA	X	-
7	Previous SFRAs	√	-
8	Expert advice from OPW who may be able to provide reports containing the results of detailed modelling and flood-mapping studies including critical damage areas, and information on historic flood events and local studies etc.	X	-
9	Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques.	√	-
10	Information on flood defence condition and performance	N/A	No flood defences near to the infrastructure sites
11	Alluvial deposit maps	N/A	-
12	'Liable to Flood' markings on the old 6" maps	√	Ordnance Survey Ireland Historic 6" Maps
13	Local libraries and newspaper reports	X	Adequate information on flooding history was provided by OPW floodmaps.ie.
14	Interviews with local people, local history/natural history societies etc.	X	-
15	Walkover survey to assess potential sources of flooding, likely routes for flood water and the site's key features, including flood defences, and their condition	X	-
16	National, regional and local spatial plans, such as the National Spatial Strategy, regional planning guidelines, development plans and local area plans provide key information on existing and potential future receptors	X	-
17	National Indicative Fluvial Mapping	√	-
18	GSI Flooding Probability Maps	√	-

√ – Information available
X – Information not available
N/A – Information not applicable

Figures



Note: Planning Application Boundary is for information purposes only and title will be reflected in acquisition mapping



Legend

Treated Water Pipeline

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F01	04/12/25	FINAL - Planning Permission	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 1
Project Overview

Drawing Status: FINAL - Planning Application

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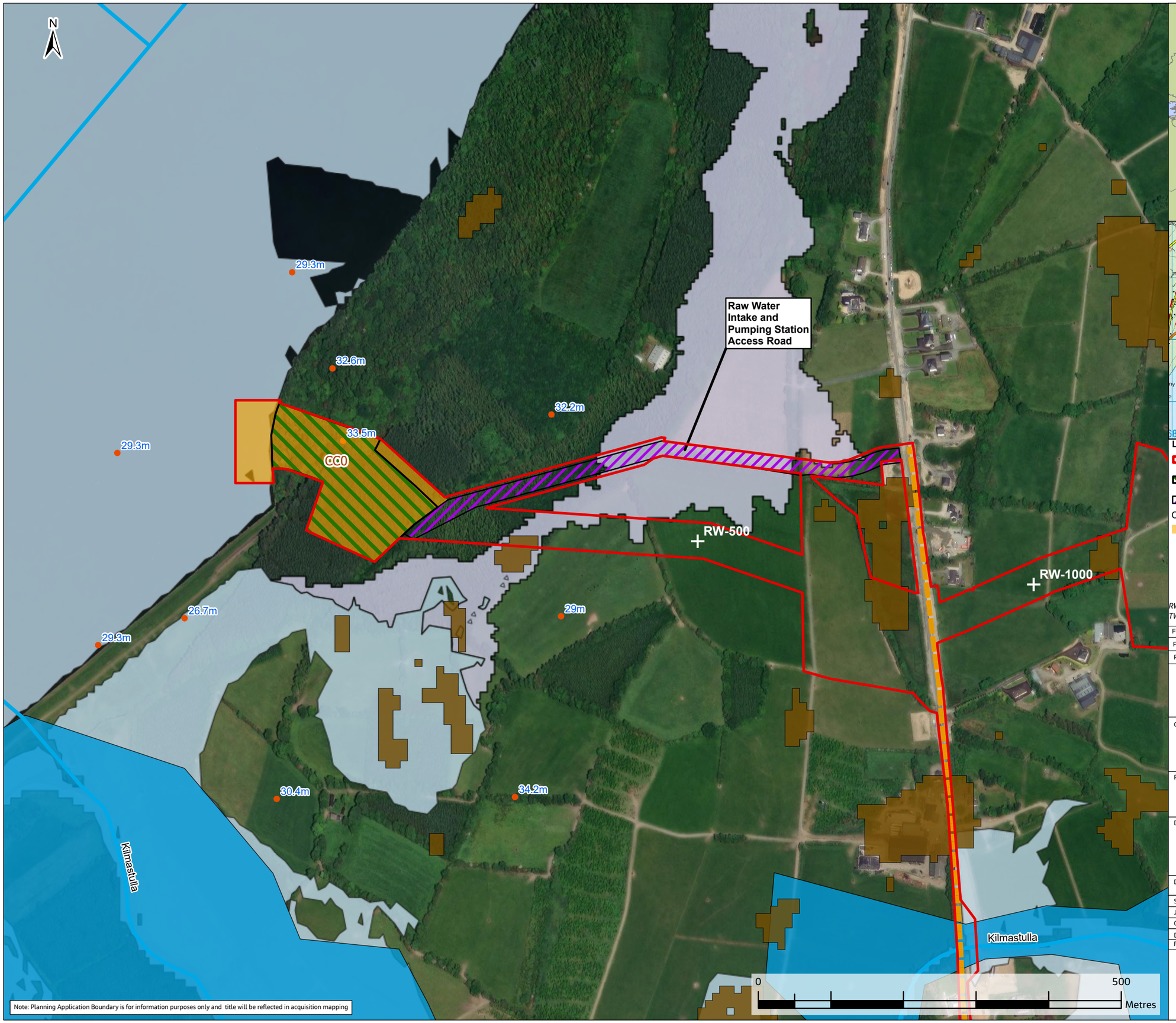

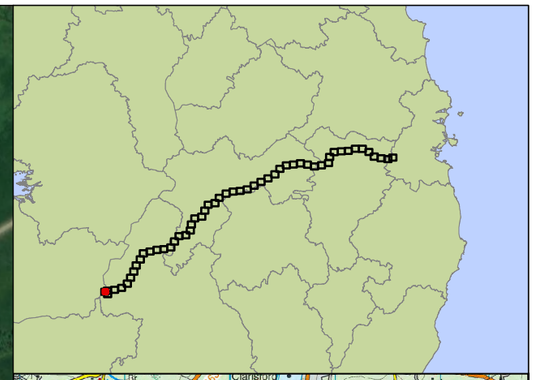

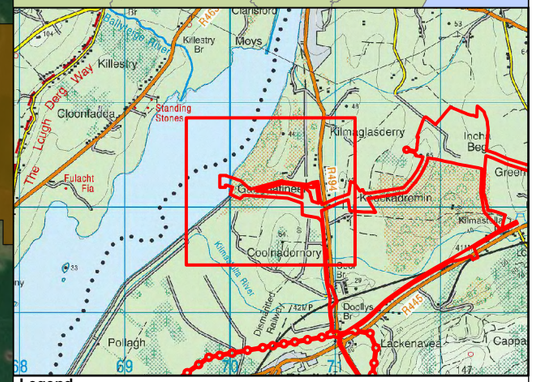

Legend

- Planning Application Boundary
- Raw Water Intake and Pumping Station
- Infrastructure Sites Access Roads

Compounds Depots

- Construction Compound (CC)
- Spot Heights (OD Malin)
- Haul Roads
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out way/eave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	20/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 2
Project Raw Water Intake and Pumping Station
Flood Overview

Drawing Status: FINAL – PLANNING APPLICATION

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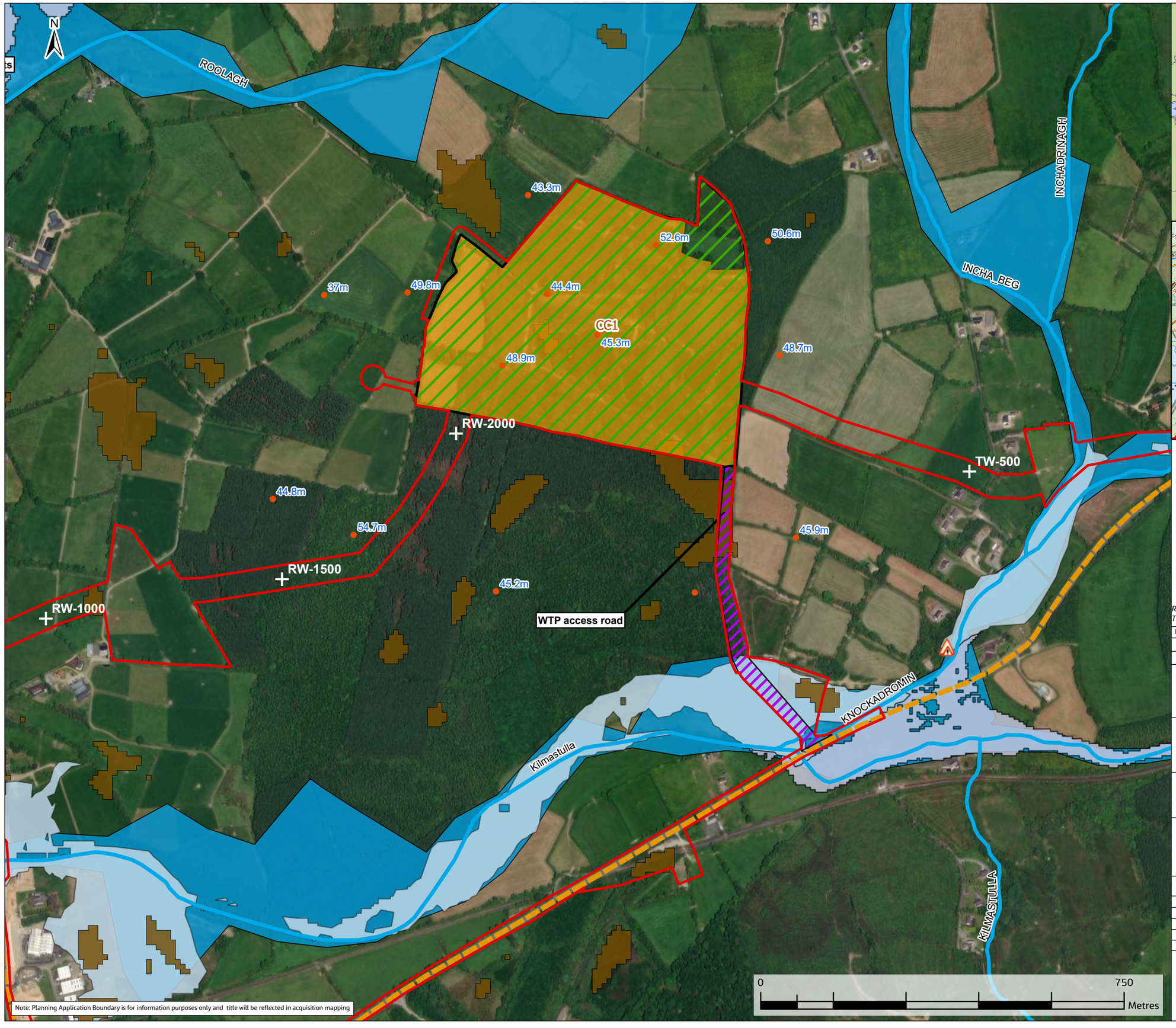

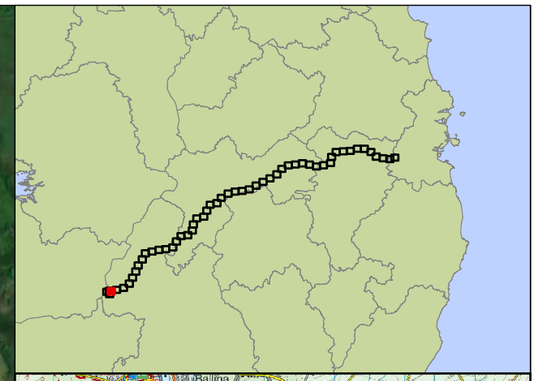

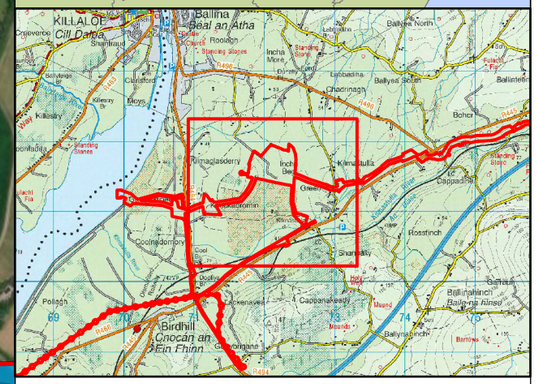

Legend

- Planning Application Boundary
- Water Treatment Plant
- Infrastructure Sites Access Roads
- Spot Heights (OD Malin)
- Recurring Flood Event
- Haul Roads
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day – Low Probability (0.1% AEP)

Compounds Depots

- Construction Compound (CC)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	20/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 3
Project Water Treatment Plant
Flood Overview

Drawing Status	FINAL – PLANNING APPLICATION	
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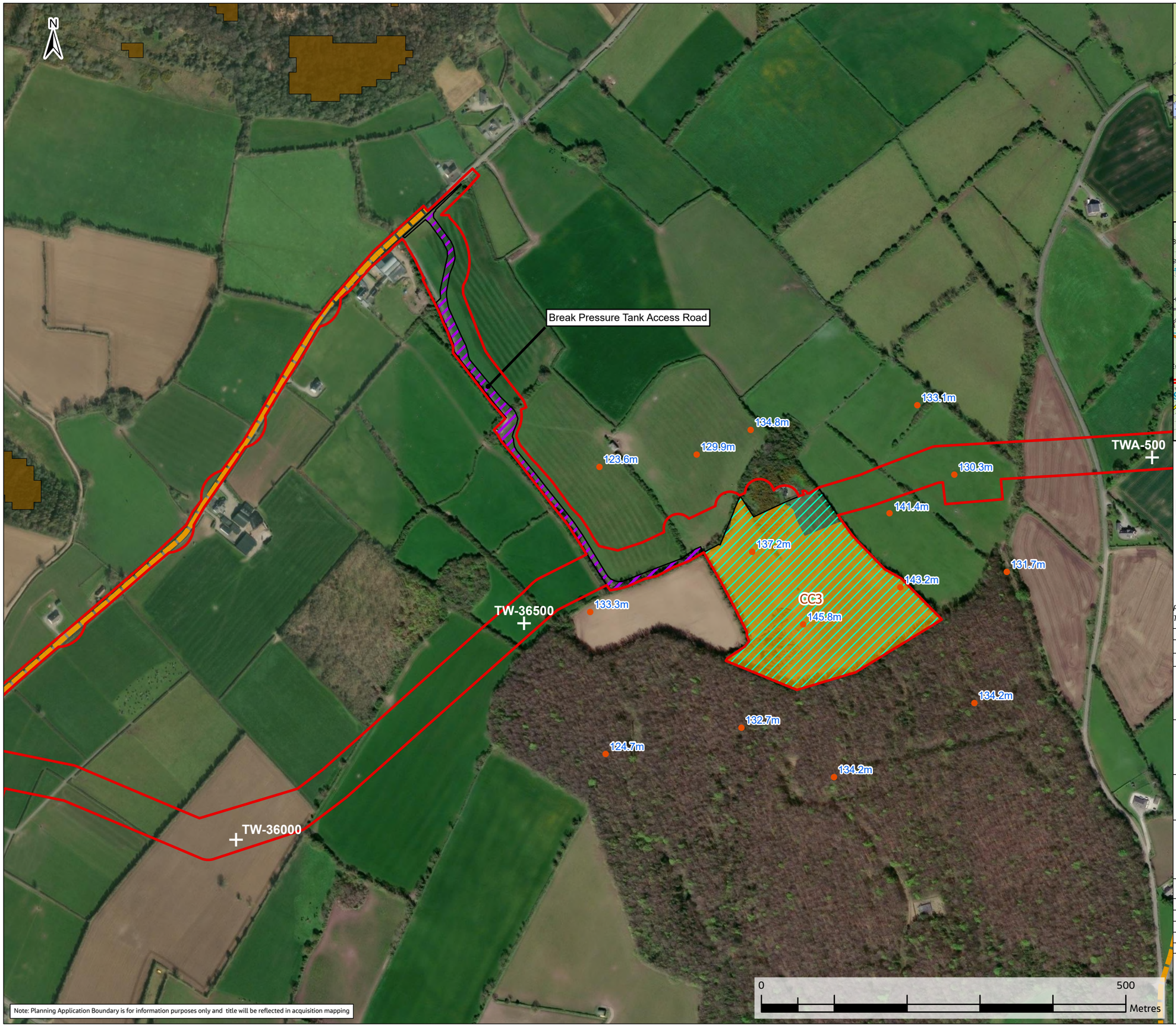

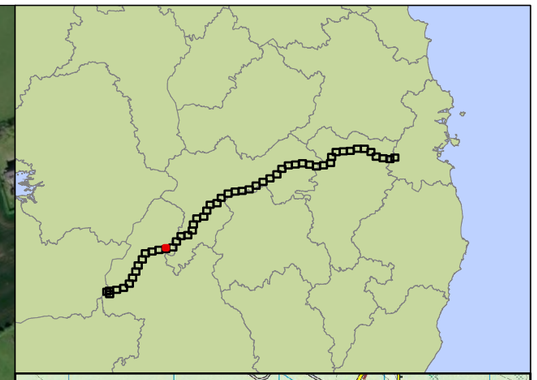

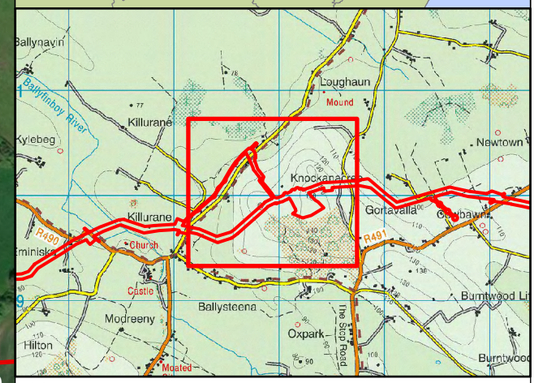

Legend

- Planning Application Boundary
- Break Pressure Tank
- Infrastructure Sites Access Roads
- Spot Heights (OD Malin)

Compounds Depots

- Construction Compound (CC)
- Haul Roads
- 1% AEP

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	20/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water — Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 4
Project Break Pressure Tank
Flood Overview

Drawing Status: FINAL – PLANNING APPLICATION

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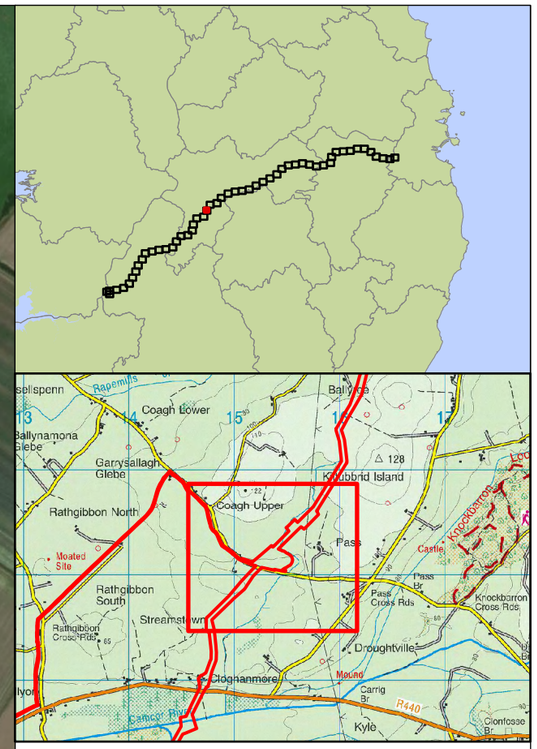

Legend

- Planning Application Boundary
- Booster Pumping Station

Compounds Depots

- Construction Compound (CC)
- Haul Roads
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	20/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 5
Project Booster Pumping Station
Flood Overview

Drawing Status: FINAL – PLANNING APPLICATION

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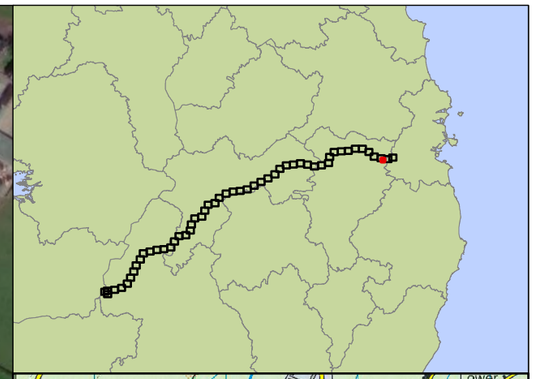

Legend

- Planning Application Boundary
- Flow Control Valve
- Single Flood Event
- Recurring Flood Event
- Haul Roads
- Rivers (WFD EPA)
- 1% AEP
- Present Day – Low Probability (0.1% AEP)
- 1% AEP

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out woyleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	20/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 6
Project Flow Control Valve
Flood Overview

Drawing Status: FINAL – PLANNING APPLICATION

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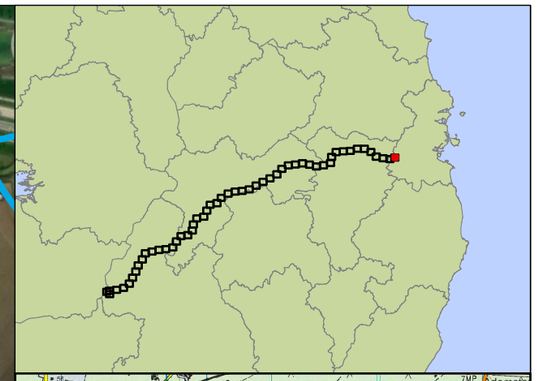
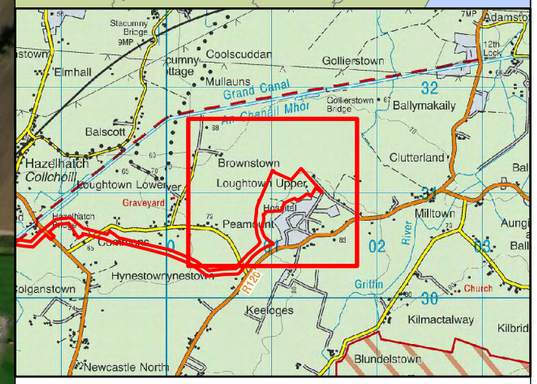
Note: Planning Application Boundary is for information purposes only and title will be reflected in acquisition mapping





Legend

- Planning Application Boundary
- Termination Point Reservoir
- Infrastructure Sites Access Roads
- Spot Heights (OD Malin)
- Future Take-off points

Compounds Depots

- Construction Compound (CC)
- Haul Roads
- Rivers (WFD EPA)
- 1% AEP

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	20/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 7
Project Termination Point Reservoir
Flood Overview

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:5000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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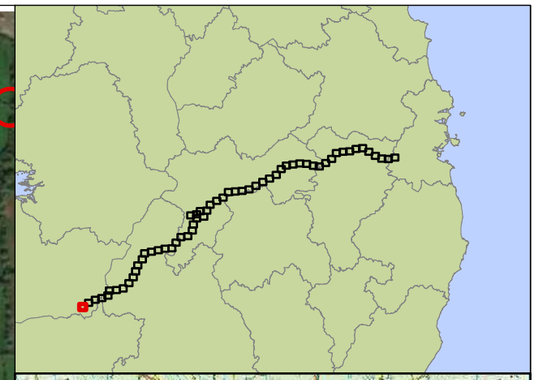

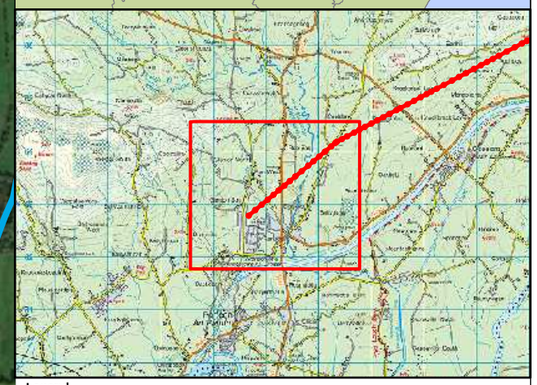

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.1
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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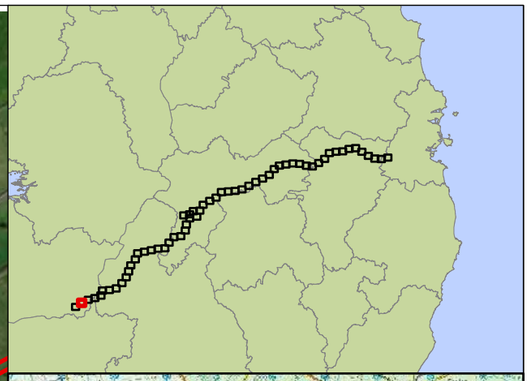

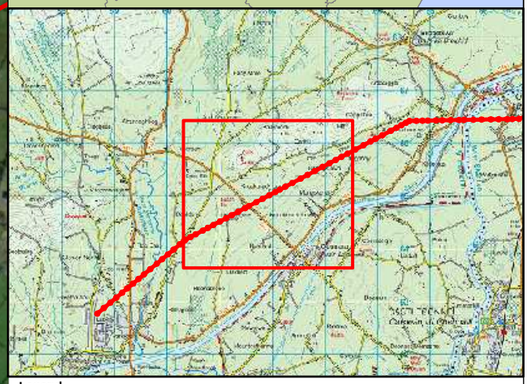

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.2
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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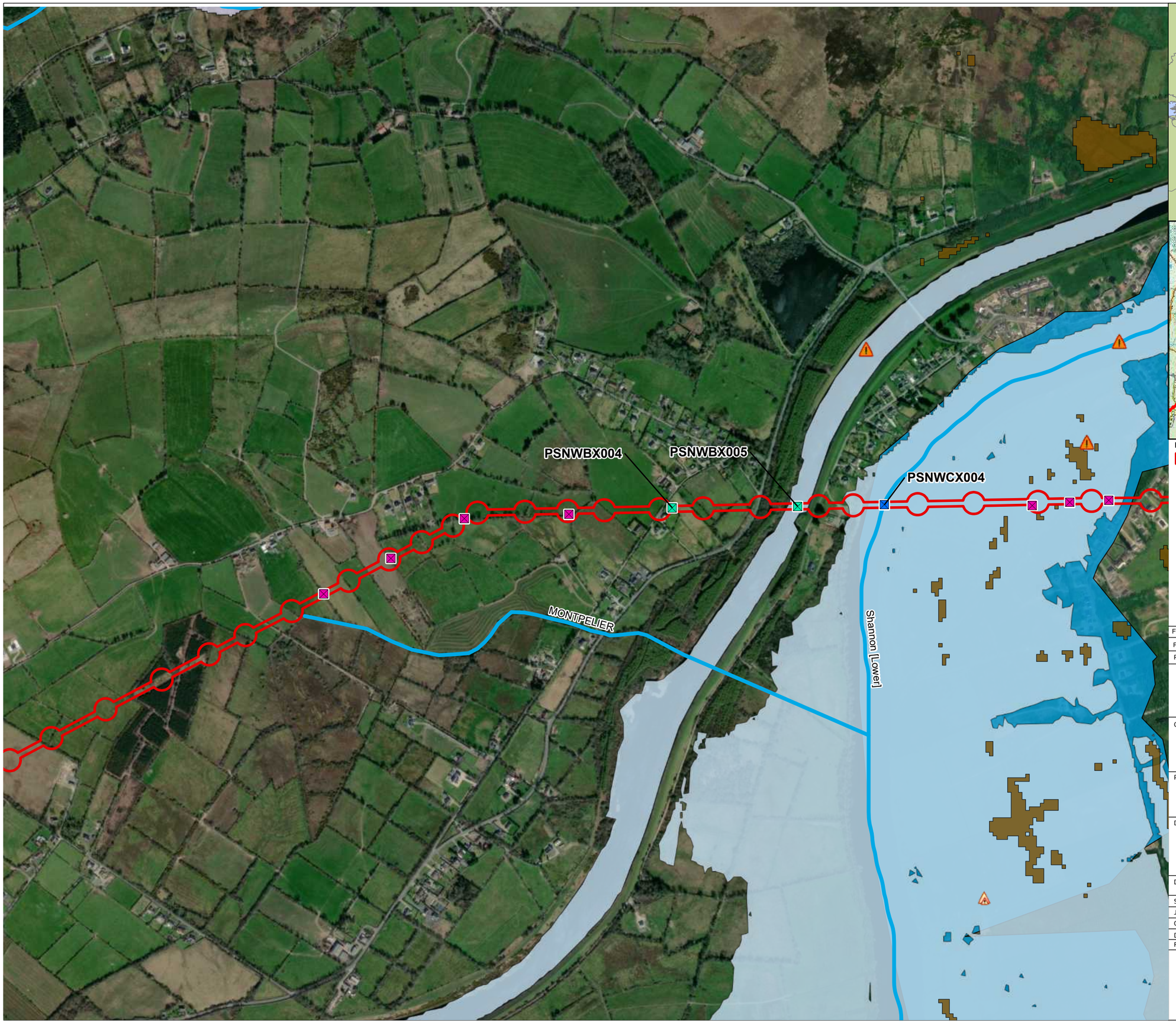

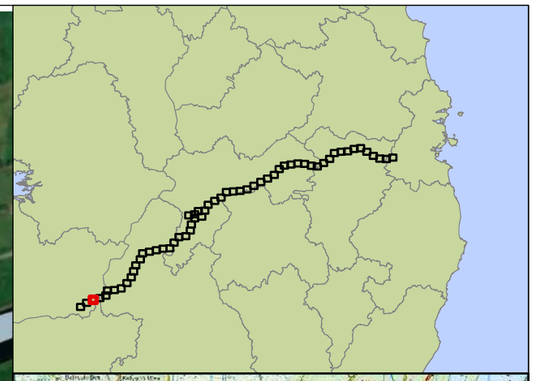

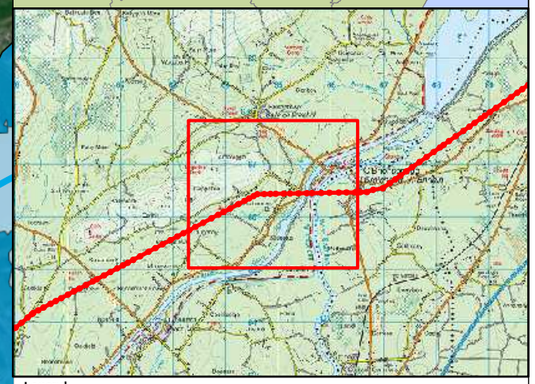

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.3
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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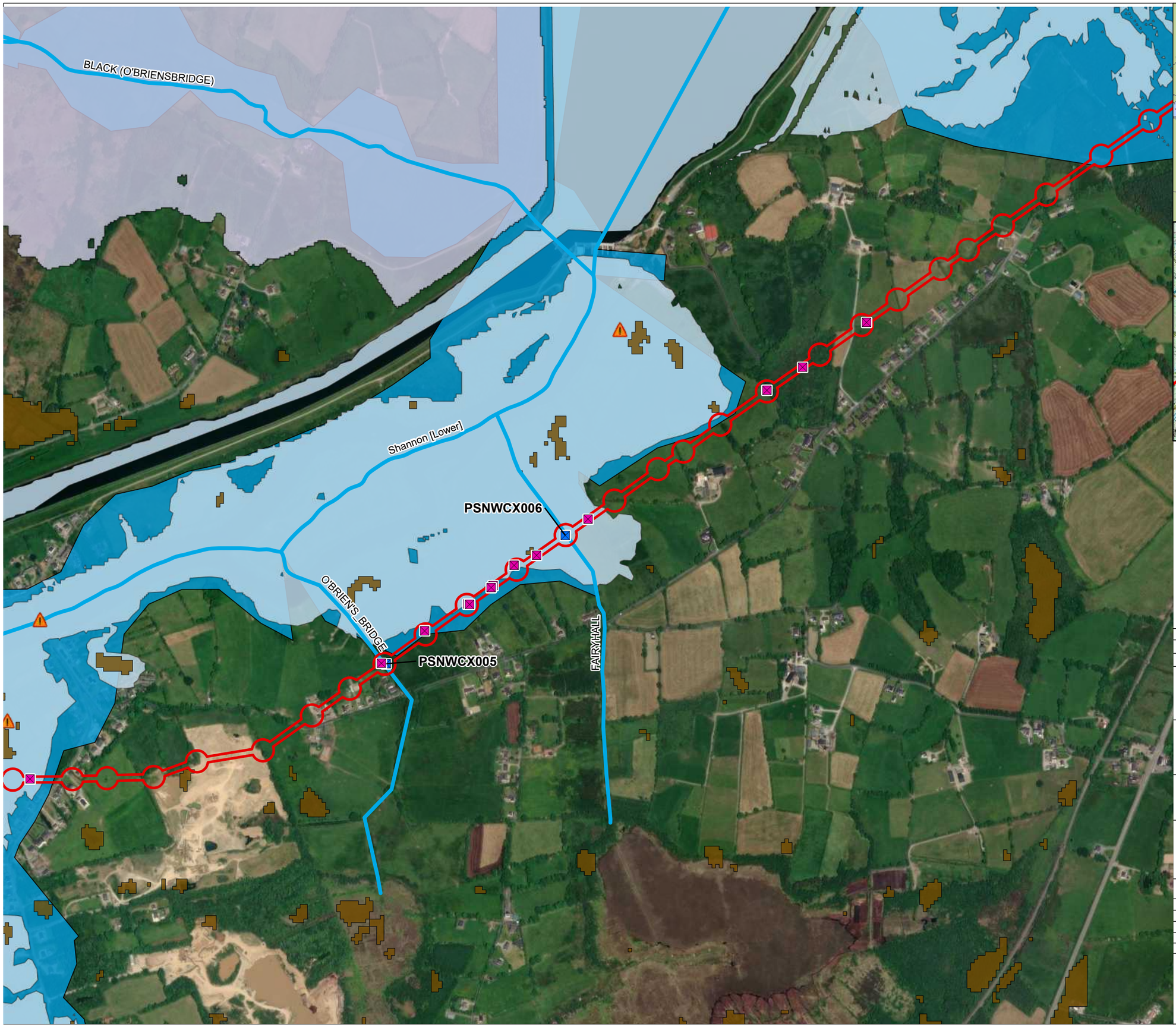

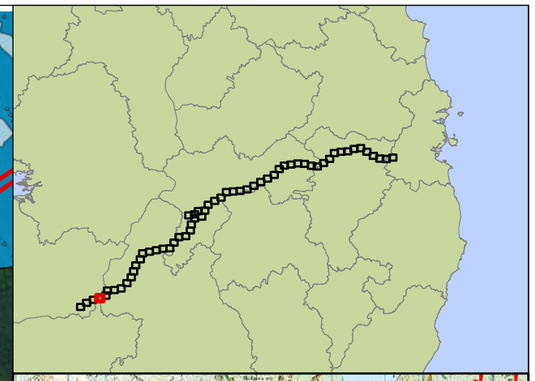

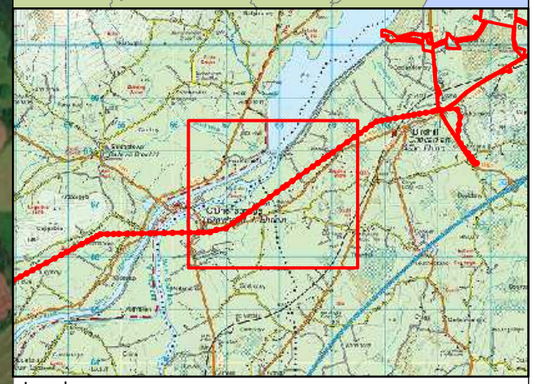

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.4
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
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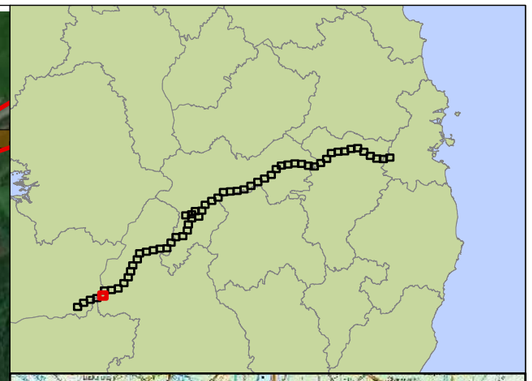

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.5
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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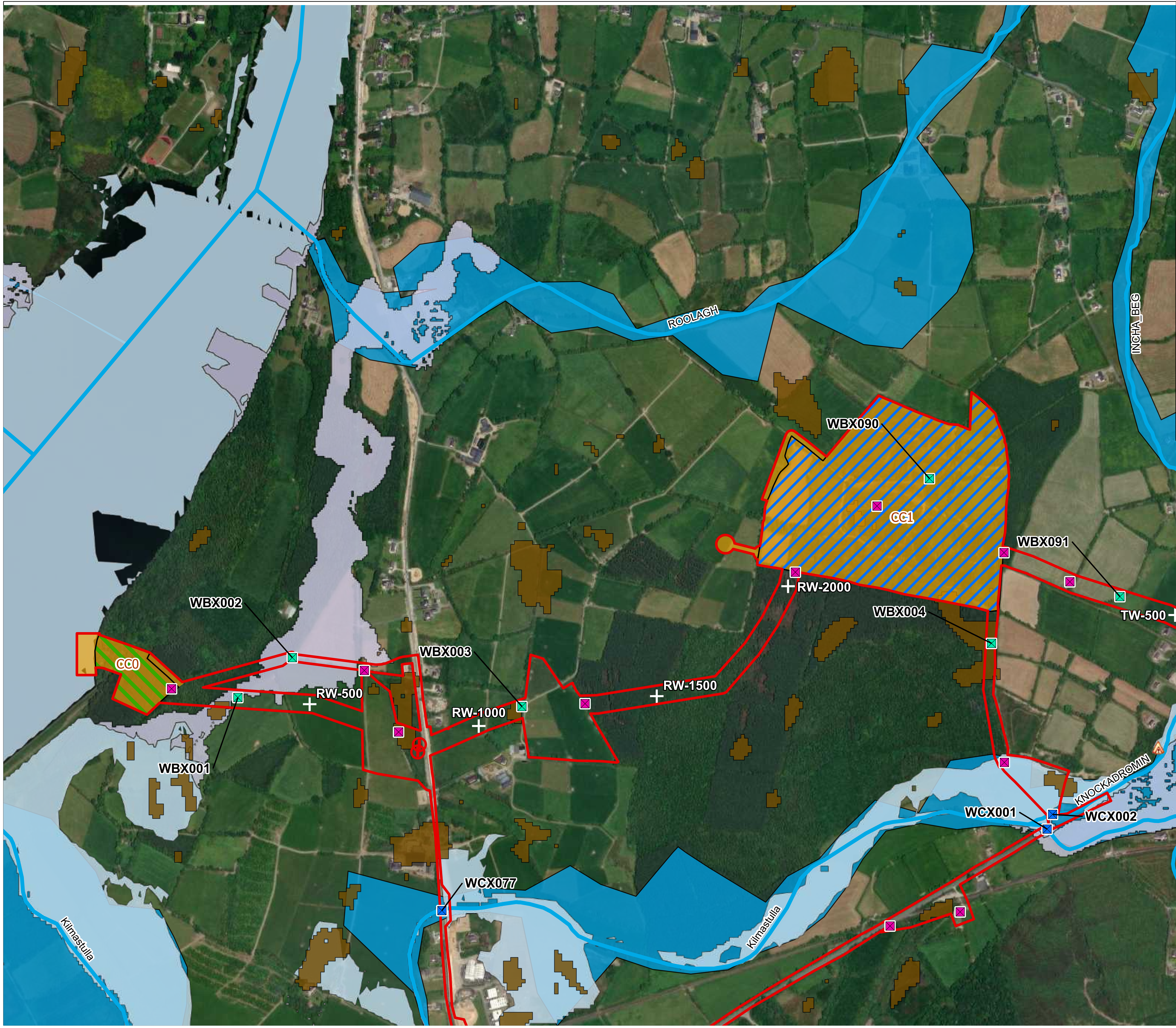

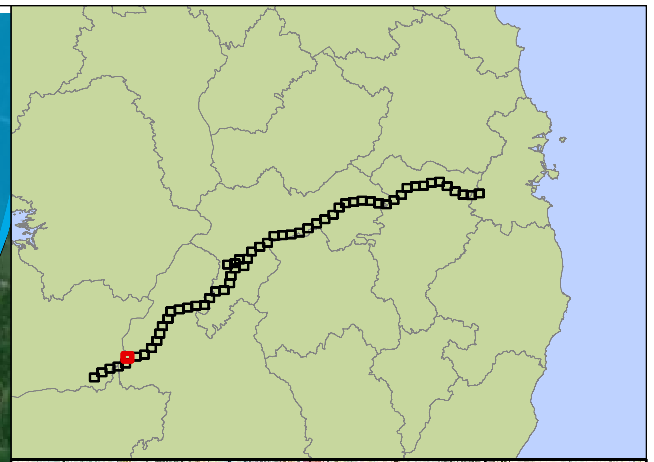

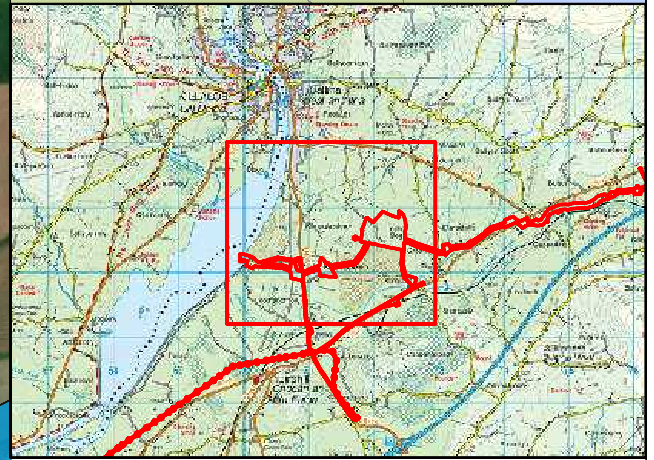

Legend

- Planning Application Boundary
- Raw Water Intake and Pumping Station
- Water Treatment Plant
- Construction Compound (CC)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.6
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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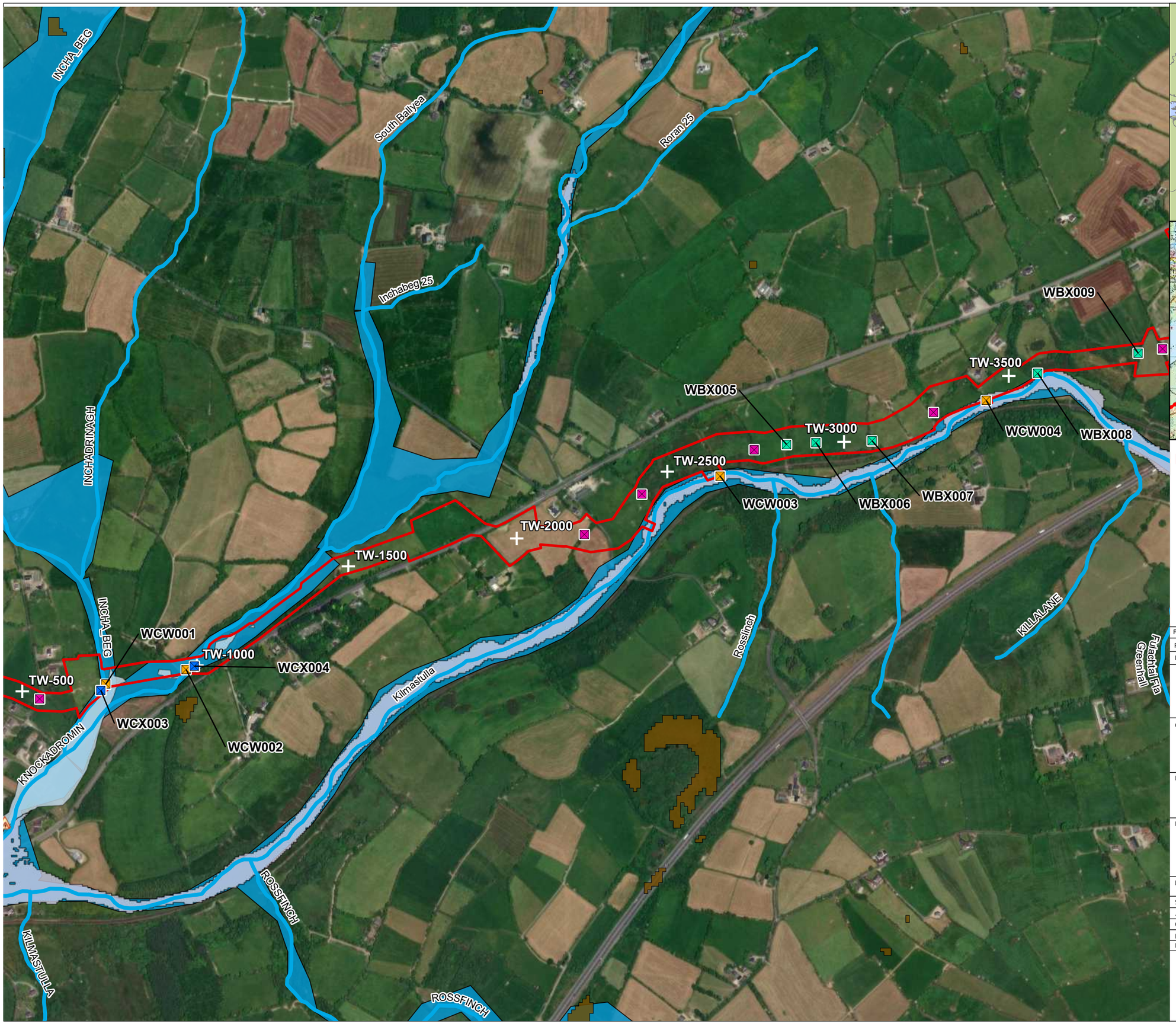

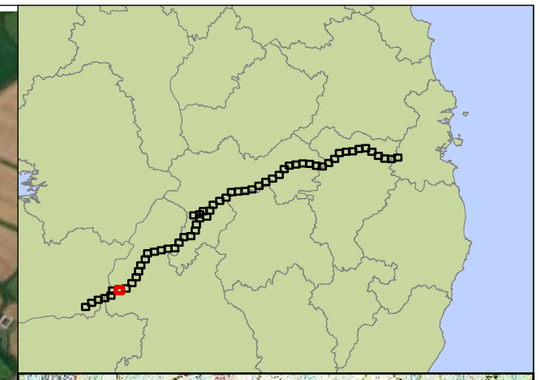

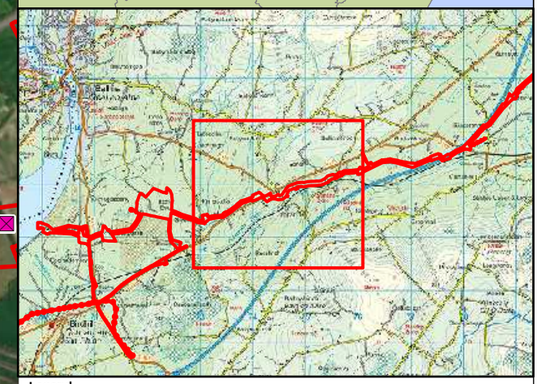

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.7
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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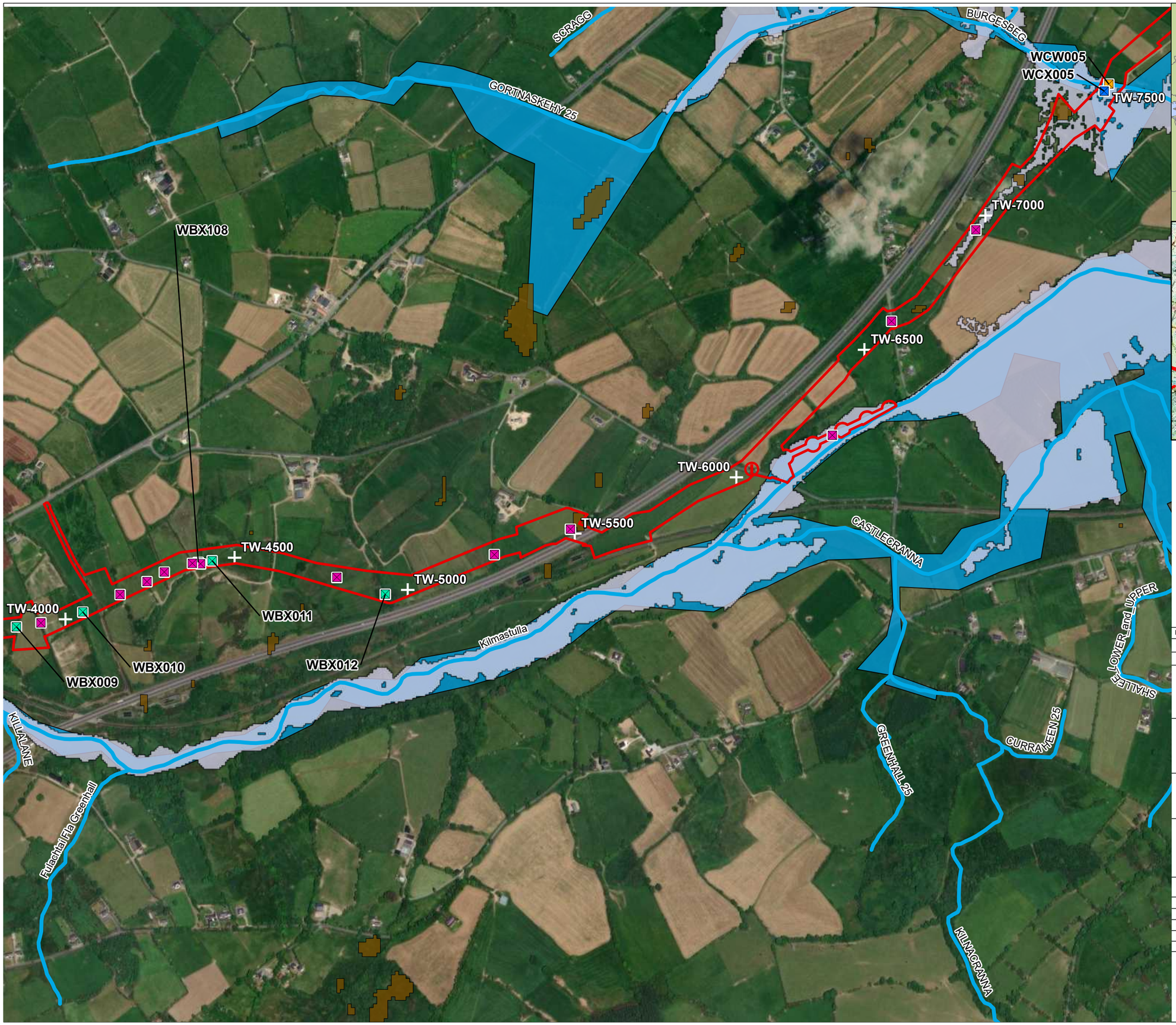

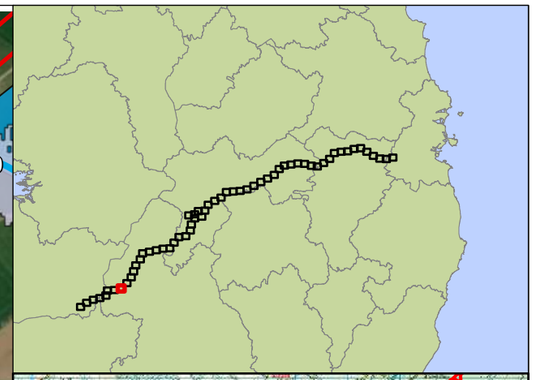

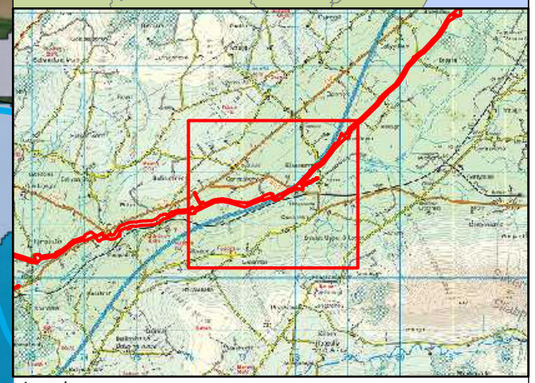

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

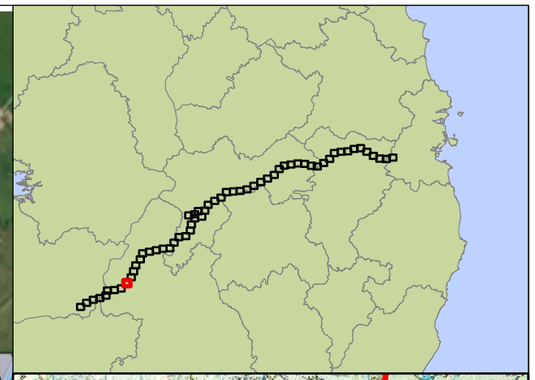
Project

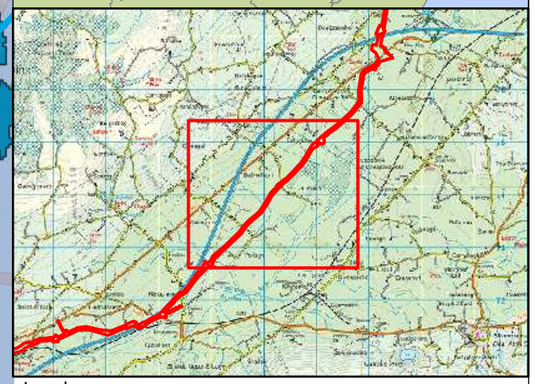
Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.8
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	I:\gis\mxd\1\GIS\rpt\32105801_WSP_DR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	





Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project

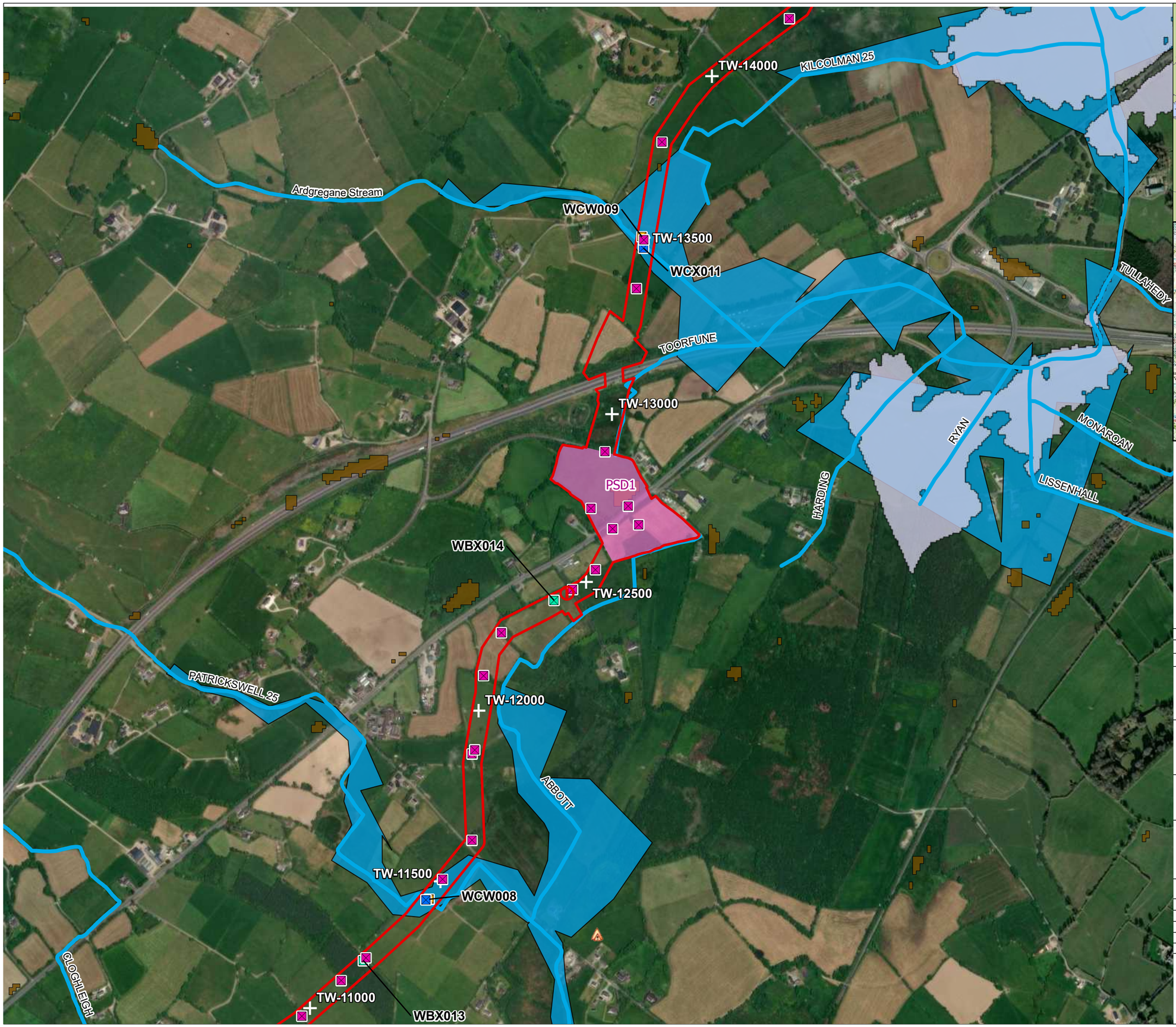
Water Supply Project
Eastern and Midlands Region

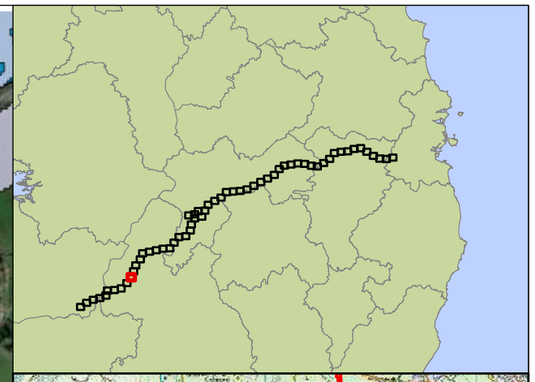
Drawing Title

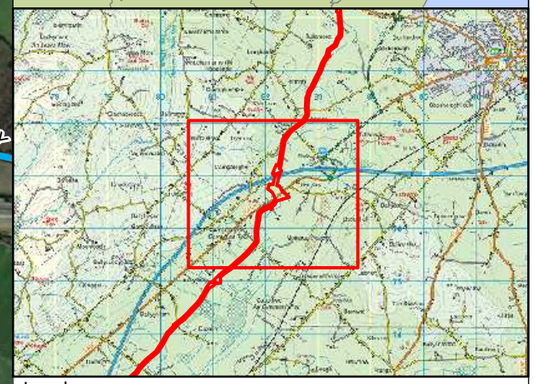
A9.4 Figure 8.9
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	I:\gis\en0nd01\GIS\Proj\32105801_WSP_DIR\Arc\GIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	







Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

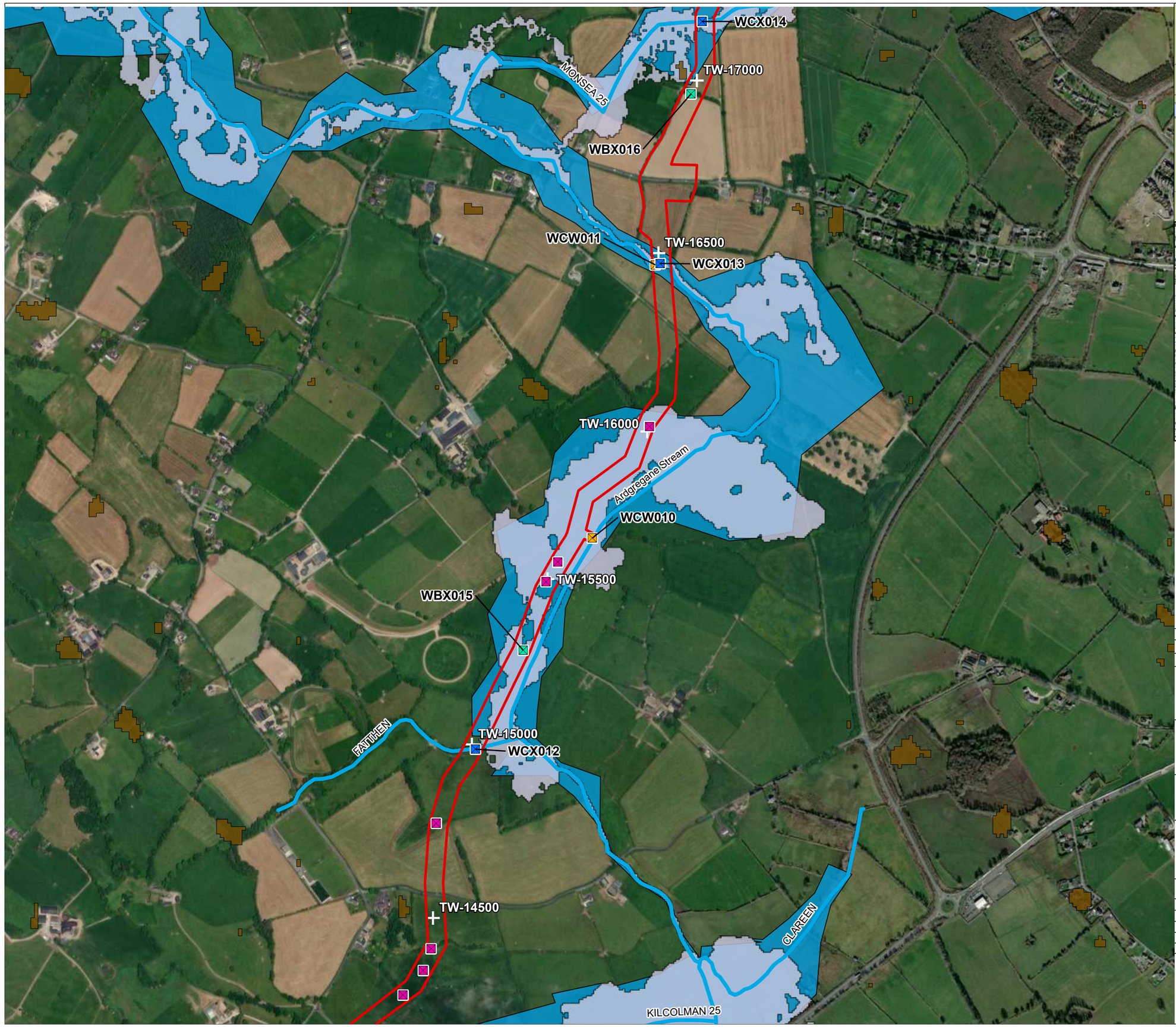
Project

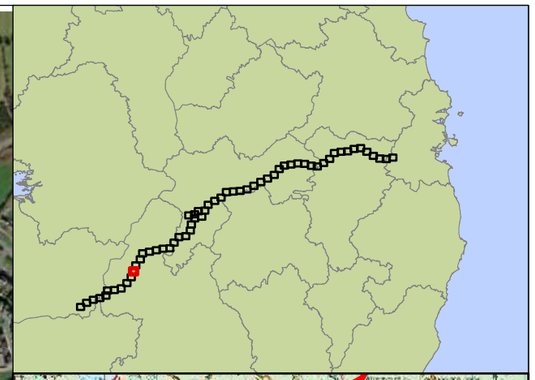
Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.10
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	C:\Jobs\Ord1\GIS\hq\32105801_WSP_DIR\ArcGIS\AIR\Ch_09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	





Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.11
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
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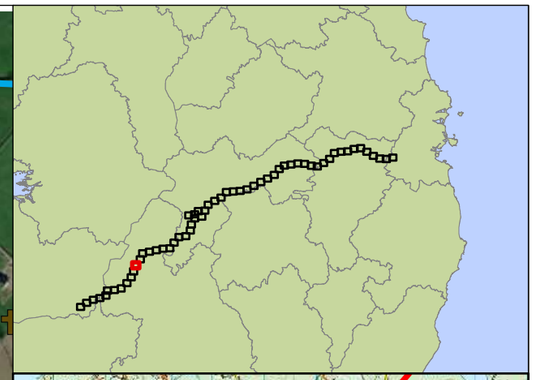

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.12
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
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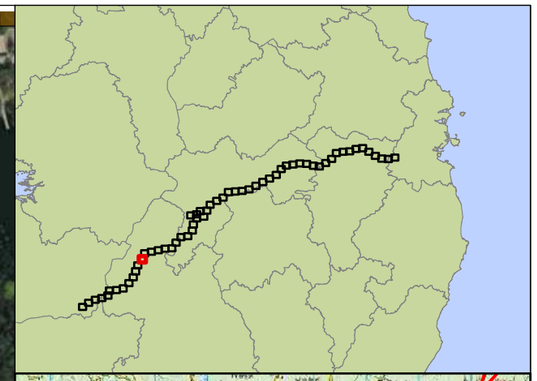

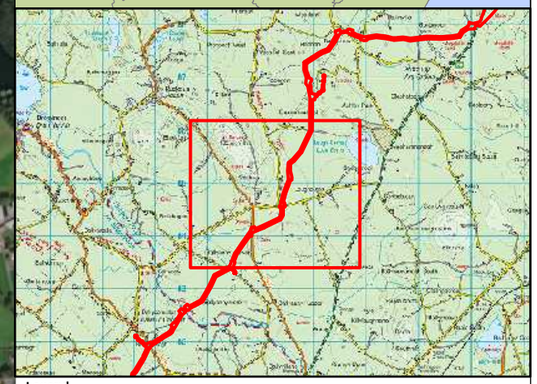

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.13
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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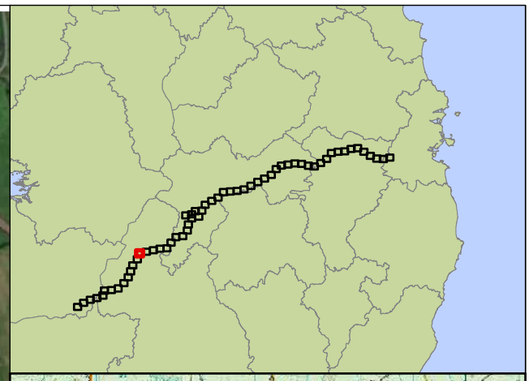

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.14
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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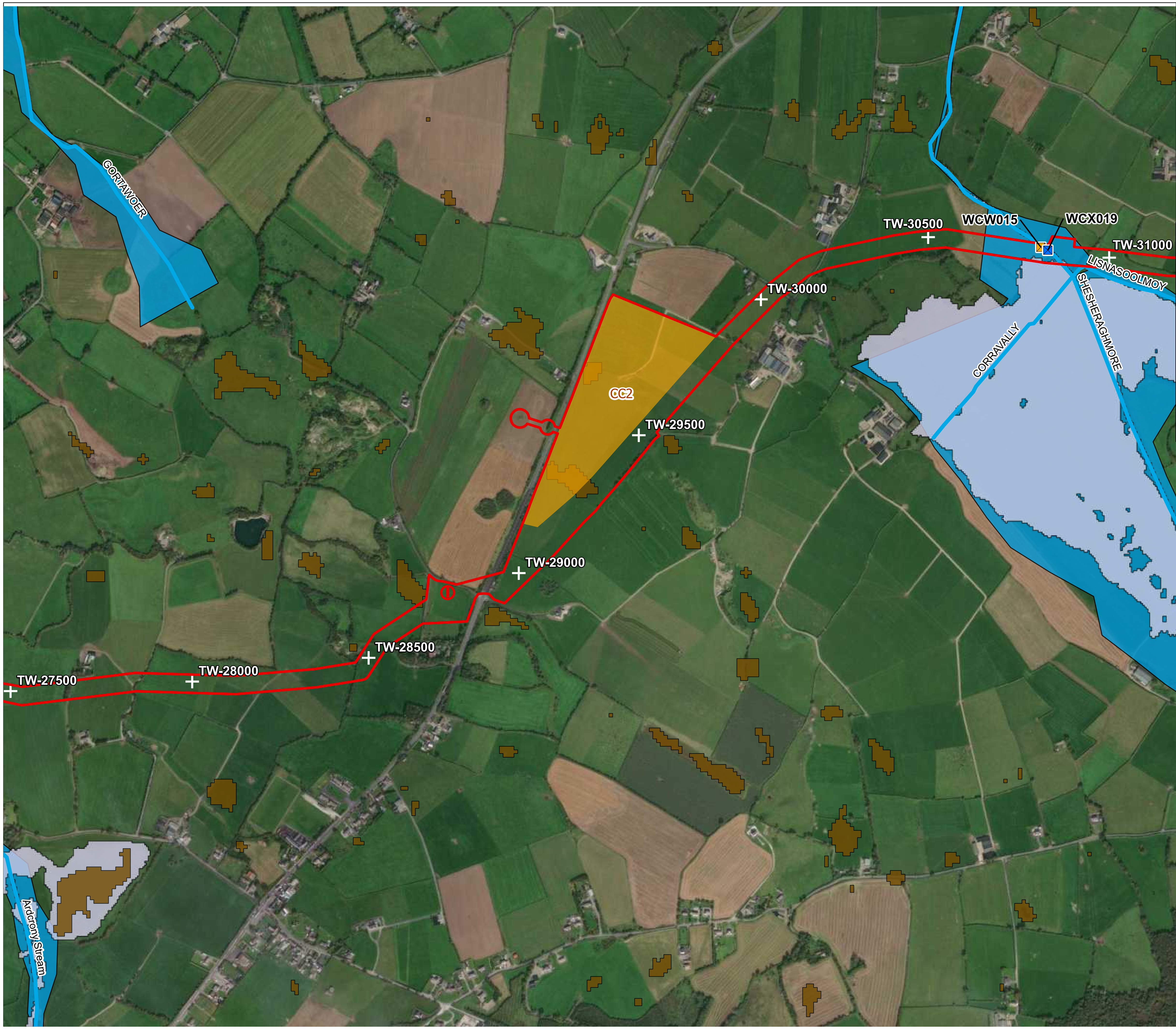

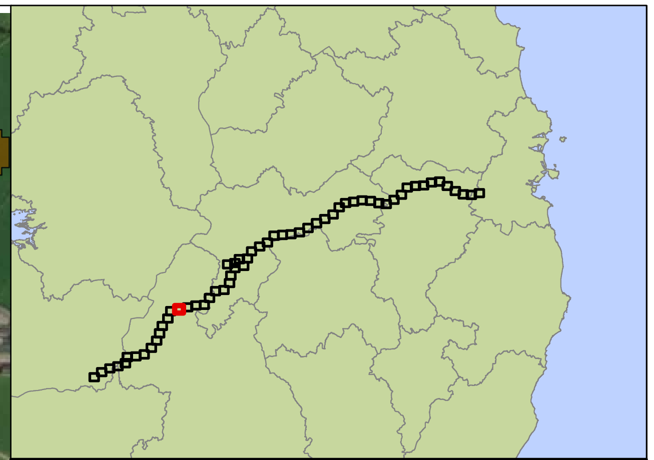

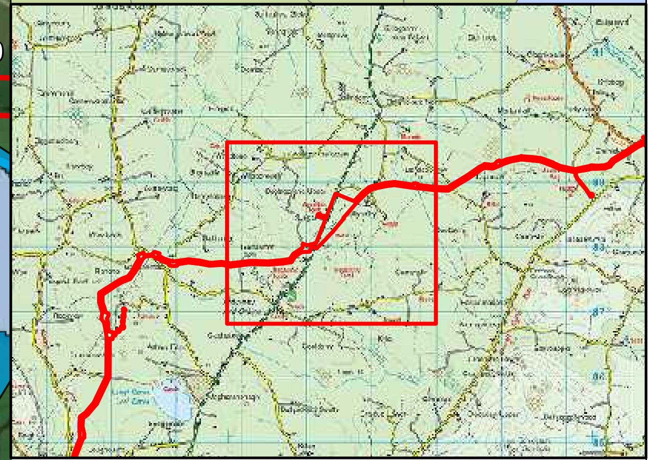

Legend

- Planning Application Boundary
- Construction Compound (CC)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water — Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.15
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
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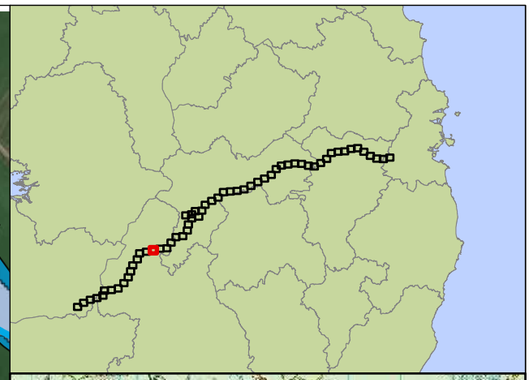

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.16
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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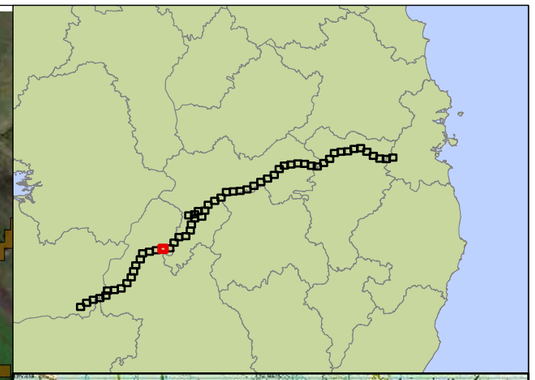

Legend

- Planning Application Boundary
- Break Pressure Tank
- Construction Compound (CC)
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.17
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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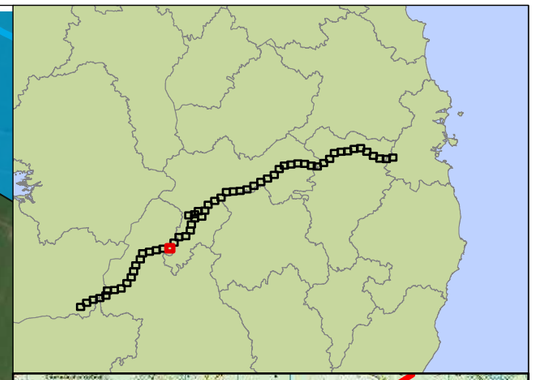

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.18
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
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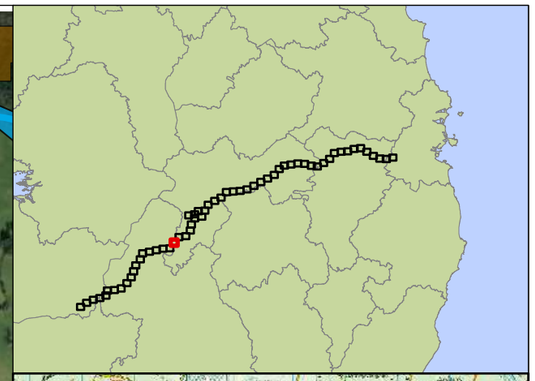


Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

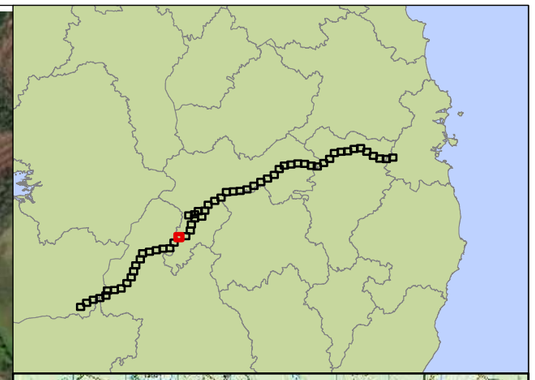
Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.19
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION
Scale @ A3	1:10,000 DO NOT SCALE
Jacobs No.	32105801
Client No.	9318
Drawing No.	32105801/700/12041
File Path	I:\gis\arcGIS\GIS\proj\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12.5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx



Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.20
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION
Scale @ A3	1:10,000 DO NOT SCALE
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Client No.	9318
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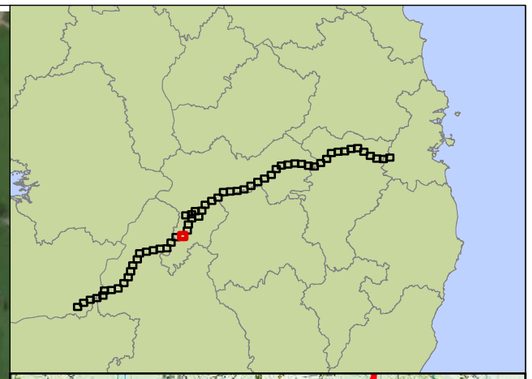

Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
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Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.21
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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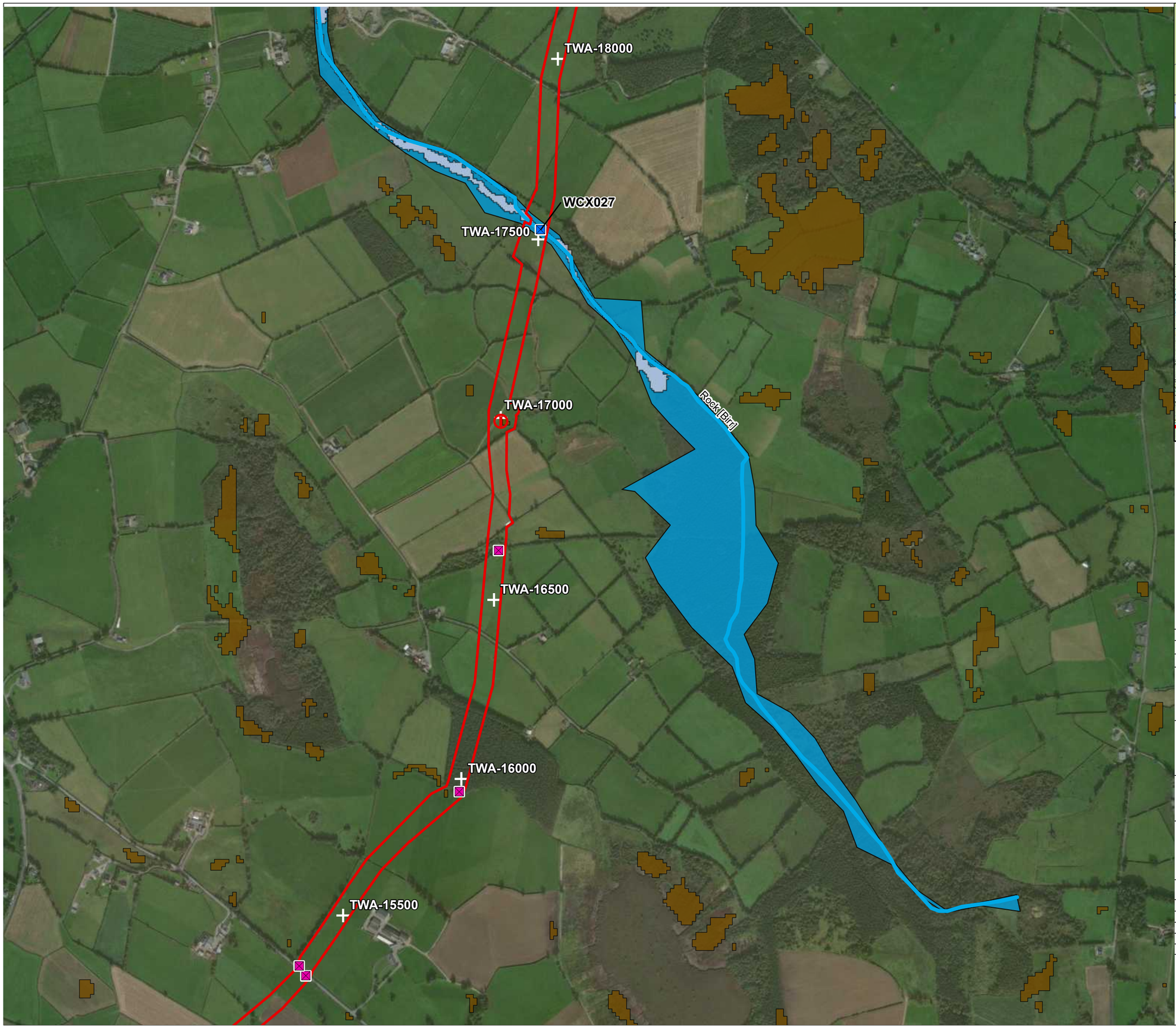

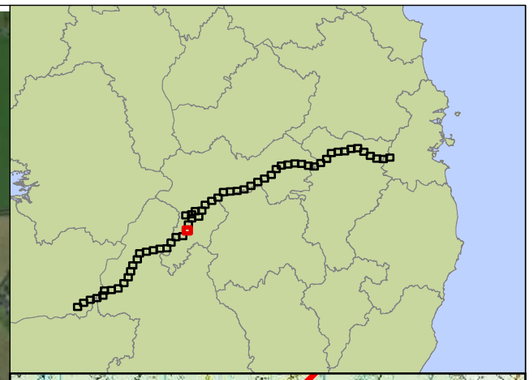

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

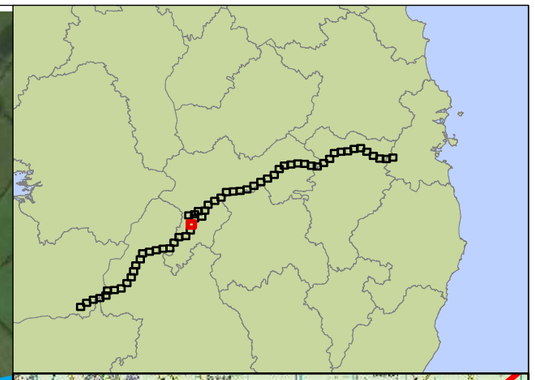
Project

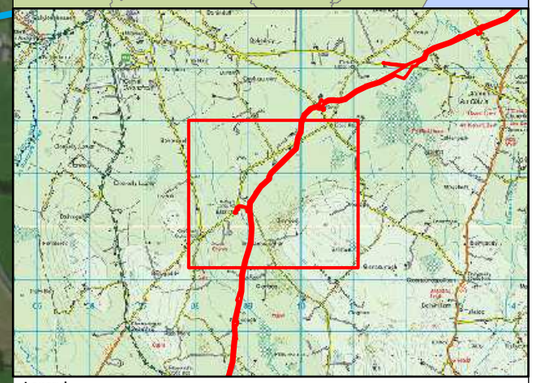
Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.22
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\global\ie0ud11\GIS\Proj\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	





Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.23
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION
Scale @ A3	1:10,000 DO NOT SCALE
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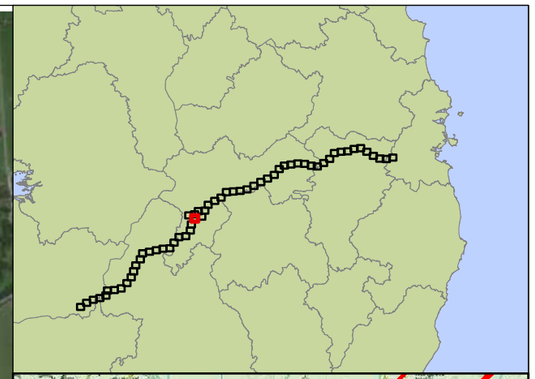
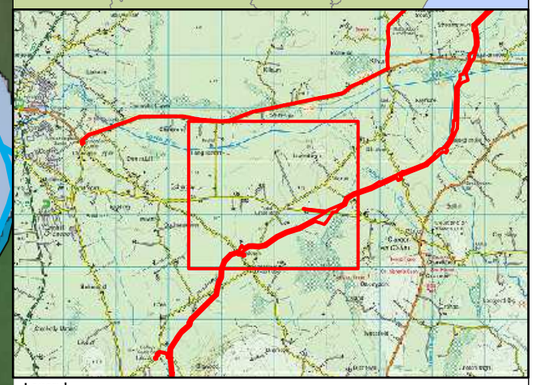
Client No.	9318
Drawing No.	32105801/700/12041
File Path	I:\gis\mxd\1\GIS\sp\J32105801_WSP_DR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12.5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx





Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.24
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
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Client No.	9318	
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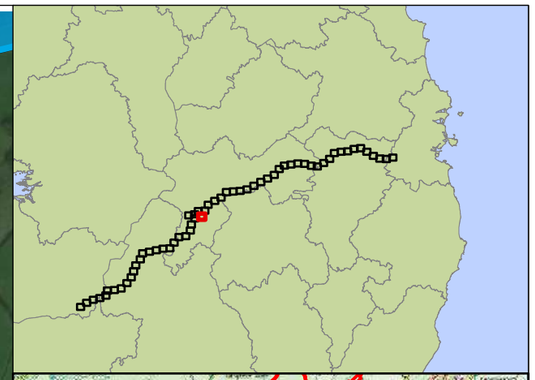

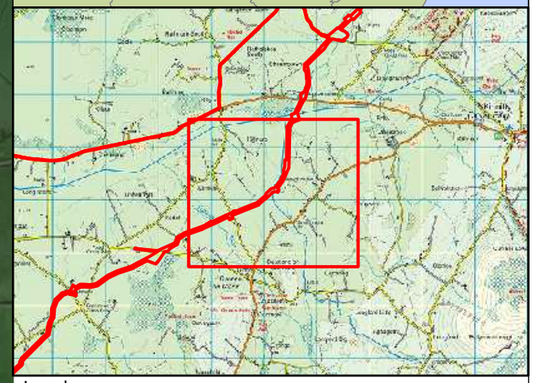

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.25
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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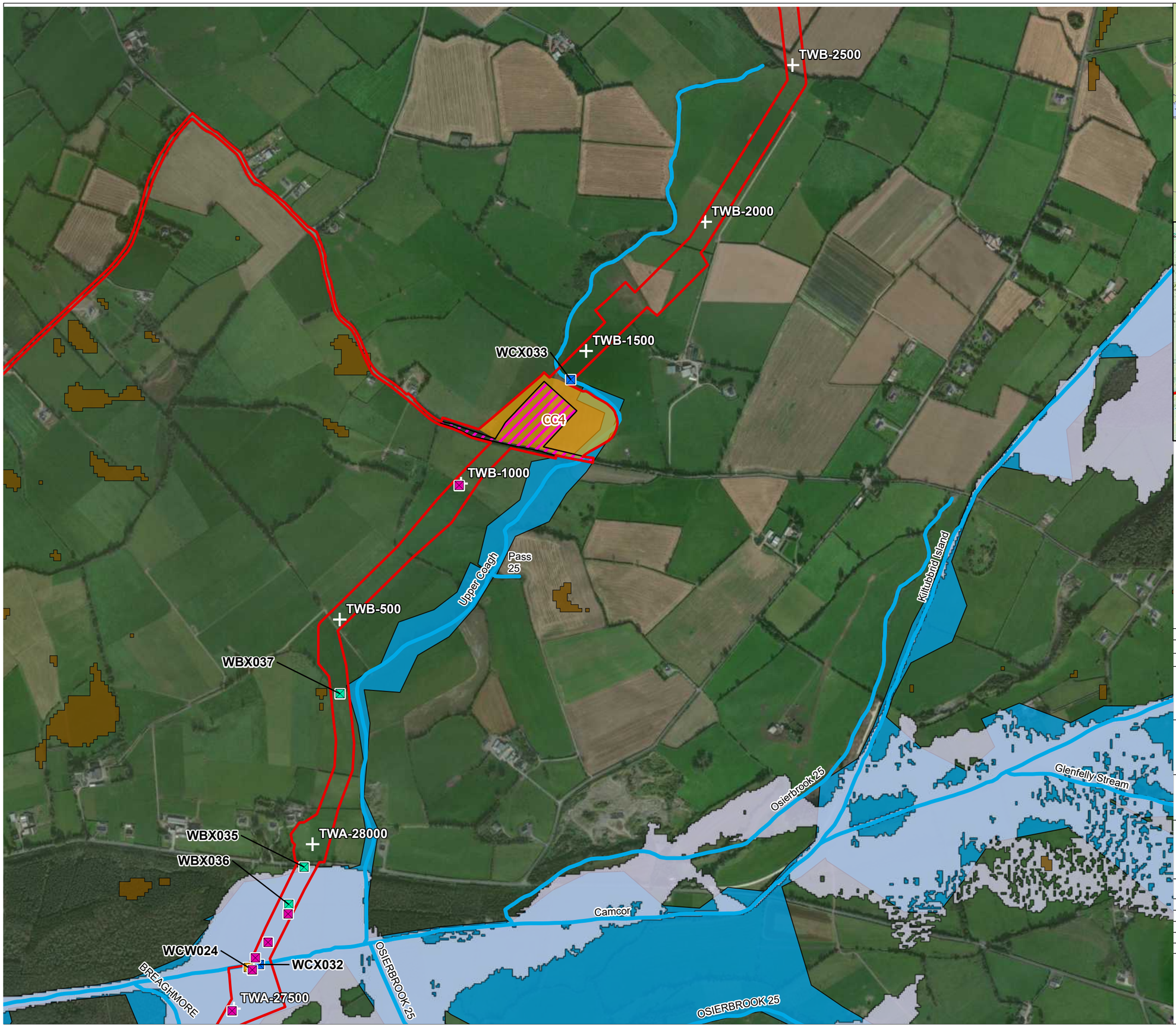

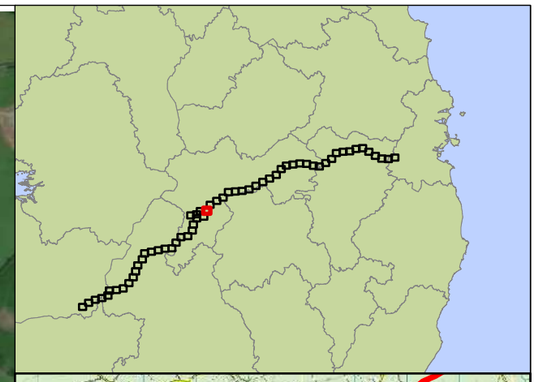

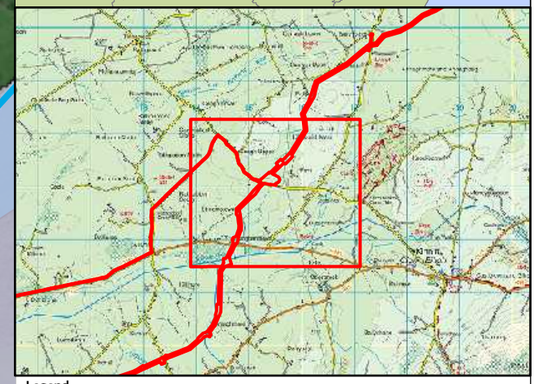

Legend

- Planning Application Boundary
- Booster Pumping Station
- Construction Compound (CC)
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.26
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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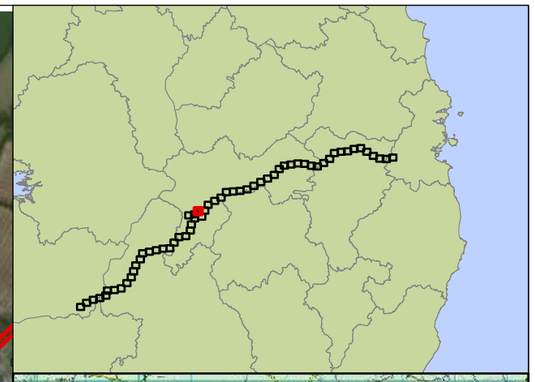

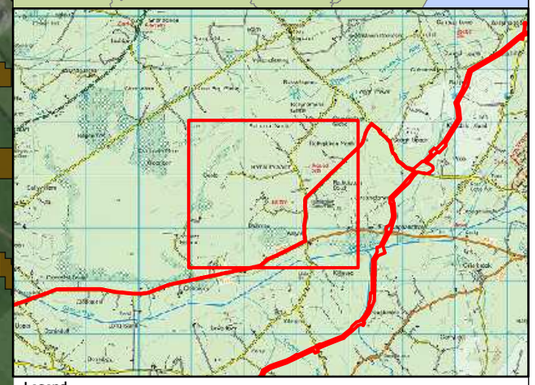

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.27
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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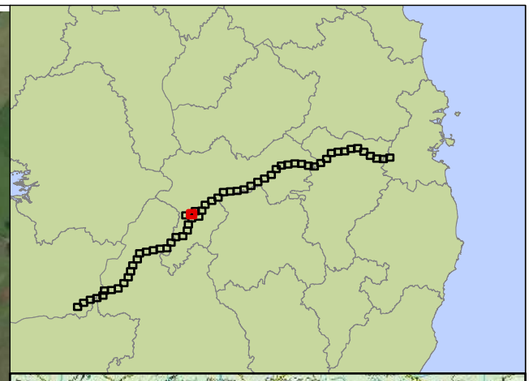

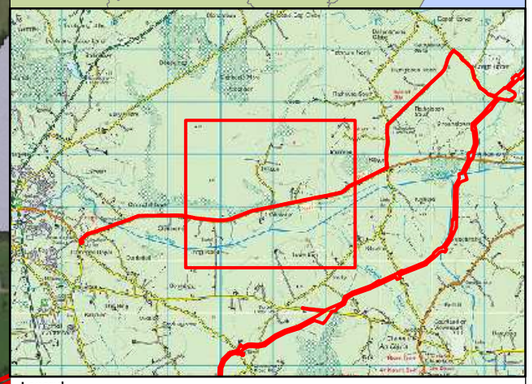

Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.28
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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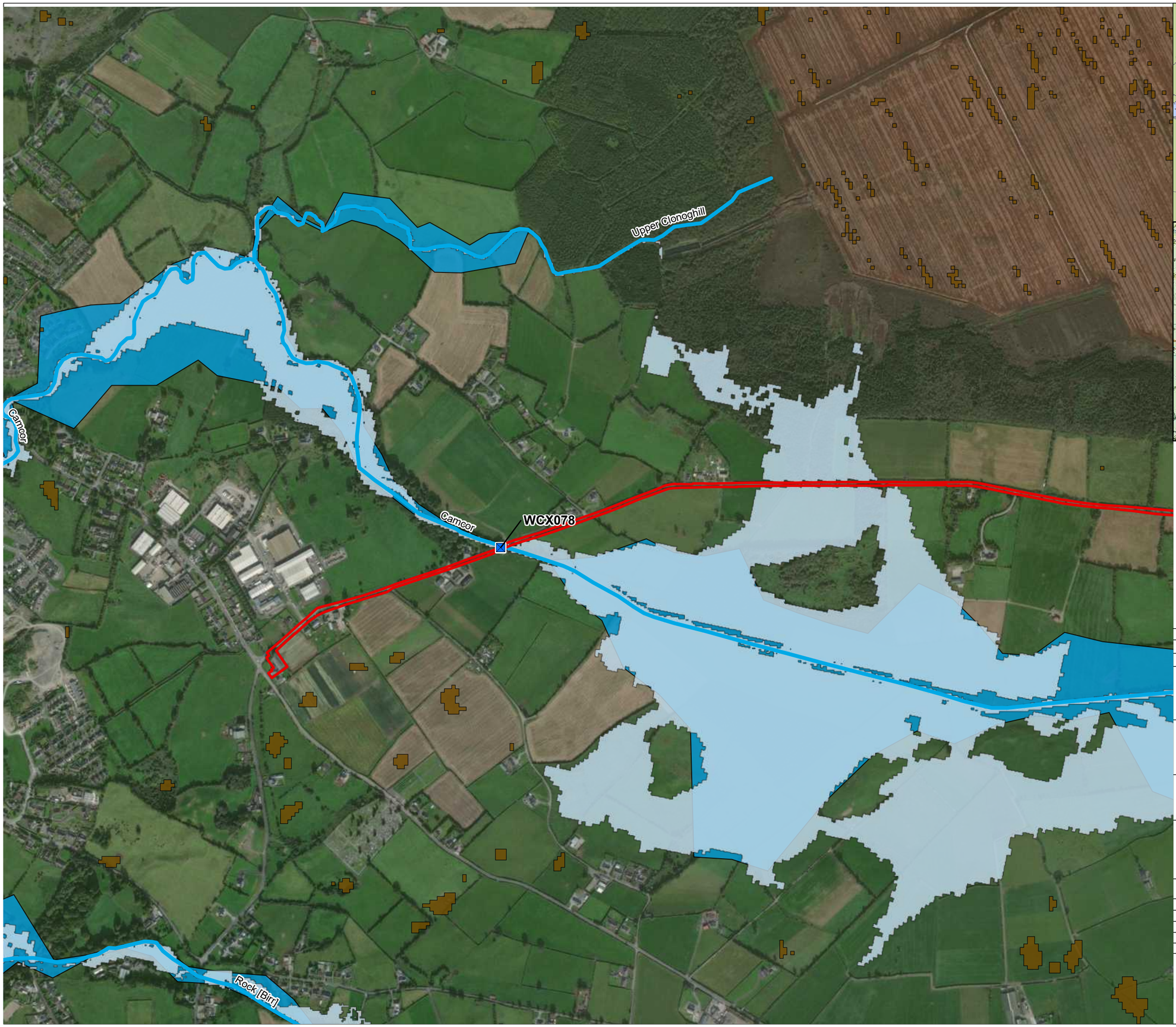
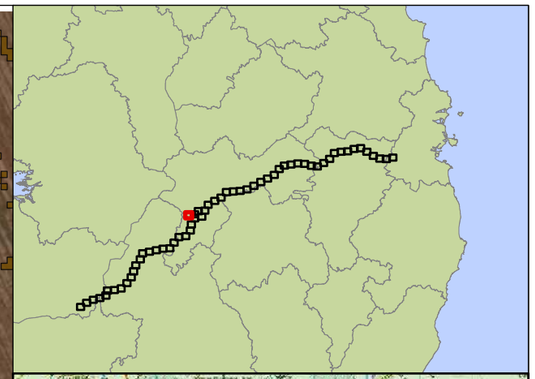
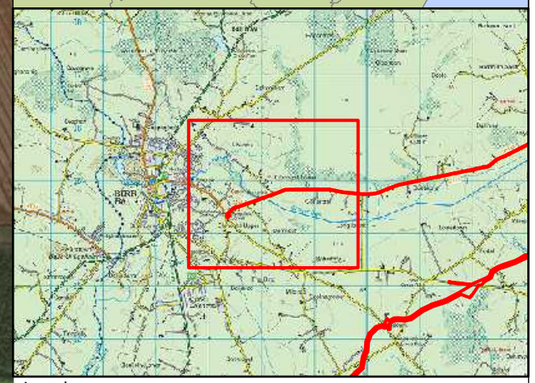






Legend

- Planning Application Boundary
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

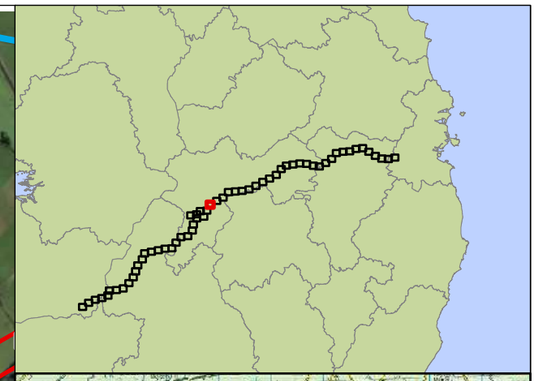
Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.29
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	T:\Jobs\Dnd\01\GIS\Proj\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	



Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.30
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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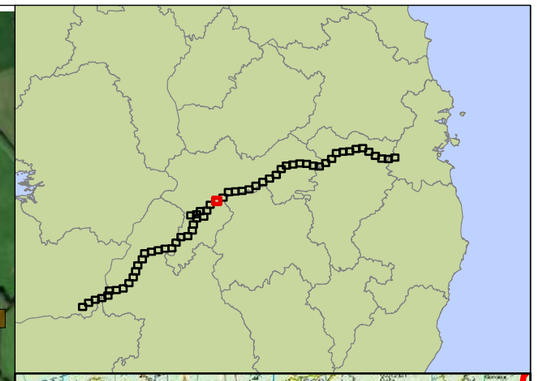
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	I:\gis\en0\v01\GIS\Proj\32105801_WSP_DRI\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12.5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx	



Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.31
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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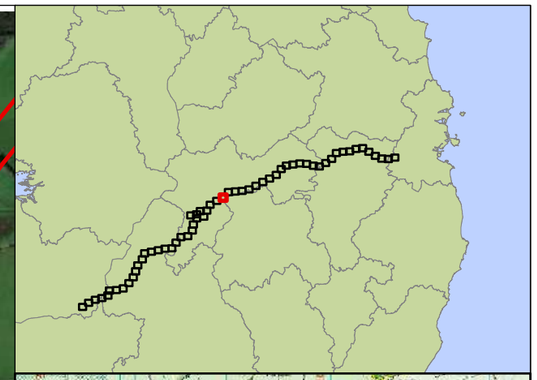
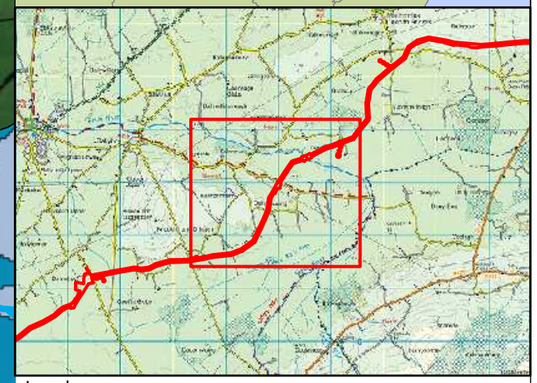




Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

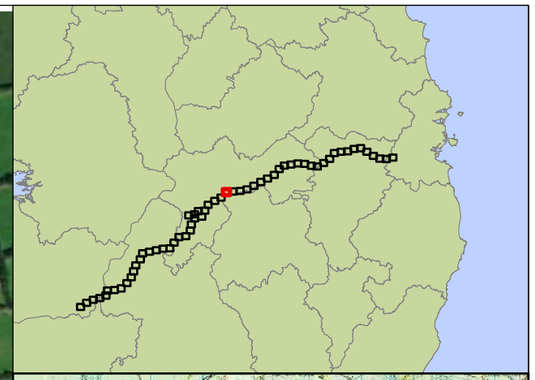
Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.32
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\global\ie\GIS\Proj\32105801_WSP_DRLAs\GIS\EIAR\Ch. 09 - Water\Flood risk\A12 S1Ch_09_Water_Flood_risk_A12_S_20250130.aprx	



Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

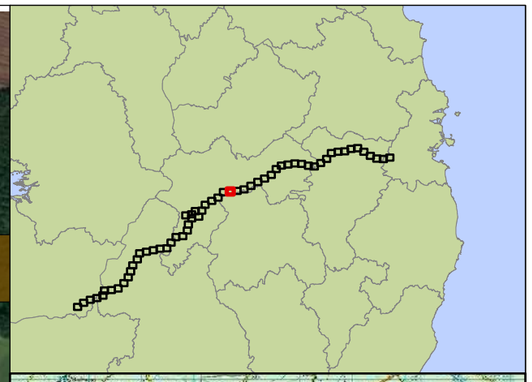
Jacobs TOBIN

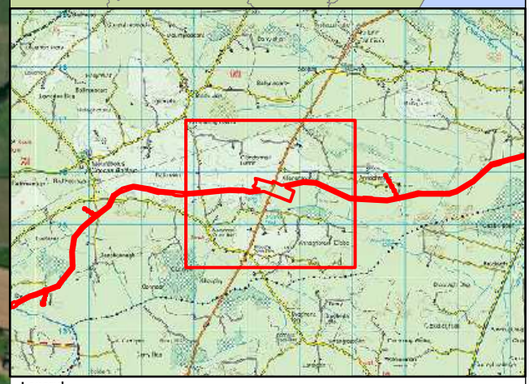
Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.33
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	T:\plan\Ond\1\GIS\Proj\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12.5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx	





Legend

- Planning Application Boundary
- Construction Compound (CC)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

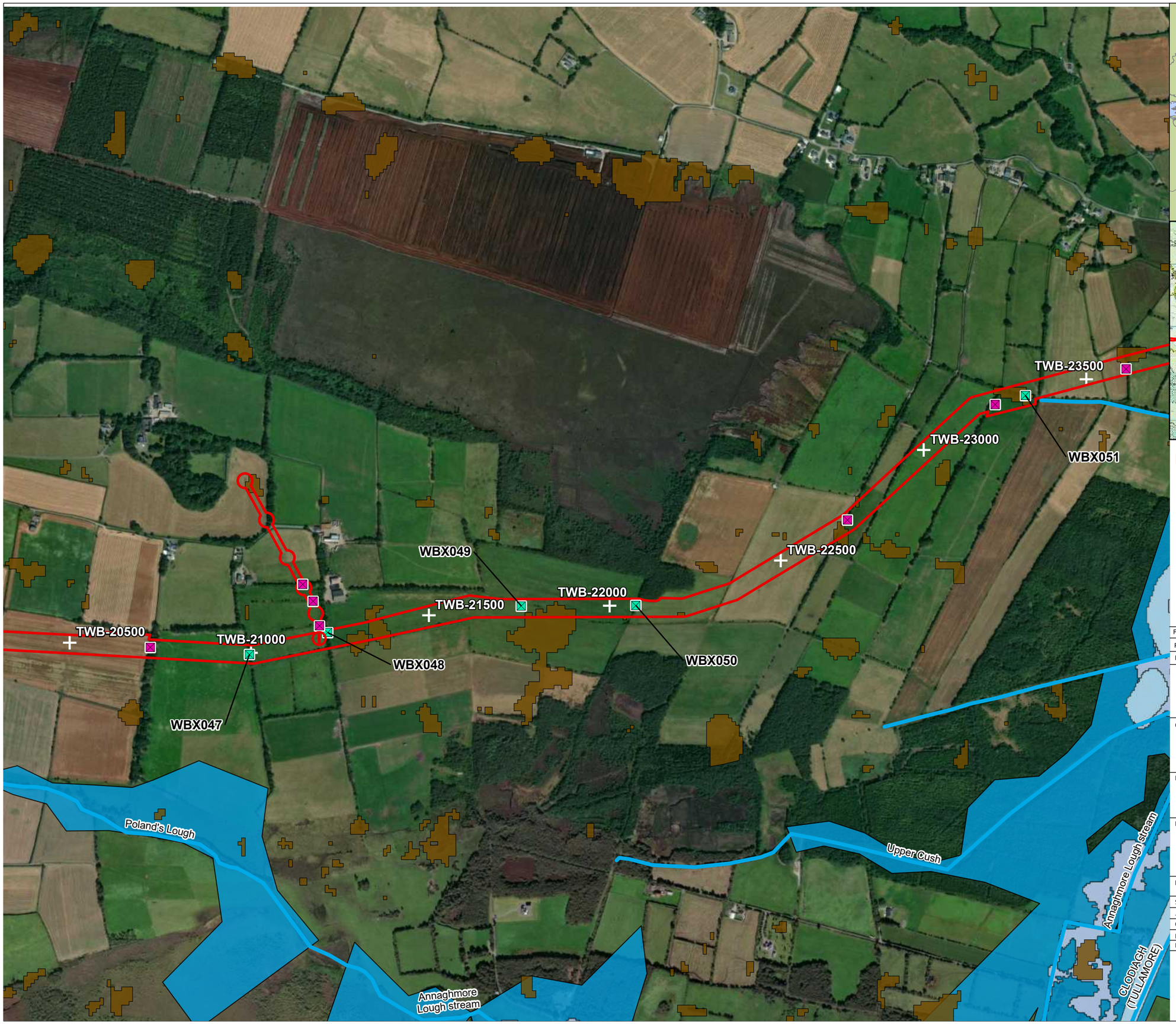
Jacobs TOBIN

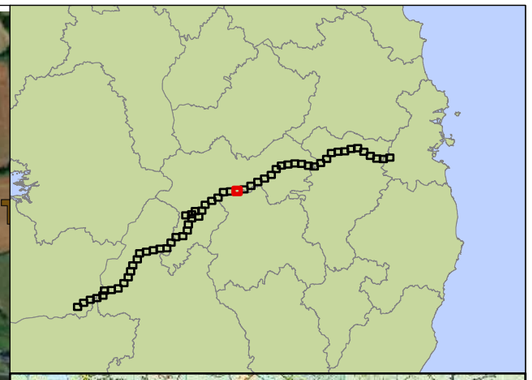
Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

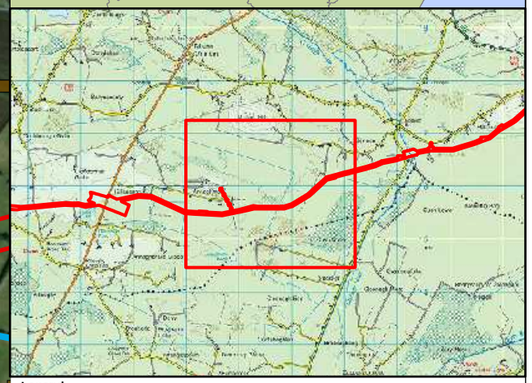
Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.34
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	I:\gilam0nd1\GISProj\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12.5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx	







Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.35
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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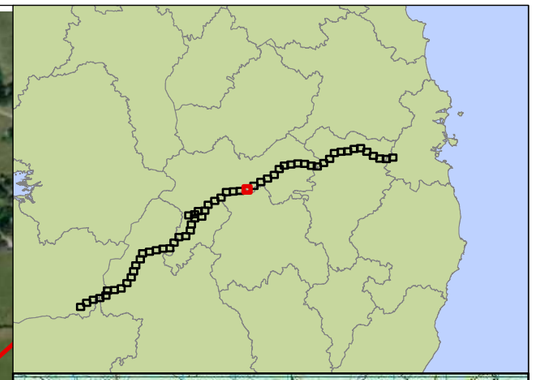

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.36
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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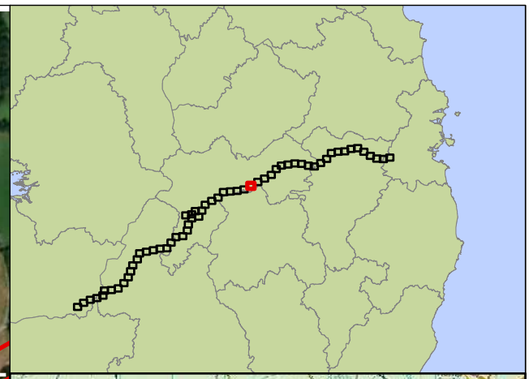

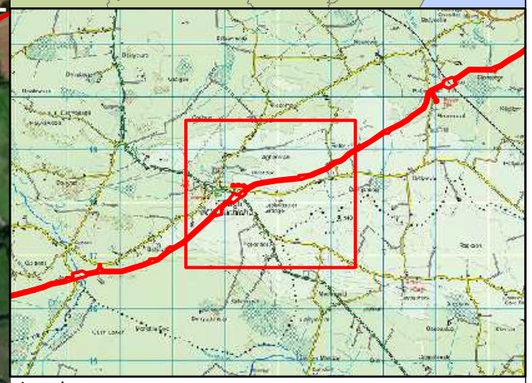

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.37
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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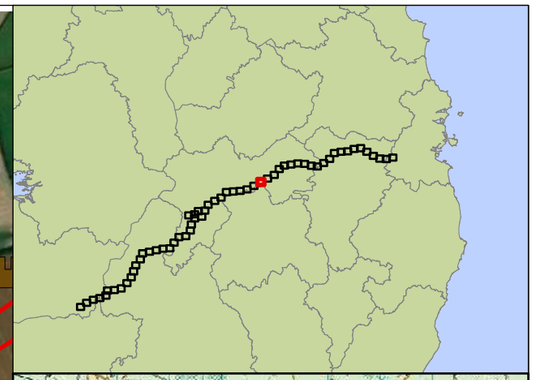

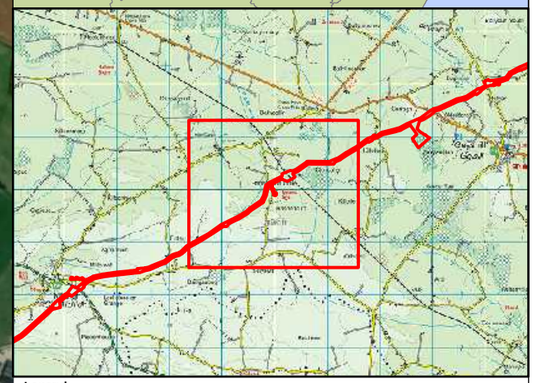

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.38
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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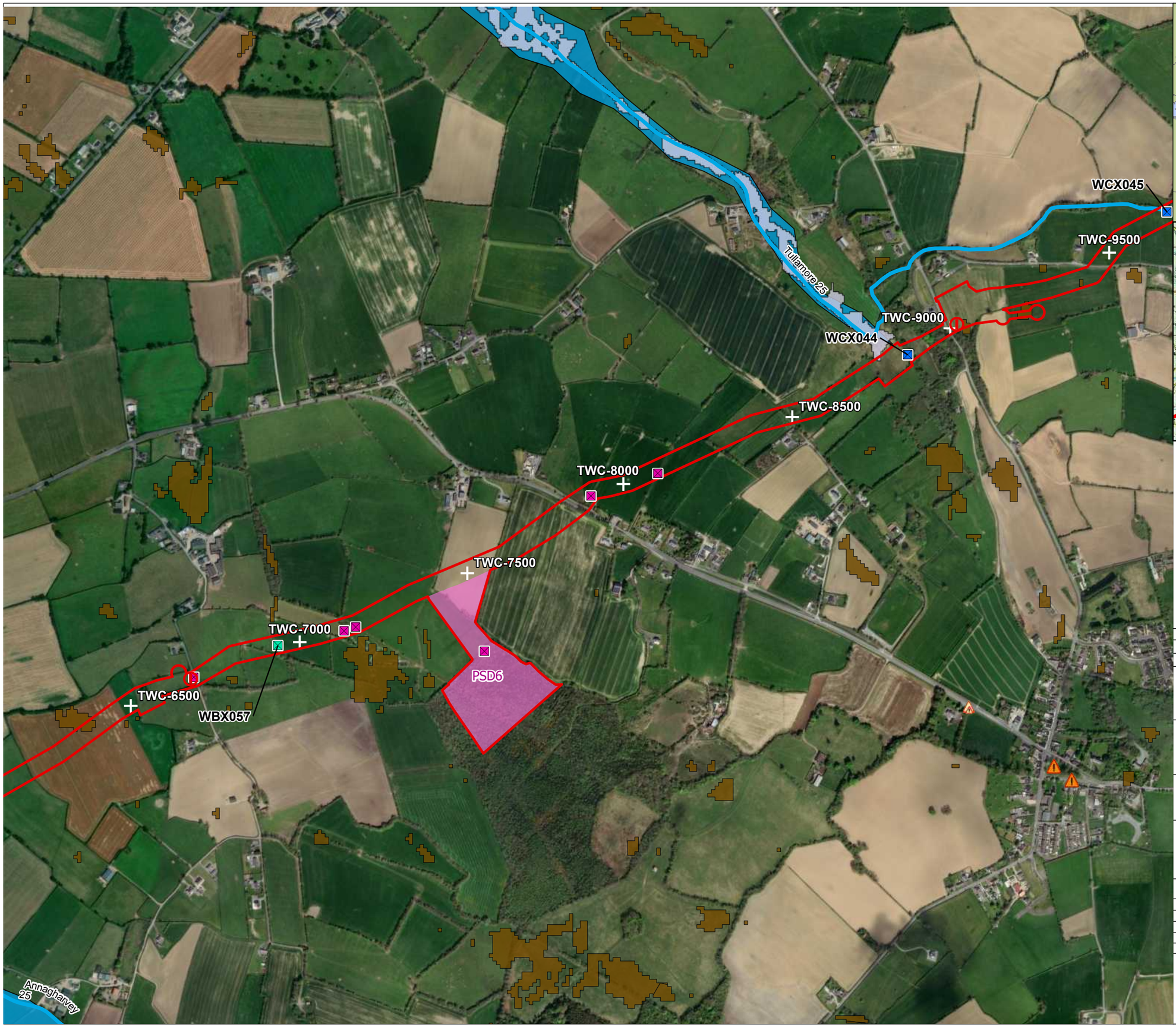

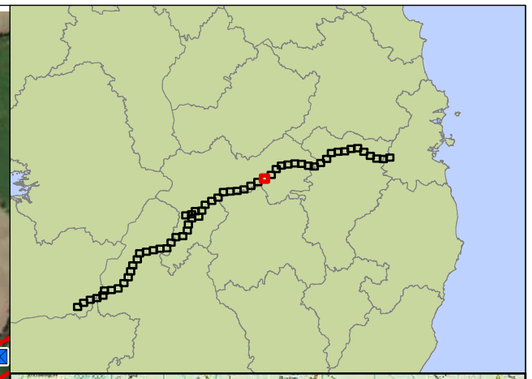

Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.39
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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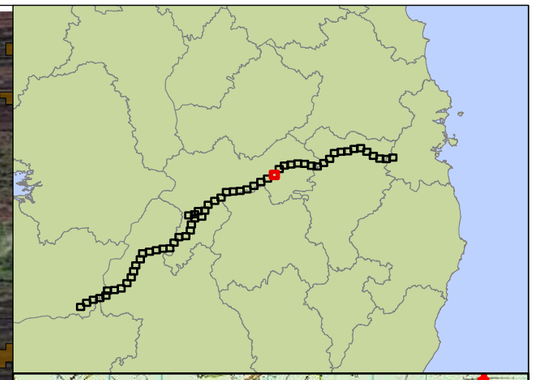
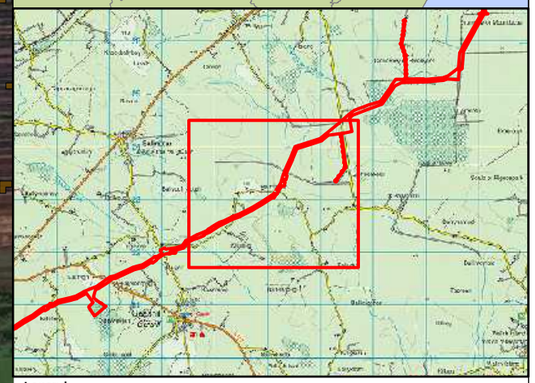




Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

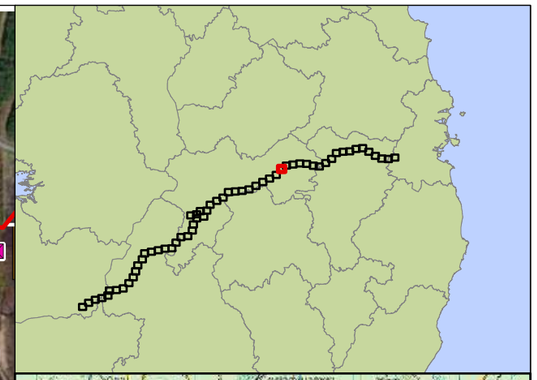
Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.40
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	I:\gis\mxd\01\GIS\proj\32105801_WSP_DR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	



Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

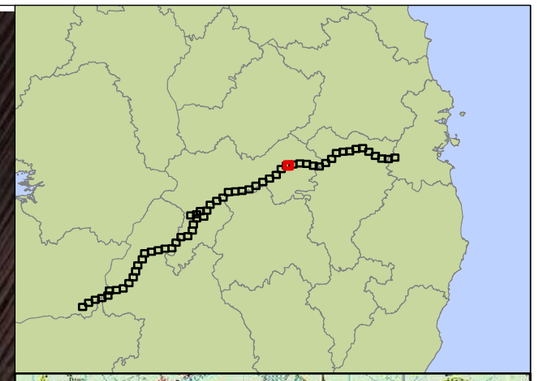
Project

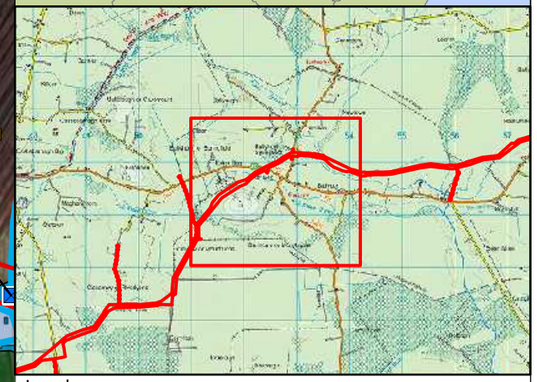
Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.41
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\gbkem0nd01\GIS\Proj\32105801_WSP_DR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	





Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

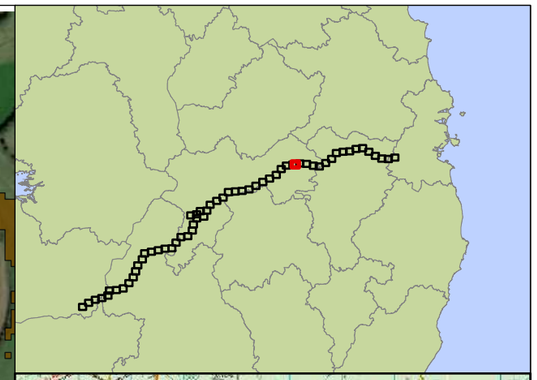
Water Supply Project
Eastern and Midlands Region

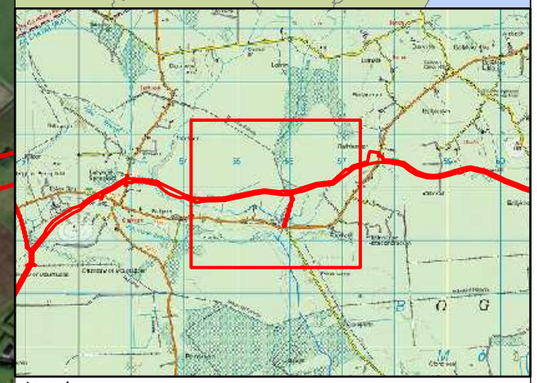
Drawing Title

A9.4 Figure 8.42
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\glenlon0nd01\GISProj\32105801_WSP_DIR\Arc\GIS\EIAR\Ch_09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	





Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.43
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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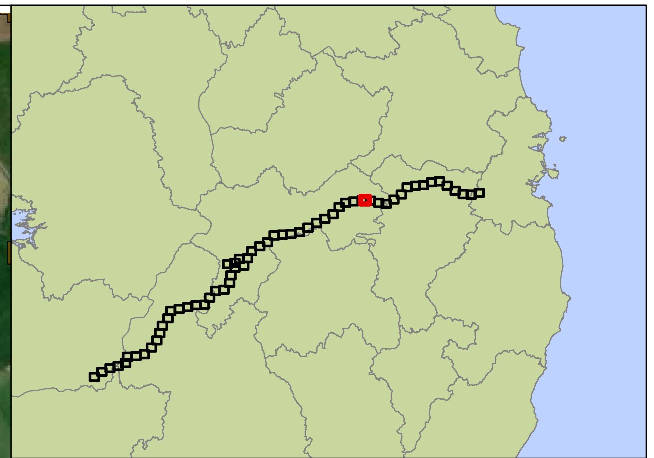

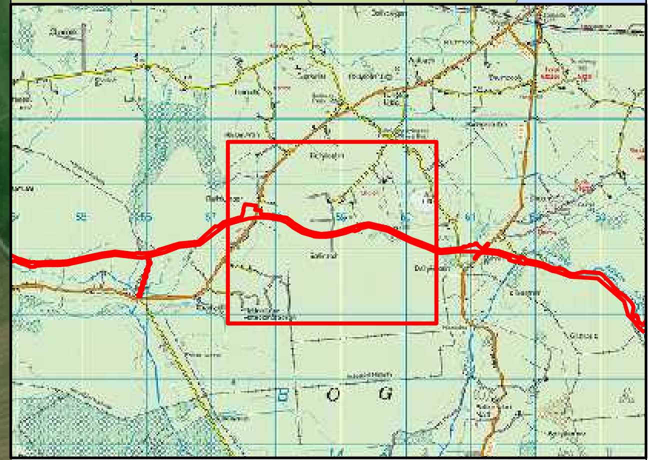

Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

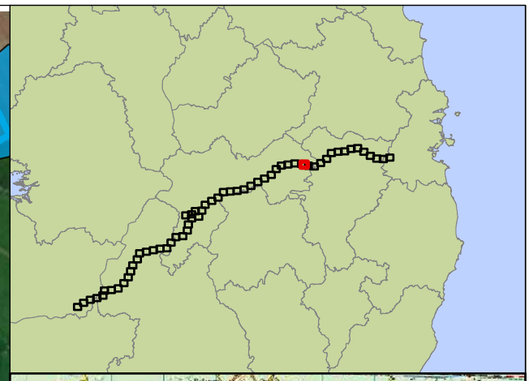
Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.44
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\gblon0vs01\GISProj\32105801_WSP_DR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12.5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx	



Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

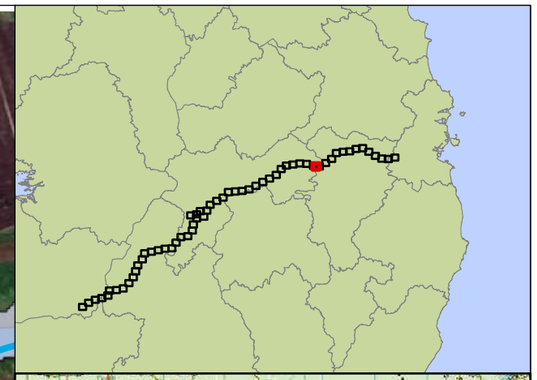
Jacobs TOBIN

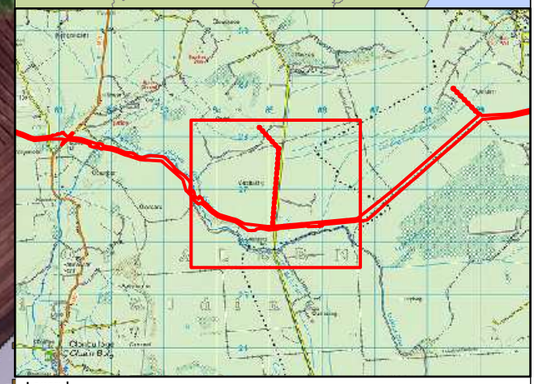
Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.45
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\global\ie0d1\GIS\Proj\32105801_WSP_DR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx	





Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

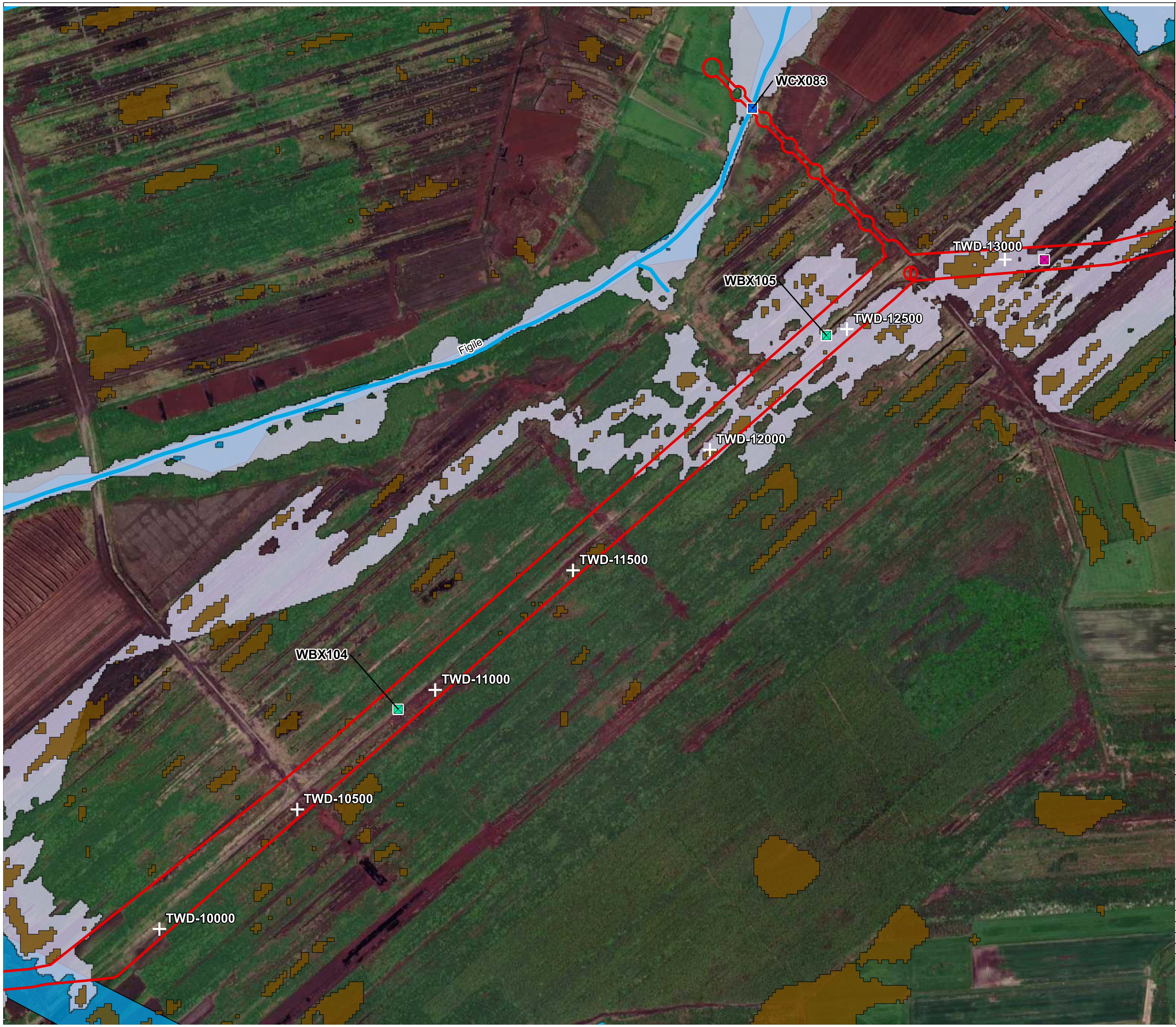
Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

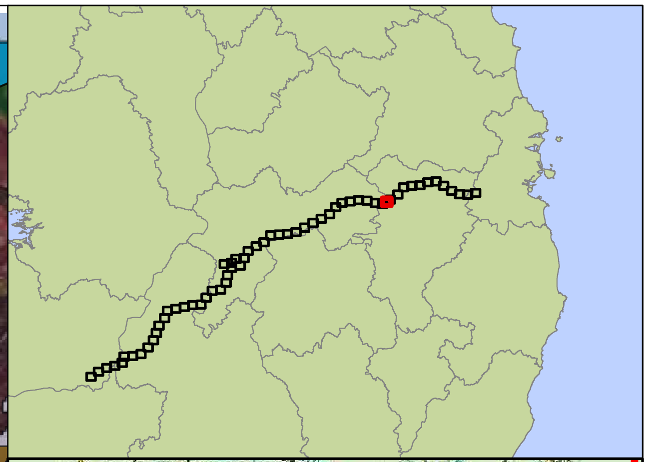
Project: Water Supply Project
Eastern and Midlands Region

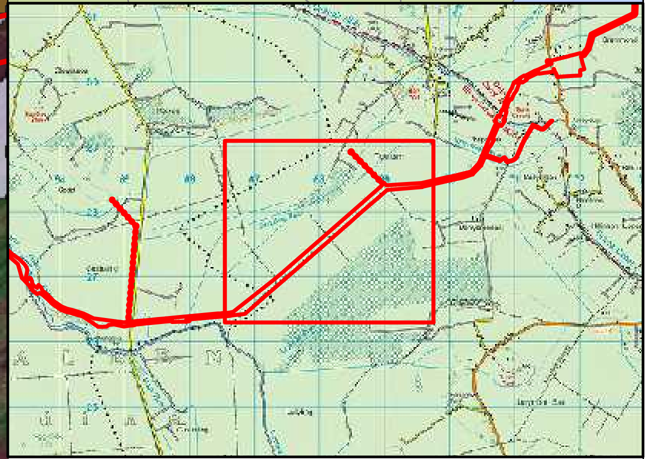
Drawing Title: A9.4 Figure 8.46
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	I:\gis\em0nd11\GIS\mxd\32105801_WSP_DR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	







Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.47
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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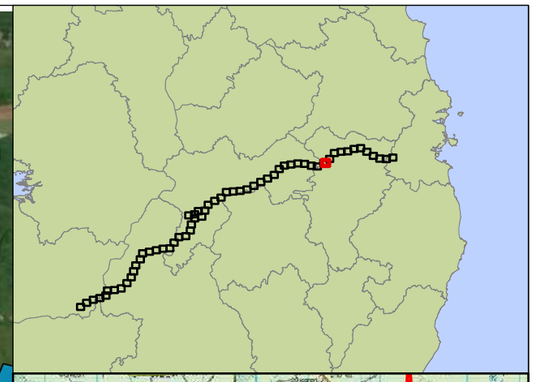

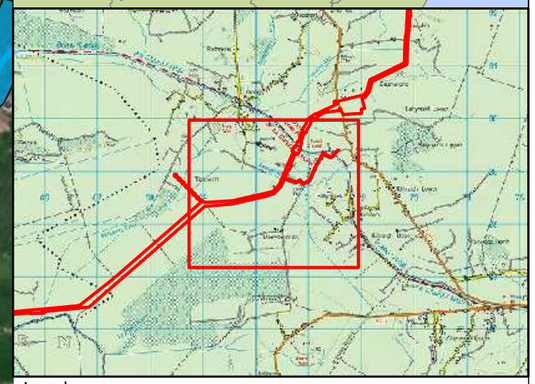

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.48
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
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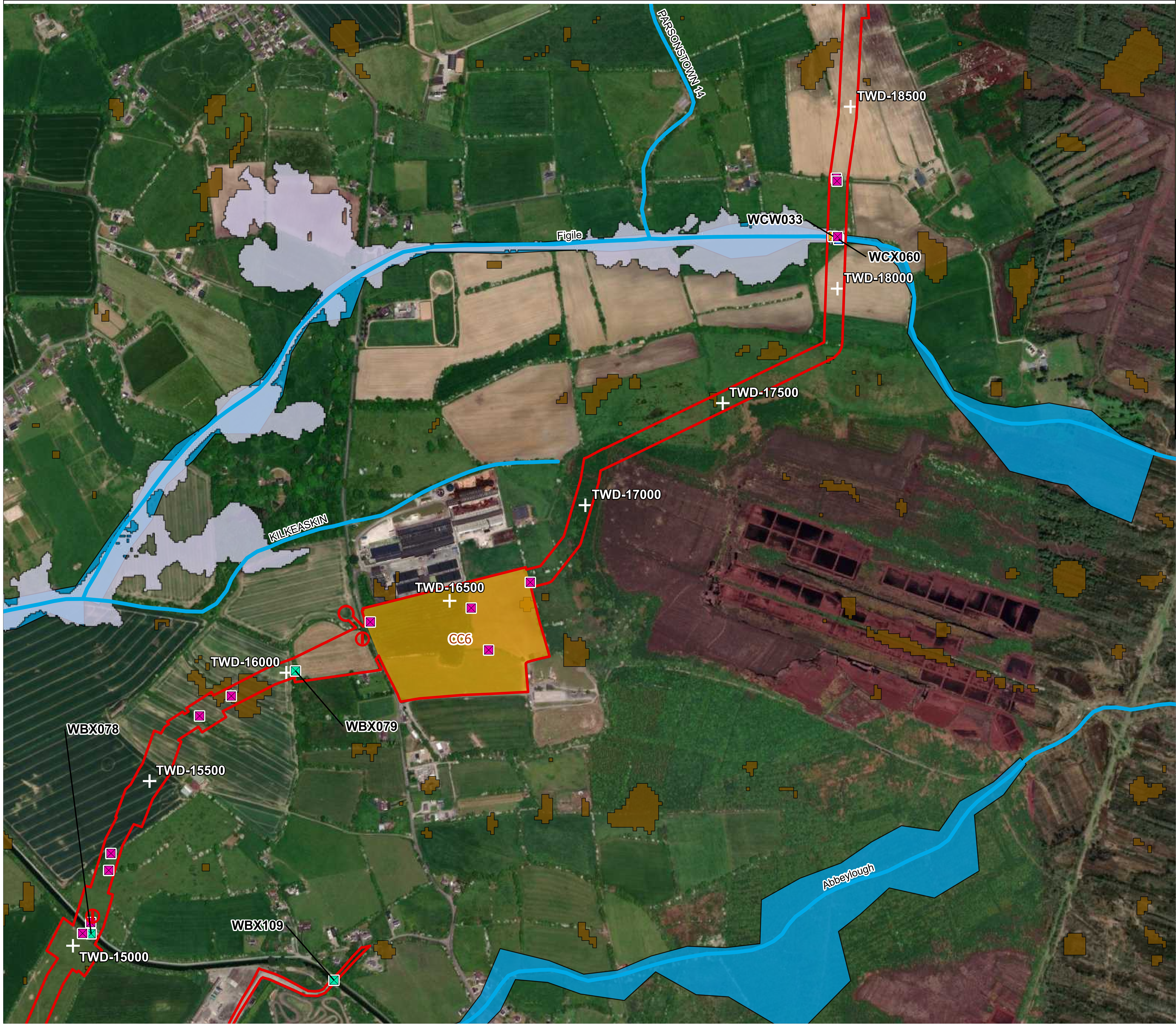
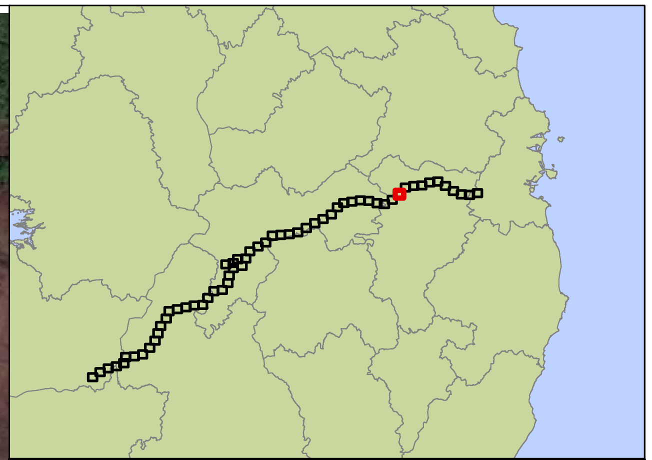
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\global\ie0vd01\GIShp\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12-S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	





Legend

- Planning Application Boundary
- Construction Compound (CC)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.49
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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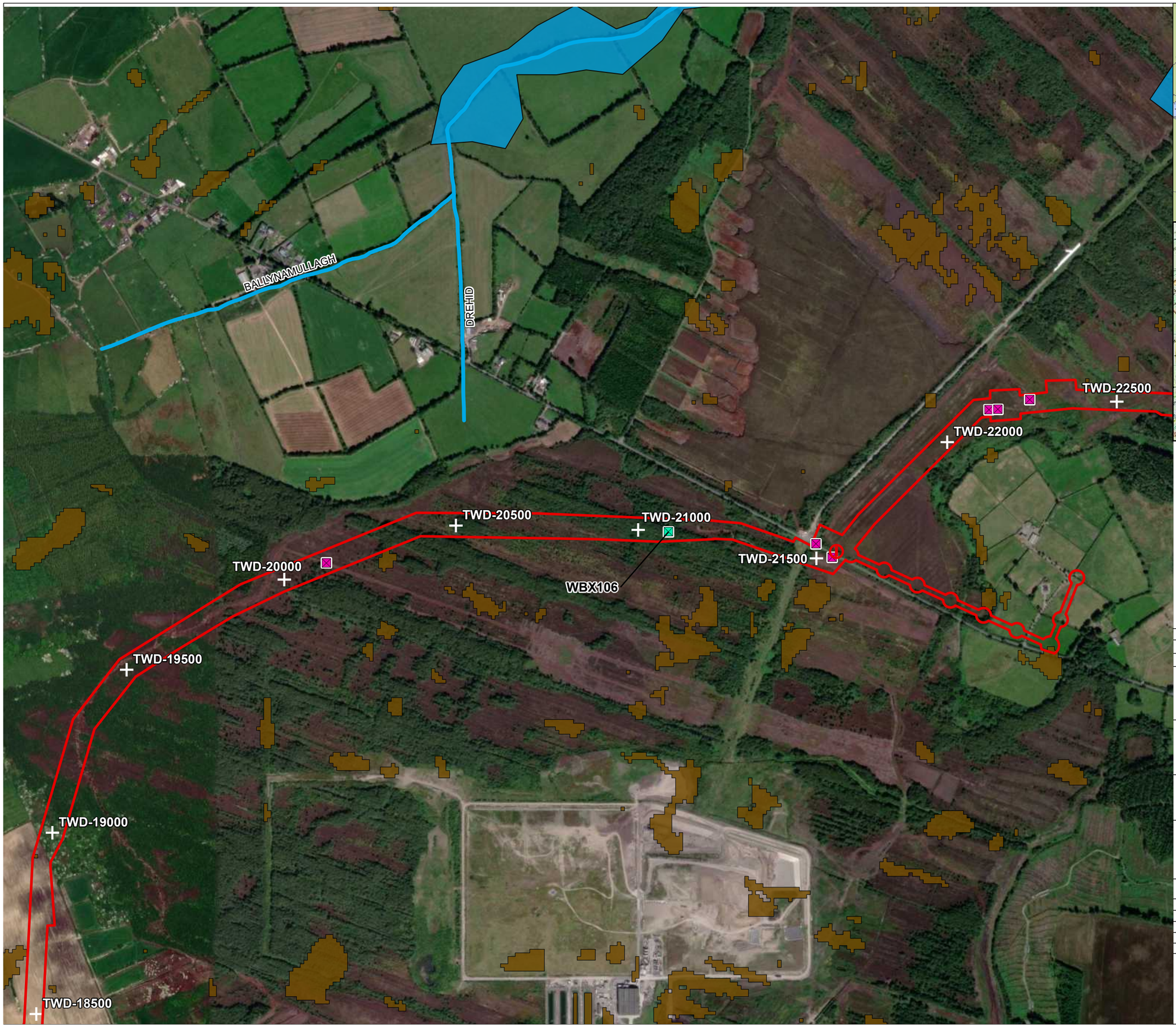

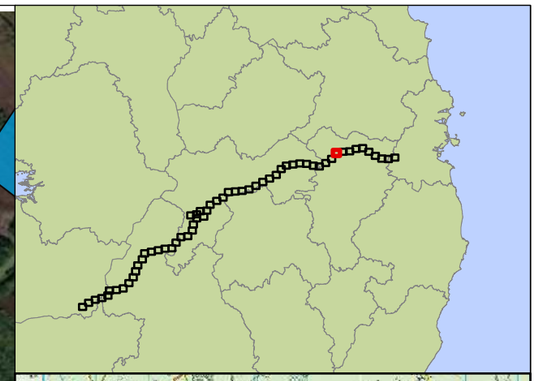

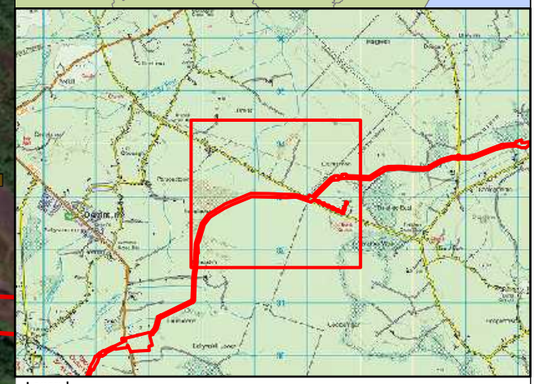

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.50
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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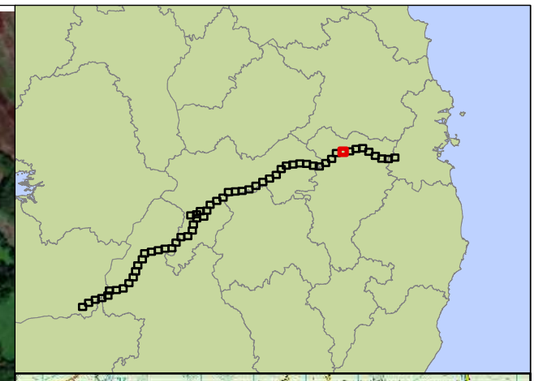

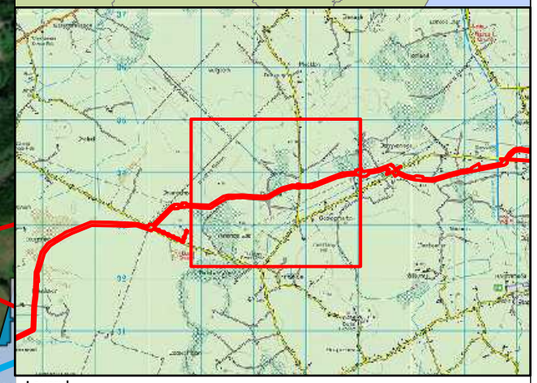

Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.51
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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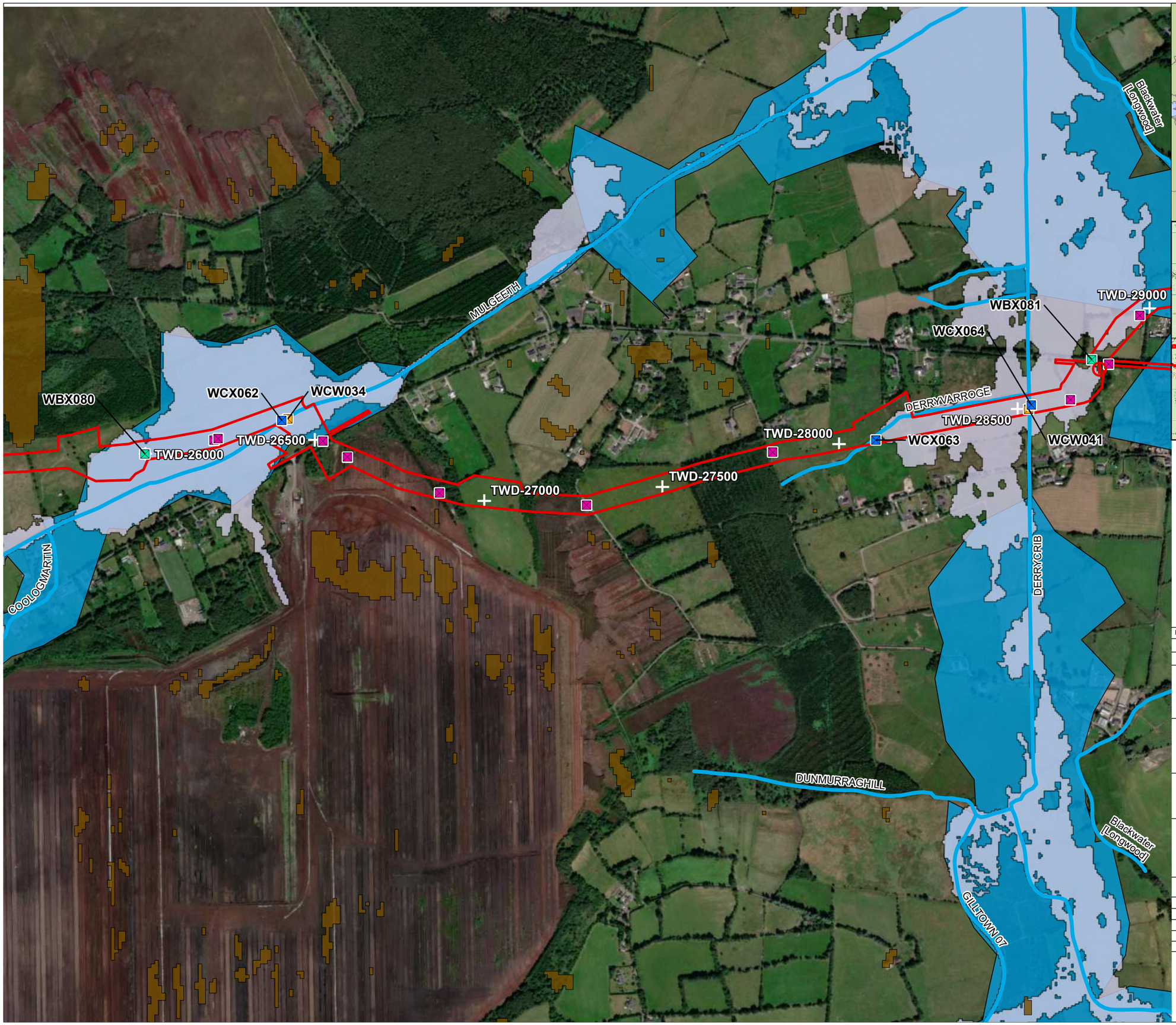
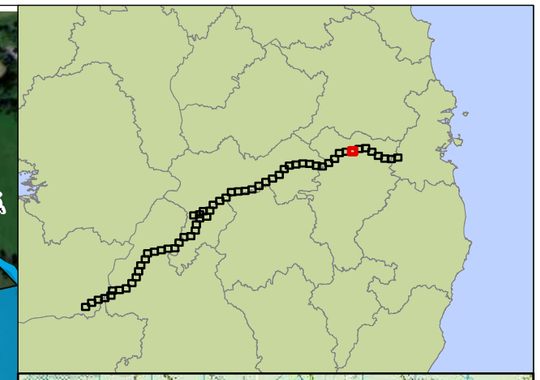




Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

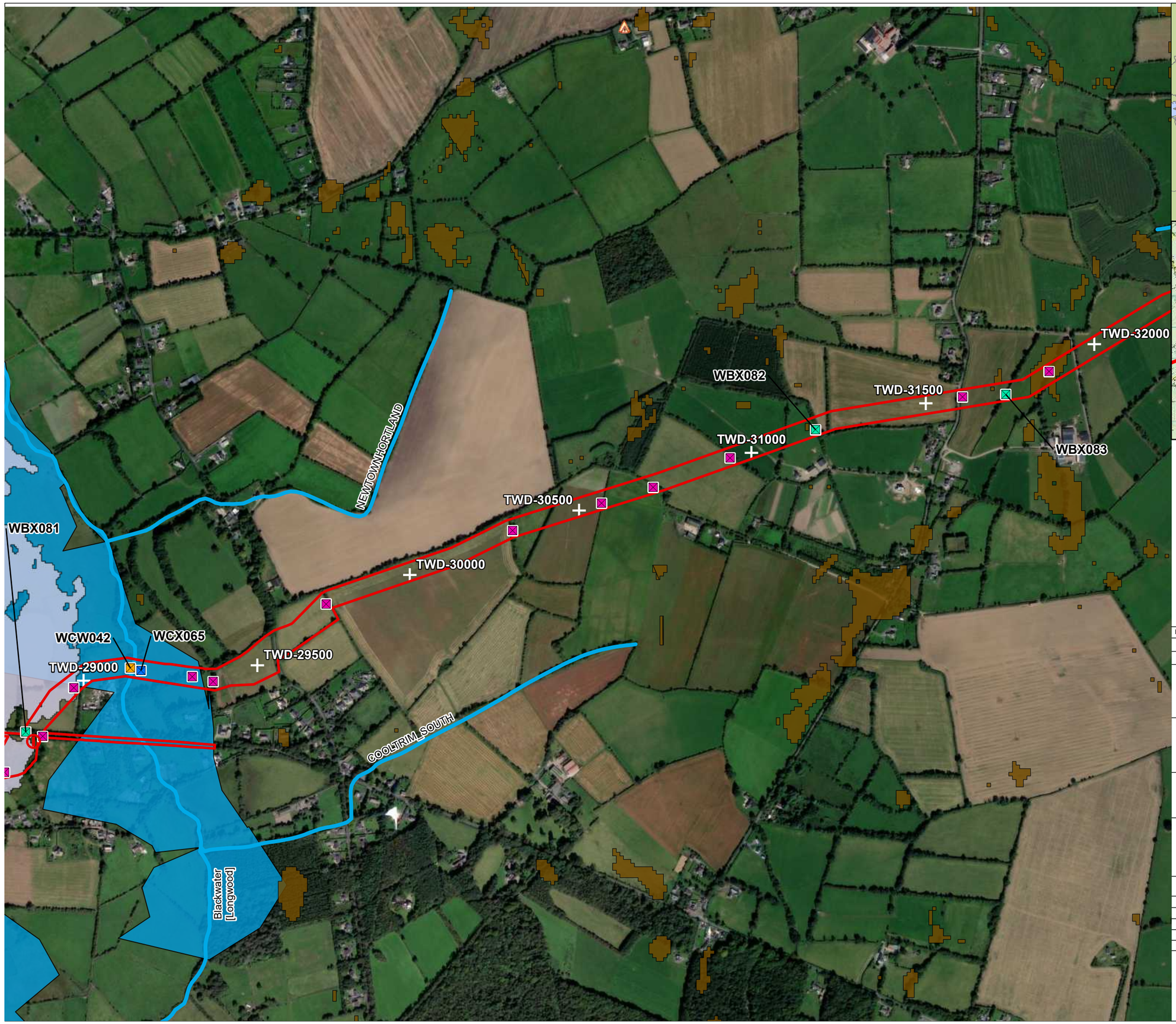
Water Supply Project
Eastern and Midlands Region

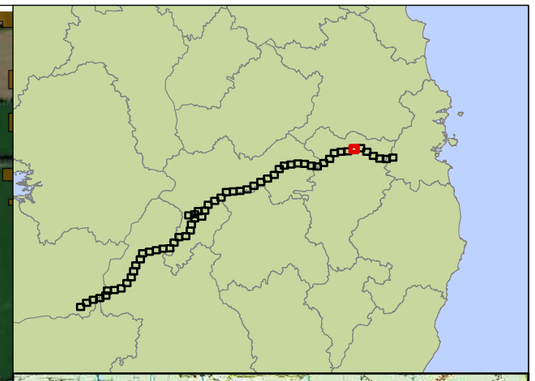
Drawing Title

A9.4 Figure 8.52
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	\\global\ie0d1\GIS\Proj\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	





Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

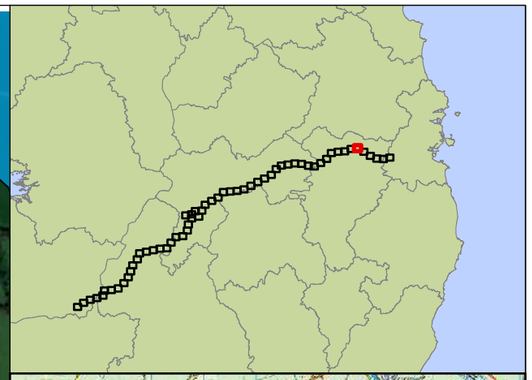
Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.53
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
File Path	T:\pklien0nd1\GIS\Proj\32105801_WSP_DRI\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12 S\Ch_09_Water_Flood_risk_A12_S_20250130.aprx	



Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

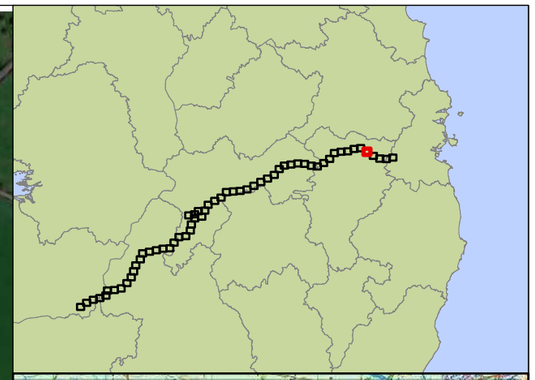
Jacobs TOBIN

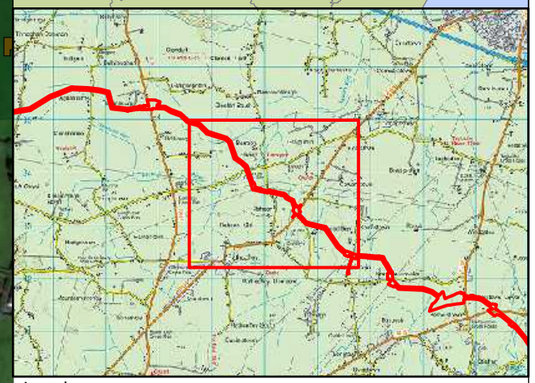
Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Figure 8.54
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION
Scale @ A3	1:10,000 DO NOT SCALE
Jacobs No.	32105801
Client No.	9318
Drawing No.	32105801/700/12041
File Path	I:\gis\arcGIS\GIS\proj\32105801_WSP_DIR\ArcGIS\EIAR\Ch. 09 - Water\Flood risk\A12.5\Ch_09_Water_Flood_risk_A12_5_20250130.aprx





Legend

- Planning Application Boundary
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Figure 8.55
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
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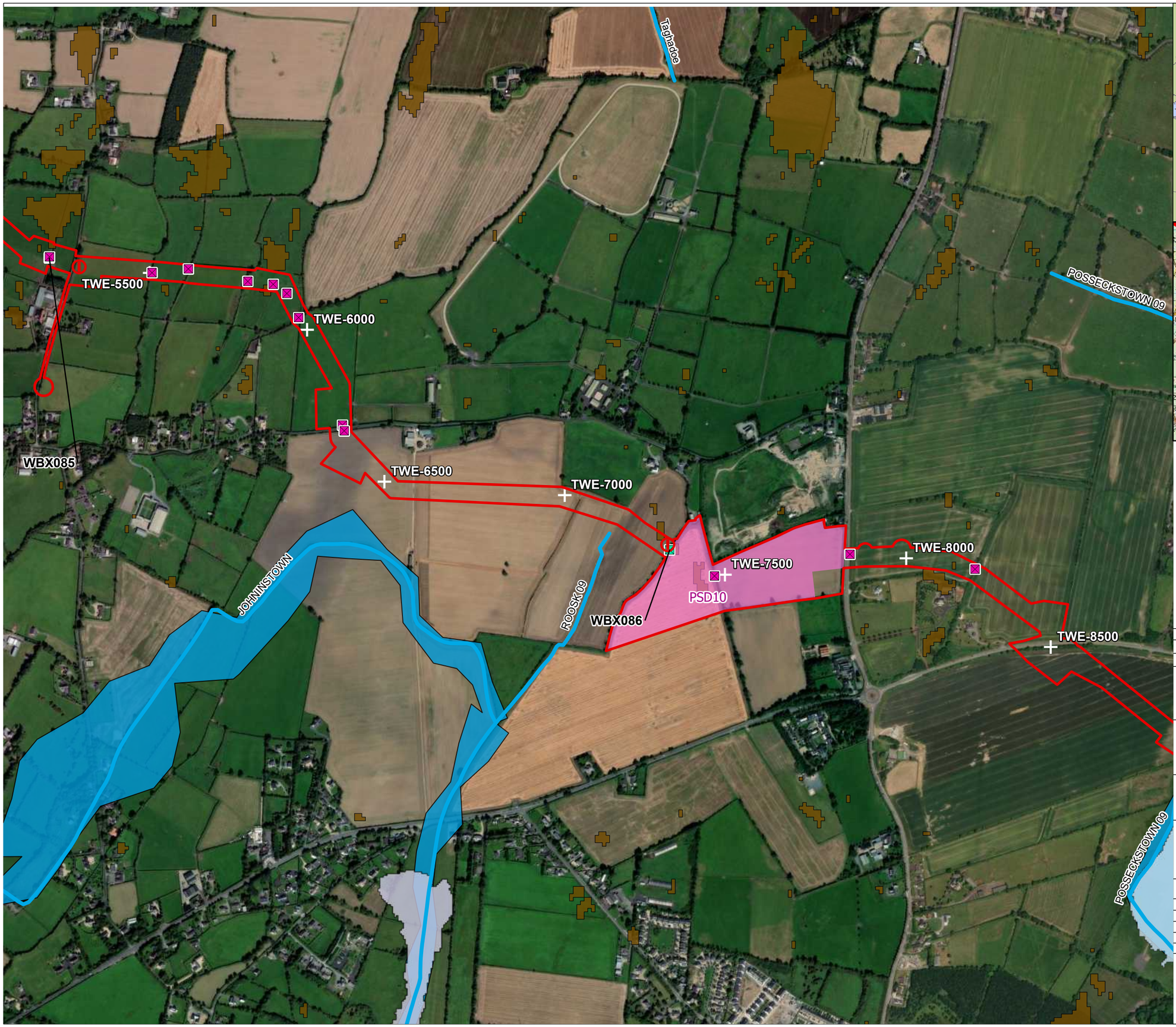

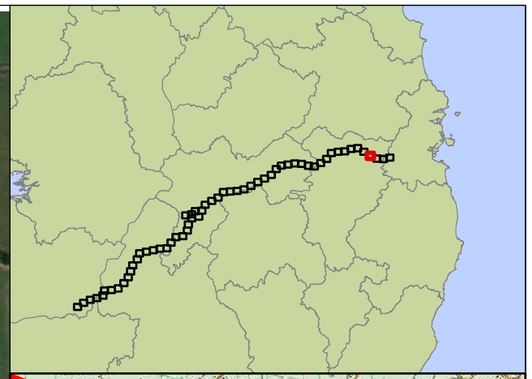

Legend

- Planning Application Boundary
- Pipe Storage Depot (PSD)
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

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Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.56
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:10,000	DO NOT SCALE
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Client No.	9318	
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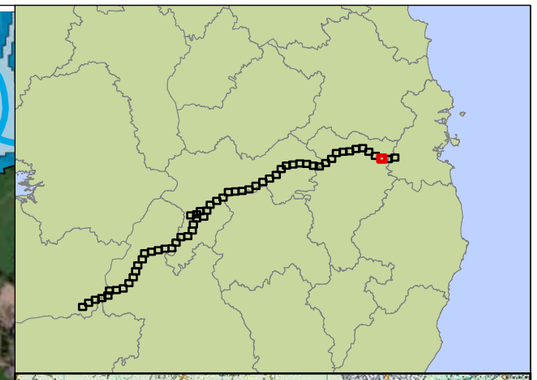

Legend

- Planning Application Boundary
- Flow Control Valve
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
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- 1% AEP
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F02	05/12/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

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Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.57
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
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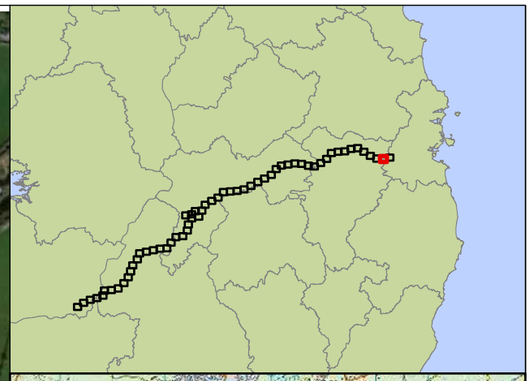

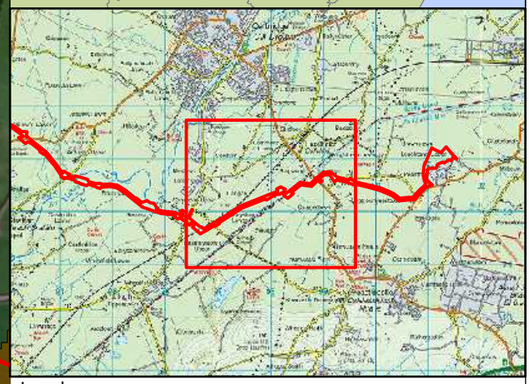

Legend

- Planning Application Boundary
- Flow Control Valve
- Line Valve
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

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Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.58
Flood Risk Mapping

Drawing Status: FINAL – PLANNING APPLICATION

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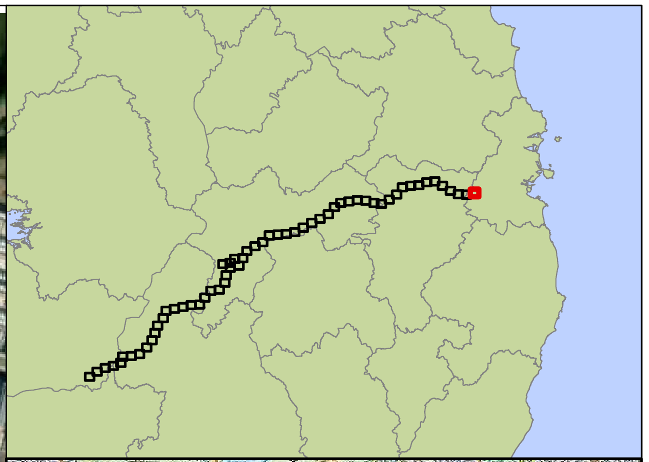

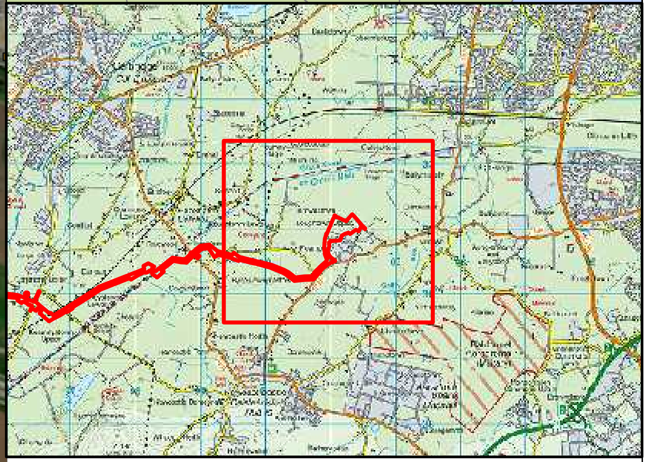

Legend

- Planning Application Boundary
- Termination Point Reservoir
- Construction Compound (CC)
- Potential Waterbody Crossing (WBP)
- Watercourse Crossing (EPA) (WCX)
- Watercourse Crossing (WBX)
- Watercourse Washout Location (WCW)
- Single Flood Event
- Recurring Flood Event
- Rivers (WFD EPA)
- 1% AEP
- 0.1% AEP
- Present Day - Low Probability (0.1% AEP)

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Figure 8.59
Flood Risk Mapping

Drawing Status	FINAL – PLANNING APPLICATION	
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Client No.	9318	
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Annex B. WTP Access Road Flood Risk Assessment

Tionscadal Soláthair Uisce
Water Supply Project

Environmental Impact Assessment Report (EIAR)

Volume 6 of 6: Appendices

(Appendix A9.4 Annex B) Water Treatment Plant Access Road Flood Risk Assessment

Document no: 32105801/EIARA9.4
Version: Final

December 2025

Uisce Éireann
Irish Water

Jacobs

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Contents

Acronyms and Abbreviations

Acronym	Meaning
AEP	Annual Exceedance Probability
CFRAM	Catchment Flood Risk Assessment and Management
EIAR	Environmental Impact Assessment Report
ESBN	Electricity Supply Board Networks
FRA	Flood Risk Assessment
FRM	The Planning System and Flood Risk Management – Guidelines for Planning Authorities
GSI	Geological Survey Ireland
HEFS	High-End Future Scenario
ICPSS	Irish Coastal Protection Strategy Study
m	Metre
mAOD	Metres Above Ordnance Datum
MRFS	Mid-Range Future Scenario
NIFM	National Indicative Fluvial Mapping
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
WTP	Water Treatment Plant

1. Introduction and Background

1.1 Project Background

1. The Proposed Project would involve the abstraction and pumping of raw water from the Lower River Shannon at Parteen Basin, treatment of the water nearby at Birdhill (County Tipperary) and pumping of the treated water to a high point in Knockanacree near Cloughjordan (County Tipperary). From this high point near Cloughjordan, the treated water would flow generally by gravity through the Midlands to a termination point at Peamount in County Dublin (within the administrative area of South Dublin County Council), where it would connect into the existing Greater Dublin Area Water Resource Zone network.

2. The approach to the development of the access roads to the proposed sites for the Raw Water Intake and Pumping Station, the Water Treatment Plant (WTP), the Break Pressure Tank, and the Termination Point Reservoir has used multi-criteria analysis for pipeline routing and infrastructure siting, with constraint mapping and factors such as engineering, topography, archaeology, environment, constructability and traffic influencing the decision-making process. Ultimately a proposed preferred route was selected to the WTP which crosses the Roran watercourse, connecting with the R445 road, shown below in Image 1.1.

3. This report sets out the Stage 3 Detailed Flood Risk Assessment (FRA) for the WTP access road, as required by the outputs of the Stage 2 Initial FRA detailed in Appendix A9.4 (FRA).

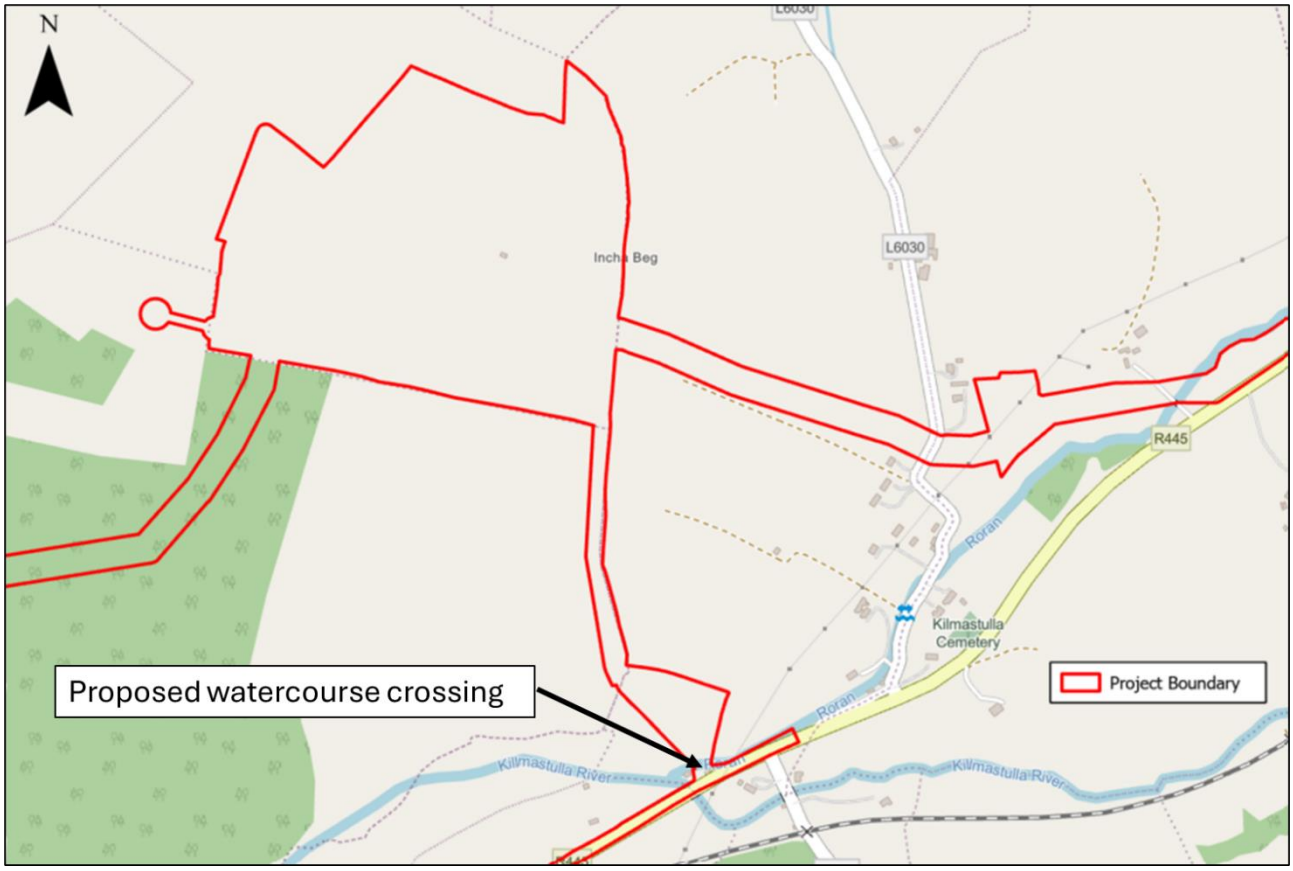


Image 1.1: Location Map of the Proposed WTP and Planning Application Boundary

1.2 Works Description

4. The WTP site is currently accessed by a privately owned unsurfaced track from the R496. It is proposed to construct a new permanent access road from the R445. The proposed access road would be 6m in width and approximately 640m in length. The permanent access would require approximately 1.8ha of land.

5. The access road junction includes a pull-in area before the security gates, safe sight lines and appropriate signage when emerging onto the R445, in accordance with TII's (2017) Geometric Design of Junctions (DN-GEO-03060). The proposed access road would include the installation of box culverts within the floodplain of the Kilmastulla River as noted on Figure 4.64 in Chapter 4 Proposed Project Description. These would ensure that there is no obstruction to water flowing across the floodplain.

6. Construction of the access road junction with the R445 public road would require the demolition of some disused and derelict buildings and old petrol pumps associated with a disused petrol station on the north-western side of the R445. This is further described in Chapter 10 (Soils, Geology & Hydrogeology) and Chapter 19 (Resource & Waste Management). It is important to note that only above ground structures need to be cleared from the petrol station site, to allow construction of the access road junction and provide the required safe sight distances. In order to protect the watercourse immediately adjacent to the buildings, the watercourse would be dammed, and flow diverted, either by over pumping or fluming, for the duration of the demolition works. This involves constructing a dam (sandbags and suitable clay material) across the existing watercourse upstream of the proposed demolition works. A suitably sized pump sump(s) is then used to extract the water and convey it around the demolition works area to a point downstream of the works. Alternatively, the flows can be conveyed by a suitably sized pipe (fluming) to downstream of the works.

7. The finished road level of the proposed route to the WTP access road at its junction with the R445 would be approximately 40.21 metres Above Ordnance Datum (mAOD), rising along its 640m length to a finished road level of approximately 42.05mAOD at the south-eastern corner of the proposed WTP site boundary. There are no steep gradients along the route. The first 200m to 250m of the route from the R445 would have to be raised above the floodplain of the Kilmastulla River and culverts incorporated into the raised section to allow flood waters to pass under the access road in times of flood.

8. The water main to serve as a link from the WTP to the regional network can be included in the access road, with the prospect of gravitational service from the Clear Water Storage Tanks as far as the point of onward connection. Similarly, the surface water drainage pipe from the site, and the ESBN cable ducts for power to the site, can be accommodated in the land acquisition for the proposed route.

1.3 Report Structure

9. This report is structured as follows:

    - Section 2 sets out the planning guidelines considered
    - Section 3 sets out the FRA methodology
    - Section 4 outlines the findings of the Stage 1 flood risk identification
    - Section 5 presents the findings of the Stage 2 Initial FRA
    - Section 6 details the potential flood risk implications arising from the WTP access road and the proposed mitigation measures
    - Section 7 presents the findings of the Stage 3 Detailed FRA of any proposed new watercourse crossings over the Kilmastulla River or the Roran watercourse
    - Section 8 assesses the WTP access road in accordance with the Justification Test
    - Section 9 presents the conclusions and recommendations.

2. Planning Guidelines

2.1 The Planning System and Flood Risk Management – Guidelines for Planning Authorities

10. The Planning System and Flood Risk Management – Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government and the Office of Public Works (OPW) 2009) (referred to herein as the 'FRM Guidelines') require the planning system at national, regional and local levels to:

- Avoid development in areas at risk from flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify development. Where this is the case, development must be appropriate and flood risks must be effectively managed to reduce the level of risk
- Adopt a sequential approach to flood risk management when assessing the locations for new development based on avoidance, reduction, and mitigation of flood risk
- Incorporate FRA into planning application decisions and appeals.

2.2 Tipperary County Development Plan – Strategic Flood Risk Assessment (2022-2028)

11. The Strategic Flood Risk Assessment (SFRA) provides '*an area wide assessment of all types of significant flood risk to inform strategic land use planning decisions*'.

12. The Proposed Project will need to demonstrate compliance with the overarching objective and recommendation of the SFRA stated in Table 2.1.

Table 2.1: Objectives and Recommendations of the Tipperary County SFRA

Tipperary County Development Plan SFRA Objective	Proposed Project Approach to Compliance
Section 1.4.4.2 of the SFRA indicates: **Development in areas that have the highest flood risk** should be avoided and/or only considered in exceptional circumstances (through a prescribed Justification Test) if adequate land or sites are not available in areas that have lower flood risk. Most types of development would be considered inappropriate in areas that have the highest flood risk.	The proposed culverts for the WTP access route are classed as Water-Compatible Infrastructure. According to the FRM Guidelines water compatible developments are considered appropriate within Flood Zone A, Flood Zone B and Flood Zone C hence those types of developments would not be required to meet the criteria of the Justification Tests. **The Proposed Project therefore meets this objective**
Section 3.4 of the SFRA states that two climate change scenarios should be considered. These are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a 'likely' future scenario based on the wide range of future predictions available. The HEFS represents a more 'extreme' future scenario at the upper boundaries of future projections. Based on these two scenarios, the OPW has recommended allowances for climate change in relation to river flows and sea levels (20% increase in rainfall depths and flood flows and/or 0.5m increase in sea level for MRFS, and 30% increase in rainfall depths and flood flows and/or 1m increase in sea level for HEFS). These climate change allowances are particularly important at the development management stage of planning and will ensure that Proposed Project is designed and constructed to take into account best current knowledge.	MRFS and HEFS climate change scenarios have been considered and accounted for as part of this FRA, and the proposed WTP access road meets acceptable target water levels as shown in Stages 2 and 3 of this report. **The Proposed Project therefore meets this objective**

3. Flood Risk Assessment Methodology

13. The FRM Guidelines outlines the key principles that should be used for assessing flood risk to Proposed Project sites. It recommends that a staged approach should be adopted. The stages of appraisal and assessment are as follows:

    - Stage 1: Flood risk identification – This stage identifies any issues (flooding or surface water management) related to the proposed WTP access road
    - Stage 2: Initial FRA – This stage will seek confirmation on the sources of flooding identified in Stage 1 that may affect the WTP access road. All existing information and the accuracy of it will be reviewed in detail, and the extent of the flood risk associated with the proposed WTP access road will be established. This stage will determine the nature of any further work required as part of the FRA
    - Stage 3: Detailed FRA – Where required, this stage will assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve using an existing, or building a new, hydraulic model across a wide enough area to appreciate the catchment-wide impacts and hydrological process involved.

3.1 Flood Zones

14. The FRM Guidelines define the following three flood zones:

    - Flood Zone A – Where the probability of flooding from rivers and the sea is highest (greater than 1% annually or 1 in 100 years for river flooding or 0.5% annually or 1 in 200 years for coastal flooding)
    - Flood Zone B – Where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1,000 years and 1% annually or 1 in 100 years for river flooding and between 0.1% annually or 1 in 1,000 years and 0.5% annually or 1 in 200 years for coastal flooding)
    - Flood Zone C – Where the probability of flooding from rivers and the sea is low (less than 0.1% annually or 1 in 1,000 years for both river and coastal flooding). Flood Zone C covers all areas of the plan that are not in zones A or B.

15. These flood zones are used to assess the suitability of the location for a proposed development with respect to its vulnerability to flooding.

3.2 Vulnerability of the Proposed WTP Access Route

16. With regard to vulnerability, as per Table 3.1 of the FRM Guidelines, the proposed WTP access road would be classified on its own as ‘less vulnerable development’. However, as it is an access road to a WTP which is essential infrastructure classified as a ‘highly vulnerable development’, the WTP access road will also be treated as highly vulnerable development.

17. According to the FRM Guidelines, a Justification Test will be required for the WTP access road, unless it is entirely located within Flood Zone C.

4. Stage 1: Flood Risk Identification

4.1 General

18. Stage 1 flood risk identification of the FRA identified potential sources of flood risk at the location of the WTP access road. This was carried out as a desktop study using existing information from a number of sources. The objective was to identify whether there are potential flooding or surface water management issues for the site that require further investigation.

4.2 OPW Preliminary Flood Risk Assessment Mapping

19. The OPW Preliminary Flood Risk Assessment (PFRA) maps were prepared for the Draft National PFRA. The PFRA mapping is not considered to be suitable for assessment of flood risk to the WTP access road, particularly where it has been superseded by the Catchment Flood Risk Assessment and Management (CFRAM) Studies (see Section 4.4) or the National Indicative Fluvial Mapping (NIFM). PFRA mapping is therefore not relied upon to characterise fluvial flood risk, just pluvial flood risk.

4.3 Historic Flood Events

20. The OPW FloodInfo website (floodinfo.ie) was used to identify historical flooding near the WTP access road, which is shown in Image 4.1.

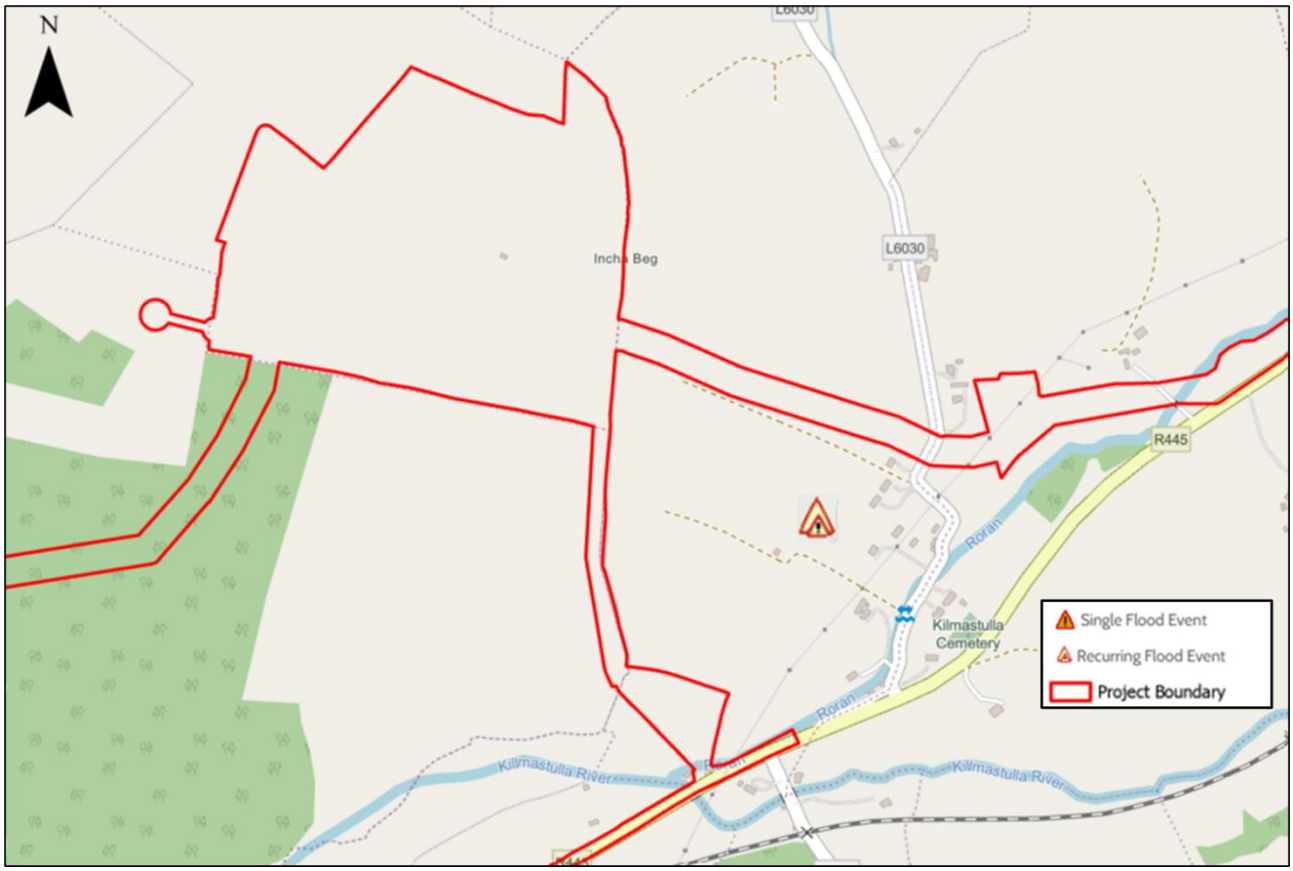


Image 4.1: Past Flood Events Near the WTP Access Road

21. Further details of the past flood events near the WTP access road are provided in Table 4.1.

Table 4.1: Historic Flood Events Identified on or Immediately Adjacent to the WTP Access Road

Location	Type	Start Date	Description
Greenhills, County Tipperary	Fluvial – Kilmastulla River	Recurrent	Kilmastulla River floods annually. Sometimes flows across M7. Houses (four or five) impacted. Kilmastulla/Shearies Road (L6030) impassable. Flooded in January 2005 after two days of rain.

4.4 OPW CFRAM Study Mapping

22. Fluvial flood risk in the location of the WTP access road was assessed as part of the OPW Western CFRAM Study. The applicable flood extents from the Kilmastulla River and its tributary, the Roran watercourse, are presented in full in Image 4.2.

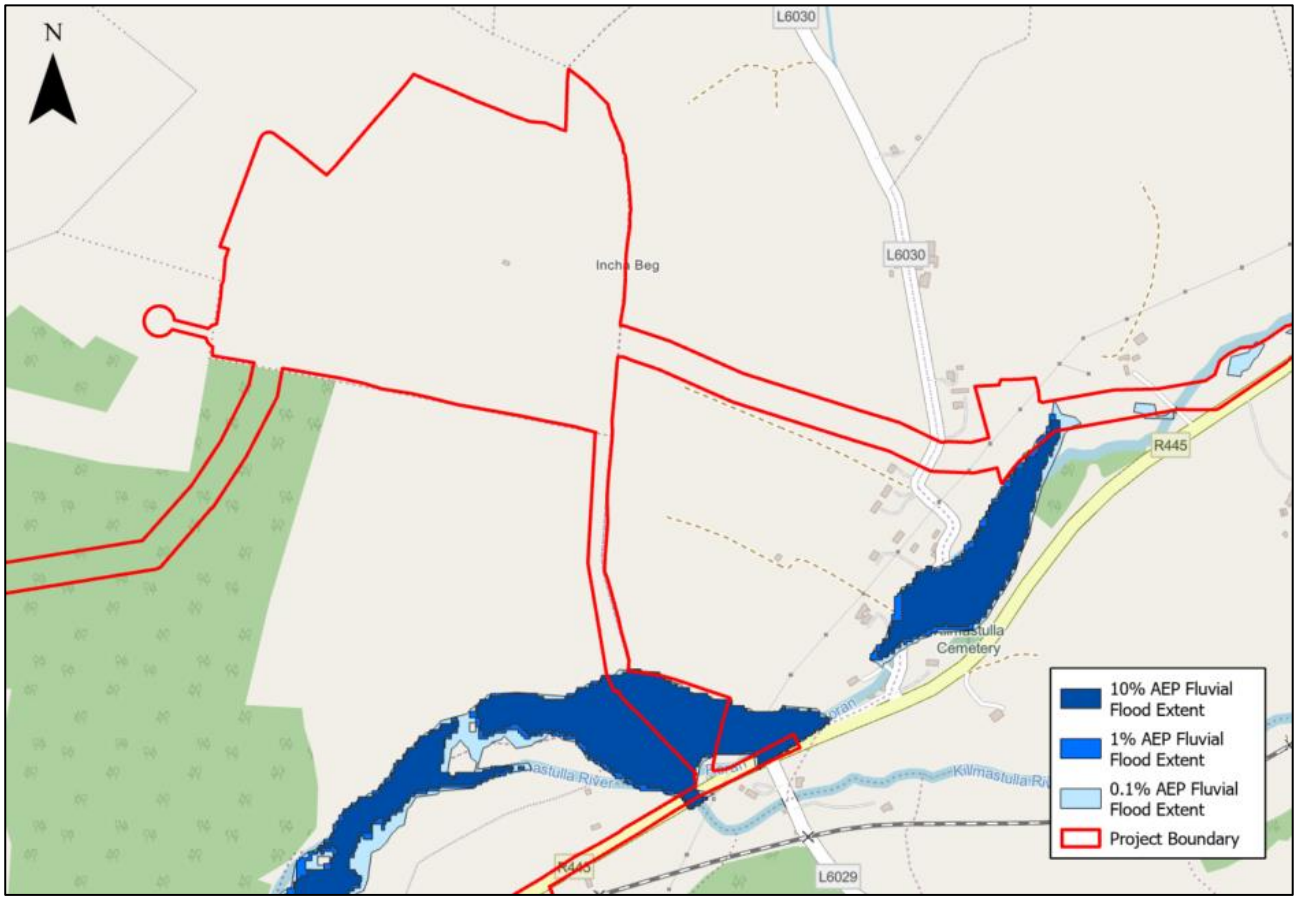


Image 4.2: Fluvial flood Mapping from CFRAM Study Near the WTP Access Road

23. As Image 4.2 shows, the WTP access road would cross the floodplain of the Kilmastulla River and the Roran watercourse even during high frequency events (10% Annual Exceedance Probability (AEP)). This is a source of fluvial flood risk to the WTP access road, which is assessed in Section 7.

4.5 Pluvial Flooding

24. Pluvial flooding occurs during periods of heavy rainfall, when the rainfall rate is greater than the infiltration capacity. It is usually associated with high intensity rainfall events (typically greater than 30mm/h) resulting in overland flow and ponding in depressions in the topography. In urban situations, underground sewerage/drainage systems and surface watercourses may be completely overwhelmed.

25. Pluvial flood extents are available for areas of County Tipperary (see Image 4.3) and provide an indication of the level of risk. The rainfall flood extents at the area of interest were reviewed based on data from the OPW FloodInfo website (floodinfo.ie), as well as an extract of PFRA pluvial mapping.

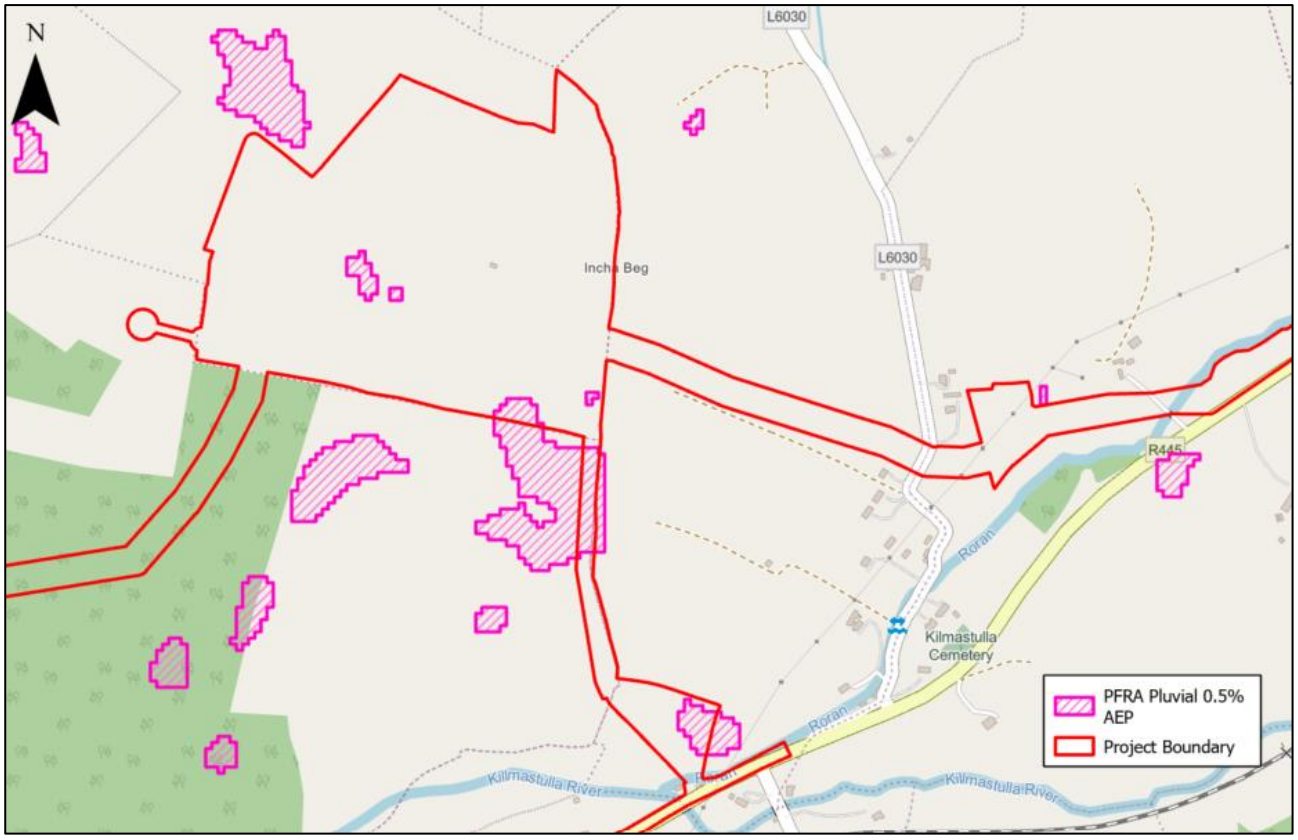


Image 4.3: PFRA Pluvial Flooding 0.5% AEP (the Most Unfavourable Rainfall Event) Near the WTP Access Road

26. As shown in Image 4.3, there are pockets of pluvial flood risk within the Planning Application Boundary, within the floodplains of the Kilmastulla River and the Roran watercourse.

27. This area of flooding is caused by a localised depression with a level of around 40.8mAOD, which compares to typical adjacent ground, including that of the proposed WTP, at around 44mAOD to 45mAOD. The access road would be constructed at a level which will elevate it above the area of potential pluvial flooding. New drainage infrastructure would also be provided for both the WTP and its access road to minimise the risk of pluvial flooding.

4.6 Groundwater Flooding

28. The OPW FloodInfo website (floodinfo.ie) was used to assess the risk of groundwater flooding.

29. There is no observed groundwater risk to the WTP access road based on the Geological Survey Ireland (GSI) Groundwater Flooding Probability Maps.

4.7 Irish Coastal Protection Strategy Study (ICPSS)

30. The Irish Coastal Protection Strategy Study (ICPSS) produced for the OPW in 2013 provides an overview of coastal flood hazard and risk in Ireland. Flood maps were produced for the 0.5% and 0.1% AEP flood events. A volume of maps is also available which represent a projected future scenario for the year 2100 and include allowances for projected future changes in climate. Specifically, these represent the Mid-Range Future Scenario (MRFS) and allow for a 500mm rise in mean sea level.

31. Flood mapping for the 0.5% and 0.1% AEP present-day flood extent along Kilmastulla River shows no coastal flood risk east of Limerick, as shown in Image 4.4. Therefore, there is no risk of coastal flooding to the WTP access road.

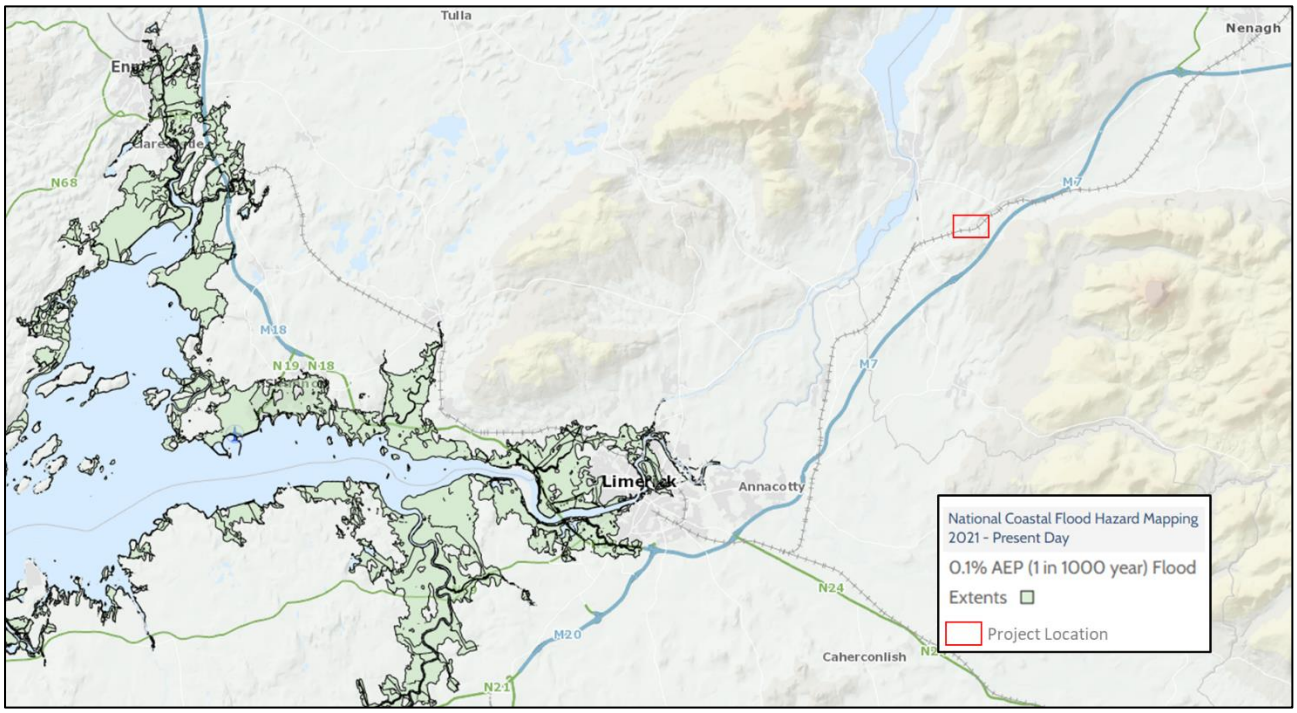


Image 4.4: Extract of ICPSS Coastal Flood Mapping Near the WTP Access Road

5. Stage 2: Initial Flood Risk Assessment

32. This section assesses the risk of flooding to the WTP access road once the works are complete from a range of different sources, which is then used to develop a broader understanding of the risk characteristics to the WTP access road.

5.1 Potential Sources of Flooding

33. Further to the Stage 1 assessment, the potential sources of flooding are listed below:

- Fluvial – The available fluvial flood risk maps reveal a high risk of fluvial flooding from the Kilmastulla River and the Roran watercourse at the watercourse crossing with the WTP access road.

5.2 Fluvial Flooding

34. The Stage 1 assessment indicated that the WTP access road is at risk of fluvial flooding at the crossing with Kilmastulla River and the Roran watercourse. The crossing is located at the confluence of both watercourses.

5.3 Artificial Drainage Systems

35. The Proposed Project design at Kilmastulla and the Roran watercourse does not cut off the overland drainage route into either. As such, no new overland drainage is proposed as the existing road drainage system would pick up surface water. It is not envisaged that the Proposed Project would adversely impact the drainage systems in place.

5.4 Flood Risk due to Climate Change

36. Future climate change is predicted to give rise to an increased risk of flooding through rising sea levels, and an increase in river flows and the frequency and intensity of extreme rainfall. The OPW has identified two potential scenarios for the impacts of climate change that are known as the Mid-Range Future Scenario (MRFS) and High-End Future Scenario (HEFS). Table 5.1 summarises the predicted impacts of both scenarios on predicted sea levels, river flows and rainfall depths over the next 100 years.

Table 5.1: Climate Change Forecast

Parameter	MRFS	HEFS
Mean sea level rise	+500mm	+1,000mm
River flows	+20%	+30%
Extreme rainfall depths	+20%	+30%

37. The MRFS is intended to represent the 'likely' future scenario based on a range of forecasts. The HEFS represents a more extreme forecast that is at the upper end of accepted projections.

38. The design events for the proposed WTP access road watercourse crossing are the T100+CC (1% AEP+CC) event, considering +30% increase in the T100 peak flows as HEFS indicates, as well as the T1000 (0.1% AEP) event. Table 5.2 summarises the potential flood risk impacts with climate change on the Proposed Project.

Table 5.2: Climate Change Impact Summary

Source of Flooding	Likely Impacts of Climate Change	Discussion
Fluvial	Increased risk	The CFRAM fluvial flood extents highlight that there is a high risk of fluvial flooding from the Kilmastulla River and the Roran watercourse to the WTP access road, which is likely to be increased by the impact of climate change.
Coastal	No change	Available coastal flood mapping shows that, in the HEFS, there is no observed coastal flood risk to the WTP access road.
Estuarine	No change	No impact from estuarine flooding is expected due to climate change.
Pluvial	No change	No impact from pluvial flooding is expected due to climate change.
Groundwater	No change	No impact from groundwater flooding is expected due to climate change.

5.5 Summary of Flood Risk

39. The flood risk to the WTP access road is summarised in Table 5.3.

Table 5.3: Summary of Flood Risk to WTP Access Road

Flood Risk	Summary of Impact	Notes
Fluvial	High risk	The CFRAM fluvial flood extents highlight that there is a high risk of fluvial flooding from the Kilmastulla River and the Roran watercourse to the WTP access road.
Coastal	None	Based on the information available, there is no known risk of coastal flooding to the WTP access road.
Estuarine	None	There is no known risk of estuarine flooding to the WTP access road based on the information provided online.
Pluvial	Low	There is a low risk of pluvial flooding to the WTP access road based on the previous analysis.
Artificial drainage systems	Low	There is no known risk of flooding from artificial drainage systems to the WTP access road based on the information provided online.
Groundwater	Low	There is no known risk of groundwater flooding to the WTP access road based on the information provided online.

6. Stage 2: Potential Flood Risk Impacts from Development

40. Section 5 considered the flood risk to the WTP access road. This section will consider the potential change in flood risk to the surrounding areas from the WTP access road for each source.

6.1 Impacts on Coastal Flooding

41. The WTP access road is not at risk from coastal flooding. The WTP access road would therefore have no known impact on coastal flood risk based on information available.

6.2 Impacts on Fluvial Flooding

42. The WTP access road has been designed in a way that would not increase flood risk to itself or the surrounding area, following the below methodology:

- Hydraulic analysis of Kilmastulla River and the Roran watercourse to confirm the peak flows before and after construction of the WTP access road
- Floodplain mapping based on online data as detailed in previous sections of this report
- A clear span bridge would be used to reduce bridge crossing spans and therefore minimise disturbance to river flow
- Elevating the proposed crossing to protect it from current flooding and anticipated increased future flooding risk as a result of climate change
- Managing attenuation from the WTP with a proposed drainage system that does not increase flood risk for the proposed access road to the WTP.

43. To confirm the above, desktop-based flood modelling has been undertaken, which is set out in the Stage 3 Detailed FRA in Section 7.

6.3 Impacts on Estuarine Flooding

44. The WTP access road is not at risk from estuarine flooding. The WTP access road would therefore have no known impact on estuarine flood fisk based on information available.

6.4 Impacts on Pluvial Flooding

45. The WTP access road is at risk from pluvial flooding according to available online flood mapping at certain areas that overlap the proposed WTP access road. To mitigate impact from pluvial flooding, the following measures are proposed:

- Raising the elevation of the proposed WTP access road to redirect water away from low-lying areas into proposed Sustainable Drainage Systems (SuDS)
- Incorporate SuDS into the WTP access road design to manage stormwater locally and attenuate inflows to a safe location.

6.5 Impacts on Flooding from Artificial Drainage Systems

46. The WTP access road is not at risk from artificial drainage systems. The WTP access road would therefore have no known impact on artificial drainage systems flood risk based on information available.

6.6 Impacts on Groundwater Flooding

47. The WTP access road is not at risk from groundwater flooding. The WTP access road would therefore have no known impact on groundwater flood risk based on online information.

6.7 Summary of Potential Flood Risk Impacts from the WTP access road

48. The flood risk impacts from the WTP access road are summarised in Table 6.1.

Table 6.1: Summary of Potential Flood Risk Impacts on Surrounding Areas as a Result of the WTP Access Road

Flood Risk	Potential Scheme Impact	Discussion and Mitigation (Where Required)
Coastal	No Impact	No known impact as the WTP access road is not at risk of coastal flooding.
Fluvial	-	Fluvial flood risk impact is assessed in the Stage 3 assessment in Section 7.
Estuarine	No impact	No known impact as the WTP access road is not at risk of estuarine flooding.
Pluvial	No impact	No added impact of pluvial flooding as a result of the WTP access road. The WTP access road will be designed to mitigate and reduce potential pluvial flood risk.
Artificial drainage systems	No impact	The WTP access road is not at known risk of surface flooding or impacting artificial drainage systems.
Groundwater	No impact	No known impact as the WTP access road is not at risk of groundwater flooding.

7. Stage 3 Detailed Flood Risk Assessment

7.1 Introduction

49. This section follows on from the findings in the Stage 2 Initial FRA that the land surrounding the WTP access road over a tributary of Kilmastulla River (the Roran watercourse) be subject to a Stage 3 Detailed FRA to assess the fluvial flood risk at the site and identify the requirement for any mitigation measures.

50. A quantitative appraisal of potential flood risk to the proposed WTP access road is provided, assessing its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This was analysed using an existing OPW hydraulic model from the CFRAM Study, which has been improved and updated to ensure accuracy for conducting a detailed flood risk analysis around the WTP access road.

51. The proposed WTP access road includes a clear span bridge over the Roran watercourse and two pairs of double culverts, aligning with the two primary flow paths within the floodplain. The dimensions of which are set out in Table 7.1.

Table 7.1: Designed Structures Included and Analysed in the Hydraulic Model

Structure	Dimensions
Clear span bridge	Beam bridge without piers 41.06mAOD soffit level
Double culvert	Rectangular cross-section; 6m width x 1m height 37.38mAOD invert level 40m length
Double culvert	Rectangular cross-section; 6m width x 1m height 37.09mAOD invert level 40m length

7.2 Model Build

52. To undertake an assessment of flood risk for existing (baseline) conditions and post-development conditions after the construction of the WTP access road, a hydraulic model was developed for the Proposed Project study area. The model uses a linked one-dimensional/two-dimensional (1D/2D) approach. The river channel is represented as a 1D component within Flood Modeller (VER=7.1.0.10375), an industry-standard tool for assessing flood risk, dynamically linked to the floodplain, which is modelled in 2D using the same software package.

53. The hydraulic model includes a representation of River Kilmastulla and Roran watercourse. Minor tributaries, such as ditches and drainage features, were included as lateral inflows without geometric representation. The software has a numerical convergence tolerance of +/- 10mm on water levels, and there are additional uncertainties within the survey data and hydrological and hydraulic parameters used to construct the model.

54. The model has been built from the OPW's existing 1D model, previously developed for a catchment-scale flood risk assessment (FRA). To meet UE’s requirement for a more detailed resolution for site-specific flood risk assessment, the model was upgraded to include a 2D modelling approach, enabling a more detailed analysis of bidirectional flows through the floodplain. A topographic survey was also conducted to improve the characterization of the 1D cross-sections. These upgrades enhanced the precision of the model, improving the simulation of overflows from the watercourse to the floodplain, which was critical for designing the culverts under the road and assessing flood risk in the project area.

55. Image 7.1 provides an overview of the extent of the Kilmastulla River and Roran watercourse at the Proposed Project location as well as the cross sections incorporated into the model. A summary of the structures included in the model is provided in Table 7.2.

Table 7.2: Summary of Structures in Kilmastulla Model

Type	Number	Summary
Bridges	12	11 existing bridges and 1 more included in design scenario. Structures modelled using BRIDGE; ARCH.
Culverts	4	2 double culverts considered in design scenario. Structure modelled using 2D embedded structure unit.
Spill units	12	11 spills associated with each bridge unit (the designed bridge has been designed to not overtop) and 1 spill representing a step. Structures modelled using SPILL.
Reservoirs	5	5 existing reservoirs. Previously modelled floodplains as reservoir units are now an active 2D area.

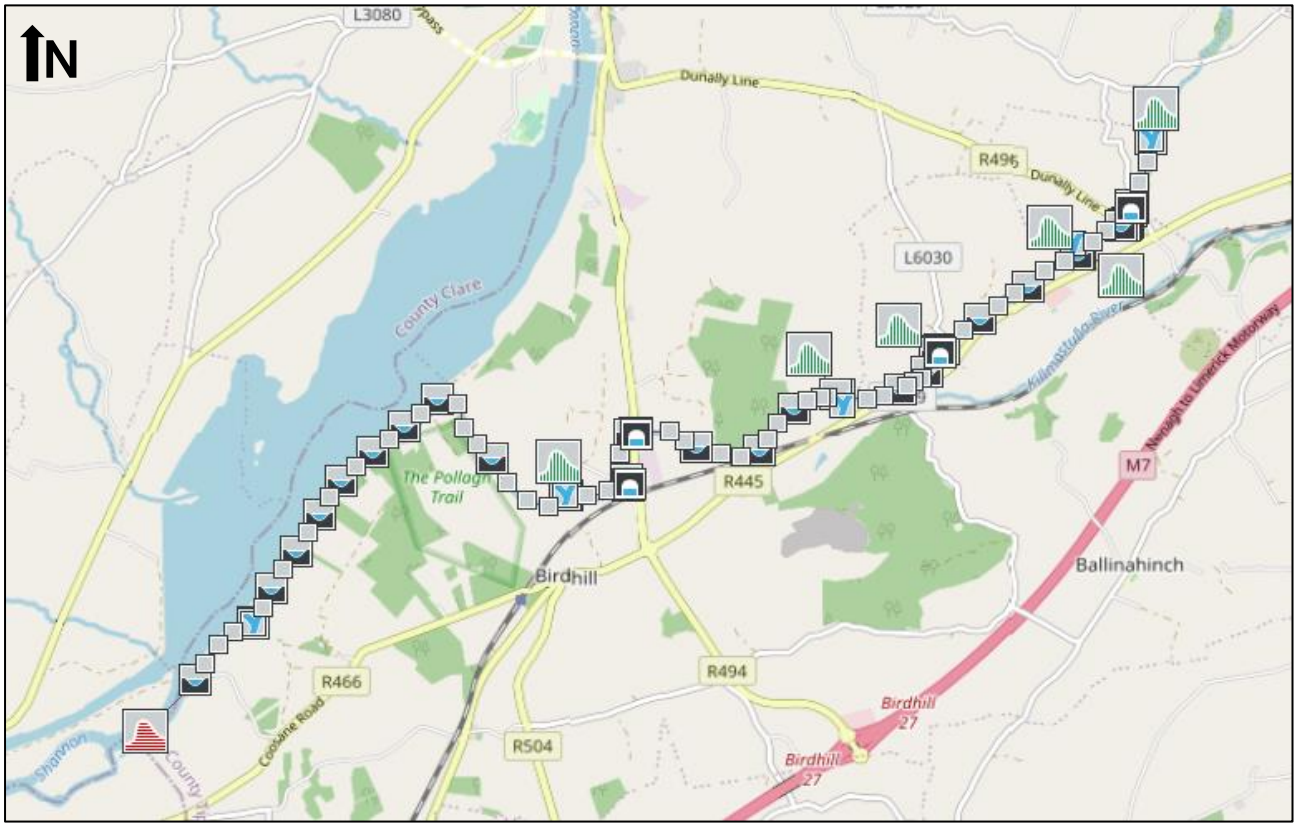


Image 7.1: Flood Modeller 1D domain schematization, including Cross Sections, Interpolates and structures

56. Regarding boundary conditions, all inflows are represented as hydrograph units. These include two upstream inflows: RR_2909 for the Roran watercourse and KR_7234 for the Kilmastulla River, as well as three lateral inflows: RR_1854_lat, RR_0613_lat, and KR_3878_lat. The downstream water level is fully controlled by the dam structure and is therefore set as a constant water level of 23.6 mAOD.

57. The flow hydrographs were already incorporated into the 1D OPW model. The events modelled include T100, T100+30%CC and T1000. T1000 flow hydrographs are shown in Image 7.2.

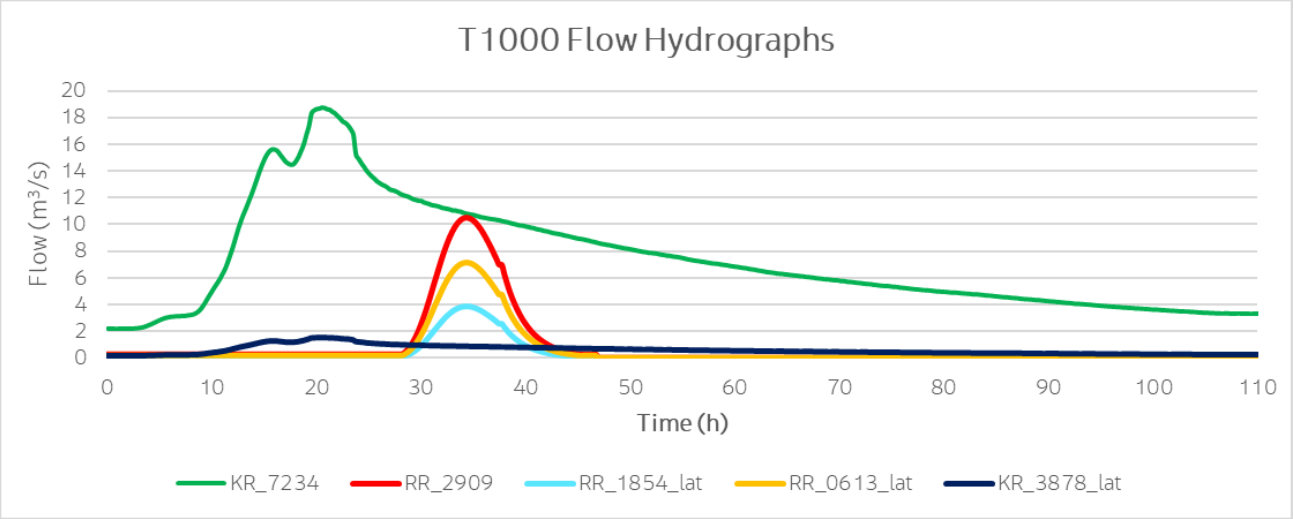


Image 7.2: T1000 Input Flow Hydrographs

58. Hydraulic roughness, or friction, is represented by Manning's coefficient, 'n,' in hydraulic models. The value of 'n' reflects various factors that influence overall roughness, either within the channel or across the floodplain. These factors include bed material and particle size, vegetation, surface irregularities, channel bed forms, erosional and depositional features, channel sinuosity, and obstructions. Manning's n values typically range from 0.025 for relatively smooth, uniform, and unvegetated channels to 0.090 for overbank flows through densely wooded areas. Table 7.3 presents the Manning's n values used in the model, which were derived from the National Land Cover Map.

Table 7.3: Summary of roughness values in Kilmastulla Model

Land Cover	Manning's n value
1D Channel	0.04
1D Banks	0.06
Buildings	0.1
Roads	0.015
Artificial Surfaces	0.020
Exposed Surfaces	0.025
Forest, Woodland and Scrub	0.060 to 0.085
Grassland, Saltmarsh and Swamp	0.05 to 0.06
Heath and Bracken	0.07
Waterbodies	0.05

7.3 Model Results

59. The aim of this section is to evaluate the potential flood risk impacts from the Proposed Project and on the Proposed Project, where the proposed access road crosses the Roran watercourse and floodplain.

7.3.1 Potential Flood Risk Impact from the Proposed Project

60. In order to analyse the impact produced by the Proposed Project, baseline and design scenarios have been compared for the 1% AEP, 1% AEP +30% HEFS Climate Change (Section 4) and 0.1% AEP events, to assess if there is a significant increase in the water levels that could be attributed to the WTP access road. This comparison is shown in Table 7.4 and illustrated on Annex B Flood Risk Mapping Figures with and without the Proposed Project.

Table 7.4: Potential Flood Risk Impact Analysis from the Proposed Project Design (m)

Location	1% AEP Baseline (mAOD)	1% AEP Design (mAOD)	1% AEP WLC* (m)	1% AEP +30%CC Baseline (mAOD)	1% AEP +30%CC Design (mAOD)	1% AEP +30%CC WLC* (m)	0.1% AEP Baseline (mAOD)	0.1% AEP Design (mAOD)	0.1% AEP WLC* (m)
Bridge	39.14	39.14	0.00	39.29	39.29	0.00	39.29	39.29	0.00
Double Culvert 1 (37.09 mAOD)	37.34	37.34	0.00	37.42	37.42	0.00	37.43	37.43	0.00
Double Culvert 2 (37.38 mAOD)	37.54	37.54	0.00	37.67	37.67	0.00	37.69	37.69	0.00

*WLC = water level change

61. To evaluate the existence of a flood risk increase due to the proposed WTP access road, water elevations have been measured in the watercourse, 1D results at the RR_0096ds cross section located 29m upstream of the crossing, as well as in the floodplain, 2D results upstream of the designed culverts.

62. Table 7.4 shows that water levels in the design scenario are the same as that in the baseline scenario. Therefore, it can be concluded that the proposed crossing structures in the watercourse and the floodplain do not produce an increase in the flood risk for the analysed events.

7.3.2 Potential Flood Risk Impact on the Proposed Project

63. In the previous section, the crossing structures design has been confirmed to not produce a significant increase in flood risk to the adjacent areas. In this section, the flood risk over the Proposed Project is analysed, as shown in Table 7.5.

Table 7.5: Potential Flood Risk Impact Analysis on the Proposed Project

Location	0.1% AEP WLH (mAOD)	WLH + Freeboard (mAOD)	Min. Recommended Road Level (mAOD)	Road Level (m)	Flood Risk to Proposed Project
Bridge	38.90	39.20	40.20	40.20	Low
Double Culvert 1 (37.09 mAOD)	37.34	37.64	39.04	39.46	Low
Double Culvert 2 (37.38 mAOD)	37.54	37.84	39.24	39.79	Low

64. To determine the minimum recommended road level, a 300mm freeboard above the 0.1% AEP Water Level Height (WLH) immediately upstream of the bridge and the culverts has been considered, along with a 700mm thickness for the beam and road package in the bridge, as well as a 400mm cross-section thickness and 1,000mm cover depth for the culverts.

65. It can be concluded from the analysis shown in Table 7.5 that fluvial flood risk to the WTP access road is low. However, even though the design guarantees no risk for the analysed events, there is always a remnant residual risk as per any project.

8. Flood Risk Management and Evaluation

8.1 The Sequential Approach to Development Planning

66. The FRA indicates that the WTP access road would be located in Flood Zone A.

67. Given the classification of the Proposed Project as a highly vulnerable development in accordance with the FRM Guidelines, a Justification Test was undertaken to demonstrate that the Proposed Project is compatible with the existing level of flood risk.

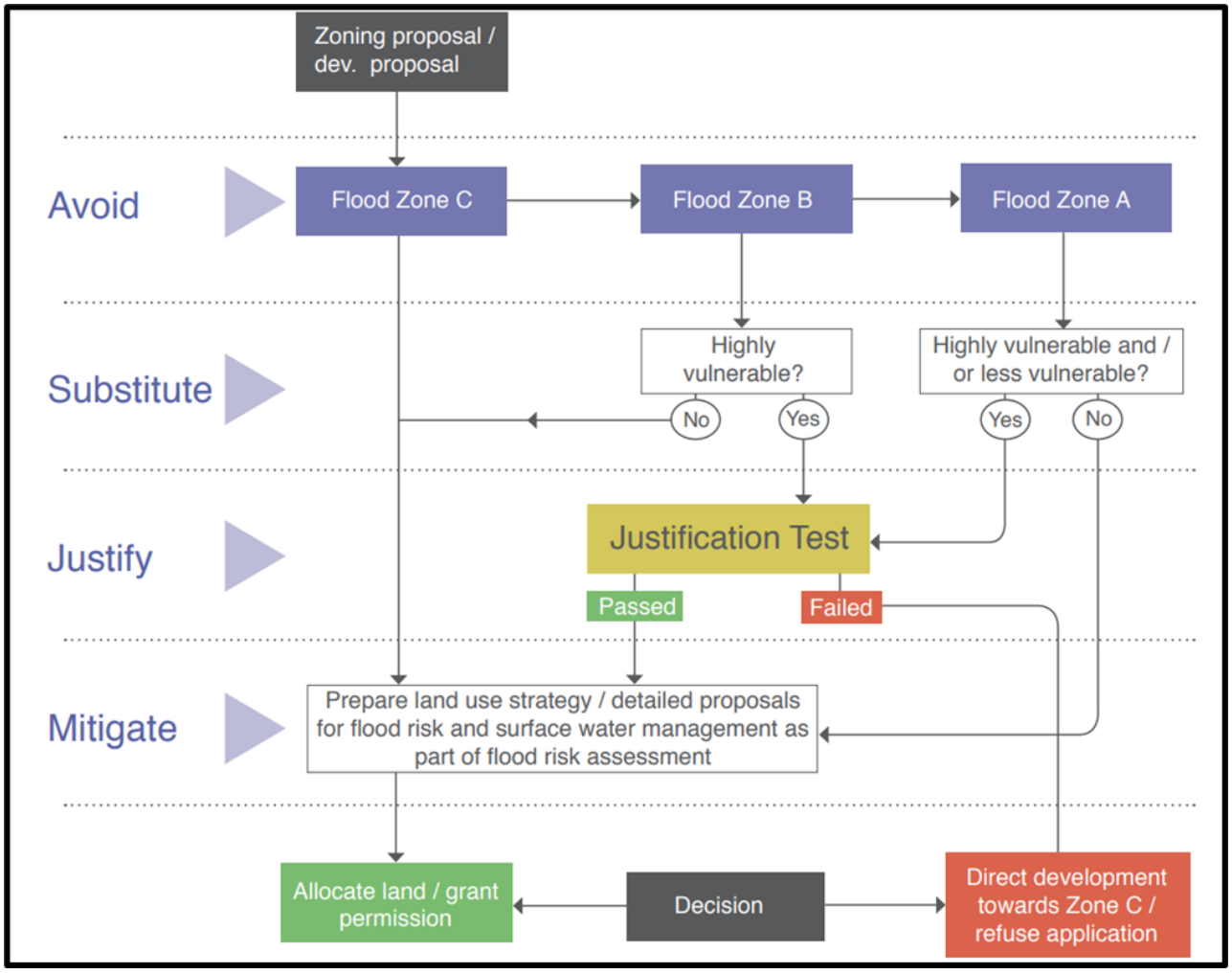


Image 8.1: Sequential Approach Mechanism in the Planning Process (Reproduced from Figure 3.2 of the FRM Guidelines)

8.2 Justification Test

68. Section 5.15 (Box 5.1) of the FRM Guidelines as amended by Circular PL 2/2014 (Department of Environment, Community and Local Government 2014), sets out the criteria for the Justification Test. An assessment of the Proposed Project against these criteria is presented in Table 8.1.

Table 8.1: Assessment Against Justification Test Criteria for the WTP Access Road

Criteria to be Satisfied	Justification	Criteria Met?
The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of the FRM Guidelines.	As critical infrastructure required for the Proposed Project, the proposed access road meets the objectives set out in the Tipperary County Development Plan (2022-2028) to cooperate with Uisce Éireann in the delivery of the Proposed Project and to ensure the maximum benefit from the Proposed Project to County Tipperary, in particular with respect to economic development potential and security of supply.	Yes
The development would not increase flood risk elsewhere, and, if practicable, would reduce overall flood risk.	It has been demonstrated that there is no notable increase in flood risk in the area as a result of the Proposed Project.	Yes
The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably practicable.	The Proposed Project would incorporate an open-span bridge over the Roran watercourse and four culverts located in its adjacent floodplain SuDS measures implemented as part of the Proposed Project would also improve the quality of runoff, delivering a net benefit to the environment.	Yes
The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.	As stated in Section 5, the Proposed Project would incorporate SuDS to ensure there is no increase in runoff rates as a consequence of the works. Therefore, there would be no increase in flood risk from an increase in the area of impermeable surfaces as part of the works.	Yes
The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.	This requirement is not relevant to this project due to its typology.	N/A

69. On completion of the Justification Test above, the Proposed Project is considered appropriate as each of the criteria from Section 5.15 (Box.5.1) of the FRM Guidelines have been clearly demonstrated.

9. Conclusions and Recommendations

70. This report assessed the potential fluvial, pluvial, coastal, estuarine, artificial drainage systems and groundwater flood risks to and from the WTP access road, using desktop sources of flooding information.

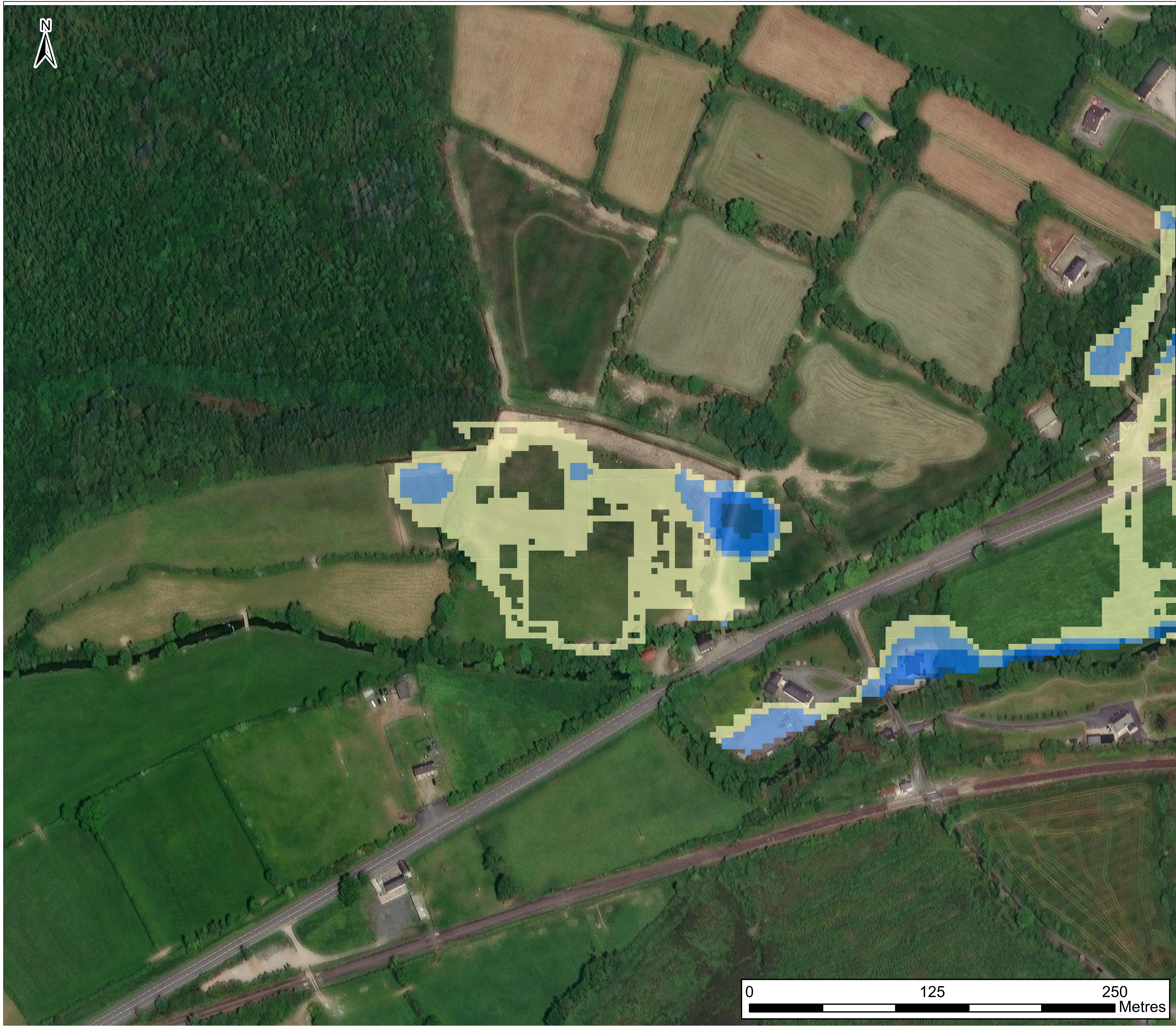
71. The Stage 3 Detailed FRA has concluded that, for the analysed events, there would be no risk from the proposed WTP access road, and there would be no increase in water levels upstream of the WTP access road and the adjacent areas.

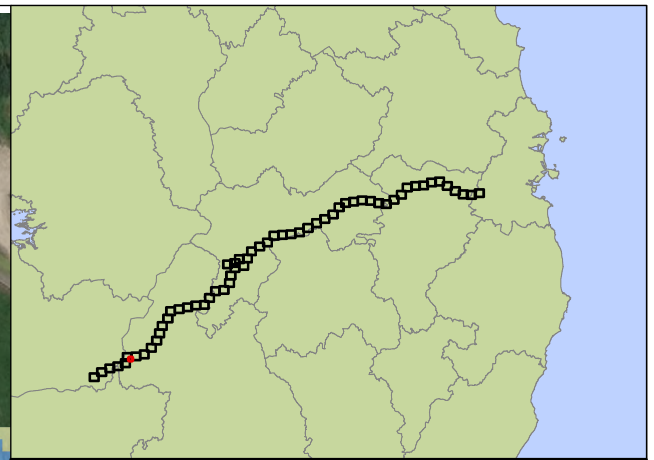
Supporting information - Information Sources Checklist

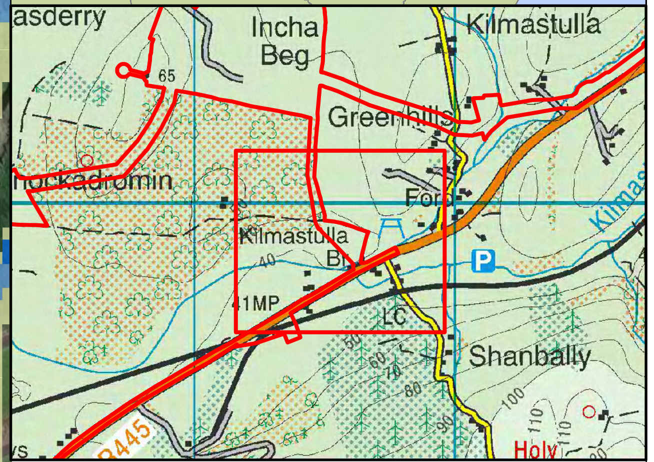
No.	Information Source	Status	Reference/Comments
1	OPW PFRA indicative fluvial flood maps	√	Included but not relied upon in this assessment for fluvial flood risk, only for pluvial flood risk.
2	National Coastal Protection Strategy Study flood and coastal erosion risk maps.	N/A	No part of the scheme is at a coastal or estuarine flood risk
3	Predictive and historic flood maps, and Benefiting Lands Map	√	Flooding history was provided by OPW floodinfo.ie
4	Predictive flood maps produced under the CFRAM Studies	√	CFRAM maps are available and have been used.
5	Indicative assessment of existing flood risk under PFRA	X	-
6	Previous SFRAs	√	Tipperary County Development Plan – Strategic Flood Risk Assessment (2022-2028)
7	Expert advice from OPW who may be able to provide reports containing the results of detailed modelling and flood-mapping studies including critical damage areas, and information on historic flood events and local studies etc.	X	-
8	Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques.	√	Topographic Survey Data from 2017 is available.
9	Information on flood defence condition and performance	N/A	
10	Local libraries and newspaper reports	√	Adequate information on flooding history was provided by OPW floodmaps.ie
11	Interviews with local people, local history/natural history societies etc.	X	-
12	Walkover survey to assess potential sources of flooding, likely routes for flood water and the site's key features, including flood defences, and their condition	X	-
13	National Indicative Fluvial Mapping	√	-
14	GSI Flooding Probability Maps	√	-

√ – Information available
X – Information not available
N/A – Information not applicable

Figures







Legend

Water Depth Baseline T100 (m)

- <0.2
- 0.2 - 0.4
- 0.4 - 0.7
- 0.7 - 1.2
- >1.2

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

**Definition of No Above Ground Disturbance:Land where it is not proposed to do any open cut excavation due to a natural or artificial obstruction. However, may be subject to light trafficking, e.g. to set out wayleave fencing.*

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
F02	18/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water — Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Baseline T100
Sheet 1 of 2

Drawing Status: FINAL – PLANNING APPLICATION

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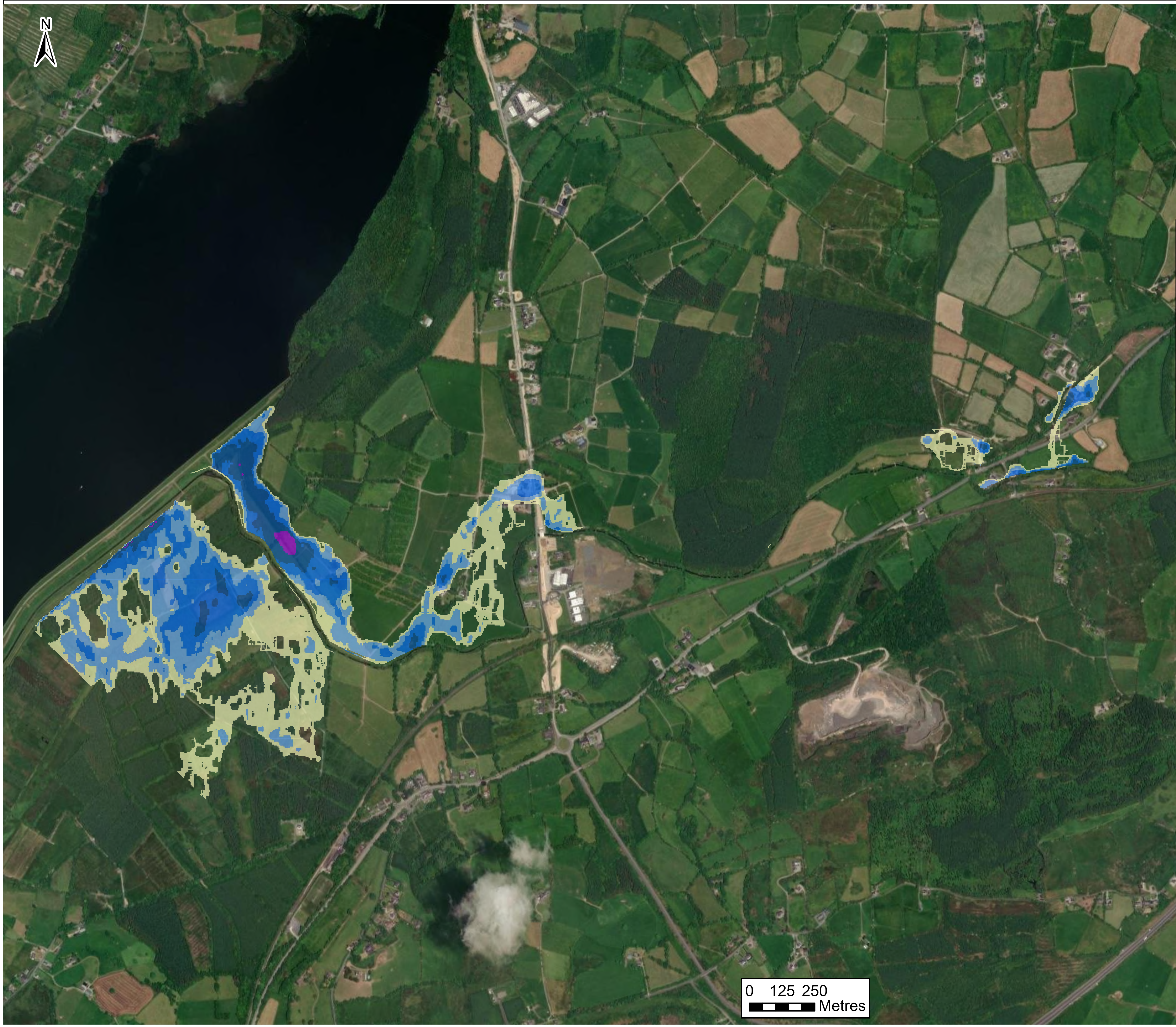

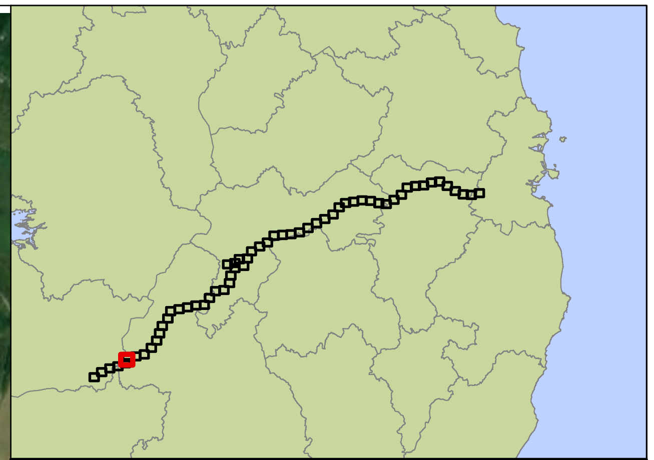

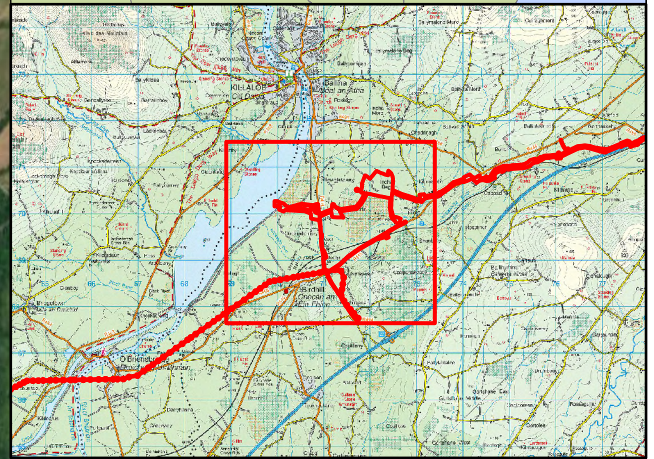

Legend

Water Depth Baseline T100 (m)

- <0.2
- 0.2 - 0.4
- 0.4 - 0.7
- 0.7 - 1.2
- >1.2

RW-xxx - Raw Water Chainage
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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water
Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Baseline T100
Sheet 2 of 2

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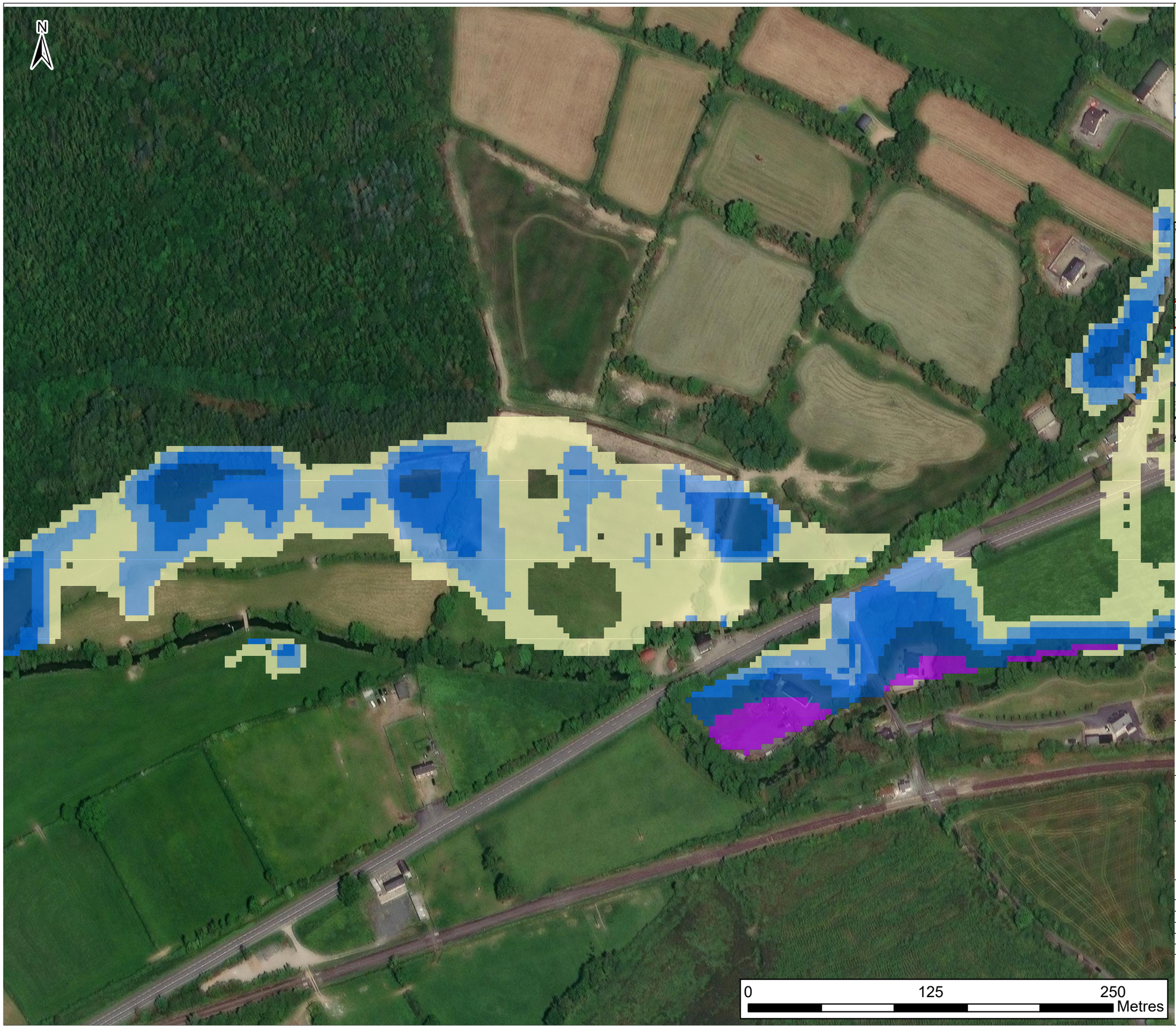

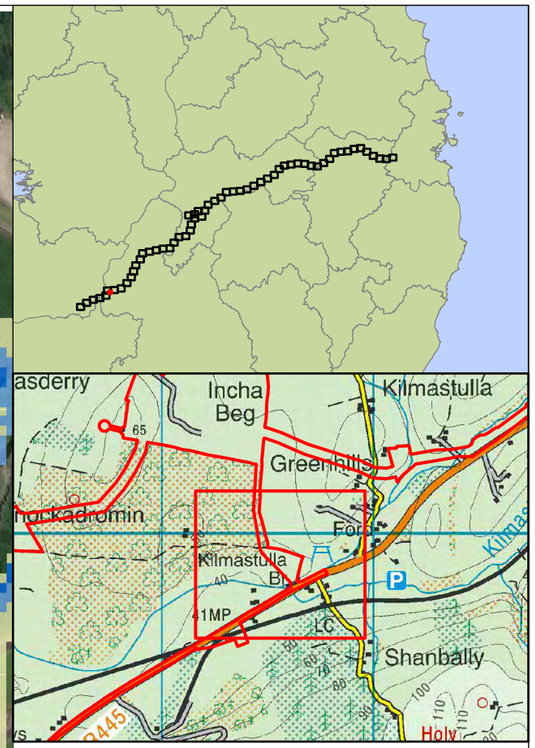

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Water Depth Baseline T100+30%CC (m)

- <0.2
- 0.2 - 0.4
- 0.4 - 0.7
- 0.7 - 1.2
- >1.2

RW-xxx - Raw Water Chainage
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F02	18/11/25	FINAL - PLANNING PERMISSION	EA	PG	KK	SW
F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Baseline T100 + 30% CC
Sheet 1 of 2

Drawing Status: FINAL – PLANNING APPLICATION

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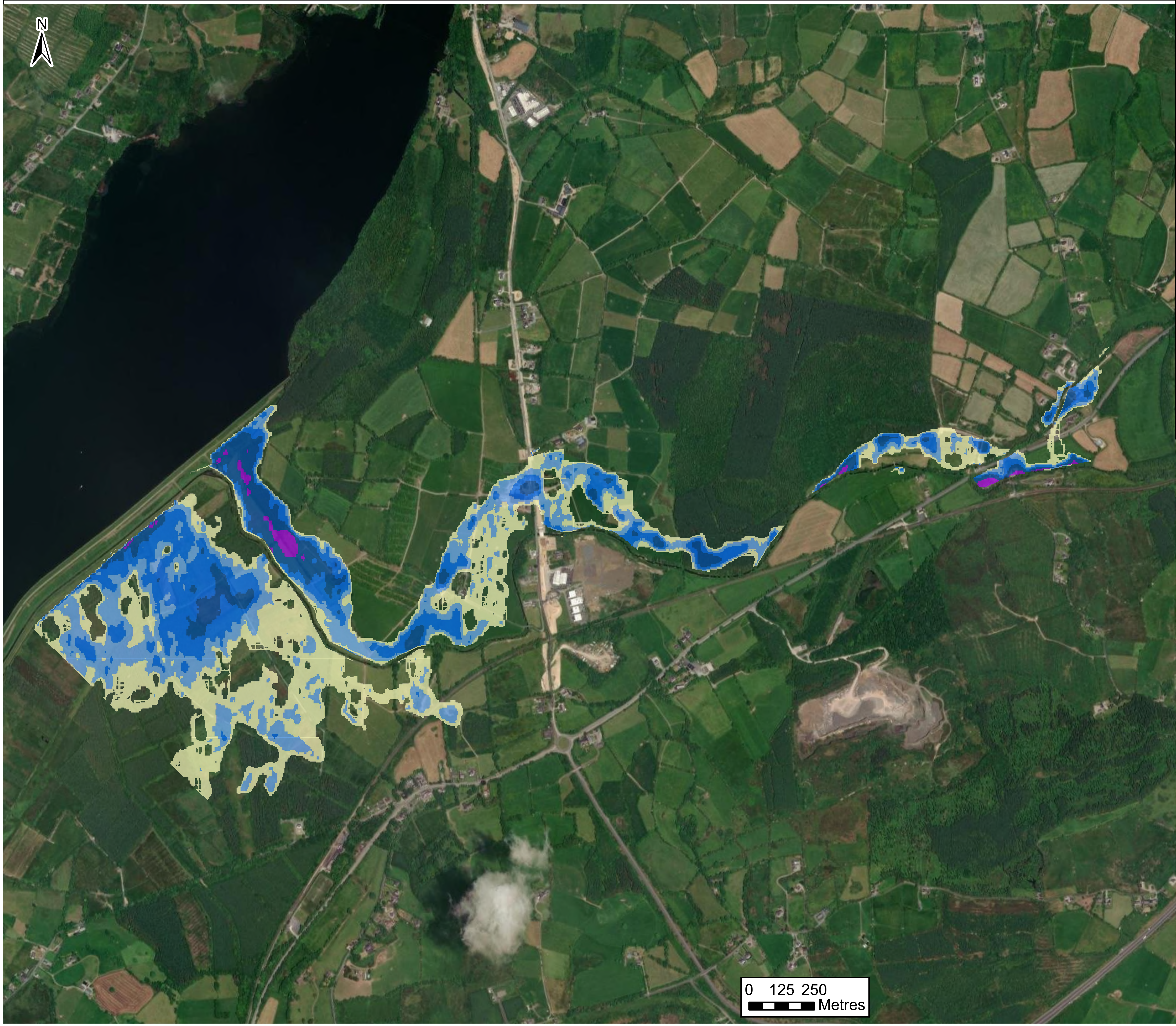

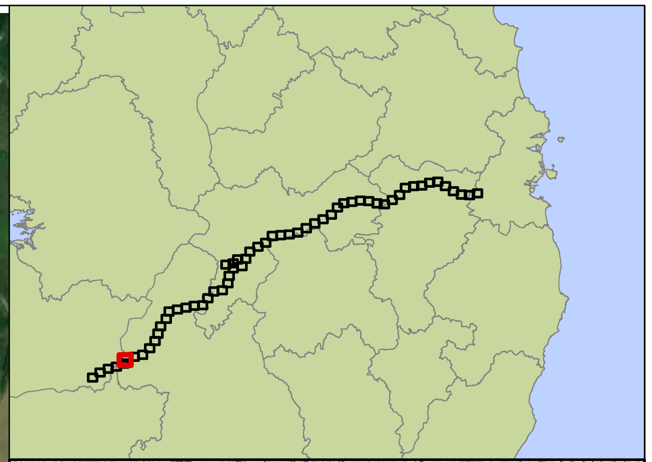

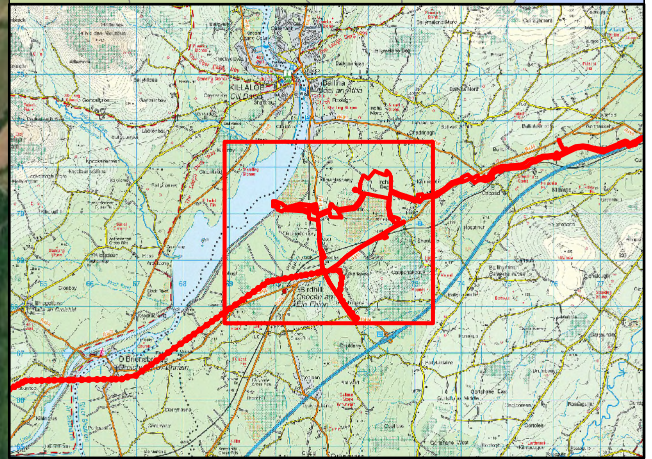

Legend

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F01	10/10/2025	FOR APPROVAL	SA	PW	AO	SW

Jacobs TOBIN

Client

Uisce Éireann Irish Water — Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Baseline T100 + 30% CC
Sheet 2 of 2

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:14,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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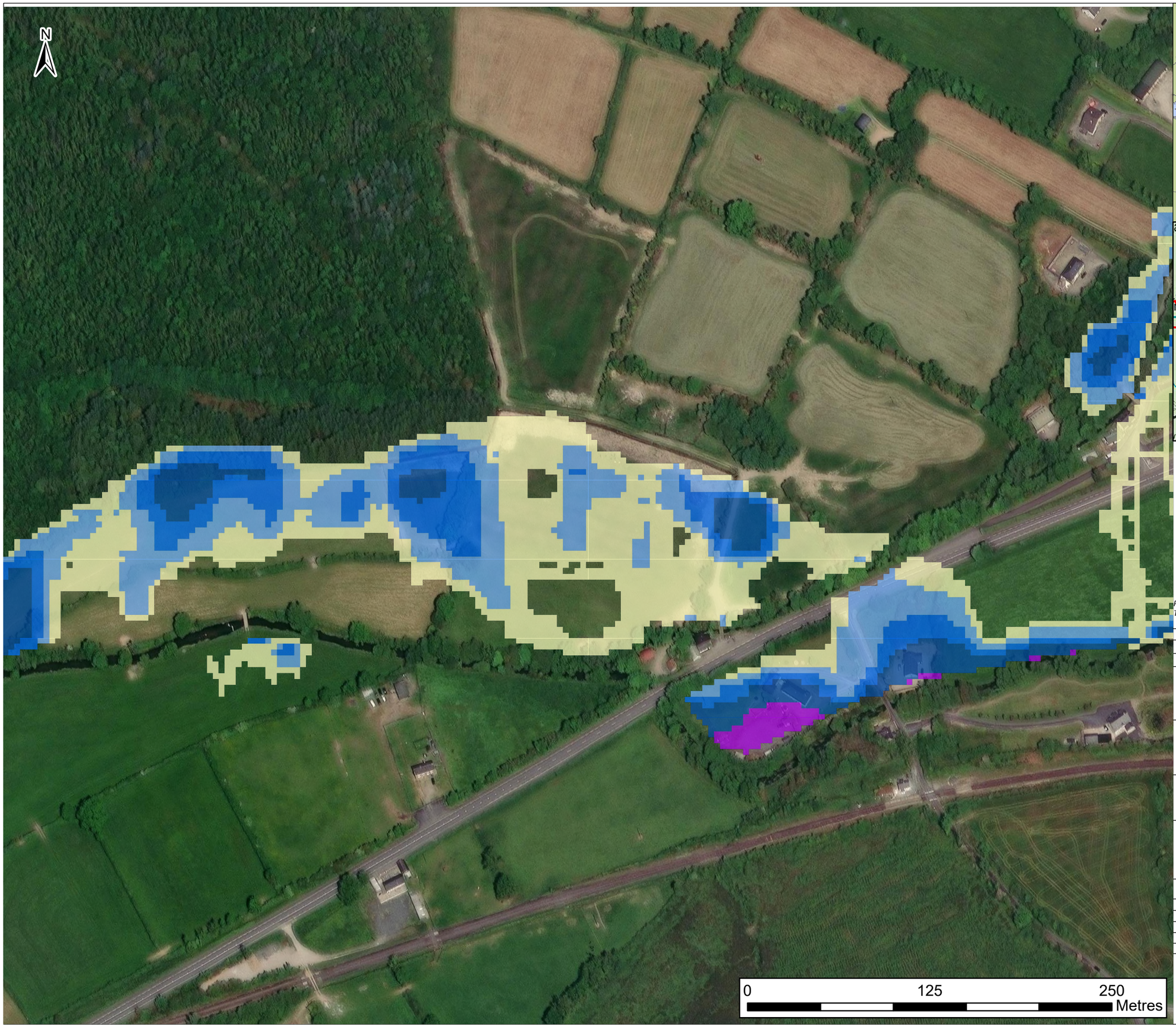

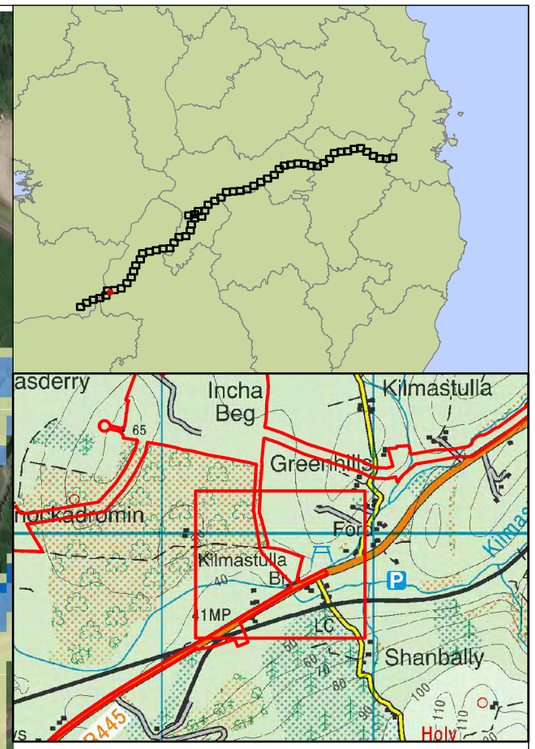

Legend

Water Depth Baseline T1000 (m)

- <0.2
- 0.2 - 0.4
- 0.4 - 0.7
- 0.7 - 1.2
- >1.2

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Baseline T1000
Sheet 1 of 2

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:2,500	DO NOT SCALE
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Client No.	9318	
Drawing No.	32105801/700/12041	
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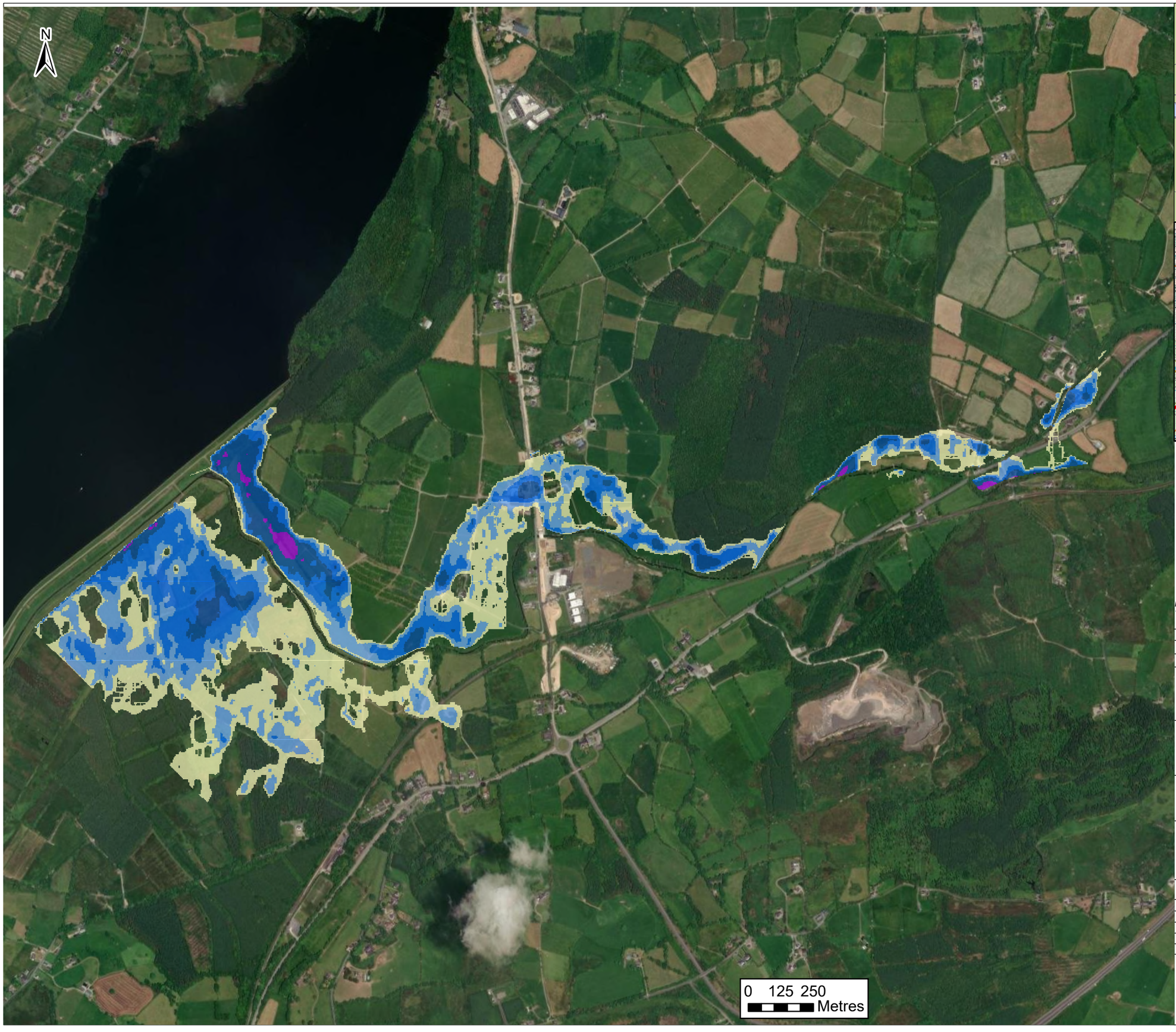

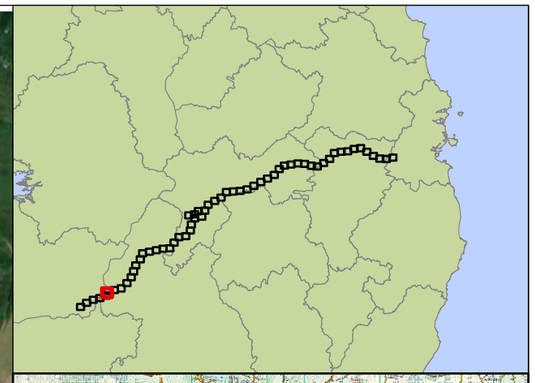

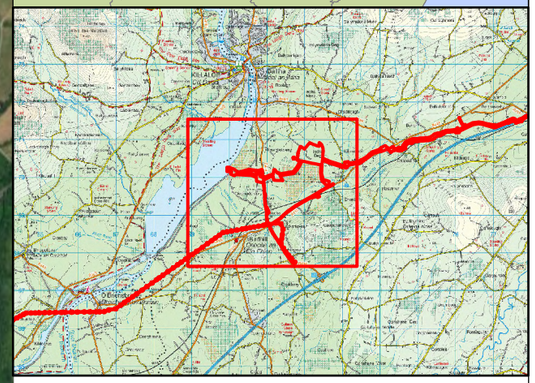

Legend

Water Depth Baseline T1000 (m)

- <0.2
- 0.2 - 0.4
- 0.4 - 0.7
- 0.7 - 1.2
- >1.2

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Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project: Water Supply Project
Eastern and Midlands Region

Drawing Title: A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Baseline T1000
Sheet 2 of 2

Drawing Status: FINAL – PLANNING APPLICATION

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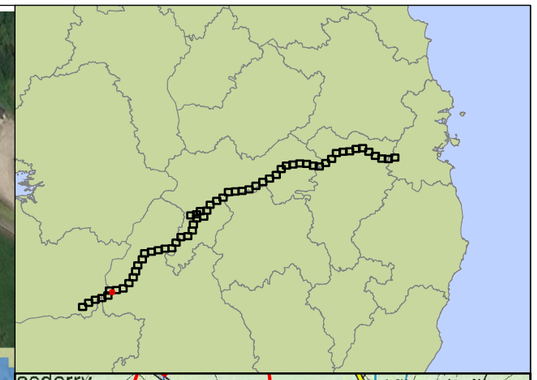

Legend

Proposed Scheme

- WTP access road
- Culverts

Water Depth Design T100 (m)

- <0.2
- 0.2 - 0.4
- 0.4 - 0.7
- 0.7 - 1.2
- >1.2

RW-xxx - Raw Water Chainage
TW-xxx - Treated Water Chainage

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Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project
Water Supply Project
Eastern and Midlands Region

Drawing Title
A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Design T100
Sheet 1 of 2

Drawing Status: FINAL – PLANNING APPLICATION

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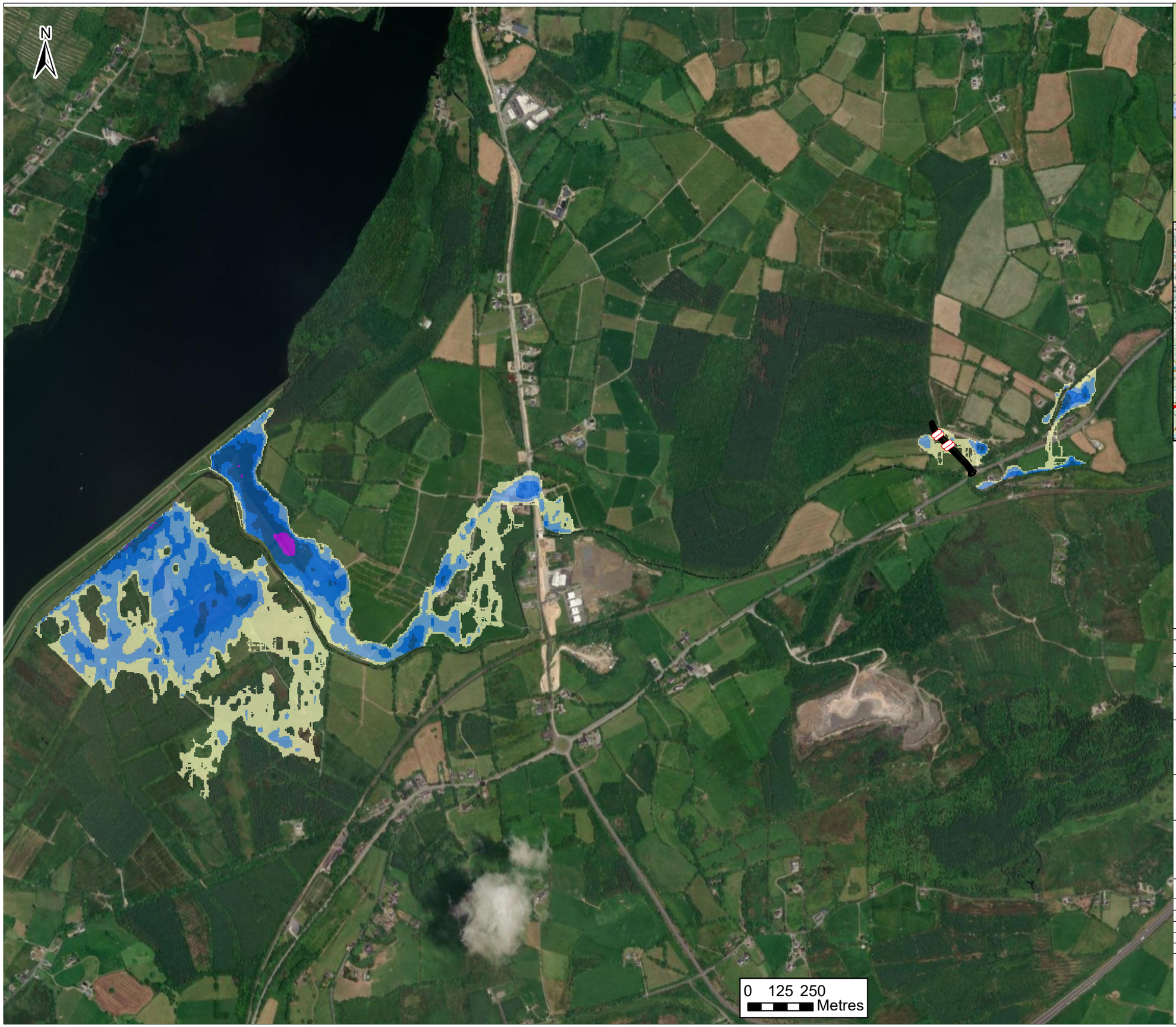

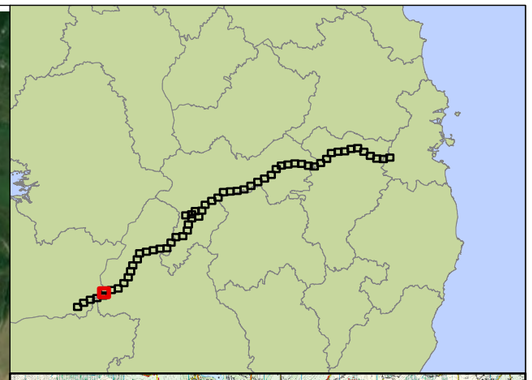

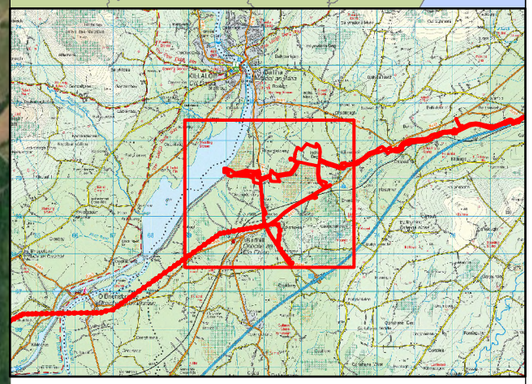

Legend

Proposed Scheme

WTP access road

Culverts

Water Depth Design T100 (m)

<0.2

0.2 - 0.4

0.4 - 0.7

0.7 - 1.2

>1.2

RW-xxx - Raw Water Chainage
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Jacobs TOBIN

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Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Design T100
Sheet 2 of 2

Drawing Status: FINAL – PLANNING APPLICATION

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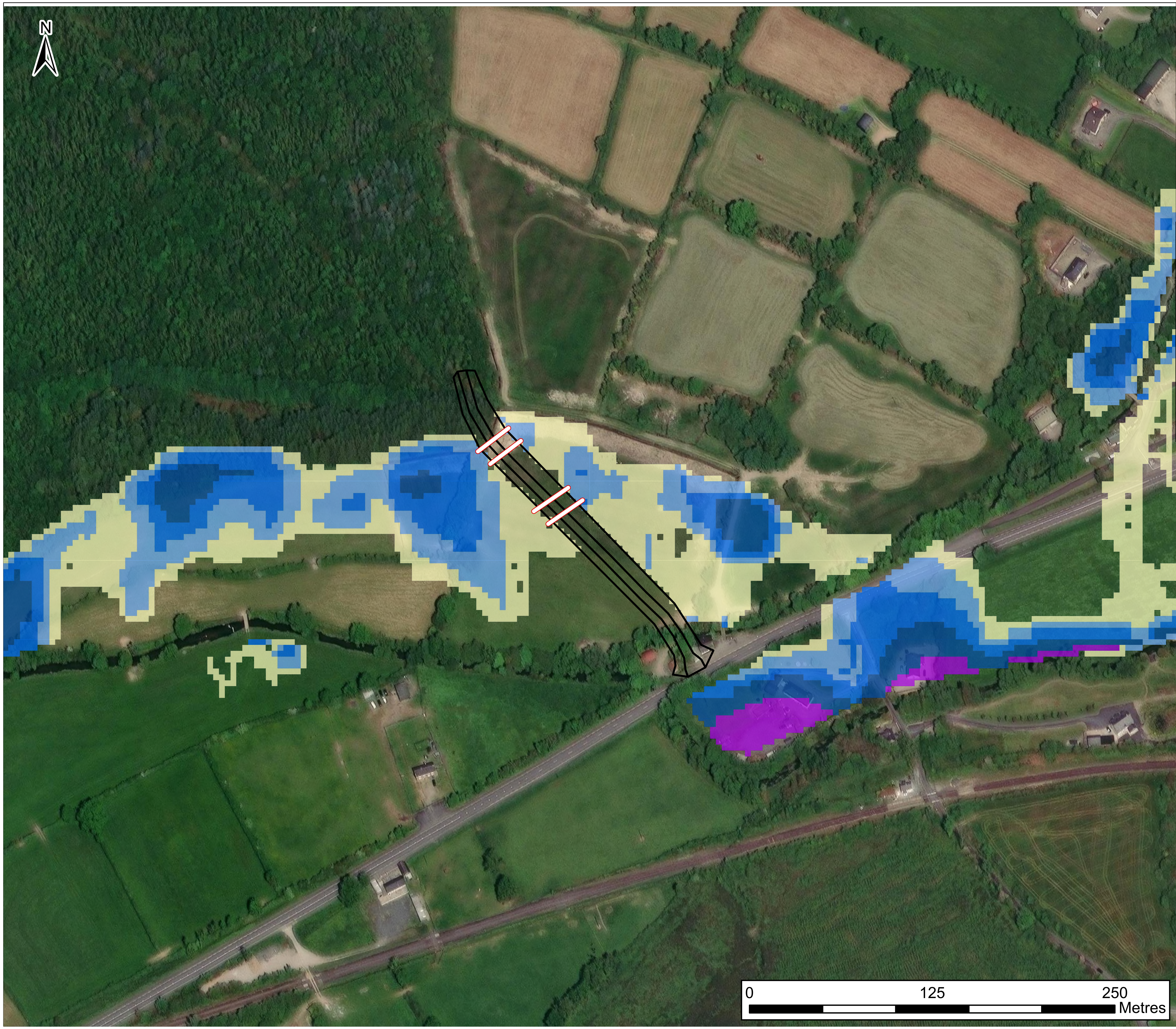

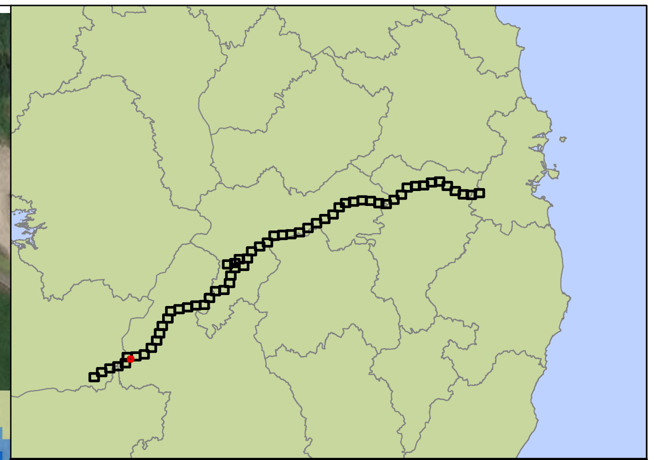

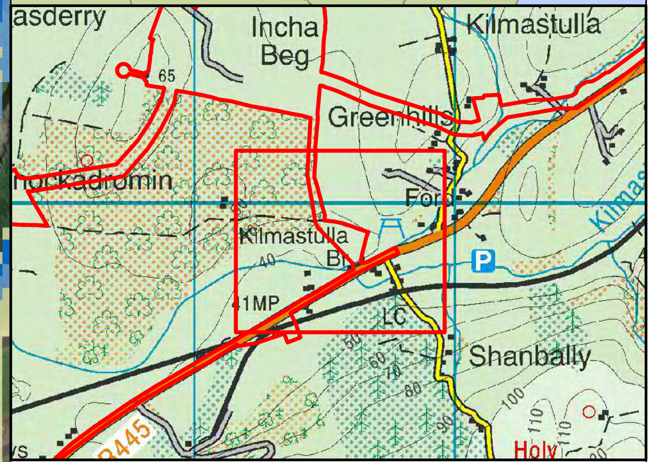

Legend

Culverts

WTP access road

Water Depth Design T100+30%CC (m)

- <0.2
- 0.2 - 0.4
- 0.4 - 0.7
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Jacobs TOBIN

Client

Uisce Éireann Irish Water

Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Design T100 +30% CC
Sheet 1 of 2

Drawing Status	FINAL – PLANNING APPLICATION	
Scale @ A3	1:2,500	DO NOT SCALE
Jacobs No.	32105801	
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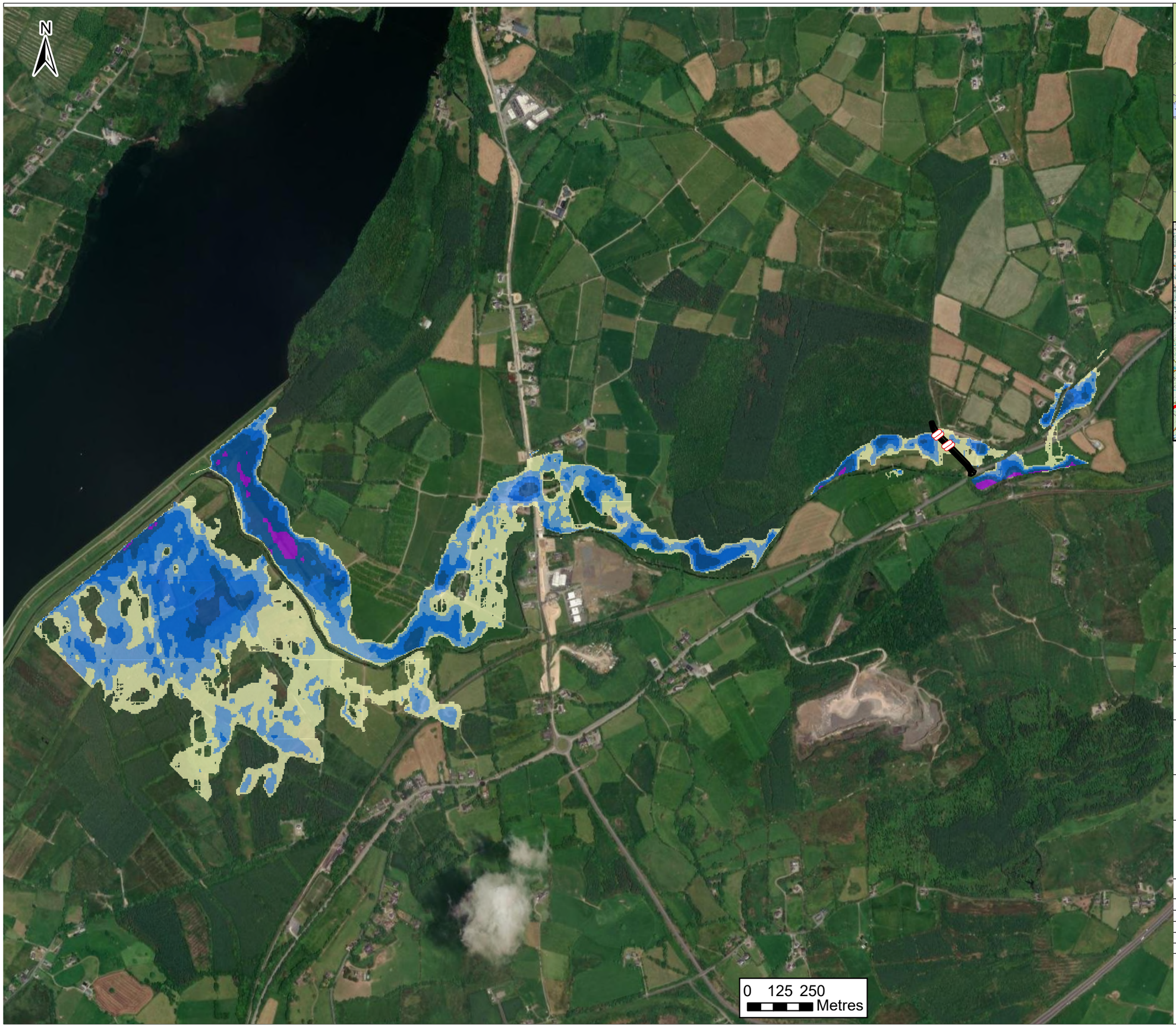

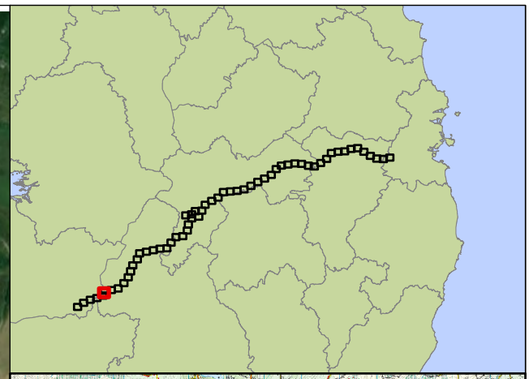

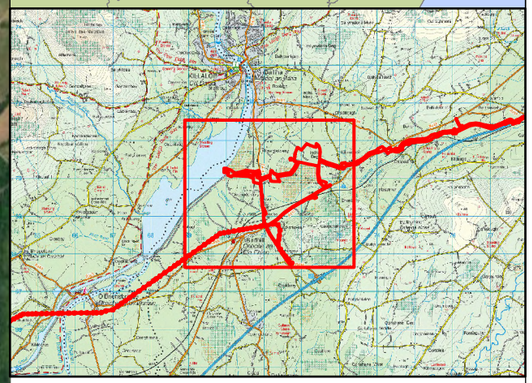

Legend

Culverts

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Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Design T100 +30% CC
Sheet 2 of 2

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:14,000	DO NOT SCALE
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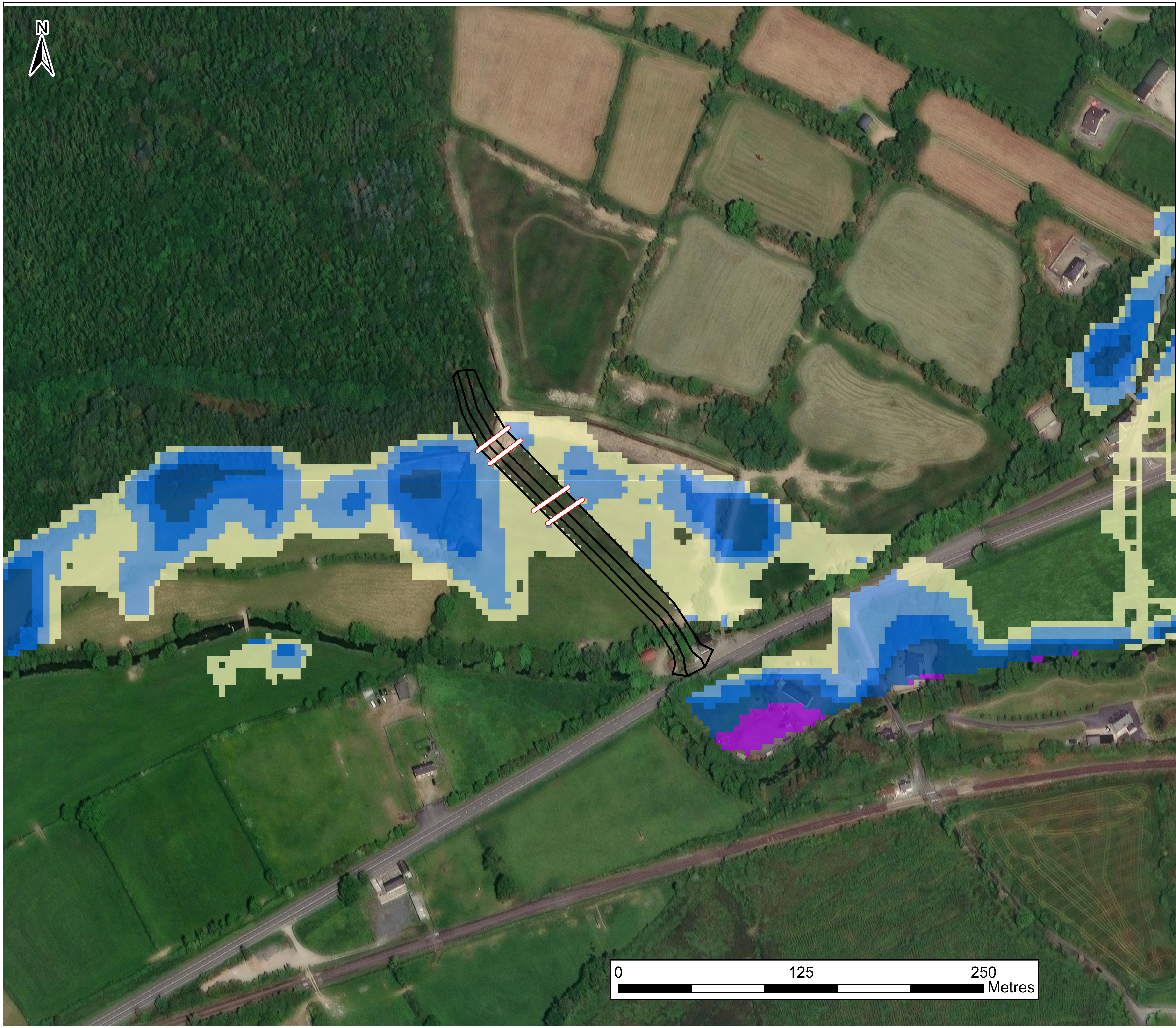

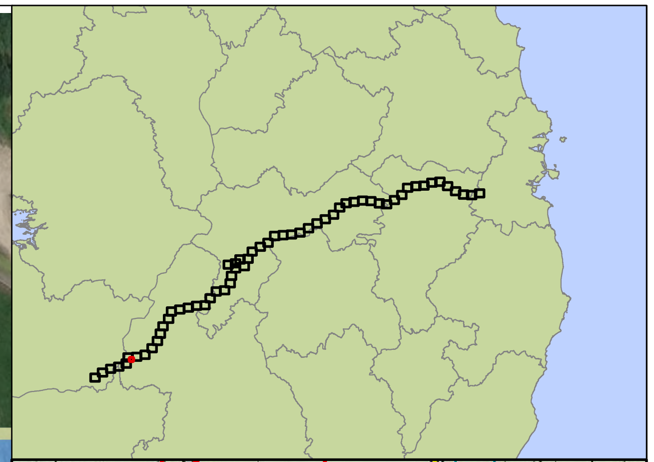

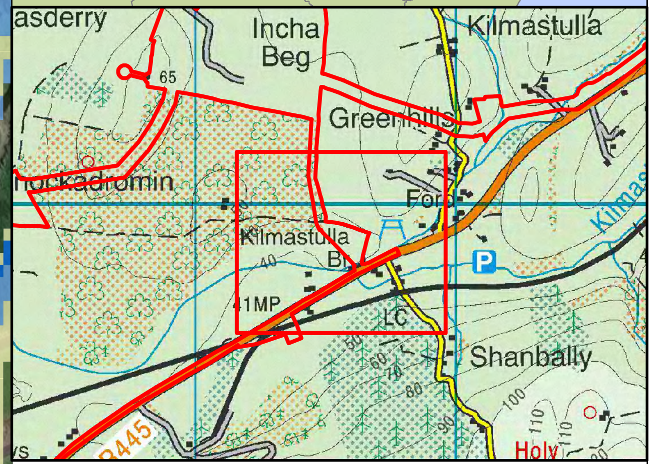

Legend

Proposed Scheme

- WTP access road
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Jacobs TOBIN

Client

Uisce Éireann Irish Water
Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Design T1000
Sheet 1 of 2

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:2,500	DO NOT SCALE
Jacobs No.	32105801	
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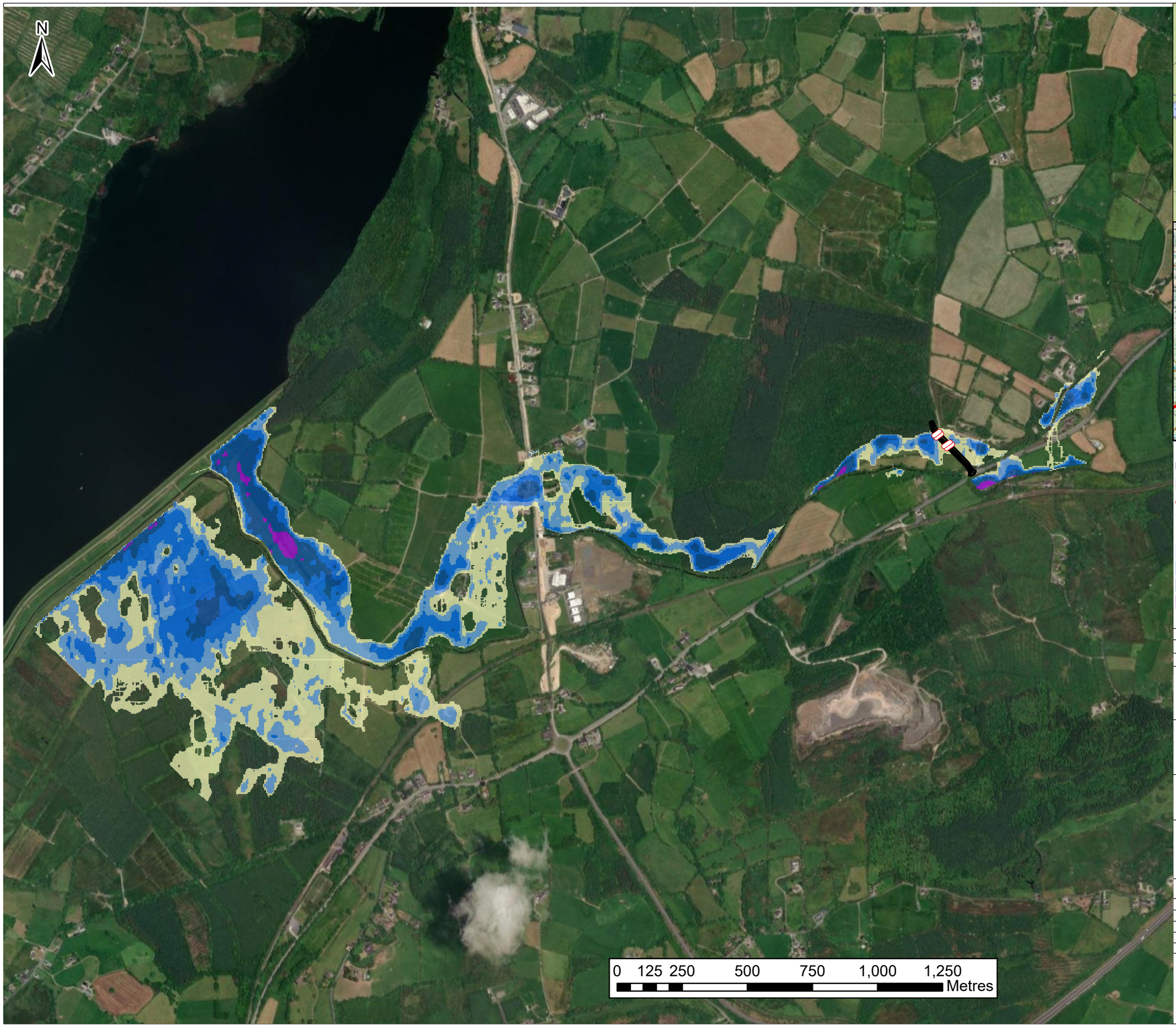

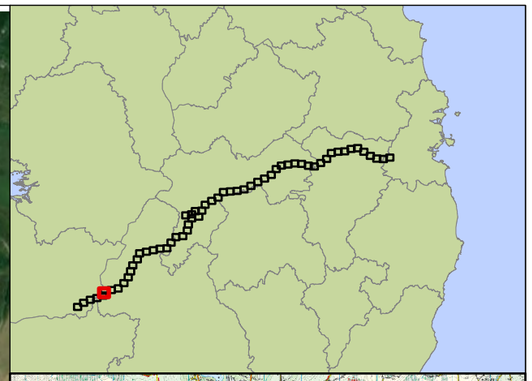

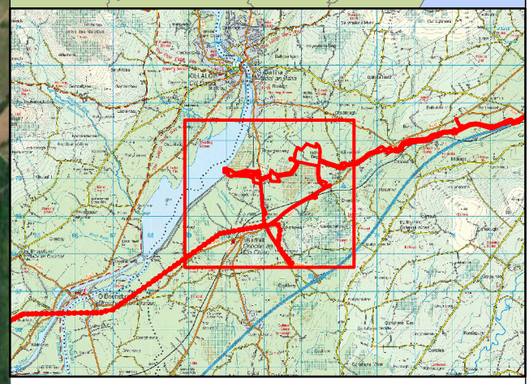

Legend

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Jacobs TOBIN

Client: Uisce Éireann Irish Water; Tionscadal Soláthair Uisce Water Supply Project

Project

Water Supply Project
Eastern and Midlands Region

Drawing Title

A9.4 Annex B Flood Risk Assessment Mapping
Water Depth Design T1000
Sheet 2 of 2

Drawing Status: FINAL – PLANNING APPLICATION

Scale @ A3	1:14,000	DO NOT SCALE
Jacobs No.	32105801	
Client No.	9318	
Drawing No.	32105801/700/12041	
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