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Environmental Impact Assessment Report (EIAR) Volume 2 – Chapter 4 – Alternatives

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BALLINA AND LOUGH TALT WATER SUPPLY UPGRADE

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Abbreviations

AA	Appropriate Assessment
BPS	Booster Pumping Station
BPT	Break Pressure Tank
EC	European Community
EEC	European Economic Community
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EU	European Union
GAC	Granular Activated Carbon
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HV	High Voltage
IROPI	Imperative Reasons of Overriding Public Interest
LAP	Local Area Plan
LC	Localised Crossing
LG01-LG04	Lisglennon Option References
m^3/day	Cubic Metres per Day
MCA	Multi-Criteria Assessment (suggested from context)
MTP	Movement and Transport Policy
MV	Medium Voltage
NHA	Natural Heritage Area
NWRP	National Water Resources Plan
OD	Ordnance Datum
PAC	Powdered Activated Carbon
pNHA	proposed Natural Heritage Area
PS	Pumping Station
RWI&PS	Raw Water Intake and Pumping Station
RWRP-NW	Regional Water Resources Plan – North West
RWS&PS	Raw Water Storage and Pumping Station
RWSS	Regional Water Supply Scheme
SA	Study Area

SAC	Special Area of Conservation
SA-C	Study Area C
SDB	Supply Demand Balance
SPA	Special Protection Area
THMs	Trihalomethanes
UE/UÉ	Uisce Éireann
WFD	Water Framework Directive
WRZ	Water Resource Zone
WSS	Water Supply Scheme
WTP	Water Treatment Plant

Glossary

Term	Meaning
Cryptosporidium	Microscopic protozoan parasite that infects the intestines and causes cryptosporidiosis, a diarrheal disease commonly spread through contaminated water, food, or surfaces
EIA Directive	Directive 2014/52/EU amending Directive 2011/92/EU on environmental impact assessment.
EPA Remedial Action List	Public record maintained by the Environmental Protection Agency (EPA) that highlights water supplies needing improvements to meet drinking water quality standards.
European drinking water standards	the EU Drinking Water Directive (Directive (EU) 2020/2184) replaces Directive 98/83/EC, and has been transposed into Irish law via the European Union (Drinking Water) Regulations 2023, S.I. No. 99/2023. These replace the earlier European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014).
European sites	Discrete areas designated under the Birds Directive (Directive 2009/147/EC) and Habitats Directive (Directive 92/43/EEC).
Habitats Directive (92/43/EEC)	European legislation protecting habitats and species of conservation importance.
National Water Resource Plan (NWRP)	National Plan developed by Uisce Éireann to identify how Uisce Éireann will provide a safe, sustainable, secure and reliable water supply to customers for now and into the future whilst safeguarding the environment.
Ordnance Datum (OD)	A fixed reference point used to measure heights, defined as the mean sea level at a specific location.
Supply Demand Balance (SDB)	Difference between the water that is available compared to the demand for water.
Trihalomethanes (THMs)	Chemical by-products formed during water disinfection and regulated in drinking water.
Water Resource Zone	An area where the supply and demand are largely self-contained, where resources, supply infrastructure and customers are interconnected. A water resource zone can consist of multiple water supply zones.

4. Alternatives

4.1. Introduction

This Environmental Impact Assessment Report (EIAR) chapter sets out the reasonable alternatives considered for the Ballina and Lough Talt Water Supply Upgrade (the 'Proposed Development') and the main reasons for choosing the option presented in Chapter 3 - Project Description. It has been prepared in accordance with Article 5(1)(d) and Part 2 Annex IV (2) of the EIA Directive (2014/52/EU) which identifies the following:

'*A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, taking into account including a comparison of the environmental effects.*'

The Environmental Protection Agency (EPA) Guidelines (2022) requires the following with respect to alternatives:

'*The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with an indication of the main reasons for selecting the chosen option. It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required.*'

This chapter fulfils the requirements of Article 5(1)(d) and Annex IV and describes the alternatives considered during the design process and outlines how environmental, planning and technical considerations informed the selection of the preferred option as described in Chapter 3 – Project Description. An overview of the recommendations of the National Water Resource Plan (NWRP) is also considered. The approach to identifying and assessing alternatives is informed by the EPA guidance, as outlined above, and reflects an iterative design process undertaken from feasibility stage through to preliminary design.

The background to the Proposed Development is described in detail in Chapter 1 – Introduction and Chapter 2 – Project Need of the EIAR and is summarised here to support a description of reasonable alternatives that were explored by Uisce Éireann. In 2015, Uisce Éireann submitted a planning application to Sligo County Council for the upgrade of the existing Lough Talt Water Treatment Plant (WTP) to achieve compliance with EPA and European drinking water standards. Planning permission was refused, and this decision was subsequently upheld by An Bord Pleanála. The Board was not satisfied that the Proposed Development, either in combination with the associated water abstraction on which it depended, would not adversely affect the integrity of the Lough Hoe Bog Special Area of Conservation (SAC) and the River Moy SAC.

In May 2019, Sligo County Council granted planning permission for an upgrade of the Lough Talt WTP (Planning Application Ref. 18210). This marked the first project in Ireland to receive approval under Article 6(4) of the EC Habitats Directive (92/43/EEC) on the basis of Imperative Reasons of Overriding Public Importance (IROPI). The consent allowed for the continued operation and use of the Lough Talt WTP and its associated abstraction for a period of up to ten years, providing an interim solution while a new public drinking water supply source is developed, constructed, and commissioned.

As part of the planning application, a range of alternative supply options were considered (RPS, May 2018, provided for information as Appendix 4-1 of Volume 3 of this EIAR) to identify a long-term replacement water

supply for the Lough Talt Water Resource Zone (WRZ). Following the granting of planning permission, Uisce Éireann continued to develop and refine options for the long-term solution for a new public drinking water supply, through a comprehensive programme of strategic planning and project development. The development of reasonable alternatives is set out in this chapter and considers the following:

- Do-Nothing Scenario;
- Alternative Water Supply Assessment;
- Appraisal with NWRP;
- Alternatives for the Proposed Development; and
- Alternative Routing and Siting.

4.1.1. Level of Assessment, Limitations and Assumptions

The level of detail available for each alternative reflects the stage of project development at which that alternative was considered. Alternatives identified and discounted at an early stage of the options assessment process were assessed using the information reasonably available at that time, including feasibility studies, desk-based environmental constraints information, mapping, engineering judgement and relevant planning and technical considerations. As the design process progressed, further environmental, technical, planning and constructability information became available, allowing more detailed comparative assessment of the shortlisted alternatives.

In accordance with the EIA Directive and the EPA (2022) Guidelines, this chapter does not seek to provide an equivalent level of design or environmental assessment for every alternative considered. Rather, it presents the reasonable alternatives studied by the Applicant and outlines the main reasons for the selection of the option brought forward, taking into account the likely significant effects on the environment.

Key limitations and assumptions include:

- Alternatives discounted at an early stage were assessed using predominantly feasibility-level and desk-based information and are therefore subject to a greater degree of uncertainty than the option brought forward;
- Detailed environmental baseline surveys were not undertaken for all alternatives that were screened out at early stages, where sufficient information was available to determine that they were less favourable or not reasonable to progress;
- Site-specific matters such as ground conditions, access arrangements, land requirements, existing utilities and construction methodology were inferred in some instances from available mapping, site inspections, preliminary engineering assessment and professional judgement; and,
- The assessment assumes the application of standard construction practices, embedded design measures and appropriate mitigation measures in accordance with relevant legislation, guidance and Uisce Éireann standards.

Notwithstanding these constraints, sufficient information was available at each stage of the options assessment process to allow a proportionate and robust comparison of reasonable alternatives and to identify the option brought forward for assessment in this EIAR.

4.1.2. ‘Do-Nothing’ scenario

The ‘Do-Nothing’ scenario considers the situation where the Proposed Development is not implemented and the existing water supply infrastructure continues to operate.

Earlier proposals to upgrade the WTP while continuing abstraction from Lough Talt were refused in 2016 and 2017 due to concerns regarding potential effects on the integrity of Lough Hoe Bog SAC, including risks associated with reduced lake levels during extended dry weather and associated effects on the protected Geyer's whorl snail.

A subsequent 2018 application was permitted in 2019 under the Habitats Directive IROPI process, on the basis of urgent public health need and the absence of an available short-term alternative. Permission was granted for a time-limited upgrade to the existing WTP, with compensatory measures, while a new long-term public drinking water source was developed. This planning history supports the conclusion that continued reliance on Lough Talt abstraction is not a sustainable long-term solution and that alternatives are required to remove or reduce abstraction pressure on Lough Talt while maintaining a safe, compliant water supply.

The existing Lough Talt WTP was upgraded in 2020 under the IROPI consent as an interim measure to address historic drinking water quality risks, including exceedances of trihalomethanes (THMs), inadequate *Cryptosporidium* barriers, EPA Remedial Action List status and a boil water notice in place from February 2018 to November 2020. While these works secured compliance in the short term, they were not intended to provide a permanent solution for the Lough Talt Supply.

Under the Do-Nothing scenario, abstraction from Lough Talt would continue only in the short term in accordance with existing permissions. However, as this abstraction is time-limited and required to cease, the existing raw water source would not provide a sustainable long-term supply for the Lough Talt RWSS. From an environmental perspective, continued abstraction from Lough Talt would maintain pressure on sensitive ecological receptors, including Lough Hoe Bog SAC, particularly during periods of low water levels.

In addition to the environmental constraints associated with Lough Talt, the existing intake at Lough Conn is also susceptible to sediment deposition increasing operational and environmental risks.

Furthermore, existing water treatment infrastructure within the Ballina and Lough Talt water supply areas would continue to operate with identified constraints in terms of capacity, resilience and long-term regulatory compliance, resulting in an ongoing risk to water supply reliability and the ability to meet future demand.

Therefore, the Do-Nothing scenario would:

- Fail to provide a secure, reliable and compliant water supply;
- Result in loss of the existing water supply due to cessation of permitted abstraction;
- Be inconsistent with regulatory and planning requirements; and,
- Maintain or potentially increase environmental pressures on designated sites.

On this basis, the Do-Nothing scenario was not considered a reasonable long-term solution.

4.2. Alternative Water Supply Assessment

As outlined above and identified during the upgrade of the Lough Talt Water Supply Project, the continued operation of the Lough Talt WTP and associated abstraction from Lough Talt was considered unsustainable due to the potential adverse effects of the abstraction on the Lough Hoe Bog SAC and the River Moy SAC.

In order to obtain planning consent to upgrade the Lough Talt WTP for a temporary period, an Article 6(4) Assessment of Alternative Solutions and IROPI was undertaken as part of the planning application. A Replacement Supply Options Report (see Volume 3, Appendix 4-1 – Assessment of Likely Significant Effects of Replacement Options) was also prepared and submitted with the planning application in 2018, examining potential alternative sources and supply arrangements that could provide a sustainable long-term replacement for the existing Lough Talt supply.

The objectives for identifying a long-term solution for the Lough Talt RWSS were:

- To provide long-term safe supply of drinking water including reduction in the risk of formation of THMs and the effective treatment barrier against *Cryptosporidium*; and,
- To eliminate the environmental impact on Lough Talt and any other water courses associated with the final solution.

In order to compare and evaluate the replacement water supply options, each option was assessed in terms of risk associated with the particular option. The following risks were assessed;

- Security of supply;
- Raw water quality;
- Planning;
- Water abstraction Licence/Order;
- Environmental;
- Technical Delivery; and,
- Programme.

In relation to source of supply, three sources were examined and a summary of the assessment is as follows:

- Lough Conn was considered the most favourable option, subject to confirmation through a yield assessment. Lough Conn is classified by the EPA as having ‘good’ water quality status, and under the Water Framework Directive (WFD) it is categorised as not at risk. Given the size and storage capacity of Lough Conn, it was considered unlikely that an increase in abstraction would have a significant impact on the hydrological regime of the River Moy SAC, although this would be subject to further assessment.
- Lough Gill was considered a less favourable option. Lough Gill is classified by the EPA as having ‘moderate’ water quality status and is categorised under the WFD as at risk. It is also unclear whether the lake has sufficient capacity to sustainably support the proposed increase in abstraction to serve the Lough Talt supply.
- Lough Easkey was considered the least favourable option. Although there may be sufficient capacity to support the Lough Talt Water Supply Scheme, this would need to be undertaken in conjunction with abstraction from Lough Gill and would be subject to a yield assessment. Lough Easkey is classified by the EPA as having ‘good’ water quality status and is categorised under the WFD as not at risk. There are no known issues with raw water quality. However, the presence of the Geyer’s whorl snail (*Vertigo geyeri*) in the vicinity of Lough Easkey and along the downstream slopes adjacent to the Lough Easkey River presents a significant environmental constraint. Increased abstraction could potentially have adverse impacts on

these populations, particularly during drought conditions. As a result, a substantial monitoring programme would likely be required before any increase in abstraction could be considered, with a high likelihood of adverse findings in the context of the Habitats Directive assessment process.

In total, seven options were identified (involving the three water supply sources) and analysed for the replacement for Lough Talt:

Option 1: Supply from Lough Conn and upgrade existing Lisglennon WTP and supply Lough Talt RWSS via Ballina and Bonniconlon.

Option 2: Supply from Lough Conn and upgrade existing Lisglennon WTP and supply Lough Talt RWSS via Foxford and Aclare.

Option 3: Supply from Lough Conn with new Water Treatment Plant at southern end of Lough Conn and Supply Lough Talt RWSS via Foxford and Aclare.

Options 1 to 3 were considered to have the lowest risk, offer the best security of supply, use of a high-quality raw water source, allow eventual cessation of abstraction from Lough Talt, and manageable environmental impacts compared with alternatives.

Option 4: Supply from Lough Gill to supply Lough Talt RWSS.

This option of combined sources, while technically feasible, carried considerably high environmental, planning and delivery risks considering issues set out above in relation to Lough Gill and the known risks with the Lough Talt supply. This option included a lot of risk in relation to impact on European sites and also required major infrastructure.

Option 5: Supply from combination of Lough Gill and Lough Easkey and supply Lough Talt RWSS.

Option 6: Provide new WTP at Lough Talt and in combination with supply from Lough Gill supply Lough Talt RWSS.

Option 7: Provide new WTP at Lough Talt and in combination with South Sligo RWSS supply Lough Talt RWSS.

Options 5, 6 and 7 were not favourable. They created significant ecological risks in relation to the Ox Mountains Bogs SAC, retained dependence on Lough Talt (with associated ecological sensitivity) and required significant additional infrastructure and integration with a number of supply schemes.

Following completion of feasibility studies, Option 1 (Supply from Lough Conn and upgrade existing Lisglennon WTP and supply Lough Talt RWSS via Ballina and Bonniconlon) was identified as the preferred option.

4.3. Reappraisal and Alignment with the National Water Resource Plan / Regional Water Resource Plan – North West

As the option development process progressed following the 2019 decision, a broader Uisce Éireann strategic planning framework emerged through the publication of the NWRP and Regional Water Resources Plans (RWRPs). These plans provided an updated assessment of long-term water resource needs and identified strategic interventions required to ensure a sustainable and resilient water supply.

The NWRP (Irish Water 2021a) noted that understandably planning for many projects had been and continued to be underway at the time the plan was being developed and that certain projects had been initiated prior to the development of the Framework Plan (Irish Water, 2021a). These projects are called 'in-flight' projects and the Lough Talt Supply Project was one such 'in-flight' project.

In light of this new policy context, a review of the strategic options for the Lough Talt water supply was undertaken. The purpose of this review was to assess the previously identified preferred solution against the emerging national and regional water resource strategies, ensuring that it remained appropriate, aligned with wider strategic objectives, and was capable of meeting future supply and demand requirements. The outcome of this review informed the ongoing development and refinement of the project.

The NWRP (Irish Water, 2021a), the RWRP – North West (RWRP-NW) (Irish Water, 2023a), and the associated Supply Demand Balance (SDB) framework established the strategic requirement to improve water supply resilience through increased treatment capacity, network reinforcement, leakage reduction, regional interconnection and the rationalisation of smaller or environmentally constrained supplies where appropriate.

The development of the RWRP-NW allowed Uisce Éireann to review water supply needs collectively for the entire North West region and across the spectrum of risk including quality, quantity, reliability, and sustainability. It allowed Uisce Éireann to consider local options to resolve these needs and larger Regional Options that can address needs across multiple supplies.

The North West region is subdivided into Study Areas to assist in the identification of needs and solutions. Both the Ballina and Lough Talt WRZs lie within Study Area C (SA-C) (Figure 4-1), which is presented in Appendix 3 Study Area C Technical Report' of the RWRP NW (Irish Water, 2023b). The RWRP-NW aimed, as part of a desktop level study, to examine all potential options that could be used to meet projected demand within the WRZ (unconstrained options) and then eliminate options (options assessment screening) which are not feasible or which involve unacceptable levels of environmental impact.

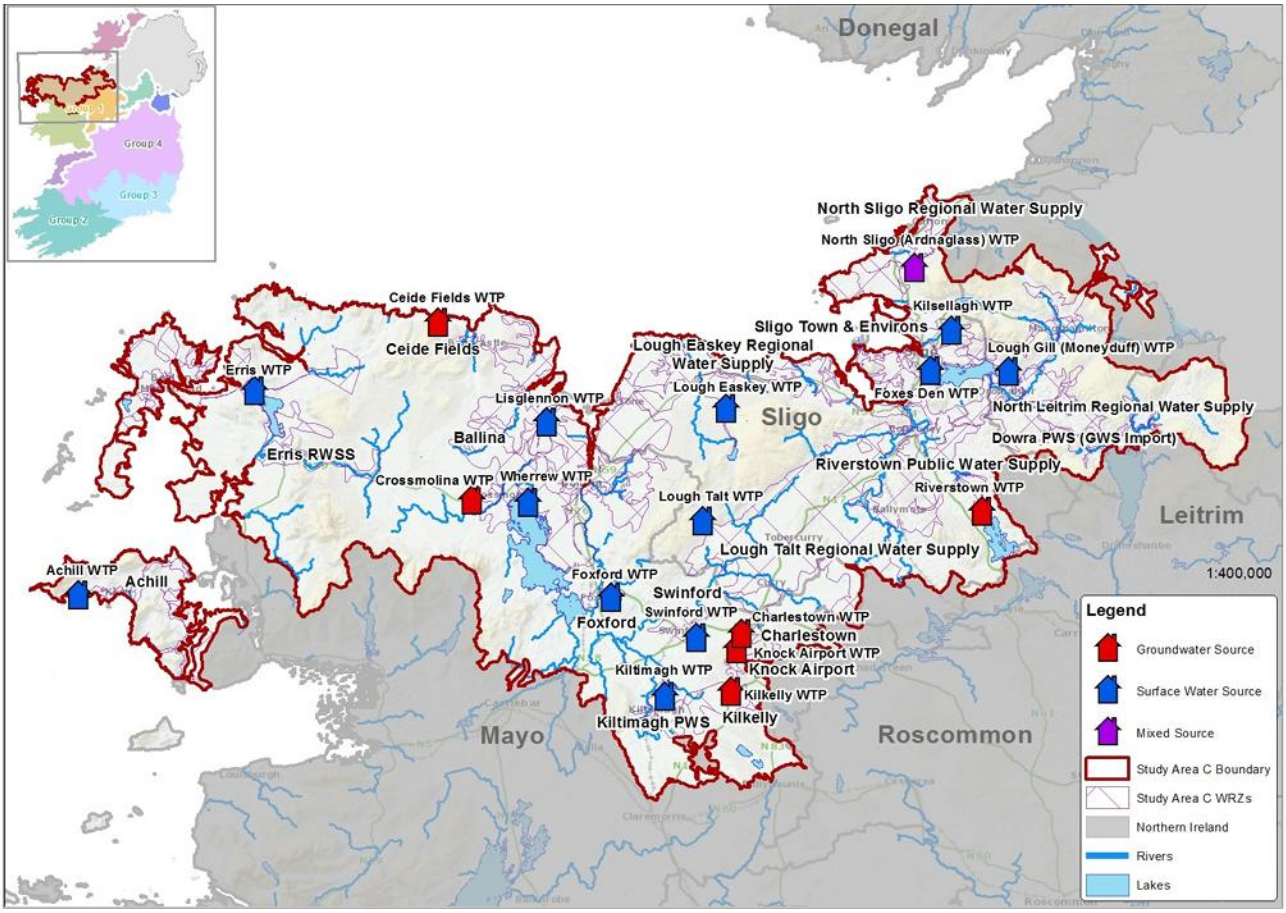


Figure 4-1 – SA-C Water Supply Study Area (Source: Irish Water, 2023b)

SA-C relies predominantly on surface water sources, including Lough Conn, Lough Talt, Lough Gill and other regional lakes. A review of water quality, supply reliability and long-term sustainability identified risks at several existing water treatment plants, including those at Lough Talt, Lisglennon and Wherrew.

To address these issues and secure future water supplies, Uisce Éireann undertook a comprehensive option development process in line with the NWRP and RWRPs. A total of 214 potential water supply options were initially identified and progressively screened against technical, environmental, sustainability and deliverability criteria. This process resulted in a shortlist of feasible options capable of meeting the long-term water supply needs of the region.

The findings of the assessment for SA-C as set out in Appendix 3 of the RWRP-NW (Irish Water 2023b) were:

- Decommissioning four existing abstractions that may not meet the sustainability guidelines – Lough Talt (Lough Talt Regional Water Supply), Lough Easkey (Lough Easkey Regional Water Supply), Kilsellagh Impounding Reservoir and Carrow Cañada Spring (Swinford WRZ);
- Ongoing leakage management. Planning leakage reduction programme to reduce leakage by 578 m^3/d between the North Leitrim Regional Water Supply, Ballina and Sligo Town & Environs WRZs.

All options were assessed, to identify which solution performed best under a set of categories, resulting in a number of alternative 'approaches'. Six categories/approaches were specifically chosen to ensure that the NWRP aligns with relevant Government Policies. These were used by Uisce Éireann as a means of identifying or 'configuring' options focused on a particular outcome, while meeting the required future water demand. The six approaches/categories are listed below:

- Least Cost;
- Best Appropriate Assessment (AA);
- Quickest delivery;
- Best Environmental;
- Most Resilient; and,
- Lowest Carbon.

Once all options were assigned in terms of the best performing within each of the six approach criteria shown above, they were compared against each other in a seven-step assessment process. This enabled the development of the Preferred Approach for a Study Area across three stages, each focusing on different assessment levels:

- Stage 1 examined solutions at WRZ level (local solutions);
- Stage 2 assessed whether there were any options that might resolve deficits across multiple WRZs at Study Area Level; and,
- Stage 3 examined combinations of solutions at Study Area and WRZ Level, to determine the best performing combination, ultimately leading to what is referred to as the 'Preferred Approach at Study Area Level'.

The sources considered for the Lough Talt WRZ were Lough Conn and Lough Gill. The determination of the RWRP-NW using the above methodology was that the preferred solution (Group 43) for meeting the Lough Talt deficit was to rationalise Lough Talt WRZ and Lough Easkey WRZ to the Ballina WRZ, which is sourced from Lough Conn (Irish Water, 2023b). The point of abstraction from Lough Conn would remain at the existing location of Wherrew with significant existing abstraction infrastructure and transfer capacity in place at Wherrew to accommodate the necessary increase in water supply to the Ballina WRZ and onwards to the Lough Talt WRZ.

Lough Conn supplies two existing treatment facilities for Ballina Water Supply – Lisglennon and Wherrew. The existing Lisglennon WTP had the capacity to expand and provide the necessary treatment capability for the additional water supply. The preferred solution, comprising the expansion of Lisglennon WTP supplied by Lough Conn, was deemed to be substantially compliant with the NWRP objective of optimising existing regional water resources and infrastructure to deliver a secure and sustainable supply.

Consequently, the project evolved from a standalone replacement supply for the Lough Talt RWSS to supporting the wider water supply needs of the region and developed into the Ballina and Lough Talt Water Supply Upgrade Project (i.e. the Proposed Development), incorporating upgrades to the Ballina supply system to facilitate the transfer of supply to the Lough Talt area.

Therefore, the assessment of reasonable alternatives in respect of the Proposed Development, as addressed below, did not re-consider strategic alternatives that had been considered by the NWRP and RWRP (Irish Water, 2021a; 2023a) and was carried out within the defined Proposed Development objectives. Therefore, the reasonable alternatives in respect of the Proposed Development have been assessed.

4.4. Alternatives for the Proposed Project

The alternatives assessed within this section are the design options that transfer the water supply from Lough Conn to the Ballina and Lough Talt Water Supply Schemes. The assessment initially focused on the identification of a suitable pipeline corridor. In tandem, the technical requirements of the transfer system were examined, including the need for a pumping station to facilitate water conveyance and a break pressure tank to regulate pressures within the network. A range of routing, siting and design alternatives were considered and are set out hereafter.

4.4.1. Route selection

The preferred pipeline route corridor was required to follow existing infrastructure where possible to minimise environmental effects, and was therefore aligned with the road network. The preferred route corridor (i.e. Option 1 – Supply from Lough Conn and upgrade existing Lisglennon WTP and supply Lough Talt RWSS via Ballina and Bonniconlon) primarily followed a route along the R314 (Ballina to Killala Road), Creggs Road, Behy Road and the R294 (Ballina to Tobercurry Road). The Study Area for the final route selection of the watermain is shown in the Figure 4-2.

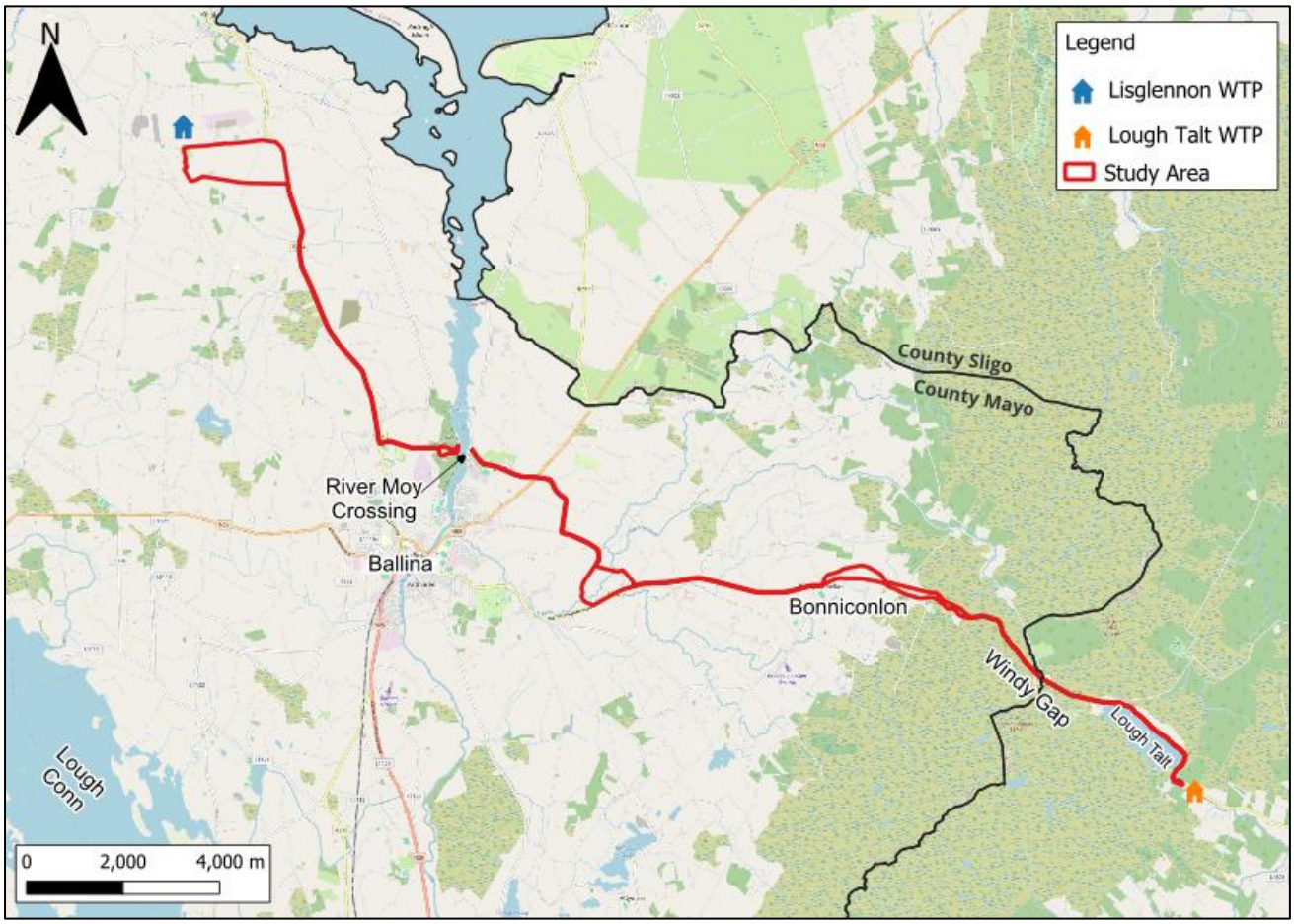


Figure 4-2 — Treated water pipeline route selection Study Area

A route selection assessment was carried out on the pipeline route in order to:

- Address particular constraints which were identified along the preferred route corridor including major and minor watercourse crossings; and,
- Refine the preferred route corridor where more than one suitable road or track existed along the selected corridor.

Following a detailed review of the preferred pipeline route, including topography, watercourse crossings, existing utility infrastructure, road network and constructability constraints, a number of localised route options were identified as shown in Figure 4-3. These route options were categorised as follows:

- Five locations where route options across a larger area need to be considered, (referred to as 'Locations 1 - 5'); and,
- Ten localised crossings (LCs) at smaller watercourse crossings (namely: LC 004, LC 005, LC 006, LC 010, LC 011, LC 015, LC 016, LC 017, LC 018 and LC 019).

A map of the options are provided in Appendix 4-2 – Final Route Options, Volume 3 of this EIAR.

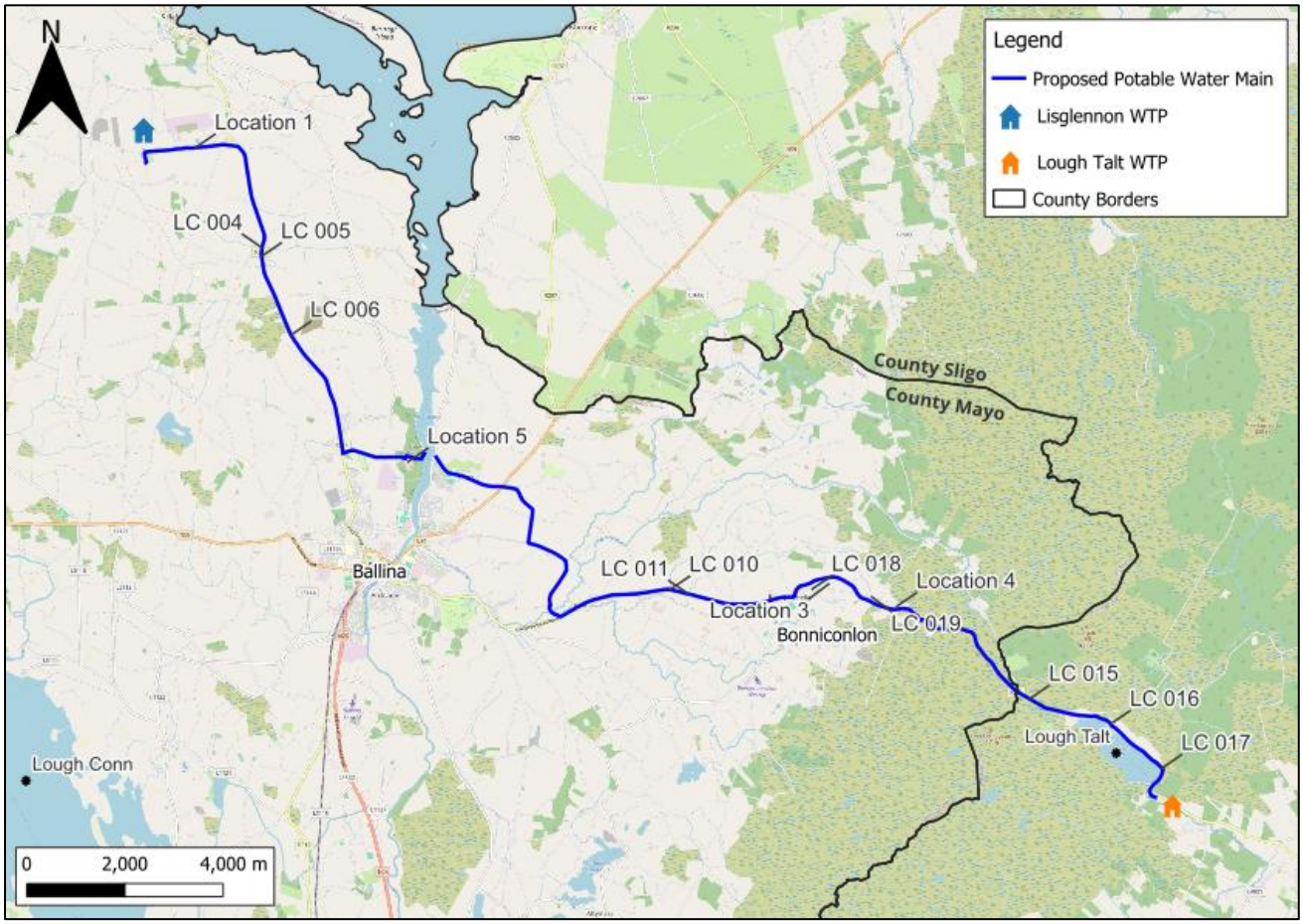


Figure 4-3 – Primary Route Option Locations (1 to 5) and Localised Crossings (LCs)

For the various options identified, Uisce Éireann's Guidance Note "IW-AD-PD-GL-008 A Guide to Route and Site Selection (Rev 3.00) (Irish Water, 2021b) was followed across four pillars, namely technical, economic, environmental and planning. Each was scored as one of 'Advantageous', 'Neutral' or 'Less Advantageous'. Sub-criteria also assessed pipeline length; topography; utility interfaces; effects on structures; traffic disruption; stakeholder interface; constructability; access; land/wayleaves; geotechnical; carbon; ecology/biodiversity;

landscape; geology/hydrogeology; hydrology; noise/air; archaeology/cultural heritage; planning history; land-use zoning; and plan policies. Desktop constraints mapping, site inspections (including bridge/culvert visual checks), and qualitative/quantitative comparisons were combined to rank options and designate preferred pipeline routes (where there was an option) and water course crossings. The outcome of the route assessments and overall preferred routes for the five locations (Locations 1 to 5) are summarised in the Table 4-1 below.

Table 4-1 – Summary of treated water pipeline route assessment (Locations 1, 2, 3, 4 and 5)

Location	Preferred Route	Summary of assessment
Location 1 – Lisglennon WTP to R314	1C	Five routes were assessed. 1C was considered most preferrable. It involved the shortest (approx. 2.4 km), least traffic effect (mainly off-road fields parallel to an existing 500 mm main), good constructability; all constraints manageable. Long, road-based alternatives (1A/1B) considered more constrained for deep excavations, traffic/HGV disruption, bridge interfaces. This route will have the lowest carbon footprint. Routes 1D and 1E were discounted given the longer alignments with greater interactions with existing utilities and do not offer the same constructability advantages.
Location 2 – Behy Rd / R294 & River Brusna / Black	2C	Three routes were assessed. 2C was selected as it is the shortest (approx.. 1.1 km) entirely off-road in fields, one Brusna crossing away from the confluence, a low traffic effect/utility conflict, and fewer structural interfaces. This pipe route has only one river crossing. This will be carried out using Horizontal Directional Drilling (HDD) under the river and will have minimal environmental effect. 2A (on-road) is most constrained (two river crossings, bridge/underpass interfaces, traffic and ecological risk within River Moy SAC). While Route 2B was viable, Route 2C offered a shorter route with fewer overall constraints and was therefore selected as the preferred alignment for Location 2.
Location 3 – Bonniconlon to Drumsheen	3B	Two routes were assessed and 3B was selected as it is the shortest (approx. 1.3 km) along the local L51172; lower traffic effect than the R294 alternative; least constrained from a biodiversity perspective as it would include a small stream crossing.
Location 4 – Drumsheen (L51172 vs R294)	4B	Two routes were assessed and 4B was selected as it uses the local road/access track for most of its length - fewer traffic and hydrology interfaces than the R294 option (which has more culverts/stone arches to manage). 4A followed the R294 and would result in greater traffic disruption and more watercourse crossings.
Location 5 – Belleek Castle grounds to Moy crossing	5C	Three routes were assessed and 5C emerged as the preferred option as it avoids extensive Japanese knotweed (*Reynoutria japoponica*) present on the 5A line, follows wider woodland paths that reduce tree effects and construction constraints, and limits effects on the operating hotel. This option has minimal environmental effects as it avoids an area of invasive species and considers the root protection zones.
Summary		The composite preferred route corridor is, therefore, formed by 1C-2C-3B-4B-5C, tying into the existing 450 mm watermain at the River Moy crossing in Belleek Woods.

With regard to LCs, it was considered that due to limited differences in location of options being compared, there was low sensitivity for some of the selected sub-criterion. Hence, while the localised crossings utilise the same set of Technical, Economic, Environmental and Planning criteria, a shorter list of sub-criteria were assessed at these locations.

LCs were assessed by comparing 'offline' crossings (e.g. through fields, avoiding bridge structures etc.) with 'online' crossings (e.g. within existing carriageway, through existing culverts or under bridges) and then selecting the least constrained. A strong pattern emerged, i.e. to choose 'offline' crossings to avoid working in/under stone-arch bridges, except where an online solution was determined to be technically feasible and have manageable risk. The emerged preferred options were LC 004B, LC 005B, LC 006B, LC 010A, LC 011A, LC 015A, LC 016B, LC 017A, LC 018B, LC 019B.

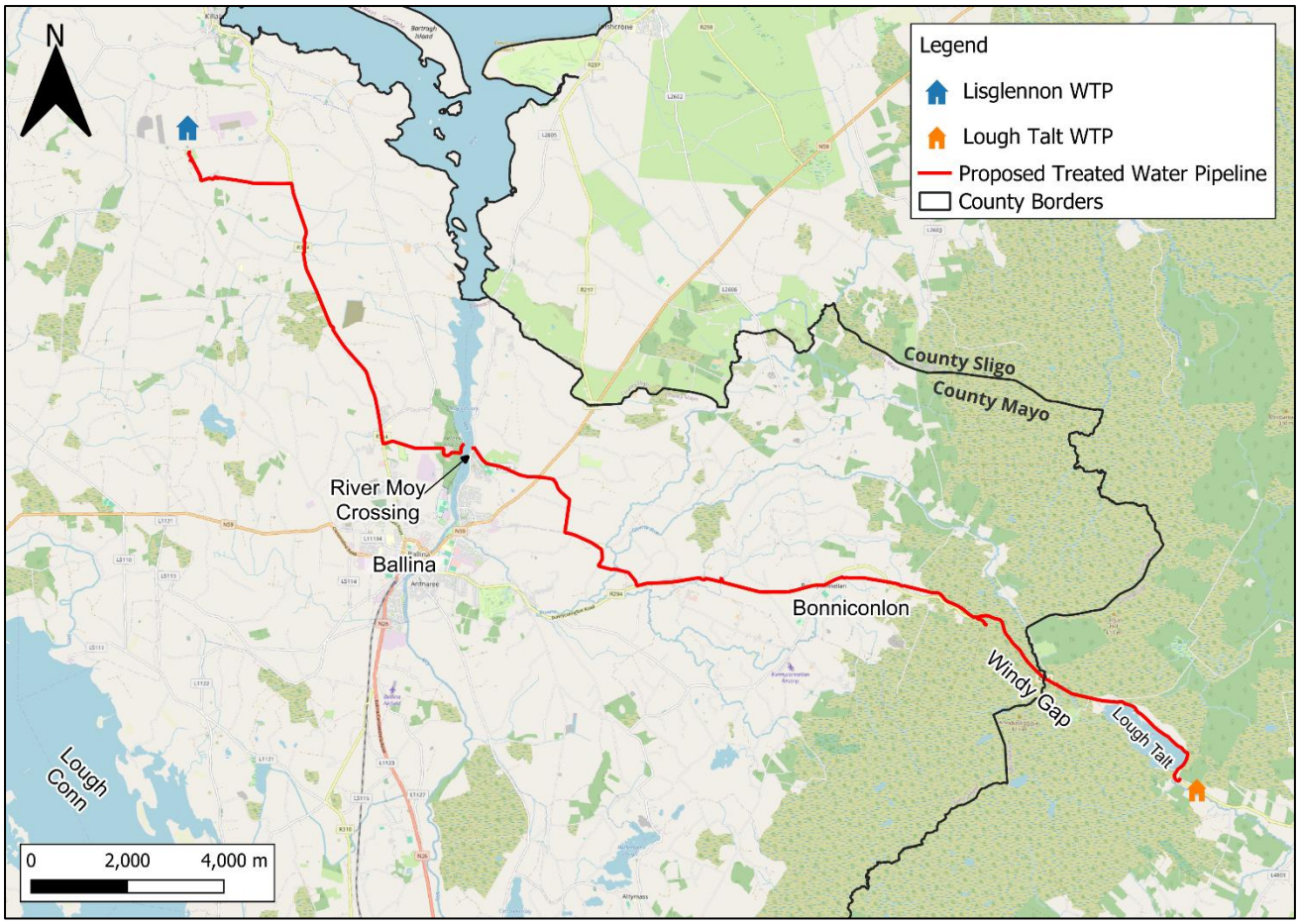


Figure 4-4 – Preferred Route Corridor

The preferred corridor shown in Figure 4-4 performed best for the following reasons:

1. Shortest practicable length – At each location the chosen line (1C, 2C, 3B, 4B) is the shortest or near-shortest option, thus reducing materials, excavations, pumping headloss, and embodied carbon.
2. Fewer works on busy regional roads – Preference was given to local roads or off-road fields as they materially reduce traffic effects versus routes primarily along the R294/R314. They also avoid extended HGV diversions near quarries and community hubs.

3. Avoidance of sensitive structures – 'Offline' choices steer clear of stone-arch bridges (multiple sites), limiting the need for deep or complex online works and safeguarding heritage structures.
4. Environmental discipline – The corridor avoids designated sites and, where SAC interaction cannot be avoided, e.g. River Moy SAC at Location 2; proximity to Lough Hoe Bog SAC near LC 015/ LC 016, reduces river interfaces where possible. Risks are minimised through single rather than multiple watercourse crossings and use of trenchless methods and route alignment choices away from qualifying habitats. In Belleek Woods the selected 5C alignment avoids extensive Japanese knotweed (*Reynoutria japonica*) and minimises tree/root effects by using wider paths. Thus, Option 5C was taken forward.
5. Constructability and access – Preferred routes provide adequate working width, fewer tight urban interfaces, and manageable access (even where multiple wayleaves are required), with clear plans for farm-gate entry and private-land coordination.
6. Planning fit – The pipelines would be below ground and routes are largely outside settlement cores or on existing roads/tracks, align with County Development Plan objectives and Local Area Plan (LAP) zoning (e.g. Recreation & Amenity at Belleek where utilities are 'open for consideration'), and avoid conflicts with protected structures or recorded monuments. A search for other projects planned for construction, within the jurisdictions of Mayo, Sligo and An Coimisiún Pleanála, which may overlap the with the Proposed Development spatially or temporally has been compiled and the compiled list is presented in Chapter 20 – Cumulative Impact Assessment and Interactions. The potential for cumulative effects with these other projects has been assessed within each topic-specific chapter of Volume 2 of this EIAR and summarised in Chapter 20.
7. Carbon and reinstatement – Shorter lengths, fewer deep urban excavations, less regional-road reinstatement, and reduced bridge interventions contribute to a lower embodied carbon profile overall.

The preferred route corridor combines 1C, 2C, 3B, 4B and 5C with localised crossings as above (mostly offline), connecting to the pre-laid Moy crossing in Belleek Woods. This corridor best balances technical feasibility, environmental stewardship, traffic and stakeholder effects, planning compliance, and carbon. The preferred corridor reflects a consistent decision pattern for the shortest workable alignments, minimised works on busy regional roads, avoiding direct interventions to heritage arch bridges, using trenchless technology for single river crossings where possible, and prioritises biodiversity and carbon outcomes while ensuring constructability and access. The resulting Preferred Route Corridor will be approx. 30.2 km in length.

4.4.2. Site Selection

Having identified the preferred pipeline route through the route selection process, a separate assessment was undertaken to determine the most suitable locations for the pumping station and break pressure tank.

The majority of the infrastructure sites ('key locations') are existing. These include Wherrew Raw Water Intake and Pumping Station, Lisglennon Raw Water Intake and Pumping Station, Lisglennon WTP, Lough Talt WTP, Bonniconlon Reservoir and the existing water supply network assets. The site selection process therefore focused on identifying the most suitable sites for the construction of the new Bonniconlon BPS and Windy Gap BPT by:

- Identifying areas with major constraints to the Proposed Development that should be avoided where possible;
- Identifying and comparing potential sites within the residual lands to narrow down the options; and,
- Evaluating and comparing all short-listed sites to identify the least constrained option.

4.4.2.1. Study Area & Site Screening

The site selection study areas for the BPS and the BPT were defined by the operational and hydraulic requirements of the proposed trunk main, while also allowing sufficient flexibility to identify practicable and environmentally preferable locations for new above-ground infrastructure (Figure 4-5). Two separate study areas were identified: one for the proposed BPS west of Bonniconlon, and one for the proposed BPT at Windy Gap.

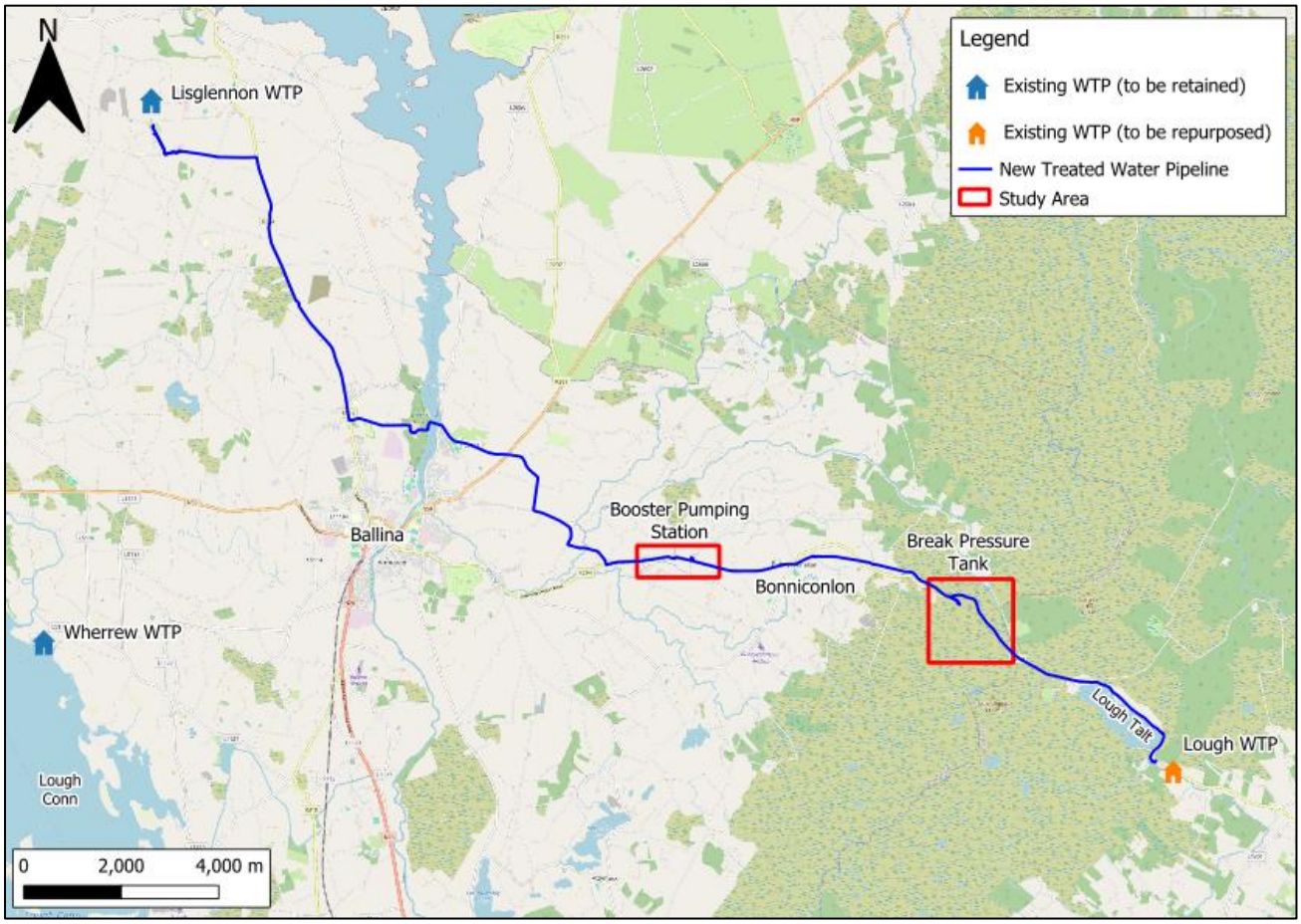


Figure 4-5 – Site Selection Study Area

The Bonniconlon BPS Study Area was informed by the hydraulic assessment, which identified the need for a pumping station west of Bonniconlon to maintain the required residual pressures in the new trunk main and to maximise the use of gravity flow. Potential sites were therefore limited to lands within the approximate elevation band of 30 to 40 m Ordnance Datum (OD) and within reasonable proximity to the trunk main alignment and available road access.

The Windy Gap BPT Study Area was informed by the preliminary hydraulic and transient/surge assessments, which identified the operational benefit of locating a break pressure facility at or close to the high point of the new trunk main near Windy Gap. The Study Area therefore focused on lands within the approximate elevation band of 190m to 210 m OD, where a BPT could provide transient suppression, assist pressure management and reduce the risk of negative pressures at the summit of the pumped main.

In both Study Areas, the identification of potential sites also had regard to access, constructability, land availability, proximity to existing utilities, environmental constraints and planning considerations. Direct access

from the R294 was avoided where practicable, having regard to the strategic function of this regional road and the relevant objectives of the Mayo County Development Plan 2022-2028 (Mayo County Council, 2022).

A staged site selection process was then undertaken. The first stage comprised an initial screening of potentially suitable lands within each study area to remove locations subject to significant constraints or locations that would not meet the core operational requirements of the BPS or BPT. The second stage comprised a more detailed comparative assessment of the shortlisted sites to identify the least constrained and most appropriate option for each item of infrastructure.

The initial screening considered whether potential sites could meet the required hydraulic elevation, could be accessed from suitable local roads, and could be connected to the proposed trunk main without disproportionate additional pipeline length or construction complexity.

Sites were also screened to avoid, where practicable, major environmental, planning and land-use constraints. The initial screening assessment considered:

- Compliance with the required elevation bands for each asset, including approx. 30m to 40 m OD for the BPS and approx. 190m to 210 m OD for the BPT.
- Avoidance of direct access from the R294, where practicable, having regard to its function as a strategically important regional road. This is in compliance with Policy MTP 28 of the Mayo County Development Plan 2022-2028 (Mayo County Council, 2025). As per this policy, '*new accesses to Strategically Important Regional Roads, is generally to be avoided unless it can be demonstrated that the development is required for economic or social reasons and cannot elsewhere be accessed*'.
- Availability of suitable local road access and reasonable proximity to the proposed trunk main.
- Avoidance of planning or zoning conflicts, including lands with recent planning permissions where these could constrain delivery.
- Avoidance of designated ecological and archaeological and architectural heritage sites, where possible.
- Avoidance of areas within the 1-in-1,000-year fluvial flood extent, where possible.
- Maintenance of an appropriate separation distance from sensitive receptors.
- Limiting additional pipeline connections and construction footprint where practicable.

Shortlisted sites were then assessed in accordance with Uisce Éireann's IW-AD-PD-GL-008 route and site selection criteria (Rev. 003) (Irish Water, 2021b). The assessment considered technical and economic, environmental and planning criteria, with each site. The detailed assessment considered factors including topography and elevation, pipeline connection length, access and traffic effects, constructability, land requirements and wayleaves, geotechnical conditions, utility and power connections, carbon and energy considerations, ecology and biodiversity, landscape and visual effects, hydrology and flood risk, geology and hydrogeology, noise and air quality, archaeology and cultural heritage, planning history, zoning and development plan policy, and proximity to population and sensitive receptors.

4.4.2.2. Bonniconlon Booster Pumping Station

An initial screening exercise identified five potential sites (sites 1, 2A, 3A, 4A and 5), as shown in Figure 4-6. These sites were screened against the core site selection requirements, including hydraulic suitability, proximity to the proposed trunk main, access, land requirements, constructability, environmental constraints, planning considerations and avoidance of direct access from the R294 where practicable.

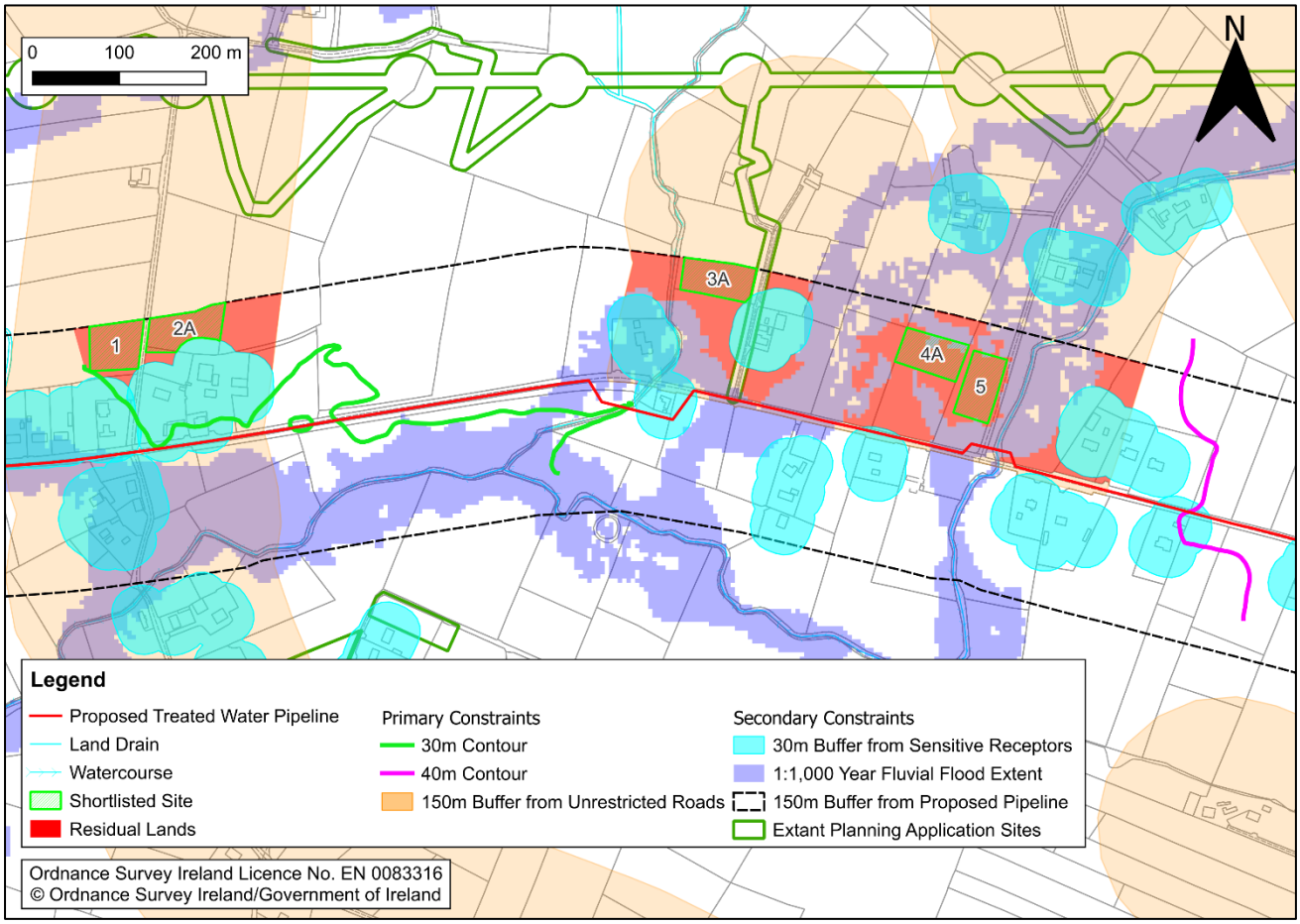


Figure 4-6 – Booster Pumping Station: Shortlisted Sites for Detailed Assessment

All five sites were located within the required hydraulic elevation band and outside designated environmental sites. Each site could be accessed from the local road network rather than directly from the R294, and each was considered capable of being connected to the proposed trunk main without disproportionate construction complexity.

The detailed assessment (Table 4-2) considered the key differentiators between the shortlisted sites, including access arrangements, land and wayleave requirements, pipeline connection length, proximity to sensitive receptors, landscape and visual considerations, flood risk, constructability, utilities and operational requirements.

Table 4-2 – Key differentiators among potential BPS sites from detailed assessment

Differentiator	Decision process
Access & wayleaves and associated pipeline lengths	Sites 1 and 5 fronts a viable local road (short access; minor grassed bank removal) and sits wholly in one folio (no wayleave/Right Of Way), has no direct access from the R294, and complies with Policy Objective MTP 28 of the Mayo County Development Plan 2022 –2028 (Mayo County Council, 2025) in relation to new access to Strategically Important Regional Roads. Site 4A lacks a viable local-road frontage, needs the longest access road and involves cross-folio wayleaves Sites 2A and 3A also fronts a viable local road and is single-folio, has no direct access from the R294, and complies with Policy Objective MTP 28 of the Mayo County Development Plan 2022-2028 (Mayo County Council, 2025). However, are farther from the R294, requiring the longest pipe runs, increased excavation and increased carbon emission.
Landscape/visual & receptors	Sites 4A and 5 are visible from the Scenic Route (R294), Sites 1, 2A and 3A benefit from existing screening.
Biodiversity, Population & Sensitive Receptors	Site 5 has the least impact on biodiversity as there are no protected or invasive species, no features of high ecological value and no loss of hedgerow for this site. Sites 3A, 4A and 5 are outside the Bonniconlon built up area and has lesser impact on Population & Sensitive Receptors with respect to odour, noise and air quality.
Selection outcome	Site 5 was subsequently identified as the preferred site because it provides suitable local road access, requires shorter lengths of pipeline, is located within a single landholding, avoids cross-folio wayleaves and has lesser impact on biodiversity and lesser impact to sensitive receptors. While it is located on a scenic route, on balance, Site 5 presented the lowest overall constrained profile and was therefore selected as the final location for the Bonniconlon BPS.

4.4.2.3. Windy Gap Break Pressure Tank

The need for a BPT at Windy Gap was identified through the preliminary hydraulic and transient/surge assessments. These assessments identified the high point of the proposed trunk main, at approx. 190 m OD, as the preferred operational location for pressure management and transient suppression. Locating the facility at or close to this high point would assist in managing pressures within the pumped main, reduce the risk of negative pressures at the summit, and provide additional operational resilience within the transfer system.

A site selection assessment was therefore undertaken to identify the most suitable location for the Windy Gap BPT, applying the same staged methodology used for the Bonniconlon BPS. The initial screening for alternative sites focused on lands within the required elevation band of approx.190m to 210 m OD, while also having regard to proximity to the proposed trunk main, access, constructability, land requirements, utilities, environmental constraints and planning considerations. . Two sites namely 1N and 2A were shortlisted and brought forward for detailed assessment. Both the sites lie on blanket bog (construction complexity acknowledged) and were therefore brought forward to detailed comparative assessment. The location of the two sites is shown in Figure 4-7 below.

The detailed assessment is summarised in Table 4-3 and considered the key differentiators between the two shortlisted sites, including pipeline connection length, constructability, power and utility connections, ecological constraints, landscape sensitivity and proximity to Lough Hoe Bog SAC.

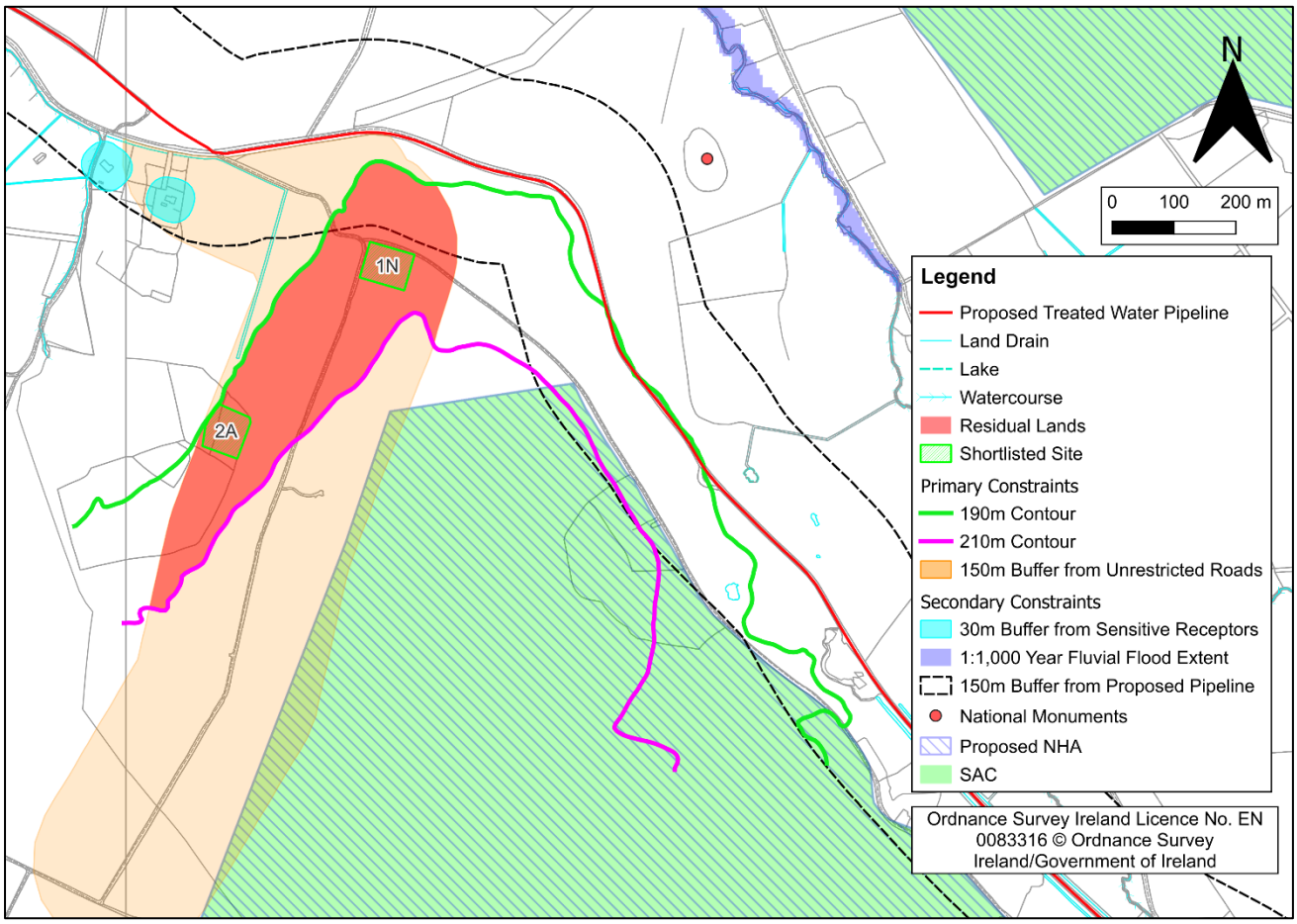


Figure 4-7 – Break Pressure Tank: Shortlisted Sites for Detailed Assessment

Table 4-3 – Key differentiators between potential break pressure tank sites from detailed assessment

Differentiator	Decision process
Pipelines & constructability	Site 1N would require less pipe lengths approx. 290m, (relatively closer to R294) compared to Site 2A, which would require approx. 760m of pipeline. Both the sites would require careful considerations for construction in peat.
Power/utility connections	Site 1N lies closer to MV power lines. Site 2A only has HV nearby, requiring more enabling works for electrical supply.
Land acquisitions	Site 1N and access road is within single folio, however, Site 2A and its access road would require two separate folios. Both the sites would require land acquisition of similar scale. However Site 1N would have reduced number of right of way and wayleave requirements, compared to Site 2A.
Ecology, Biodiversity &	Both the sites are not located within a Lough Hoe Bog SAC, nor within any SPA, NHA or pNHA and will not likely have potential effects on ecology.

Differentiator	Decision process
Landscape Sensitivity	Both the sites would have some impact on an area of NPWS mapped Non-Qualifying Interest Annex I Blanket Bog habitat [7130]. Both the sites are located to the south of the designated scenic route of R294 and would have some visual impact.
Selection outcome	Site 1N is preferred because it has less ecological risk (farther from Lough Hoe Bog SAC), an easier power connection (proximity to MV), and short lengths of pipeline due to proximity to the Private Road / Commonage, shorter access road and lesser wayleave requirements, easier to construct the tank partially below ground, minimising landscaping requirements. Both the sites require careful landscape/ecology design and bog-specific construction controls but Site 1N presents the lower overall constraint profile.

4.5. Design Alternatives

Following site selection, each key location was subject to a review to identify any necessary upgrades and new infrastructure required. Due to the inherent constraints as set out in Section 4.3, there was limited scope for reasonable alternatives in design, however alternative options considered are set out below. The EIA was undertaken and measures and mitigations identified which would avoid, reduce, remedy or offset adverse effects on the environment were incorporated into the design where relevant. Due to the sensitivity of the environment within the Study Area the effects of the alternatives on Natura 2000 sites, protected species was considered and was rated in the ranking assessments.

4.5.1. Wherrew Raw Water Intake & Pumping Station

Design alternatives for the Wherrew raw water intake focused on addressing sediment deposition within the existing intake channel and providing an appropriate fish screening arrangement. Options considered included new submerged intake pipework and screens within Lough Conn, and retention of the existing intake with land-based fine screening and fish recovery/return facilities. While submerged screening would provide protection at the point of abstraction, it raised greater operational, maintenance and resilience risks due to access, cleaning and blockage management requirements. The land-based screening option was therefore selected as the preferred design approach, as it provides improved access for inspection and maintenance, incorporates fisheries protection measures, avoids additional in-lake infrastructure, and maintains greater operational resilience at the existing raw water pumping station.

As the function, location and general operating arrangement of the Wherrew Pumping Station remain unchanged, no reasonable alternative design arrangements were identified for detailed assessment.

4.5.2. Lisglennon Raw Water Storage and Pumping Station

The existing Lisglennon RWS&PS site already operates in principle in the manner required to support the future development, by receiving raw water from the Wherrew intake system and transferring it onwards to Lisglennon WTP. The required future capacity can be provided through operational interventions and upgrades within the existing Lisglennon Raw Water Pumping Station, including the use, replacement or optimisation of existing pump assets. As the function, location and general operating arrangement of the site remain unchanged, no reasonable alternative design arrangements were identified for assessment.

4.5.3. Lisglennon Water Treatment Plant

The upgrade of Lisglennon WTP is required to provide the additional treatment capacity necessary to support the future supply requirements of the Ballina, Lough Talt and Lough Easkey RWSS's. The existing WTP already performs a strategic function within the Ballina RWSS and is located on an established Uisce Éireann operational site. The preferred scheme-level option is therefore dependent on increasing treatment capacity at this location rather than developing a new treatment site.

Design alternatives at Lisglennon WTP were therefore limited to the arrangement and integration of the required process upgrades within the existing site. As the function, location and general operating arrangement of the WTP remain unchanged, and as the future capacity requirement can be achieved through upgrades within the established site boundary, no reasonable alternative site or fundamentally different design arrangement was identified for detailed assessment. However, the use of Powdered Activated Carbon (PAC) was investigated as a means of reducing high concentrations of organic matter in the raw water, thereby reducing the risk of formation of disinfection byproducts such as THMs when the treated water is chlorinated for disinfection purposes. However, dosing of PAC into the raw water, while effective, would increase the volume of sludge produced. Therefore, it was decided to include a secondary filtration process stage using Granular Activated Carbon (GAC), to filter a proportion of the treated water to reduce total organic carbon concentration below the levels associated with disinfection by-product formation. The advantage of this system is that less additional sludge is produced via backwashing of the secondary filters when compared with use of PAC.

4.5.4. Repurposing of Lough Talt Water Treatment Plant

The existing Lough Talt WTP site is proposed to be repurposed to support the future operation of the Lough Talt water supply following cessation of abstraction at Lough Talt. The site already forms part of the established water supply infrastructure serving the area and is suitably located within the existing network to provide a continued operational function.

Design alternatives at this location were therefore limited to how the existing site could be adapted to support the future supply arrangement, rather than whether an alternative site should be developed. As the site is already in Uisce Éireann operational use, and as the future requirements can be accommodated through repurposing of existing infrastructure within the established site boundary, no reasonable alternative site or fundamentally different design arrangement was identified for detailed assessment.

4.5.5. Bonniconlon Reservoir

The existing Bonniconlon Reservoir site already supports the Bonniconlon WSS. As the function, location and general operating arrangement of the site remain unchanged, and as the future storage requirement can be achieved through upgrades within the established site boundary, no reasonable alternative site or fundamentally different design arrangement was identified for detailed assessment.

4.5.6. Bonniconlon BPS

A Water Pumping Station design was developed with necessary design mitigations to minimise the noise impact. Alternative options for design were constrained by the required function of the BPS.

4.5.7. Windy Gap BPT

A break pressure tank design was developed with necessary design mitigations to minimise the impact on the Bog habitat (see Chapter 7 – Biodiversity). Alternative options for design were constrained by the required function of the BPT.

4.6. Summary

The assessment of reasonable alternatives described above, demonstrates the iterative processes and assessments conducted by Uisce Éireann, and AtkinsRéalis on their behalf, to provide a sustainable water supply for the Ballina and Lough Talt supply areas. The proposed design optimises all elements of the Proposed Development, including an alternative assessment for a sustainable water supply for Lough Talt, alternative assessments for the locations for the new BPS and BPT and re-utilisation of existing infrastructure. The alternative assessment considered the economic, technical, social and environmental constraints for each option.

The trunk main routes assessment also considered the effects of the alternative routes on road, bridge crossing and through agricultural land.

The preferred options, as outlined in this chapter, were chosen because of their strengths in providing a secure water supply, while making every effort to avoid, reduce, remedy or offset adverse effects on the environment and the public. The chosen option has in its design catered for biodiversity net gain, sustainability, reduced carbon and the provision of renewable energy. The preferred option as described in Chapter 3 – Project Description is the subject of this EIAR, and is assessed in Chapters 6 to 19.

The Proposed Development supports the Mayo County Development Plan 2022-2028 (Mayo County Council, 2025), and meets the responsibility of Uisce Éireann to provide safe, reliable water supply accounting for future demand.

This outcome reflects not only the characteristics of the raw water sources themselves, but also the relative performance of the associated infrastructure required to abstract, treat and convey water from each source. Key differentiating factors included the potential to integrate with existing infrastructure, the scale and complexity of new works required, and the level of environmental, social and planning constraints associated with each option.

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