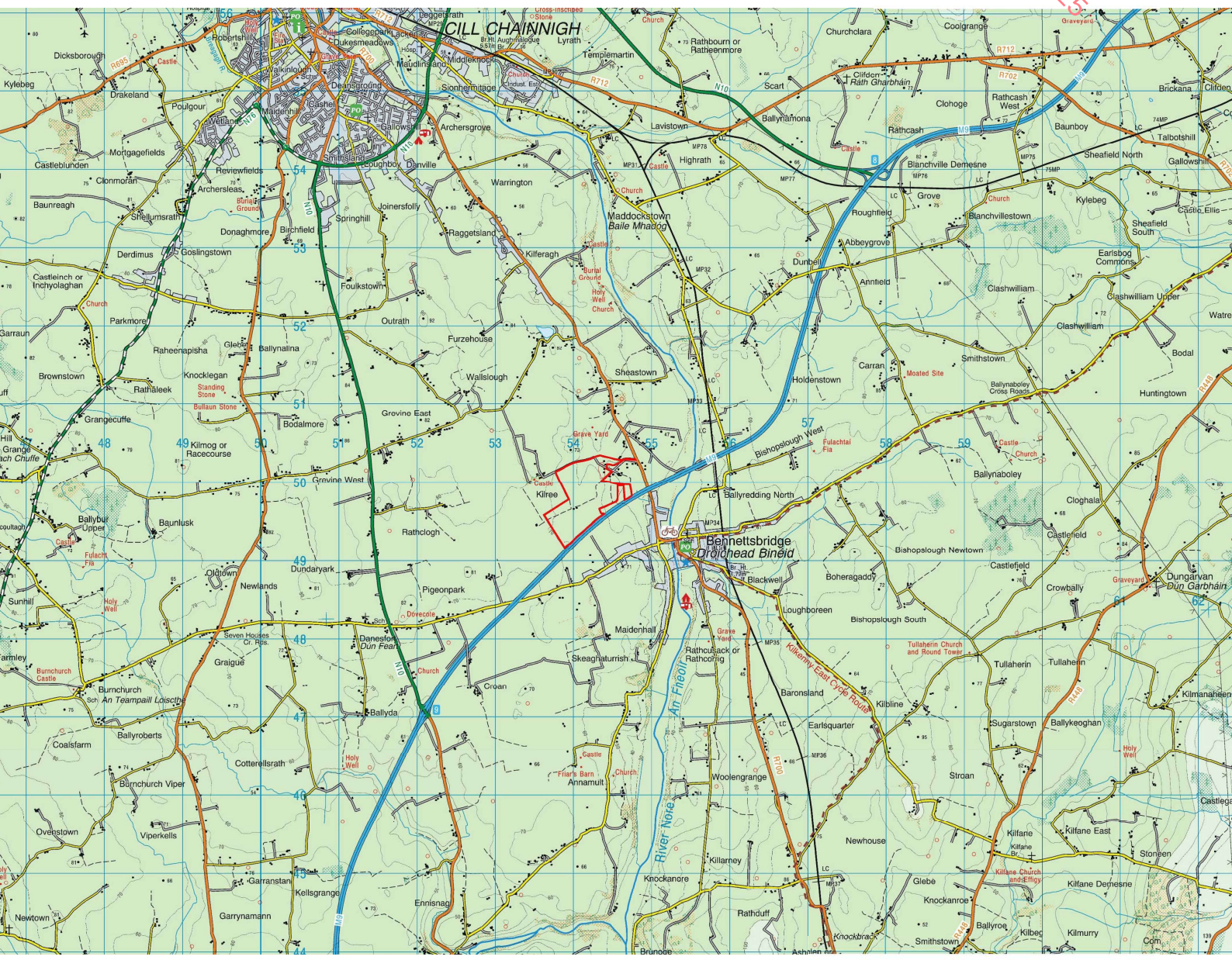
CHAPTER 8

WATER



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QUARRY CONSULTING

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CHAPTER 8: WATER

Statement of Authority

8.1 The evaluation of the Water (hydrological and hydrogeological) Environment and the assessment of Effects and Potential Impacts, with Mitigation Measures and Residual Impacts, was completed by Dr. Pamela Bartley (Hydro-G) who is considered a karst hydrogeology and groundwater specialist with specific expertise in the assessments of quarries, Section 4 Discharge Licencing and Public Water Supply.

8.2 Pamela Bartley's Statement of Expertise is presented as Appendix 8.1.

8.3 This Water Chapter and the Lands, Soils & Geology Chapter were created by the same professional civil engineering hydrogeologist because understanding the science and engineering of quarries and the hydrogeological environment results in complimentary competencies in soils, geology and the interactions between hydrology and hydrogeology.

8.4 Dr. Pamela Bartley has been working and assessing this site since 2016 and she was responsible for the site's Section 4 Licence Application and associated Assimilation Capacity Report, the EIA and Water Chapter of the EIAR that resulted in the most recent Grant of Permission for quarrying at the site (PL18/858), assessments of the site's wastewater infrastructure, Annual Environmental Reporting for the site's discharge compliance and local area groundwater impact assessments in the intervening years.

EIAR Structure

8.5 The Road Map for the EIAR was presented in Chapter 2.0 of this EIAR. Chapter 1.0 provided information on the Site Location and Context, Chapter 3.0 provided the Description of the Proposed Development and Chapter 16.0 addresses the Interactions.

8.6 This Chapter of the EIAR assesses the impact of the proposed development on the hydrological and hydrogeological environment.

Overview

8.7 Bennettsbridge Limestone (the applicant) is proposing a lateral extension to an existing limestone quarry at Kilree, Bennettsbridge, Co. Kilkenny.

8.8 The proposed total footprint of the site (*i.e.,* the existing quarry site and the proposed site extension) will be referred to as "the site" for ease of reference throughout this chapter.

8.9 The lands immediately north and west of the permitted void (PL 18/858) are in the applicant's ownership. The proposal is to laterally extend excavation in these areas down to the same overall floor level as the existing second working bench—i.e. to between 25 m and 30 m OD, noting that the current permitted bench floor sits at approximately 30 m OD.The coordinates central to the overall quarry site are ITM 654,034E, 649,785N.

8.10 The pre-quarrying natural land surface elevation of the entire quarry lands was 65m OD in the west and 50m OD in the east, approximately.

8.11 The site's licenced Section 4 (EN_W_78 2017) water discharge point is in the eastern part of the site. Refer to **Appendix 8.2** for a copy of the Site's Discharge Licence. Refer to Figure 8.1 for the Site Layout and Discharge Location.

8.12 The River Nore (EPA code: IE_SE_15N012090) flows in a north-south direction approx. 1.1km to the east of the application site. The Dunbell_Little stream (EPA Name: Nore_190 and EPA Code: IE_SE_15N012090) is 620m east of the application area.

8.13 The site lies within the Nore Catchment (HA15) and the River Nore has multiple designations as a European Site (River Barrow and River Nore SAC 002162, River Nore SPA 004233). The River Nore is also classified as a Nutrient Sensitive Area - Rivers (Type Urban Waste Water Treatment Directive Sensitive Area) with the published 'Type' = "Urban Waste Water Treatment Directive Sensitive Area" [Hydro-G notes that Kilkenny's WWTP discharges to the River Nore at a distance of c. 6km upstream length and Bennettsbridge WWTP discharges at a distance of <1km downstream length, relative to the licensed point of discharge from the quarry]. The River Nore is also a mapped Salmonid River (S.I. 293: European Communities (Quality of Salmonid Waters) Regulations, 1988), protected for Fish Life.

8.14 The River Nore has two site specific Statutory Instruments associated: European Union Habitats (RIVER BARROW AND RIVER NORE SPECIAL AREA OF CONSERVATION 002162) Regulations 2024 [S.I. No. 648 of 2024] and European Union Conservation Of Wild Birds (RIVER NORE SPECIAL PROTECTION AREA 004233) Regulations 2012 [S.I. No. 193 of 2012]. Water is a supporting habitat. Therefore, this assessment considers water, ecological receptors and Conservation Objective Sites in an integrated way. There is a hydrological link between the quarry and the River Nore.

The Site's Section 4 Water Discharge Licence

8.15 The site's existing Section 4 Water Discharge Licence was reviewed by Kilkenny County Council and reissued in 2017 (ENV/W/78). The Licence is therefore current with legislative requirements as determined in the enactment of the Water Pollution Act, the Surface Water Regulations (2009, as amended) and the Birds and Habitats Regulations (2014, as amended). A copy of the Licence is presented in the Discharge Licence Appendix 8.2

8.16 The discharge licence granted in 2017 (Ref. ENV/W/78) was expressly based on the full hydrological catchment of the quarry landholding, encompassing not only the existing void but also the adjoining greenfield areas that drain naturally toward the quarry sump. The lands now proposed for lateral extension lie within that contributing catchment and were therefore included in the calculations that underpinned the licensed flow and water-quality limits. As a result, the approved water-management infrastructure—sump, pumps, settlement lagoons, interceptor and licensed discharge point—has already been sized to accommodate runoff and groundwater ingress from these additional areas, and no upgrade is required to serve the current proposal.Details for individual components of the Water Management System are presented in a separate section, below: after the sections describing the Application Site and Existing Development.

8.17 The site is permitted to discharge groundwater and stormwater runoff with an Emission Limit Value (ELV) not exceeding 70,000m^3/d, as the maximum value, and an annual mean ELV volume of 22,000m^3/d**.**

8.18 The other ELVs of the Section 4 licence (ENV/W/78) are as follows:

- pH 6-9pH units
- Suspended Solids 10mg/l
- BOD 2mg/l
- COD 10mg/l
- Nitrate 10mg/l - N
- Total Ammonia 0.17mg/l - N
- MRP 0.07mg/l - P
- Total Hydrocarbons 0.68mg/l

8.19 A Kilkenny County Council letter, dated the 11th of March 2025, demonstrating compliance with the Licence Conditions is presented with a copy of the Licence in the Discharge Licence Appendix 8.2.

8.20 A Condition of the Section 4 Licence is that Annual Environmental Reports must be submitted to Kilkenny County Council each year and a copy of each AER 2018 – 2024 is presented in the Discharge Licence Appendix 8.2.

The Application Site

8.21 The applicant is seeking a 25-year permission for extraction and associated activities, with an additional 2 years for final site restoration.

8.22 The overall application area consists of the established Bennettsbridge Quarry (permitted under Plan File Ref. 18/858) together with adjoining greenfield lands immediately to the west. Under the 2018 permission the quarry was authorised to expand east-west into c.8.5 ha of previously unworked ground. Excavation of that consented area is now under way. The present application seeks to continue that westerly progression into the next block of greenfield land, thereby forming a logical lateral extension of the existing extraction void while retaining the same finished floor level (25–30 m OD) and drainage regime. The works will be carried out within an overall red-line area of **c. 61 ha**. This comprises:

- **c. 36 ha** – the existing permitted quarry (Plan Ref. 18/858), and
- **c. 25 ha** – a lateral extension on the western and north-western flanks of the quarry.

7.1 Of the extension lands:

- **c. 18.2 ha are new, green-field extraction blocks, and**
- **c. 3.3 ha are areas inside the present quarry boundary (an existing haul-ramp and an un-constructed berm) that will now be worked through to gain access to the extension.**

7.2 Accordingly, the total additional rock-extraction footprint amounts to c. 21.5 ha. The balance of the extension area – c. 6.3 ha – will accommodate overburden storage, new landscaped screening berms, haul-road tie-ins and the mandatory safety/set-back standoffs from boundaries.

8.23 The application area 'Red Line' boundary and proposed extraction area are shown in Plate 8-1, which is a direct extract from Planning Drawing 3 of the Quarry Consulting Drawing Series of this application.

8.24 The quarry is located to the north of the M9 Motorway connecting Waterford to Dublin: the M9 merges with the M7 to Dublin in the vicinity of Newbridge, Co. Kildare, at a distance of 70km to the north east of the quarry. The site is located between Junctions 9 and 8 on the M9. Kilkenny city centre is c.7km to the north west and the village of Bennettsbridge is 0.8km to the south east. Carlow town is c.32km to the north east and Waterford is c. 38km to the south. Refer to Figure 1 of the EIAR DWG Series.

8.25 The current permission (Plan Ref. 18/858) allows the existing quarry floor to be worked down to 12 m OD. No further deepening of that permitted void is now sought. Instead, the proposal is to develop the adjoining green-field extension in two benches, bringing the new extraction area down to match the second-bench level already established in the quarry – c. 25–30 m OD.Access to the site is from a minor road (L26322) that branches from the R700 regional road that links Bennettsbridge Village with Kilkenny City. To the east of the existing quarry there is an office building, weighbridge and wheelwash located near the entrance to the quarry. The M9 motorway forms the southernmost boundary.

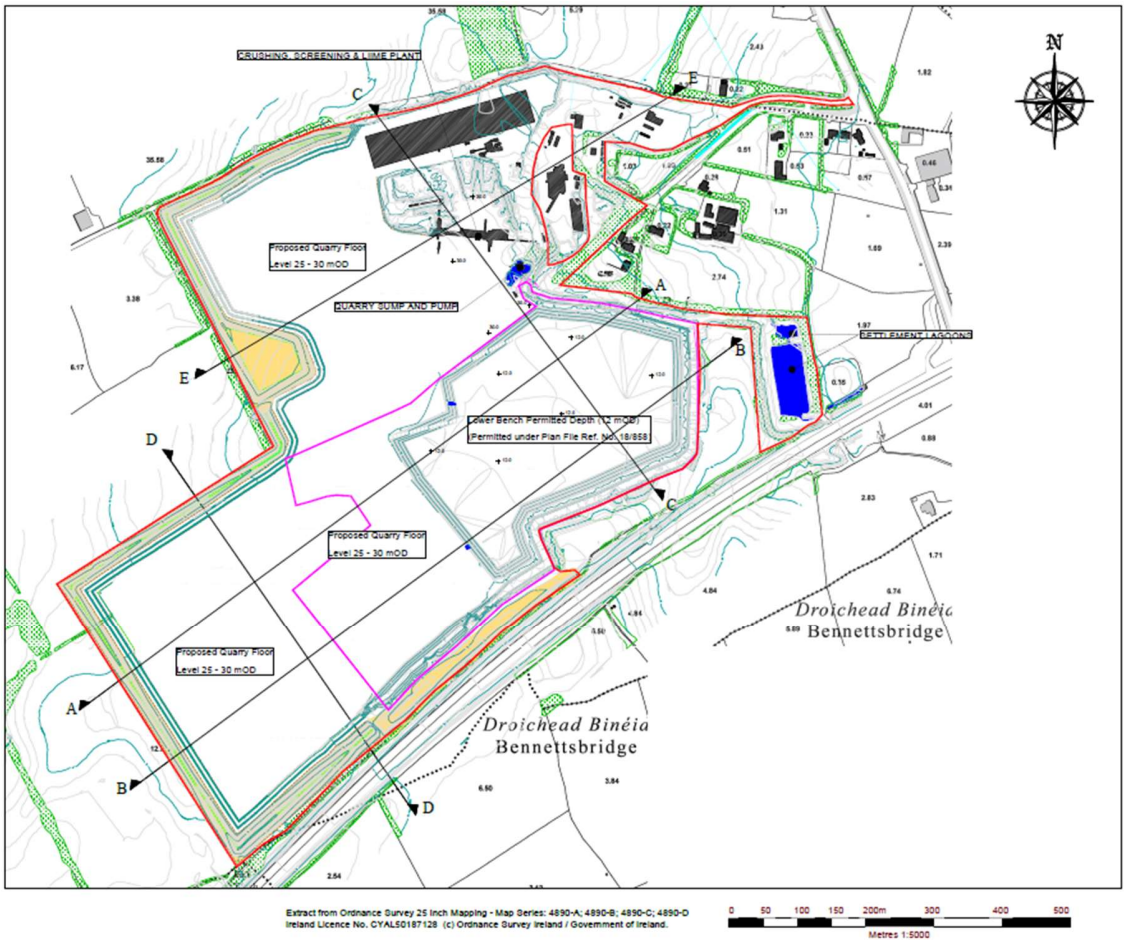


Plate 8-1 Bennettsbridge Limestone overall Site with Red Line Planning Application Area, Existing and Proposed Layout. (Refer to Quarry Consulting Figures for detail).

8.26 Beyond the site, the landscape is rural in character, consisting primarily of agricultural land interspersed with some areas of forestry and two other quarries. The main land use in the study area is agricultural, with dairy farming being the predominant sector practiced.

8.27 The two other operational quarries are located at distances of 1km and 2Km to the north east of the subject quarry. P. Hennessy & Company Ltd. (Hennessy Concrete) has a Section 4 Licence to Discharge waters arising (Kilkenny County Council ENV/W/94) and Roadstone have an EPA IPPC Licence (P0521-03). Hennessy's Concrete Quarry is a Sand & Gravel Quarry mapped by the EPA as lying in the Stoneyford Gravels GWB. The potential for interaction between the three quarries and potential cumulative impacts are discussed in the 'Cumulative Impact' section of this chapter.

8.28 Residences within the general area typically consist of one-off rural houses and ribbon development along the local road network. The nearest properties to the site are a cluster of one-off dwellings situated to the south of the site's entrance road from the R700 road that connects Bennettsbridge to Kilkenny city – refer to EIAR Chapter 5.

The Existing Development

8.29 As stated, the existing quarry is an area of c.36 ha within the proposed total application area of 61ha.

8.30 The layout of the quarry, including the location of plant and infrastructure, is detailed in Figures of Chapter 3 of the EIAR. Existing infrastructure at the quarry will be retained to service the proposed extension.

8.31 Established infrastructure includes, as follows:

- Processing infrastructure (crushing, screening & lime plant),
- A precast manufacturing facility and associated ancillary works for the manufacturing of concrete products,
- Batching of lime products,
- General storage of products and plant,
- A Workshop, canteen, toilet facilities, weighbridges, wheelwash, fuel storage area and switch room,
- Haul roads,
- ESB substation,
- Plant and product storage areas and all other ancillary facilities,
- Floor sumps with pump infrastructure delivering attenuated waters to a series of settlement lagoons, at natural ground level to the east of the site, with a flume and flow meter in advance of a licensed discharge point,
- An asphalt plant operated by Breedon on an area of the quarry under a lease agreement with the applicant.

8.32 The site is compartmentalised to separate the non-extraction activities as permitted under the various permissions associated with the site. More detail is presented in the Planning History section of this Chapter.

8.33 The quarry overall 'blue line' ownership boundary landholding is on lands that would have natural greenfield elevations of between the 72m OD contour lines in the western part of the site, which slopes towards the 59m OD contour to the east of the settlement lagoons.

8.34 The site's entrance and office areas are in the north east of the landholding at an elevation of c.50m OD.

8.35 The quarry has excavated a 'Bench 2' floor to the previously permitted 30m OD and a 'Bench 3' floor is currently being developed, as permitted by the 2018 permission to an elevation of 12m OD. Extension of bedrock extraction into some of the greenfield lands to the south west of the quarry floor is in progress, as also permitted by the 2018 permission to the 'Bench 2' 30m OD elevation.

8.36 Bedrock is extracted using permitted blasting and rock breaking techniques. The entire site is enclosed by secure boundary fencing, complemented by perimeter landscaped screening berms.

Water Management Systems

8.37 The Conceptual Understanding of the site is captured in Kilkenny County Council's stated 'Scope' of site's Section 4 Licence (ENV/W/78): **Condition 1.2** states that the licence and discharge relates to "groundwater from dewatering operations at the quarry and stormwater runoff from internal areas".

8.38 Refer to Figure 8.1 for existing Water Management System components.

8.39 The office, toilets, sprinklers and wheelwash are fed by the site's main well, which is located c.185m to the west of the offices. This well also provides water to the cooling system for the crushers. The well is also used to provide water to the concrete batching plant.

8.40 The wheelwash for the site is to the west of the weighbridge near the site's offices. All trucks leaving the quarry pass through the wheelwash in advance of the weighbridge.

8.41 The floor of the quarry is accessed, from natural ground level at the site's offices, *via* one wide haul route that can accommodate two way traffic of haul trucks. Sprinklers are active along both sides of the roads that connect the site entrance, where the offices exist, and the floors of the quarry.

8.42 Dust suppressing sprinkler water, rainwater runoff, and any waters entering from the quarry's exposed walls, flows naturally by gravity over haul routes and the floors of bedrock to multiple attenuation sumps on the floors of the quarry.

8.43 The main sump is located central to the overall quarry site and it is on the floor of Bench 2 at an elevation of <30m OD. The main sump receives gravity flow from the floor of Bench 2 and in this way the main sump also indirectly receives water from the lowest elevation of the site, which is Bench 3's sump, because water is pumped from Bench 3's sump to a channel that delivers water to the main sump.

8.44 The Bench 3 sump is currently located in the south east of the floor of Bench 3. Water is pumped from Bench 3 to a perimeter drain that flows along the southern and eastern boundary of the floor of Bench 2. The perimeter drain is 2 to 3m wide and c.0.6m deep and lined with clean washed 3" down stone. This perimeter drain enables more attenuation capacity, filtering and retention of

solids as water flows under gravity to the main and original sump located mid-way along the eastern boundary of the floor of Bench 2.

8.45 From Bench 2 water is pumped up the wall and piped to a concrete tank sump that is situated in advance of the site's settlement lagoons. From the tank sump, water flows by gravity to the 1st pond of the settlement lagoons, which provide the final phase of treatment for suspended solids removal from waters before discharge under the Conditions and ELVs of the Site's Section 4 Licence (ENV/W/78).

8.46 Details for the capacity of the settlement lagoons is presented with all Discharge Licence Information in **Appendix 8.2**. A Murphy Surveys Ltd. Report (MSL, 2017) is presented as Section 4 of Appendix 8.2. The invert and plan dimensions were accurately surveyed and reported by Murphy Surveys.

8.47 Desilting of Pond 1 of the Settlement Lagoons was completed in the Summer of 2018 and this is reported in Section 5 of Appendix 8.2.

8.48 The capacity of the final settlement lagoons is a subset of the capacity of the water management systems used to reduce the suspended solids content of waters arising at the site. Most settlement is completed on the floors of the quarry where the water moves from the 3rd Bench and through the sump of the 2nd Bench, which is a large capacity sump.

8.49 The condition of the ponds remains fit for purpose because the settlement lagoons prove their functionality each month by virtue of the Suspended Solids concentration of the final discharge. With reference to Appendix 8.3 Site Monitoring Data, Section 7, Table 3 of each AER for each year (2018 – 2024) demonstrates that Suspended Solids are <LOD of the Analyser for many months of each year. The Average Suspended Solids concentration in the discharge was <5mg/l SS in 2024. The ELV of the Licence is 10mg/l SS.

8.50 There is a hydrocarbon interceptor between Pond 1 and 2 of the Settlement Lagoons.

8.51 The Water Management Systems operate to ensure compliance with the Conditions of the Section 4 Licence. From the Settlement Lagoon, water overflows to the Dunbell_Little stream (Nore_190) to the east of the site.

8.52 There is a Flume Control structure and ultrasonic Flow Meter on the discharge leaving the Settlement Lagoon. The flow meter sends continuous records back to the office. Daily discharge is reported in the Annual Environmental Reports submitted to Kilkenny County Council's Environment Section each year, as Conditioned by the Licence. A copy of each AER (2018 – 2024) is presented in the Discharge licence Appendix 8.2.

8.53 As previously stated, the western area under consideration for quarrying already sends its rainfall runoff and shallow interflow to the existing sumps located on the excavated floor. Therefore, the existing Water Management Systems have proven capacity to accommodate the proposed development's waters arising.

8.54 Surface water runoff from the original land's surface at the office, workshop, concrete batching plant and lime batching plant, drains back naturally under gravity to the Bench 2 sump. The floor is a large area that can accommodate any extreme rainfall depths and durations of rainfall from other areas of the site.

8.55 Class 1 hydrocarbon interceptors are in place where the potential exists for hydrocarbon pollution, *e.g.*, at refuelling points. There is a final hydrocarbon interceptor between Pond 1 and Pond 2 of the site's settlement lagoons.

Site Services - Water and Wastewater

8.56 With respect to water supply to the site, a Water Supply Borehole serves the site's need's, which includes the offices, concrete batching plant, cooling water for equipment, the sprinklers for dust suppression around all parts of the site, including the lime batching plant, and the wheelwash. The onsite water supply well is shown in Figure 8.1 and it is located on the floor of Bench 1 in the yard to the south of the 'Eden' Shed. This is a high yielding well that supplies the quarry with an average of 350m^3/d. The well has never failed to service the site. Water from the onsite water supply well is tested routinely for suitability for its use. Certificates of Analysis are presented with all 'Site Monitoring Data' in Appendix 8.3.

8.57 With respect to wastewater treatment, the site's staff are serviced by the wastewater treatment system and discharge zone that was granted permission in the permission for the new offices for the site under Kilkenny County Council PL reference 20/891. A report detailing wastewater infrastructure at the site, demonstrating that the wastewater system is of adequate condition and can service the proposed development, is presented as Appendix 8.4. No intensification and no increase in staff numbers are proposed with the proposed development.

Planning History & Historic Assessments

8.58 The quarry was first granted permission almost 40 years ago. There have been no environmental incidents since then. There is supporting evidence of competency and environmental responsibility.

8.59 Successful historic planning applications relating to the application site and the associated Planning File references are, as follows:

- 85/419: Granted on 16th January 1987 for extraction of rock within a 3.5ha site area over a 10 year period.
- 89/433: Provided for the retention of office accommodation – namely offices, canteen facilities, staff washrooms and associated septic tank.
- 99/1161: Granted in March 2001 for retention and proposed 30.8ha extension and additional site infrastructure comprising a wheel-wash. landscaped berms and boundary treatment. lime and asphalt plants. and crushing plant on the floor of the quarry. ABP Reference 10/120270: Following a third party appeal on 99/1161, An Bord Pleanála upheld the decision of Kilkenny County Council and granted permission to 31st December 2018
- 01/726 and 04/129: modified the opening hours of the Irish Asphalt facility permitted under Kilkenny County Council Reg. Ref. 99/1161. ABP Reference 120270.
- 03/75: Permission granted for the development of a pre-cast concrete manufacturing facility (production building, casting machine, batching plant, and associated works). The development

included a new access road, separating residential and quarry traffic, and associated embankments, landscaping and planting.

- 03/1532: Permission granted for amendments and alterations to 03/75 precast concrete manufacturing facility, including an extension to the production building and new adjacent building for concrete storage and curing.
- 04/1806: Permission granted for the creation of a new stockyard for the storage of precast concrete products, involving semi-hardcore covering approx. 4.75ha and the use of a mobile crane (13m tall)., along with associated site works and landscaping. This permission was not acted upon and has ceased to have effect in 2009.
- 05/127: Permission granted for retention of a landscaped screening mound adjacent to the quarry lagoon in a different location to that previously approved under Reg. Ref. 99/1161 (ABP P10.120270), and retention of constructed mound, concrete pathway and mechanical equipment installed on the eastern boundary.
- PL10QV.0244: An Bord Pleanála confirmed the determination of the Planning Authority under S261(a)(i) and (ii) and Section 261A(3)(a). The effect of the Board's order was to direct the quarry owners to apply for substitute consent. An Bord Pleanála Ref. SU10. SU0122: Substitute consent was granted for an area of approximately 9.5Ha.
- An Bord Pleanála Ref. QD10.QD0001: Refused: Section 37L application for the deepening of existing quarry, modifications to Condition No. 2 of PL 10.120270.
- 17/316: Permitted the continuation of quarrying and extraction of rock.
- 18/150: Permitted Lagan Macadam to operate an asphalt plant at the quarry.
- 18/858: Permission granted for a total area of 36.5 Hectares comprising of the following:
    - Deepening of 13.4 hectares, previously subject to rock extraction down to 12mOD.
    - Removal of overburden, construction of screening berms and extraction of rock down to 30mOD from a greenfield area consisting of 8.5 hectares.
    - Continuation of use of 11.6 hectares consisting of processing infrastructure (crushing, screening & lime plant), offices, workshop, canteens and toilet facilities, weighbridges, wheelwash facilities, fuel storage area and switch room, settlement lagoons, entrance, haul roads, ESB sub-station and all other ancillary facilities.
    - Continuation of use of existing pre-cast manufacturing facility and associated ancillary works for manufacturing of concrete products, batching of lime products and general storage of products and plant on an area of 3.0 hectares.
    - Landscaping and restoration of the site and all associated ancillary facilities/works. Granted 11/06/2019 for a period of 20 years.
- 20/891: The development consists of a Planning Application for the removal of existing office cabins and the proposed erection of a new office structure, the erection of entrance walls and signage and all associated ancillary facilities within an existing quarry complex. Granted 10/05/2021.

The Proposed Development

8.60 The western side of the overall site is the area proposed for lateral extension of the bedrock extraction area to the same 25 - 30m OD elevation permitted for the site's working area of Bench 2.

8.61 Along the current western face, limestone bedrock is already exposed from the Bench floors up to natural ground level, providing a clear view of the geology and groundwater regime in the area earmarked for expansion to the west.The proposed development seeks to laterally extend the extraction area further to the west and north to an elevation of only two 19m deep benches so that there is a floor elevation of 25 to 30m OD, integrating additional lands into the overall extraction footprint. These lateral extensions will maintain the same extraction methods and depth as the central portion of the quarry, without introducing any new buildings, plant, or processes.

8.62 The proposed development will allow for the continuation of quarrying, processing activities and concrete manufacturing at the site and the lateral extension of the quarry floor's permitted extraction area into lands to the west and north of the current working floor area. The proposed extension area presently includes several rectangular fields of gently sloping pastureland bounded by hedgerows, together with an existing farmyard and associated slatted shed complex. These agricultural buildings will be demolished and the site cleared to facilitate the lateral extraction works.

8.63 There is an area of 6.8 ha, approximately, of commercial forestry in the south of the application area.

8.64 The proposed development will take place within an overall application area of approximately 61 hectares and will consist of the following:

- The continued extraction of rock — including periodic blasting to fragment the rock prior to excavation — from the existing permitted quarry area (Plan File Ref. No. 18/858) beyond the current permission expiry date.
- The continued use of existing quarry infrastructure (including crushing, screening and lime processing plant), existing pre-cast manufacturing facility (including associated ancillary works for manufacturing of concrete products), batching of lime products, workshop, canteen, toilet facilities, weighbridges, wheelwash, fuel storage area and switch room, settlement lagoons, haul roads, ESB substation, plant and product storage areas and all other ancillary facilities as permitted under Plan File Ref. No. 18/858.
- The continued use of site offices authorised under Plan File Ref. No. 20/891.
- A lateral extension of the existing limestone quarry, within an area of approx. 24.5 Ha., comprising:
    - approximately 18.2 hectares of extraction, including blasting, over 2 no. c 19-metre-high benches to a final floor level ranging from 25 to 30m OD. and
    - overburden storage areas and landscaped screening berms (6.3 Ha).
- To access the extension lands rock will be extracted - including by controlled blasting - from under:
    - approx. 1.4 hectare of land that is currently under landscaping measures authorised under Plan File Ref. No. 18/858.

    - approx. 2.1 hectare of land that is currently in use as an access ramp authorised under Plan File Ref. No. 18/858.
- The removal of topsoil and overburden, construction of landscaped screening berms, and provision of an overburden storage area.
- Demolition of an existing farmyard and associated buildings and structures, permitted under Plan File Ref. No. 15/595, and removal of approximately 6.81 hectares of commercial forestry within the proposed extension area to allow for the proposed quarry development.
- All associated ancillary site facilities/works, including surface water management, internal haul roads, phased restoration, and landscaping.

8.65 The applicant is seeking a 25-year permission for extraction and associated activities, with an additional 2 years for final site restoration. The planning application is supported by an Environmental Impact Assessment Report (EIAR) and a Natural Impact Statement (NIS).

8.66 Bennettsbridge Limestone owns the site where the proposed development will take place.

Assessment Objectives

8.67 Under the European Union's Environmental Impact Assessment (EIA) Directive (2011/92/EU as amended by 2014/52/EU), major building or development projects in the EU must first be assessed for their impact on the environment.

8.68 In Ireland, the EPA (2022) Guidance for Information to be Contained in Environmental Assessment is used to guide assessments and the preparation of an Environmental Impact Assessment Report (EIAR). EPA (2022) has been used in this assessment (refer to EIAR Chapter 2).

8.69 The objectives of this assessment are, as per the EIA Directive (2014/52/EU) and EPA Guidance (2022), to present an EIAR that contains all the relevant information for the Planning Authority's EIA, which includes, as follows:

- Baseline hydrogeological and hydrological conditions for the site & update previous assessments, which had a strong foundation in drilling and monitoring information.
- Potential impacts of the proposed development on the underlying groundwater body, associated surface water bodies and ecosystems.
- Potential for Cumulative Impacts and Transboundary Impacts.
- Appropriate mitigation measures for any identified potential impacts, as deemed necessary, with impacts and proposed mitigations reassessed and residual impacts defined for the convenience of the Planning Authority's EIA.

Guidance and Legislative Instruments

8.70 This report was prepared with consideration of Industry Guidance documents and ensuring compliance with European Legislation (Directives) and Irish Statutory Instruments and Regulations as listed in **Appendix 8.5**.

8.71 The author of this assessment hereby confirms that the assessment completed and reported adheres with EU EIA and EIAR Guidance and that the proposed project has been assessed in accordance with EPA (2022) Guidelines for EIA.

8.72 The author of this assessment hereby confirms that the assessment completed and reported has been completed with consideration of Irish Statutory legal instruments enacting the Water Framework Directive (WFD) and the Birds & Habitats Directive.

Data and Maps

8.73 This report was prepared using Desk Study available Data and Maps appropriate to the study site, and wider environment, and site-specific reports for the site as listed in **Appendix 8.6**.

8.74 Reports that provide information critical to the development of an understanding of the hydrology and hydrogeology of the area, which enable development of the 'Conceptual Understanding of the Site' and the completion of the subsequent 'Impact Assessment', are provided in full in **Appendix 8.7**.

Consultations

8.75 In relation to water, the site's agents engaged with Uisce Eireann, the Department of Housing, Local Government and Heritage (Development Applications Unit and NPWS), the HSE and the Geological Survey of Ireland. In addition, the response to scoping from TII had a query in relation to addressing potential for impact on roads arising from water management at the site.

8.76 Scoping Responses of relevance to this Water Assessment presented as **Appendix 8.8**, in which Hydro-G responses are provided after presentation of the full correspondence received from each agency.

8.77 Hydro-G hereby confirms that all resources and consideration requests returned by the GSI has been included in the assessment.

8.78 Water related requests in all scoping responses have been addressed.

8.79 The Impact Tables at the end of this Chapter incorporate all information required for an EIA Directive compliant Impact Assessment.

Overall Assessment Methodology

8.80 The methodology adopted for this assessment is as follows:

- Review of current Legislation and Guidance relating to EIA and EIAR, Quarry Assessment Guidance and Water and Habitats related Legislation.
- Review of the 'Subject' development currently under consideration and assessment.
- Review of the Project Scoping document's Responses from Statutory Bodies.
- Characterisation of the Receiving Environment (hydrology and hydrogeology).
    - Determination of the Baseline.
    - Evaluation of WFD Reported characterisations for the environment.

- Evaluation of the site's own receiving environment.

- Review and analysis of Site Investigation Results and Long-Term site monitoring data for the operational quarry site and its Licensed discharge.
  - Whilst no additional quarrying is proposed for the operational and permitted existing quarry area, other than that previously sanctioned by PL18/858, the water management system's monitoring results are relevant. As explained earlier, the floor of the operational quarry already manages rainfall runoff and interflow from the greenfield application area. The AERs were presented in Appendix 8.2 and will be discussed in detail later.
  - With respect to groundwater quality at the existing operational quarry and the wider area, hydrochemical analyses are presented in Appendix 8.3 Site Monitoring Data.
  - A Condition of the PL18/858 permission was that a Groundwater Monitoring Programme be implemented with respect to water levels. This was completed and includes domestic and farm wells in the wider area as well as on site wells. Results will be discussed later. Data are presented in Appendix 8.3 Site Monitoring Data.

- Review and analysis of the Site Investigation Results and monitoring data for the lands at and immediately adjacent to the proposed greenfield application area, which include as follows:
  - Apex Geophysical surveys and interpretative reports for the existing permitted quarry and the proposed greenfield application area (Apex 2006a, 2006b, 2007, 2009, 2018a, 2018b, 2025). The results and significance of the work completed by Apex are presented in Chapter 7 Lands, Soils & Geology. Summary details for each Apex Reported Investigation are presented here, as follows:
    - APEX Geoservices 2006a (AGL06028): This survey consisted of 3 ERT Profiles over a now extracted area to the east. The assessment was completed in order to map overburden thickness and rock type. It was followed by 23 rotary percussive site investigation boreholes.
    - APEX Geoservices 2006b (AGL06097): This was a geophysical survey of greenfield lands (Gibbons' Land) to the north and west of the quarry and consisted of EM conductivity readings and 19 ERT profiles.
    - APEX Geoservices 2007 (AGL07395): This survey consisted of 2 ERT profiles over the quarry extension area to the east and south (now extracted). A total of 8 rotary cored boreholes to investigate and sample the rock resource were also drilled.
    - APEX Geoservices 2009 (AGL09133): This consisted of 9 Trial Pits over the quarry extension area to the east and south (now extracted) to confirm overburden type and thickness.
    - APEX Geoservices 2018 (AGL18010): This consisted of 9 ERT profiles 1 seismic profile over the proposed extension area to the west of the quarry. A total of 61 rotary percussive boreholes were carried out at the same time.
  - Seven Site Investigation Boreholes drilled in 2024 and instrumented with 50mm diameter piezometers and continuous water level datalogger response. These boreholes enabled evaluation of the geology and the hydrogeology of the site. The boreholes have base depth elevations ranging from 25m OD to 15m OD. Details will be presented and

discussed later. From the perspective of this Impact Assessment for Water, no groundwater strikes of any significance were encountered in the seven SI BHs drilled in 2024.

- Application of EPA (2022) and IGI (2013) Guidelines on the Assessment of Potential Effects. Identification of Potential Effects, Mitigation Measures, Assessment of Residual Impacts & Other Impacts, as specified in Guidance. (**Appendix 8.9**).
- Application of the UK Environment Agency's Hydrogeological Impact Appraisal Methodology for Dewatering at Quarries (**Appendix 8.10**).
- Consideration of PWS Protection Measures & Consideration of SAC Protection Measures, including the conservation objectives of designated Natura 2000 sites.
- Completion of the Water Framework Directive Assessment, information for which is presented in both this Chapter and a Stand-Alone Report.

Desk Study Receiving Environment

Historic Land Use

8.81 Historical land uses, reviewed using maps and aerial photography, are detailed in Table 8.1.

Table 8.1 Historical Land-use at the Site and its Surroundings

Ordnance Survey Map / Photo Reference (Dates)	On Site	Immediate Surroundings
OS 6" colour (1837-1842)	Quarry site is open fields.	To the west of the site, Kilree House is not mapped: Castle (In Ruins) is mapped there. White Williams Well is mapped to the east of the site and a drain connects it to a pond, which is the current location of Settlement Lagoon Pond 1. Bennettsbridge village consists of c.25 homes and the Flour Mill.
OS 6" Cassini (1845)	No change from above.	No change from above.
OS 25" Historic (1888-1913)	No change at the site: open fields.	In addition to the above, a spring is now mapped to the south of the current quarry site.
Aerial Imagery 1996	An area of c.6.5ha shows as a relatively recent excavation of a quarry. There are no Settlement Lagoons serving the site. The site is accessed from a more southerly route off the L26322.	Some farm buildings and 9 one-off houses appear in the immediate landscape of the site's entrance. The two other quarries in the area appear advanced. There is a Farm yard now over White Williams well and the pond is not visible in the landscape. Bennettsbridge village is a substantially bigger agglomeration of homes and there are many one-off and clusters of homes in the wider area. The lands to the west of the quarry (Kilree House and associated lands) remain development free.

Aerial Imagery 2001	The quarry has advanced to c. 12.5ha. The Settlement Lagoons are constructed to their full extent and hold water. There is a small narrow spur of the quarry to the south west.	No significant changes from those described above.
Aerial Imagery 2006	The quarry footprint has expanded to c.26ha. The Eden shed along the site's northern boundary is fully constructed.	The M9 Motorway to the south of the quarry is complete and has traffic. A culvert has been built under the M9 close to the site's licensed discharge point from the M9.
Aerial Imagery 2011 – 12/2024	No significant changes at the site.	No changes in the vicinity of the site, wider area or Bennettsbridge village.

Conservation Objective Sites

8.82 Conservation Objective (CO) Sites/ Designated Areas and the site are presented as Figure 8.2.

8.83 More detailed information for each Conservation Objective (CO) site, and the associated species and habitats, is presented in the Natura Impact Statement (NIS) (Green & Blue Ecology, 2025) accompanying this application for consent for lateral extension. In this Water Chapter, the potential for hydraulic and hydrogeological connectivity, between the proposed development and the CO sites, is evaluated.

8.84 Water is a supporting habitat. Therefore, this assessment considers water, ecological receptors and Conservation Objective Sites in an integrated way. There is a hydrological link between the quarry and the River Nore.

8.85 The River Nore has two site-specific Statutory Instruments associated:

- European Union Conservation Of Wild Birds (RIVER NORE SPECIAL PROTECTION AREA 004233) Regulations 2012 [S.I. No. 193 of 2012].
- European Union Habitats (RIVER BARROW AND RIVER NORE SPECIAL AREA OF CONSERVATION 002162) Regulations 2024 [S.I. No. 648 of 2024].

8.86 The River Nore is also a mapped Salmonid River under S.I. 293: European Communities (Quality of Salmonid Waters) Regulations 1988.

8.87 As previously introduced, the quarry lies within the Nore Catchment (HA15) and the River Nore has multiple designations as a European Site:

- River Nore SPA (Site Code 004233).
- River Barrow and River Nore SAC (Site Code 002162).

8.88 The River Nore SPA 004233 site includes the river channel and marginal vegetation from Borris in Ossory to south of Inistioge (and other tributaries are listed also: Kings River being the closest at 5km to the south of the application site, Bennettsbridge Limestone Quarry). The Site Synopsis for the SPA (2011) states, as follows:

"For a large part of its course the River Nore traverses Carboniferous limestone plains. it passes over a narrow band of Old Red Sandstone rocks below Thomastown.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive of special conservation interest for the following species: Kingfisher.

A survey in 2010 recorded 22 pairs of Kingfisher (based on 16 probable and 6 possible territories) within the SPA.

Other species which occur within the site include Mute Swan (35), Mallard (267), Cormorant (14), Grey Heron (45), Moorhen (14), Snipe (17) and Sand Martin (1,029) – all figures are peak counts recorded during the 2010 survey.

The River Nore SPA is of high ornithological importance as it supports a nationally important population of Kingfisher, a species that is listed on Annex I of the E.U. Birds Directive".

8.89 Given that Bennettsbridge Limestone Quarry has a Section 4 Discharge Licence to the River Nore, there is a direct hydrological link between the quarry and the River Nore SAC. The Conditions of the Discharge Licence (W/ENV/78) are the Mitigation Measure: the Conditions of the Licence include for immediate reporting to Kilkenny County Council of issues arising from exceedances of the Emission Limit Values specified for the discharge licence, which include for all parameters that could affect the quality of the water and interfere with the bird's health: BOD, COD, Suspended Solids, Nutrients and Petroleum. NPWS (2024) advise that the SPA overlaps with River Barrow and River Nore SAC (002162) and that the conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

8.90 The River Barrow and River Nore SAC 002162 consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. The Site Synopsis (DHLGH, 2024) states, as follows

"Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow, it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also run through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore."

8.91 The Habitats listed in the Site Synopsis can be grouped into the coastal (Estuaries, Reefs, Atlantic salt Marsh Meadows, Tidal Mudflats and Sandflats, Salicornia Muds), woodlands (Old Oak and Alluvial), habitat (Dry Heath) associated with river banks (floating river vegetation and Hydrophilous Tall Herbs), with only one groundwater related habitat specified: petrifying springs [Priority Habitat, 7220]. The Site Synopsis (DHLGH, 2024), states that

"A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the E.U. Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls."

8.92 The Species listed in the Site Synopsis (DHLGH, 2024) include Freshwater Pearl Mussel (Margaritifera margaritifera). Other species listed in the Site Synopsis include Salmon, numerous types of Crayfish, Otter, Twaite Shad and Killarney Fern.

8.93 Considering the catchment areas of the River Nore and the River Barrow upstream of their merge to the north of New Ross, the combined catchment area of the two rivers drain an area of at least 6,000 km2. Given the large magnitude of this CO site, it is the hydrological link between the quarry and the river segment to which its licensed discharge assimilates: that is the river segment of the Nore immediately upgradient and immediately downgradient of Bennettsbridge settlement. The SAC's White-Clawed Crayfish are reported at a distance of c.6km downstream of the point at which the Bennettsbridge Limestone Quarry's licensed discharge joins the Nore. There is no potential for impact at a distance of c6km because the flow in the Nore is large, relative to the volume of water discharged by the quarry and full assimilation will have been achieved in a 6km flow length. NPWS (2025) suggests that the Petrifying springs associated with the River Nore and River Barrow SAC have been described in woodlands at Dysart, between Thomastown and Inistioge. This is c.13km to the south east of Bennettsbridge Limestone Quarry and in a different GWB, separated by many other GWBs. These springs are located within a different geological and hydrogeological environment to the Bennettsbridge Limestone Quarry and there is therefore no potential for interaction, impact or affect. As previously stated, given that Bennettsbridge Limestone Quarry has a Section 4 Discharge Licence to the River Nore, the Conditions of the Discharge Licence (W/ENV/78) are the Mitigation Measure controlling the potential for the hydrological link to affect the SAC: the Conditions of the Licence include for immediate reporting to Kilkenny County Council of issues arising from exceedances of the Emission Limit Values specified for the discharge licence, which include for all parameters that could affect the quality of the water and interfere with the bird's health: BOD, COD, Suspended Solids, Nutrients and Petroleum.

8.94 The Upper Nore is mapped by DCHG (2020) of as a catchment of SAC populations listed in The Pearl Mussel Regulations (S.I. 296 of 2009). The quarry is not part of the Upper Nore Catchment and therefore the quarry, or its discharge, do not have potential to affect the Upper Nore and its Pearl Mussel population. The Middle and Nore Lower are not listed in SI 296 of 2009. The Middle Nore mapped by DCHG (2020) as a catchment of other extant populations and the most succinct reasoning is provided by Wikipedia https://en.wikipedia.org/wiki/Nore_pearl_mussel (15/6/25) as follows:

> *"The Nore mussel is often described as a rare ecophenotype of M. margaritifera. The European Union's Habitats Directive on the conservation of natural habitats and wild fauna placed Margaritifera durrovensis on Annex II and Annex V as a separate taxon.[2] The species is native to the Three Sisters - the rivers Barrow, Suir and Nore, the latter of which being the mussel's namesake. However, specimens have not been found outside of the River Nore since 1993. Unlike M. margaritifera, which can tolerate acidic conditions, the Nore pearl mussel requires highly calcareous waters, and generally inhabits sections of the River Nore which have CaCO3 concentrations of over 330 mg/L. The Nore pearl mussel also has a significantly shorter lifespan than M. margaritifera, typically living for 60 to 80 years."*

8.95 Thomastown Quarry SAC (Site Code 002252) is a terrestrial SAC mapped at a distance of c.8km to the south east of the quarry and on the other side of the River Nore, relative to the quarry's westerly location relative to the Nore. Thomastown Quarry is situated along the R700 road about 1 km north of Thomastown. It is a disused limestone quarry in which "an excellent diversity of calcareous habitat types has developed" (DAHG, 2014). The Qualifying Interest of the Thomastown Quarry

SAC is 'Petrifying springs with tufa formation (Cratoneurion) [7220]'. The Thomastown Quarry SAC has its own Statutory Instrument: S.I. No. 199/2016 - European Union Habitats (Thomastown Quarry Special Area of Conservation 002252) Regulations 2016. Thomastown Quarry SAC is a small derelict quarry (c.900m² (c.0.09ha)) of Petrifying springs with tufa formation (Cratoneurion)* habitat, in which there is a 'north pool' (c.400m²), described as shallow, marl-lined pools with marl/paludal tufa formations and a 2nd small site of tufa-forming fen with paludal tufa. In addition, the Site Synopsis states that the

> *"ponds support populations of the Common Frog and Common Newt, both legally protected species. There are two rare species of Frog here, the beetle (Order Coleoptera) Haliplus variegatus and the Corixid bug Hesperocorixa moesta.*
>
> *Despite its small size, this site has an excellent diversity of calcareous habitats, including petrifying springs, a habitat with priority status on Annex I of the E.U. Habitats Directive. The presence of rare and uncommon species of plant and animal add further to its interest and importance."*

8.96 There is no potential for direct land surface connectivity between Bennettsbridge Limestone Quarry and the Thomastown Quarry SAC because the SAC is terrestrial and in no way connected to the River Nore.

8.97 Similarly, there is no potential for hydrogeological connection between the Bennettsbridge Limestone Quarry and the Thomastown Quarry SAC because groundwater flows towards rivers like the River Nore and therefore, sites on opposite banks of such a river will not have a groundwater flow direction connection. Additionally Bennettsbridge Limestone Quarry is mapped as being part of the Kilkenny GWB and the Thomastown Quarry SAC is mapped as being part of the Clifden South GWB: there are numerous other GWBs between the Bennettsbridge Limestone Quarry and the Thomastown Quarry SAC and therefore there is High Confidence that there is no groundwater flow potential between the two sites. Refer to the later discussion on GWB mapping in the Hydrogeology section of this chapter and the associated Figure 8.8. The boundaries of GWBs are conceptualised by the GSI and EPA as 'no flow' boundaries because each GWB has a unique geological and aquifer characteristic and is envisaged to discharge to its own segment of draining surface water.

8.98 EPA Envision mapping for WFD Protected Areas maps the application quarry in a Protection Area mapped as "Groundwater in SAC Species [EU_CD IE_SE_G_078]", mapped Protection Type "Special Area of Protection-Conservation Objective" and also a "Drinking Water Protection Area (DWPA)" [Code IEPA1_SE_G_078 Article 7 Abstraction for Drinking Water] (https://gis.epa.ie/EPAMaps/). The Roadstone quarry, located c.2kms to the north-east of the application site, is mapped by the EPA as is in the same mapped Kilkenny GWB and therefore the same Kilkenny GWB, Groundwater in SAC and DWPA, as the application quarry.

8.99 The land mass between the quarry's Settlement Lagoon systems and the River Nore is mapped by the EPA as the Stoneyford Gravels GWB [IE_SE_G_128]. The Stoneyford Gravels GWB extends an equal c.900m across both the western and eastern land banks of the River Nore. EPA Envision mapping for WFD Protected Areas reports that Stoneyford Gravels as a Protection Area mapped as "Groundwater in SAC Species [EU_CD IE_SE_G_128]", mapped Protection Type is "Special Area of Protection-Conservation Objective" and also a "Drinking Water Protection Area (DWPA)" [Code IEPA1_SE_G_128 Article 7 Abstraction for Drinking Water] (https://gis.epa.ie/EPAMaps/). The Kilkenny GWB and the Stoneyford Gravels GWB share a boundary. However, the Stoneyford Gravels GWB is a relatively shallow (c. 5 to 10m estimated) mass of waterlain gravels along the River Nore's banks in a small area east of Bennettsbridge Limestone. The limestone bedrock's regional

groundwater flow direction is from the west of the application site, through the quarry, underneath the Stoneyford Gravels GWB and on through to the River Nore. Hennessy's Concrete Quarry located 1km, approximately, to the northeast of the application site is mapped by the EPA as being in the Stoneyford Gravels GWB but the deeper bedrock underlying the Sand & Gravel at the Hennessey Quarry will be part of the bedrock of the Kilkenny GWB. However, it is noted that Hennessey quarry does not interfere or alter that bedrock.

8.100 The River Nore is also mapped as a Nutrient Sensitive Area (NSA) – Rivers, with the published 'Type' = "Urban Waste Water Treatment Directive Sensitive Area". Hydro-G notes that Kilkenny's WWTP discharges to the River Nore at a distance of c. 6km upstream length and Bennettsbridge WWTP discharges at a distance of <1km downstream length, relative to the licensed point of discharge from the quarry.

National Heritage Areas (NHAs) and pNHAs

8.101 There is only one officially designated National Heritage Area in County Kilkenny and that is the Cuan Bogs (Natural Heritage Area (Coan Bogs NHA 002382) Order 2005. S.I. No. 471/2005). The bogs are immediately east of Castlecomer and those bogs are c.24km to the northeast of the quarry. The site has conservation significance because it is upland blanket bog with some raised bog indicator species. Blanket bog habitat is a globally scarce resource. On the basis that Cuan Bogs are upland at an elevation of c.245m OD, underlain by shales and sandstones, and the greenfield application area at Bennettsbridge Limestone quarry is at an elevation of c.60 – 70m OD, there is no potential for an almost 200m higher upland bog to be affected by a limestone quarry 24km distance.

8.102 There are a number of proposed National Heritage Areas (pNHAs) in the wider landscape of the quarry and these are also shown on Figure 8.2, named as follows:

- Ardaloo Fen (000821) pNHA is a 37ha fen site that is c.15km to the north west of the quarry. CAAS (2008) state that "Ardaloo Fen is a wetland area beside the Nuenna River about 5km southeast of Freshford. There is a transition from improved grassland to common reed (Phragmites australis) swamp encompassing a diverse wetland flora. The wetland is in a fairly natural condition and the whole site is valuable for birds: The winter flooded grassland supports wildfowl and waders. The reedbed itself is home to warblers." The Ardaloo Fen is mapped by the EPA as being part of the Killkenny-Ballynakill Gravels [IE_SE_G_163]. This is a different GWB to that associated with the groundwater flow regime of the quarry, which is mapped as being part of the Kilkenny GWB. The Ardaloo Fen pNHA is therefore discounted as having any risk of potential impact affect and the Fen is deemed as not connected to the quarry site under consideration.

- Dunmore Complex pNHA (001859) is c. 10km to the north west of the quarry. This cave system is mapped by the GSI as a County Geological Site (KK001). It is reported to be the largest and most impressive cave in the county, with broad and dry passageways making most regions of this cave accessible to the public. It is a 'show cave'. Geologically it is a rare Irish example of a cave that has been formed directly by glacial meltwaters, rather than solution caused by the presence of groundwater. It is a geological feature and dry. The quarry's operation has no potential to affect the cave.

- Lough Macask pNHA (001914): this is a wetland in the urban landscape of Kilkenny and c.9km to the north west of the quarry. BSM (2022) for Kilkenny County Council cite previous information as "The main wetland on the west side of a small road is proposed for designation as an NHA (Lough Macask pNHA). Lough Macask itself is a wetland in two basins connected by a channel that was occupied by wet grassland". Goodwillie (1995) reported that "Lough Macask is a small pond north-west of Kilkenny that fluctuates in size over the year. It is isolated from the underlying limestone by glacial till with a shale content from the Slieve Ardagh Hills. The substrate is generally mineral without much content of peat, except, perhaps in the centre" and "The vegetation shows that the site is similar in some ways to a turlough. It therefore differs from most other wetlands around Kilkenny and has a certain interest for this reason". It is mapped as part of a different GWB to the quarry and is named the Killkenny-Ballynakill Gravels [IE_SE_G_163]. Lough Macask pNHA is therefore discounted as having any risk of potential impact affect and is deemed as not connected to the quarry site under consideration.

- Newpark Marsh pNHA (000845) is c.8km to the north west of the quarry, on the outskirts of Kilkenny Town that supports a semi-natural fen vegetation. The area is used as a feeding site by three protected bat species. Leisler's Bats (Nyctalus leisleri, Long-eared Bat (Plecotus ausitus and the Pipistrelle (Pipistrellus pipistrellus). The naturalness of this site in a location so close to an urban population is unusual and increases the importance of this site. It is a wet sedge fen. It is used by the public as a recreational area. It, too, is mapped as part of the Killkenny-Ballynakill Gravels [IE_SE_G_163], which is separate to the quarry. Newpark Marsh pNHA is therefore discounted as having any risk of potential impact affect and the is deemed as not connected to the quarry site under consideration.

- Archersgrove pNHA (002051). This pNHA was described by CAAS (2008) in the Environmental Report for the Strategic Environmental Assessment (SEA) for Kilkenny City And Environs Development Plan 2008 – 2014 as "The embankment on the south side of the River Suir (sic., surely meaning Nore), opposite the Inch saw mills, about 2km south of Kilkenny, supports a cover of scrubby woodland, chiefly of Gorse (Ulex europaeus), Ash (Fraxinus excelsior), Hazel (Corylus avellana), Beech (Fagus sylvatica) and occasional conifers. Three separate blocks of scrub woodland have been identified as a Natural Heritage Area. The sole interest of the site lies in its significant population of the legally protected plant Nettle-leaved bellflower (Campanula trachelium). This is a very rare species in Ireland. The River Suir (sic., surely meaning Nore) bankside woodlands represent its Irish stronghold." Any potential for the quarry's extension to affect Archersgrove pNHA is discounted by Hydro-G because there is no connection to it and the quarry site under consideration. The reason there is no connection is that the bankside habitat will have its own resilience to flooding and the quarry's (downstream) maximum discharge volume is insignificant in the scale of flood flows in the River Nore in the vicinity of Kilkenny.

- Mount Julliet pNHA (000843) is a pNHA located c.7.5km to the south of the quarry. It is mapped as of heritage value because of its built, natural and cultural heritage, the Manor House, gardens, golf destination, equestrian activities, and walking trails. The estate includes

the River Nore, pasture and wildlife. Mount Julliet is a terrestrial site overlooking the River Nore. There is not potential for the quarry to affect the terrestrial Mount Julliet.

- Red Bog_Dungarvan pNHA (000846) is a small fen located c.7km to the east of the quarry. It is on the other side of the River Nore and it is mapped in the Clifden South GWB with the Bennettsbridge GWB inlying. The quarry sits in a completely different GWB (Kilkenny GWB). In addition, groundwater flow path lengths to fen bogs are short. Red Bog_Dungarvan pNHA is discounted as having any risk of potential impact affect and the is deemed as not connected to the quarry site under consideration.

- Thomastown pNHA (000410) is listed in many publications of Kilkenny County Council. https://consult.kilkenny.ie/ga/consultation/kilkenny-city-and-county-draft-development-plan-2021-2027. However, no site specific details as to why it is proposed as a NHA are provided. The site is on the southern shores of the River Nore, immediately west of the Source Protection Zones mapped for Thomastown's PWS. Thomastown pNHA is c.9km south east of the quarry, as the crow flies. However, it is c.11.4km stream length flow when one considers the meandering of the river. There is NO potential for the quarry to affect the river bankside and terrestrial Thomastown pNHA.

Public Water Supply (PWS)

8.103 EPA Envision mapping presents Drinking Water Protection Area (DWPA) information, as shown in Table 8.2.

Table 8.2 Drinking Water Protection Area (DWPA) information (Envision Mapping Source)

Name	Drinking Protection Type	EU Priority Area (PA) Type	EU PA Code	Hydro-G Notes
Kilkenny GWB	Groundwater	Article 7 Abstraction for Drinking Water	IEPA1_SE_G_078	The quarry is directly connected to this GWB. However, the quarry is not within any mapped Zones of Contribution or Source Protection Areas of any Water Supply Sources.
Stoneyford Gravels GWB	Groundwater	Article 7 Abstraction for Drinking Water	EU_CD IE_SE_G_128	The Stoneyford Gravels are mapped over a large land mass between the quarry's Settlement Lagoon systems and the River Nore. However, the bedrock being excavated at the application site is part of the Kilkenny GWB, which underlies the Stoneyford Gravels. No potential for connection or interaction between the application site and this Gravel GWB DWPA.

Name	Drinking Protection Type	EU Priority Area (PA) Type	EU PA Code	Hydro-G Notes
Clifden Northwest GWB	Groundwater	Article 7 Abstraction for Drinking Water	IEPA1_SE_G_161	This GWB is mapped at distances of 5km to the west of the quarry and at 1.6km to the south of the quarry. Groundwater flows west to east. No potential for connection.
Clifden GWB	Groundwater	Article 7 Abstraction for Drinking Water	IEPA1_SE_G_038	This GWB is on the eastern side of the River Nore and the quarry is on the western side of the Nore. Groundwater flowing through the quarry will discharge to the Nore. Therefore, no potential for connection.
Bennettsbridge GWB	Groundwater	Article 7 Abstraction for Drinking Water	IEPA1_SE_G_021	The Clifden GWB separates the quarry's Kilkenny GWB from the Bennettsbridge GWB, which is c.5km south of the quarry. Given that groundwater at the application site will flow west to east and discharge to the Nore, there is no potential for interaction with the groundwater of the Bennettsbridge GWB. The Bennettsbridge PWS is mapped in this GWB. Source Inner Protection Area Unique ID IE_GSI_SPA_42 & Source Outer IE_GSI_SPA_207. The PWS is reported in the Kilkenny Groundwater Protection Scheme – Volume II (GSI, 2002). Uisce Eireann were consulted but no more modern information is available than the 23 year old works completed by the GSI. The Inner Source Protection Area is mapped at a distance of 5km to the south of the application quarry and the Source Protection Area is mapped as attached to the River Nore and extending across lands to the east of the River Nore. it is likely that the BENNETSBRIDGE PWS's infiltration area takes much of its water from the River Nore. There is therefore a surface water connection with the quarry rather than a groundwater connection. This will be assessed further in the mathematical, hydrological and hydrogeological detail of this Chapter.
Thomastown GWB	Groundwater		IEPA1_SE_G_135	The Thomastown PWS is on the far bank of the River Nore, relative to the application quarry, and a distance of c.9km to the south east of the quarry. The Source Inner [Unique Protection Area Code IE_GSI_SPA_167] and Source Outer [Unique Protection Area Code IE_GSI_SPA_325] are reported in the County Kilkenny Groundwater Protection Scheme – Volume II (GSI, 2002). Uisce Eireann were consulted but no more modern information is available than the 23 year old works

Name	Drinking Protection Type	EU Priority Area (PA) Type	EU PA Code	Hydro-G Notes
		Article 7 Abstraction for Drinking Water		completed by the GSI. The Stoneyford Gravels GWB, the Clifden Northwest, the Clifden South and the Bennettsbridge GWBs separate the quarry's Kilkenny GWB from the Thomastown PWS's Thomastown GWB. Therefore, a groundwater (hydrogeological) connection is highly unlikely to be present (High Confidence). Similarly, the surface water (hydrological) connection is very weak (High Certainty) and unlikely for two reasons: (1) the sources are reported to be from deep bedrock wells in Sandstone Formation (GSI, 2002) and (2) even if there were shallow interflow from the river bank gravels, there is c.12.5km of river length between the quarry and the Source Inner of the Thomastown PWS and the magnitude of flow in the river dwarfs the abstraction volume. Similarly, the Conditions of the quarry's Section 4 Licence to Discharge to the River Nore, at c. 12.5km upstream distance, preclude impact on the river and this has been monitored and reported in AERs since 2018 (Appendix 8.2 of this Chapter).

8.104 On the basis of Desk Study data and evaluation, as presented in Table 8.2, the Kilkenny GWB feeds into the Nore and the DWPAs brought forward for mathematical assessment and specific PWS Protection Measure evaluation are the Bennettsbridge and Thomastown PWSs, even though the preliminary screening suggests no groundwater connections, there is very weak potential for surface water connection impact potential because of the quarry's Section 4 Licence (ENV/W/78) to Discharge Treated waters arising on the floor.

Rainfall & Recharge & Site Water Balance

8.105 There are Met Eireann Synoptic Stations at Johnstown Castle, Co. Wexford, and Oakpark, Co. Carlow. Johnstown Castle is c.80km to the south east of the quarry and Oakpark is c.50km to the northeast. The Oakpark station is closest and has a more similar landscape position than Johnstown Castle. Therefore, the Met Eireann Synoptic Station data for Oakpark, Co Carlow for the last number of years are shown in Table 8.3.

Table 8.3 Monthly rainfall values (mm) Oakpark, Co. Carlow, Met Eireann Synoptic Station.

Total rainfall in millimetres for OAK PARK													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2025	103.8	91.2	21	80.4	31.7	51.5							**380**
2024	70.8	66.6	110.5	84.5	54.9	36.5	57.4	41.8	55.6	49.7	87.2	62.3	**778**
2023	66.1	14.3	103.4	49.4	23.3	46	144	62.9	126.8	141.8	53.8	104.6	**936**
2022	28	82.5	58.6	43.3	36	62.5	25.4	36.5	153.2	153.1	93.5	68	**841**
LTA	**80.3**	**62.5**	**61.7**	**57.5**	**56.4**	**60.1**	**61.2**	**69.3**	**67.9**	**92.6**	**92.5**	**89.1**	**851**

8.106 The Long-Term Average Annual Rainfall amount reported by Met Eireann, for the Oakpark Station for the 2022 - 2024 period, is c. 851mm/yr.

8.107 The Geological Survey of Ireland provides Groundwater Recharge Data in which Annual Rainfall (RF) is reduced to ER [Effective Rainfall (ER) = RF - Evapotranspiration Et] as shown in Table 8.4.

Table 8.4 GSI reported Groundwater Recharge and Effective Rainfall Water Balance Components.

Effective Rainfall (mm/yr)	461.70
Recharge Coefficient (%)	85
Groundwater Recharge Pre Cap (mm/yr)	392.50
Recharge Cap Apply	N
Average Groundwater Recharge Range (mm/yr)	351-400
Hydrogeological Setting Description	High permeability subsoil (sand & gravel) overlain by well-drained soil.
Vulnerability Category	H
Vulnerability Description	High
Subsoil Type (Quaternary Sediment Code)	GLs
Subsoil Description (Quaternary Sediment Description)	Glaciofluvial sands and gravels
Bedrock Aquifer Category & Description	Regionally Important Aquifer - Karstified (diffuse)
Hydrostratigrahpic Rock Unit Group Name	Dinantian Pure Bedded Limestones

8.108 With reference to Table 8.4, the GSI data can be interpreted, as follows:

- Of the 851mm/yr Met Eireann Long Term Average (LTA) Annual rainfall, 461.70mm/yr is reported as 'Effective'. This means that c.389mm/yr is lost to the atmosphere by evapotranspiration or evaporation.
- The Groundwater Recharge co-efficient applied by the GSI is 85% because the GLs Subsoil type and the Dinantian Pure Bedded Limestone make it easy for rainfall infiltration to the underlying groundwater system. No 'Cap' is applied by the GSI and therefore the mapped amount of Groundwater Recharge is calculated to be 392.5mm/yr of the 851mm/yr Met Eireann Rainfall.
- If the Effective Rainfall is 461.70mm/yr and the GSI mapped groundwater recharge is 392.5mm/yr then the balance is what is lost to runoff and that value is (461.70 – 392.5) = c.69mm/yr.

8.109 These values for rainfall, effective rainfall, groundwater recharge (and by balance, runoff) are important for each site's Water Balance and conceptualisation of the way that water moves through a site. However, in the case of Bennettsbridge Limestone's quarry at Kilree, the subsoil bedrock interface, epikarst, also plays a significant role in the water balance.

Hydrology

8.110 The site lies within the Nore Catchment (HA15), which is the area drained by the River Nore and all streams entering tidal water between its confluence with the River Barrow at Ringwood, and the

Barrow railway bridge at Drumdowney, Co. Kilkenny, draining a total area of 2,595km². The largest urban centre in the catchment is Kilkenny. The other main urban centres in this catchment are Abbeyleix, Callan and Thomastown.

8.111 The River Nore is 140 kilometres long, approximately, and rises in Gurteenshingaun in the Devils Bit mountain, in county Tipperary.

8.112 The river rises from sandstone bedrock geology but flows for c.10km only in sandstone and remainder of its c130km flow to the sea is underlain by limestone bedrock.

8.113 The river Nore flows through Kilkenny city, Bennettsbridge, Thomastown and Inistioge and becomes an estuarine water that discharges to the sea through New Ross and joins the Celtic Sea immediately east of Waterford city.

8.114 EPA (2018) provides information, as follows:

- The Nore Rises on the north-eastern slopes of Borrisnoe Mountain, from where it runs northeast over an area underlain by a large gravel aquifer and past Borris-in-Ossory. The southern slopes of the Slieve Bloom Mountains are drained by the Tonet, Delour and Mountrath Rivers which join the Nore east and south of Mountrath.

- The next sizable tributaries that flow into the Nore are the Cappanacloghy River and the Ballyroan River, which drains the area around Abbeyleix. Downstream of this confluence, the River Gully enters the Nore before the Erkina River joins at Durrow. It then flows over a gravel aquifer which follows the course of the river as far downstream as Kilkenny City.

- The Owveg River joins the Nore north of Ballyragget before the Nuenna River joins from the west near Freshford. Downstream of this, the Dinin River flows into the Nore near Threecastles. On entering Kilkenny City, the Bregagh River and the Brownstown River join the Nore. There is a sparsity of drainage channels in the catchment south of Kilkenny City as the karstified nature of the bedrock in this location means that much of the rain falling in this area infiltrates underground.

- The next major tributary to join the Nore is the King's River, which drains the southern side of the Slieve Ardagh Hills. Flowing south in a steep-sided valley, the Nore is joined by the Little Arrigle River and the Dungarvan Glebe.

- The Nore becomes tidal just upstream of Inistioge before continuing southeast to its confluence with the River Barrow at Ringwood.

- Flood relief works were completed during 2006.

8.115 The River Nore (EPA code: IE_SE_15N012090) flows in a north-south direction approx. 1.1km to the east of the application site.

8.116 The site's discharge is to the Dunbell_Little stream (EPA Name: Nore_190 and EPA Code: IE_SE_15N012090), 620m east of the rock extraction are and immediately east of the site's Settlement Lagoons.

8.117 The River Nore's waterway segments are numbered from source to sea, with numbering of significance to this EIA, as follows:

- Upstream of the quarry, the most significant settlement is Kilkenny City and the River Nore's water segment is numbered by the EPA as Nore_170 in the city where there is an active OPW Hydrometric Station named John's Bridge. The Nore is numbered _180 in the vicinity of the city's Municipal WWTP and associated discharges.
- After The Kilkenny Industrial and Business park on Sion Road in Kilkenny, downstream of the Municipal WWTP and associated discharges, the EPA numbering on the River Nore is _190, and this numbering applies to the region of the river in which all three quarries are situated upstream of Bennettsbridge.
- As stated, the quarry under primary consideration in this assessment, has a Section 4 Licence to discharge waters arising at the quarry to the segment of the Nore numbered _190,
- To the immediate south of Bennettsbridge settlement the EPA numbering on the River Nore is _200,
- To the south of Bennettsbridge WWTP' discharge, the EPA numbering on the River Nore is _210 and this numbering still applies to the river in the vicinity of Bennettsbridge PWS's 4 groundwater abstraction BHs and river bank infiltration gallery locations on its easterly shores at Knockanore, and the _210 numbering is retained even to the south of where the King's River joins the Nore from a westerly tributary,
- As the river continues to flow in a southerly direction, in the vicinity of Norelands Stud and Mount Juliet, the EPA numbering on the River Nore is _220. There is an OPW Hydrometric Station at Mount Juliet. The _220 numbering on the river segment waterway persists through to upstream of the settlement of Thomastown and the _220 code applies to the river in the vicinity of Thomastown PWS's abstractions on the southern banks of the Nore,
- As the river passes through Thomastown it's river segment number is _230 and this numbering applies to a tributary that joins the Nore, from the northeast, at the Quay in the town,
- After Thomastown, the river segment number is _240 as it flows through Dangan Woods and on to Brownsbarn Bridge, where there is an OPW Hydrometric Station,
- After Brownsbarn Bridge and the OPW Hydrometric Station, the final numbering applied to the Nore is the _250 for the segment that flows in the direction of Inistioge. However, before the Nore reaches Inistioge, the river becomes estuarine and the numbering of river segments ceases.

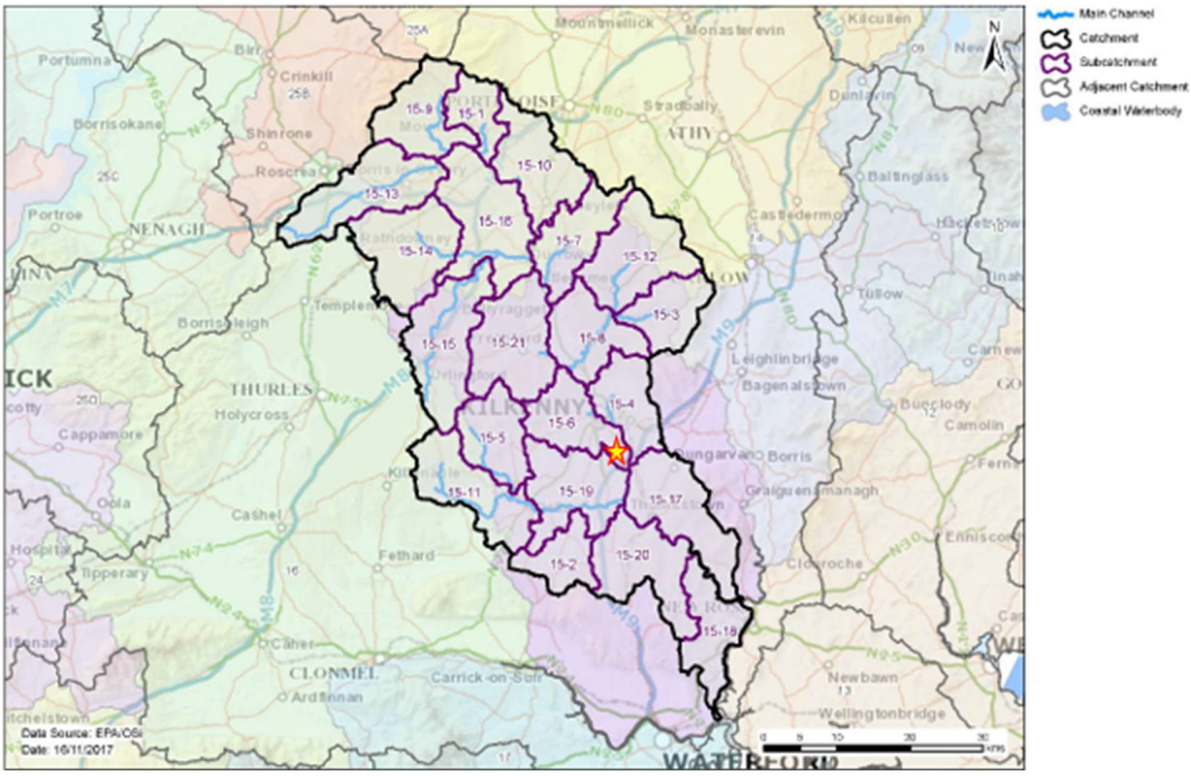
8.118 Regional Hydrology is presented in Figure 8.3 and Local Hydrology is shown as Figure 8.4.

8.119 On the basis that EPA (2024) reports that the Nore catchment (HA15) drains a total area of land of 2,595km² into the sea, when the proposed development area of the site is considered as having a total area of c.61ha (equivalent to c.0.61km2) and it is therefore 0.02% of the total catchment area. This has significance in terms of small scale and insignificant potential for impact.

8.120 The most recent EPA (2024) Hydrometric Area Report for HA15, which is presented in Appendix 8.7, reports that the Nore catchment is divided into 21 subcatchments with 123 river waterbodies, five transitional waterbodies and 48 groundwater bodies.

8.121 EPA (2024) provides a useful image for the detail of HA15, and its constituent sub components of sub catchments and sub basins, and names of the other Hydrometric Areas (HAs) around the site. Refer to Plate 8-2.

Plate 8-2 EPA (2018b) presentation for the Nore Catchment (HA15) & Subcatchment IDs.



(Hydro-G Annotation for the approximate location of quarry ★ northwest of Bennettsbridge).

8.122 When the River Nore becomes tidal at a distance of c. 750m upstream of Inistioge, it is mapped as the Nore Estuary [IE_SE_100_0400].

8.123 The River Barrow flows, to the east of the River Nore, in a southerly direction through Carlow and it becomes the Upper Barrow Estuary and then merges with the Nore Estuary just upstream of New Ross and when they merge, they become the Barrow Nore Estuary Upper [IE_SE_100_0250].

8.124 The River Suir flows through Clonmel and on to Carrick on Suir, to the southwest of Kilkenny, and merges with the Nore and Barrow after Waterford and those 'Three Sisters' rivers have become tidal and estuarine before Waterford.

8.125 The Barrow Suir Nore Estuary [IE_SE_100_0100] becomes Waterford Harbour [IE_SE_100_0000] and then discharges to the Eastern Celtic Seas (Has13, 17) [IE_SE_050_0000].

Hydrometrics

8.126 There are long term records for OPW Hydrometric Stations applicable to the study of the site and its associated River Nore. Information is available at https://waterlevel.ie/hydro-data/#/overview/Waterlevel).

8.127 The quarry and the OPW Hydrometric Stations are shown in Plate 8-3. Information available for OPW Hydrometric Stations is published per station at https://waterlevel.ie/hydro-data/#/overview/Waterlevel/station/. Details for each station on the Nore are presented here.

8.128 The first OPW Hydrometric Station on the River Nore is **Borris-in-Ossory** (Station 15008) and this is considered the 'Source' hydrometric data. This station is at an elevation of c.98m AOD and is c.62km river flow distance upgradient of the quarry's discharge. This is considered the 'Source' hydrometric data. For Abstraction Impact Assessment, the Irish EPA advocate a 'Source > Sea' conceptualisation of the river under consideration.

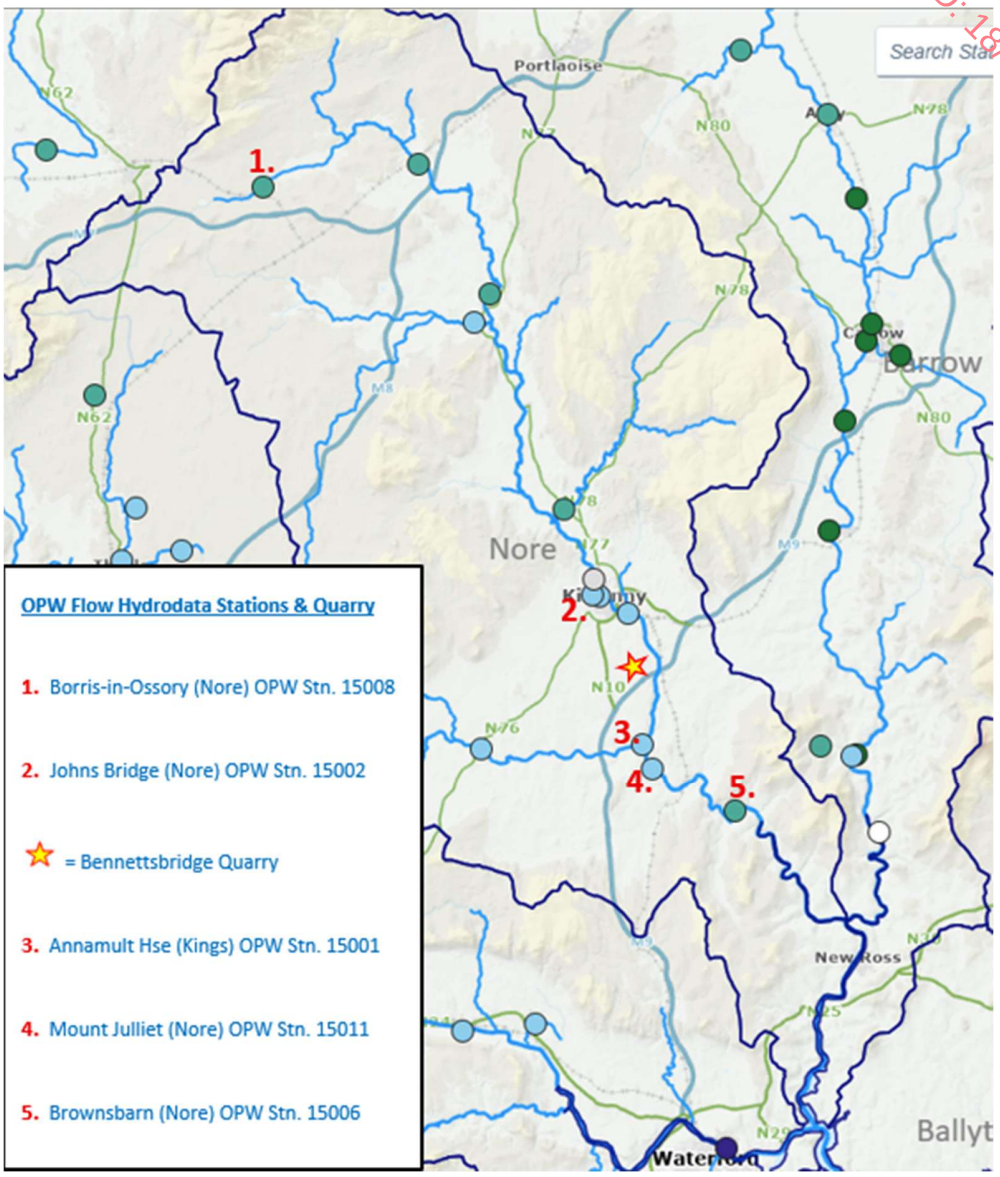
8.129 The OPW Hydrometric Station upstream of the quarry is **Johns Bridge (Nore)** (Station 15002). This station is at an elevation of c.41m AOD and is c.8.5km river flow distance upgradient of the quarry's discharge. This is considered the 'Upstream' OPW hydrometric data.

8.130 The OPW Hydrometric Station downstream of the quarry is **Mount Julliet** (Station 15011). This station is at an elevation of c.18.5m AOD and is c.8km river flow distance downgradient of the quarry's discharge. This is considered the 'downstream' OPW hydrometric data.

8.131 There is a OPW Hydrometric Station on a tributary of the Nore (Kings River), which joins the Nore between the quarry and the downstream Mount Julliet Station: **Annamult House** (Station 15001). This station is at an elevation of c.22m AOD and is c.6km river flow distance downgradient of the quarry's discharge. Information for this station has been included because it provides insight with respect to additional river (Kings) contribution to the Nore at a location between the Johns Bridge and Mount Julliet Stations.

8.132 The final Station on the River Nore is **Brownsbarn** (Station 15006). As stated, the Irish EPA advocate a 'Source > Sea' conceptualisation of the river under consideration and the Brownsbarn Station is the final element of the River Nore, before it becomes estuarine. This station is at an elevation of c.4.5m AOD and is c.19.5km river flow distance downgradient of the quarry's discharge.

Plate 8-3 Bennettsbridge Limestone location relative to OPW Hydrometric Stations.



Source https://waterlevel.ie/hydro-data/#/overview/Waterlevel & quarry location annotated by Hydro-G.

8.133 Catchment and Flow information for each Station are OPERATIONAL Flow and Level OPW Hydrometric Station are presented in Table 8.5.

Table 8.5 OPW Hydrometric Data (https://waterlevel.ie/hydro-data/#/overview/waterlevel).

Station Position on the River Nore	Nore: First OPW Station (@ c.62km U/S)	Nore: Kilkenny City Upstream of Quarry (c.8.5km)	King's River: Tributary of Nore Joining Upstream of Mount Juliet	Nore: Mount Julliet Downstream of Quarry (c.8km)	Nore: Final OPW Station before Tidal (c.18km D/S of Quarry)
Station Number	**15008**	**15002**	**15001**	**15011**	**15006**
Station Name	Borris-in-Ossory	Johns Bridge (Nore)	Annamult House	Mount Julliet	Brownsbarn
Station Type	Level & Flow	Level & Flow	Level & Flow	Level & Flow	Level & Flow
Latitude	52.9431	52.6534	52.5485	52.5313	52.5008
Longitude	-7.6441	-7.2504	-7.1996	-7.1893	-7.0917
Waterbody	NORE	Nore	Kings	Nore	NORE
Catchment	Barrow	Nore	Nore	Nore	NORE
Catchment size	115.5 km^2	1605 km^2	443 km^2	2315 km^2	2388 km^2
Gauge datum (m Above Malin Head)	c.97 m	c.41.5 m	c.22.1 m	18.5 m	4.5 m
Approx. Average flow (m3/s)*	2	**36**	8	**45**	**47.5**
Longterm average flow (m3/d calc.)*	174,459	**3,140,640**	701,689	**3,902,014**	**4,100,630**
Maximum Flow Observed m3/s (Year)	15.6 (2017)	472 (2015)	133 (2009)	403 (2009)	412 (2009)
Maximum Flow Observed (m3/d calc.)	1,347,840	40,780,800	11,491,200	34,819,200	35,596,800
Max Depth H20 (Staff Guage)	2.26m	2.2m	2.95m	3.87	3.8m
Channel Width	10m	35m	15m	45m	50m
OPW Hydrodata Long Term Flow Percentiles >30year's Record to 2025	**Borris-in-Ossory m3/s**	**Johns Bridge m3/s**	**Annamult House m3/s**	**Mount Julliet m3/s**	**Brownsbarn m3/s**
1%	10.355	**116.007**	45.546	186.899	193.795
5%	6.159	**78.648**	22.991	119.32	118.54
10%	4.362	**62.26**	15.928	89.844	89.104
25%	2.251	**40.785**	9.135	50.667	52.487
50%	1.092	**18.61**	4.067	23.143	27.357
75%	0.424	**7.256**	1.554	11.509	12.198
90%	0.247	**3.918**	0.793	6.817	7.695
95%	0.168	**2.638**	0.59	**5.709**	**6.297**
99%	0.052	**0.938**	0.387	4.389	4.635
(Indicative Values) calculated from the OPW m3/s	**Ossory (m3/d)**	**Johns Bridge (m3/d)**	**Annamult House (m3/d)**	**Mount Julliet (m3/d)**	**Brownsbarn (m3/d)**
1%	894,672	10,023,005	3,935,174	16,148,074	16,743,888
5%	532,138	6,795,187	1,986,422	10,309,248	10,241,856
10%	376,877	5,379,264	1,376,179	7,762,522	7,698,586
25%	194,486	3,523,824	789,264	4,377,629	4,534,877
50%	94,349	1,607,904	351,389	1,999,555	2,363,645
75%	36,634	626,918	134,266	994,378	1,053,907
90%	21,341	338,515	68,515	588,989	664,848
95%	14,515	**227,923**	50,976	**493,258**	**544,061**
99%	4,493	81,043	33,437	379,210	400,464
Impact on True Flows (OPW Data)		**Upstream OPW Stn.**		**Downstream OPW Stn.**	**Pre Estuary = Sea**
% of Quarry's Max Discharge vs 1%tile Storm Flows	n/a (Source @ c.62km U/S)	**0.7**	n/a Kings River (D/S trib of Nore)	0.4	0.4
% of Quarry's MEAN Discharge vs 50%tile Flows		**1.4**		1.1	0.9
% of Quarry's MEAN Discharge vs 95%tile LOW Flows		**9.7**		4.5	4.0
*** EPA (2018) Nore Catchment Assessment 2010 - 2015: Average Flow or 30% flow**					

8.134 With respect to the information presented in Table 8.5, information for each station is presented as follows:

- For the first OPW Hydrometric station on the Nore (Borris-in-Ossory: 15008), which is c.62km upstream of the quarry, information from the OPW suggests, as follows:
  - Catchment = 115 km^2
  - Average Flow (30%ile*) = c.2 m^3/s or c.174,459 m^3/d.
  - Max Observed Flow = 1,347,840 [*i.e.* c.1.3 million m^3/d].
  - 50%ile Flow is 1.09 m^3/s or 94,349 m^3/d.
  - 95%ile Flow is 0.168 m^3/s or 14,515 m^3/d.

- For the OPW Hydrometric station upgradient of the quarry, (Johns Bridge (Nore): 15002) , which is c.8.5km upstream of the quarry and in Kilkenny City, information from the OPW suggests, as follows:
  - Catchment = 1,605 km^2
  - Average Flow (30%ile*) = c.36 m^3/s or c.3,140,640 m^3/d.
  - Max Observed Flow = 40,780,800 m3/d [*i.e.* c.41 million m^3/d].
  - 50%ile Flow is 18.6 m^3/s or 1,607,904 m^3/d.
  - 95%ile Flow is 2.638 m^3/s or 227,923 m^3/d.

Notes:

- Uisce Eireann's Kilkenny City WWTP (Reg No. D0018-01) is located downstream of John's Bridge OPW Hydrometric Stn. and upstream of the Bennettsbridge Limestone Quarry's licensed discharge location. However, the OPW Hydrometric Stations will capture that discharge at a downstream station because the OPW data is true flow.
- Uisce Eireann's Bennettsbridge WWTP (Reg No. D0400-01) discharges to the River Nore downstream of Bennettsbridge Limestone Quarry's licensed discharge location. However, the OPW Hydrometric Stations will capture all discharges at the downstream Mount Julliet OPW Hydrometric station.

Note: The **King's (Kilkenny)** Tributary River joins the River Nore between the quarry and the next station on the Nore, which is Mount Julliet). This Tributary merge is c.6km downstream of the quarry. information from the OPW suggests that this Tributary carries water to the Nore, as follows:

- Catchment = 443 km^2
- Average Flow (30%ile*) = 8 m^3/s or c.701,609 m^3/d.
- Max Observed Flow = 11,491,200 m^3/d [*i.e.* c.11.5 million m^3/d].
- 50%ile Flow is 4.07 m^3/s or 351,389 m^3/d.

- 95%ile Flow is 0.59 m^3/s or 50,976 m^3/d.

Therefore, an additional flow from the King's (Kilkenny) Tributary joins the River Nore downstream of Bennettsbridge settlement and the quarry's discharge: the King's (Kilkenny) Tributary adds 351,389 m^3/d (50%ile) and 50,976 m^3/d (95%ile) to the river Nore. This a natural hydrological mitigating measure downstream of the quarry's discharge and it demonstrates that the Nore has natural ability and capacity to accommodate additions in flow.]

- For the OPW Hydrometric station on the River Nore downgradient of the quarry's receiver of discharge, (Mount Julliet: 15011), which is c.8km downstream of the quarry, information from the OPW suggests, as follows:
  - Catchment = 2,315.5 km^2
  - Average Flow (30%ile*) = 45 m^3/s or c.3,902,014 million m^3/d.
  - Max Observed Flow = 34,819,200 [*i.e., c.*35 million m^3/d].
  - 50%ile Flow is 23 m^3/s or 1,999,555 m^3/d [*i.e., c.*1.9 million m^3/d].
  - 95%ile Flow is 5.709 m3/s or 493,258 m^3/d.

- For the final OPW Hydrometric station on the River Nore (Brownsbarn: 15006), before it becomes estuarine (termed Transitional in WFD mapping), which is c.18km downstream of the quarry, information from the OPW suggests, as follows:
  - Catchment = 2,388 km^2
  - Average Flow (30%ile*) = 47.5 m^3/s or c.4,100,630 million m^3/d.
  - Max Observed Flow = 35,596,800 [*i.e.* c.35 million m^3/d].
  - 50%ile Flow is 27 m^3/s or 2,363,645 m^3/d [*i.e.* c.2.4 million m^3/d].
  - 95%ile Flow is 5.709 m^3/s or 493,258 m^3/d.

Overall, with respect to the OPW information, total streamflow length of the River Nore is c.140km and the OPW (https://waterlevel.ie/hydro-data) mapped catchment area is 2,388km2 at the final Brownsbarn OPW Hydrometric Station, approximately. It is noted that the Brownsbarn OPW Hydrometric Station is slightly short of the location of where the EPA maps the commencement of the estuarine (Transitional) waters south of Inistioge. As previously stated, the EPA maps the Nore as having a total catchment area of 2,595km^2 from 'Source' to 'Sea'. In this sense, it is worth recapping that the Brownsbarn OPW hydrometric station (15006), quantifies discharge of the Nore to Transitional Waters, as follows:

- Under the Average flow condition, c.47.5 m^3/s or **4,100,630 m^3/d** is discharged to the estuary, and
- the 95%ile low flow condition ensures that at least c.6.3 m^3/s or c.**544,000 m^3/d** of river water discharges from the River Nore to the sea.

8.135 In addition to OPW Hydrometric Station data, naturalised flow (modelled) data for rivers are published in the HydroTOOL model output for the River Nore. Naturalised flows are the simulated flows for a river when all anthropogenic effects are discounted: meaning that they are the flows if there were no abstractions for PWS, Industry or farming, and no discharges of treated effluent.

8.136 The EPA's HydroTOOL model node immediately upstream of the quarry's discharge (HydroTOOL Node 15_484) suggests an upstream contributing catchment of c.1,745 km2, as shown in Plate 8-4. Relevant **Naturalised** (**NAT**)* **flow rate model output values** as shown in Table 8.6.

8.137 Returning to the EPA's 2,595km² mapped 'Source to Sea' catchment for the Nore and the 1,745 km^2 HydroTOOL model's mapped catchment area upstream of the discharge: 67% of the Nore's total catchment area is upstream of the quarry's point of discharge to the Nore [(1,745/2,595)*100 = 67%].

Plate 8-4 Catchment for EPA HydroTOOL Model Node (15_484) immediately Upstream of the Quarry's Licensed Discharge.

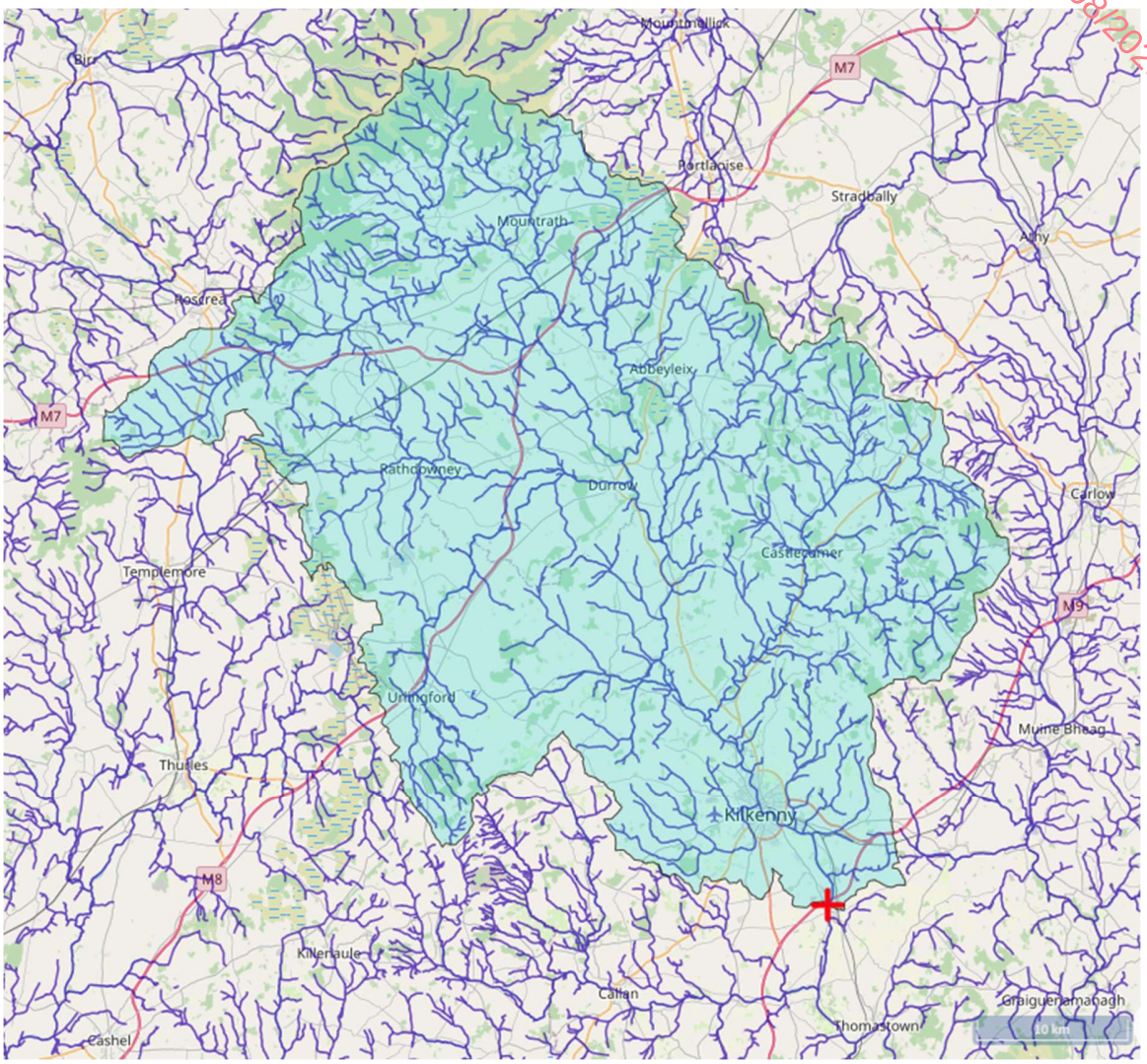


Table 8.6 EPA HydroTOOL Naturalised %ile Flows for the Model Node (15_484) Immediately Upstream of the Quarry's Licensed Discharge.

EPA Envision HydroTOOL Model Outputs		Hydro-G Daily Equivalents m3/d (Calculated)
Model Segment Code	15_484	for the HydroTOOL Model Node immediately upstream of the Quarry's Licensed Discharge
CatchmentArea_Km2	1744.477	
Easting	255220	
Northing	149680	
FARL	1	
RAINFALL_SAAR	956 mm/yr	
EVAPOTRANSPIRATION	509 mm/yr	
NATQ1 (m^3/s)	160.369	13,855,882
NATQ5 (m^3/s)	94.492	8,164,109
NATQ10 (m^3/s)	69.723	6,024,067
NATQ20 (m^3/s)	45.524	3,933,274
NATQ30 (m^3/s)	33.396	2,885,414
NATQ40 (m^3/s)	25.146	2,172,614
NATQ50 (m^3/s)	19.112	1,651,277
NATQ60 (m^3/s)	14.541	1,256,342
NATQ70 (m^3/s)	10.764	930,010
NATQ80 (m^3/s)	7.501	648,086
NATQ90 (m^3/s)	4.761	411,350
NATQ95 (m^3/s)	3.601	311,126
NATQ99 (m^3/s)	2.271	196,214
HydroTOOL EPA Annual and Monthly Mean Flows		m3/d equivalents
NATAMF (m^3/s)	31.121	2,688,854
NATMMF1 (m^3/s)	57.894	5,002,042
NATMMF2 (m^3/s)	49.097	4,241,981
NATMMF3 (m^3/s)	36.6	3,162,240
NATMMF4 (m^3/s)	27.267	2,355,869
NATMMF5 (m^3/s)	19.41	1,677,024
NATMMF6 (m^3/s)	15.25	1,317,600
NATMMF7 (m^3/s)	11.858	1,024,531
NATMMF8 (m^3/s)	15.421	1,332,374
NATMMF9 (m^3/s)	16.075	1,388,880
NATMMF10 (m^3/s)	27.704	2,393,626
NATMMF11 (m^3/s)	43.33	3,743,712
NATMMF12 (m^3/s)	53.55	4,626,720

8.138 With respect to the EPA's HydroTOOL model node immediately upstream of the quarry's discharge (HydroTOOL Node 15_484) and the values as shown in Table 8.6, important impact assessment information to be carried forward are those NATQ flow rates for > Q60. > Q70 and Q95 because those are the assessment boundaries for the different river types presented in Table 3 of the Guidance Document on Potential Impacts on associated surface waters arising from abstractions of groundwater from the catchments of the rivers, as outlined in EPA (2025a). Flow characteristics of importance include, as follows:

- **NATQ60** = 14.541 m^3/s, which is broadly equivalent to **1,256,342 m^3/d** or 1.2million m^3/d.
- **NATQ70** = 10.764 m^3/s, which is broadly equivalent to **930,010 m^3/d** (almost 1 million m^3/d).
- **NATQ95*** = 3.601 m^3/s, which is broadly equivalent to **311,126 m^3/d.**
- **NATQ99** = 2.271 m^3/s, which is broadly equivalent to **196,214 m^3/d**. NAQ99 is the lowest flow rate in a river: the absolute lowest baseflow that is exceeded 99% of the time.
- **NATAMF** = 31.121 m3/s, which is **2,688,584 m3/d** or almost 3million m3/d.
- **NATQ30**** = 33.396 (m^3/s), which is broadly equivalent to **2,885,414 m^3/d.**

* Reiterating that in the HydroTOOL model there can be a +/-56%error for the 95%ile flow values (Bree, 2018). However, given that there are many OPW stations on this river, the model should not have large magnitudes of error because true data is used to build a model. As previously presented, the upstream OPW hydrometric station at Johns Bridge in Kilkenny City reports true and actual 95%ile Flow of 2.638 m^3/s (227,923 m^3/d) and the downstream OPW station at Mount Julliet reports 95%ile Flow is 5.709 m^3/s or 493,258 m^3/d. OPW Data incorporates abstractions such as Uisce Eireann's abstractions for Kilkenny PWS and discharges of treated wastewater. EPA Abstraction Impact methods use the HydroTOOL Naturalised flow rates in order to evaluate potential changes relative to the natural, no human consumption, environment.

** EPA (2018b) states that for the Nore Catchment (HA15) NATQ30 can be related to Annual Mean Flow.

River Typology

8.139 River 'Typology' is a cornerstone foundation of the Irish EPA's application of Abstraction Impact Assessment. EPA (2025a) presents an impact assessment framework that hinges on river 'Typology'. The concept is adopted from Uk Government legislation (2015) in Northern Ireland for the purposes of the WFD: Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015 (*legislation.gov.uk*). EPA (2017) also provides detail on Environmental Flow Assessment for Irish Rivers and the Irish EPA's adoption of this methodology is presented by Quinlan and Quinn (2018).

8.140 A river is assigned a 'Typology' based on Rainfall, catchment area and Baseflow Index. Altitude and alkalinity are also important criteria. The River Nore's 'Typology', in the stretch applicable to the quarry, is 'B1 – Hard limestone. low-medium altitude. low-medium slope'.

8.141 River Typology is considered because of the concept named 'Streamflow Depletion', which conceptualises that all rivers receive variable amounts of groundwater as baseflow and in times of low rainfall the baseflow component is important for the ecological life of a river. It is therefore conceptualised that abstractions from a GWB are essentially abstractions from the baseflow component of a river.

8.142 The B1 typology makes up 73% of the river systems in the South East region (Uisce Eireann, 2023).

8.143 The EPA assigns a particular ecological sensitivity to low flows in rivers and impounding structures. The River Nore in the vicinity of the quarry is not a low flow river when one considers the OPW hydrometric data previously presented.

8.144 As presented in Quinn & Quinlan (2018) and reproduced in EPA (2025a), Tables are provided for maximum impact % values for High Status Objective Rivers (Table 2) and for Good Status Objective Rivers (Table 3). The River Nore is reported in EPA (2024a) as a Good Status Objective River. The applicable Impact Table is Table 3 (EPA, 2025) and this is presented in a Text Box, below.

Table 3* of EPA (2025a) as a Text Box extract here:

Table 3 Good status environmental objective river flow limits

Maximum permitted total abstraction per day as a percentage of daily natural flow (Q)				
River Type	Flow > Q60	Flow > Q70	Flow > Q95	Flow < Q95
	(% change allowed from the natural flow)			
A1	35	30	25	20
A2 (downstream), B1	30	25	20	15
A2 (headwaters), C2, D2	25	20	15	10

* https://www.epa.ie/publications/corporate/consultations/-consultations/Significant-Abstraction-Guidance-10.03.2025---public-consultation.pdf

8.145 With reference to Table 3 (EPA, 2025a), the allowable percentages that can be abstracted are as follows:

- When the naturalised flow is at Q95-Q99 (low flow), the allowable percentage that can be abstracted is 15%.
- When the naturalised flow increases to between Q70-Q95, the allowable percentage abstraction increases to 20%.
- When the naturalised flow increases to between Q60-Q70, the allowable percentage abstraction increases to 25%
- When the naturalised flow is >Q60, the allowable percentage abstraction increases to 30%.

8.146 Hydro-G's experience suggests that whilst river 'Typology' is an important facet of WFD characterisations and Abstraction Impact Assessment, there is no net loss of water to the low flow condition of a river system when a quarry abstracts from an associated GWB and discharges, under licence, to the same river water body, as is the case for the application site. Therefore, there is no loss to the 95%tile flow of a river. Consequently, the proposal complies with the EPA abstraction thresholds for Typology B1 rivers and will not compromise the Nore's Good-Status objective. However, the legislation and EPA Guidance is published and therefore, the data particular to the quarry must be provided in the EIAR and populate the EIA.

Uisce Eireann Water, Wastewater and the River Nore

8.147 The abstractions and discharges are listed here for the record only because the OPW Hydrometric Stations on the River Nore capture the resultant flow rates that demonstrate the effects of all abstractions from, and discharges to, the river.

8.148 Upstream of the quarry and upstream of Kilkenny City, drinking water for Kilkenny City and environs is abstracted from the River Nore at Troyswood WTP c.4.3km to the north west of Kilkenny city. An Uisce Eireann press release (https://www.water.ie/news/eu33m-investment-completed-secure-water-supply-kilkenny-city) states that 28,000 people are served by the upgraded Troyswood WTP, which then makes the Radestown WTP defunct.

8.149 The EPA Register of Abstraction (December 2024) lists Troyswood WTP as a 27,463 m^3/d abstraction. Whilst the same EPA Register also documents Radestown WTP as abstracting c.10,000 m^3/d, the media message reports that the Troyswood WTP upgrade enabled the decommissioning of the Radestown Water Treatment Plant.

8.150 Downstream of the quarry, Uisce Eireann abstracts water from abstraction points in the banks of the River Nore and Bennettsbridge PWS and Thomastown PWS. Details for each scheme are presented in Vol II of the County Kilkenny Groundwater Protection Scheme (GSI, 2002). Further details for Bennettsbridge are provided in the EPA GWMP Report for Bennettsbridge (EPA, 2011). The EPA Register of Abstraction (December, 2024) reports, as follows:

- Bennettsbridge PWS is registered to abstract a cumulative total of 4,603 m^3/d using 8 ACTIVE and 1 non-active registered abstraction points, with abstraction details as follows:
    - Two Groundwater Boreholes are registered as capable of abstracting a combined total of c.1,160 m^3/d (680 m^3/d and 483 m^3/d) from bedrock boreholes in the Clifden South GWB [IE_SE_G_159], and
    - Five Groundwater abstraction points are registered as capable of abstracting a combined total of between 2,701 m^3/d and 3,184 m^3/d from the Stoneyford Gravels GWB [IE_SE_G_128], and
    - Two Surface Water abstractions taking a combined total of c.1,222 m^3/d from the River Nore [SC NORE_210, EU Code IE_SE_15N012200, Townland Annamult].
    - The Bennettsbridge abstractions and WTP are located adjacent to the River Nore but immediately upgradient of the King's River confluence with the River Nore. The Annamult OPW Hydrometric Station is on the King's River immediately before this confluence.
- Thomastown PWS is registered to abstract a cumulative total of 3,720 m^3/d using two 'groundwater boreholes' and one 'infiltration gallery', with abstraction details as follows:
    - c.1,700 m^3/d abstracted from the 1st groundwater borehole, mapped as taking from the Inistioge GWB [IE_SE_G_076], and
    - c.1,300 m^3/d abstracted from the 2nd groundwater borehole, mapped as taking from the Inistioge GWB [IE_SE_G_076], and

- c.660 m^3/d from an infiltration gallery, mapped as taking from the Stoneyford Gravels GWB [IE_SE_G_128].

8.151 As previously outlined in the section heading 'Consultations', Uisce Eireann provided a response to scoping (Appendix 8.8) and the requests included assessment of potential for impact with PWS abstractions. Hydro-G's impact assessment is presented in Appendix 8.8 with details for specific engagement with Uisce Eireann relating to details for the schemes.

8.152 As outlined earlier, there are Uisce Eireann discharges of treated wastewater to the River Nore at stations in proximity to the quarry's licensed discharge point, as follows:

- Kilkenny City WWTP (Reg No. D0018-01), to the south of John's Bridge Stn., has an agglomeration PE of 36,281 and a design PE of 77,000 and (EPA envision https://gis.epa.ie/EPAMaps). On the accepted basis (EPA, 2021) that 150litres = 1PE, it is calculated that volumes of 5,442m3/d (agglomeration PE) to 11,500 m3/d (Design PE) of Tertiary Treated Wastewater with P removal, plus additional stormwater overflow volumes, are discharged by Uisce Eireann to the River Nore downstream of John's Bridge and upstream of Bennettsbridge Limestone Quarry's discharge. Kilkenny City has an associated Primary Treatment system and Discharge Overflow at Sion Road (A0071-01), which is c.350m from the main Kilkenny City WWTP. EPA Envision mapping (Wastewater) presents 15 Storm Water overflows to the River Nore in the vicinity of Kilkenny City.

- Bennettsbridge WWTP (Reg No. D0400-01) discharges Primary Treated Wastewater at a stormwater overflow discharge location to the River Nore downstream of Bennettsbridge village and downstream of Bennettsbridge Limestone Quarry's discharge. EPA Envision mapping suggests that this WWTP has an agglomeration PE of 701 and a design PE of 475. Therefore, an additional 70 to 110 m^3/d of Primary Treated Wastewater, plus stormwater overflow volumes, are discharged to the River Nore at a location downstream of the quarry's discharge to the Nore. Bennettsbridge WWTP was cited as a Pressure on the River Nore in EPA (2018b).

- Thomastown WWTP (Reg No. D0151-01) discharges Tertiary Treated Wastewater with P Removal. EPA Envision mapping suggests that this WWTP has an agglomeration PE of 3,375 and a design PE of 7,000. Therefore, an additional c500 to 1,125 m^3/d of Treated Wastewater, plus stormwater overflow volumes, are discharged to the River Nore at a location downstream of Thomastown. EPA Envision mapping shows 5 stormwater overflows in the vicinity of Thomastown.

Uisce Eireann Infrastructure in the Vicinity of the Quarry

8.153 Uisce Eireann (datarequests@water.ie) responded, by email on the 11/06/2025, to requests for mains and foul infrastructure with maps, as requested.

8.154 All maps obtained from Uisce Eireann are presented in the National Agency Reports and Map Series Appendix 8.7.

8.155 The Uisce Eireann Water Mains Distribution Maps demonstrate that there is mains supply potential to service existing homes along roads to the east, north, south and east of the quarry, as follows:

- From Bennettsbridge village heading north to Kilkenny, the Regional Road R700: 150mm uPVC (2006).
- The Local Road L6700 heading west from the R700 north of the quarry: 110 HPPE (2016) on the road leaving the R700 heading west and reducing to 75mm uPVC approaching the N10.
- From Bennettsbridge village heading west, the Local Road L4200: 125mm uPVC in the vicinity of the bridge at Bennettsbridge and reducing to 100mm and 75mm uPVC in the westerly direction.
- From Jn9 on the M9, the N10 Route named 'Waterford Road' heading north to J3 on the southern periphery of Kilkenny City: 75mm uPVC at Jn9 and reducing to 50mm uPVC going north along the N10 until it meets the Local Road L6700.

8.156 The reservoir for Uisce Eireann's Bennettsbridge PWS is c.8km to the south west of the quarry, and to the south of King's River. Therefore, there is no potential for affecting this Uisce Eireann asset because of the significant distance from the quarry

8.157 The Uisce Eireann Sewer Maps supplied to this assessment team (Appendix 8.8) suggest, as follows:

- Bennettsbridge village is served by a Combined Foul Sewer in the older parts of the agglomeration (surface water and foul combined) and a separate foul network for the newer built segments to the south east of the developed area.
- There is no foul sewer service network in the vicinity of the quarry or any roads to the north, south, east or west of the site.
- There is no potential for the quarry to affect Uisce Eireann foul pipe network infrastructure.

Flooding

8.158 No flooding has been reported by the OPW (https://www.floodinfo.ie/map/floodmaps) in or around the point, or channel in, which the discharge leaves Bennettsbridge Limestone Quarry nor at, or immediately downstream of, the point of receipt in the River Nore. The site has been licensed to discharge its current discharge volumes since 2017. No flooding has occurred.

8.159 OPW flooding maps past flood events immediately south of the quarry's access road and the junction onto the R700 road from Bennettsbridge to Kilkenny (https://www.floodinfo.ie/map/floodmaps/). However, the reports for those flood events relate to events between 2003 and 2005 (https://www.floodinfo.ie/map/pf_addinfo_report/2576/). Flood events near Bennettsbridge are reported by the OPW at https://www.floodinfo.ie/map/pf_addinfo_report/4034/. However, the events are reported for 1947 and 1996. On the basis that there were no events documented by the OPW for the 2009 and 2015 extreme weather events, it is concluded that flood relief / road drainage measures have resolved all historic issues.

8.160 The GSI presents Maximum Historic Groundwater Flooding in the Nore associated with the extreme Winter 2015-2016 period but the areas mapped as flooded in the Nore are upstream of the quarries discharge or on lands on the other, eastern, side of the Nore. There are no GSI mapped groundwater flood events in any lands in the vicinity of the quarry. There are no GSI mapped

groundwater flood events on either side of the banks of the stream that conveys the quarry's licensed discharge to the River Nore.

8.161 The development proposal is deemed to concur with mapping for Kilkenny's County Development Plan (2021 – 2027)'s and the associated Strategic Flood Risk Assessment (SFRA). The Kilkenny County Development Plan (Kilkenny County Council, 2021a)'s Section on Flooding opens as follows:

> "10.2.6 Flooding
>
> Flooding is a natural phenomenon of the hydrological cycle. There are many factors that influence flood behaviour and the degrees of risk that it possesses. Like other natural processes, flooding cannot be completely eliminated, but its impacts can be minimised with proactive and environmentally sustainable management. The accepted national policy response to flood protection is now to manage the risk to life and property as sustainably as possible and to consider flood risk and its related impacts on development on a catchment basis, rather than on an individual location basis. This will facilitate sustainable development through the reduction of future flood damage and hence reduce the associated potential economic and social costs".

8.162 The Strategic Flood Risk Assessment 2021-2027 (Kilkenny County Council, 2021b) of the Kilkenny City & County Development Plan, discusses the Bennettsbridge settlement and Map 3 (page 62 of 85) of the SFRA enables the interrogation of the area in which the discharge from the quarry leaves the site and approaches the River Nore: the location is NOT mapped as a Flood Zone and neither is it mapped as an Area requiring a site specific flood risk assessment. As outlined in the City and County Development Plan, flooding is natural and expected along the course of the Nore. There is no mapped information and no reporting to suggest that the quarry interacts with the natural flood expression of the Nore.

8.163 The quarry site itself is not located in an area that is mapped as 'liable to flood'. Therefore, there are no flood risks associated with the extraction location.

8.164 The quarry is licensed to discharge a maximum of 70,000 m^3/d (ENV/W/78) to the River Nore. As previously outlined in the section heading 'Hydrometrics', the River Nore immediately upstream of the discharge has capacity to accommodate, as shown in Table 8.6 above, a usual storm volume of c.14million m^3/d in the NATQ1 scenario (aka similar to 1%ile) and the maximum observed flows at the upstream Kilkenny City and downstream Mount Julliet OPW Hydrometric Stations are reported by the OPW (https://waterlevel.ie/hydro-data/#/overview/Waterlevel), as shown in Table 8.5 above, as 41 million and 35million m^3/d, respectively. Therefore, with respect to capacity of the River Nore to assimilate flows and stream banks, the quarry presents no flood risk / threat in the scale of capacity in the river.

Hydrogeology

8.165 The Lands, Soils and Geology Chapter presented detail for the Soils, Subsoils and Bedrock components of the hydrogeological environment at the site and in the surroundings. In this chapter, water related aspects of the hydrogeological systems are presented. National mapping and reporting provides some desk based information.

8.166 The County Kilkenny Groundwater Protection Scheme Report (GWPSR) (Kilkenny County Council and GSI, 2004) provides detail for the hydrogeological components of specific relevance to protection of the groundwater resource based on the characteristics of the overlying strata and the

ability of the rocks to transmit water. The same information is presented on the Data and Maps online service of the GSI. A lot of information about each of the PWSs is presented in Vol II of the same GWPSR (2004). That information was used as a base in the Impact Assessment completed and reported in this EIAR.

8.167 **Groundwater Vulnerability** is mapped by the GSI as High across the quarry and greenfield application area. Refer to Figure 8.5. However, all quarries are essentially E or X Groundwater Vulnerability because the concept relates to the depth of subsoil cover over bedrock and the whole aim of quarrying is to expose and extract bedrock for societal use.

8.168 **Aquifer Classification** is mapped by the GSI as Rkd - Regionally Important Karst (diffuse). Refer to Figure 8.6. The GSI states that the aquifer underlying the quarry has a total area of 2,343 km2. The proposed 61ha site represents 0.003% of the total mapped aquifer area. This has significance in terms of the potential Magnitude of Impact, which is small scale based on the potential for removal of a 'small proportion of aquifer' (IGI, 2013, Table C5, Appendix 8.9).

8.169 **Karstification** is the process whereby fissures, faults and joints in the purer units of limestone are enlarged by dissolution. Karstification can considerably enhance the permeability of limestone which has essentially no inter-granular permeability. The area is mapped to have a number of springs, as shown in Figure 8.7. GSI karst mapping for the area is presented in in Figure 8.7. The GSI maps some springs but no other karst features such as swallow/sinkholes, sinking streams, turloughs or seasonal lakes or caves. The GSI does not present any mapped traced underground water systems in the area.

8.170 There are two springs in proximity and they are mapped on the 6" OS map and GSI web mapping. "WHITE WILLIAMS WELL" is a spring that is located on land just immediately north of the settlement lagoons (GSI Ref: 2315SEK034). There is another unnamed spring mapped by the GSI (REF: 2313NEK003) between the application area and the M9 motorway adjacent. No conduit Karst has been encountered in the operational excavation of bedrock in the previously sanctioned and completed permission elevation of 25 to 30m OD, which is proposed for the greenfield excavation.

8.171 The most important hydrogeological concept is where the groundwater will move to after it passes through or under the site. Hydro-G offers that the likely groundwater flow direction from the site will be in the general direction of the River Nore, which suggests a westerly to easterly groundwater flow direction. Whilst there may be deflections and meanderings that influence groundwater flow direction along the way, ultimately all groundwater is trying to escape it subterranean environment and find the atmosphere in the River Nore, which discharges to the estuary south of Inistioge and finally the Eastern Celtic Sea.

8.172 The site is underlain by the Kilkenny Body (GWB) [IE_SE_G_078]. Refer to Figure 8.8. A copy of the Kilkenny GWB Descriptor Sheet (GSI, 2004) is presented in Appendix 8.7, in which it is reported that the area of this GWB is 152 km^2. Again, in terms of scale, the proposed 61ha total future area of the site represents 0.04% of the total mapped GWB area. Some significant points presented in GSI (2004) are as follows:

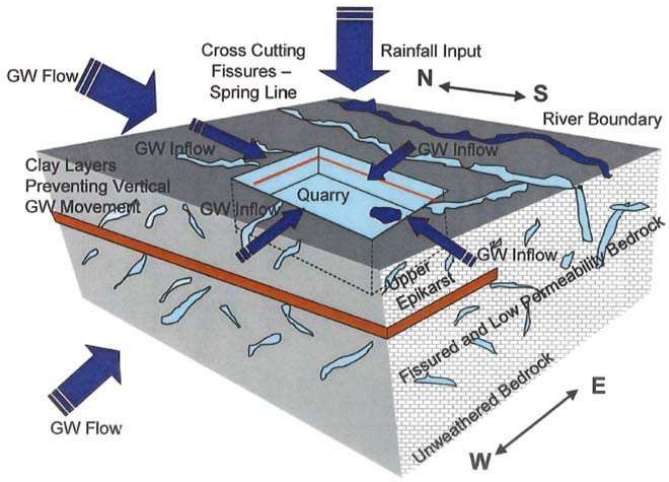
- "These rocks are generally devoid of intergranular permeability.
- Groundwater flows through fissures, faults, joints and bedding planes.
- In pure bedded limestones these openings are enlarged by karstification which significantly enhances the permeability of the rock.
- Karstification can be accentuated along structural features such as fold axes and faults.

- Groundwater flow through karst areas is extremely complex and difficult to predict.
- Overall, regional groundwater flow will be towards the River Nore, but the highly karstified nature of the bedrock means that locally groundwater flow directions can be highly variable."

8.173 In addition to the usual desk based data of the GSI, there is a large body of site-specific hydrogeological information reported for the quarry over the years. Historical reports of other hydrogeologists for the Bennettsbridge Quarry site include sections within reports and planning applications referenced as BJ Murphy & Associates (1999). Walton (1999 & 2000). EDA (2000 & 2002). ONGWE (2007). AOS and AWN (SC 2014 & 37L 2015) and Apex (2006, 2008, 2010, 2014, 2018a and 2018b, 2025). In the PL18/858 application Hydro-G integrated and updated historical hydrogeological information on the basis of the results of Site Investigations completed in 2017 and 2018.

8.174 In review of all historical reports and evaluation of information specific to the proposal to extend the excavation into the western greenfields, the Conceptual Understanding presented by Mannix in ONGWE (2007) and others (Daly etc.) remains relevant: the shallow subsoil/broken bedrock interface (epikarst) is an important hydrogeological component at Bennettsbridge Limestone Quarry. The schematic of that Conceptual Site Model (CSM)is presented as Plate 8-5.

Plate 8-5: Bennettsbridge Limestone Quarry's Hydrogeological Model (Mannix, ONGWE, 2007).



8.175 The western wall of the operational quarry has opened up the epikarst zone of the entire boundary wall that the operational quarry shares with the proposed greenfield application area. This demonstrates that subsurface drainage from the extension area already percolates toward, is intercepted by, and is managed within the quarry's current water-management system.

Water Framework Directive Mapping, Status, Risk & Assessments

Surface Water Catchment & Baseline Information Sources

8.176 EPA Envision mapping provides information on WFD names, codes, status, risk and report links for all cycles of the WFD, for which Ireland is currently in its 3rd Cycle of WFD assessment and reporting. WFD data are available to all at https://gis.epa.ie/EPAMaps/Water and it is this mapping resource that has been used to populate the Desk Study baseline and WFD assessment, which is reported at the end of this Chapter.

8.177 All 3rd Cycle information for the Nore Catchment (HA15), and its associated waterbodies (rivers, groundwater, transitional and coastal), is reported in a May 2024 3rd Cycle report available at https://www.catchments.ie/data/#/catchment/15. A copy of that 3rd Cycle Report and other EPA reports are presented in Appendix 8.7. The Nore Catchment (HA15) 3rd Cycle Report (EPA, 2024a) suggests that a total of 38% of surface water bodies were at Good or High Ecological Status in the 2016-2021 monitoring period.

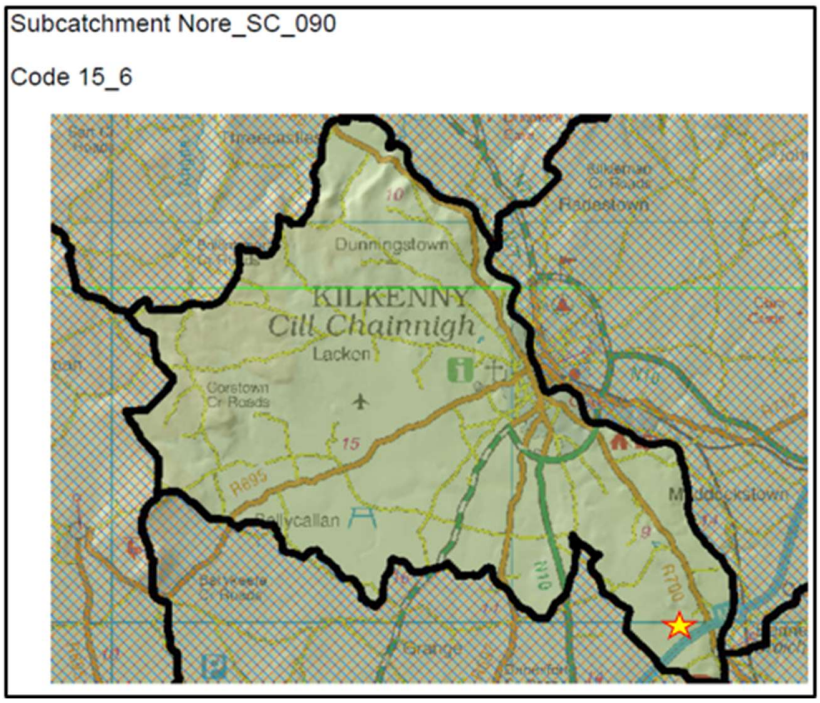
8.178 The Nore Catchment (HA15) is the **macro** scale of WFD assessment and reporting. On the micro scale there are sub catchments and sub basins. The overall Nore Catchment is described in great detail in WFD Reports EPA (2018a, 2018b, 2019, 2024a). EPA (2018a) provides a useful image for the subcatchment in which the site sits, as shown in Plate 8-6, over.

Sub Catchment & Sub Basin

8.179 At the local scales, *i.e.,* micro scale, the site is mapped by the EPA as being part of the sub catchment (SC) and sub basin named, as follows:

- Sub Catchment Name = Nore_SC_090 [SC ID 15-6].
- Sub Catchment ID = 15_6
- Sub Basin Nore_190 [EU_CD IE_SE_15N012090]. Area 28.96km2.
    - Good Status Objective (Date 2022-2027).
    - 3rd Cycle Status (2016 – 2021) = MODERATE (Modelling).
    - 3rd Cycle Risk = Under Review.
    - Protected Area mapping for association of SAC (Special Area of Conservation, Natura 2000 (water dependent habitats and species). Fish (Salmonid Waters). SPA (Special Area of Protection, Natura 2000 (water dependent habitat and species) and Nutrient Sensitive Area (NSA).

Plate 8-6 Bennettsbridge Limestone INDICATIVE location , as annotated by Hydro-G, within the EPA presentation for the sub catchment named Nore_SC_090 [SC ID 15_6] (EPA, 2018a)



Reported Pressures

8.180 EPA (2018b) reports Pressures associated with the SC ID Nore 15_6 as follows:

- Diffuse urban: Diffuse urban pressures, caused by misconnections, leaking sewers and runoff from paved and unpaved areas, have been identified as significant in three river water bodies – Nore_200 which flows through Bennettsbridge. Little Arrigle_010 which flows through Knocktopher. and Brownstown (Pococke)_010 high flows through the outskirts of Kilkenny city, Figure 15. Elevated concentrations of phosphates and ammonia are the significant issues.

- Hydromorphology: River water bodies (three) within the Nore (SC15_6), King's [Kilkenny] (SC15_11) and Nore (SC15_16) subcatchments are subject to extensive modification. Drainage schemes exist within these subcatchments, in addition to an embankment scheme within the Nore (SC15_6), which may impact habitat conditions.

8.181 EPA (2024a) reports less detail for the subcatchment but lists Pressures and Significant Issues per each river segment (sub catchment). For the Nore_190, no specific Pressures are published in EPA (2024a). However, Nutrients are listed as an 'Issue' for other reaches of the river. Specific to the Nore_190, elevated nitrates in the Clifden – The Highrath GWS are listed as an Area for Action, with a 'Protection' remit.

Groundwater & WFD

8.182 With respect to groundwater (hydrogeology) underlying the application quarry, the Groundwater Body (GWB) underlying the site is Kilkenny GWB [IE_SE_G_078], which is reported by the EPA (2024a) for WFD Compliance, as follows:

- Good Status Objective (Objective Date 2021 or earlier).
- Achieved Good Status (2016-2021) for Overall, Chemical and Quantitative Status.
- 3rd Cycle = mapped as AT RISK.
- Protected Area for Drinking Water and SAC associated.
- "Significant Pressure" = 'Agriculture and Unknown'. Overall, EPA (2018b and 2024) list Agriculture as the main pressure for the Kilkenny GWB.
- "Significant Issues" = "Diminution of chemical quality of surface waters, Nutrients".
- Monitoring information for the period 2016 - 2021 presents trends for the single groundwater monitoring station 'Clifden /Clara GWS' [GWIE_SE_G_07815000006], which demonstrate currently compliant, but upward trends in the direction of exceedances in the indicative quality guide levels for Nitrate, Chloride and ortho-Phosphate (https://www.catchments.ie/data/#/waterbody/IE_SE_G_078). The Clifden/Clara GWS is 6.6km to the north east of the quarry and on the other side of the River Nore. There is no groundwater connection between the quarry and the Clifden/Clara GWS because groundwater flow direction from the quarry and the GWS will each meet from opposite directions flowing to the Nore. In the lands and river systems around the Clifden GWS, it is ortho-P that is the reported dominant nutrient pressure (EPA, 2019) and the sources of the problem are agriculture, combined stormwater overflows (CSO), sewer misconnections and historically inadequate municipal WWTPs treatment infrastructure.
- Protected Area for Drinking Water (DWPA) and SAC associated.
- For the Nore (HA15) Catchment, the Kilkenny GWB is one of the 96% GWBs achieving its Objectives.

8.183 Between the quarry and the River Nore, to the east, is a separate GWB named the Stoneyford Gravels GWB [IE_SE_G_128]. EPA (2024a) reporting for the Stoneyford Gravels GWB, includes as follows:

- Good Status Objective Waterbody (Objective Date 2022 – 2027).
- 3rd Cycle mapping = Poor Status (2016-2021).
- 3rd Cycle At Risk.
- "Significant Pressure" = Agriculture.
- "Significant Issues" are that the chemical quality of the surface waters are negatively affected (Nutrients).
- Protected Area for Drinking Water (DWPA) and SAC associated.

8.184 The Kilkenny GWB and the Stoneyford Gravels GWB share a boundary. As previously stated, the Stoneyford Gravels GWB is a relatively shallow (c. 5 to 10m estimated) mass of water lain gravels along the River Nore's banks in a small area east of Bennettsbridge Limestone. The limestone bedrock's regional groundwater flow direction is from the west of the application site, through the quarry, underneath the Stoneyford Gravels GWB and on through to the River Nore. Hennessy's Concrete Quarry located 1km, approximately, to the northeast of the application site is mapped by the EPA as being in the Stoneyford Gravels GWB but the deeper bedrock at that Hennessy quarry is being excavated from bedrock that is part of the Kilkenny GWB. As outlined in Table 8.2, the Stoneyford Gravels, Clifden Northwest, Clifden South, Bennettsbridge and Thomastown GWBs are all separate and distinct groundwater flow systems, as mapped by the EPA and WFD catchments.ie teams. Therefore, a groundwater connection is highly unlikely to be present (High Confidence).

The Quarry & WFD

8.185 The quarry has operated through all WFD Cycles and at no stage has it ever been reported by the EPA report as a Pressure. EPA (2018b) 2nd Cycle overarching catchment report for the entire Nore catchment (HA15) cites only one quarry as an 'extractive industry' Pressure and that is connected to the Dinin (Main Channel) _020, impacting on the main channel of the water body. Bennettsbridge Limestone Quarry is not reported as a pressure in any EPA Report in any year.

Transitional & Coastal Waterbodies & WFD

8.186 With respect to Transitional & Coastal Water Bodies associated with the site, a number of Hydrometric Areas are involved (HAs 13, 14, 15 and associated EPA 3rd Cycle Reports (2024c, 2024b and 2024a, respectively). Detail provided by the EPA maps includes, as follows:

- The site's associated surface water, the River Nore, becomes the **Nore Estuary [IE_SE_100_0400]** (tidal) at a distance of c.14km to the south east of the quarry, c. 750m upstream of Inistioge, with the estuary catchment area of 2,446 km^2. On the basis of scale within the catchment, the quarry is insignificant in the scale of the Nore Estuary's WFD Status or Risk classifications. EPA (2024a) reports WFD information for the Nore Estuary, as follows:
  - Transitional Waterbody with a Good Status Objective (Objective Date 2022 – 2027).
  - Currently reported as Moderate Status (2016-2021).
  - 3rd Cycle AT RISK.
  - "Significant Pressure(s)" = Agriculture.
  - "Significant Issue(s)" = Nutrients and Organics.
  - Protected Area for Drinking Water SAC, SPA and Nutrient Sensitive Area (NSA).

- The Nore Estuary merges with the Upper Barrow Estuary, upstream of New Ross, becoming the **Barrow Nore Estuary Upper [IE_SE_100_0250].** Again, on the basis of the large contributing catchment area to the Barrow Nore Upper Estuary, the quarry is insignificant in scale. EPA (2024a) reports WFD information for the Barrow Nore Estuary Upper, as follows:

- Transitional Waterbody with a Good Status Objective (Objective Date 2022 – 2027).
- Currently reported as Moderate Status (2016-2021).
- 3rd Cycle AT RISK.
- "Significant Pressure(s)" = Agriculture and Urban.
- "Significant Issue(s)" = Nutrients.
- Protected Area for Drinking Water SAC and NSA.

- The Barrow Nore Estuary Upper then flows into a waterbody mapped by the EPA as **New Ross Port [IE_SE_100_0200]** to the south of New Ross. EPA (2024a) reports WFD information for New Ross Port, as follows:
  - Transitional Waterbody with a Good Status Objective (2022 – 2027).
  - Currently reported as Moderate Status (2016-2021).
  - 3rd Cycle AT RISK.
  - "Significant Pressure(s)" = Agriculture.
  - "Significant Issue(s)" = Nutrients and Organics.
  - Protected Area for Drinking Water SAC, SF (Shellfish) and NSA.
- East of Waterford, the River Suir (one of the Suir, Nore and Barrow Three Siters) is mapped as the Upper, and then Middle, Suir Estuaries and they **merge with New Ross Port** waterbody to become the Lower Suir Estuary (Little Island - Cheekpoint), which then becomes the Barrow Suir Nore Estuary, which flows into **Waterford Harbour**. The quarry under evaluation is not connected with the River Suir, or any of its limbs, from an 'impact potential' perspective.

- **Waterford Harbour [IE_SE_100_0000]** is mapped by the EPA (HA13, 2024c), as follows:
  - Coastal Waterbody with a Good Status Objective (Obj. Date 2022 – 2027).
  - Currently mapped as Moderate Status (2016 - 2021).
  - 3rd Cycle AT RISK.
  - Significant Pressure(s)" = Agriculture.
  - "Significant Issue(s)" = Nutrients.
  - Protected Area for Drinking Water Bathing Water (BW), SAC and SF.
  - Waterford harbour is an Area for Action (AFA) with a LAWPRO lead for Restoration.

- Waterford Harbour discharges to the **Eastern Celtic Seas (HAs 13, 17) [IE_SE_050_0000],** which is mapped and reported by the EPA (2024c) as follows:
  - Good Status Objective Waterbody (2021 or earlier)

- Exceeded the Good Status Objective and is currently reported as High Status (2016-2021).
- 3rd Cycle NOT AT RISK.

EPA Water Monitoring Data

EPA Surface Water Biological (Q Values) Monitoring Data

8.187 The results for EPA River Quality Biological (Q Values) Surveys for Irish River Systems are reported at https://epawebapp.epa.ie/qvalue/webusers/. The last surveys for Q Values on the Nore were completed in June and July 2022 and the overall comment published for the Nore in the HA15 Report stated, as follows:

- "The 2022 biological water quality results for the River Nore main channel are most disappointing, with 12 of the 19 sites assessed found to be in unsatisfactory condition. Only at the uppermost site (Station 0080) was there a slight improvement in Q-value recorded, while declines in ecological condition was found to have occurred at nine sites. This includes a drop from High to Good ecological condition at Poorman's Bridge (Station 0900), which was the only site where Q4-5 was recorded in 2019. Eight sites from Threecastles Bridge (Station 1700) downstream dropped from Good to Moderate ecological condition, resulting in all sites surveyed along the channel downstream of this point recorded as unsatisfactory in 2022".

8.188 In the last Monitoring year, 2022, of the first 9 Q Value Monitoring Stations downstream of it source and along the River Nore, 7 of those stations were achieving the Good Status (Q4) Objective required under the WFD. However, once the river leaves Laois at a location upstream of Ballyragget, the River Nore persistently scores Q3-4 (inferred to be Moderate Status) and never again is the Nore Q4 (inferred to be Good Status). The entire HA15 Q Value Result Report is presented with National Dataset information in Appendix 8.7 and it is reported that the last Q4 (Good Status) station was Tallyho Br. (Stn Code RS15N011300), at a distance of c.21km north west of Kilkenny City.

8.189 It is worth noting, however, that the Status reported by the EPA Envision relates to the 2016 -2021 period, prior to the 2022 Q Value surveys, and on the EPA Envision webservice the Nore is mapped as Good Status in the vicinity of Kilkenny.

8.190 With respect to the River Nore_190 water segment to which the quarry is licensed to discharge (ENV/W/78): Appendix 8.7 (National Data), Section 2 of Appendix 8.7, Table 1 presents relevant Station details with an associated Map. EPA monitoring result data for upstream and downstream 2022 Q Values are summarised, as follows:

- The upstream Q Value Monitoring Point (MP) in 2022 was at the point where the _180 segment becomes the _190 segment and this is on the southern outskirts of Kilkenny, at a distance of c.5km river flow length distance upstream of the quarry's discharge. That upstream MP's Station Name is 'NE of Warrington, d/s Kilkenny' [RS15N012000] and the Q Value (2022) was 3-4 Moderate Status. That station captures the discharges and Storm Water Overflows (SWOs) from the Kilkenny City Municipal WWTP. It is noted, again, that the Status of the Nore was Moderate (Q3-

4) since upstream of Ballyragget at 21km upstream of Kilkenny City. Therefore, the WWTP's discharge neither improved nor resulted in deterioration of river water quality, on a Q Value basis.

- The downstream Q Value Monitoring Point (MP) in 2022 was at the point where the _210 segment becomes the _220 segment and this is at a distance of c.6km river flow length downstream of the quarry's discharge. This MP is downstream of the point where King's River joins the Nore as a tributary and upstream of Mount Juliet. This downstream MP's Station Name is 'Ballylinch Br. [RS15N012200] and the Q Value (2022) was again 3-4 Moderate Status. That station captures a lot more than the licensed discharges from all quarries upstream of Bennettsbridge settlement. The river has neither improved nor deteriorated in quality on a Q Value basis.

EPA Surface Water Hydrochemical Monitoring Data

8.191 In addition to Biological Monitoring (Q Values), the EPA reports hydrochemical data for the River Nore for more locations than are surveyed for biological quality. Details for each station and the dataset for hydrochemical parameters of relevance to the site and its potential for impact or effect are presented in Tables, text and graphs in Appendix 8.7 (National Data), Section 2 of Appendix 8.7. Table 2 of Appendix 8.7, Section 2, presents relevant Station details with an associated Map. (National Data). Also presented in Appendix 8.7, Hydro-G has extracted EPA data from their published spreadsheets and Hydro-G has graphed relevant parameters for the last ten years: from 2016 – 2025. Summary information for each EPA Hydrochemical station on the River Nore includes, as follows:

(i) **Table 4 of Appendix 8.7, Section 2,** presents hydrochemical results for Monitoring Station named 'NE of Warrington, d/s Kilkenny' [NORE_180. IE_SE_15N012090. Stn. ID RS15N012000]. THIS IS THE UPSTREAM STATION, relative to the quarry's discharge point, for hydrochemical quality on the River Nore. Biological Monitoring (Q Value) is also reported for this location. The dataset spans from 2007 to present, 2025. The data presented in Table 4, the summary text after it and the graphs following it, demonstrate that the water quality at the NE of Warrington station is generally good with historical issues for occasional peaks in Ammonia and Ortho-P in 2016 – 2017, which are now rectified. Compliance with the Environmental Quality Objectives (EQOs) of the Surface Water Regulations is demonstrated by the EPA dataset. The hydrochemical signal for Electrical Conductivity and the seasonal response proves that the Nore has a strong groundwater baseflow component. The graphed correlation pattern for EC and Nitrate is the factual evidence to support the EPA's hypothesis of WFD risk to the Nore by nutrients carried to the Nore by groundwater. Refer to the text after the data Table 4 in Appendix 8.7.

(ii) **Table 5 of Appendix 8.7, Section 2,** presents hydrochemical results for an upstream tributary to the Nore. This tributary to the Nore joins from the east and is upstream of Bennettsbridge Limestone Quarry's licenced discharge. The Monitoring Station is named 'RATHGARVAN_or_CLIFDEN - Interstitial, 1st Br u/s from Nore R Conf.': on the EPA named Rathgarvan_or_Clifden_010 tributary to the Nore [IE_SE_15R370950. RS15R370950]. This Monitoring Station is an 'investigative' station and the data spans from 2023 to present. The station is on the surface water downstream of the Roadstone Maddockstown quarry. Results suggest good quality water, low BOD and compliance with the Environmental Quality

Objectives (EQOs) of the Surface Water Regulations apart from one Ammonia & ortho-P exceedance. Given the ortho-P association with the Ammonia peak, it is likely a catchment issue and not anything related to the Roadstone quarry.

(iii) **Table 6 of Appendix 8.7, Section 2,** presents hydrochemical results for a Monitoring Station named 'Upstream Bennettsbridge WWTP' [NORE_190. IE_SE_15N012090. Stn. ID RS15N012090]. This station is at the bridge in Bennettsbridge and 400m **downstream of the quarry's licenced discharge**. This dataset spans from 2012 to present, 2025. In Appendix 8.7, Section 2, Table 6, Hydro-G has presented the summary Max, Min, Average data in two tables beneath the entire dataset: before and after the issue of the 2017 ENV/W/78 Licence for the quarry. The graphs presented are for the entire data period. The 'Upstream of Bennettsbridge WWTP' stn is downstream of Bennettsbridge Limestone Quarry's discharge. Comments relating to the data record include, as follows:

- Suspended Solids are not reported by the EPA for this MP.
- Electrical Conductivity (EC @ 25oC) was not reported until 2023. At this station, the same pattern for EC and seasonality occurs as at the stn upstream of the quarry's discharge ['NE of Warrington']: groundwater baseflow results in higher EC values in summer. At the same time as EC monitoring commenced, the EPA included analysis for Total Hardness. The patterns for EC and Total Hardness mirror each other: heavy rains in the catchment result in lower hardness and lower EC. This is the accepted model repeated for the River Nore: strong groundwater component to the baseflow condition. The river water is extremely hard (>300 mg/l as CaCO3) in summer and less so in high recharge February 2024 (c.200 mg/l as CaCO3). There are not enough concurrent data that would enable exploration of the relationship between nitrate and EC.
- Ortho-P seems to present excessive concentrations. There is no source of ortho-P at the quarry.
- The ortho-P and ammonia peaks share a pattern. This suggests that they have the same source and a catchment source is assumed on the basis that there is no source of ammonia or ortho-P at the quarry.
- BOD at this station is erratic and regularly exceeds the BOD mean EQO of 1.5 mg/l.

(iv) **Table 7 of Appendix 8.7, Section 2,** presents hydrochemical results for a Monitoring Station downstream of Bennettsbridge settlement named 'Bennettsbridge, 600 m d/s Br' [NORE_200. IE_SE_15N012130. Stn. ID RS15N012100]. In Appendix 8.7, Section 2, Table 7, Hydro-G has presented the summary Max, Min, Average data and graphs. In summary, data from this station suggests, as follows:

- The same pattern is seen: Electrical conductivity in the River Nore peaks in summer months, generally. This is groundwater baseflow. Note: one of the lowest ECs recorded was August 2017 but this was because it was one of the wettest Augusts in Irish history.

- River EC and river nitrate concentrations share the same pattern, suggesting that groundwater carries nutrients to the river.
- Nitrate concentrations are not excessive. The reporting for Nitrate ends in 2022.
- On an average basis, parameters generally comply with the EQOs (mean) of the SW Regulations. BOD is close to the EQO (mean) line often. See graphs overleaf.
- pH is higher than neutral, which is expected in the Limestone environment. pH is in the range c.8 to c.8.5, which is between the required 6 to 9pH and SW Regulations compliant.
- Ammonia concentrations appear problematic in 2017 but since then only occasional exceedances are recorded. See graphs after Table 7, Appendix 8.7, Section 2.
- Ortho-P hovers close to the EQO.
- There are occasional excessive Suspended Solids but SS reporting ceased January 2019.

(v) **Table 7 of Appendix 8.7, Section 2,** presents hydrochemical results for a Monitoring Station c.3km downstream of the bridge at Bennettsbridge. Station named u/s 'King's R confl (u/s abstr)' [IE_SE_15N012200. ID RS15N012180]. Data spans 2007 – present. This is a downstream station on the Nore that is downstream of the quarry's discharge and also far enough downstream of Bennettsbridge settlement and its WWTP. This Station could be considered an integrator station that enables evaluation of all five potential upstream pressures (3 quarries, a settlement and its municipal WWTP). Summary interpretation of the EPA results includes, as follows:

- Suspended Solids not reported by the EPA for the far downstream stn. 'U/S Kings R Confluence'.
- Strong groundwater baseflow signal persists by virtue of the low EC concentrations in high rainfall periods.
- The exact same characteristic ranges and issues exist here as for the upstream stations: The average result for Nitrate-N is at the expected baseline concentration, average Ammonia, ortho-P and BOD comply with the EQOs of the Surface Water Regulations (2009, as amended).

8.192 Hydro-G has taken the EPA dataset for the 2016 – 2025 time period (Appendix 8.7, Section 2, Tables 4 to 7) and provided summary statistics in Table 3 of the Appendix 8.7, Section 2, reproduced here as Table 8.7, below. The data presented in Table 8.7 are for those parameters of relevance to the Conditions of the site's Discharge Licence: Nitrate. Ammonia-N. BOD. ortho-P as P. and pH. On an average basis, EPA data suggest the quarry's discharge does not change the result relative to upstream and downstream locations.

8.193 With reference to Table 8.7, the Hydro-G appointed sequential numbers and EPA official names of the **most relevant EPA Monitoring Stations to the quarry's discharge** are, as follows:

- **"1. NE of Warrington, d/s Kilkenny"** is the MP UPSTREAM on the River Nore of the site's discharge location, and
- "**3. Upstream Bennettsbridge WWTP"** is the MP DOWNSTREAM of the site's discharge to the River Nore. Hydro-G has separated out the data for **3. Upstream Bennettsbridge WWTP"** - data before the site's section 4 Licence ENV/W/78 is presented for (2012 – 2015) and for (2017 – 2025).
- Readers are advised to discount the Station "2. Rathgarvan of Clifden – Interstitial…." because that is a TRIBUTARY joining from the east after flowing through the Roadstone Maddockstown Quarry. Therefore, the Station "2. Rathgarvan of Clifden – Interstitial…." does not provide the upstream baseline: **1. NE of Warrington, d/s Kilkenny"** is the MP UPSTREAM on the River Nore of the site's discharge location.

Table 8.7 Summary Statistics for Relevant EPA Hydrochemical Monitoring Stations on the Nore (Upstream & Downstream).

	Conductivity @ 25Â°C (uS/cm)	Nitrate (as N) mg/l	Ammonia-Total (as N) mg/l	BOD mg/l	ortho-Phosphate (as P) - mg/l	pH	Suspended Solids (mg/l)	Station Name
MAX	685	5.2	0.28	5.4	0.12	8.7	no values	**1. NE of Warrington, d/s Kilkenny**
MIN	269	1.4	0.01	0.5	0.013	7.8		
AVERAGE	551	3.1	0.03	1.3	0.033	8.2		
MAX	791	no values	0.1	0.5	0.041	8.3	no values	**2. RATHGARVAN_or_CLIFDEN - Interstitial, 1st Br u/s from Nore R Conf.**
MIN	722		0.01	0.5	0.005	8		
AVERAGE	759		0.02	0.5	0.013	8.2		
MAX	not reported	3.5	0.06	3	0.14	8.4	no values	**3. Upstream Bennettsbridge WWTP [2012 - 2015]**
MIN		1	0.01	0.8	0.016	8		
AVERAGE		2.40	0.03	1.33	0.060	8.1		
MAX	668	6.76	0.083	3.9	0.168	9.2	no values	**3. Upstream Bennettsbridge WWTP [2017 - 2025]**
MIN	428	0.03	0.002	0.4	0.002	7.9		
AVERAGE	570	3.08	0.029	1.4	0.034	8.2		
MAX	702	5.5	0.094	6.5	0.16	8.6	39	**4. Bennettsbridge, 600 m d/s Br**
MIN	290	1.3	0.01	0.5	0.005	7.9	2	
AVERAGE	552	3.3	0.02	1.1	0.030	8.3	7	
MAX	673	5.1	0.086	7.3	0.15	8.7	no values	**5. u/s King's R confl (u/s abstr)**
MIN	269	1.3	0.01	0.5	0.005	7.9		
AVERAGE	541	3.1	0.02	1.3	0.030	8.3		
Surface Water Regulation 2019 (mg/l) Good Status EQO (mean)			0.065	1.5	0.035	6 - 9	25mg/l (Salmonid Regulations)	**Regulation**

8.194 With reference to the data presented in Table 8.7, when data for upstream Station "1." and the downstream Station "3. (2017-2025)" are compared, there is no significant change in any parameter specified in the site's Section 4 Licence. Detail for the parameters specific to the site's Discharge licence ELVs is presented, as follows:

- Electrical Conductivity Upstream averages 551uS/cm and downstream of the quarry it averages 570uS/cm. This 19uS/cm increase is not environmentally significant when the degree of precision of the measurement probe and natural variability are considered. It is a strong limestone groundwater signal in both cases. The quarry's discharge does not change the river's characteristic in that regard. This is an important component of the requisite EIA: the river is naturally strongly influenced by its contact with limestone bedrock and the quarry's discharge does not change the characteristic.
- Average Nitrate N is 3.1 mg/l NO3-N upstream and 3.1 mg/l NO3-N downstream of the discharge. It is a below baseline Nitrate signal in both cases. In the evaluation of the EPA dataset, the quarry's discharge does not change the nitrate characteristic of the River Nore.
- With respect to average Ammonia N concentrations, the quarry's discharge does not result in change in average Ammonia-N concentrations in the river. However, the quarry's discharge has a positive effect in reducing the peak (maximum) ammonia- N concentrations in the River Nore at the station "3. (2017-2025)" downstream of the discharge, relative to the "1." Station upstream of the discharge. With respect to Table 8.7, above, and the detail of Appendix 8.3, Section 2, Tables 4 to 7, peak concentration of Ammonia-N in the Nore is 0.29mg/l and Peak concentration downstream of the quarry is and order of magnitude lower at 0.083 mg/l Ammonia-N. Whilst Hydro-G acknowledges that both concentrations are unfavourable and both are in breach of the Surface Water Regulations (2009, as amended), the effect of the discharge is a mitigation measure to reduce on the scale of catchment related impacts.
- Similar to Ammonia-N results, BOD maximum observed concentrations appear to be reduced at the station downstream of the quarry's discharge, "3. (2017 – 2025)" relative to the upstream station "1.". The quarry's discharge does not result in significant change in the minimum or average BOD concentrations reported by the EPA for the River Nore.
- With respect to maximum results for ortho-P, there is one excessively high ortho-P concentration reported for the 8th March 2023: ortho-P at the downstream station "3. (2017-2025) is reported to be 0.169 mg/l (Table 6, Appendix 8.7, Section 2 EPA Data). This is a gross outlier and suggests a catchment contamination incident. It is noted the season for slurry spreading opens in February. The quarry's discharge had been sampled on the 7th March 2023 and its ortho-P concentration was 0.02 mg/l and compliant with the ELV of 0.07 mg/l ortho-P (Certificates of Analysis for the quarry's discharge quality are presented in Appendix 8.3, Section 7, AER 2023). The quarry's 0.02 mg/l ortho-P discharge the day before the EPA's finding of 0.169 mg/l ortho-P suggests that the quarry was not a source of that issue. Discounting the maximums, the average ortho-P concentration is significantly lower at the downstream location and the average ortho-P is the same for the monitoring locations "1. Upstream" and "3. Downstream (2017 – 2025)". The quarry's discharge does not alter the River Nore's ortho-P concentration characteristic.

- The pH characteristic of the river is not changed at all by the quarry's discharge when average and minimum values for the monitoring locations upstream "1." and downstream "3. (2017 – 2025)"are compared. Similar to ortho-P, the maximum value for pH observed at the downstream monitoring location "3. (2017 – 2025)" appears excessive and is slightly higher than the 6 to 9 pH range of the Surface Water Regulations. However, when the data for each monitoring event are interrogated, there are three consecutive monitoring events in November and December 2018 and January 2019 in which pH of 9 – 9.2 are reported by the EPA (Table 6, Appendix 8.7, Section 2 EPA Data). Again, with reference to the Certificates of Analysis for the quarry's discharge quality and the Summary Table 3 in each year's AER for the Discharge Licence – the pH of the quarry's discharge is consistently 8pH in 2018 and 2019 (Appendix 8.3, Section 7, AER 2023). The pH in the discharge is lower than the peaks reported by the EPA for the Nore and given the likely high flows in all years in the Nore for the period November to January, an 8pH in the discharge cannot cause a 9pH in the river because the high flow of the river would assimilate and reduce the quarry's contribution. Again, it is concluded that the quarry does not result in a change in the river's pH.
- Of particular note is that the EPA does not report Suspended Solids (SS) concentrations in the National Water Monitoring Programmes datasets on Envision Mapping. Suspended Solids are not a specified Environmental Quality Objective (EQO) of the Surface Water Regulations (2009, as amended). However, the River Nore is designated as a Salmonid River under the Salmonid Regulations and the associated Suspended Solids Objective is <25 mg/l SS. As previously stated, the site's Discharge Licence ELV for SS is 10mg/l.

8.195 An interesting characteristic of the monitoring results for the River Nore is that the changes in the Electrical Conductivity (EC) results throughout the year confirm the accepted conceptual understanding for the River Nore, which is that it has a high groundwater baseflow component.

8.196 The Hydro-G graphs presented in Appendix 8.7, Section 2, EPA Data, for each of the EPA's MP's Electrical Conductivity results enable interpretation of the groundwater baseflow component. For the River Nore Upstream Station at NE of Warrington, d/s Kilkenny, the data suggest as follows:

- The average value of 551 uS/cm is a relatively high value for surface water and a relatively low value for groundwater in limestone bedrock environments, which is the rock type underlying the Nore in the vicinity of Kilkenny.
- However, the maximum ECs reported by the EPA are close to 700 uS/cm, which is a strong and definitive groundwater signal for limestone bedrock.
- The maximum values occur in the drought months of April 2017. April to August in the 2018 Drought. June in 2019. June 2021. April to June 2021. April to August 2022 and April to August in 2024. In 2023 and 2025 the >600 uS/cm values occurred in February. The significance of the pattern is that it confirms the groundwater baseflow component when there is little rainfall in the catchment *i.e.,* during droughts (Hydro-G graphs of Appendix 8.7).

Groundwater Monitoring Data

8.197 There are five Groundwater Monitoring Stations within 10km of the quarry and in Appendix 8.7 (National Data), Section 2, detail for each Station is shown (Table 9) and a labelled map presented. The Station names, associated GWB and information on their location relative to the quarry, include as follows:

- Pub in Pike Stn.: located c.6km to the northeast and in the Clifden GWB.
- **Clifden/Clara GWS Stn.:** located c.6.6km to the northeast and in the **Kilkenny GWB.**
- Bennettsbridge RWS (BH2) Stn.: located c.5.5km to the south and in the Stoneyford Gravels GWB.
- Thomastown WS (BH 9, GAA Grounds) Stn.: located c.10km to the southeast and in the Stoneyford Gravels GWB.
- Rathduff (KNY 27/58) Stn.: located c.8km to the southwest and in the Bennettsbridge GWB.
- Cuffesgrange GWS Stn.: located c.7km to the west and in the Callan GWB.

8.198 EPA data for groundwater quality in the Groundwater Monitoring point in the Kilkenny GWB (the Clifden/Clara GWS Stn.) suggests upward trends in nutrients and this is presented (EPA, 2024) as posing a risk to surface water quality. Monitoring information for the period 2016 - 2021 presents trends for the single groundwater monitoring station 'Clifden /Clara GWS' [GWIE_SE_G_07815000006], which demonstrate currently compliant, but upward trends in the direction of exceedances in the indicative quality guide levels for Nitrate, Chloride and ortho-Phosphate (https://www.catchments.ie/data/#/waterbody/IE_SE_G_078).

8.199 In the EPA (2024) 3rd Cycle Report, agriculture is the most cited Pressure resulting in Significant Impact arising from increased nutrients in the river systems of the Nore.

8.200 The site monitors its own groundwater and the data will be presented in the Field Work Completed section of the Chapter.

River Basin Plan & Programmes of Measures

8.201 In September 2024 the Department of Housing, Local Government and Heritage launched The Water Action Plan 2024 and its launch stated that the "*River Basin Management Plan for Ireland sets out the measures that are necessary to protect and restore water quality in Ireland. The overall aim of the plan is to ensure that our natural waters are sustainably managed and that freshwater resources are protected so as to maintain and improve Ireland's water environment. The principal causes of the decline in Ireland's water quality are the increasing loss into water of polluting phosphorus and nitrogen from farmland, inadequately treated waste water and physical impacts on water bodies, due to river barriers, and drainage of lands and rivers".*

8.202 The WAP 2024 and the RBMP 2022 – 2027 concerns the attempt that will be made over the next few years to maintain Good Status water bodies and improve those that are not good status.

8.203 The sub basin segment of the River Nore in which the quarry sits is the Nore_190 and this is listed in the AFA of the 2024 WAP as a Public Health Area for Protection for the AFA Name Clifden - The Highrath GWS (National Federation of Group Water Schemes NFGWS). That GWS is on the other

side of the Nore and the GWS is neither hydrologically nor hydrogeologically connected to the quarry.

8.204 The Water Action Plan 2024 is available at https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/ and there is an Appendix series: Appendix 2 sets out the Programme of Measures (POMs). However, there are no actual actions or practical measures outlined. The WAP and the POMs are management documents that tabulate and list how civil servants and groups/departments will meet and manage discussions on the issues.

Groundwater Supply Wells: Private and Public

8.205 The closest groundwater supply well is located within the quarry itself. As previously stated, it is located on the floor of Bench 1 in the northern part of the operational quarry, immediately south of the Eden Sheds and immediately west of the haul route down from the offices to Bench 2. The well's location is shown as the 'Onsite Well' on Figure 8.1. In the history of all Bennettsbridge Limestone Quarry's excavations over the last number of decades, the onsite water supply well has never failed to supply the total volume of water needed at the site each and every working day, which is c.350 m^3/d. This is a high yielding well that has not been impacted by bedrock quarrying excavations carried out around it.

8.206 There are many water supply wells in the lands surrounding the operational quarry and a subset of local domestic wells have been monitored since 2018. GSI wells are shown on the Aquifer Map (Figure 8.6) and details for the wells, as presented by the GSI Data and Maps server, are presented in Appendix 8.3 Site Information. Many of the wells mapped by the GSI have been discontinued in use: for example, the Kilree House and Farm Well were not sufficient in yield to support a growing dairy herd and multiple attempts at sourcing a new well failed to secure water strike at the magnitude required. The same information was obtained in the 7 Site Investigation Monitoring Wells drilled in the proposed Greenfield application area under consideration here, which is on lands previously farmed at the Kilree House farm. However, a subset of the local wells have been monitored since assessments began (Walton, 1999), through the 2017 – 2018 EIA field work period for the most recent permission for hard rock quarrying at the site and a number of local groundwater wells, to the west of the quarry, have been added in order to assess the potential for impact that could be presented by the proposed westerly extension.

8.207 A Condition of the PL18/858 permission was that a Groundwater Monitoring programme be implemented with respect to water levels. This was completed and includes domestic and farm wells in the wider area as well as on site wells. The Annual Reports to the quarry for local area water level responses are presented in Appendix 8.3 Site Monitoring Data.

8.208 Information and water level response data for the local wells added to the west of the quarry will be itemised in the Field Results section of this Chapter.

8.209 Of note is that in 2023 a well was drilled to the immediate east of the quarry in order to service a domestic residence, which has been granted Planning Permission (PL 2460611). A substantial assessment was completed by Dr. Pamela Bartley for the applicant in order to satisfy the planning authority that the quarry presented no risk to quality of water in that well. In addition, the works completed and reported detail the quality and separation distances to local wells, onsite Domestic Wastewater Treatment Systems (DWWTS) and density of DWWTS. A copy of that assessment is available at https://idocsweb.kilkenny.ie/. The well is known as 'Kirwan' and is now included in the

Groundwater Monitoring Programme for the site. A full list of local wells instrumented with continuous dataloggers recording water level is provided in Appendix 8.3. In total, 7 domestic wells are instrumented and monitored. In addition, 12 on site Monitoring Point Site Investigation Boreholes are instrumented and monitored within the operational quarry and the proposed greenfield area.

8.210 Details were provided earlier for the abstractions from the Bennettsbridge PWS and Thomastown PWS. The quarry has no potential to interact with either of the PWSs for reasons including, but not limited to, the following:

- Each of the PWSs are from Groundwater Bodies that are not the Kilkenny GWB in which the site is located. There is therefore no potential for interaction. The EPA and GSI have delineated GWB Boundaries as No Flow Boundaries on the basis that the adjacent surface waters will drain a GWB.
- There are numerous other GWBs between the quarry and the PWS's GWBs.
- Each of the PWSs are in different bedrock types than the quarry.
- Each of the PWSs are in different aquifer types than the quarry.
- The Zones of Contribution to the PWSs are mapped and are significantly remote from the quarry (refer to maps in Appendix 8.8):
    - Bennettsbridge PWS's Sources and the Inner ZOC is c.5.5km to the south east of the site and extends across the eastern banks of the River Nore. There is no potential for interaction with the quarry because the quarry is c.1km to the west, on the opposite side of the River Nore.
    - Thomastown PWS's Sources and the Inner ZOC is c.9km from the quarry and again extends to lands on the banks of the Nore in which the groundwater flow direction is from south to north on a limb of the Nore where the river is travelling west to east. Given that the quarry's groundwater flow direction is west to east, again, there is no potential for impact.

8.211 Hydro-G engaged with various departments in Uisce Eireann regarding the potential for connectivity, impact or affect, and a full record of communications is provided in Appendix 8.8 Scoping Responses. The overall definitive proof that the quarry, and its proposed extension, cannot affect or cause impact at the PWSs was provided by Ms. Lorraine Gatson of Uisce Eireann's catchment teams, which stated, as follows: "*The development site is not located within a UÉ surface or groundwater drinking water abstraction catchment that we have currently delineated. The closest abstraction points are the 3 no. boreholes and 1 no. infiltration gallery associated with the Bennettsbridge Water Supply, located approx. 4.6 km to the south. The delineation of the surface water catchment for the infiltration gallery is yet to be completed".*

8.212 Hydro-G offers that the assimilation capacity simulations completed, to support the 2018 issue of the Section 4 Discharge Licence W/ENV/78, demonstrated that the requirements of the Surface Water Regulations (2009, as amended) would be met downstream of the discharge. The Environmental Quality Objectives of the Surface Water Regulations are more onerous than the Parametric Limit Values of the Drinking Water Regulations (2023). Therefore, it can safely be concluded that the quarry's discharge poses no threat to the security of supply at the Bennettsbridge PWS sources, even the infiltration gallery that likely draws water from the gravel bank and the River Nore.

8.213 Information supplied by Uisce Eireann (Appendix 8.8), in response to consultation and enquiry from Hydro-G, suggests, as follows:

- The National Water Resource Plan (NWRP) has identified that the PWS will require additional water to meet the requirements of the 2044 Dry Year Critical Period (DYCP) and aims to meet this demand entirely from groundwater sources.
- The investigative focus for meeting additional groundwater is in the Regionally Important Aquifer north of the infiltration gallery and east of the River Nore in the townland of Woolengrange.

8.214 Hydro-G respectfully concludes that the application site quarry on the west of the River Nore and the Nore dissects the landscape between the quarry and the proposed investigations to increase groundwater abstractions for Bennettsbridge PWS in the Woolengrange townland, which is to the east of the River Nore. The quarry, in Kilree townland, is at least 4km from the townland of the proposed investigations of Uisce Eireann for groundwater supplementary volume in Woolengrange. The ZOC for any new PWS BHs will not extend across the River Nore or for a distance of 4km.

8.215 There is a mapped CUFFESGRANGE PWS at a distance of c.7km to the west of the proposed greenfield application area. There is an EPA Source Protection Zone Report (EPA, 2010) for the Cuffesgrange Water Supply Scheme's Cuffesgrange Borehole. The mapped zone of contribution for the reported 50 m^3/d supply volume is c.0.2km2 (EPA, 2010). The quarry is significantly outside of and separated from this PWS. There is no potential for impact arising.

EPA Register of Abstractions

8.216 The EPA Register of Abstractions documents all Abstractions > 25 m^3/d and all PWS Abstractions will be of that magnitude, at least.

8.217 Information for abstractions registered as 'Active' are presented in this section. First of all, the registered abstractions for the quarry's Kilkenny GWB are presented in Table 8.7(a).

Table 8.7(a) EPA Registered Abstractions for the Kilkenny GWB.

Reg No	Abstraction Point Code	Organisation / Site Location Name	Abstraction Purpose / Use	Maximum Daily Volume Estimate for Abstraction (m^3/d)	County	GWB Name (Waterbody)	GWB Waterbody Code
R00050-01	APR000123	Bennettsbridge Limestone Quarry	Quarrying (Discharge Licence W78)	70,000	Kilkenny	Kilkenny	IE_SE_G_078
R00110-01	APR000167	Clifden Group Water Scheme Co-Op Ltd	Drinking Water	48	Kilkenny	Kilkenny	IE_SE_G_078
R00150-01	APR000272	Roadstone Limited (Dunbell Sump)	Quarrying	4,354	Kilkenny	Kilkenny	IE_SE_G_078
R00150-01	APR000273	Roadstone Limited (Dunbell Well)	Industrial other manufacturing	18	Kilkenny	Kilkenny	IE_SE_G_078
R01547-01	APR002532	P&M Croke Farm Ltd	Agriculture	25	Tipperary	Kilkenny	IE_SE_G_078
R02697-01	APR003133	Ie Consulting Engineers (Waslough 1)	Private Domestic Drinking Water Supply	54	Kilkenny	Kilkenny	IE_SE_G_078
				74,499	**m3/d Maximum Total Registered Abstractions from the Kilkenny GWB**		

8.218 With respect to the information presented in Table 8.7(a), it is noted that for the Kilkenny GWB the total registered MAXIMUM daily volume of groundwater abstracted is 74,499 m^3/d and of that total, 74,354 m^3/d is redirected back to the River Nore under Licence from Bennettsbridge Limestone Quarry and Roadstone's Quarry. Therefore, the actual amount taken from the Kilkenny GWB's contribution to base flow in the River Nore, by usage in agriculture, industry and human consumption, is (74,499 m^3/d - 74,354 m^3/d) **= 145 m^3/d.**

8.219 Whereas, Table 8.7(a), above, detailed abstractions registered for the quarry's Kilkenny GWB, abstractions, Table 8.7(b) presents information on abstractions for the River Nore Catchment (HA15).

Table 8.7(b) EPA Registered Abstractions River Nore & All Tributaries from Source to Sea.

Reg No	Abstraction Point Code	Site Location	Primary Use	Abstraction Type	Maximum Daily Volume Estimate for Abstraction (m^3/d)	Cumulative Max. Daily Vol. Est. for Registration (m^3/d)	Total Annual Volume (m^3/yr)	No. of Abstr. Points	County	Waterbody Name	Waterbody Code
R00774-01	APR001347	Uisce Éireann Ballyroan WS	Public Water	Groundwater spring	435	870	158,749	2	Laois	BALLYROAN_010	IE_SE_15B010100
R00716-01	APR001259	Uisce Éireann Urlingford-Johnstown WS	Public Water	Groundwater spring	188	752	61,757	4	Kilkenny	GOUL_030	IE_SE_15G020200
R00353-01	APR000637	Cullahill Agric. Co-op Soc. Ltd Toberboe Spr.	Group Water	Groundwater spring	200	200	73,000	1	Laois	ERKINA_050	IE_SE_15E010550
R00895-01	APR001542	Uisce Éireann Gorteen WS	Public Water	Groundwater spring	313	313	101,210	1	Kilkenny	DININ (NORTH)_030	IE_SE_15D070250
R00960-01	APR001631	Uisce Éireann Clogh-Castlecomer WS 1005	Public Water	River	100	950	57,500	3	Kilkenny	DININ (NORTH)_030	IE_SE_15D070250
R00062-01	APR000138	Ballypickas Group Water	Group Water	Groundwater spring	300	300	109,500	1	Laois	OWVEG (NORE)_050	IE_SE_15O010400
R01005-01	APR001699	Uisce Éireann Ballinakill 1 WS	Public Water	Groundwater spring	252	252	92,066	1	Laois	OWVEG (NORE)_030	IE_SE_15O010160
R00287-01	APR000503	Clonmantagh Kiloshulan Group Water Scheme	Group Water	Groundwater spring	100	100	36,500	1	Kilkenny	NUENNA_010	IE_SE_15N020100
R00065-01	APR000142	Tirlán Limited (Ballyragget)	Industrial	River	12,000	17,140	4,000,000	6	Kilkenny	NORE_120	IE_SE_15N011400
R00595-01	APR001058	Uisce Éireann Kilkenny City (Troyswood) WS 1011	Public Water	River	27,463	27,463	10,023,888	1	Kilkenny	NORE_160	IE_SE_15N011750
R00603-01	APR001075	Uisce Éireann Abbeyleix 1 WS	Public Water	Groundwater spring	747	1,494	272,655	2	Laois	OWVEG (NORE)_050	IE_SE_15O010400
R00920-01	APR001578	(Zone 1)	Public Water	Groundwater spring	3,865	3,901	1,410,845	2	Tipperary	NORE_030	IE_SE_15N010200
R00920-01	APR001579	(Zone 1)	Public Water	Groundwater spring	36		11,367	2	Tipperary	NORE_030	IE_SE_15N010200
R01428-01	APR002325	Mountrath Golf Club	Golf Course	River	30	30	5,550	1	Laois	NORE_070	IE_SE_15N010600
R00863-01	APR001499	Uisce Éireann Abbeyleix 2 WS	Public Water	Groundwater spring	505	505	169,098	1	Laois	NORE_100	IE_SE_15N011100
R00794-01	APR003105	Uisce Éireann Bennettsbridge Regional WS	Public Water	River	1197	4603	1389677	7	Kilkenny	NORE_210	IE_SE_15N012200
R00794-01	APR003106	Uisce Éireann Bennettsbridge Regional WS	Public Water	River	25		1389677	7	Kilkenny	NORE_210	IE_SE_15N012200
R00859-01	APR001493	Uisce Éireann Callan WS	Public Water	Groundwater spring	545	1,090	198,925	2	Kilkenny	(KILKENNY)_030	IE_SE_15K020560
R01585-01	APR002599	Callan Golf Club Well	Golf	Groundwater spring	45	45	6,500	1	Kilkenny	(KILKENNY)_040	IE_SE_15K020600
R01561-01	APR002554	Ballyhenebry Farms Limited River Kings	Agric. irrig.	River	1,500	1,500	12,335	1	Kilkenny	KING'S (KILKENNY)_050	IE_SE_15K020910
R01462-01	APR002388	Mount Juliet Estate River Nore - Inch River bank (800m upstream from weir)	Golf Course	River	450	450	44,000	1	Kilkenny	NORE_220	IE_SE_15N012310
						61,958	**m3/d Maximum Total Regsitered Abstractions from the Nore & Tributaries**				

8.220 With respect to capturing all registered abstractions in the data filter, it is noted that in the EPA Register of Abstractions, Groundwater Springs are registered to their associated surface water's Water Body Code. Therefore, all headwater tributary Names and Water Body Codes of the Nore must be, and have been, included in Hydro-G's Filter Searches for the River Nore. EPA (2018b) provides a full list of river water body sub catchments. In this way, Groundwater Spring results are captured in the river water body Table 8.7, as they are attributed to the surface water tributaries to the River Nore, such as:

- The Ballyroan_010 and the Erkina_050 in the upland stretches in Laois,
- The NUENNA_010 and the DININ (NORTH)_030 in the upper stretches north of Kilkenny city, and
- The King's (Kilkenny)_030, _040 and _050, which each have registered abstractions on the upland stretches of the river that joins the Nore_120 downstream of the quarry and upstream of Mount Juliet and its OPW Hydrometric Station.

8.221 In Table 8.7(b) Hydro-G has arranged the EPA registered abstractions in descending order of their Water Body Name (*e.g.* Nore_190) and location on the River Nore relative to commencement at the 'Source' upland areas and progressing south as the river moves to the 'Sea' (refer to Chapter Section named 'Hydrology' for detail on the order of numbering for the River Nore).

8.222 It is noted that the total registered MAXIMUM daily volume of water taken from the Nore's surface water systems, including groundwater springs, is 61,958 m^3/d.

8.223 To complete the regional dataset, filtered published information is presented in Table 8.7(c) from the EPA Register of Abstractions (December 2024) for the Stoneyford Gravels and the two PWSs to the south of the quarry.

Table 8.7(c) EPA Registered Abstractions Stoneyford Gravels GWB & Downstream PWSs Details.

Reg No	Abstraction Point Code	Owner / Site	Abstraction Purpose	Abstraction Type	Maximum Daily Volume Estimate for Abstraction (m^3/d)	Cumulative Max. Daily Vol. Est. for Registration (m^3/d)	No. of Abstr. Points	County	Waterbody Name	Waterbody Code
R00367-01	APR000651	P Hennessy & Co Ltd Hennessy Quarry	Mining or Quarrying	Groundwater well / borehole	45	45	1	Kilkenny	**Stoneyford Gravels**	IE_SE_G_128
R00794-01	APR001375	Uisce Éireann Bennettsbridge RWS	Drinking Water	Groundwater well / borehole	1,088		7	Kilkenny	**Stoneyford Gravels**	IE_SE_G_128
R00794-01	APR001376	Uisce Éireann Bennettsbridge RWS	Drinking Water	Groundwater well / borehole	797	4,603	7	Kilkenny	**Stoneyford Gravels**	IE_SE_G_128
R00794-01	APR001377	Uisce Éireann Bennettsbridge RWS	Drinking Water	Groundwater well / borehole	816		7	Kilkenny	**Stoneyford Gravels**	IE_SE_G_128
R00794-01	APR001379	Uisce Éireann Bennettsbridge RWS	Drinking Water	Groundwater well / borehole	0		7	Kilkenny	**Stoneyford Gravels**	IE_SE_G_128
R01125-01	APR002703	Uisce Éireann Thomastown WS	Drinking Water	Groundwater well / borehole	664		3	Kilkenny	**Stoneyford Gravels**	IE_SE_G_128
R01125-01	APR002703	Uisce Éireann Thomastown WS	Drinking Water	Groundwater well / borehole	664		3	Kilkenny	**Stoneyford Gravels**	IE_SE_G_128
m3/d Maximum Total Stoneyford Gravel GWB					**4,557**	3,720	Area Stoneyford Gravel GWB = c. 10km2			
R01125-01	APR001879	Uisce Éireann Thomastown WS	Drinking Water	Groundwater well / borehole	1,727		3	Kilkenny	**Inistioge**	IE_SE_G_076
R01125-01	APR001880	Uisce Éireann Thomastown WS	Drinking Water	Groundwater well / borehole	1,329		3	Kilkenny	**Inistioge**	IE_SE_G_076

8.224 The area for the Stoneyford Gravels GWB is not reported in the GWB Descriptor Sheet (GSI, 2004). However, use of the measurement function on EPA Envision Mapping suggests an area of c.10km2.

Group Water Scheme Supply Wells

8.225 The EPA Register of Abstractions formally cites one GWS abstraction in the same GWB as the quarry, Kilkenny GWB, and this is the Clifden South GWS and it is registered to abstract 48 m^3/d. As previously discussed in Section 8.177 GWB Status & EPA Groundwater monitoring, the Clifden South GWS is across on the other side of the River Nore and therefore, there is no likelihood of connectivity with the application site quarry.

8.226 The EPA Register of Abstractions also lists an abstraction in the Kilkenny GWB in the Wallslough townland, to the north of the quarry, under the registration name of consulting hydrogeologists 'IE Consulting' [Reg No. R02697-01. APR003133. Ie Consulting Engineers (Waslough 1)]. The registered abstraction volume is 54 m^3/d. This is also likely to be a GWS. However, for an abstraction volume of c.50 m^3/d, the likely ZOC in this geology is c.0.2km2 area and the quarry is sufficiently remote from Wallslough and can guarantee that it is outside any ZOC, mapped or otherwise. For that reason, the operation of the quarry or the proposed greenfield extension area will not affect the Waslough GWS.

8.227 On GSI mapping, there are other GWSs and Preliminary Source Protection Areas / ZOCS, as follows:

- Maddockstown GWS (IE_GSI_ZOC_206), which is mapped by the GSI as located at a distance of c.3km to the north east of the quarry, across the other side of the River Nore. The mapped ZOC for Maddockstown GWS suggests that groundwater flows to the Maddockstown source from northeast to southwest, which is the opposite direction of to the groundwater flow through the quarry. The quarry is many kilometres from the boundary of the ZOC delineated by Geoserve (2017). For reasons of distance and the river between the quarry and this GWS, the operation of the quarry or the proposed greenfield extension area will not affect the Maddockstown GWS.
- Dunbell GWS (IE_GSI_ZOC_199), which is c.4.3km to the north east of the quarry across the other side of the River Nore. There is a Geoserve (2017) mapped ZOC that suggests groundwater is flowing to the GWS's source from northeast to southwest, in the opposite direction to the groundwater flow through the quarry. The quarry is many kilometres from the boundary of the mapped ZOC and the quarry is on the other side of the River Nore. For those reasons, the operation of the quarry or the proposed greenfield extension area will not affect the Dunbell GWS.
- Castleinch GWS (IE_GSI_ZOC_202), which is c.7km to the northwest of the quarry. There is a mapped ZOC flowing from south to north, which is not the same as groundwater flow direction through the quarry. The quarry is many kilometres from the Geoserve (2017) mapped boundary of the ZOC. For those reasons, the operation of the quarry or the proposed greenfield extension area will not affect the Castleinch GWS.
- Ballmack GWS (IE_GSI_ZOC_64), which is c.10km to the southwest of the quarry. There is a mapped ZOC (Arup, 2015) and the quarry is significantly remote from it. No impact is possible.

- Newtown_Ovenstown GWS (IE_GSI_ZOC_105), c.9km to the southwest of the quarry. There is a mapped ZOC (Arup, 2015) and the quarry is significantly remote from it. No impact is possible.
- Kilree_Stoneyford GWS (IE_GSI_ZOC_221), which is c.10km to the south west of the quarry, located on the other side and south of the King's River and in a different GWB than the application site quarry. There is a mapped ZOC (Arup, 2015) and the quarry is significantly remote from it. Again, there is no likelihood of connectivity with the application site quarry.

8.228 Although not mapped by the GSI, there is a small cluster of six houses to the south west of the quarry that were granted planning permission to be served by a communal 'GWS' well. This well serves some of the houses still and some of the houses have chosen to connect to the Uisce Eireann PWS on the road. The 'GWS' well was included in the baseline study dataset for continuous water level sensor datalogging. It shall be discussed further in this chapter's section entitled Field Work Completed. It is not registered as an abstraction because it supplies <5 m^3/d, which is significantly lower than the 25 m^3/d requirement for abstraction registration.

Geoheritage Sites

8.229 As requested in the GSI's Response to Scoping (**Appendix 8.8**), County Geoheritage Sites (CGS) associated with the site and wider environment should be considered in all assessments.

8.230 An Audit of County Geological Sites in County Kilkenny is reported by Clarke *et al.,* (2007). Neither the quarry, nor its greenfield application area, feature in the Geological Heritage of County Kilkenny. Whilst there is mention of 'Bennettsbridge Quarry' throughout the County Geological report, cross referencing with the GSI's data and map viewer for 'Geological Heritage' suggests that when Clake *et al.* (2007) make reference to 'Bennettsbridge Quarry' it is the Roadstone Quarry at Maddockstown that is referred to (Site Code KK010 on the GSI's 'Geological Heritage' data viewer).

8.231 The GSI Geoheritage Site map viewer presents mapping and information for Geoheritage sites along the M9. However, these are all geological and not related to water. Similarly, "Bennettsbridge Quarry" (not the application site 'Bennettsbridge Limestone Quarry') and Archersgrove Quarry are mapped by the GSI on their Geoheritage map viewer.

8.232 Each of these Geoheritage sites are mapped for their contribution to geological understanding resulting from exposures during the construction of roads, and their embankments, or quarries. 'Bennettsbridge M9 Cutting' Geological Heritage site (Site Code KK021) is immediately south of the quarry. All Geoheritage sites are presented and included in the Impact Assessment of the Land, Soils and Geology Chapter. The

8.233 There are no mapped Geoheritage sites with water impact of affect potential.

Planning Policy, County Development Plan & Quarrying

8.234 Quarry Consulting's Planning Report accompanies the application, and it concludes that the proposal aligns with national and local planning policy for quarries.

Field Work Completed

Rain Gauge

8.235 A site specific rain gauge (RG) was installed at the site in 2024. The purpose of the RG was to establish an independent station that measures site-specific rainfall. The daily rainfall record for the closest Met Eireann Synoptic Station, which is Oakpark at c.50km to the northeast, was plotted with the site-specific rainfall data and compared. Rainfall data are presented in Appendix 8.3 with all Site Monitoring Data. The on-site rainfall recorded compares well with the Oakpark data, in general. Peak (extreme) rainfall is localised to each station and the slightly offset peaks of daily rainfall highlight this. However, the conclusion is that the Oakpark data is fit for purpose in relating it to the site's discharge and records for borehole water level response.

Site Investigations for the Operational Quarry's Bedrock

8.236 This is a Water Chapter for an EIA that includes the continued use of the operational quarry, as sanctioned in Kilkenny County Council PL18/858, but it is not proposed to deepen the extraction in the operational quarry. The operational quarry is included in the application because it will service the proposed continuance of the lateral extension into the western greenfields.

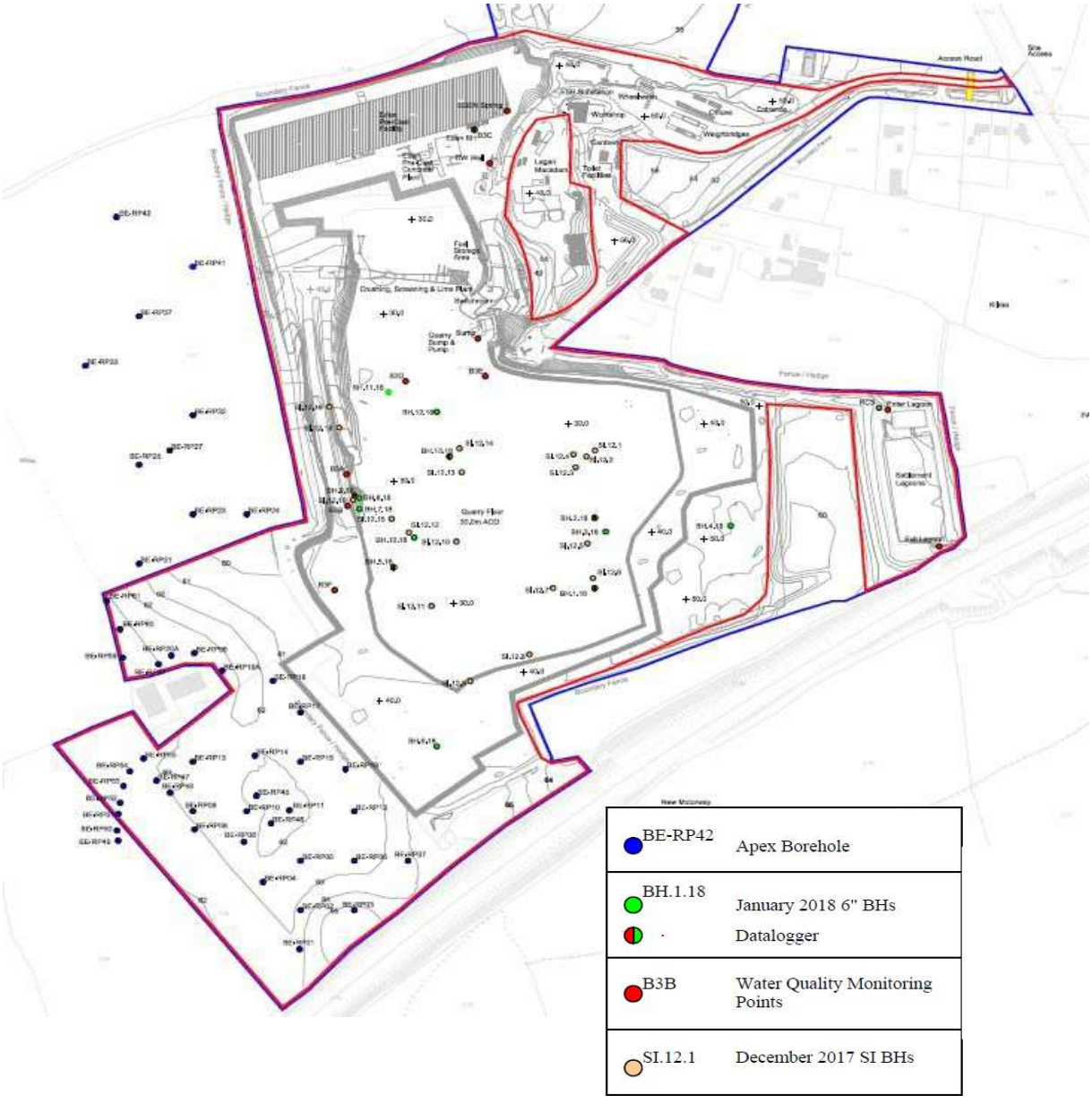
8.237 On the basis that no depth extension is proposed in the existing quarry, other than that sanctioned in PL18/858, neither drilling nor geophysics were required for the operational quarry area. A large body of information exists for the bedrock of the existing operational quarry. It is useful to recap on the information gained from historic work for the purposes of comparing the more recent site investigations in the greenfield area, which are presented after.

8.238 Many BHs have been drilled across the operational quarry, and its adjacent lands, throughout the last 10 years. The location of all historic BHs drilled for the Red Line Boundary of the PL18/858 application are shown on Plate 8-7. Summary details for the historic record of drilling includes, as follows:

- In January 2017 Hydro-G supervised a drilling programme designed to investigate a greenfield area of 8.5ha to the west of the southern part of the operational quarry. This area was approved by KCC as part of the PL18/858 grant of permission and the area is currently being worked. Ten BHs were drilled and logged by EurGeol Dave Blaney BSC., MSc., P.Geo. over a period of two weeks during the site investigation works. Hydro-G observed for hydrogeological responses during drilling. No major water ingress zones were encountered in 10 investigative boreholes in that lateral greenfield extension area into the west. This area is currently being worked and it has brought the southern portion of the main quarry site into the lands of the west. **This 2025 application proposes to continue west into this same greenfield area and into a large field to the north of the greenfield granted in PL18/858.**
- In December 2017 Hydro-G supervised drilling of 19 Site Investigation boreholes on the working quarry's floor. These BHs were designed to investigate the elevations from the floor of the 2nd Bench (30m OD), into a proposed 3rd Bench with a proposed floor elevation of 12m OD: this was subsequently permitted in PL18/858.

- In January 2018 Hydro-G drilled a further 13 number 6" diameter boreholes in the floor. Borehole details and logs are presented in Appendix C5 of the PL18/858 EIAR.
- Of all the boreholes ever drilled at the site, no obvious water strike nor water bearing karst features were encountered. Subsequent permeability and pump testing of the floor boreholes suggested that the Saturated Hydraulic Conductivity was of 10^{-7} to 10^{-10} m/s, which suggests the same porosity and water transmissive properties of CLAY.

Plate 8-7 All Historic SI BHs drilled for the PL18/858's Red Line Application Area at that time.



Site Investigations for the Greenfield Application Area

8.239 As stated, the proposed greenfield extension area in this 2025 application aims to secure the bedrock resources to the west and in a field north of the greenfield portion sanctioned in PL18/858. Geophysical Surveys and extensive Drilling Site Investigations have been completed in the greenfields. The Water related aspects are presented here.

8.240 Site Investigations relating to the nature and characteristic of the overburden and bedrock were presented in the Land, Soils & Geology Chapter (LSG) and the associated Appendices. However, a summary overview of information relating purely to geology and of relevance to water is presented here, as follows:

- **Geotechnical:** A Geotechnical Appraisal of proposed extension to Bennettsbridge Limestone was completed by Advanced Mining Solutions (report dated April 2025). Its findings are of more significance to the Lands Soils and Geology Chapter but it is noteworthy that its photograph series shows that the boundary wall between the operational quarry and the proposed western extension area is generally a dry wall with no evidence of a 'water table' and very limited rare groundwater ingress: this is the view from ground level into the underground bedrock of the proposed extension area. It is readily observed that from ground level to the depth proposed for the floor of the extension area large scale groundwater flow potential is absent.
- **Geophysical:** Apex (2018a, 2018b and 2025) reported geophysical surveys and extensive investigative drilling in the proposed greenfield area. Their interpretation is that the bedrock is solid massive limestone, apart from a CLAY infill channel running NW to SE in the northern field. There are sometimes differences in resistivities returned from the responses to geophysical signalling from the limestone beneath Bennettsbridge Limestone Quarry. However, follow up drilling always return competent bedrock and always fail to find any abnormalities or water in the bedrock.

8.241 With respect to **Drilling**, which has significance to LSG and Water, site Investigation boreholes drilled across the proposed greenfield application area, include as follows:

- Sixty number Site Investigation BHs in the greenfield application area application area drilled to depths of 35m bgl (Apex 2018a and 2018b). The purpose of the boreholes was to log overburden depth, for the purposes of planning resource management, determine the characteristic of the bedrock and report evidence of groundwater flow. No groundwater strike was found in the 60 boreholes drilled in 2018. A Summary Table is provided in the Appendix Series of the Lands, Soils & Geology Chapter, as is the entire Apex (2018a) and Apex (2018b) reports for the southern fields (Phase 1) and northern fields (Phase II) of the proposed greenfield application area subject to this 2025 planning consent application.
- Seven Site Investigation BHs were drilled in 2024 by Petersen Drilling with a supervising hydrogeologist (Pamela Bartley). The driller's records were presented in full in the Lands, Soils and Geology Appendices and in a Summary Table in Appendix 8.3, Section 4, with an accompanying map of their locations. The purpose of the boreholes was to try to find groundwater strike but no strikes were encountered in any of the 7 BHs. Small seeps of water were encountered and these are referenced in the detail of Appendix 8.3, Section 4, Table 1 SI BH Details. Important information from the 2024 Drilling Programme includes, as follows:

- The Greenfield Application Area BHs were drilled to target base of hole elevations of 25 to 30m OD, which is the range of the proposed lowest elevation bench level of the application area. Those target base elevations are the elevation range of the floor of the 2nd bench of the adjacent operational quarry. This means that the rock beneath the application area is visible.
- Five of the 7 BHs were drilled on the periphery boundaries of and within the red line application area of the greenfield: BHs labelled SP1-24 to SP5-24.
- Two of the 7 BHs were drilled outside the red line application area of the greenfield and upgradient of the proposed development in the context of regional groundwater flow: BHs labelled SP6-25 and SP7-24.
- Small seeps of groundwater were encountered in 3 of the 7 SI BHs at depths of >30m bgl: BHs labelled SP1-24 to SP3-24. No groundwater was encountered in 4 of the SI BHs SP4-SP7.
- Each of the 7 SI BHs were instrumented with 2" Piezometers in the 4" drilled BHs. Each Piezometer was completed with a Gravel Pack around a screened interval at the base, a deep bentonite seal at the bedrock subsoil interface and a Well Head on a concrete base. Each Piezometer was instrumented with a datalogger recording water level continuously.
- Whilst no strikes were found in the final 4 of 7 SI BHs, water seeped into those BHs slowly in the month after drilling: BHs labelled SP4-24 to SP7-24.
- Whilst no significant strikes of groundwater were observed during drilling of any of the 7 BHs, by the end of winter 2025 there was standing water in each of the 7 piezometers. Water level depths ranging from 23m to 38m bgl, which correspond to water elevations ranging from 32m to 48m OD. A subset of recorded water levels in the greenfield application are presented in Table 8.8 and an accompanying graph is presented as Plate 8-8, below.

Table 8.8 Greenfield Application Area Piezometer Water Levels (m bgl) and Elevations (data subset).

	MP Casing mOD	1. Water Levels (m bcl)			
		Oct-24	Feb-25	Mar-25	Apr-25
SP1-24	63.67	32.64	23.04	26.32	28.3
SP2_24	60.60	33.51	26.6	28.11	28.78
SP3_24	68.46	39.79	30.69	32.82	33.82
SP4_24	61.36	33.58	29.41	32.035	32.63
SP5_24	68.71	33.28	27.45	30.835	32.26
SP6_24	76.73	48.53	38.46	40.8	41.79
SP7_24	71.64	30.07	25.4	27.84	28.22

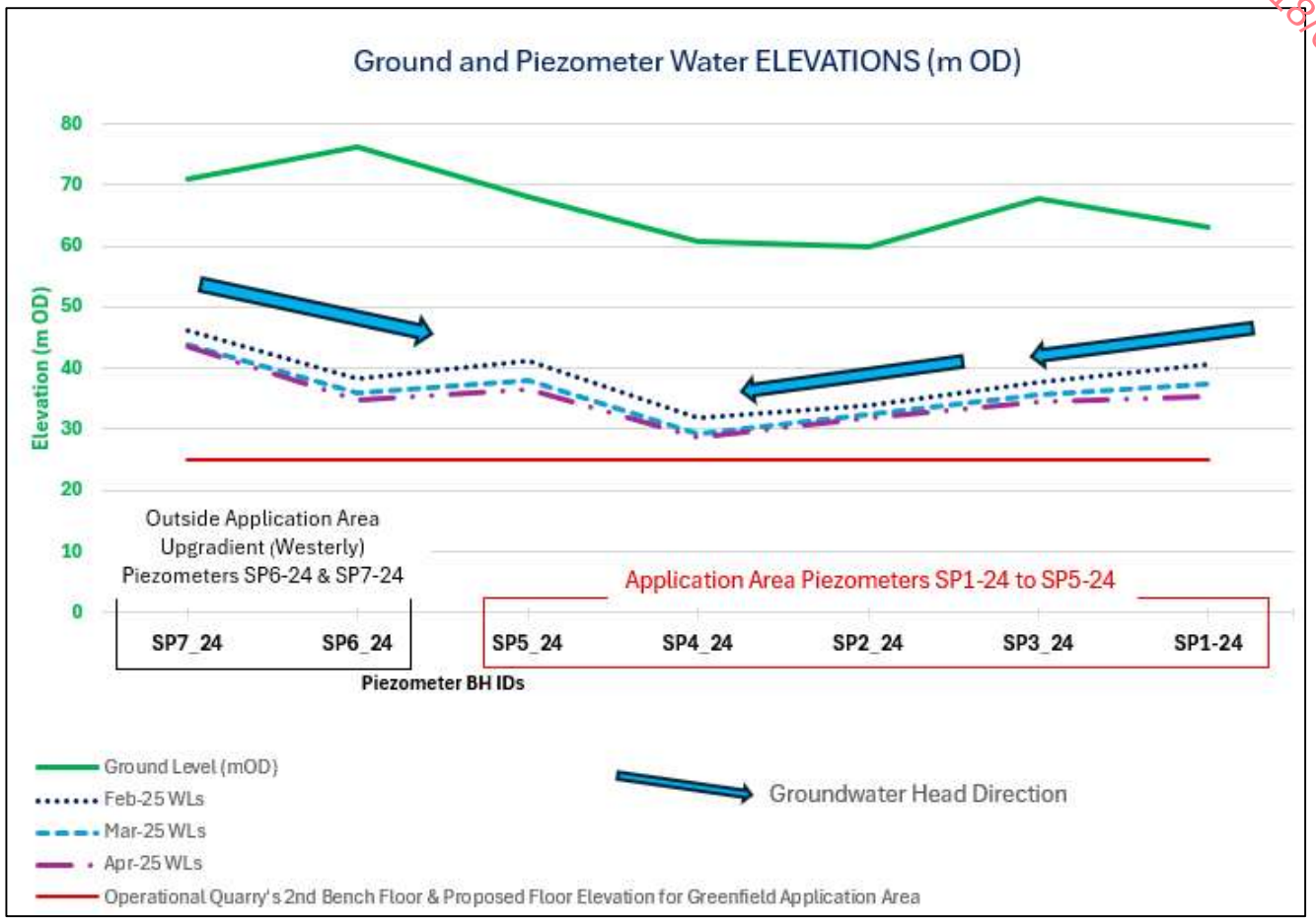
	MP Casing mOD	2. Water ELEVATIONS (m OD)			
		Oct-24	Feb-25	Mar-25	Apr-25
SP1-24	63.67	31.03	40.63	37.35	35.37
SP2_24	60.60	27.09	34.00	32.49	31.82
SP3_24	68.46	28.67	37.77	35.64	34.64
SP4_24	61.36	27.78	31.95	29.32	28.73
SP5_24	68.71	35.43	41.26	37.88	36.45
SP6_24	76.73	28.20	38.27	35.93	34.94
SP7_24	71.64	41.57	46.24	43.80	43.42
		23/10/2025	13/02/2025	19/03/2025	07/04/2025

8.242 With respect to the subset of data presented as Table 8.8, It is reiterated that no significant strikes of groundwater were encountered during drilling. Immediately after drilling (October, 2024), the water levels were approximately equal to the water seeps encountered during drilling: note that SP6-24 was drilled to 51m bgl and the water level 1 month later was 48.53m bgl. This suggests that it is merely subsurface moisture accumulating in the monitoring point and not a groundwater flow system. This is well understood in Irish hydrogeology: Irish limestone has no primary porosity and therefore, if no water is struck, no groundwater 'flows' into the borehole. Instead, interstitial water percolating from recent rainfall infiltrates slowly into the BHs.

8.243 The information presented in Table 8.8 for the 7 SI BHs in the Greenfield Application Area, is presented graphically in Plate 8-5. Explanation of the water level responses includes, as follows:

- The water levels in the piezometers are c.25m to 35m below ground level in late winter to early spring.
- On a Regional basis, groundwater flows from west of the quarry (SP7-24 and SP6-24), through the subsurface of the greenfield application area lands and on through the operational quarry on the way to the River Nore.
- Within the greenfield application area lands there are some local deflections in that both SP2-24 and SP3-24 were drilled specifically to target the dry clay infill trench described in Apex (2018b, Northern field).
- Groundwater is always trying to escape to the release of the atmosphere, if possible, and this is seen in that the SP4-24 BH, closest to the walls with the working quarry, presents the lowest elevation water level.

Plate 8-8 Subset of Greenfield Application Area Recorded Water Levels with Additional Information (Refer to Appendix 8-2, Section 4 for BH map).



8.244 **Bedrock Permeability:** Bedrock underlying the greenfield application area was independently tested for its ability to transmit water (saturated hydraulic conductivity, Ksat) using hydraulic response tests in each of the 7 BHs. Given that it is a Lands, Soils and Geology component, results for the bedrock's conductivity are presented in detail in the Envirologic report for Ksat, Appendix 7.3. In summary, the limestone bedrock is a solid mass of limestone with extremely low permeability ranging from 10^{-8} to 10^{-10} m/s. Whilst SP2_24 and SP3_24 are in or near the dry karst clay infill fault in the northern field of the greenfield application area, those SI BHs have 2" piezometers installed with only the screened interval at base open to the bedrock. Therefore, their bedrock permeability is the same as at other locations at the site. " The final sentence of Envirologic (2025) states that "In terms of practical water management at quarries, bedrock hydraulic conductivity values of the order of 10^{-8} to 10^{-10} m/s can essentially be regarded as impermeable and groundwater inflows to the void are likely to be negligible". Ksat results ranging from 10^{-8} to 10^{-10} m/s suggest the matrix of the limestone bedrock has a conductance for water similar to the British Standard for CLAY. This is the classic limestone **matrix** porosity of **no ability to transmit water** unless the **secondary** porosity network is encountered.

8.245 All site investigation results confirm the Diffuse Karst (RKd) Aquifer classification. Site investigation results confirm that this very low value matrix porosity of the bedrock. This is why the bedrock's pore water seeped in very slowly in those BHs drilled by Petersen and Bartley in 2024.

Local Area and Operational Quarry Water Level Responses

8.246 Water Levels are monitored in a subset of the quarry BHs and the results are reported in the Annual Groundwater Monitoring Reports, a copy of each report is presented in Appendix 8.3, Section 3. In summary, groundwater on the floor remains at the controlled water levels of the quarry floor. This is normal and safe working practice at the workplace, where safe and dry conditions are required for machine and equipment operators working to abstract bedrock.

8.247 The historical Groundwater Monitoring Programme (Conditioned in PL18/858) also includes local area wells. A map of sampling locations, the annual and long term record are shown in the Groundwater Monitoring Reports presented in Appendix 8.3, Section 3. The closing statement of the Groundwater Monitoring Report for 2024 (dated 18/02/25) provides, as follows:

> *"There have been no significant or unexplainable changes in groundwater level since 2018. Any observed changes were temporal and when January 2024 and February 2025 data are compared, water level results are similar. The most telling, and stable Groundwater Monitoring Point is RC8, which is between the Quarry and the River Nore. RC8 shows that the operation of the quarry has not caused any decline in groundwater levels in landscape between the quarry and the River Nore. Similarly, for the Hughes, Waslough Pump and Whites' Monitoring Points, each currently not in use for user specific reasons, groundwater elevations in the wells are essentially the same now as when monitoring began in 2018*."

8.248 For the proposed greenfield application area, more wells have been added to form an updated network of wells for the Local Area Groundwater Monitoring Programme. All wells of the Monitoring Programme are shown in Figure 8.10. The purpose of the western monitoring well programme is to establish a baseline for upgradient groundwater in advance of excavations in the western greenfield lateral extension, subject to permission. Locational and construction details for all wells are shown in Table 8.9. The (Year Added) first column of Table 8.9 provides an indication of the most recently added wells.

Table 8.9 Wider Landscape Wells now included in updated Groundwater Monitoring Programme.

Wider Landscape Wells Outside the Active Quarry & Proposed Greenfield Extension Area							Base of BH		Borehole Water Level	
No.& (Year Added)	Name	Position relative to the centre of the Proposed Greenfield Application Area.	Context	Easting	Northing	GL mOD	Depth (m bgl)	Elevation (m OD)	Water Depth (m bgl)	Elevation Apr-25 (m OD)
1 (2025)	Kelly Farm Well	2km to the South West (SW).	West and Deep Well - Most Westerly. Dairy Farm High Volume User. BOH -41m OD.	652317.2	648561.7	68.76	110	**-41**	33.38	36.1
2 (2025)	Mullins	2Km to the SW of the closest boundary of the proposed Greenfield ext area.	West and Shallower Well quite close to Kelly (@ 165m from Kelly). BOH 50m OD.	652406.4	648431.6	67.93	50	**18**	31.2	36.6
3 (2025)	McCarthy	2km to the South - South West (S-SW). [SE of Kelly and Mullins]. Also a relatively shallow well.	South West of quarry & shallow well.	652711.4	647874.3	63.52	51	**13**	29.2	34.5
4 (2019)	Drea	850m to the South East.	South East & deep well.	654183.9	649063.2	63.93	115	**-51**	22.5	41.4
5 (2025)	Kirwan	c.800m to the northeast of the centre of the greenfield area, c.550m from the centre of the working permitted quarry and c.50m to the east of the site entrance.	Closest well to the quarry in an easterly direction heading to the Nore.	654565.2	650287.7	46.46	100	**-54**	12.97	33.9
6 (1999)	RC8	c.930m East of the greenfield area, c.650m east of the centre of the working quarry.	Part of Long Established Monitoring Record.	654836.1	650036.3	41.72	46	**-4**	8.98	33.0
7 (1999)	Whytes	1.3km to the Northeast.		654449.7	650995.1	55.99	48.7	**7**	3.33	52.7
8 (1999)	Waslough Pump	2km due North.		653979.6	651903.5	68.47	14.6	**54**	13.1	55.4
9 (1999)	Hughes	2.2km due North		653658.7	652041.9	75.03	50	**25**	20.4	54.6

Long Term On-Site Monitoring Data

8.249 In terms of existing data available, the assessment is fortunate in that there is a long-term dataset for the **operational phase** of the permitted quarry.

8.250 Results for all site monitoring are presented in Appendix 8.3 and the information included is numbered in the Sections of that Appendix, as follows:

8.3.1. On Site Water Supply Well Historic Data.

8.3.2. Baseline Groundwater Quality - The Quarry Wells & Wider Area.

8.3.3. Groundwater Monitoring Programme Annual Reports: Site & Local Wells.

8.3.4. Greenfield Application SI BHs.

8.3.5. Greenfield Application Area Groundwater Quality.

8.3.6. Surface Water Quality – River Nore 2025.

8.3.7. Annual Environmental Reports (AERs) – Discharge Licence: 2018 – 2024.

8.3.8. Rain Gauge (RG) Data Bennettsbridge Limestone and Oakpark, Co. Carlow.

8.251 In relation to each of the 8 Sections of Appendix 8-3, listed above, the significant points for the Long Term Site Monitoring Results for the quarry are summarised, as follows:

1. Appendix 8.3, Section 1: On Site Water Supply Well Historic Data:

- The Summary Data Table for the pre-2018 application (baseline) and the Certificates of Analysis for 2019 – 2024 demonstrate that the quarry's well water supply complies with the Parametric Values of the Drinking Water Regulations.

2. Appendix 8.3, Section 2: Baseline Groundwater Quality -The Quarry Wells & Wider Area:

- In order to establish the wider area's groundwater characteristic for the 2024 baseline before Site Investigations commenced for the currently proposed greenfield extension area to the west of the quarry, groundwater sampling was completed at six groundwater wells.
- The wells are shown in Plate 1 of this Appendix and the location of each well is explained in text. In addition, this Appendix references and expands on the 2018 Baseline for the part of this application that relates to the operational quarry.
- All baseline information is integrated into the Impact Assessment Section, later in this Chapter.
- The baseline hydrochemistry of the local area is explained for each parameter in pages 9-11 of this Appendix: 8.3.2. Overall, the quality of groundwater sampled complies with all Hydrochemical and Physiochemical Parametric Values of the Drinking Water Regulations (2023) but will require treatment to ensure compliance with Microbial Parametric Values. The Parametric Values of the Drinking Water Regulations (2023)

apply to treated water. All six groundwater sampling locations were sampled for the untreated state. This body of work provides answers to the HSE's Environment Unit, whose Environmental Health officer conveyed concerns regarding human health.

3. Appendix 8.3, Section 3: Groundwater Monitoring Programme Annual Reports: Site & Local.

    - As previously stated, a Groundwater Monitoring Programme (GMP) was a Condition of PL18/858. The reports for the GMP (2019 – 2025) are presented in this Appendix and the closing statement for the 2024 report, as stated earlier, is as follows:

    "There have been no significant or unexplainable changes in groundwater level since 2018. Any observed changes were temporal and when January 2024 and February 2025 data are compared, water level results are similar. The most telling, and stable Groundwater Monitoring Point is RC8, which is between the Quarry and the River Nore. RC8 shows that the operation of the quarry has not caused any decline in groundwater levels in landscape between the quarry and the River Nore. Similarly, for the Hughes, Waslough Pump and Whites' Monitoring Points, each of which are currently not in use for user specific reasons, groundwater elevations in the wells are essentially the same now as when monitoring began in 2018."

4. Appendix 8.3, Section 4: Greenfield Application SI BHs.

    - As previously introduced in the Section Heading 'Field Investigations Completed for the Greenfield Application Area', seven Site Investigation BHs drilled in 2024 by Petersen Drilling with a supervising hydrogeologist (Dr. Pamela Bartley, Hydro-G). The driller's records were presented in full in the Lands, Soils and Geology Appendices. This Appendix contains a map of the 2024 SI locations and a Summary Table provides information of relevance to this Water Chapter: depths, strikes (seeps). The purpose of the 2024 boreholes was to try to find groundwater strike but no strikes were encountered in any of the 7 BHs.
    - Readers are referred to the details, Appendix and Map Series of the Lands, Soils and Geology Chapter of this EIAR (Chapter 7) for information relating to the 60 Site Investigations completed in the greenfield application area by Apex (2018a, 2018b and 2025).

5. Appendix 8.3, Section 5: Greenfield Application Area Groundwater Quality.

    - No groundwater flow system was found in any of the 7 BHs in the greenfield area. The BHs were retained for water level monitoring purposes and future impact appraisal.
    - The lack of groundwater strike precluded their use as truly representative groundwater sampling locations. The requisite abstraction of 3 x Volume of Standing Water could not be achieved.
    - It is the accepted conceptual model for the site that the walls of the operational quarry bring recent rainfall, epikarst water and some zones of groundwater seep. The western boundary of the operational quarry is the eastern boundary of the proposed greenfield

application area: this is a wall of bedrock in which, on occasion, there are some groundwater seeps. Those seeps were sampled in order to provide insight into the quality of water beneath the surface of the proposed greenfield application area.

- As shown in Summary Tables and the accredited laboratory Certificates of Analysis presented in Appendix 8.3.5, the subterranean water emitted from the greenfield application area complies with the Objectives of the Groundwater Regulations (2009, as amended).
- The Summary Table for Groundwater Quality in Appendix 8.3.5 presents data in columns for the laboratory results, the statutory Threshold Values (TVs) of the Groundwater Regulations (2010, as amended), the average result for the sampling locations and Hydro-G commentary regarding compliance, as follows:
    - pH is neutral and within the 6-9pH TV of the Groundwater Regulations.
    - The groundwater's Electrical Conductivity signal is compliant with the TV range of the Groundwater Regulations.
    - The average Nitrate concentration in the groundwater of the greenfield application area is 29 mg/l as NO3, which is compliant with the TV of 37.5 mg/l. Although 29 mg/l as NO3 is a relatively high value, this is the norm for the south east of Ireland and agriculture is cited in EPA reports on this issue (*e.g.* EPA, 2018b and 2024a).
    - Total Ammonia concentrations in the groundwater are <0.05 mg/l (Limit of Detection, <LOD) of the analyser, on average. Ammonia concentrations are compliant with the 0.065 to 0.175 mg/l Ammonia TV of the Groundwater Regulations.
    - Similarly, Nitrite concentrations in the groundwater are always <LOD of the analyser and the <0.1 mg/l NO2 results are compliant with the 0.375 mg/l TV of the Groundwater Regulations.
    - With respect to the 'Greenfield Wall South' groundwater seep, the ortho-phosphate concentrations are always below the 0.01 mg/l TV of the Groundwater Regulations. However, the 'Greenfield Wall North' samples exceeded the TV in both April and June 2025. This has significance to the current land use in the greenfields. There are no sources of phosphates in bedrock quarrying. Therefore, the situation can only improve as the pressure is removed.
    - Chloride concentrations average 52mg/l, which although a relatively high value it remains an order of magnitude and compliant with the upper limit of the TV of 187.5 mg/l.
    - For all metals analysed, groundwater concentrations are generally <LOD of the laboratory and there is compliance with the TVs of the Groundwater Regulations for Lead, Zinc, Arsenic and Chromium. For Aluminium, groundwater concentrations were <LOD for the majority of the sampling results: one exceedance is recorded but that could be associated with a very small rock particle .

- There are no hydrocarbons no PAHs, no BTEX compounds, no Benzene and no Toluene in the groundwater.
- Therefore, for all parameters analysed and specified in the Groundwater Regulations (2010, as amended), full compliance is demonstrated.
- For other parameters, such as BOD, COD, Total Organic Carbon, the results also suggest a good quality groundwater.

6. Appendix 8.3, Section 6: Surface Water Quality – River Nore 2025.

- The River Nore was sampled in April, May and June 2025, at locations Upstream and Downstream of the discharge point to the Nore, for a large range of parameters.
  - For all parameters specified in the Surface Water Regulations (2009, as amended), the River Nore upstream and downstream are compliant: this includes BOD, Ammonia, pH and ortho-P.
  - Suspended Solids concentrations, for both the Upstream and Downstream sampling locations, comply with the Salmonid Regulations limit of 25mg/l and in two months the results are reported as <5mg/l and in the third month as <10mg/l.
  - In addition to statutory parameters, hydrocarbons no PAHs, no BTEX compounds, no Benzene and no Toluene in the River Nore samples.
  - Table 1 of Appendix 8.3.6 also demonstrates compliance with all ELVs of the Discharge Licence at the time of Nore sampling in June 2025.
  - When the results for Upstream and Downstream are compared on each of the sampling events, there are NO resultant changes in the quality of the River Nore.

7. Appendix 8.3, Section 7: Discharge Licence AERs: 2018 – 2024.

- The complete set of reported Annual Environmental Reports (AERs) for each year since the issue of the Section 4 Licence, and its Condition for AER reporting in 2018, are presented in this in this Appendix. Compliance is demonstrated for both the volumetric ELVs and the hydrochemical ELVs.
- The site records discharge each day and discharge volumes are presented in Table 2 of each year's AER (2018 – 2024). Hydro-G has collated all year's information for daily discharge and the characteristics for daily discharge volumes (maximum, minimum, average), the total annual volumes and the Long Term Average Annual Discharge Volume (m3/yr) are presented as Table 8.10. The Long Term Average Annual Discharge Volume will be employed in the quantitative assessment for the potential for explosive's residues impact and the separate GWB quantitative impact.

Table 8.10 Summary Characteristics for the Site's Discharge each Year (2018 - 2024) & LTAA Discharge.

	2018	2019	2020	2021	2022	2023	2024
MAX m3/d	67,338	63,204	61,308	63,271	65,566	62,174	62,078
Min m3/d	3,793	5,739	6,393	5,078	5,250	6,770	2,608
Average m3/d	19,826	17,105	17,233	17,227	17,287	20,716	19,852
Annual TOTAL m3/yr	7,236,336	6,243,197	6,290,017	6,287,822	6,309,594	7,561,227	7,186,315
LTA m3/yr (2018 - 2024)	**6,730,644**						

Employing each day's discharge volume total, a graph is presented as Plate 8-9 in which the continuous record for daily discharge is shown, in which the discharge volume values are also graphically presented for the same frequency of exceedance percentiles, *i.e.,* the Flow rates met or exceeded for each %ile used in the assessment of abstraction (discharge) impact. These %ile flow rates are presented numerically in Table 8.11 for the same frequency of exceedance occurrences outlined in Quinlan and Quinn (2018) and (EPA, 2025a) Stream Depletion / Abstraction Impact assessment. These data will be employed in the Potential Impact Assessment on the Quantitative Status of the River Nore.

Plate 8-9 Bennettsbridge Limestone Quarry Daily Discharge Volumes and Frequency %ile Values

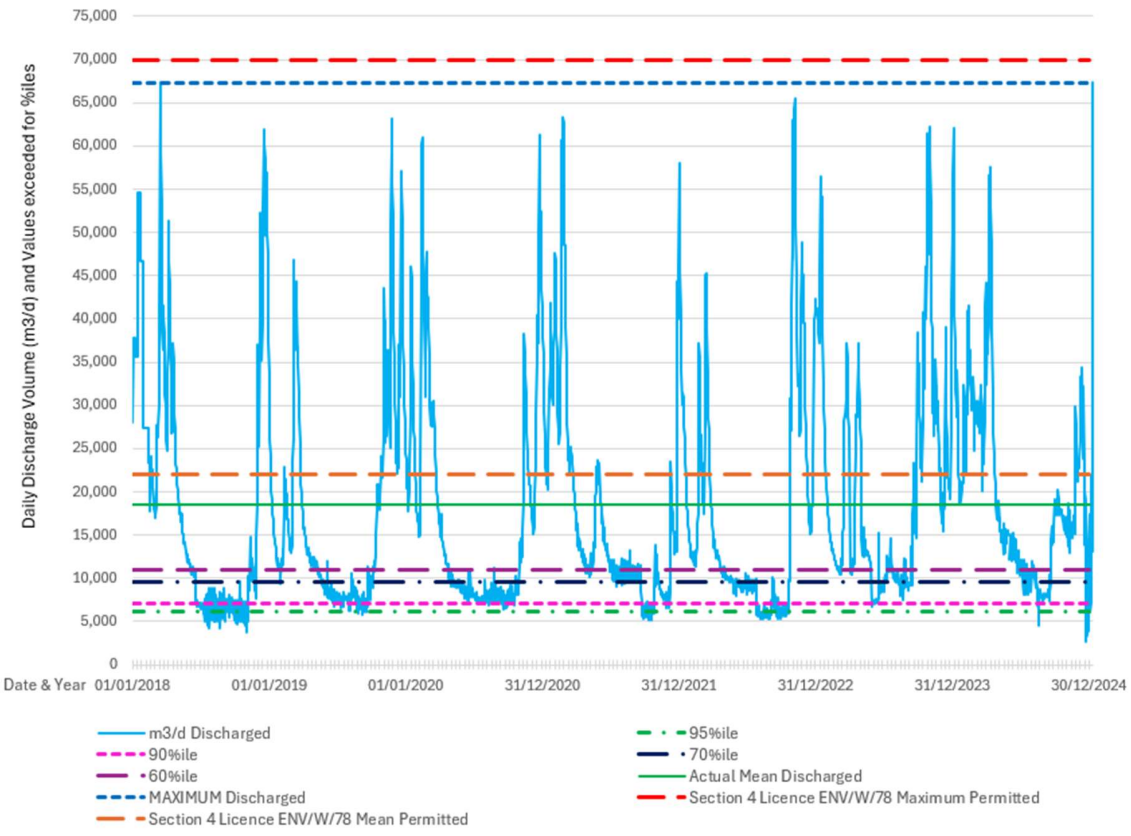


Table 8.11 Flow Exceedance Values for the Site's Daily Discharge Record (2018 - 2024)

%iles for Discharge Volumes (m3/d)	2018	2019	2020	2021	2022	2023	2024	All Year's Data (m3/d)	All Year's Data (m3/s)	%iles for Discharge Volumes (m3/d)
95%ile	5,060	7,100	7,140	5,996	5,662	7,590	7,483	6,136	0.071	**95%ile**
90%ile	5,922	7,428	7,428	7,395	5,946	8,964	8,177	7,112	0.082	**90%ile**
70%ile	7,399	8,845	8,474	10,245	8,908	11,042	12,934	9,589	0.111	**70%ile**
60%ile	9,668	10,550	9,152	11,044	9,843	12,566	15,169	11,005	0.127	**60%ile**
30%ile	27,410	19,298	19,535	19,391	18,593	26,465	23,654	21,954	0.254	**30%ile**
50%ile	12,441	12,031	10,468	12,328	11,207	15,207	16,776	13,098	0.152	**50%ile**
MEAN	19,826	17,105	17,233	17,227	17,287	20,716	19,852	18,462	0.214	**MEAN**
MAXIMUM	67,338	63,204	61,308	63,271	65,566	62,174	62,078	67,338	0.779	**MAXIMUM**

- As previously stated, the site's discharge characteristics include the influence of both rainwater and groundwater from the proposed greenfield application area.
- With respect to the hydrochemical results of the discharge quality, although the regional groundwater nitrate concentration is relatively high, compared to the national baseline, the site complies with its discharge Emission Limit Values each month of each year. Hydrochemical results for each month of each year, for each ELV, are presented in Table 3 of each year's AER (2018 – 2024) in Appendix 8.3, section 7.
- Overall, it is demonstrated that the site complies in full with the ELVs for Volume and Hydrochemical Quality, as set down in the Section 4 Licence ENV/W/78.

8. Appendix 8.3, Section 8: Rain Gauge (RG) Data for the Quarry and Oakpark, Co. Carlow.
    - In the final Section of the Appendix presenting Site Data, site-specific Rain Gauge daily rainfall data are presented and compared with the daily rainfall recorded at the Met Eireann Synoptic Weather Station at Oakpark, Co. Carlow.
    - In demonstrating that the data are comparable, apart from some storm peaks, it is established that the historic and ongoing record for Oakpark can be used for the site's responses in discharge and water levels.

Conceptual Understanding of the Site, the Proposed Development and Interactions

8.252 The Conceptual Understanding of how the site interacts with the environment is a crucial element of all EIAs. The understanding of how this site works with the environment was developed by Hydro-G on the basis of ten years' experience at the site, site visits in all seasons, observations of how the walls of rock behave in different seasons, site supervision of drilling programmes in 2017, 2018 and 2024, investigation information and assessments by others and reporting of the Annual Groundwater Monitoring data and the evaluation of compliance of the site's discharge throughout each year, as is reported int eh site's annual AERs: detail for which is shared in the Appendix series of this EIAR. Key points are presented as follows:

8.253 The quarry is a large limestone bedrock quarry that has been in existence since the last century.

8.254 The M9 Motorway is to the south of the site.

8.255 The underlying Kilkenny Groundwater Body is mapped by the EPA as Good Status (2016 – 2021) and 3rd Cycle At Risk. The At Risk mapping is reported by the EPA (2024a) as due to 'Significant Pressures' from Agriculture and 'unknown'. The 'Significant issue' is that groundwater is carrying nutrients to the River Nore.

8.256 Regionally, groundwater generally flows from west to east in the direction of the River Nore.

8.257 From south of Kilkenny city, all segments of the River Nore are mapped by the EPA in their 3rd Cycle report (2024a) as either At Risk or under Review. Nutrients in groundwater are the reported issue.

8.258 The site's Section 4 Licence (ENV/W/78) allows for discharge of waters to the River Nore. The site causes no change in the hydrochemistry of the Nore. The reasons reported by the EPA (2018b) for the Moderate Status (2016-2021) and 3rd Cycle 'Review' are 'Diffuse Urban' and 'Hydromorphology'. The quarry has never been cited as a Pressure in EPA reporting. Neither are 'Extractive Industries' cited as a pressure on the Nore or any of the associated Groundwater Bodies. The Emission Limit Values (ELVs) of the Section 4 Licence preclude impact on the basis of the assimilation capacity simulations (Hydro-G, 2017) demonstrating that the ELVs were justifiable and would ensure that there would be no resultant change with respect to the Environmental Quality Objectives of the Surface Water Regulations (2009, as amended).

8.259 There are adequate flow volumes in the River Nore to enable the quarry's management and discharge of waters to it. The accepted hydrogeological model for the Nore (Daly, 1984) is that there is a high baseflow of groundwater to the River Nore. Therefore, the site's discharge continues the natural hydrological cycle.

8.260 The River Nore's 'Typology', in the stretch applicable to the quarry, is 'B1 – Hard limestone. low-medium altitude. low-medium slope'. The B1 typology makes up 73% of the river systems in the South East region (Uisce Eireann, 2023). The EPA assigns a particular ecological sensitivity to low flows in rivers and impounding structures.

8.261 The River Nore in the vicinity of the quarry is not a low flow river when one considers the OPW data and EPA HydroTOOL model values presented in this EIAR. The OPW records and reports, for upgradient of the site at Kilkenny (Johns Bridge Stn.), as follows:

- a maximum observed flow equivalent to 40 million m3/d.
- a mean flow of c.3 million m3/d.
- low flow 95%tile of c.230,000 m3/d.

8.262 Similar to the OPW data, the EPA HydroTOOL model reports naturalised flows for all the relevant flow conditions used in impact assessment. EPA HydroTOOL model NATQ flow rates for > Q60. > Q70 and Q95 are the assessment boundaries for the different river typologies presented in Table 3 of the Guidance Document on Potential Impacts on associated surface waters arising from abstractions of groundwater from the catchments of the rivers, as outlined in EPA (2025a). Flow characteristics of importance include, as follows:

- NATQ60 = 14.541 m^3/s, which is broadly equivalent to 1,256,342 m^3/s or 1.2million m^3/d.
- NATQ70 = 10.764 m^3/s, which is broadly equivalent to almost 1 million m^3/d.

- NATQ95 = 3.601 (m^3/s), which is broadly equivalent to 311,126 m^3/d.

8.263 EPA (2025a) presents abstraction impact assessment criteria of note. However, whilst river 'Typology' is an important facet of WFD characterisations and Abstraction Impact Assessment, there **is no net loss of water to, *i.e.,* no stream depletion of, the flow condition of the river system** receiving the discharge from this, or any, quarry. Bennettsbridge Quarry intercepts rainwater and groundwater and attenuates, manages and discharges waters under licence from the GWB that was going to discharge this water to the same river water body. This is the case for the application site's proposed elevations of c.65m OD ground level in the greenfield to c.25m OD minimum floor elevation of the proposed greenfield application area. The Conceptual Understanding for the hydrological system's hydrometrics will be used in the Impact determinations that follow in the Impact Assessment Tables of the latter sections of this EIAR.

8.264 There are numerous Public Water Supply abstractions associated with the River Nore: upgradient of Kilkenny City at Troyswood and downgradient of the quarry at Bennettsbridge and Thomastown. However, the River has the benefit of many OPW Stations that measure the river before and after the abstractions. Hydro-G has documented the scale and characteristics of each PWS.

8.265 With respect to hydrogeology, the site is mapped as part of a limestone body that is a Regionally Important Karst (diffuse) Aquifer. Excavations to the proposed elevation of the greenfield application area have not encountered unmanageable groundwater in the depth from natural ground level to the proposed 25 to 30m OD elevation. There is no evidence of a contiguous groundwater flow system in the excavated open area of rock walls of the void.

8.266 On a site scale, no ground water was detected in 60 site investigation boreholes drilled in the greenfield application area (Apex 2018a, 2018b and 2025) nor in 7 Site Investigation BHs drilled under the supervision of Hydro-G in 2024. Within the area proposed for continued lateral extension into the greenfields to the west of the operating quarry, the subsurface has been explored at 67 drilling locations to elevations of the proposed floor level.

8.267 The subsurface was also explored using geophysical survey technique, which enables a comprehensive understanding of the entire subsurface. The Apex (2018a, 2018b and 2025) assessments conclusions are that there was no evidence of groundwater flow in the depth from ground level to 25m OD.

8.268 The best karst expertise in Ireland suggests that the major karst flows could be significantly below sea level (Drew, D., *pers. comm.,* 2015). Therefore, impacts are not an issue with respect to the proposed 25m OD lowest elevation of the floor excavation proposed.

8.269 The site does not present Flood Risk and neither is it located in a mapped Flood Risk zone. Neither the site, nor its discharge route, were affected or impacted by the historic 2009 flood events. Neither did the 2015/2016 national groundwater flood events result in any effect at the site or along its discharge route.

8.270 The site has a Section 4 Discharge Licence that allows for the management and control of both rainwater and groundwater at the site. The Licence was issued in 2018 and full compliance has been demonstrated year on year. The site's discharge includes waters received from the proposed lateral extension area. Therefore, the licence already makes provisions for the likely water that will be received from the new application area and the site's water management infrastructure has the ability to attenuate, treat and discharge according to the requirements of the licence.

Envisaged Dewatering Volumes

8.271 No groundwater conveyance features and no water strikes have been encountered in any of the 61 SI BHs drilled in 2018 or any of the 7 SI BHs drilled in 2024. None are expected as the quarry expands laterally in the western portion of their landholding.

8.272 There is no need to increase the estimation on discharge volume to provide a greater contribution for a groundwater component associated with the proposed excavation of the greenfield area because the hydrogeological evidence does not suggest that there will be an increased groundwater component from the greenfield area, when it is brought to 25 to 30m OD.

8.273 With respect to the greenfield lands, in the south of the operational quarry the rock face is already exposed to the floor of the 2nd bench of the operational quarry and partially into the 3rd Bench and in the northern part of the operational quarry the stockpile areas are exposed to the floor of the 2nd Bench. The quarry is already collecting the groundwater from the discrete pipe network 'spring' discharges in that western face of the operational quarry that bounds the eastern fact of the greenfield application area.

8.274 Therefore, Hydro-G offers that the volume of groundwater requiring management from that new zone will be the same as that observed in the past because the system is driven by rainfall events through the epikarst layers in that dairy farming land: the hydrochemistry of the groundwater seeps from that quarry rock face are agriculturally influenced in their nitrate and ortho-phosphorus signature.

8.275 The Emission Limit Value of the Section 4 Licence (ENV/W/74, 2018) specifies a maximum discharge volume of 70,000 m^3/d and it is envisaged that for the lowest elevation floor proposed in the greenfield application area, the Licence Conditions will suffice. The ELV was set with an included provision for the future, considering rainfall, storms, and climate change.

8.276 Groundwater elevation at the operational and permitted quarry has already been lowered to the working level of the deepest part of the permitted 3rd Bench 12m OD.

8.277 There are multiple hydrogeological characteristics at this site that lends confidence supporting the hypothesis that there will be no major increase contributed by groundwater and requiring management for the greenfield application area's excavation to the proposed 25 to 30m OD, which will allow for two benches in the greenfield area similar to the first two benches of the operational quarry:

- Primarily, the features in the subsurface of the rock mass now proposed for excavation are exposed over a large area already in the walls of the quarry excavated from natural ground level in the greenfield (c.61 to c.65mOD) to the 2nd bench floor level in the working quarry.
- In that boundary wall between the operational quarry and the greenfield application area there is only one significant groundwater seep discharge at 30m OD, which is relatively small with a measured volume of 125m3/d, approximately.
- There are multiple seeps but no large features with the potential to bring additional water.
- The epikarst traditionally brought the waters to the site and the epikarst is already exposed for the entire length of the boundary wall between the permitted and application areas of the site.

8.278 It is this high flow condition that is when there will be the high flow discharge requirement from the quarry. Therefore, Surface Water Regulation assimilation capacity simulations presented in the 2017 Discharge Licence review documentation presented that it was reasonable and justifiable for surface water simulations for the ability of the River Nore to assimilate 70,000 m3/d. in the matter of climate changes and extreme storms, the excess over the discharge licence consent volume can be accommodated on the quarry floor and new floor benches and sumps at times of extreme weather.

8.279 Pump tests and hydrogeological calculations from the original British hydrogeologists for the site in the original application suggested 56,000 m^3/d as the winter requirement dewatering volume associated with excavations to the proposed greenfield floor elevation (Walton 1999 and 2000 for BJ Murphy & Associates, 1999). The site are managing this groundwater already and can continue to do so.

Effects, Impact Assessment Methodology & Structure

8.280 This EIA and EIAR were completed in accordance with enacted EU and Irish legislation pertaining to Environmental Impact Assessment (Directive 2014/52/EU, meaning the EIA Directive and Irish EIA Regulations (2018, as amended 2020). As previously stated, the complete list of Guidance and Legislation employed in the completion of this work was presented in **Appendix 8.5**.

8.281 The Impact Assessment was completed with reference to Guidance relating to EIA and the preparation of EIA Reports, which includes the EU (2017), Department of Housing, Planning and Local Government (2018) and EPA (2022) on Guidelines on the information to be contained in Environmental Impact Assessment Reports.

8.282 Criteria for assessing importance of site attributes and their magnitude of importance were taken from the NRA Guidelines (NRA, 2008) and 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013).

8.283 The tools and structure of the assessment of Effects and Potential Impacts were detailed in **Appendix 8.9**, in which Industry Standard Tables for rating of the Importance of Environmental Criteria, Significance of Effects, Impacts, Mitigation Measures, Residual Impacts and more are presented.

8.284 In addition to the application of Irish Guidelines as outlined in EPA (2022) and NRA (2008), and in the absence of Irish Guidance specifically focussed on quarries and hydrogeology, the work presented in this EIAR Section has also applied UK practical guidance as published by the UK Environment Agency (the public body equivalent of the Irish EPA). The UK Guidance provides a 'Hydrogeological impact appraisal for dewatering abstractions' (Boak, R. et. al. (2007) and the approach is outlined in **Appendix 8.10**.

Development Phases Considered

8.285 The evaluation of Potential Effects and Impact Assessment completed usually considers phases as follows:

- Construction (enabling) Phase

- Operational Phase
- Landscaping, Restoration, Decommissioning & Aftercare.

Description of Likely Effects

8.286 The procedure for determination of potential impacts on the receiving hydrogeological environment was to identify potential receptors within the site boundary and surrounding environment and use the information gathered during the field work and desk study to assess the degree to which these receptors will be impacted upon.

8.287 The application site lies within and adjacent to the existing quarry void, and when considered as a cumulative site, will be of moderate to large size.

8.288 The site is therefore considered to be an attribute of high importance.

8.289 In line with best practice, the individual impacts will be considered with respect to the application site, plus the cumulative impacts with respect to the existing and application site.

8.290 Groundwater, the River Nore and Barrow SAC & the River Nore SPA are potential receptors.

Potential Impacts

8.291 The main anticipated impact associated with the proposed quarry extension, in relation to hydrology and hydrogeology, relates to the potential contamination of groundwater from quarrying activities and the subsequent risk posed to the underlying groundwater and the River Nore and Barrow SAC and the River Nore SPA, which are all adopted as the potential receptors.

8.292 As mentioned previously, water is discharged from the floor sump and pumped to settlement lagoons and then routed via an inline hydrocarbon interceptor before being discharged, under a Section 4 Licence, to the River Nore.

8.293 A detailed assessment of all Potential Effects associated with all phases of the proposed development, on different environmental components are presented in **Table 8.12**, Duration, Frequency and Type of Effect are presented.

8.294 The direct impacts identified as likely to occur during the enabling (construction) stage are included in the assessment because the site proposed is greenfield. Detailed assessments of the depth and nature of the overburden were reported by Apex (2018a, 2018b and 2025).

8.295 The Importance of an Attribute was determined on the basis of criteria from NRA (2008) and IGI (2013), as outlined in more detail in **Appendix 8.9**.

8.296 With reference to hydrogeology, the aquifer associated with the site is deemed to be an attribute of 'Extremely High Importance' Importance Rating because it is mapped as a Regionally Important Karst Aquifer and, by virtue of the Section 4 licence it has a direct hydrological connection to the River Nore Conservation Objective Surface Water.

8.297 Incorporating the Importance Criteria ratings with the Criteria for Estimating the Magnitude of Impact on a Hydrogeology Attribute is provided in the IGI (2013) Guidance (**Appendix 8.9,** Table 4) and the proposed development may have a Potential Impact of 'Adverse', rather than 'Beneficial' and the Magnitude of Impact on the HYDROGEOLOGY Attribute (Regionally Important Aquifer),

could be concluded, as 'Small' based on the potential for removal of a 'small proportion of aquifer', 'minor changes to water supply springs and wells and river baseflow' and a 'Potential Low Risk of Pollution to Groundwater from routine runoff'. The conclusion on the potential Magnitude of Impact on Hydrogeology is 'Small, Adverse'.

8.298 Considering the 'Extremely High Importance' Importance of Attribute and the 'Adverse-Small' magnitude of Impact (**Appendix 8.9,** Table 4), the overall potential outcome on hydrogeological receptors, **in the absence of Mitigation Measures**, could in the application of EIA Impact theory, be 'SIGNIFICANT' (**Appendix 8.9,** Table 5). However, that is the purpose of the Mitigation Measures. 'Significant' is not the worst outcome. 'Very Significant' and 'Profound' has a greater significance in terms of impact (Table 5, Appendix 8.9).

8.299 The application of criteria, as outlined in Tables 1 to 5 of **Appendix 8.9**, to the specifics of the study area provides a framework for general screening of the likely impact to the hydrological and hydrogeological environment. The methodology involves the identification of all the potential receptors within the site boundary and surrounding environment. This information is gathered during the desk study, site walkover, site investigation and monitoring phases of the study.

8.300 Upon collation and consideration of all project information for the site and macro scale, an Impact Assessment is completed and reported under headings, as follows:

- Potential Impacts
- Mitigation Measures
- Residual Impacts
- Do Nothing
- Cumulative Impacts
- Transboundary Impacts
- Dewatering Impact Appraisal (UK Environment Agency)
- SAC Protection Measures

8.301 Additional quantitative Impact Assessments are presented, specific to quarrying, relating to the following:

- Quantitative assessment regarding the potential use of explosives at the site to cause deterioration of groundwater quality in the context of the Threshold Values for Nitrogen Species, as specified in the Groundwater Regulations (2009, as amended), which is an arm of the Water Framework Directive.
- Quantitative assessment regarding the potential for the waters arising, which is deemed an 'Abstraction' by the EPA, to result in impact on the Quantitative Status of the Kilkenny GWB, in the context of the obligations of the Water Abstraction Regulations (2024), which is also an arm of the Water Framework Directive.
- Quantitative assessment regarding the management and discharge of waters arising, an 'Abstraction', to result in 'Stream Depletion' from the River Nore in the context of the obligations of the Water Abstraction Regulations (2024), which is also an arm of the Water Framework Directive.

8.302 The restoration stage of the project describes the aftercare phase that follows the cessation of activities. The direct impacts identified as likely to occur during the restoration stage are deemed to be Significant to Moderate and permanent in duration.

8.303 Indirect impacts (or secondary impacts) are those which are not a direct result of the proposed activity, often produced away from the project site or because of a complex pathway. For example, if runoff from soil-stripping contains suspended solids, downstream deposition of silt can impact instream habitats—a potential adverse indirect impact on surface-water ecology. A positive indirect impact is that raw materials extracted and processed bring benefits to the progression of society housing and ensuring road safety by enabling the maintenance of roads.

8.304 Consideration has also been given to environmental impacts associated with unplanned events such as intense rainfall events, spillage, accidents, fire, trespassing, etc. The impacts identified as likely to occur due to unplanned events are deemed to be slight to significant and brief in duration.

Table 8.12 Summary of Potential Effects on the Water Environment

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
Construction Phase	Stripping of Overburden.	Soils & Subsoils. Surface Waters.	Soils & Subsoils: Medium to Low Importance. Surface waters: Extremely High Importance	Excavation and stockpiling of soil and subsoil creates potential for Suspended Solids mobilisation. Silt in runoff has potential to affect the quality of the discharge and degrade water quality.	Adverse	Significant	River Nore and Barrow SAC. River Nore SPA.	Likely	Occasionally, infrequently, (e.g., extreme rainfall events). Temporary	Direct
	Removal of Woodland	Soils & Subsoils. Surface Waters.	Soils & Subsoils: Medium to Low Importance. Surface waters: Extremely High Importance	Removal of subsoil with roots creates potential for Suspended Solids mobilisation. Silt in runoff has potential to affect the quality of the discharge and degrade water quality.	Adverse	Significant	River Nore and Barrow SAC. River Nore SPA. Bedrock Aquifer. Kilkenny GWB.	Likely	Occasionally, infrequently, (e.g., extreme rainfall events). Temporary	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	Demolition of farmyard.	Soils & Subsoils. Surface Waters. GWB, Bedrock Aquifer, Groundwaters.	Soils & Subsoils: Medium to Low Importance. Surface waters: Extremely High Importance GWB and Bedrock Aquifer: Extremely High Importance	Removal of silage from yards has potential to mobilise high nutrient and potentially contaminating liquids. Demolition of feeding silos has the potential to mobilise nutrients and potentially contaminate surface water runoff. Removal of the underground slurry tank, and the concrete floor slats over the tank, has the potential to release and mobilise slurry, which is a contaminating substance. Demolished corrugated metal, reinforcing steel and concrete has the potential to be a nuisance.	Adverse	Significant	River Nore and Barrow SAC. River Nore SPA. Bedrock Aquifer. Kilkenny GWB.	Likely	Occasionally, infrequently, (e.g., extreme rainfall events). Temporary	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	Use of excavator & dump trucks: spillages during refuelling, use and storage of lubricants.	Surface Water & Groundwater.	Surface waters: Extremely High Importance GWB and Bedrock Aquifer: Extremely High Importance	Contamination of surface waters and groundwaters with hydrocarbons. Potential to affect the quality of the discharge, groundwater and degrade water quality.	Adverse	Significant	River Nore and Barrow SAC. River Nore SPA. Bedrock Aquifer. Kilkenny GWB	Unlikely	Rarely Temporary	Direct
Operational Phase	Blasting of bedrock.	Surface Water, Groundwater.	GWB and Bedrock Aquifer: Extremely High Importance	Deterioration in groundwater quality	Adverse	Small	Bedrock Aquifer. Kilkenny GWB.	Unlikely (Blast Technology is Advanced)	Intermittent Monthly – Bi Monthly) Long-term	Direct
	Extraction of bedrock.	Bedrock Aquifer.	GWB and Bedrock Aquifer: Extremely High Importance.	Permanent removal of bedrock for society's use.	Adverse	Small	Bedrock within site boundary.	Likely	Permanent	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
Operational Phase	Movement of aggregate stockpiles.	Surface waters.	Surface waters: Extremely High Importance	Mobilisation and migration of suspended solids Sediment deposition in river channels disrupting sensitive riverine habitats	Adverse	Significant	River Nore and Barrow SAC. River Nore SPA.	Likely	Occasional Temporary	Direct
	Use of quarrying machinery: spillages when refuelling, lubricant use and storage.	Surface waters & Groundwater.	Surface waters: Extremely High Importance GWB Bedrock Aquifer: Extremely High Importance	Contamination of surface waters and groundwaters with hydrocarbons	Adverse	Moderate	River Nore and Barrow SAC. River Nore SPA. Kilkenny GWB.	Unlikely	Rarely Temporary	Direct
	Quarry dewatering, lowering groundwater levels, 'Stream Depletion'.	Groundwater & associated surface water.	Groundwater & Surface Waters: Extremely High Importance.	Reduction in third party well yields. Reduction in baseflow to river. Reduction in quantity of groundwater in the GWB.	Adverse	Significant	Third party wells River Nore.	Unlikely	Long-term (Reversible)	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	Quarry dewatering, lowering groundwater levels, 'Stream Depletion'.	Public Water Supply Sources.	Extremely High Importance.	Reduction in PWS well yields. Reduction in baseflow to river. Reduction in quantity of groundwater in the GWB.	Adverse	Significant	Bennettsbridge PWS. Thomastown PWS. Multiple GWS sources (as detailed in Chapter). River Nore.	Unlikely	Long-term (Reversible)	Direct
	Use of settlement lagoons	Surface Waters.	Surface Waters: Extremely High Importance	Removal and entrapment of particulate matter entrained in waters leaving site.	Positive	Significant	River Nore and Barrow SAC. River Nore SPA.	Likely	Long-term Constant	Direct
	Discharge from Settlement Lagoons.	M9 Motorway	Motorway: Extremely High Importance.	Flooding of the adjoining M9.	Adverse	Significant	M9 Motorway	Unlikely	Never	Direct
	Cleaning of settlement lagoons	Surface Waters.	Surface waters: Extremely High Importance	Improves efficiency of settlement lagoons, attenuation	Neutral	Not Significant	River Nore and Barrow SAC. River Nore SPA.	Likely	Annual Long-term	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
				Mobilisation and migration of suspended solids						
	Use of wheelwash	Surface waters	Surface waters: Extremely High Importance	Removal and entrapment of particulate matter attached to vehicles	Positive	Slight	River Nore and Barrow SAC. River Nore SPA.	Likely	Long-term Constant	Direct
Operational Phase	Wheelwash maintenance	Surface waters	Surface waters: Extremely High Importance	Improves wheelwash efficiency and reduces mobilisation and migration of suspended solids	Neutral	Not Significant	River Nore and Barrow SAC. River Nore SPA.	Unlikely	Long-term, Annual	Direct
	Use of hydrocarbon interceptors	Surface waters & Groundwater	Surface waters: Extremely High Importance	Entrapment of hydrocarbons lost during refuelling/discharge	Positive	Slight	River Nore and Barrow SAC. River Nore SPA.	Likely	Long-term Constant	Direct
	Monitoring	Surface waters & Groundwater	Surface waters: Extremely High Importance GWB and Bedrock Aquifer:	Monitoring of discharge rates, suspended solids, discharge water quality, receiving surface water quality, groundwater quality	Positive	Not Significant to Imperceptible	On- and off-site	Unlikely	Long-term, hourly, quarterly, annually	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
			Extremely High Importance							
Operational Phase	Pumped discharge of quarry waters	Surface waters	Surface waters: Extremely High Importance	Deterioration in surface water quality. Change in River Hydromorphology. Increased Flood Risk to downstream receptors.	Adverse	Slight	River Nore and Barrow SAC. River Nore SPA.	Unlikely	Long-term Constant	Direct
	Use of Office Toilet Facilities, On-Site WWTS Plant & Discharge Zone	Groundwater	Surface Water: Extremely High Importance	Discharge of treated wastewater to groundwater (nutrient and bacteriological).	Adverse	Imperceptible	Kilkenny GWB	Unlikely	Long-term, Constant	Direct
	Use of crushing plant at operational site to work materials from the	Surface Waters & Groundwater	Surface waters: Extremely High Importance GWB and Groundwater:	Contamination of Surface Waters and groundwaters with small particles of rock and dust.	Adverse	Moderate	River Nore and Barrow SAC. River Nore SPA.	Unlikely	Long-term, Constant	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	planning application area		Extremely High Importance							
Restoration Phase	Removal of semi-mobile and mobile plant (pumps, generators, etc.)	Surface waters & Groundwater	Surface waters: Extremely High Importance GWB and Groundwater: Extremely High Importance	Elimination of hydrocarbon sources	Positive	Moderate	Within site boundary	Likely	Permanent	Direct
	Dismantling and removal of fixed plant & machinery (crushing plant, wheelwash, etc.)	Surface waters & Groundwater	Surface waters: Extremely High Importance GWB and Bedrock Aquifer: Extremely High Importance	Elimination of hydrocarbon and dust sources	Positive	Moderate	Within site boundary	Likely	Permanent	Direct
	Landscaping and movement of infrastructure	Surface waters & Groundwater	Surface waters: Extremely High Importance	Mobilisation and migration of suspended solids	Adverse	Moderate	River Nore and Barrow SAC. River Nore SPA.	Likely	Short-term	Direct & Indirect

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	and overburden stockpiles necessary to facilitate site restoration		GWB and Bedrock Aquifer: Extremely High Importance	Sediment deposition in channels disrupting sensitive riverine habitats						
	Cessation of pumping	Surface waters & Groundwater	Surface waters: Extremely High Importance GWB and Bedrock Aquifer: Extremely High Importance	Recovery of groundwater levels. Risk of Flooding. Risk of contamination to surface waters.	Positive	Significant	Within site boundary and 5 km radius	Likely	Permanent	Direct
Unplanned Events (Major Accidents)	Major Spillage	Surface waters & Groundwater	Surface waters: Extremely High Importance GWB and Bedrock Aquifer: Extremely High Importance	Hydrocarbon contamination	Adverse	Significant	Within site boundary and 1 km radius	Likely	Momentary	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	Intense Rainfall Events	Surface waters & Groundwater	Surface waters: Extremely High Importance GWB and Bedrock Aquifer: Extremely High Importance	On-site & off-site flooding	Adverse	Moderate	Within site boundary & local Lands.	Likely	Brief	Indirect

Quantitative Impact Assessment - Explosives (Blasting)

8.305 Mass balance calculations are presented to mathematically demonstrate potential for effects of blasting to present nitrogen residues in the pore water of the bedrock, which has potential to impact the hydrochemical quality of groundwater and site's discharge. This is a quantitative impact assessment. The risk to groundwater and surface water is assessed by quantifying the resultant hydrochemical concentrations for the potential residual nitrogen compounds Nitrate (NO3), Ammonia (NH4) and Nitrite (NO2) remaining after the explosives have detonated during the blast process.

8.306 Peak activity rates for envisaged blasting frequency and extraction rates and the type of explosives used were supplied to Hydro-G by the Environmental Manager of the quarry.

8.307 The explosives contractor used by the quarry is Kemek and the explosives material used is Kemex 70, which is a site mixed bulk emulsion explosives produced from emulsion matrix. Emulsion matrix is essentially an aqueous solution of ammonium nitrate emulsified in oil. Kemex products may also contain ammonium nitrate prills, fuel oil, aluminium and/or gassing agents. The Technical Data Sheets (TDS's) and MATERIAL SAFETY DATA SHEET (MSDS's) for explosives, primers and detonators used at the site were used in the simulations presented here.

8.308 Literature suggests that small percentages of N compounds can remain as residual coating on bedrock following blasting. This has the potential to be dissolved when it comes into contact with water, albeit potential concentrations are low. The study that is most referenced was completed by Environment Canada in 1988 (Ferguson & Leask, 1988), which outlines a procedure for determining the residual N compounds for various site types. The stepwise procedure used in the 1988 study for predicting aqueous concentrations of N species, is as follows:

a) Calculate the annual leached nitrogen loading (kg/year) for the entire site based upon annual explosive mass usage and residual N fraction associated with explosive type.

b) Separate the leached nitrogen loading among quarry components (e.g. entering surface water, remaining on extracted rock etc.).

c) Separate into loadings of N compounds (Nitrate, Nitrite and Ammonia), and

d) Calculate the flow concentration.

8.309 The concentrations of N species in discharge water from the blasting of bedrock in the proposed greenfield extension at the application site quarry are calculated using this procedure. This is presented in Table 8.13, below.

8.310 The highest residual is for nitrate (99%), and upper limits of the ranges are used in all cases to determine the concentration of N species in pumped water. These are very conservative assumptions and they will result in worst case simulation results.

8.311 The calculation also assumes that 100% of residual N is dissolved in drainage waters and is subsequently pumped from the quarry by dewatering. The results of calculations presented in Table 8.13 clearly show that the residual N compounds would have low concentrations. Resultant concentrations in waters discharged by the quarry are calculated to be: 0.03mg/l NO_3-N (0.13 mg/l as NO3), 0.007 mg/l NH_4-N (7 ug/l NH_4-N) and 0.002 mg/l NO_2-N (2 mg/l NO2-N).

8.312 Overall, the quantitative impact assessment presented in Table 8.13 demonstrates that the residual concentrations meet the requirements of the Threshold Values (TVs) of the Groundwater Regulations (2010), which prescribe TVs of 37.5 mg/l of NO3, 65 to 175 ug/l as

Ammonium and 375 ug/l as Nitrite. The calculated residuals for all N Species are a fraction of the TVs defined in the Groundwater Regulations. Consequently, there is no expected exceedance for Regulatory Threshold Values specified in the Groundwater Regulations (2010, as amended).

Table 8.13 N compound concentrations for explosives in dewatering discharge.

EXPLOSIVE MASS BALANCE		
62	Total Quarry area	ha
21.5	**Proposed area for rock blasting** (excludes set backs from boundaries and deep clay channel)	**ha**
215,000	Proposed new area for working	m2
38	Average depth of extraction	m
288,462	Max. Volume of Rock to be extracted (per year)	m3/yr
245,192	Rock Volume accounting for Industry Standard 15% losses	m3
0.4	Explosive Mass Required (Generally, at all quarries)	kg/m3
98,077	Explosives Mass Required per year	kg/yr
25	Planned Duration of extraction	years
2,451,923	Explosives Mass Required	kg TOTAL
NITROGEN MASS BALANCE		
94%	% Explosive mass as Ammonium Nitrate	%
35%	% Ammonium Nitrate as N	%
32,267	Mass of N	kg/yr
0.06	Residual Fraction	
1,936	Residual N	kg/yr
N COMPOUNDS**		
1,917	Residual NO_3 *(75-99% of Residual N value of 604 kg/yr)*	kg/yr
465	Residual NH_4 *(0.5 - 24% of Residual N value of 604 kg/yr)*	kg/yr
116	Residual NO_2 *(0-6% of Residual N value of 604 kg/yr)*	kg/yr
WATER BALANCE		
70,000	Section 4 maximum Permitted Daily Quarry Discharge	m^3/day
6,730,644	Long Ternm Average (LTA) Annual Total Volume Discharged 2018-2024	m3/yr
67,306,440,224	LTA Annual Total Volume Discharged (2018 - 2024)	litres/yr
NITROGEN COMPOUND CONCENTRATIONS***		
Residual NO_3-N	***0.03***	***mg/L***
Residual NH_4-N	***0.007***	***mg/L***
Residual NO2-N	***0.002***	***mg/L***
*** Calculation of Residual Concentrations = (kg/yr*10^6 = mg/yr)/(litres/yr)		
MASS OF NITROGEN COMPOUNDS GENERATED AT THE SITE (kg/ha/yr)***		
Residual NO_3-N	***30.91***	*K/ha/yr*
Residual NH_4-N	***7.49***	*K/ha/yr*
Residual NO2-N	***1.9***	*K/ha/yr*

8.313 The calculated masses are lower than the concentrations in the site's quarterly discharge monitoring, which range from 2 to 8mg/l NO3-N.

8.314 The calculated residual for Ammonia is compliant, in itself, with the Environmental Quality Objective specified in the Surface Water Regulations (2009, as amended).

8.315 There will be no explosive's residuals impact on the underlying groundwater or the River Nore.

8.316 The risk of impact to local and regional water quality arising from the use of explosives at the site is therefore negligible.

8.317 The calculations are based on PEAK abstraction rates and no risk is determined.

Quantitative Impact Assessment - Abstraction & The GWB

8.318 The Kilkenny GWB is reported to have an approximate area of 152km^2 (GSI, 2004) and the GSI assigns a whole GWB area weighted average groundwater recharge value of c.400 mm/yr. The volume of groundwater associated with this groundwater body is therefore 60,800,000 m^3/yr, approximately.

8.319 A quantitative water balance for the Kilkenny Groundwater Body is presented as Table 8.14. Impact is determined based on the Long Term Annual Average (LTAA) volume of water intercepted, managed, treated and discharged from the quarry. The metered LTAA volume is 6,730,644 m3/yr (Table 8.10, above).

Table 8.14 Groundwater Quantitative Balance

WFD Groundwater Balance BBLGroundwater Usage & All Registered Users	
GSI assigned area for 'Kilkenny Groundwater Body' (km2)	152
Kilkenny Groundwater Body (m2)	152,000,000
AVERAGE Across Region GSI Effective Rainfall (mm/yr)	462
AVERAGE Across Region GSI Groundwater Recharge (mm/yr)	400
GSI Groundwater Recharge (m/yr)	0.4
Groundwater Recharge to Kilkenny GWB = [0.5m rainfall recharge x 1,422,000,000 m2 area] (m3/yr)	60,800,000
AVERAGE Groundwater Recharge to Kilkenny GWB = [0.5m rainfall recharge x 1,422,000,000 m2 area]/365 days] (m3/d)	166,575
Long Term Annual Average Total Discharge Volume Total metered 2018-2024 (m3/yr)	6,730,644
This water goes straight back to the River Nore = NO NET LOSS From the GWB to the River Nore = The Abstraction and the Discharge Negate each other.	
Hydro-G Calculation	
1. WFD Scale - Quarry Only	
Proportion of Quarry's Water's Intercepted (Discharge / 'Abstraction') as a % of Kilkenny GWB's annual rechange amount to groundwater from rain falling on its catchment (%)	11
2. WFD Scale - Cummulative - All Groundwater Consumptive use Abstractions	
ALL Other Registered abstractions Kilkenny GWB (m3/yr)	**1,642,135**
Proportion of ALL GROUNDWATER Users as a % of Kilkenny GWB's annual rechange amount to groundwater from rain falling on its catchment (%) [Bennettsbridge Limestone Quarry + All Other Registered Groundwater Users]	**14**

8.320 The significance of the water balance information presented in Table 8.14 is that the Long Term Annual Average volume of water intercepted, managed, treated and discharged from the quarry represents 11% of groundwater flowing through the GWB. WFD Working Group

Guidance GW5 (WFD WG, 2004b) assigns a rating of **'Moderate Potential for Impact'** for a <10 to 20% result in Low Storage groundwater systems, which the Kilkenny GWB is. The calculated impact is on the very low side of the 10 – 20% range of GW5.

8.321 The Groundwater Balance presented as Table 8.14 relates to the Impact Potential of the site and the proposed development. However on a cumulative basis for the entire GWB, the EPA (December 2024) Register of Abstractions suggests that the volume registered for other groundwater abstractions in the Kilkenny GWB is an additional 1,642,135 m^3/yr. When the quarry's abstraction is added to the total registered users, the calculated cumulative impact accounts for 14% of the available groundwater in the Kilkenny GWB. That value remains within the **'Moderate Potential for Impact'** classification rating, for Low Storage groundwater systems, in the WFD Working Group Guidance GW5 (WFD WG, 2004b).

8.322 Given that the Total Registered Abstractions for Consumptive Use accounts for 14% of the volume of groundwater in the GWB, on a Quantitative basis, the Kilkenny GWB is NOT at Risk from the quarry's proposal to continue.

8.323 Other impact mitigating factors are, as follows:

- Quarries discharge their 'abstraction' back to the hydrological system.
- There is no loss arising from a quarry's 'abstraction'.
- It is calculated that Bennettsbridge Limestone Quarry intercepts 11% of the annual rainfall recharge contribution to the Kilkenny GWB and then sends it straight to the River Nore, as nature had originally intended.
- The outer, upgradient, boundaries of the Kilkenny GWB extend to c.13km from the quarry in a northerly and northeasterly direction. The quarry is very close to the ultimate discharge mechanism for the Kilkenny GWB, which is the River Nore. Groundwater intercepted and managed at the quarry is sent to the Nore in any case.

Quantitative Impact Assessment - Stream Depletion & The River Nore

8.324 Following on from the adoption into law of the Abstraction Act (2022) and Abstraction Regulations (2024), EPA (2025a) provides a framework Impact Assessment methodology based on River Type and maximum % permissible abstraction volumes that are envisaged to be within the river system's resilience to change. The assessment technique was brought into law in Northern Ireland in 2015 and was initially presented in an Irish Context in EPA (2017 and again by EPA staff Quinlan and Quinn (2018). The interception and management of waters at a quarry is considered an 'abstraction' in the Abstraction legislation.

8.325 The abstraction impact framework applies a concept of 'Streamflow Depletion' in which it is conceptualised that all groundwater contributes baseflow to a river and therefore abstractions from a GWB, even temporary ones at a quarry, are essentially abstractions from the baseflow component of a river.

8.326 As stated previously, Hydro-G's experience suggests that 'Stream Depletion' is not an applicable concept when a quarry abstracts from an associated GWB and discharges, under licence, to the same river water body. This is the case at the application site. Nonetheless, the administration and legal basis exists and the information is hereby presented to enable the Competent Authority's independent assessment regarding the legitimacy of the site's 2017 Section 4 Licence Conditions regarding Maximum and Mean Emission Limit Values for volumetric discharge.

8.327 For the purposes of simplicity, the entire volume of water managed and discharged at Bennettsbridge Limestone Quarry is assumed to have the potential to deplete the River Nore from its baseflow component. Therefore, Hydro-G will not apply a 'Stream Depletion Factor' to the volume of water quantified at the quarry. For PWS abstraction impact assessment, it is usual to use aquifer characteristics to reduce the daily abstraction rate before comparing with the accepted % change values (EPA, 2025a) for the associated river. As stated, no reduction in volumes is applied here. This presents the most conservative and safe simulation.

8.328 The River Nore is a Good Status Objective waterbody (EPA, 2024a).

8.329 The River Nore's 'Typology', in the stretch applicable to the quarry, is 'B1 – Hard limestone. low-medium altitude. low-medium slope'. As previously presented in the Desk Study, Table 3 of EPA (2025a) presents percentages for 'Maximum permitted total abstraction per day as a percentage of daily natural flow (Q)' are presented for each river 'Typology'. For a B1 river Typology, the (EPA, 2025a) permitted maximum % changes for a Good Status Objective waterbody are as follows:

- For NATQ95 - NATQ99 (low flow), the allowable percentage that can be abstracted is 15%.
- For NATQ70 - NATQ95, the allowable percentage abstraction increases to 20%.
- For NATQ60 - NATQ70, the allowable percentage abstraction increases to 25%
- For > NATQ60, the allowable percentage abstraction increases to 30%.

8.330 Naturalised flow is the flow characteristic that the EPA HydroTOOL model provides. As was presented in the Desk Study 'Hydrometrics' section of this chapter (Table 8.6), the Naturalised Flows attributed to the HydroTOOL model node immediately upgradient of the quarry's discharge [Model Node 15_484] are, as follows:

- NATQ99 = 2.271 (m^3/s), which is broadly equivalent to 196,214 m3/d.
- NATQ95 = 3.601 (m^3/s), which is broadly equivalent to 311,126 m3/d.
- NATQ70 = 10.764 m3/s, which is broadly equivalent to almost 1 million m3/d.
- NATQ60 = 14.541 m3/s, which is broadly equivalent to 1,256,342 m3/d or 1.2 million m3/d.
- NATAMF = 31.121 m3/s, which is broadly equivalent to 2,688,854 m3/d or 2.7 million m3/d.

8.331 In addition to the usual flow characteristics advised by the EPA (2025a), Hydro-G suggests that the HydroTOOL model values for Naturalised Mean Monthly Flow (NATMMF) for the months of January (NATMMF1) and December (NATMMF12) for HydroTOOL model node immediately upgradient of the quarry's discharge [Model Node 15_484] are important impact assessment data because it is during these months that the quarry records maximum discharge volumes. The HydroTOOL flow rate characteristics for January and February upstream of the Discharge are, as follows:

- NATMMF1 = 57.894 m3/s
- NATMMF12 = 53.55 m3/s
- Average of NATMMF1 & NATMMF12 = **55.772 m3/s.**

8.332 The effect of the quarry's 'abstraction' (discharge) on the River Nore is presented in Table 8.15, which adheres to the methodologies for impact as outlined in EPA Research and Guidance (EPA, 2017. Quinlan & Quinn, 2018. EPA, 2025a).

Table 8.15 Quarry's 'Abstraction' as a % of River Nore NatQ Rates

HydroTOOL [Model Node 15_484]	Nore_190 Naturalised Flow upstream of Discharge (m3/s)	Quarry's Measured Discharge Volumes for that Flow Condition (m3/s)	Effect of abstraction as % change NATQ Rate/%ile	EPA (2025a) Maximum % Change for B1 River Typology (Nore)	Hydro-G Comment
	3.601	0.071	**2.0**	15	COMPLIANT: For All Flow %iles, the % Change in Flow is At least an Order of Magnitude lower than EPA (2025a) Maximum Permitted. 100% Compliant.
	4.761	0.082	**1.7**	15	
	10.764	0.111	**1.0**	20	
	14.541	0.127	**0.9**	25	
Naturalised annual mean flow (NATAMF)	31.121	0.152	**0.5**	30	
Average NATMMF1 & NAMMF2 (Months for Max Recorded Discharge from the Quarry)	55.722	0.779	**1.4**	30	

8.333 With respect to the results of the simulations for groundwater abstracted at the quarry to impact on the baseflow of the Nore, the % changes at each flow rate, using data for the quarry's discharge, are as follows:

- For NATQ95, the river's flow rate is 3.601 m3/s, the quarry's discharge is 0.071 m3/s, the resultant effect is 2.0% and the published permissible impact is 15%. The quarry's 'Abstraction' (discharge) is deemed acceptable when the maximum % impact of Quinn & Quinlan (2018) and EPA (2025a) are considered.

- For NATQ90, the river's flow rate is 4.761 m3/s, the quarry's discharge is 0.082 m3/s, the resultant effect is 1.7% and the published permissible impact is 15%. The quarry's 'Abstraction' (discharge) is acceptable when the maximum % impact of Quinn & Quinlan (2018) and EPA (2025a) are considered.

- For NATQ70, the river's flow rate is 10.764 m3/s, the quarry's discharge is 0.111 m3/s, the resultant effect is 1% and the published permissible impact is 20%. The quarry's 'Abstraction' (discharge) is acceptable when the maximum % impact of Quinn & Quinlan (2018) and EPA (2025a) are considered.

- For NATQ60, the river's flow rate is 14.541 m3/s, the quarry's discharge is 0.13 m3/s, the resultant effect is 0.9% and the published permissible impact is 25%. The quarry's 'Abstraction' (discharge) is acceptable when the maximum % impact of Quinn & Quinlan (2018) and EPA (2025a) are considered.

- For Naturalised annual mean flow (NATAMF), the river's flow rate is 31.121 m3/s, the quarry's discharge is 0.152 m3/s, the resultant effect is 0.5% and the published permissible impact is 30% (for flows > NATQ60). The quarry's 'Abstraction' (discharge) is acceptable when the maximum % impact of Quinn & Quinlan (2018) and EPA (2025a) are considered.
- For the higher quantity discharge months, January and December, HydroTOOL's average NATMMF1 & NAMMF2 is 55.722 m3/s and the maximum discharge from the quarry is 0.779 m3/s. The resultant effect is 1.4% and the published permissible impact is 30% (for flows > NATQ60) when the maximum % impact of Quinn & Quinlan (2018) and EPA (2025a) are considered. The quarry's 'Abstraction' (discharge) is acceptable.

8.334 Under every flow band and using worst-case licensed discharge, the predicted abstraction effect is ≤ 2 % compared with permissible 15–30 % thresholds. therefore there is no significant hydrological impact on the River Nore.

Impact Assessment - Discharge - River Nore & Hydrochemistry

8.335 The impact assessment relating to discharge was addressed during the consideration by Kilkenny County Council in the revised issue of the Section 4 Discharge Licence in 2017 following a site initiated Review Application. The Licence ELVs were determined by Kilkenny County Council to present no impact potential and compliance with the Surface Water Regulations (2009) and Groundwater Regulations (2010). Again, refer to Appendix 8.2, Section 3.3, for the mathematical demonstration of the ability of the River Nore to assimilate the Discharge.

8.336 The site's monitoring data suggest compliance with the Conditions of the Licence, as demonstrated in each AER (2018 – 2024) presented as Appendix 8.3, Section 7.

8.337 A detailed review of EPA (2025b) Biological Quality Monitoring and the EPAs hydrochemical monitoring record for the River Nore demonstrates that currently, the River Nore continues to assimilate the quarry's discharge and there is no degradation in biological quality or hydrochemical quality of the River Nore when upstream and downstream monitoring station data are considered (Appendix 8.7, Sections 2 and 3).

8.338 Consideration of the site's independent monitoring of the River Nore upstream and downstream of the discharge in April, May and June 2025 enables a conclusion of no impact arising from the site's discharge.

8.339 The most recent letter of Compliance from Kilkenny County Council, dated the 11th of March 2025, is presented in Appendix 8.2 with a copy of the Discharge Licence.

8.340 A conclusion of no potential for impact resulting from the discharge is adopted.

Impact Assessment Flooding

8.341 There is no potential for impact with respect to flood potential arising from the proposal to continue operation of the quarry and expand to the west, for reasons as follows:

- Quarrying creates a void that can accommodate extreme rainfall events that might cause flooding.
- OPW information, HydroDATA, CFRAMS and Floodmaps confirms that there is no risk of flooding at the site or as a result of activities associated with the site's discharge of waters.

No flooding has been reported by the OPW (https://www.floodinfo.ie/map/floodmaps) in or around the point where the discharge leaves from Bennettsbridge Limestone Quarry nor immediately downstream of the point of receipt in the River Nore.

- As shown in Table 8.5 (OPW Hydrometrics, above), the OPW records maximum flow accommodated by the River Nore upstream and downstream of the site, as follows:
    - Johns Bridge (Station No. 15002) = Upstream of Quarry, at Kilkenny City. OPW hydro-data suggests 1% (Storm Flows) = 116 m^3/s = 10,023,005 m^3/d. [*c.*10million m3/d].
    - Mount Juliet (Station No. 15011) = Downstream of Quarry, at Mount Julliet. OPW hydro-data suggests 1% (Storm Flows) = 186.9 m^3/s = 16,148,074 m^3/d. [*c.*16million m3/d].
- There is 6 million m^3/d gain in the Storm Flow condition in the River Nore between the upgradient Kilkenny City (Johns Bridge) Station and the Mount Julliet Station, at c. 7km south and downgradient of the quarry's discharge. Relative to the 6 million m^3/d gain during the storm flow condition, the quarry's maximum permissible 70,000 m3/d discharge represents 1.14 % of the full flood flow.
- A c.1% impact is deemed insignificant in all Impact Criteria methodologies.
- With respect to the site's discharge, the site has discharged with no flooding responses for the last 8 years within the Section 4 Licence permitted range of 22,000 m^3/d to 70,000 m3/d. In the responses to scoping, TII requested that the discharge from any holding ponds/lagoons is managed so that flooding of the adjoining M9 does not occur. Hydro-G provides scoping responses from state agencies and Hydro-G's addressing in Appendix 8.8. However, the response in relation to the M9 Motorway is crucially important in relation to the Impact Assessment and the detail of Appendix 8.8 is provided here for the planning authorities convenience and ease of reference. The Impact Assessment concludes that there is no potential for impacting the M9 for reasons including, as follows:

- The quarry discharges waters arising in the void, under licence. All impacts of the Licence were appropriately considered by the Environment Section of Kilkenny County Council in the initial phases of work at the quarry and in a site initiated 'Review' in 2017. During that review, all aspects of the River Nore and its associated relevant tributary's hydrological system was duly considered. No flooding has since, or ever, occurred.

- Given that the proposed western extension area already drains to the operational quarry and that only two benches are proposed in the new application area, no significant increases are envisaged.

- TII requested that the M9 drainage regime should not be impacted nor affected by the proposed development. Hydro-G offers that the quarry operated in advance of the construction of the M9 motorway and therefore, the M9's drainage system will have incorporated the site in its drainage network design.

- The M9 is significantly elevated above the quarry's settlement lagoon system and discharge route, so much so that there is a bridge over the R700 to allow the M9 to convey traffic above the road that connects Bennettsbridge to Kilkenny.

- The discharge from the quarry's settlement lagoons is at a much lower elevation than the M9 and therefore no flood potential or affect is possible.

- Even in the GSI mapping for the most recent extreme flood events nationally (2009 and 2014-2015), no flood incidents occurred in relation to the quarry's discharge.

- Neither do the OPW nor TII report or communicate any incidences of flooding associated with the quarry's discharge and the M9 in response to ordinary rainfall patterns.

- Physically, on an elevation basis, a flood relationship is just not possible. On a plan map basis, the quarry and the M9 are located close to each other, as are many of the quarries used during the construction of the motorway network. However, on a Cross Sectional Drawing basis, there is adequate and appropriate separation between the quarry and the M9 and its associated drainage system.

- The M9's drainage network is at a lower elevation than the M9 and it is well understood professionally that the Motorway Storm Network Designs account for a high degree of design security. The M9 drainage regime is an independent drainage regime and will not be impacted nor affected by the proposed development.

- The issue of the M9's proximity to the quarry was addressed at the Further Information stage of the PL18/858, which was subsequently granted permission.

Impact Assessment PWS & GWS Sources

8.342 Detail and assessment for each PWS and GWS source was presented in the Desk Study Section of this Chapter.

8.343 With respect to PWSs, and as previously presented, the quarry has no potential to interact with, impact or affect, Bennettsbridge or Thomastown PWSs for reasons including, but not limited to, the following:

- Each of the PWSs are from Groundwater Bodies that are not the Kilkenny GWB in which the site is located. There is therefore no potential for interaction. The EPA and GSI have delineated GWB Boundaries as No Flow Boundaries on the basis that the adjacent surface waters will drain a GWB.
- There are numerous other GWBs between the quarry and the PWS's GWBs.
- Each of the PWSs are in different bedrock types than the quarry.
- Each of the PWSs are in different aquifer types than the quarry.
- The Zones of Contribution to the PWSs are mapped and are significantly remote from the quarry (refer to maps in Appendix 8.8):
    - Bennettsbridge PWS's Sources and the Inner ZOC is c.5.5km to the south east of the site and extends across the eastern banks of the River Nore. There is no potential for

interaction with the quarry because the quarry is c.1km to the west, on the opposite side of the River Nore.

- Thomastown PWS's Sources and the Inner ZOC is c.9km from the quarry and again extends to lands on the banks of the Nore in which the groundwater flow direction is from south to north on a limb of the Nore where the river is travelling west to east. Given that the quarry's groundwater flow direction is west to east, again, there is no potential for impact.

8.344 With respect to GWS sources, and as previously presented, the quarry has no potential to interact with, impact or affect, any GWS sources because the quarry is many kilometres from the boundary of any mapped and published Zones of Contribution for GWSs.

Mitigation Measures

8.345 The significant potential Effects identified in Table 8.13, above, are resolved under the mitigation measures set out under Table 8.16, below. The key principles of avoidance, prevention, reduction and remedy/off-set have been adhered to in this regard.

8.346 Key mitigation measures for the site include, as follows:

- There is a long established Section 4 Licence in which AERs reported to Kilkenny County Council since 2018 have demonstrated that there has been no impact on the quality of the River Nore. Good site practices and pollution prevention is well established.

- The Groundwater Monitoring Programme has determined that there has been no impact on the wells that were monitored as a Condition of PL18/858 for the extraction of rock to the proposed greenfield application area's proposed floor elevation of 25m OD to 30m OD.

- The quarry is operational and permitted and the wall that the quarry shares with the proposed greenfield application area provides substantive evidence that there are no major groundwater flow paths from natural ground level to the proposed greenfield application area's proposed floor elevation of 25m OD to 30m OD. Groundwater flows from the west to the east towards the Nore. If there was potential for major groundwater flow ingress in the two benches of bedrock proposed for excavation, it would be visible because the walls of the 3rd bench of the quarry enable observation of the proposed greenfield 25m OD to 30m OD elevation. It is a diffuse karst aquifer flow system, not a conduit system.

- An existing Environmental Management System (EMS) is in place that includes a comprehensive monitoring program. Annual Environmental Reports (AERs) are submitted to the local authority to ensure compliance and transparency. Additionally, staff training programs are implemented to ensure continuity and effective execution of the EMS.

- The void can be left as open as a habitat and rainfall attenuation system with ecological benefit. On the basis of the total 61ha proposed area of the overall site and its shallowest elevation of c.25m on its western boundary and 12m OD in the southern part of the operational quarry, there will be a final void volume of c.28,000,000 m3. Based on the rainfall runoff contribution data (Table 8.4 and text following), c.3,000,000 m3/yr of rainfall runoff will accumulate on the floor (350 mm/yr recharges to groundwater through the floor). It is estimated that it will take at c.10 - 15 years for the void to fill with water after the cessation

of works at the quarry. It is likely to take a little longer, given uncertainties and some lateral movement through the walls of the void's epikarst. It is therefore predicted that the void will be a lake type habitat by 2065, considering that this is a 25-year application for consent and that means that it will be at least 2050 by the end of works. The elevation of the epikarst zone in the south eastern boundary of the operational quarry site will control the maximum final site water level and this is 47m OD. Natural ground level across the eastern boundary of the site is c.53m OD and the epikarst zone is 6m below ground level. There is adequate freeboard between the flooded water level and the elevation of the lands and berms on the eastern boundary. The safety mitigation measure is that there is an access track from the quarry to the site's settlement lagoons. The track leads from the south eastern boundary of the rock void excavation to the primary sump at the settlement lagoons that receive pumped discharge from the 2nd Bench's sump. This track can transform to a gravity overflow mechanism for the flooded quarry and overspill waters, should they occur in storm situations, will travel through the settlement lagoons and out to the usual discharge mechanism of the Dunbell Little stream (EPA Nore_190). The discharge mechanism has adequate treatment function and volumetric capacity for the maximum pumped discharges and therefore it is justified that they will be able to accommodate any occasional gravity overflows. Consequently, post-closure flooding poses no risk to third-party lands or to receiving waters.

Residual Impacts

8.347 Residual Impacts, following Mitigation Measures, are also presented in Table 8.16.

8.348 There are no anticipated residual impacts on the hydrological or hydrogeological environment as a result of the proposed quarry extension and the site's standard mitigation measures. The mass of solid bedrock, beneath the epikarst layer of more weathered rock at the subsoil bedrock interface, has little porosity and this has been proven by field measurement in the course of this work. No groundwater will be encountered at the site because the conduits are not there in the zone between ground level and the 25m OD permitted and proposed. The site has been dealing with its water allotment for years and it has easily been managed and no impacts have been detected in the receiving groundwater or surface water environments.

8.349 Following the implementation of the mitigation measures proposed, residual impacts on the hydrological and hydrogeological environment during all phases are assessed to be unlikely and imperceptible.

Table 8.16 Summary of Mitigation Measures & Residual Effects

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
Construction Phase	Stripping of Overburden.	Soils & Subsoils. Surface Waters.	Excavation and stockpiling of soil and subsoil creates potential for loss of particulates in the stockpiling of soils and subsoils. Silt in runoff has potential to affect the quality of the discharge and degrade water quality	There will be no net loss of soils and subsoils as they will be retained on site and reused in landscaping berms. Therefore, there is no loss of resource. Movement of soils and subsoils to boundary berms is part of site mitigation for visual impact, noise, safety. The slope on berms shall be minimised to reduce degradation of subsoil structure and generation of dust. Handling and placement of soils/subsoils shall only take place during appropriate weather conditions and when the soils are in optimum condition (moist but friable). Soils shall not be moved when they are too dry or during unusually windy conditions. Silt fences shall be utilised to prevent loss of sediment across the site boundary. Working contours shall be such that there are no direct pathways for suspended solids to leave the site via uncontrolled runoff. Sprinklers and road sweepers shall be used to suppress dust.	Imperceptible	Unlikely
	Removal of Woodland	Soils & Subsoils. Surface Waters.	Removal of subsoil with roots creates potential for Suspended Solids mobilisation. Silt in runoff has potential to affect the quality of the discharge and degrade water quality.	Tree Felling, stripping and excavating the roots of the trees shall only take place during appropriate weather conditions and when the soils are in optimum condition (moist but friable). Soils shall not be moved when they are too dry or during unusually windy conditions. Silt fences shall be utilised to prevent loss of sediment across the site boundary. Working contours shall be such that there are no direct pathways for suspended solids to leave the site via uncontrolled runoff. Sprinklers and road sweepers shall be used to suppress dust.		

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
	Demolition of Farmyard and associated buildings and underground structures.	Soils & Subsoils. Surface Waters. GWB, Bedrock Aquifer, Groundwaters.	Removal of silage from yards has potential to mobilise high nutrient and potentially contaminating liquids. Demolition of feeding silos has the potential to mobilise nutrients and potentially contaminate surface water runoff. Removal of the underground slurry tank, and the concrete floor slats over the tank, has the potential to release and mobilise slurry, which is a contaminating substance. Hydrocarbon or oil residues on the yard have the potential to contaminate waters when the yard is being cleaned. Demolished corrugated metal, reinforcing steel and concrete has the potential to be a nuisance.	Works shall only take place during appropriate weather conditions. Silage shall not be moved during unusually wet conditions. The farmer will take all materials and equipment of his and move to other yards on the farm. The farmer will empty all slurry from the underground tanks of the slatted shed and the slurry will be spread according to the controls specified in the Good Agricultural Practice Regulations 2022 (S.I. 113 2022) and the requirements of the Low Emission Slurry Spreading (LESS) regulations, if applicable to the stocking rate of the farm. Upon complete yard clearance all silage, machinery and other items, the yard will be inspected evidence of hydrocarbon stains or residues of oils and these will be treated appropriately and safely with suitable absorbent and cleaning products. Following this, the yards will be power washed before demolishing any buildings. Farmyard drainage will allow for the collection of all power washing water from the yards and silage storage areas into the underground tanks of the yard. All wash waters arising from power washing the yards will be spread using constraints and regulation criteria of the Good Agricultural Practice Regulations 2022 (S.I. 113 2022) for dirty water and slurry. A 'Demolition Waste Management Plan (DWMP)' has been prepared for the removal and demolition of the existing farmyard. The DWMP is submitted with the application and the detail within it outlines the strategy for demolition and managing demolition-related waste in accordance with the Waste Management Act 1996 (as amended) and all associated regulations.		

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
Operational Phase	Use of quarrying machinery and equipment – spillages during refuelling, use and storage of lubricants	Surface Waters & Groundwaters.	Contamination of surface waters and groundwaters with hydrocarbons	Potentially contaminating substances will be stored in a designated area that is isolated from potential receptors. There are no drainage ditches or surface waters at the greenfield application area or operational quarry. Hazardous wastes such as waste oil will be stored in designated, sealed containers. All waste containers and fuel tanks shall be stored within a secondary containment system (e.g., a bund for static tanks or a drip tray for mobile stores and drums). The bunds will be capable of storing 110% of tank capacity, plus a minimum 30 mm rainwater allowance where the bund is uncovered. Where more than one tank is stored, the bund must be capable of holding 110% of the largest tank or 25% above the aggregate capacity. Drip trays used for drum storage must be capable of holding at least 25% of the drum capacity. Regular monitoring of water levels within drip trays and bunds due to rainfall will be undertaken to ensure sufficient capacity is maintained at all times. Refuelling shall be by mobile bunded bowser at a designated area, i.e., site compound, or where possible off-site. An adequate supply of spill kits and hydrocarbon absorbent packs shall be stored in works area. An oil interceptor forms part of the system the settlement lagoon system and removes hydrocarbons that may be present in the water.	Imperceptible	Unlikely
	Blasting of bedrock.	Surface Water, Groundwater.	Deterioration in surface water and groundwater quality	Bedrock blasting at all sites is Gardai licenced, supervised and controlled. Installation of, and detonation of, explosives can only be completed by Industry specialists. In the EIAR, a sequence of calculations were presented to estimate the residuals of all nitrogen species (Nitrate, Ammonia, Nitrite) in all site waters after blasting. The results of the calculations show that the simulated resultant concentrations all N Species are microscopically very low and satisfy the relevant Environmental Quality Standards (EQSs) of the Surface Water Regulations and Groundwater Regulations by at least an order of magnitude. It is surmised that the risk of impact to the environment and water quality is imperceptible.	Imperceptible	Unlikely
	Extraction of bedrock.	Bedrock Aquifer.	Permanent removal of bedrock for society's use.	There is no measure to mitigate against loss of bedrock. The amount to be extracted is considered small in terms of the overall limestone bedrock resource available in the County and nationally. The Ballyadams Formation limestone that is being abstracted is reported by the GSI 400 – 700m thick and by Tedd (2011) as at least 200m thick. The Kilkenny GWPSR (2002) reports that the average thickness is 200m, and the unit is widespread across the northern half of Kilkenny, where it overlies both the Durrow and the Butlersgrove Formations. The proposed extraction of bedrock over the relatively small lateral extension area and a relatively small depth compared to the reported average 200m thick, and 400 – 700m depth, limestone is inconsequential in terms of the regional resource of bedrock remaining in situ.	Imperceptible	Unlikely

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
Operational Phase	Movement of aggregate stockpiles.	Surface waters.	Mobilisation and migration of suspended solids Elevated Suspended Solids in the discharge resulting in sediment deposition in river channels disrupting sensitive riverine habitats.	There are sumps on the quarry floor that act as intermediary settlement lagoons for waters that runoff the aggregates. There is an efficient final settlement lagoon system that is demonstrated to be efficient. The final discharge is monitored monthly and samples analysed in an accredited laboratory for a range of hydrochemical parameters, including Suspended Solids. The EPA Extractive Industry Guidelines (2006) recommend a Suspended Solids ELV concentration of 35 mg/l SS. The quarry's Section 4 in Licence ENV/W/78 ELV is 10 mg/l SS and on most occasions the discharge's SS is <LOD. The established water management systems are fit for purpose to serve the proposed greenfield application area because the quarry already receives, attenuates, manages and discharges the greenfield area's rainfall runoff, epikarst discharges and subterranean groundwater seeps.	Imperceptible	Unlikely
	Use of quarrying machinery: spillages when refuelling, lubricant use and storage.	Surface waters & Groundwater.	Contamination of surface waters and groundwaters with hydrocarbons	The same Mitigation Measure applies to the use of Quarrying Machinery, Spillages, refuelling, use of Lubricants as was presented, above, for the Construction Phase. The same control and mitigation measures will apply to all site activities: enabling, operational and restoration.	Imperceptible	Unlikely
	Quarry dewatering, lowering groundwater levels, 'Stream Depletion'.	Groundwater & associated surface water.	Reduction in third party well yields. Reduction in baseflow to river. Reduction in quantity of groundwater in the GWB.	The quarry has already excavated a portion of the overall application site to the proposed 25m OD elevation of the newly proposed westerly extension area and there have been no groundwater strikes other than those accounted for in the Conditions of the Licence and the Conditions of PL18/858. The Impact Assessment for the western greenfield area's extraction has already been approved in PL18/858 for the 2 bench scenario. There are no 3rd Party operational, in use, wells within radius of the proposed greenfield application area that are not already included in the Groundwater Monitoring Programme of the PL18/858 permission. The evaluation of, and action on, the Groundwater Monitoring Programme is the Mitigation Measure. The works completed for this application included consultation with Uisce Eireann and a determination that PWS water mains serves all roads surrounding the quarry, to the North, South, East and West. The quarry's own water supply well is within the application area and it has never failed to supply the required c.350 m3/d each working day. Impact Assessments presented in the Impact section of this EIAR demonstrated that the quarry's 'abstraction' (discharge) resulted in the potential to take 0.5 to 2% of the River Nore's baseflow for the range of naturalised flow characteristics outlined by Quinn & Quinlan (2018) and EPA (2025a) for Streamflow Depletion acceptability. The EPA suggested ranges are 15% for NATQ95 to 30% for flows >NATQ60. In all cases, simulation for the effects of the quarry's 'abstraction' (discharge) suggest acceptable abstraction impact: for the NATQ95 flow characteristic in the River Nore immediately upgradient of the quarry, the resultant % change is 2%, which is significantly lower than the suggested acceptable 15% of EPA (2025a). With respect to the potential for the waters arising at the quarry to impact the Quantitative Status of the Kilkenny GWB, simulations suggest that the quarry intercepts 11% of the groundwater flowing through the GWB. On a cumulative basis, all Registered Abstractions including the quarry, account for 14% of the likely groundwater flow through the GWB. The WFD Working Group (2004b) assign 'Moderate Potential for Impact' for a <10 to 20% result in Low Storage groundwater systems, which is what the Kilkenny GWB is. 'Moderate Potential for Impact'	Imperceptible	Unlikely

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
				is deemed acceptable in the context of the facts that the quarry sits at the most downgradient, south easterly, location within the Kilkenny GWB and the waters arising at the quarry would very soon be in the River Nore in any case. The outer, upgradient, boundaries of the Kilkenny GWB extend to c.13km from the quarry in a northerly and northeasterly direction. The quarry is very close to the ultimate discharge mechanism for the Kilkenny GWB, which is the River Nore. Groundwater intercepted and managed at the quarry is sent to the Nore and there is no net loss to the overall hydrogeological system. Overall, there is no risk presented to the GWB by the quarry's proposal to continue and extend.		
	Quarry dewatering, lowering groundwater levels, 'Stream Depletion'.	Public Water Supply Sources.	Reduction in PWS well yields. Reduction in baseflow to river. Reduction in quantity of groundwater in the GWB.	The quarry is outside all mapped Source Protection Areas and Zones of Contribution. The quarry is in a different GWB to Bennettsbridge PWS and Thomastown PWS. An EPA (2025a) guided quantitative impact assessment has been completed for the % impact of the quarry's abstraction/discharge on the flow of water in the River Nore. The quarry's % impact is an order of magnitude lower than all maximum permitted % impacts as per published in Quinn & Quinlan (2018) and EPA (2025a). A quantitative assessment has been completed for the % of the quarry's discharge to affect the volume of groundwater in the Kilkenny GWB. The result suggests that the quarry's waters account for 11% of the groundwater in the GWB and it was concluded that there is no risk presented to the GWB by the quarry's proposal to continue and extend – details presented above.	Imperceptible	Unlikely
	Use of settlement lagoons	Surface Waters.	Removal and entrapment of particulate matter entrained in waters leaving site.	The site's Settlement Lagoons are in use and have the benefit of prior planning. The Mitigation Measure is in place: discharge waters pass through a sequence of sumps on the floors of the quarry and are pumped to the existing settlement ponds, which are maintained in good condition. Monthly monitoring results from an accredited laboratory prove that lagoons are fit for purpose and efficient. These serve to clarify pumped quarry waters prior to them leaving site. The Conditions of the site's Section 4 Licence specify monitoring of the discharge and this is a Mitigation Measure already in place. AERS are returned each year and the results from the water management system is monitored internally on a daily and monthly basis. The quarry floor, sump and settlement lagoon system have sufficient volumetric capacity to accommodate all waters for the required residence time. Discharge will be of a quality that will not have a detrimental impact on surface water quality in terms of suspended solids.	Imperceptible	Unlikely
	Cleaning of settlement lagoons	Surface Waters.	Improves efficiency of settlement lagoons, attenuation Mobilisation and migration of suspended solids	Particulate matter captured in settlement ponds is managed sustainably. A Report is presented in Appendix 8.2, Section 4, detailing the scale and capacity of the Settlement Lagoons and the and evaluation techniques used to assess their condition. A Report is presented in Appendix 8.2, Section 5, detailing the procedures and SOP for cleaning out the Settlement Lagoons. The Primary Pond is the only Pond that should need cleaning because it would retain any solids that were not captured on the floor and in its sumps.	Imperceptible	Unlikely

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
	Use of wheelwash	Surface waters.	Removal and entrapment of particulate matter attached to vehicles	A wheel wash facility exists near the site offices and the roads have sprinkler systems. Regular monitoring and maintenance of the wheel wash's tank and silt traps is undertaken in accordance with the manufacturer's specifications.	Imperceptible	Unlikely
	Wheelwash maintenance	Surface waters.	Improves wheelwash efficiency and reduces mobilisation and migration of suspended solids	The wheelwash is maintained in accordance with manufacturer's specifications.	Imperceptible	Unlikely
	Use of hydrocarbon interceptors	Surface waters & Groundwater	Entrapment of hydrocarbons lost during refuelling/discharge	The site's infrastructure is already in place to manage solids and interception of oils in the interceptor between Pond 1 and 2 of the settlement lagoon system prior to discharge.	Imperceptible	Unlikely
	Monitoring	Surface waters & Groundwater.	Monitoring of discharge rates, suspended solids, discharge water quality, receiving surface water quality, groundwater quality	The Conditions of the existing Section 4 Licence prescribe monitoring. There is no Mitigation needed. The action is Positive.	Imperceptible	Unlikely
Operational Phase	Pumped discharge of quarry waters	Surface waters.	Deterioration in surface water quality. Change in River Hydromorphology. Increased Flood Risk to downstream receptors.	With respect to the potential for deterioration in surface water quality, the Conditions of the existing Section 4 Licence specify ELVs that have been demonstrated to ensure compliance with the EQOs of the Surface Water Regulations. The water management systems are proven to work: the AERs provided in Appendix 8.3, Section 7, demonstrate this. Analysis of EPA Monitoring data, Appendix 8.7, Sections 2 and 3, allow demonstration that the quality of the Nore is not negatively impacted by the discharge. The site's own monitoring of River Nore, at locations upstream and downstream of the site's discharge, suggest the same hydrochemical quality in the river. The site's discharge does not change the hydrochemical signal of the Nore because it is accepted in the hydrological and hydrogeological community that the Nore has a strong baseflow signature from groundwater from a limestone bedrock environment. With respect to the potential for change in river Hydromorphology, a large range of flows is readily accommodated, naturally, in the River Nore. In this study, application of the EPA (2025a) impact assessment methodology for abstraction potential to affect baseflow (Hydromorphology) of a river, demonstrated that at times of low flow, the potential change in flow resulting from the quarry's 'abstraction' (discharge) was 1.9% and at times of the highest discharge from the quarry (January and December), the potential change in flow was	Imperceptible	Unlikely

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
				1.4%. These calculated % changes in flow are well within the permitted maximum changes of 15 to 30%. The ELV for volume in the ENV/W/78 Licence for the site is the mitigation measure here. The void on the floor of the quarry is large enough to accommodate and holdback all extreme rainfall events until the storms have passed in the downstream systems.		
	Discharge from the Settlement Lagoons.	M9 Motorway.	Flooding of the adjoining M9.	The M9 drainage regime is an independent drainage regime and shall not be impacted nor affected by the proposed development. The channel that conveys the site's discharge from the site is lower in elevation than the R700 local road that connects Kilkenny to New Ross. The M9 is built over the R700. The bridge of the M9 over the R700 provides headroom for articulated trucks. The site's discharge does not have any physical means to rise to a height of > than the height of an articulated truck. The site's discharge is independent of the Motorway and its drainage systems.	Imperceptible	Unlikely
	Use of Office Toilet Facilities, On-Site WWT Plant & Discharge Zone	Groundwater.	Discharge of treated wastewater to groundwater (nutrient and bacteriological).	The site's wastewater infrastructure is compliant with EPA (2021). This is the nationally accepted mitigation measure to prevent contamination. No increase in staff numbers is proposed. The site's staff contingent will service the proposed extension area because no further extraction of the operational quarry's bedrock is proposed in this application, only that rock permitted in PL18/858 will be extracted from the floor of the operational site. A Baseline survey of the quality of groundwater at 6 local area wells was completed in 2024 in advance of the EIAR for this application. Local groundwater to the immediate east of the site's percolation area is good quality and that is evidence that the system is functioning correctly. Groundwater flow is from the quarry to the east. The site's wastewater infrastructure is inspected each year by Anua and the reports are presented in the Site Wastewater Services Appendix 8.4. In that same Appendix, a detailed assessment (Hydro-G, 2021) of the infrastructure completed for the FI Stage of PL20/891 during the consent process for the new site offices built after the consent of PL18/858.	Imperceptible	Unlikely
	Use of crushing plant at operational site to work materials from the planning application area	Surface Waters & Groundwater.	Contamination of Surface Waters and groundwaters with small particles of rock and dust.	Dust and small rock particles can present significant Adverse impact potential for water arising on the floor of a quarry. However, as previously stated, the site's floor sumps and settlement lagoons are appropriately sized, operated and managed, so as to ensure no elevated suspended solids concentrations in the site's discharge. Monthly monitoring, reported in each AER (Appendix 8.3, Section 7) demonstrates that there is adequate mitigation in place.	Imperceptible	Unlikely
Restoration Phase	Removal of semi-mobile and mobile plant (pumps, generators, etc.)	Surface waters & Groundwater.	Elimination of hydrocarbon sources	Positive impact. No mitigation required.	Imperceptible	Unlikely

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	**Attribute**	**Character of the Potential Impact**	**Description of Mitigation**	**Significance or Quality of the Effect**	**Probability of Effect Post Mitigation**
	Dismantling and removal of fixed plant & machinery (crushing plant, wheelwash, etc.)	Surface waters & Groundwater.	Elimination of hydrocarbon and dust sources	Positive impact. No mitigation required.	Imperceptible	Unlikely
	Landscaping and movement of infrastructure and overburden stockpiles necessary to facilitate site restoration	Surface waters & Groundwater.	Mobilisation and migration of suspended solids Sediment deposition in channels disrupting sensitive riverine habitats.	Site restoration will take place on a phased basis as extraction is completed in defined areas of the site. In the final restoration of boundaries with adjoining lands levels will be graded to harmonise with the surrounding landscape. Perimeter silt fence to be installed at the toe of any overburden stockpiles. Restored areas to be vegetated to enhance stability.	Imperceptible	Unlikely
	Cessation of pumping	Surface waters & Groundwater.	Recovery of groundwater levels. Risk of Flooding. Risk of contamination to surface waters.	Post-completion groundwater levels will return to current baseline levels, thereby partially filling any voids. These voids may be left as open waterbodies for recreational or ecological benefits. The void can be left as open as a habitat and rainfall attenuation system with ecological benefit. On the basis of the total 61ha proposed area of the overall site and its shallowest elevation of c.25m on its western boundary and 12m OD in the southern part of the operational quarry, there will be a final void volume of c.28,000,000 m3. Based on the rainfall runoff contribution data (Table 8.4 and text following), c.3,000,000 m3/yr of rainfall runoff will accumulate on the floor (350 mm/yr recharges to groundwater through the floor). It is estimated that it will take at c.10 - 15 years for the void to fill with water after the cessation of works at the quarry. It is likely to take a little longer, given uncertainties and some lateral movement through the walls of the void's epikarst. It is therefore predicted that the void will be a lake type habitat by 2065, considering that this is a 25 year application for consent and that means that it will be at least 2050 by the end of works. The elevation of the epikarst zone in the south eastern boundary of the operational quarry site will control the maximum final site water level and this is 47m OD. Natural ground level across the eastern boundary of the site are c.53m OD and the epikarst zone is 6m below ground level. There is adequate freeboard between the flooded water level and the elevation of the lands and berms on the eastern boundary. The safety mitigation measure is that there is an access track from the quarry to the site's settlement lagoons. The track leads from the south eastern boundary of the rock void excavation to the primary sump at the settlement lagoons that receive pumped discharge from the 2nd Bench's sump. This track can transform to a gravity overflow mechanism for the flooded quarry and overspill waters, should they occur in storm situations, will travel through the settlement lagoons and out to the usual discharge mechanism of the Dunbell Little stream (EPA Nore_190). The discharge mechanism has adequate treatment function and volumetric capacity for the maximum pumped discharges and therefore it is justified that they will be able to accommodate any occasional gravity overflows.	Imperceptible	Unlikely

PHASES	POTENTIAL IMPACT			MITIGATION MEASURES	RESIDUAL EFFECT FOLLOWING MITIGATION	
	Activity	Attribute	Character of the Potential Impact	Description of Mitigation	Significance or Quality of the Effect	Probability of Effect Post Mitigation
Unplanned Events	Major Spillage	Surface waters & Groundwater.	Hydrocarbon contamination	As specified above, Spill Kits are SOP and all Refueling Vehicles will carry those Spill Kits. bunded tanks, drip trays, appropriate containers in appropriate locations will be ensured.	Imperceptible	Unlikely
	Intense Rainfall Events	Surface waters & Groundwater.	On-site flooding. Off-site flooding.	The floor of the quarry is large and this is the mitigation measure. In the operational phase of the quarry, the pumps in the sump can be shut off it there is a threat of flooding, caused by storm events, in the wider environment. In the post closure phase when the final water level is at 47m OD, there is adequate freeboard between the flooded water level and the elevation of the lands and berms on the eastern boundary. The safety mitigation measure is that there is an access track from the quarry to the site's settlement lagoons. The track leads from the south eastern boundary of the rock void excavation to the primary sump at the settlement lagoons that receive pumped discharge from the 2nd Bench's sump. This track can transform to a gravity overflow mechanism for the flooded quarry and overspill waters, should they occur in storm situations, will travel through the settlement lagoons and out to the usual discharge mechanism of the Dunbell Little stream (EPA Nore_190). The discharge mechanism has adequate treatment function and volumetric capacity for the maximum pumped discharges and therefore it is justified that they will be able to accommodate any occasional gravity overflows. With respect to the site's discharge, the site has discharged with no flooding responses for the last 8 years within the Section 4 Licence permitted range of 22,000 m^3/d to 70,000 m3/d. These volumes are associated with pumping from the floor. There has been no flooding. Gravity overflow will be significantly less volumes. No flooding will occur then either. Regular monitoring and maintenance of the mitigation systems will be conducted to ensure their continued effectiveness. Compliance with relevant environmental regulations and standards will be maintained throughout the operational and post closure phases.	Imperceptible	Unlikely

Cumulative Effects / Synergistic Effects

8.350 The cumulative impact assessment considered proposed and permitted activities within the Nore catchment and Hydrometric Area (HA15). Discretion has been used to select those activities most likely to have an in-combination effect with the application site.

8.351 The application area forms part of an overall working quarry where processing, manufacturing plant and associated ancillary facilities are located along with extraction areas. The application site is self-contained, and both discharge and groundwater monitoring programmes are already in place to quantify the hydrogeological regime within the site and in the surrounding environs.

8.352 A search of Kilkenny County Council's and An Bord Pleanála's online planning search facilities indicates that there are no other planned developments in the vicinity of the application site that have the potential to have any significant cumulative effects with the proposed development.

8.353 Whilst there is a live planning application with Kilkenny County Council (PL25/60187) for dairy farm infrastructure at the adjacent farm to the west, there is no potential for cumulative impact because the two adjacent developments are different in the nature of their potential impact. Whilst EPA (2024a) cites nutrients as an 'Issue' and agriculture as a 'Pressure' in the catchment, the quarry has demonstrated that it does not add to the nutrient concentrations in waters that arrive at and are discharged under licence.

8.354 As stated in the Introductory Sections of this Chapter, there are two other quarries in the area: Hennessy and Roadstone (Maddockstown). There is no potential for water related cumulative impacts arising from an in combination effect for the three quarries for reasons, as follows:

- The Hennessey Quarry abstracts from the Stoneyford Gravels and not the Kilkenny GWB's bedrock that underlies Bennettsbridge Limestone Quarry.
- Roadstone (Maddockstown) Quarry is managed within the Conditions of an IPC Licence PO521-03. This quarry is on the east side of the River Nore and is therefore hydrologically separated from Bennettsbridge Limestone Quarry, which is on the west side of the Nore. The Roadstone Quarry operates in a different sub catchment, different sub basin, and extracts a different type of limestone bedrock (Butlersgrove Formation) relative to Bennettsbridge Limestone Quarry's Ballyadams Formation.
- There is a mapped slip fault between Bennettsbridge Limestone Quarry and the other two quarries: that fault would act as a physical barrier.

8.355 With reference to the EPA (December 2024) Register of Abstractions there are other >25m^3/d groundwater abstractions in the Kilkenny GWB. Quantitative Impact Assessment has been completed for the total volume of water intercepted at Bennettsbridge Limestone in 2024 (a known volume) and the maximum limits of the other registered abstractions, which includes the Hennessey and Roadstone quarries. The calculated resultant Cumulative Impact Potential is 15%. That value is in the **'Moderate Potential for Impact' classification rating of the** WFD Working Group Guidance GW5 (2004b). This is deemed an acceptable Impact Potential rating because the three quarries account for the largest 'abstraction', waters arising interception values, but all three quarries recharge those same volumes back to the surface water system. Most of the water abstracted from the Kilkenny GWB causes no loss to the adjacent and associated River Nore.

8.356 There is no potential for cumulative or synergistic effects with PWS or GWS sources because the quarry is in a different GWB and/or outside all mapped Zones of Contribution and Source Protection Areas for all PWS and GWS sources.

Transboundary Impacts

8.357 EIA Directive 2014-52-EU invokes the Espoo Convention on Environmental Impact Assessment in a Transboundary Context (1991) and applies its definition of transboundary impacts.

8.358 Given the location of the site at c.170 km, approximately, at its closest position to the border with Northern Ireland to the north of the site, the nature, size and scale of the proposed development, and the fact that water from the catchment flows in a southerly direction towards estuarine discharge in the vicinity of Inistioge for discharge to the south of New Ross and Waterford, it is expected that the development will not have any significant transboundary effects with respect to water bodies.

8.359 Waterford Harbour receives the River Nore. Given that the quarry's discharge to the River Nore does not change the quality of the river's water, there can be no impact on the Celtic Sea that receives water from Waterford Harbour. Therefore, no transboundary effects *via* the ocean are envisaged.

Do Nothing Scenario

8.360 This item requires consideration of the effect on the environment as it would be in the future should the proposed works not be carried out.

8.361 If the development did not proceed,

(a) the operational quarry portion of the proposed development would remain an operational quarry floor working through the permission for the 3rd Bench and the 2 Benches of the portion of the greenfields that were sanctioned in PL18/858 . The existing quarry void is in the eastern half of the overall 2025 area for planning application, and

(b) the grasslands immediately west of the working quarry would remain as grasslands.

8.362 In this work, the greenfield site has been assessed as having no evidence of groundwater conduits carrying groundwater. The waters arising from the greenfield application area already ingress to the working quarry and are primarily driven by rainfall and shallow interflow through the epikarst subsoil bedrock interface.

8.363 Interception of waters and discharge of same from the site will not significantly change the groundwater dynamics component of the site in its current condition because there is no significant net loss of water arising from the operation of the site but there would eventually be a lake if the Do Nothing Scenario were adopted.

8.364 Under the 'Do-Nothing' scenario the site will operate subject to the Conditions of PL 18/858.

8.365 When planning consents at the site expire, the restoration phase would involve the removal of all infrastructure and the restoration of the site to a secure wildlife refuge wetland and pond area. The natural progression to lake or water feature would take place over the course of c.10 -15 years, on the basis of the size of the void and the effective rainfall component (minus groundwater recharge). This would result in an attendant increase in the biodiversity interest and amenity of the site and environs.

8.366 If the proposed development did not proceed, the aggregate resource would remain unused *in situ*, and the local supply of quality aggregates and concrete products would be more restricted, the availability of materials for road maintenance would be constrained until another company filled the need. There would be increased traffic and increased cost of materials at the alternative site, due to the nuances of the market and material's availability.

8.367 If the proposed development did not proceed, there would be an increase in heavy goods vehicles from a wider extent in the county and from a different hub.

8.368 It is expected that the site would not undergo any changes in terms of surface and groundwater under a 'do-nothing' scenario, and that the interception and discharge from the site will not significantly change the groundwater dynamics component of the site.

8.369 The nature of the void and on-site water management lagoon system provides significant attenuation capacity, which has a positive effect of reducing flood risk when compared with the pre-development regime. The proposed activities include restoration of the site following completion of targeted bedrock extraction.

8.370 Quarrying in the local area is established and has been integrated into the local environment. It is therefore considered more appropriate to continue activities at the current application site, as opposed to opening a new quarry on a greenfield site to meet the demands of the construction industry.

8.371 The demand for rock resources continues to be driven by the ongoing need for housing, roads, shopping centres, data centres and industrial parks. The 'Do-Nothing' scenario would create a temporary supply shortfall in the construction market, which would eventually restore itself, but likely at a higher cost to the consumer.

8.372 With respect to this water assessment, and water dependent habitats and species, given that the quarry has been in operation for many decades and there is no observable environmental or ecological effect there is no reason to enter the Do Nothing Scenario.

Monitoring Measures

8.373 Bennettsbridge Limestone operates an Environmental Management System based on the Quarry Guidelines (2004), EPA Guidelines (2006), its Section 4 Licence (ENV/W/78, 2017) and specific requirements the site's PL18/858 permission. Quarry management have comprehensive Standard Operation Procedures in place for all components of its activities at the site.

8.374 With respect to groundwater monitoring at the site,

- There is routine monitoring of Groundwater Levels, at the site and in the wider area, and that will continue.
- The hydrochemical quality of groundwater is controlled by virtue of the ELV Conditions of the Section 4 Discharge Licence because the Licence's Scope is for the integrated rainwater and groundwater arising at the site.

8.375 The 7 new BHs drilled in the greenfield site in 2024 are not suitable locations for groundwater quality monitoring because there was no groundwater flow system encountered to the target base elevations at which the wells terminated: only small seeps were encountered. Therefore, no Future Groundwater Quality Monitoring can be proposed additional to that which is already taking place at the site: The Quarry Well and the Discharge.

8.376 With respect to discharge monitoring, the Conditions of the Section 4 Licence for the site (ENV/W/78, 2017) specify monitoring and this is completed: Daily Discharge is quantified and water samples are collected and analysed by a contracted accredited laboratory.

8.377 Monitoring measures will continue as usual and they verify whether the development is impacting on the hydrological and/or hydrogeological environment, and that the mitigation measures are effective.

8.378 The site's Standard Operation Management Plan addresses all potentially polluting activities and includes an emergency response procedure.

8.379 All personnel working on the site are trained in the implementation of procedures. As a minimum, training and operations are formulated in consideration of the standard best international practice including but not limited to:

- EPA (2006) Environmental Management Guidelines for the Extractive Industry (Non-Scheduled Minerals).
- CIRIA, 2011. Control of Water Pollution from Construction Sites, Guidance for Consultants
- CIRIA, 2005. Environmental Good Practice on Site (C650).
- EI, 2005. Oil Storage Guidelines (BPGCS005).
- Environment Agency, 2004. UK Pollution Prevention Guidelines (PPG).

8.380 Hydrocarbon and silt interceptors are serviced and maintained on a regular basis by an independent licensed contractor.

8.381 Regular inspections of the site infrastructure (settlement ponds, hardstanding, drainage infrastructure, on site WWTP and discharge zone, etc.) are undertaken by a designated person.

8.382 Both the Quarry Manager and the site's Environmental Manger understand that it is part of their work and overall responsibility to ensure that all operations are carried out in such a way as to minimise potential impacts on water receptors. The quarry manager is in constant communication, and works in the same office, as the operative monitoring the performances of pollution control measures adopted to ensure that the proposed development is not impacting on the environment.

Interaction with Other Measures

8.383 The EIAR guidelines (EPA, 2022) highlight that the interaction of impacts to the hydrological and hydrogeological environment arising from the proposed activities, with potential receptors identified in other EIAR chapters, must be given due consideration.

8.384 Biodiversity, Land, Soils and Geology and Water are the only components of the EIA that have any potential to be connected. Each of these EIA components and the mitigation measures that are proposed are addressed in detail in the relevant chapters of the EIAR. Considering the conclusions and residual impact assessment of the Water Chapter, there are no negative impacts to interact with each other.

Application of Dewatering Impact Appraisal Methodology (UK EA)

8.385 In addition to the usual impact assessment, description of likely impacts and mitigation measures presented above, Hydro-G presented a UK Environment Agency (Boak, R. et. al., 2007) 'best practice' approach to a hydrogeologically focussed assessment (refer to Appendix 8.10). As previously outlined, the UK EA's approach suggests a stepwise thought-process. Following on from the completed desk and field studies, Hydro-G answers to each of the steps can be summarised as follows:

- ***Step 1:*** Establish the regional water resource status:

Groundwater is mapped as a Regionally Important Diffuse Karst Aquifer (Rkd), named the Kilkenny Groundwater Body, assigned EPA WFD Good Status (EPA 2016 - 2021) & 3rd Cycle At Risk.

Surface Waters: The site is licenced to discharge waters arising to the River Nore. This is a direct hydrological link between the site and a Conservation Objective and Salmonid surface waters.

- ***Step 2:*** Develop a conceptual model for the abstraction and the surrounding area:

  Answer =

  Recharge to the greenfield application portion of this overall application site is rainfall driven with most contributions from the subsoil/bedrock transition zone ingresses of recent rainfall.

  No conduits were determined during borehole drilling in the proposed greenfield expansion of the extraction area: 7 SI BHs were drilling on the peripheries in 2024 and 60 Site Investigation boreholes drilled and reported by Apex (in the 2018a, 2018b).

  No groundwater transmission conduits are visible in the large expanses of exposed bedrock of the western wall of the operational void, which is the western wall of the greenfield application area.

  The operational quarry portion of the overall site proposes no further depth excavations other than that currently permitted for parts of the operational quarry in PL18/858.

  The proposed lateral extension to the west of the operating floor will be extracted down to a floor level of 25m to 30m OD and there are large expanses of walls in which those depths of bedrock is visible: the western wall of the operational quarry is the eastern wall of the greenfield application area.

  Groundwater flow direction is from west to east and therefore, the entire wall in which there could be groundwater is already visible.

  The conceptual model, based on drilling and hydraulic response testing, is that no groundwater will be encountered in the bedrock to the proposed 25m OD to 30mOD elevation.

  The field measured hydraulic conductivity (Ksat) of the bedrock beneath the proposed excavation area in the greenfields is 10^{-8} to 10^{-10} m/s (Envirologic, 2025: LSG Chapter Appendix). This is **very** low. The final statement of the Ksat report for the greenfield application area states that "In terms of practical water management at quarries bedrock hydraulic conductivity values of the order of 10^{-8} to 10^{-10} m/s can essentially be regarded as impermeable and groundwater inflows to the void are likely to be negligible."

  The GWB scale water balance suggests that the site accounts for 12% of the WFD mapped Groundwater Body's water balance. This is 'Moderate Potential For Impact' value. The Conceptual Model allows that Moderate Impact to be considered mitigated because the quarry does not cause a loss of that water from the River Nore, which would have been and remains the receiver of the groundwater in any case.

- ***Step 3:*** Identify all potential water features that are susceptible to flow impacts:

- Kilkenny GWB
- River Nore and River Barrow SAC and River Nore SPA.

- ***Step 4:*** Apportion the likely flow impacts to the water features.

  Answer = None,

  - No effects have been determined to date and the operational and permitted quarry is already receiving and managing water from the proposed greenfield application area.
  - Overriding value of significance is that the interception amount at the quarry represents 15% of the Kilkenny Groundwater Body's water balance but that water is not lost and is recharged to the River Nore.
  - Further, calculations suggest that the waters arising and managed at the site affect the River Nore's baseflow by 2% and its storm month flows by 1.4%. Both of those % affect values comply with the 15% to 30% maximum permitted rates, by an order of magnitude.
  - The conclusion of ongoing no flow impacts is supported by mathematics.

- ***Step 5:*** Allow for the mitigating effects of any discharges, to arrive at net flow impacts:

  Answer =

  Discharge of waters that are surplus to dust suppression and product generation requirements is discharged from the site under Licence from Kilkenny County Council.

  Monitoring data submitted to KCC in AERs demonstrates that the quality of the quarry's discharge is compliant with the Conditions of the Licence.

- ***Step 6:*** Assess the significance of the net flow impacts.

  Answer = Negligible significance. There is no net loss.

- ***Step 7:*** Define the search area for drawdown impacts.

  Answer = The groundwater flow mechanism is Diffuse Karst flow with extremely low measured hydraulic conductivity in the matrix of the bedrock boreholes. However, no conduits were determined during extensive site investigations. Drawdown, being a primary porosity bedrock media concept, **is not applicable to the greenfield application site and neither has the operation of the permitted quarry resulted in drawdowns when working to the same 25m OD elevation**.

- ***Step 8:*** Identify all features in the search area that could be impacted by drawdown.
  - Answer =

  Local wells have been identified and are included in the Monitoring Programme. Some local wells have been monitored since 1999. An extending drawdown radius concept does not apply to the site. Bedrock characteristics preclude porous medium extension of a

'cone of depression' and no interconnectedness in secondary porosity has been determined in either AWN's (AOS, 2015) drilling and pump test programme or Hydro-G's (2017 & 2018) drilling, geophysics and hydraulic response analyses or in Apex's (2000 to 2018) rock coring, drilling and geophysical explorations.

- ***Step 9:*** For all these features, predict the likely drawdown impacts.

  Answer = None predicted.

- ***Step 10:*** Allow for the effects of measures taken to mitigate the drawdown impacts.

  Answer = Not relevant.

- ***Step 11:*** Assess the significance of the net drawdown impacts.

  Answer = Not applicable

- ***Step 12:*** Assess the water quality impacts.

  Answer =

  - Calculations have been completed with respect to explosives residues and no water quality impact is predicted.
  - Kilkenny County Council licensed the discharge (ENV/W/78) and issued ELVs that would ensure no water quality impacts.
  - Groundwater monitoring demonstrates no change in groundwater concentrations after a considerable number of years quarrying and dewatering at the site.
  - Calculations have been completed with respect to explosives residues and no water quality impact is predicted.
  - Discharge monitoring demonstrates 100% compliance with Discharge Licence ELVs. These ELVs were specified by KCC in the 2017 reviewed licence so as to ensure that the River Nore SAC receiving water would retain compliance with the Surface Water Regulations 2009.
  - Monitoring of the River Nore demonstrates no water quality impact.

- ***Step 13:*** If necessary, redesign the mitigation measures to minimise the impacts.
  - Not necessary.
- ***Step 14:*** Develop a monitoring strategy.
  - Monthly sampling of discharge will continue and this incorporates groundwater monitoring. AERs will continue to be submitted to Kilkenny County Council.
  - The Groundwater Monitoring Programme of PL18/858 will continue.

Conservation Objective Site Protection Measures (NATURA 2000)

8.386 As previously introduced, the site is c.1km from the River Nore, which is mapped as an SAC and SPA Conservation Objective site: River Nore SPA (Site Code 004233) & River Barrow and River Nore SAC (Site Code 002162).

8.387 Conservation Objective sites were presented in detail in the Desk Study section of this EIAR in a section entitled Conservation Objective Sites. The sites are shown in Figure 8.2.

8.388 The River Nore has two site-specific Statutory Instruments associated:

- European Union Conservation Of Wild Birds (RIVER NORE SPECIAL PROTECTION AREA 004233) Regulations 2012 [S.I. No. 193 of 2012].
- European Union Habitats (RIVER BARROW AND RIVER NORE SPECIAL AREA OF CONSERVATION 002162) Regulations 2024 [S.I. No. 648 of 2024].

8.389 The River Nore is also a mapped Salmonid River under S.I. 293: European Communities (Quality of Salmonid Waters) Regulations 1988.

8.390 The detail of the EIAR demonstrated that there is no potential for Bennettsbridge Limestone Quarry to cause any negative impact on the CO sites to which it is directly connected to: the River Nore.

8.391 Further, there is no potential for Bennettsbridge Limestone Quarry to interact or impact the Thomastown Quarry SAC.

8.392 There is no potential for Bennettsbridge Limestone Quarry to affect the Pearl Mussel populations in the River Nore. The Upper Nore is mapped by DCHG (2020) as a catchment of SAC populations listed in The Pearl Mussel Regulations (S.I. 296 of 2009). The quarry is not part of the Upper Nore Catchment and therefore the quarry, or its discharge, do not have potential to affect the Upper Nore and its Pearl Mussel population. The Middle and Nore Lower are not listed in SI 296 of 2009. The Middle Nore mapped by DCHG (2020) as a catchment of other extant populations and the most succinct reasoning is provided by Wikipedia https://en.wikipedia.org/wiki/Nore_pearl_mussel (15/6/25) as follows:

> "The Nore mussel is often described as a rare ecophenotype of M. margaritifera. The European Union's Habitats Directive on the conservation of natural habitats and wild fauna placed Margaritifera durrovensis on Annex II and Annex V as a separate taxon.[2] The species is native to the Three Sisters - the rivers Barrow, Suir and Nore, the latter of which being the mussel's namesake. However, specimens have not been found outside of the River Nore since 1993. Unlike M. margaritifera, which can tolerate acidic conditions, the Nore pearl mussel requires highly calcareous waters, and generally inhabits sections of the River Nore which have CaCO3 concentrations of over 330 mg/L. The Nore pearl mussel also has a significantly shorter lifespan than M. margaritifera, typically living for 60 to 80 years."

PWS Protection Measures

8.393 EPA Envision mapping, as tabulated earlier in this report, presented Drinking Water Protection Areas and potential for Impact has been assessed.

8.394 Detail presented in Table 8.2 and Section 8.216 explain the rationale behind the outcome conclusion of no potential for impact with any PWS. Appendix 8.8 detail the communications with Uisce Eireann and the information supplied in which no Drinking Water Protection Areas and no PWS Sources are deemed to be connected to the site.

Water Framework Directive Compliance Assessment

8.395 A WFD Compliance Assessment is reported in full in a separate report accompanying this application and associated EIAR. Summary points are presented here.

8.396 With respect to the direct hydrological link from the quarry to the River Nore,

- The site's Section 4 Licence and the AERs (2018 – 2024) demonstrate no risk posed to the Good Status Objective of the River Nore. Although currently mapped as Moderate Status, the River Nore has a Q3-4 rating from significantly upstream of the site and upstream of Kilkenny. For the last reported Biological Quality Surveying reported, EPA (2025b) report that "*Eight sites from Threecastles Bridge (Station 1700) downstream dropped from Good to Moderate ecological condition, resulting in all sites surveyed along the channel downstream of this point recorded as unsatisfactory in 2022".* The Pressures on the Nore are not related to quarrying. Neither does the proposal, currently under consideration for the quarry, have potential to affect the Status or Risk to the Nore.

- A quantitative, numerical, water balance has been completed for the % change that might occur in the Nore as a result of the quarry's management of waters arising: No potential for impact is concluded because the % changes are 2% for the naturalised low flow (NATQ90), 0.9% for the median flow condition (>NAT60) and 1.4% change for the high flow month (January and December) conditions. EPA (2025a) cites maximum acceptable % changes, for this Type B1 river, ranging from 15% in low flow to 25% at NATQ6 to 30% at greater flows. The calculated % changes arising from the quarry's management of waters arising are an order of magnitude less than those deemed acceptable by the EPA in their assessment procedures related to the WFD's associated Abstraction Regulations legislation.

8.397 The underlying Kilkenny GWB is mapped by the EPA as Good Status (2016 – 2021) and 3rd Cycle mapped as 'At Risk'. With respect to an assessment of the potential of the proposed development to affect Groundwater Body Status and Risk,

- A quantitative, numerical, water balance has been completed for the underlying Kilkenny GWB [IE_SE_G_078] and reported in this work. The result is that the abstraction/licensed discharge of waters from the site accounts for 11% of the available groundwater resource volume. When the site's abstraction/discharge is considered in combination with all other EPA (2024) registered abstractions from the GWB the result is that 14% of the available groundwater resource volume is affected. Quantitative impact values of 10 - 20% are within the **'Moderate Potential for Impact'** category of the WFD (2004b) Working Group GW5 Guidance Document on Groundwater Abstractions. However, the Moderate Potential for Impact class is acceptable because the quarry is situated close to the River Nore and therefore, there is no loss to the GWB's ability to sustain the Nore's baseflow.

- A quantitative impact assessment on the potential impact of the use of explosives in blasting was completed. The resultant concentrations presented in the EIAR suggest full compliance with the suite of Nitrogen Species Environmental Quality Objectives of the Surface Water Regulations (2009, as amended) and the Groundwater Regulations (2010, as amended).

8.398 The quarry has operated through all 3 Cycles of the WFD and never has it been identified as a pressure or caused an issue. Quarries are not the published Issues or Pressures for this catchment: nutrients, agriculture and urban pressures are the reported Issues and Pressures (EPA, 2024a). The quarry poses no risk to the Objectives of the WFD.

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