



STRATEGIC ROAD MAINTENANCE FACILITY AT DRUMFIN



Planning Report

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An Roinn Iompair
Department of Transport



Sligo County Council
Comhairle Chontae Shligigh

Sligo.

Strategic Road Maintenance Facility at Drumfin

Planning Report

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1. EXECUTIVE SUMMARY

Sligo County Council (SCC) are seeking Part 8 planning approval to develop a Strategic Road Maintenance Facility, including Strategic Resilience Salt Barn facility, Maintenance/Operation Depot and Local Authority Municipal District Machinery Yard, with ancillary buildings and structures, to provide a range of national, regional and local road maintenance services. The regional reach will cover the whole northwest region, including counties Donegal, Sligo, Longford, Leitrim, Galway, Mayo and Roscommon.

The need for the development aligns with or supports various government policy including the National Adaptation Framework (NAF), National Investment Framework for Transport in Ireland (NIFTI), National Planning Framework (NPF) and the Government's Climate Action Plan 2023.

The proposed development site is approximately 3.1ha in size and is located within the townland of Drumfin in Co. Sligo, approximately 16km south of Sligo town and 6.0km northeast of Ballymote. It is strategically located adjacent to the N4 National Road which was recently re-aligned and upgraded to dual carriageway between Castlebaldwin and Collooney.

The Part 8 planning proposal for this proposed development includes information pertaining to the nature and extent of the proposed development, the design elements, the environmental elements and traffic for the site.

The Part 8 Planning Report provides information on the main infrastructural elements proposed on the site, including:

- 4 no. Strategic Salt Barns, with capacity of 30,000 tonnes of salt, for national reserves and Resilience Salt stocks.
- Two-storey Administration Building for Maintenance/Operation activities which includes internal storage area, welfare facilities, offices and canteen facilities on the ground floor, with offices and meeting/training room on the first floor.
- Maintenance & Operation Barn including lean-to vehicle storage and secure internal storage for maintenance and operation salt supplies.
- Single-storey workshop and staff welfare facility.
- Ancillary structures and associated works.

Other proposed facilities include an internal access road, weighbridge, bunded re-fuelling area, truck washdown area, underground storage tank for collection of brine/contaminated runoff from salt containment and truck washdown, road material storage areas and a staff/visitor carpark.

Environmental protection has been provided on the site to ensure that possible contaminants in the site runoff are intercepted at source and treated prior to discharge. These will include the use of flow control devices to limit runoff to existing greenfield runoff rates, class 1 bypass separators and forecourt separators. Salt-water will be managed through an independent sealed networks preventing contaminated runoff entering the surrounding ephemeral drainage networks.

Foul water, storm water, water supply, electricity and telecommunications are proposed to be provided to the siter in accordance with the relevant standards.

Environmental considerations have been assessed for the site. These assessments include an Appropriate Assessment (AA) Screening Report, Environmental Impact

Assessment (EIA) Screening Report, Flood Risk Assessment (FRA), Cultural Heritage Impact Assessment (CHIA) and Landscape Plan.

- The AA and EIA Screening Reports concludes that both AA and EIA were considered to have screened out. Sligo County Council, as Competent Authority, has determined that an EIA and AA are not required.
- The FRA concludes that the site is appropriate for the proposed development as per the OPW's "The Planning System and Flood Risk Management Guidelines for Planning Authorities.
- The CHIA concludes that there is one area of archaeological potential (AAP1) within the proposed development area and recommends that a programme of non-intrusive geophysical survey is carried out in AAP1. Furthermore, a programme of Construction Phase archaeological testing is recommended to be undertaken in AAP1 under licences issued by the National Monument Service, over a minimum of 10–12% of AAP1.
- The Landscape Plan for the proposed development will include the following: screen planting to screen the salt barns, depot building and lighting; hedgerow planting; woodland planting; low growing shrub planting; and low maintenance grass mix. It is proposed to retain existing hedgerows and trees insofar as reasonably practicable. Screen planting, Woodland planting and Hedgerow planting will be of native provenance.

Traffic impacts due to the proposed development were assessed through a Traffic Impact Assessment (TIA). Access to the site is proposed from the L3700 local road via a simple priority junction. Parking and EV charging facilities are proposed to be provided to the site. The TIA concluded that the development access as outlined in this report has sufficient capacity to accommodate both the proposed development and background traffic levels well into the future.

The report concludes that the proposed development will be designed in accordance with the current relevant standards and guidance documents as appropriate.

2. INTRODUCTION – PLANNING AND DEVELOPMENT

This document has been prepared in compliance with Part VIII of the Planning and Development Regulations 2001 to 2023

This report should be read in conjunction with the Part VIII Planning Drawings, which were also prepared in accordance with the above-named legislation.

The proposed development aligns with the Government's National Adaptation Framework (NAF), by facilitating reduced carbon footprint for road maintenance services through delivery, storage and security of salt supplies proximate to demand, thereby significantly reducing haulage distances to serve the north-western region. It will facilitate the roll out of consistent proactive network management for the entire north-western region and environs including counties Sligo, Leitrim, Longford, Galway, Donegal, Mayo and Roscommon. Further specific benefits include:

Strategic Salt Barn facility:

- The Strategic Salt Barn facility will ensure full control, security and the supply of salt in the north-western region for all proximate local authorities, TII and DoT.
- A large portion of the strategic salt for the region is currently stored in the private sector. The risks and costs associated with this arrangement will be removed with the construction of the strategic salt barn facility.

Maintenance/Operation Depot:

- Provision of a Municipal District (MD) Depot for Sligo County Council will allow for efficient storage of materials and plant proximate to need.
- Local authorities are designated as the lead agency for coordinating and delivering the response to severe weather emergencies and lead the local response in collaboration with TII, DoT and other principal response agencies. The proposed integrated facility will enable coordinated management in severe weather conditions.
- The proposed Maintenance/Operation Depot will allow for the scale up to full maintenance services by TII including winter maintenance, incident response and renewals on the 24km of N4 Dual Carriageway in county Sligo and other routes in the region.

Maintenance and management of infrastructure assets has a very high priority in the National Investment Framework for Transport in Ireland (NIFTI) investment hierarchy, which is the Department of Transport's framework for prioritising future investment in the land transport network to support the delivery of National Strategic Outcomes (NSOs) identified within the National Planning Framework (NPF). The proposed development of a Strategic Road Maintenance Facility will support journey time reliability, road safety and accessibility for the north-western region by facilitating the provision of road maintenance services, including winter maintenance and incident response services. The provision of such road maintenance services supports enhanced regional connectivity which is an NSO and an investment priority of NIFTI. Enhanced connectivity to the Northwest supports the regional balance of economic growth through providing journey time reliability for commercial activities. The proposed development also supports the Government's Climate Action Plan 2023 which sets out the Avoid-Shift-Improve framework for decarbonisation of the transport sector. The development predominantly aligns with 'Improve' measures, which are measures which aim to improve the efficiency of the vehicles and the network itself, including during periods of severe weather conditions.

3. SITE DESCRIPTION

The proposed development is a 3.1 hectare (ha) site (ITM coordinates of 571198 E 819452 N) within the townland of Drumfin in Co. Sligo, approximately 16km south of Sligo town and 6.0km northeast of Ballymote. It is strategically located adjacent to the N4 National Road which was recently re-aligned and upgraded to dual carriageway between Castlebaldwin and Collooney. The site location is shown in Figure 3.1 and Figure 3.2.

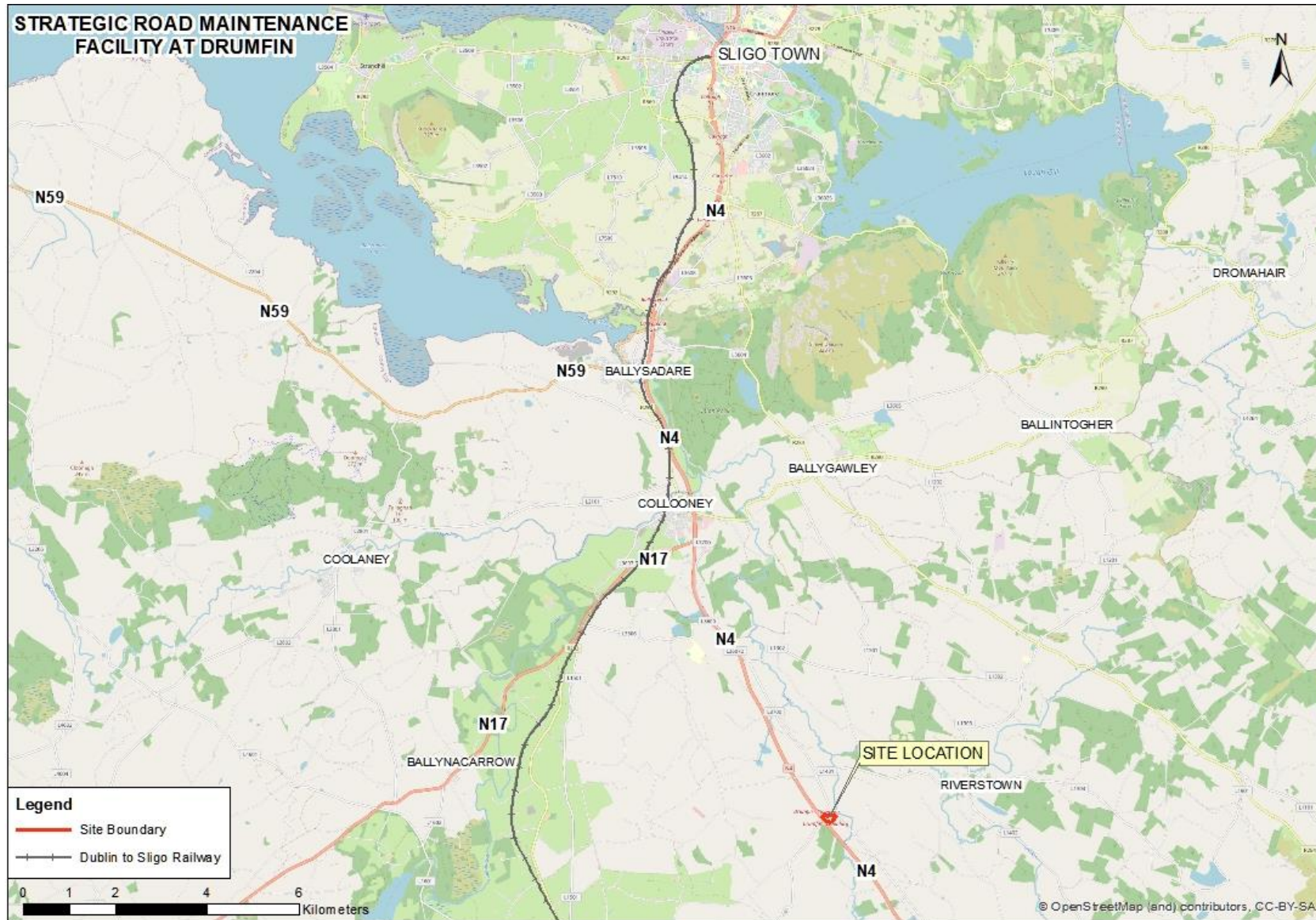


Figure 3.1 - Location of the proposed development site in Drumfin, Co. Sligo



Figure 3.2 - Strategic Road Maintenance Facility site (map underlay source: Bing)

The proposed development is bounded by the N4 dual carriageway to the south-west, the L1502 local road to the north-west and the L3700 to the north-east. There are two private dwellings to the north of the site and one private dwelling with ancillary farm buildings to the east. The remaining site is bounded by agricultural lands.

The western part of the site is sloping to south-west, towards the N4, and the eastern part is sloping to south-east. The levels across the site vary, with the highest point approx. 60mOD and the lowest approx. 50mOD.

The proposed site is a combination of greenfield and brownfield conditions. The brownfield section of the site is located to the south-west of the development, adjacent to the N4 dual carriageway and L1502 and extends to approx. 0.9 ha. This area comprises of a redundant and now unauthorised site compound and storage area developed for the construction of the N4 dual carriageway scheme between Castlebaldwin and Collooney. The remaining approx. 2.2 ha is a greenfield site.

The Drumfin River is located approximately 90m north-east of the site. The Drumfin River connects to the Unshin River approximately 1.3km to the north. Drainage network mapping shows the proposed development site drains towards the Drumfin River from both the northeastern and southwestern sections of the proposed development site through a network of ephemeral ditches, as illustrated in Figure 3.3.

A drainage ditch, constructed during the N4 dual carriageway scheme, flows in a south-easterly direction along the western and southern boundary. This ditch continues parallel to the N4 before outfalling into a local watercourse network and ultimately to the Drumfin River approximately 0.5km downstream of the site.

The land is currently in private ownership, however Sligo County Council have a draft agreement in place to purchase the lands.

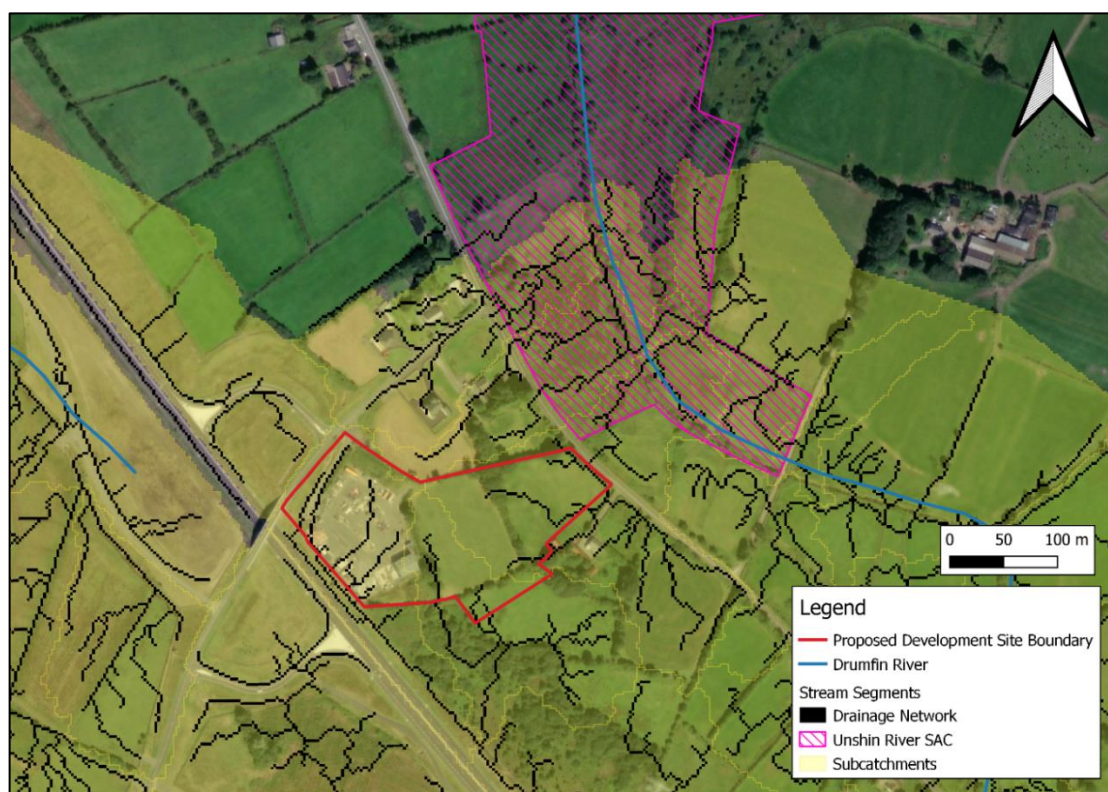


Figure 3.3 - Existing drainage network underneath proposed development site (map underlay source: ESRI World Imagery)

4. NATURE AND EXTENT OF PROPOSED DEVELOPMENT

Sligo County Council proposes to construct a Strategic Road Maintenance Facility, including resilience regional salt barns, a maintenance and operation depot and a Local Authority Municipal District (MD) machinery yard with ancillary buildings and structures to provide a range of national, regional and local road maintenance services. The regional reach will cover the whole northwest region, including counties Donegal, Sligo, Longford, Leitrim, Galway, Mayo and Roscommon.

The main infrastructural elements proposed on the site are:

- 4 no. Strategic Salt Barns for national reserves and Resilience Salt stocks.
- Two-storey Administration Building for Maintenance/Operation activities which includes internal storage area, welfare facilities, offices and canteen facilities on the ground floor, with offices and meeting/training room on the first floor.
- Maintenance & Operation Barn including lean-to vehicle storage and secure internal storage for maintenance and operation salt supplies.
- Single-storey workshop and staff welfare facility.
- Ancillary structures and associated works.

4.1 Strategic Resilience Salt Barns

The proposed salt barn facility is a reinforced concrete plinth structure with profiled metal roof, comprising of four salt barns. Each barn will be 50.9m x 20.0m x 8.8m with a total floor area of 4,072m². The walls will be made of concrete and each barn entrance will have 1 No. industrial metal roller shutter. The resilience salt barns will store approx. 30,000 tons of salt supplied by TII and DoT to ensure that carriageways on the Roads network are kept free of frost, ice and snow as far as is reasonably practicable.

The barns will have an isolated drainage network, intercepting salt-contaminated runoff and outfalling to a sealed underground storage tank. This tank will be periodically emptied on an 'as-needed' basis, with the contents transferred to a licensed water treatment facility by an appropriately licensed Contractor.

It is proposed to incorporate solar panel arrays on the roofs of the four salt barns to generate electricity for use by the depot offices, lighting, electric vehicle charging, etc., with excess generation stored on-site through batteries with provisions in place for the excess to be fed back into the electricity grid network.

4.2 TII Maintenance/Operation Depot

TII's maintenance and operation depot for the ongoing maintenance and operations of the National Road network extends to approximately 13,200m² and comprises the following:

- Two storey Administration Building for Maintenance/Operation activities which includes internal storage area, welfare facilities, offices and canteen facilities on the ground floor, with offices and meeting/training room on the first floor.
- Maintenance & Operation Barn including lean-to vehicle storage and secure internal storage for maintenance and operation salt supplies.
- Truck washdown area with isolated drainage network for salt-contaminated runoff.
- Underground storage tank for collection of brine/contaminated runoff from salt containment and truck washdown.
- Bunded fuel storage for approximately 15,000L of on-site diesel storage tanks. The fuel storage will be bunded with the bund providing a storage capacity

equivalent to 110% of the tank capacity it protects, in compliance with the EPA 'Guidance Note on Storage and Transfer of Materials for Scheduled Activities'.

- Staff/visitor car park for Maintenance/Operation Depot with provision for EV charging points.
- Rainwater harvesting system.
- Air-source heat pump for temperature control and energy efficiency within the office building.

4.3 Sligo County Council Municipal District Depot

Sligo County Council's operational depot is approximately 3,810m² comprising of the following:

- Single storey Maintenance & Operation Depot Building (375m²) which includes vehicle storage, workshop and secure internal storage.
- Road materials storage areas for Local Authority Machinery Yard (640m²), surrounded on 3 sides by approx. 2.5m high block walls.
- Secure storage area for Local Authority Machinery Yard.
- Parking Area for Sligo County Council staff (approx. 5-10 spaces anticipated).

4.4 Ancillary Structures and Works

Other ancillary structures and associated works at the proposed development include:

- 7.0m internal access road with access to the L3700 road via simple priority junction.
- Weighbridge for use during loading and unloading of resilience salt supplies.
- Site clearance, including removal of partly constructed access from the L1502 and removal of unauthorised site compound, shed and all associated elements.
- Site boundary and internal boundary treatments.
- Drainage works, including surface water systems and foul wastewater treatment and outfalls.
- Lighting for internal road network and compounds.
- Landscaping for visual screening and biodiversity enhancement.

5. DESIGN ELEMENTS

5.1 Road Access and Egress and Construction

5.1.1 Layout Access and Egress

A direct access to the proposed development will be provided via the L3700 public road. The L3700 is a local road that was previously part of the N4 national road. However, with the opening of the recently constructed N4 dual carriageway in the vicinity, this road has been re-classified as a local road and carries reduced traffic.

The access will be a simple priority junction. Given that the public road is lightly trafficked and is anticipated to have relatively low traffic flows generated by the proposed development, this junction type is of sufficient capacity to serve the development.

A Junction Visibility Assessment has been undertaken as part of the Traffic Impact Assessment in the Engineering Report to demonstrate that minimum sightlines and visibility distances are achieved.

Road alignments within the proposed development are designed to limit vehicle speeds throughout the scheme and facilitate pedestrian movements where required.

5.1.2 Road Geometry and Construction

The internal road layout geometry has been developed in accordance with the design principles of the Design Manual for Urban Streets and Roads (DMURS), which provides guidance relating to urban or low speed roads with a series of principles, approaches and standards that are necessary to achieve balanced, best practice design outcomes with regard to such road networks and individual roads.

The design and construction of the proposed internal access road pavement within the proposed development will be in accordance with the relevant TII pavement design standards and TII "Specification for Works" (SPW).

All road signs and road markings will be in accordance with the 'Traffic Signs Manual' published by the Department of Transport.

The minimum lateral clearance of fixed objects from the roadway edge will be generally 1m with absolute minimum clearance set at 450mm; this applies to items such as public lighting columns, posts, trees etc.

Footpaths within the proposed development will be of in-situ concrete or bituminous construction.

5.2 Foul Water

A wastewater drainage system is proposed to treat and outfall the foul drainage from the proposed development through a secondary treatment system followed by a tertiary polishing filter. Wastewater is treated in a secondary treatment package plant and then polished in the tertiary treatment package. The tertiary polishing filter, such as the Ecoflo Coconut filter, is placed on a 300mm deep bed of 20mm pebble distribution gravel and effluent from this polishing filter percolates into the distribution gravel by gravity.

A Site Suitability Assessment was undertaken by Dr Eugene Bolton of Trinity Green Environmental Consultants in June 2023 which confirmed that the proposed

development is suitable for such wastewater treatment. Details of this assessment and the proposed secondary treatment system are provided within the Engineering Report.

5.3 Surface Water

5.3.1 Surface Water Drainage

The surface water drainage network for the proposed development was designed in accordance with IS EN 752-4: Part 4 'Drain and sewer systems outside buildings', as published by the NSAI, and using the industry-standard software package 'Microdrainage'.

As per the above standard, pipes in surface water sewers have been designed using the Modified Rational Method (Wallingford method) to calculate the volume of surface water run-off under storm conditions. The Modified Rational Method is incorporated in the software design package utilised in the design process.

Site-specific rainfall data provided by Met Eireann was used as the basis for the design of the surface water system, after first being factored up by 10% to meet the required allowance for climate change.

In accordance with IS 752-4: Part 4, the surface water drainage network was initially designed to carry a 2-year storm without surcharge. Self-cleansing flows of greater than 0.75m/s are provided generally although this is not always possible at upstream pipe-runs where contributing areas are low. In these cases, minimum gradients of 1:DN or greater are provided, thus meeting the recommendations of IS EN 752-4 for ensuring self-cleansing flow velocities.

The stormwater drainage network was assessed for compliance with the key design parameters as set out in Table 5.1.

Table 5.1 Key Design Parameters

Parameter	Value/Requirement
Minimum depth	1.2m cover under highways 0.9m elsewhere
Maximum depth	5m
Minimum sewer size	225mm
Runoff factors for pipe sizing and storage requirements	100% paved and roof surfaces 0% of previous surfaces
Max. velocity at pipe full	3.0 m/s
Min. velocity in pipe	0.75 m/s
Roughness	0.6mm
Maximum discharge rate from site	As outlined elsewhere in this report
Level of Service Critical Storm 1 in 2 yr return period	No Surcharge within the pipe network, no flooding
Level of Service Critical Storm 1 in 30 yr return period	Surcharge allowed, no flooding
Level of Service Critical Storm 1 in 100 yr return period	Surcharge allowed, no flooding

The depot sites will be drained through a series of gullies and linear drainage channels which tie into an underground network of chambers and pipes.

A swale is proposed along the internal access road to collect and attenuate runoff from the road and subsequently treat the attenuated water in accordance with the principle of SuDS. This swale will outfall to the north of the site, passing through a bypass interceptor installed downstream of the attenuation feature within the swale.

Class 1 bypass separators will be installed on each drainage run downstream of the respective attenuation systems. A forecourt separator will be provided immediately downstream of the bunded fuel area to treat contaminated storm water inflow to the storm water sewer network. The fuel tank itself is bunded to contain emergency spills and avoid contamination of storm watercourses with hydrocarbons. The fuel tank bund will be provided in accordance with the details in the Greater Dublin Strategic Drainage Study (GSDSDS) stormwater management policy document and providing a storage capacity equivalent to 110% of the tank capacity it protects, in compliance with the EPA 'Guidance Note on Storage and Transfer of Materials for Scheduled Activities'. This separator is also provided in the event of a spill in the surrounding area during fuelling of vehicles or filling of the fuel tank.

Washdown separators and silt traps will be provided at the truck wash down areas to remove contaminants from the salt contaminant area, allowing the saltwater runoff from this area to be disposed of as salt water in holding tanks.

A separate collection system will be provided for the salt containment areas. These areas will be drained separately during washdown activities, and the runoff will enter holding tanks via a silt trap. A valve switch system will be in place to drain rainfall from these salt containment areas to the drainage network during normal conditions. The valves will open during washdown activities within the salt contamination areas, directing water containing contaminants to the salt-water holding tanks, the valves will otherwise remain closed. The tanks will be fitted with an alarm to inform the site operator when the tank is full to 70% to allow for arrangement of the disposal of the salt water off site.

5.4 Sustainable Drainage Systems Strategy

The principles of sustainable drainage systems (SuDS) have been adopted in the development in accordance with the recommendations of the GSDSDS.

Compliance with GSDSDS requires the discharge of surface water run-off to be restricted to discharge rates equal to 1-year greenfield site peak runoff rate or 2l/s/ha, whichever is the greater in accordance with Table 16.3 of the GSDSDS. For the proposed development, Q_{bar} is 16.56l/s for the TII Maintenance Depot site and 4.89l/s for the Sligo County Council depot site. These represent the maximum permissible rates of discharge of surface water run-off from the proposed development.

Discharge from the storm water network will be restricted by installing a flow control device, such as an orifice plate or a Hydro-Brake by Hydro International or similar, directly upstream of the outfalls. It will be necessary to provide attenuation storage via underground tanks upstream of the flow control device. The two tanks will provide adequate storage to ensure that all surface water attenuated during the 100-year critical storm can be stored without giving rise to flooding.

A swale is proposed along the internal access road to collect and attenuate runoff from the road and subsequently treat the attenuated water in accordance with the principle of SuDS.

Rainwater harvesting is proposed for use in the TII Administration/office building and SCC office building. Stormwater runoff from the roofs of those buildings will be collected into a rainwater harvesting system to facilitate grey water re-use, including toilet flushing, vehicle washdowns and the like.

The provision of silt traps for the salt containment areas is in keeping with the principles of SuDS.

5.5 Outfall

It is proposed that the rate at which stormwater outflows from the proposed development will be restricted to the pre-development run-off rate using a proprietary flow control device and that attenuation of the peak volume, including allowance for climate change, arising during the 1 in 100 yr critical storm event would be required. This will be done in accordance with GSDSDS policy documents and the use of SuDS for the drainage will be included where possible as part of the design.

There are a series of ephemeral ditches bounding the scheme which are proposed to be utilised as outfall locations. As above, the outfall rate will be limited to existing greenfield runoff rates.

5.6 Water Supply

There is a 90mm watermain in the verge of the L1502 road adjacent to the proposed development. This watermain belongs to the Castlebaldwin Group Water Scheme (GWS). It is proposed to connect into this watermain for water supply and a letter of consent has been obtained from the Group Water Scheme in this regard. A copy of this consent is provided in the Engineering Report.

It is proposed to utilise rainwater harvesting in the proposed development. Stormwater runoff from the roofs of the TII Administration/office building and SCC office building will be collected into a rainwater harvesting system to facilitate grey water re-use, including toilet flushing, vehicle washdowns and the like. Water conservation measures such as low flush toilets and tap aerators will be implemented in the office buildings also.

It is proposed to provide a looped watermain around the site. The watermains, fire hydrants and fire water storage tanks layouts are detailed on Drawing No. MCAAS2W-ROD-HDG-TO15_AE-DR-CH-300505.

The watermain will be constructed and tested in accordance with the "1998 Recommendations for Site Development Works for Housing Areas". The watermain will be sized in agreement with the GWS and will be adequate at a minimum to meet the demand of the proposed development.

The design requirement for a firefighting supply including fire hydrants and water storage tanks will be determined with specific consultation with the local Fire Department. An indicative layout is provided on the above reference drawings. Onsite firefighting storage is proposed to accommodate 45,000 litres storage in accordance with Fire Safety Engineering CIBSE Guide E.

Watermain pipe material will either be MoPVC, MDPEo, Steel or Ductile Iron.

5.7 Electricity, Telecommunications and Public Lighting

It is intended that electricity supply and the exact route of proposed ESB underground cables and/or overhead lines to the site will be agreed with ESB Networks at detailed design stage. Supply cables will be linked to the main switchboard and ESB meters via approved uPVC ducts. The main switchboard and ESB meters will be housed within the proposed generator room.

Solar panels will be incorporated onto the roofs of the 4 no. resilience salt barns to provide power supply for the proposed development and for internal use on equipment such as electric car chargers and heat pumps.

A standby diesel generator will also be provided so that site operations can continue in the event of a power failure. The standby diesel generator will be located separately adjacent to the administration/office building.

Existing ESB overhead networks will be diverted where required and as agreed with ESB Networks.

Telecommunications will be provided via underground link to the existing network on the L3700, with the exact route of any proposed underground ducts/cables to be agreed with Eir at detailed design stage. The provision of a telecommunications tower or mast within the proposed development is not anticipated.

The lighting within the proposed development will follow the relevant design standards and best practices and will utilise modern LED luminaires with appropriate dimming and sensor activation. These luminaires provide significant energy savings through improved efficiencies over traditional options as well as reducing light spill beyond the intended focus area. Lighting columns are not expected to exceed 12 metres in height for access roads and working areas.

CCTV cameras will be provided within the proposed development for security reasons.

5.8 Building Layout Design

The proposed scheme design is clean and simple, using a simple palette of materials to compliment the functionality of the buildings. Considerable attention will be given to the design to produce an ensemble of buildings which is of a high standard. In particular, high levels of natural light to the staff office and operational buildings are proposed.

5.9 Proposed Materials & Finishes

The proposed materials and finishes are consistent with buildings of this type which are robust and require low levels of maintenance. The finish material proposed for the buildings is profiled metal cladding, with muted contrasting colours proposed to accentuate the elements with a reinforced concrete plinth. The windows and doors are proposed to be double glazed aluminium units with the use of ribbon glazing in areas of the office building typical of similar developments.

The proposed development will be built to a high standard with emphasis on sustainable design, landscaping and management to ensure not only a high-quality development on completion, but also that the development is sustainably maintained and managed into the future.

An array of solar panels will be placed on the roofs of the 4 no. Resilience salt barns.

5.10 Parking

Parking will be provided in accordance with the guidelines set out in the statutory documents and the requirements of Part M of the Building Regulations Technical Guidance Documents.

5.11 Mechanical and Electrical Services

A rainwater harvesting system is proposed for use in the office buildings and for vehicle washdowns.

Solar panels will be incorporated onto the roofs of the 4 no. resilience salt barns to provide power supply for the proposed development and for internal use on equipment such as electric car chargers and heat pumps. Excess generation will be stored on-site through batteries with provisions in place for the excess to be fed back into the electricity grid network.

Air source heat pumps are proposed for temperature control and energy efficiency within the office buildings.

Electric car chargers will be provided for charging the maintenance contractor's electric vehicle fleet and other electric vehicles associated with road maintenance operations.

A Mechanical and Electrical Consultant will be retained to oversee the mechanical and electrical installations associated with the proposed development.

6. ENVIRONMENT

6.1 Environmental Impact Assessment Screening Report

The requirement for an Environmental Impact Assessment (EIA) is set by European Union (EU) Directive 85/33/EEC on the assessment of the effects of certain public and private projects on the environment (the EIA Directive) as amended by Directive 97/11/EC, 2003/35/EC and 2009/31/EC and by Directive 2014/52/EU. The EIA Directive requires that certain developments be assessed for likely significant effects before planning permission is granted.

The proposed development has undergone screening for Environmental Impact Assessment under the EIA Directive 2011/92/EU as amended by Directive 2014/52/EU (and the relevant provisions of the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001 (as amended) and Sligo County Council has determined that there is no real likelihood of significant effects on the environment arising from the proposed development and that an Environmental Impact Assessment is not required.

6.2 Appropriate Assessment Screening Report

Article 6(3) of the EU Habitats Directive (92/43/EEC) states that: “Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site’s conservation objectives”.

The proposed development has undergone screening for Appropriate Assessment and Sligo County Council has determined that following and examination, analysis and evaluation of all relevant information, on the basis of the objective information and in view of the best scientific knowledge and applying precautionary principle, the proposed development either individually or in combination with other plans and projects, and in the absence of mitigation, it is not likely to have a significant effect on any European Site(s), in view of the sites conservation objectives, and that there is no reasonable doubt in relation to this conclusion.

6.3 Landscape Plan

The landscape design for the proposed development, as shown on Drawing No. MCAAS2W-ROD-ELS-TO15_AE-DR-CH-300001, will include the following elements:

- Screen planting to screen the salt barns, depot buildings and lighting from residential properties to the northern boundary of the development, supplementing the existing hedgerows on this boundary. Additionally, screen planting to mitigate visual impacts on the N4 and L1502 is provided on the western and southern boundary.
- Hedgerow planting along the eastern boundary.
- Woodland planting along the western perimeter of the proposed development.
- Low growing Shrub planting will help to guide visitors to the entrances to the office buildings;
- Low maintenance grass mix for areas between the buildings and the perimeter fence. These areas will help assimilate the buildings into the landscape; they will also be used for drainage attenuation where necessary.

- It is proposed to retain existing hedgerows and trees insofar as reasonably practicable, particularly along the site boundaries.

Both the Screen planting and the Woodland planting will be outside the security fence around the proposed development so that the planting does not obscure any perimeter lighting within the hard standing areas. The Screen planting, Woodland planting and Hedgerow planting will be of native species in accordance with the NRA Guidelines 'A Guide to Landscape Treatments for National Road Schemes in Ireland', (National Roads Authority, 2006).

6.4 Flood Risk Assessment

A flood risk assessment for the proposed development has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLE) in 2009.

The Guidelines set out a staged approach to the assessment of flood risk with each stage carried out only as needed. The stages are listed below:

- Stage I – Flood Risk Identification
- Stage II – Initial Flood Risk Assessment
- Stage III – Detailed Flood Risk Assessment.

The flood risk assessment undertaken for the proposed development considers all stages and so it is considered that this level of assessment is sufficient given the nature of the proposed development and the level of flood risk identified for the site.

The primary source of flood risk identified for the proposed development is fluvial, emanating from the Drumfin River.

A hydraulic model has been prepared to ascertain the effects of extreme fluvial flood events on the site and it has been determined that the site is outside the 1 in 1000-year (+ climate change) flood extents and therefore within Flood Zone C. As such the site is appropriate for the proposed development as per the OPW's "The Planning System and Flood Risk Management Guidelines for Planning Authorities.

The Flood Risk Assessment is included in Appendix A of this report.

6.5 Cultural Heritage Impact Assessment

A Preliminary Cultural Heritage Impact Assessment (CHIA) has been undertaken by Archaeological Management Solutions (AMS) in July 2023.

The *Framework and Principles for the Protection of the Archaeological Heritage* (DAHGI 199, 25) states that "where it is considered that a proposed development may (due to its location, size, or nature) have archaeological implications, then an archaeological assessment should be carried out" and defines archaeological assessment as an investigation aimed at:

- 1) Gaining a better understanding of a known or suspected archaeological site or monument with particular reference to considering the implications of proposed development for such a site or monument; and

- 2) Locating previously unidentified archaeological sites or monuments (or possible ones) prior to the commencement of development works with particular reference to considering the implications of proposed development for such sites or monuments.

In line with this, the purpose of the current assessment is to provide a preliminary desktop survey and analysis of recorded archaeological sites that lie within proximity to the proposed development, as well as an initial appraisal of the archaeological potential of the development area, with a view to informing an appropriate archaeological strategy to avoid/mitigate any likely impacts that are identified.

Recorded architectural/built heritage sites within proximity to the proposed development, including Protected Structures, buildings, monuments and demesnes/historic gardens listed on the National Inventory of Architectural Heritage (NIAH) and Architectural Conservation Areas (ACAs), as well as previously unrecorded architectural heritage sites have also been identified and considered where present. The CHIA also considers whether any sites/features with notable history or folklore are in proximity to the proposed development.

The CHIA concludes that there is one area of archaeological potential (AAP1) within the proposed development area. AAP1 comprises the greenfield area in the eastern two-thirds of the proposed development site in proximity to the River Unshin. The CHIA recommends that a programme of non-intrusive geophysical survey is carried out in AAP1, owing to the potential for previously unrecorded archaeological remains. Furthermore, a programme of Construction Phase archaeological testing is recommended to be undertaken in AAP1 under licences issued by the National Monument Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH), over a minimum of 10–12% of AAP1.

All archaeological works should be carried out in accordance with the Code of Practice for Archaeology agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and Transport Infrastructure Ireland (2017).

The results of the geophysical survey and archaeological testing will be detailed in reports (as per conditions of the granting of licences) and will be used to inform an appropriate mitigation strategy for any further archaeological works that may be necessary. Such works could include archaeological monitoring, preservation in situ, and/or preservation by record (excavation). Appropriate time will need to be included in the programme of works for revisions to the Method Statement, licence details and liaison/consultation with the TII Project Archaeologist, as per the Code of Practice for Archaeology.

The Cultural Heritage Impact Assessment is included in Appendix B of this report.

6.6 Photomontage

A photomontage was undertaken adjacent to the residential properties located to the north-west of the site to assess the visual impact of the proposed development on the adjacent properties and to provide a visual representation of the proposed development. The photomontage was developed by Chris Shackleton Consulting in July 2023.

The photomontage is included in Appendix C of this report.

7. TRAFFIC

A Traffic Impact Assessment has been prepared and is included within the Engineering Report. This sets out the baseline traffic flows and the anticipated traffic flows arising from the proposed development, including those anticipated at construction stage and operational stage. An analysis of the traffic impacts for the construction stage and operational stage is included in the Traffic Impact Assessment also.

The Assessment concludes that that the proposed development will generate slight increases in through traffic and turning movements at the L1502 junction, with the highest increase occurring during the salt delivery/filling operations which are anticipated to occur for up to 30 days each year. The existing L1502 junction with the L3700 road is currently well below capacity, with no queues and delays anticipated for the Opening and Design year scenarios.

The analysis also shows that the L3700 through traffic is not impacted by the proposed development due to the low traffic volumes on this section of that road.

The proposed site access caters for turning movements of HGVs and achieves the minimum required sightlines along the left and right approaches of the L3700.

8. DRAWINGS

Detail of the proposed development is provided on the following drawings:

Table 8.1 Drawings

Drawing Number	Title
MCAAS2W-ROD-GEN-TO15_AE-DR-CH-300003	Location Map Sheet 01 of 01
MCAAS2W-ROD-GEN-TO15_AE-DR-CH-300001	Proposed Layout Sheet 01 of 01
MCAAS2W-ROD-HSC-TO15_AE-DR-CH-300001	Proposed Site Clearance Sheet 01 of 01
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300001	Proposed TII Depot – Resilience Salt Barn Sheet 01 of 03
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300002	Proposed TII Depot – Resilience Salt Barn Sheet 02 of 03
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300003	Proposed TII Depot – Resilience Salt Barn Sheet 03 of 03
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300004	Proposed TII Depot – Maintenance & Operations Office Sheet 01 of 02
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300005	Proposed TII Depot – Maintenance & Operations Office Sheet 02 of 02
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300006	Proposed TII Depot – Maintenance Salt Barn Sheet 01 of 02
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300007	Proposed TII Depot – Maintenance Salt Barn Sheet 01 of 02
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300008	Proposed SCC Depot – Welfare Facilities & Workshop Sheet 01 of 02
MCAAS2W-ROD-SGN-T015_AE-DR-CH-300009	Proposed SCC Depot – Welfare Facilities & Workshop Sheet 02 of 02
MCAAS2W-ROD-HGN-TO15_AE-DR-CH-300001	Proposed Road Layout Sheet 01 of 01
MCAAS2W-ROD-HDG-TO15_AE-DR-CH-300501	Proposed Stormwater Drainage Layout Sheet 01 of 01
MCAAS2W-ROD-HDG-TO15_AE-DR-CH-300506	Proposed Storm Network Pipe Longsections Sheet 01 of 02

Drawing Number	Title
MCAAS2W-ROD-HDG-TO15_AE-DR-CH-300507	Proposed Storm Network Pipe Longsections Sheet 02 of 02
MCAAS2W-ROD-HDG-TO15_AE-DR-CH-300503	Proposed Foul Water Drainage Layout Sheet 01 of 01
MCAAS2W-ROD-HDG-TO15_AE-DR-CH-300508	Proposed Foul Network Pipe Longsections Sheet 01 of 01
MCAAS2W-ROD-HDG-TO15_AE-DR-CH-300505	Proposed Water Supply Layout Sheet 01 of 01
MCAAS2W-ROD-HDG-TO15_AE-DE-CH-300501	Proposed Drainage Typical Details Sheet 01 of 01
MCAAS2W-ROD-HDG-TO15_AE-DE-CH-300502	Proposed Watermain Typical Details Sheet 01 of 01
MCAAS2W-ROD-ELS-TO15_AE-DR-CH-300001	Proposed Landscaping Sheet 01 of 01
MCAAS2W-ROD-HFE-TO15_AE-DE-CH-300301	Proposed Boundary Treatment Details Sheet 01 of 01
MCAAS2W-ROD-HLG-TO15_AE-DR-CH-301301	Proposed Lighting Layout Sheet 01 of 01
MCAAS2W-ROD-GEN-TO15_AE-DR-CH-300005	Proposed Site Sections Sheet 01 of 04
MCAAS2W-ROD-GEN-TO15_AE-DR-CH-300006	Proposed Site Sections Sheet 02 of 04
MCAAS2W-ROD-GEN-TO15_AE-DR-CH-300007	Proposed Site Sections Sheet 03 of 04
MCAAS2W-ROD-GEN-TO15_AE-DR-CH-300008	Proposed Site Sections Sheet 04 of 04

9. SUBMISSIONS

Plans and full particulars of the proposed development are available for inspection, or purchase at a fee not exceeding the reasonable cost of making a copy, on line at <https://consult.sligococo.ie> or during office hours at the Main Foyer, Sligo County Council, County Hall, Riverside, Sligo, from **Wednesday 26th July 2023 to Friday 25th August 2023** (both dates inclusive).

Submissions or observations with respect to the proposed development, dealing with the proper planning and sustainable development of the area in which the development would be situated, may be made online by registering on the consult.sligococo.ie portal <https://consult.sligococo.ie> or in writing, and submitted to the undersigned not later than **4pm on Friday 8th September 2023**.

APPENDIX A

FLOOD RISK ASSESSMENT



STRATEGIC ROAD MAINTENANCE FACILITY AT DRUMFIN



Site-Specific Flood Risk Assessment

P01 | July 2023



An Roinn Iompair
Department of Transport



Sligo County Council
Comhairle Chontae Shligigh

Sligo.

Strategic Road Maintenance Facility at Drumfin

Site-Specific Flood Risk Assessment

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APPENDICES

APPENDIX A **Glossary of Terms**

APPENDIX B **Indicative Flood Sources**

1. INTRODUCTION

Roughan & O'Donovan were engaged on behalf of Transport Infrastructure Ireland (TII), Sligo County Council (SCC) and Department of Transport (DoT) to provide consultancy services in relation to the development of a Strategic Road Maintenance Facility at Drumfin ("the proposed development"). It is proposed to construct a Strategic Resilience Salt Barn facility, Maintenance/Operation Depot and a Local Authority Municipal District (MD) Machinery Yard, with ancillary buildings and structures in order to provide a range of national, regional and local road maintenance services.

This report has been prepared to assess the flood risk to the subject sites and adjacent lands as a result of the proposed development.

1.1 Description of Study Area

The site is located north-east of the N4 road which forms the south-west boundary of the subject site. On the north-west side, the site is bounded by the L1502 road, on the north-east and south-east the site is surrounded by agricultural greenfield lands.

The western part of the site is sloping to south-west, towards the N4, and the eastern part is sloping to south-east. The highest point is about 60 mOD and the lowest is 50mOD.

It is noted that the Drumfin river is located approximately 100m north-east of the site, which discharges to the Unshin River approximately 1.6km to the north.

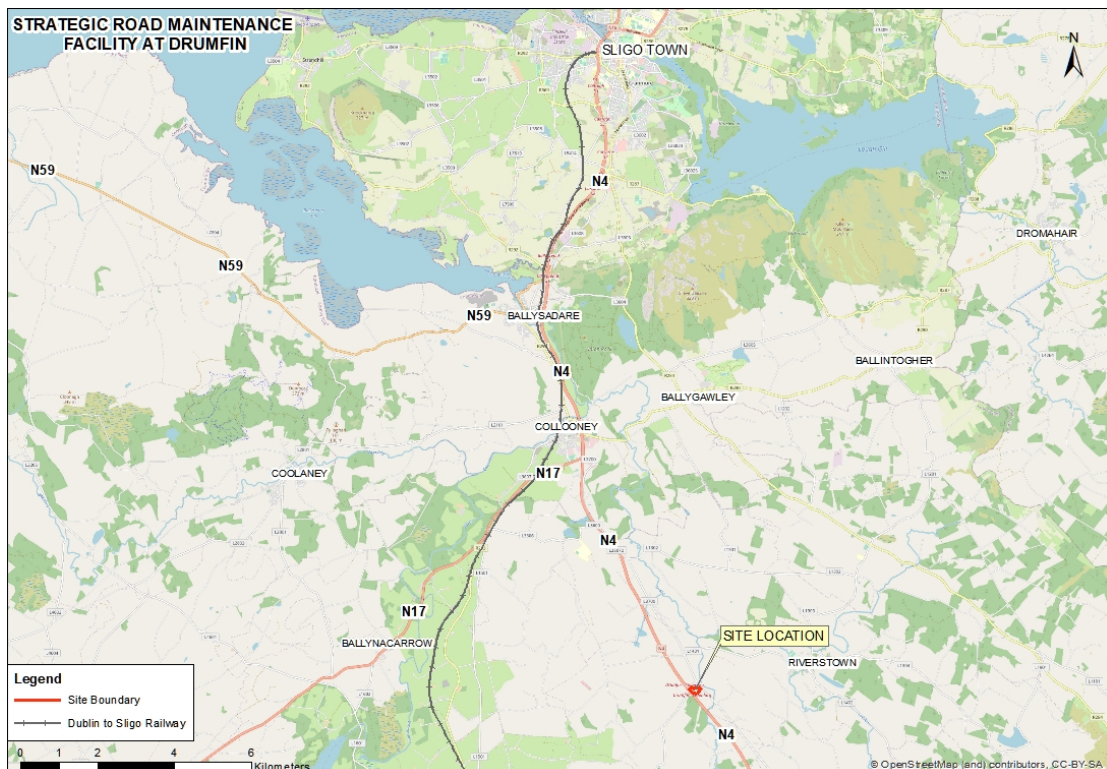


Figure 1.1 - Location of the proposed development site in Drumfin, Co. Sligo



Figure 1.2 - Strategic Road Maintenance Facility Site (map underlay source: Bing)

2. FLOOD RISK

2.1 Introduction

This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoH LG) in 2009.

2.2 Identification of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood risk, an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 2.1 below shows a source-pathway-receptor model reproduced from 'The Guidelines' (DEHLG-OPW, 2009).

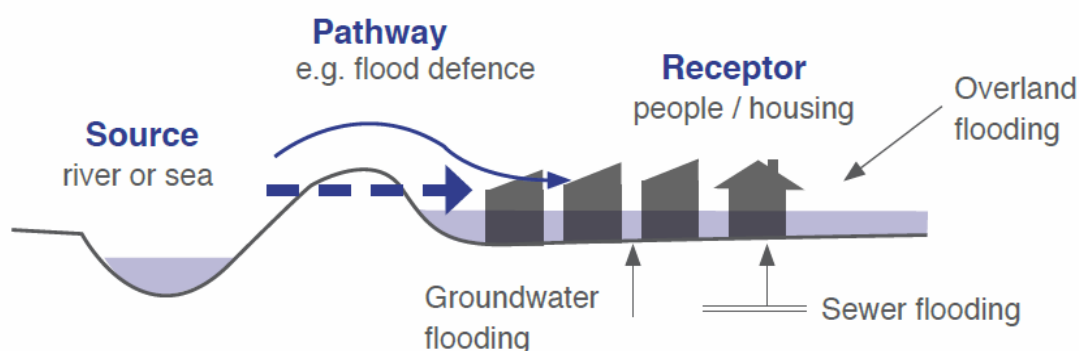


Figure 2.1 Sources, Pathways and Receptors of Flooding

The principal sources of flooding generally are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The Guidelines set out a staged approach to the assessment of flood risk with each stage carried out only as needed. The stages are listed below:

- **Stage I Flood Risk Identification** – to identify whether there may be any flooding or surface water management issues.
- **Stage II Initial Flood Risk Assessment** – to confirm sources of flooding that may affect an area or proposed development, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps.
- **Stage III Detailed Flood Risk Assessment** – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average once every hundred years and has a return period of 1 in 100 years. Annual Exceedance probability is the inverse of return period as shown Table 2.1 below.

Table 2.1 Correlation Between Return Period and AEP

Return Period (years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

2.4 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. These are split into three categories in The Guidelines:

Flood Zone A

Flood Zone A where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal/tidal flooding);

Flood Zone B

Flood Zone B where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 or 0.5% or 1 in 200 for coastal/tidal flooding);

Flood Zone C

Flood Zone C where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal/tidal flooding. Flood Zone C covers all plan areas which are not in zones A or B.

It is important to note that when determining flood zones, the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

2.5 Sequential Approach & Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 2.2 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.

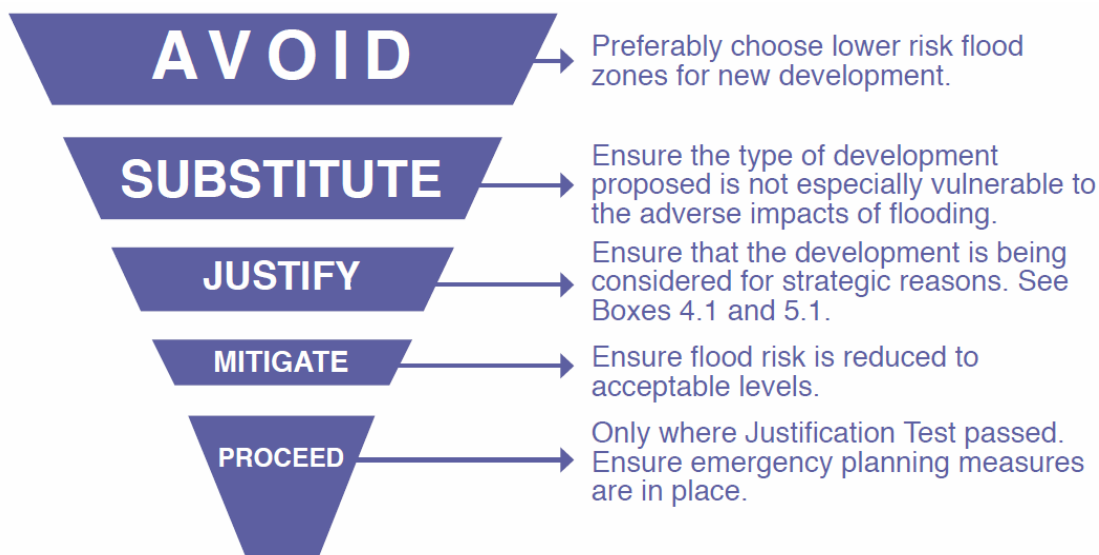


Figure 2.2 Sequential Approach (Source: The Planning System and Flood Risk Management)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

Table 2.2 Matrix of Vulnerability Versus Flood Zone to Illustrate Appropriate Development that is Required to Meet the Justification Test (Source: The Planning System and Flood Risk Management)

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

3. STAGE 1: FLOOD RISK IDENTIFICATION

3.1 General

This Stage 1 Flood Risk Identification includes a review of the existing information and the identification of any flooding or surface water management issues in the study area that may warrant further investigation.

3.2 Vulnerability

As per the OPW Guidelines, the proposed development is classified as “highly vulnerable” development as it comprises essential transport infrastructure. The guidelines stipulate that typically highly vulnerable developments are only appropriate within Flood Zone C (low risk areas).

3.3 Information Sources Consulted

The following information sources were consulted as part of the Stage 1 Flood Risk Identification:

Table 3.1 Information Sources Consulted

Source	Data Gathered
Primary Sources of Baseline Data	
Catchment Flood Risk Assessment and Management Study (CFRAM): www.floodmaps.ie	Fluvial, Pluvial, Coastal flooding examined
National Indicative Fluvial Maps: www.floodmaps.ie	National Indicative Fluvial Maps examined
OPW Past Flood Events Mapping: www.floodinfo.ie	OPW Records of Fluvial, Pluvial, Coastal flooding examined
Secondary Sources of Baseline Data	
Strategic Flood Risk Assessment (SFRA) of the Draft Sligo County Development Plan 2017-2023	Fluvial, Coastal and Pluvial flooding examined
N4 Colloney to Castelbaldwin, proposed road development – Flood Risk Assessment	Flood risk assessment examined
Geological Survey of Ireland (GSI) Maps	GSI Teagasc subsoils map consulted to identify if alluvial sediments are shown to be present at development site that may indicate historic flooding.
Historical Maps	OSI 25” mapping assessed
News Reports	News reports published in newspapers or digital news websites.

3.4 Primary Sources of Baseline Data

(i) Catchment Flood Risk Assessment and Management Study (Floodinfo.ie)

The CFRAM programme led by the OPW, provides a detailed assessment of flooding in areas identified as AFA's during the PFRA study. From the consultation of the CFRAM maps it has been found that the development is not covered within the Wester CFRAM Study.

(ii) Catchment National Indicative Fluvial Maps (Floodinfo.ie)

The indicative fluvial flood maps were finalised in December 2020. The mapping presents flood extents for river reaches that were not previously modelled as part of the CFRAMS and have catchments larger than 5 km². As per the OPW the use of these maps is to *“provide an indication of areas that may be prone to flooding. They are not necessarily locally accurate, and should not be used as the sole basis for defining the Flood Zones nor for making decisions on planning applications.”* The mapping indicates flooding in the vicinity of the study area, north-east of the site, although the flooding is not shown to inundate the site.

The National Indicative Fluvial Mapping are reproduced in Appendix B.

(iii) OPW past flood Events (Floodinfo.ie)

The OPW National Flood Hazard Mapping was examined to identify any recorded flood events within the vicinity of the site. No flood events have been recorded.

An overview of the OPW National Flood Hazard Mapping is reproduced in appendix B.

3.5 Secondary Sources of Baseline data

The following sources were also examined to identify areas that may be liable to flooding:

(i) Sligo Strategic Flood Risk Assessment of the Sligo Draft County Development Plan 2017-2023

The site area, is covered as part of the Sligo Draft County Development Plan 2017-2023 SFRA but there are no indicators of flood risks

(ii) N4 Collooney to Castlebaldwin, proposed road development – Flood Risk Assessment.

The subject site was not explicitly included in the N4 FRA model, the flooding on the subject site presented in the FRA is an extrapolation based on pre-construction topography. Additionally, although an allowance for climate change is discussed regarding the proposed watercourse crossings, results in the form of flood mapping or flood levels are not presented in the FRA.

(iii) Geological Survey of Ireland Maps

According to the Geological Survey Ireland (GSI), the underlying subsoil is Till derived from Namurian sandstones and shales, with Cut over raised peat and there are no known karst features (swallow holes, enclosed depressions, wells or springs) within the footprint of the site.

(iv) Historical Maps

Historical Maps were studied. No areas of the site have been identified as liable to flooding.

(v) News reports

No News report of flooding have been found in relation to the site.

3.6 Source – Pathway – Receptor Model

The following source-pathway-receptor model has been developed using the information examined in the Stage I Flood Risk Identification to categorise the sources of flooding, where it flows to (pathway) and the people and infrastructure affected by it (receptors). The likelihood and consequences of each type of flooding have also been assessed to determine the risk. These are summarised in Table 3.2 (taken from Appendix A of the Guidelines).

Table 3.2 Source-Pathway-Receptor Model

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Fluvial flooding	Overbank flow from the Drumfin River	Building used for warehousing, commercial, industrial and non-residential institutions	<i>Low</i>	<i>High</i>	<i>High</i>
Pluvial / Surface Water flooding	Extreme rainfall events and inadequate surface water drainage	Building used for warehousing, commercial, industrial and non-residential institutions	<i>Low</i>	<i>High</i>	<i>High</i>
Coastal flooding	Extreme tides, storm surges or wave overtopping	Building used for warehousing, commercial, industrial and non-residential institutions	<i>Low</i>	<i>High</i>	<i>High</i>
Ground-water Flooding	Rising groundwater levels	Low lying lands along the southern boundary	<i>Low</i> (No reports or geological indicators)	<i>High</i>	<i>High</i>

3.7 Stage 1 Conclusions

3.7.1 Fluvial Flooding

Catchment national indicative fluvial flood maps indicates flooding in the vicinity of the site. Considering the intrinsic low accuracy of the source, a Stage 2 – Initial Fluvial Flood Risk Assessment is required for the development.

3.7.2 Pluvial Flooding

Pluvial flooding was not identified as a source of flooding affecting the site in the PFRA maps or the previous Flood Risk Assessments undertaken. Therefore, the risk of pluvial flooding is classified as low and no further assessment is required.

3.7.3 Coastal Flooding

Coastal flooding was not identified as a source of flooding affecting the site in any of the sources of information consulted including the PFRA maps, and CFRAM maps. The site is > 60m above sea level. Therefore, the risk of coastal flooding at the site is classified as low and further assessment is not required.

3.7.4 Groundwater Flooding

Groundwater flooding was not identified as a source of flooding affecting the site in the PFRA maps or the previous Flood Risk Assessments undertaken. Therefore, the risk of groundwater flooding is classified as low and no further assessment is required.

4. STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

4.1 General

The Stage 2 Initial Flood Risk Assessment will confirm the sources of flooding that may affect the proposed development site, appraise the adequacy of existing information and scope the requirements of the Stage 3 Detailed Flood Risk Assessment.

4.2 Sources of Flooding

Flooding from Fluvial & Sea Level Rises / Coastal Flooding

The proposed development's north-east border is about 100m away from the Drumfin River. National indicative fluvial maps indicate flooding in close proximity to the site along the northern boundary of the old N4 road (now L3700 road). The site is considered to require a stage 3 detailed flood risk assessment with respect to flooding derived from Fluvial Flooding.

Surface Water Flooding

Surface water flooding occurs when the local drainage system cannot convey stormwater flows from extreme rainfall events. The rainwater does not drain away through the normal drainage pathways or infiltrate into the ground but instead ponds on or flows over the ground instead. Surface water flooding is unpredictable as it depends on a number of factors including ground levels, rainfall and the local drainage network. The drainage network for any development on the site will incorporate Sustainable Drainage Systems (SuDS) for the purpose for managing surface water in terms of both flow and quality.

Groundwater Flooding

Ground water flooding is a result of upwelling in occurrences where the water table or confined aquifers rises above the ground surface. This tends to occur after long periods of sustained rainfall and/or very high tides. High volumes of rainfall and subsequent infiltration to ground will result in a rising of the water table. Groundwater flooding tends to occur in low-lying areas, where with additional groundwater flowing towards these areas, the water table can rise to the surface causing groundwater flooding. The sources consulted such as the CFRAM mapping and GSI records show no indication that the Site is subject to Groundwater derived flooding.

Pluvial Flood Risk

Pluvial flooding results from heavy rainfall that exceeds ground infiltration capacity or more commonly in Ireland where the ground is already saturated from previous rainfall events. This causes ponding and flooding at localized depressions. Pluvial flooding is commonly a result of changes to the natural flow regime such as the implementation of hard surfacing and improper drainage design. The sources consulted such as the CFRAM mapping and PFRA mapping show no indication that the Site is subject to pluvial derived flooding. Pluvial flooding will be considered in the design of drainage systems as part of planned developments.

4.3 Conclusion of Stage 2 SFRA

The available sources consulted above indicate that there is fluvial flood risk arising on the site. As per the OPW Guidelines, a Stage 3 detailed flood risk assessment is required to be undertaken to confirm flood risk (water levels and flood extents) to the proposed development and determine potential flood mitigation measures.

5. STAGE 3 – DETAILED FLOOD RISK ASSESSMENT

5.1 Introduction

Stages 1 and 2 of the flood risk assessment for the proposed development have indicated that there is a potential risk of fluvial flooding. A hydraulic model has been prepared to ascertain the effects of extreme fluvial flood events at this location. This section outlines the detailed hydrological and hydraulic analysis undertaken.

5.2 Hydrological Analysis

The peak fluvial flows for 1% AEP and 0.1% AEP events were estimated for the subject catchment using a series of industry standard flow estimation methods including:

- Flood Studies Report
- Flood Studies Supplementary Report No.6
- Institute of Hydrology Report 124
- OPW FSU Portal

Estimated flows are shown in Table 5.1 below.

Table 5.1 Hydrological Flow Estimation

	Hydrological Estimation Methodology			
	FSR	FSSR No.6	IH124/ICP IN124	Flood Studies Update
Design Event	m ³ /s			
Q2	9.785	9.608	14.163	5.02
Q100	20.189	19.824	29.22	11.28
Q1000	28.223	27.713	40.849	14.65

Estimates are relatively disparate in their estimation of Q_{med}, with a difference of 300% between the minimum and maximum estimates. As the catchment is under 25Km², it would be regarded as “small” and FSR and FSU methodologies would generally be unsuitable for such a catchment, the IH124 / ICP IH124 flows become the design flow.

5.3 Hydraulic Assessment

A 1D-2D hydraulic model of the subject lands was developed using the Flood Modeller software v5.1. The model was developed with surveyed topographic and channel cross-sections and LiDAR data. A digital terrain model (DTM) of the subject lands was created using LiDAR data with points at 2m centres. The DTM was linked to the 1D model using a series of link lines that allow water to pass from the 1D domain to the 2D domain when the water level in the channel exceeds the bank levels.

Regarding additional modelling parameters (such as roughness) these were recorded as part of site visits and the model is not considered to be sensitive to minor alterations in these parameters given that the topography of the catchment and floodplain is the primary control on flood extents.

5.3.1 Hydraulic Assessment Findings

No flooding has been identified on site in the design flood event (1 in 1000 year + Climate change Factor). Flooding in lands adjacent to the proposed development site is significantly influenced by the existing Behy bridge, located approx. 500m east of the site location on the L3700. The Behy bridge represents the main constraint to flow along the reach with a head differential of > 1.5m in the design event. In comparison the newer N4 river bridge appears to have a limited impact (~100mm). Flood levels in the design event are calculated to be:

- South of site (upstream of Behy Bridge) - 52.22mOD
- North East of site (downstream of Behy Bridge) - 49.51mOD

Flood extents in relation to the site are shown in figures 5.1 and 5.2 below.

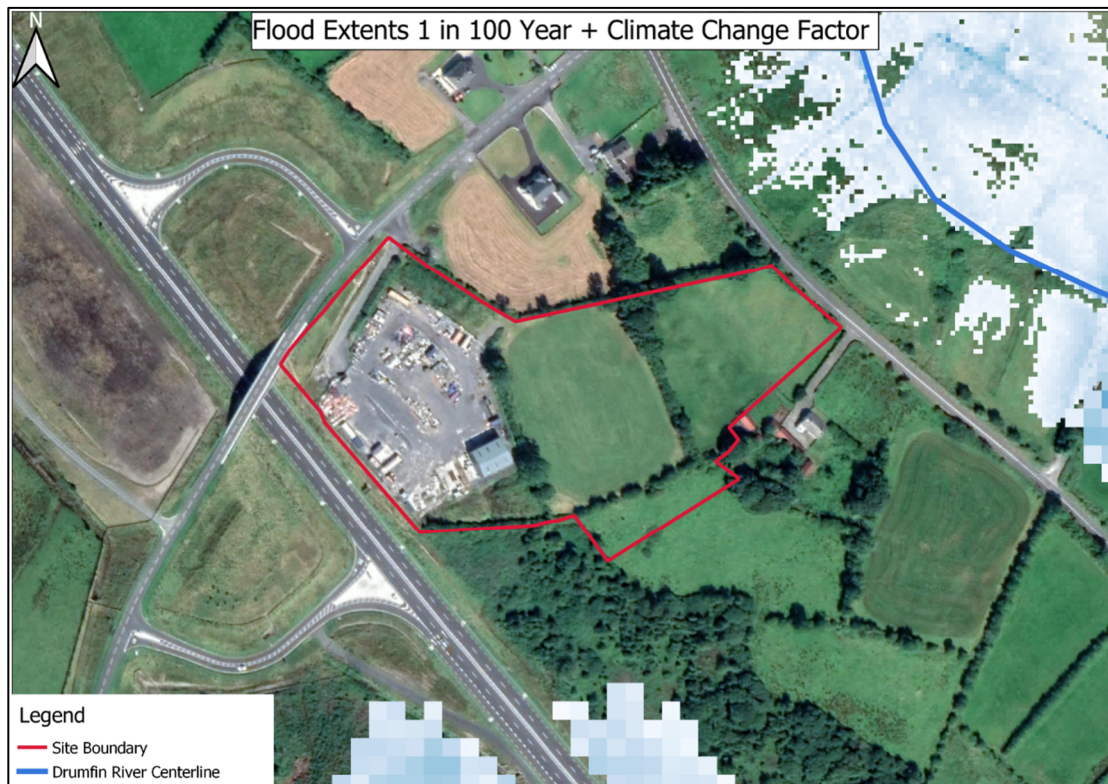


Figure 5.1 Flood Extents 1 in 100 Year + Climate Change Factor

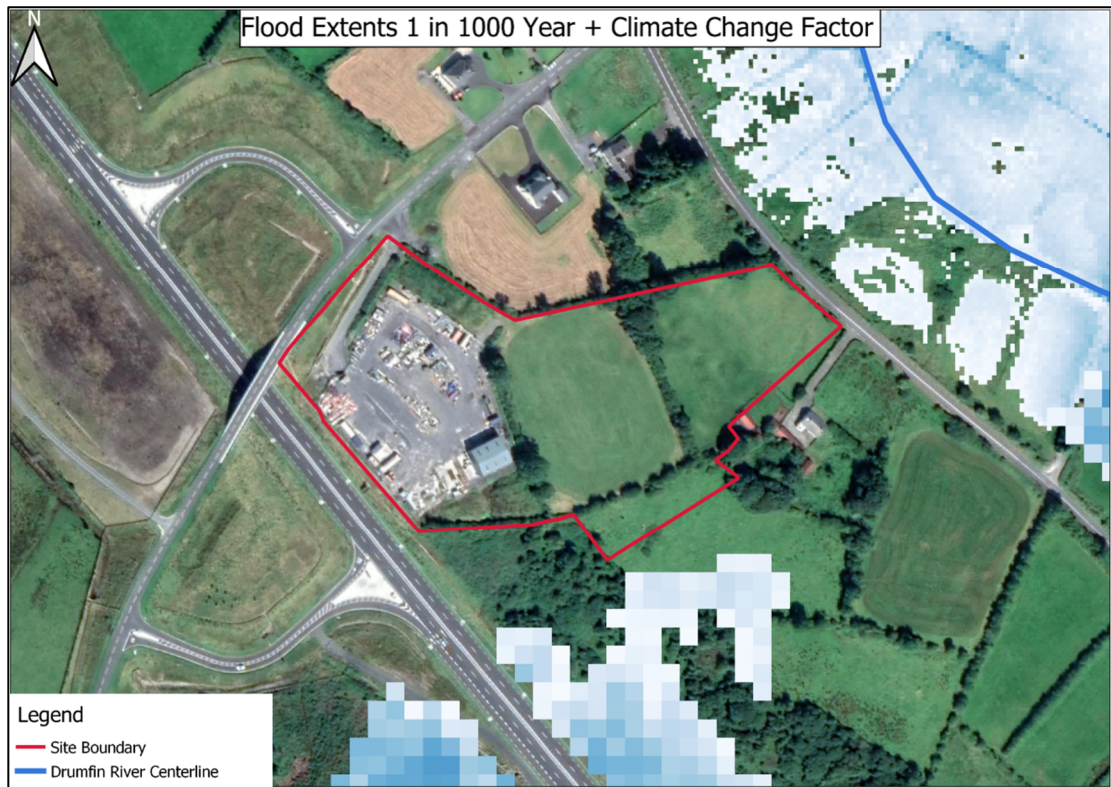


Figure 5.2 Flood Extents 1 in 1000 Year + Climate Change Factor

6. FLOOD RISK ASSESSMENT CONCLUSIONS

The proposed development has been assessed for existing and future sources of flood risk. The primary source of flood risk identified for the site is fluvial, emanating from the Drumfin River.

A hydraulic model has been prepared to ascertain the effects of extreme fluvial flood events on the site and it has been determined that the site is outside the 1 in 1000 year (+ climate change) flood extents and therefore within Flood Zone C. As such the site is appropriate for the proposed development as per the OPW's "The Planning System and Flood Risk Management Guidelines for Planning Authorities.

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Catchment: The area that is drained by a river or artificial drainage system.

Catchment Flood Risk Assessment and Management Studies (CFRAMS): A catchment-based study involving an assessment of the risk of flooding in a catchment and the development of a strategy for managing that risk in order to reduce adverse effects on people, property and the environment. CFRAMS precede the preparation of Flood Risk Management Plans (see entry for FRMP).

Climate change: Long-term variations in global temperature and weather patterns, which occur both naturally and as a result of human activity, primarily through greenhouse gas emissions.

Core of an urban settlement: The core area of a city, town or village which acts as a centre for a broad range of employment, retail, community, residential and transport functions.

Detailed flood risk assessment: A methodology to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of flood hazard and potential risk to an existing or proposed development, of its potential impact on flood elsewhere and of the effectiveness of any proposed measures.

Estuarial (or tidal) flooding: Flooding from an estuary, where water level may be influenced by both river flows and tidal conditions, with the latter usually being dominant.

Flooding (or inundation): Flooding is the overflowing of water onto land that is normally dry. It may be caused by overtopping or breach of banks or defences, inadequate or slow drainage of rainfall, underlying groundwater levels or blocked drains and sewers. It presents a risk only when people, human assets and ecosystems are present in the areas that flood.

Flood Relief Schemes (FRS): A scheme designed to reduce the risk of flooding at a specific location.

Flood Defence: A man-made structure (e.g. embankment, bund, sluice gate, reservoir or barrier) designed to prevent flooding of areas adjacent to the defence.

Flood Risk Assessment (FRA): FRA can be undertaken at any scale from the national down to the individual site and comprises 3 stages: Flood risk identification, initial flood risk assessment and detailed flood risk assessment.

Flood Risk Identification: A desk-based study to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation.

Flood Hazard: The features of flooding which have harmful impacts on people, property or the environment (such as the depth of water, speed of flow, rate of onset, duration, water quality, etc.).

Floodplain: A flood plain is any low-lying area of land next to a river or stream, which is susceptible to partial or complete inundation by water during a flood event.

Flood Risk: An expression of the combination of the flood probability, or likelihood and the magnitude of the potential consequences of the flood event.

Flood Storage: The temporary storage of excess run-off, or river flow in ponds, basins, reservoirs or on the flood plain.

Flood Zones: A geographic area for which the probability of flooding from rivers, estuaries or the sea is within a particular range.

Fluvial flooding: Flooding from a river or other watercourse.

Groundwater flooding: Flooding caused by groundwater escaping from the ground when the water table rises to or above ground level.

Initial flood risk assessment: A qualitative or semi-quantitative study to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information, to provide a qualitative appraisal of the risk of flooding to development, including the scope of possible mitigation measures, and the potential impact of development on flooding elsewhere, and to determine the need for further detailed assessment.

Freeboard: Factor of safety applied for water surfaces. Defines the distance between normal water level and the top of a structure, such as a dam, that impounds or restrains water.

Justification Test: An assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The justification test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk-based approach adopted by this guidance.

Likelihood (probability) of flooding: A general concept relating to the chance of an event occurring. Likelihood is generally expressed as a probability or a frequency of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is based on the average frequency estimated, measured or extrapolated from records over a large number of years and is usually expressed as the chance of a particular flood level being exceeded in any one year. For example, a 1-in-100 or 1% flood is that which would, on average, be expected to occur once in 100 years, though it could happen at any time.

Ordnance Datum (or OD) Malin: is a vertical datum used by an ordnance survey as the basis for deriving altitudes on maps. A spot height may be expressed as AOD for "above ordnance datum". Usually mean sea level (MSL) is used for the datum. In the Republic of Ireland, OD for the Ordnance Survey of Ireland is Malin Ordnance Datum: the MSL at Portmoor Pier, Malin Head, County Donegal, between 1960 and 1969. Prior to 1970, Poolbeg Ordnance Datum was used: the low water of spring tide at Poolbeg lighthouse, Dublin, on 8 April 1837. Poolbeg OD was about 2.7 metres lower than Malin OD.

Management Train/Treatment Train: the sequence of drainage components that collect, convey, store and treat runoff as it drains through the site.

Mitigation: The term is used to describe an action that helps to lessen the impacts of a process or development on the receiving environment. It is used most often in association with measures that would seek to reduce negative impacts of a process or development.

Pathways: These provide the connection between a particular source (e.g. high river or tide level) and the receptor that may be harmed (e.g. property). In flood risk management, pathways are often 'blocked' by barriers, such as flood defence structures, or otherwise modified to reduce the incidence of flooding.

Pluvial flooding: Usually associated with convective summer thunderstorms or high intensity rainfall cells within longer duration events, pluvial flooding is a result of rainfall-generated overland flows which arise before run-off enters any watercourse or sewer. The intensity of rainfall can be such that the run-off totally overwhelms surface water and underground drainage systems.

Regional Planning Guidelines (RPG): These provide the regional context and priorities for applying national planning strategy to each NUTS III region and encourage greater co-ordination of planning policies at the city/county level. RPGs are an important part of the flood policy hierarchy as they can assist in co-ordinating flood risk management policies at the regional level.

Resilience: Sometimes known as “wet-proofing”, resilience relates to how a building is constructed in such a way that, although flood water may enter the building, its impact is minimised, structural integrity is maintained, and repair, drying and cleaning and subsequent reoccupation are facilitated.

Receptors: Things that may be harmed by flooding (e.g. people, houses, buildings or the environment).

Residual risk: The risk which remains after all risk avoidance, substitution and mitigation measures have been implemented, on the basis that such measures can only reduce risk, not eliminate it.

Sequential Approach: The sequential approach is a risk-based method to guide development away from areas that have been identified through a flood risk assessment as being at risk from flooding. Sequential approaches are already established and working effectively in the plan-making and development management processes.

Sustainable Drainage System (SuDS): Drainage systems that are considered to be environmentally beneficial, causing minimal or no long-term detrimental impact.

Site-specific Flood Risk Assessment: An examination of the risks from all sources of flooding of the risks to and potentially arising from development on a specific site, including an examination of the effectiveness and impacts of any control or mitigation measures to be incorporated in that development.

Source: Refers to a source of hazard (e.g. the sea, heavy rainfall).

Strategic Flood Risk Assessment: The assessment of flood risk on a wide geographical area against which to assess development proposed in an area (Region, County, Town).

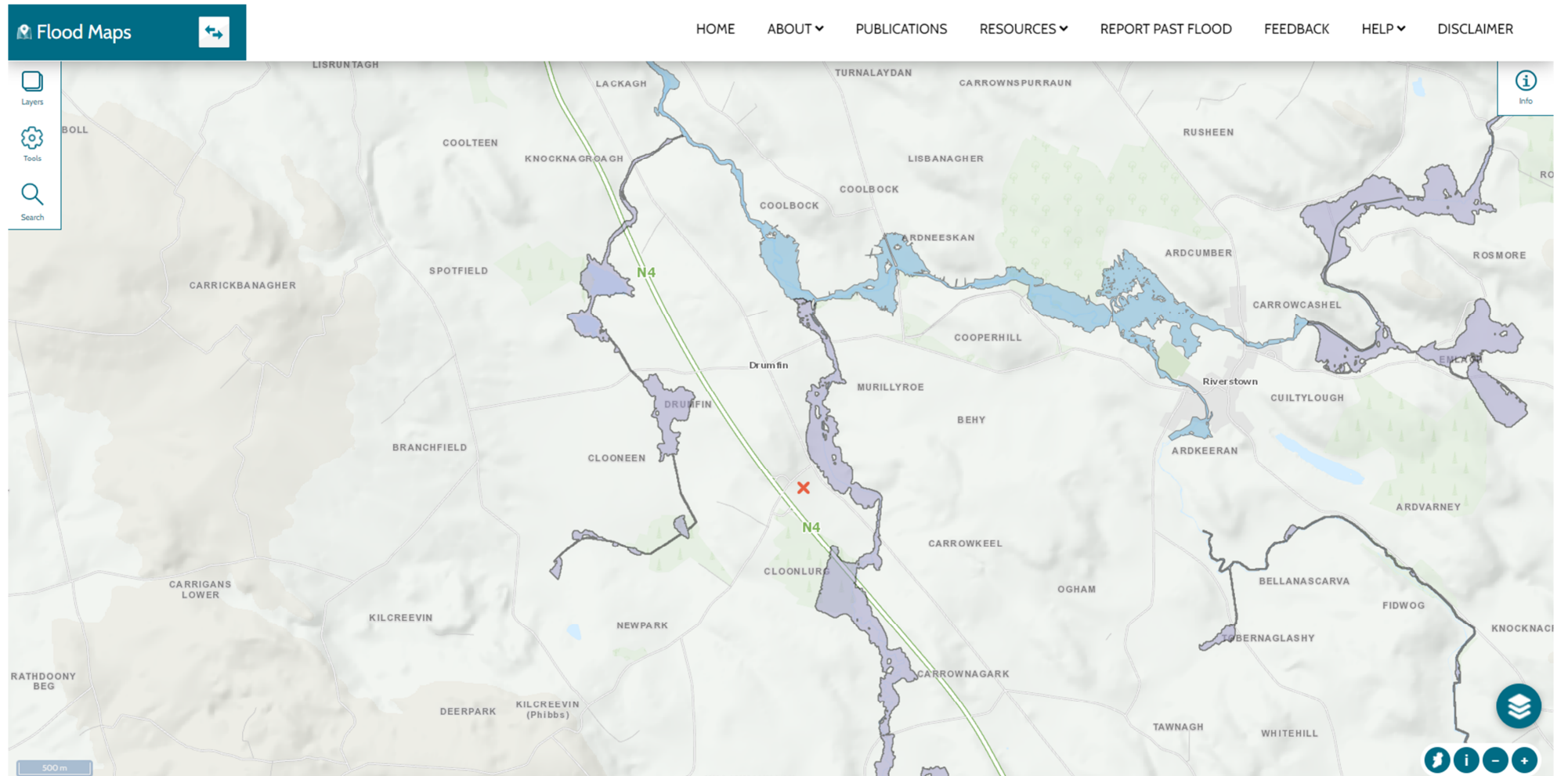
Vulnerability: The resilience of a particular group of people or types of property or habitats, ecosystems or species to flood risk, and their ability to respond to a hazardous condition and the damage or degree of impact they are likely to suffer in the event of a flood. For example, elderly people may be more likely to suffer injury, and be less able to evacuate, in the event of a rapid flood than younger people.

Source: *The definitions above are sourced from the DoEHLG Guidelines for Planning Authorities on ‘The Planning System and Flood Risk Management, 2009’ and Ciria 753 “the SuDS Manual”.*

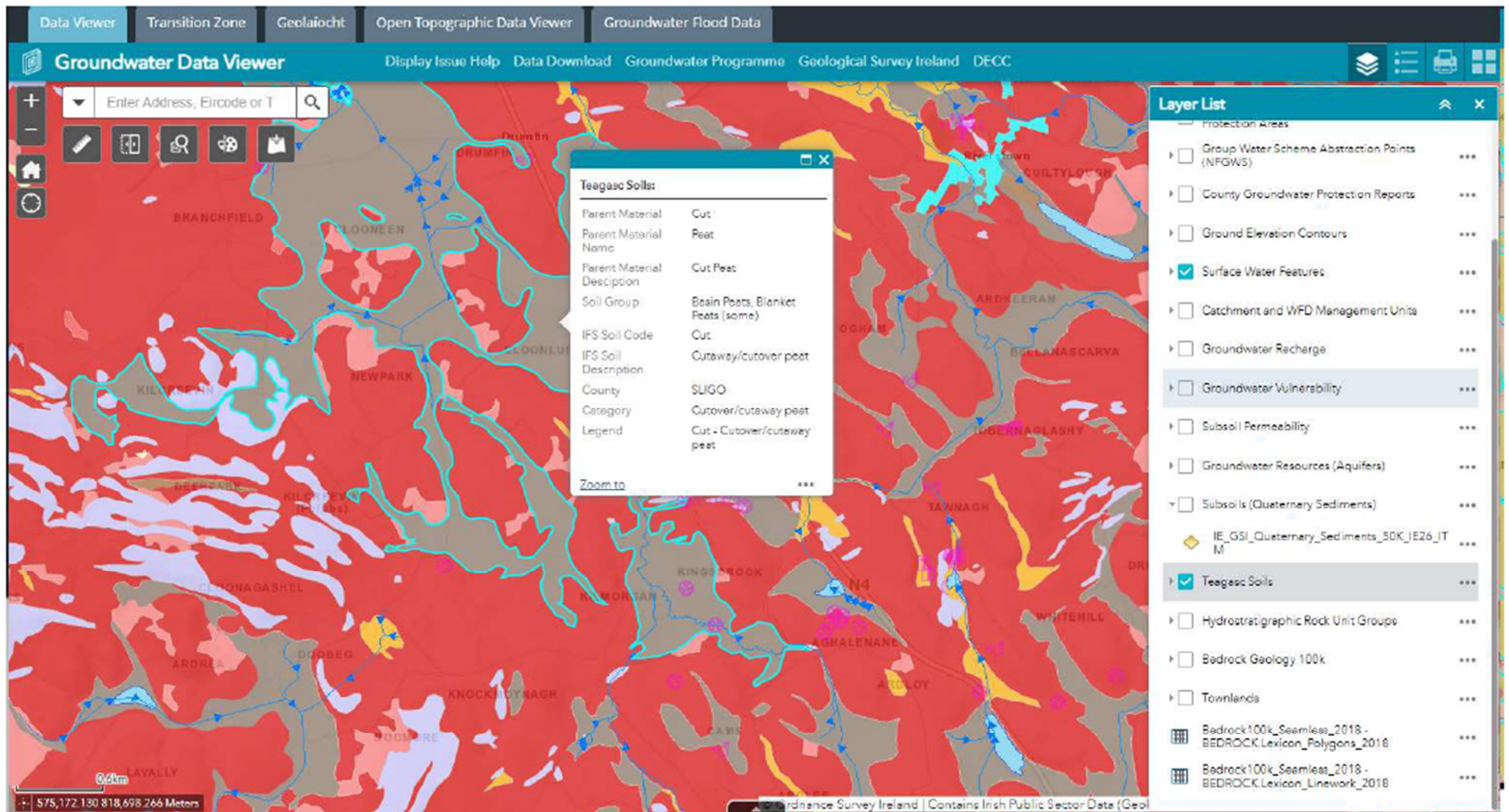
APPENDIX B

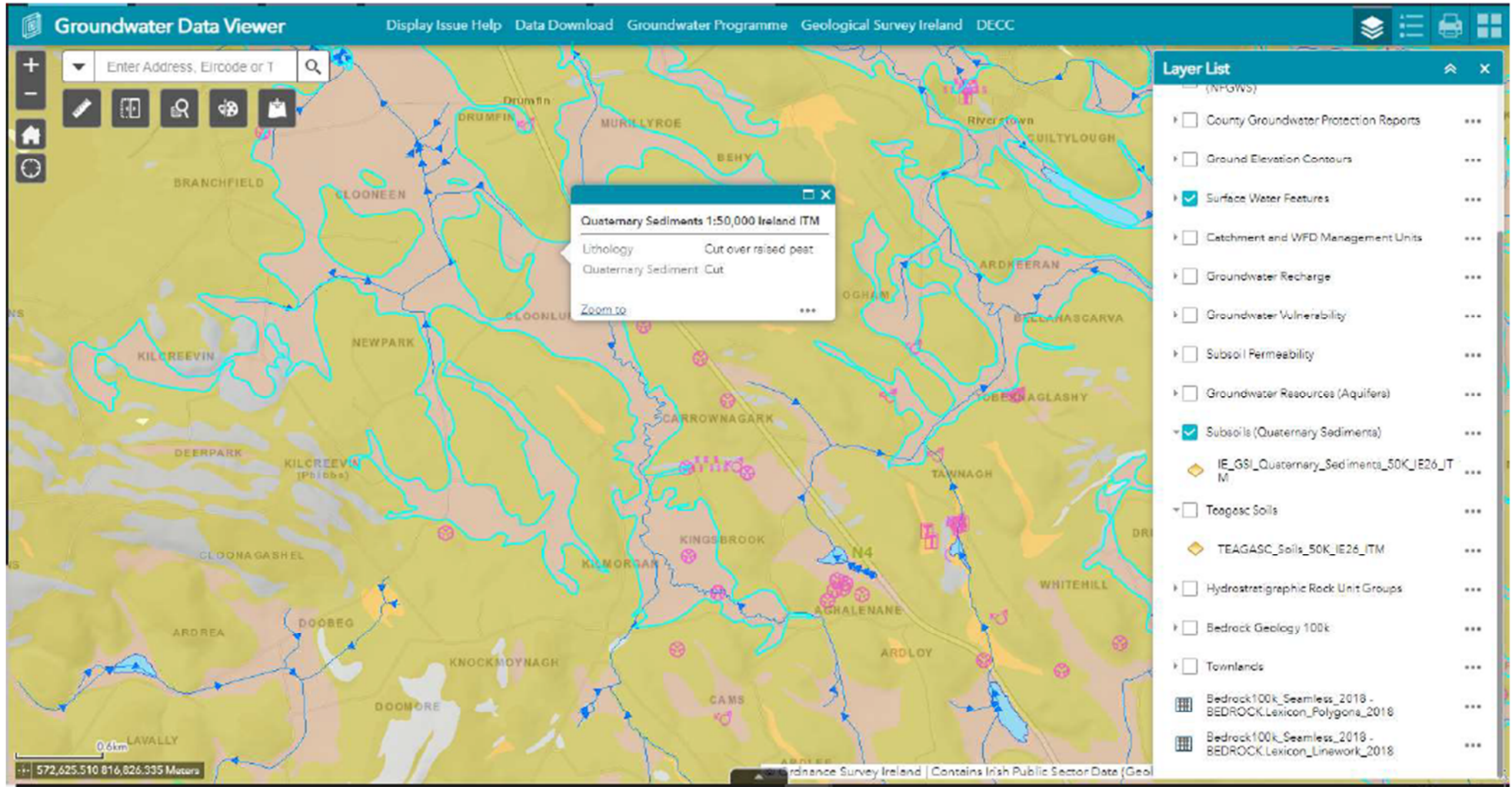
INDICATIVE FLOOD SOURCES

Catchment Flood Risk Assessment and Management Study

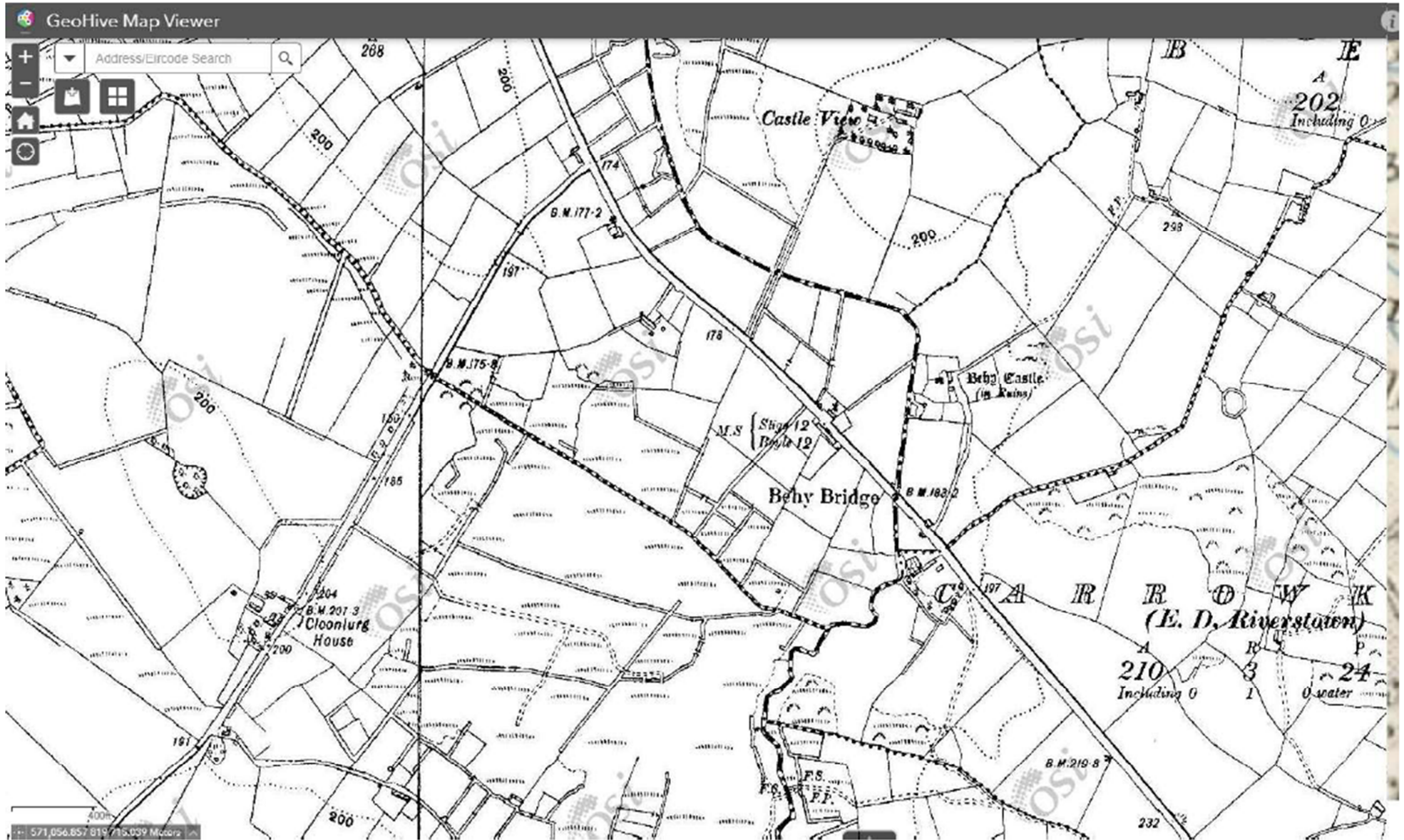


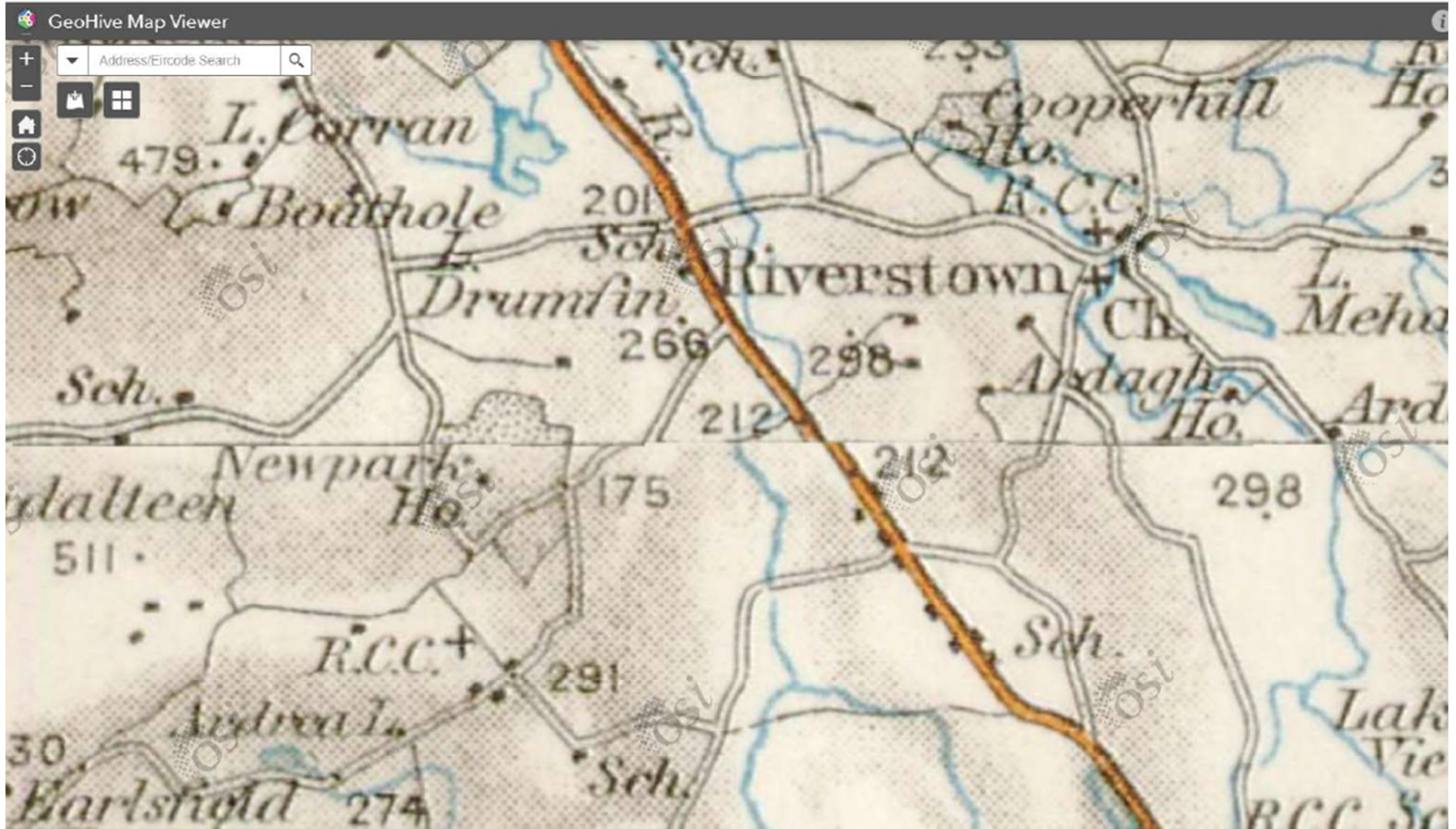
Geological Survey of Ireland: Teagasc Subsoil Mapping



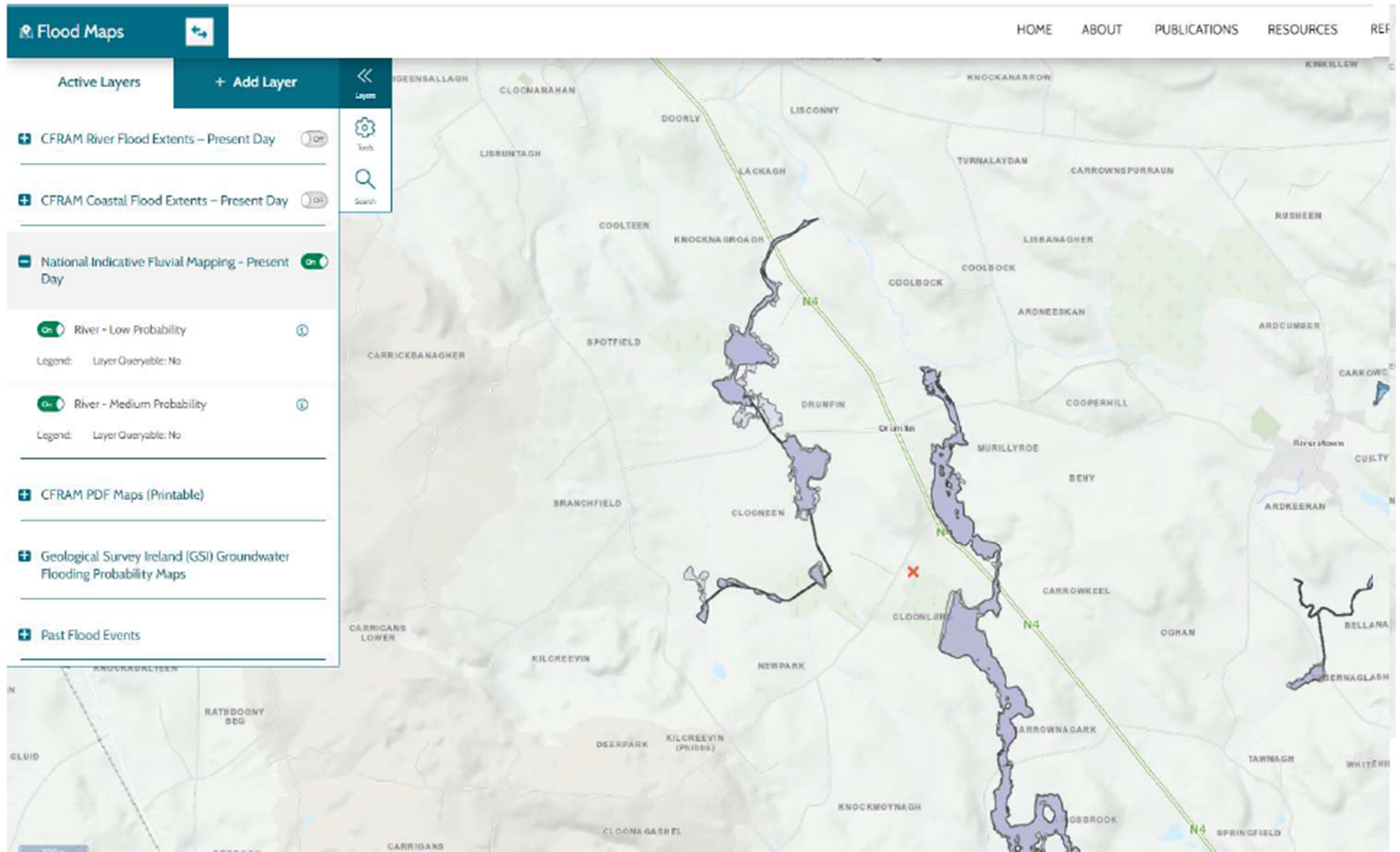


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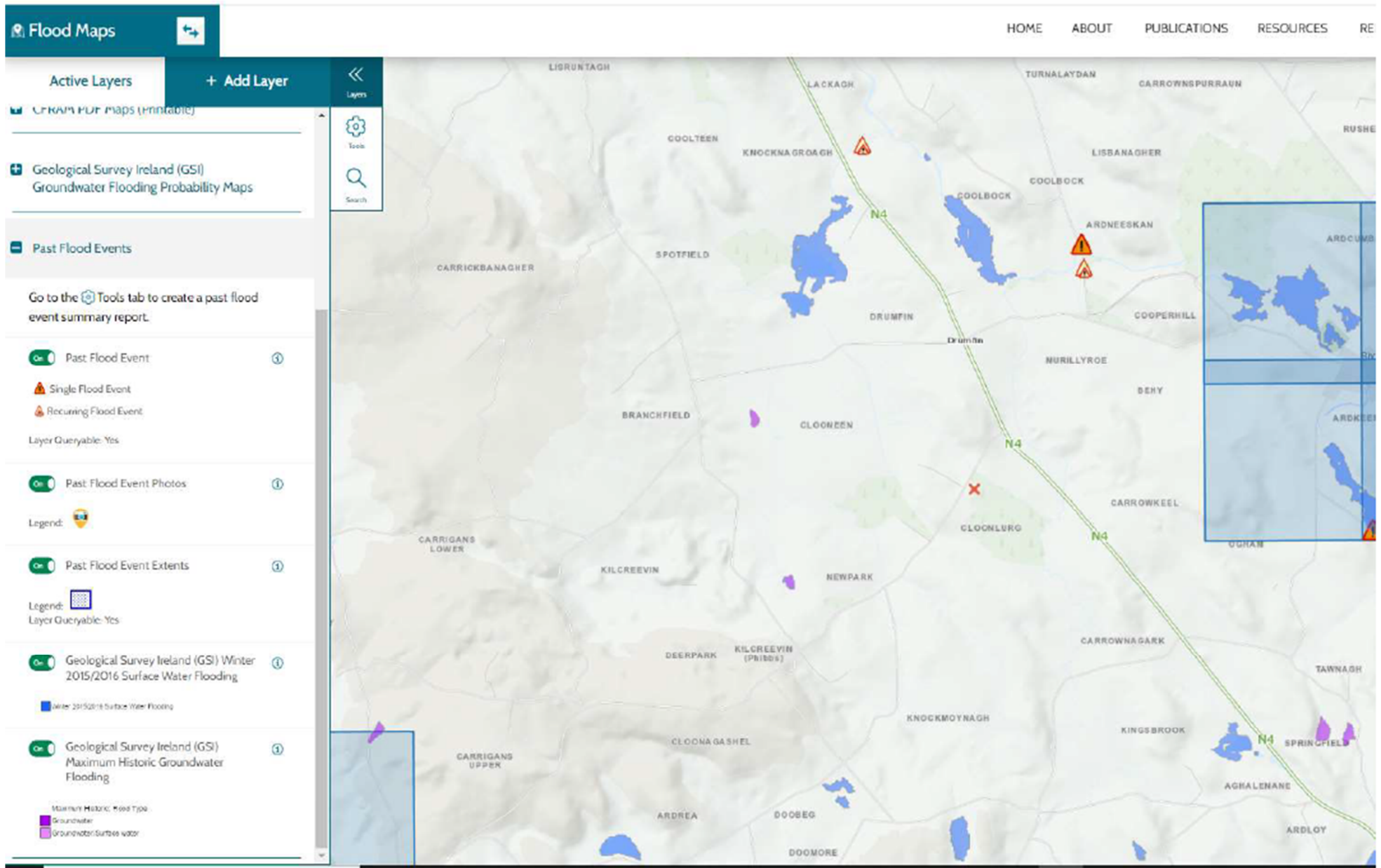




National Indicative Fluvial Mapping



OPW Past Flood Events



APPENDIX B

CULTURAL HERITAGE IMPACT ASSESSMENT

Preliminary Cultural Heritage Impact Assessment for a Proposed Strategic Road Maintenance Facility at Drumfin, County Sligo



Prepared for Roughan & O'Donovan
By Dr Fergal Donoghue

21 July 2023

TITLE PAGE

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Disclaimer

The results, conclusions and recommendations contained within this report are based on information available at the time of its preparation. Whilst every effort has been made to ensure that all relevant data have been collated, the author and AMS accept no responsibility for omissions and/or inconsistencies that may result from information becoming available subsequent to the report's completion.

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NSAI



Summary

Archaeological Management Solutions (AMS) has been engaged by Roughan & O'Donovan Consulting Engineers to conduct a desktop Cultural Heritage Impact Assessment (CHIA) for a proposed new Strategic Road Maintenance Facility at Drumfin, County Sligo.

The purpose of this assessment is to identify whether any recorded archaeological or built heritage sites, areas of archaeological potential or sites/features of cultural heritage interest or with notable history or folklore, will be impacted by the proposed development with a view to making recommendations for any mitigation measures required to avoid, prevent, reduce, or offset any likely adverse effects identified.

The CHIA will be submitted in support of a planning application to Sligo County Council for the proposed development. All archaeological works will be carried out in accordance with the *Code of Practice for Archaeology agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and Transport Infrastructure Ireland* (2017) and the programme should allow for liaison and consultation with the TII Project Archaeologist in accordance with this *Code of Practice*.

This report finds that there are three Recorded Monuments listed on the Record of Monuments and Places (RMP) within a 500m study area around the proposed development site (SL033-023---, a ringfort [rath]; SL034-001001-, a castle [tower house]; and SL034-001002-, a sheela-na-gig. There is also one site recorded on the Record of Protected Structures (RPS) for County Sligo within the study area; Behy Bridge (RPS 77). Archaeological testing and a geophysical survey were carried out in the western part of the site as part of the N4 Collooney to Castlebaldwin Archaeological Works during Construction Phase (Licence Nos. E005036, R000502). Twenty-seven test trenches were investigated across the site (Figure 9); no material of archaeological significance was noted. However, two archaeological sites were excavated within the study area during the Construction Stage of the N4 Collooney to Castlebaldwin Road Development Project, Cloonlurg 1 and Drumfin 7, which produced prehistoric remains.

There is one area of archaeological potential (AAP1) within the proposed development area. AAP1 comprises the greenfield area in the eastern two-thirds of the proposed development site in proximity to the River Unshin. This CHIA recommends that a programme of non-intrusive geophysical survey is carried out in AAP1, owing to the potential for previously unrecorded archaeological remains. Furthermore, a programme of Construction Phase archaeological testing should be undertaken in AAP1 under licences issued by the National Monument Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH), over a minimum of 10–12% of AAP1.

The results of the geophysical survey and archaeological testing will be detailed in reports (as per conditions of the granting of licences) and will be used to inform an appropriate mitigation strategy for any further archaeological works that may be necessary. Such works could include archaeological monitoring, preservation *in situ* and/or preservation by record (excavation).

Recommendations in this report are subject to the agreement of the TII-assigned Project Archaeologist, the NMS of the Department of Housing, Local Government and Heritage, the National Museum of Ireland, and the local planning authority and should only be carried out in accordance with the necessary approvals. Please note that the statutory and local authorities may issue alternative and/or additional recommendations/conditions.

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Abbreviations and Definitions

Abbreviation	Definition
AAP	Area of Archaeological Potential
AMS	Archaeological Management Solutions
CHIA	Cultural Heritage Impact Assessment
DHLGH	Department of Housing, Local Government and Heritage
DoT	Department of Transport
EPA	Environmental Protection Agency
HEV	Historic Environment Viewer
IAC	Irish Archaeological Consultancy
IFC	Irish Folklore Commission
ITM	Irish Transverse Mercator
NIAH	National Inventory of Architectural Heritage
NMS	National Monuments Services
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SAC	Special Area of Conservation
SCC	Sligo County Council
SMR	Sites and Monuments Record
TII	Transport Infrastructure Ireland
ZoN	Zone of Notification

Coordinate System

All grid coordinates in this report use the Irish Transverse Mercator (ITM) coordinate reference system unless otherwise stated.

1 Introduction

1.1 Project Background

Archaeological Management Solutions (AMS) have been engaged by Roughan & O'Donovan Consulting Engineers to prepare a Cultural Heritage Impact Assessment (CHIA) for the location of a proposed Strategic Road Maintenance Facility in the townland of Drumfin, County Sligo.

The site is located adjacent to the recently upgraded N4 Collooney to Castlebaldwin Road Development Project (hereafter referred to as the 'N4'). The facility is intended to provide a range of regional and local road maintenance services to Transport Infrastructure Ireland (TII), Department of Transport (DoT) and Sligo County Council (SCC). The regional reach will cover the northwest region, including Donegal, Sligo, Leitrim, Mayo and Roscommon.

1.2 Purpose and Scope of this Assessment

Framework and Principles for the Protection of the Archaeological Heritage (DAHGI 199, 25) states that “where it is considered that a proposed development may (due to its location, size, or nature) have archaeological implications, then an archaeological assessment should be carried out” and defines archaeological assessment as an investigation aimed at:

- 1) *Gaining a better understanding of a known or suspected archaeological site or monument with particular reference to considering the implications of proposed development for such a site or monument; and*
- 2) *Locating previously unidentified archaeological sites or monuments (or possible ones) prior to the commencement of development works with particular reference to considering the implications of proposed development for such sites or monuments.*

In line with this, the purpose of this current assessment is to provide a preliminary desktop survey and analysis of recorded archaeological sites that lie within proximity to the proposed development, as well as an initial appraisal of the archaeological potential of the development area, with a view to informing an appropriate archaeological strategy to avoid/mitigate any likely impacts that are identified.

Recorded architectural/built heritage sites within proximity to the proposed development, including Protected Structures, buildings, monuments and demesnes/historic gardens listed on the National Inventory of Architectural Heritage (NIAH) and Architectural Conservation Areas (ACAs), as well as previously unrecorded architectural heritage sites have also been identified and considered where present. The CHIA also considers whether any sites/features with notable history or folklore are in proximity to the proposed development.

1.3 Site Location

The proposed development is a 3.1-hectare (ha) site (centred on coordinates 571198, 819452) within the townland of Drumfin, County Sligo, c.16km south of Sligo town and 6km northeast of Ballymote. It is strategically located adjacent to the N4 National Road which was recently realigned and upgraded to dual carriageway between Castlebaldwin and Collooney (Figure 1).

1.4 Proposed Works

SCC proposes to construct a Strategic Road Maintenance Facility, including resilience regional salt barns, a maintenance and operation depot and a SCC machinery yard with ancillary buildings and structures to provide a range of regional and local road maintenance services to TII, DoT and SCC. The regional reach will cover the whole northwest region, including Donegal, Sligo, Leitrim, Mayo and Roscommon. The proposed layout is illustrated on Figure 2.

The main infrastructural elements proposed on the site are:

- Four Strategic Salt Barns for TII, DoT and Resilience Salt stocks.
- A two-storey Administration Building for Maintenance/Operation activities which includes internal storage area, welfare facilities, offices, and canteen facilities on the ground floor, with offices and meeting/training room on the first floor.
- A Maintenance and Operation Barn including lean-to vehicle storage and secure internal storage for maintenance and operation salt supplies.
- A Single-storey workshop and staff welfare facility for SCC.
- Ancillary structures and associated works.

The proposed salt barn building is a reinforced concrete plinth structure with a profiled metal roof housing/comprising four salt barns. Each barn will be 50.9m by 20m by 8.8m with a total floor area of 4,072m². TII/DoT's resilience salt barns will store approximately 30,000 tons of salt used to ensure that carriageways on the National Road network are kept free of frost, ice and snow as far as is reasonably practicable.

2 Methodology

The methodology used in the preparation of this assessment is broadly based on guidance for assessing development schemes provided in the Environmental Protection Agency (EPA)'s *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (EPA 2022) and *Advice Notes on Current Practice* (EPA 2003), as well as the forthcoming TII guidelines for cultural heritage assessments.¹ Distances between cultural heritage assets and the site boundary were measured from the edge of each site unless this crosses the site's extents. The study was divided into two main components: the collation of baseline data (comprising desk-based assessments) and the analysis of this data to determine any likely impacts.

2.1 Desktop Assessment

The methodology for the first component comprised a high-level desktop survey to identify all designated cultural heritage assets within a defined study area of 500m around the proposed development area. This component included a high-level desktop review of other readily available information that can provide an indication of the cultural heritage potential of the study area. The survey and review involved consultation of the sources listed in Table 1, below.

Table 1: Sources consulted for the assessment.

Data	Source
Background Information	<ul style="list-style-type: none"> • <i>Sligo County Development Plan 2017–2023</i>² • <i>Sligo County Heritage Plan 2016–2020</i>³ • Topographical/toponymic data: Lewis (1837) <i>Topographical Dictionary</i>;⁴ <i>Logainm.ie</i> (Placenames Database of Ireland); and <i>Townlands.ie</i> (Irish townlands data) • Historical sources: Wood-Martin (1889) <i>History of Sligo, County and Town</i>, vol ii, Pender (1939) <i>A census of Ireland</i> • Folklore: Irish Folklore Commission (IFC) Schools' Collection⁵ • Cartographic evidence: first-edition six-inch and 25-inch Ordnance Survey (OS) maps via State's geospatial data hub – GeoHive.⁶

¹ See: <https://www.ams-consultancy.com/tii-guidance-and-standards-project/> [Accessed: 12 June 2023].

² Available at: <https://www.sligococo.ie/cdp/> [Accessed: 21 June 2023].

³ Available at: https://www.sligococo.ie/media/SligoCountyCouncil2015/Services/Planning/Downloads/SligoHeritagePlan2016_2020.pdf [Accessed: 21 June 2023].

⁴ Available at: <https://www.askaboutireland.ie/reading-room/digital-book-collection/digital-books-by-subject/geography-of-ireland/lewis-a-topographical-dic/> [Accessed: 21 June 2023].
<https://www.logainm.ie/en/>, <https://www.townlands.ie/> [Accessed: 21 June 2023].

⁵ Available at <https://www.duchas.ie/en/cbes> [Accessed: 21 June 2023].

⁶ Available at: <https://webapps.geohive.ie/mapviewer/index.html> [Accessed: 21 June 2023].

Data	Source
	<ul style="list-style-type: none"> • Aerial and street views: Google Earth and Digital Globe;⁷ orthophotographs via GeoHive; Bing images (QGIS Web Mapping Service); Google Street View. • Previous Archaeological Investigations: Database of Irish Excavation Reports (DIER) and TII Digital Heritage Collection;⁸ and opensource LiDAR data.⁹
Designated Archaeological Heritage	<ul style="list-style-type: none"> • Record of Monuments and Places (RMP) – statutory list of protected places and monuments, with accompanying constraints maps, published for Sligo in 1995.¹⁰ • The National Monuments Service (NMS) Historic Environment Viewer (HEV) – Database of information on sites and monuments based on the RMP and Sites and Monuments Record (SMR).¹¹ The HEV provides information not only on those archaeological monuments included in the statutory RMP, but also in regard to many more which have been identified since the RMP was issued (DHLGH 2021). • List of ‘National Monuments in State Care: Ownership and Guardianship’ for County Sligo, published in 2009.¹² • List of national monuments subject to preservation orders (NMS 2019).¹³
Designated Built Heritage	<ul style="list-style-type: none"> • Sligo County RPS¹⁴ • NIAH building survey and survey of historic gardens and designed landscapes¹⁵

2.2 Walkover Survey

A Walkover Survey of the site was carried out in 2019 during the Construction Phase N4 Collooney to Castlebaldwin Road Development Project, in advance of the archaeological testing (licence E005036). The purpose of this survey was twofold: firstly, to determine the environmental condition of the study area from a cultural heritage perspective, considering in particular any evidence of risk factors; and secondly, to inspect potential cultural heritage assets and areas of archaeological potential (AAPs) that may be adversely affected by the proposed scheme, and thus formulate appropriate mitigation proposals for these impacts.

⁷ Available at: <https://maps.archaeology.ie/HistoricEnvironment/> [Accessed 21 June 2023].

⁸ Available at: www.excavations.ie and <https://repository.dri.ie/catalog/v6936m966> [Accessed 21 June 2023].

⁹ Available at: <https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b7c4b0e763964070ad69bf8c1572c9f5> [Accessed: 21 June 2023]

¹⁰ Available at: <https://www.archaeology.ie/publications-forms-legislation/record-of-monuments-and-places> [Accessed: 21 June 2023].

¹¹ Available at: <https://maps.archaeology.ie/HistoricEnvironment/> [Accessed: 21 June 2023].

¹² Available at: <https://www.archaeology.ie/national-monuments/search-by-county> [Accessed: 21 June 2023].

¹³ <https://www.archaeology.ie/sites/default/files/media/publications/po19v1-all-counties.pdf> [Accessed: 21.06.23].

¹⁴ https://www.sligococo.ie/cdp/RecordProtectedStructures_2017_2023.pdf [Accessed: 21.06.23].

¹⁵ Available at: <https://www.buildingsofireland.ie/> [Accessed: 21 June 2023].

3 Receiving Environment

3.1 Location and Topography

Drumfin townland is located in the Civil Parish of Kilmorgan and Barony of Corran in County Sligo. The proposed development site is situated at the base of an off-ramp from the N4. Lands within the eastern two-thirds of the proposed development and in the surrounding area are largely in use for agricultural purposes. The western third of the proposed development site is gravel hardcore with a corrugated roofed structure in the southeastern corner. The majority of the boundaries around the two fields in the eastern two-thirds of the proposed development site are formed by mature trees. There is a farm complex and access road bordering the site to the east. There is also a watercourse, the Unshin river, to the east of the proposed development within the study area (Figure 3–Figure 7). Table 2 shows the townlands considered as part of this CHIA with an interpretation of the townland name derived from the Townlands Database.

Table 2: Townlands in the study area.

Townland Name (English)	Townland Name (Irish)	Suggested Meaning	Permanent Weblink
Behy	<i>An Bheithigh</i>	'Birch, birchland'	https://www.logainm.ie/en/57324
Cloonlurg	<i>Cluain Lorg</i>	'Plain/lawn of the tracks'	https://www.logainm.ie/en/45294
Drumfin	<i>Droim Foinn</i>	'White ridge'	https://www.logainm.ie/en/45298
Murillyroe	<i>An Mhuinchille Rua</i>	'Red Sleeve'	https://www.logainm.ie/en/57333

3.2 Archaeological and Historical background

3.2.1 Prehistoric Period (c.7000BC–AD400)

County Sligo is rich in prehistoric remains with at least 195 recorded megalithic tombs in the county (Ó Nualláin 1989, 1). Each of the four main types of megalithic tomb are well represented in the county indicating that there has been settlement in County Sligo since at least the Neolithic period. While there are no recorded prehistoric monuments within the site boundary, archaeological investigations in advance of and during the construction of the N4 discovered burnt mounds in the townlands of Drumfin and Cloonlurg in proximity to the proposed development (see Section 3.7 for further detail).

3.2.2 Early Medieval Period (AD400–1100)

Of the three Recorded Monuments that are located within the study area (see Section 3.4), one consists of an early medieval ringfort (SL033-023----), in the townland of Cloonlurg (see Figure 3 & Figure 5–Figure 8). Ringforts are a common site type in the Irish landscape reflecting settlement in the early medieval period and are amongst the most numerous monument type in Ireland. They represent the enclosed farmsteads of relatively prosperous farmers. The majority were constructed over a 300-

year period from the beginning of the seventh until the end of the ninth-century AD (Stout 1997, 24). They are subdivided into circular or subcircular enclosures with earthen encircling banks and ditches known as a *rath* or *lios* and those of drystone construction known as *cashels* or *cahers*.

3.2.3 Medieval Period (AD1100–1600)

There are two Recorded Monuments dating to this period within the study area in the townland of Behy – a castle (SL034-001001-) and a sheela-na-gig (SL034-001002-). The castle was a former tower house, which appears to have been in ruins from at least the late eighteenth-century. The sheela-na-gig is built into the walls of a nearby nineteenth-century farm building, which also contains other carved stones derived from the tower house (Source: HEV; see Appendix 1).

There are no documentary references to Drumfin until the early-seventeenth century. The earliest identified reference to the townland comes from the *Rentals of the estates of landed proprietors of the county Sligo in the years 1633–6*. These were transcribed from the original manuscripts and published by Wood-Martin in the late-nineteenth century (Wood-Martin 1889, 173–74). These rentals suggest that the land was let to the O’Benaghan family with Drumfin (*sic*) valued at £8. Following this, the next documentary evidence comes from mid- to late-seventeenth century sources, namely – ‘A *Census of Ireland circa 1659*’ edited by Pender (1939) and the *Books of Survey and Distribution: County Sligo Part of Killmurrough Parish Corran Barony* (available online).¹⁶ The former source provides a tenuous population estimate of four for the townland (Pender 1939, 602) and the latter suggests a change of ownership and indicates the extent of the townland.

3.2.4 Post-Medieval/Modern

Following the medieval period, documented references to Drumfin come from the early- to mid-nineteenth century. These references are typical of this period and generally deal with the valuation of the townlands and their extent, with surveys from the time such as Lewis’s *Topographical Dictionary* and the *Parliamentary Gazetteer* (of unknown authorship) describing the parish of Kilmorgan, of which Drumfin is a part, as “principally under tillage with some pasture land and bog” (Lewis 1837, Vol. ii, 189) and “the land is of varying quality” (*Parliamentary Gazetteer* 1846, Vol. ii, D-M, 519).

3.2.5 Historical Maps of Drumfin

The seventeenth-century Down Survey map for the Barony of Corran does not show any specific detail

¹⁶ Available at:

<https://virtualtreasury.ie/item?isadgReferenceCode=NAI%20QRO%201%2F1%2F3%2F14%2F8%2F1> [Accessed: 21 June 2023].

for Drumfin. The townland is shown as a largely empty area with no structures indicated.¹⁷ The location of the proposed development site is next depicted cartographically on the first-edition six-inch OS map (published in 1838; Figure 5). This shows the proposed development site bounded by a road (now the L1502) on the west with another road bounding the site to the northeast and townland/field boundaries on the north, south and east. There is also a field boundary (CH23) along the centre of the site. There is a rectangular structure (CH15) shown to the east of the proposed development site, which is on the site of the modern farm complex noted previously. It appears to have either been fully or partially replaced in the interim with the 25-inch OS map showing little change.

3.3 Folklore

There are approximately 40 references to folklore recorded in the IFC Schools' Collection relating to Drumfin, some of which are presented in Appendix 1. A number of these relate to the roads in the area and how one was previously used as a mail coach road, while another entry discusses an old road, which predated the Sligo to Drumfin road and crossed a ford at Behey (Behy) and purports that this was the oldest road in the country. A further road-related story talks about the road from Riverstown to Drumfin being tarred in the 1920s.

Another tale recounts how a slighted fiddler from Ballymote was responsible for sending a plague of rats to two houses in Drumfin. While two stories discuss the number of households in the townlands and how emigration was a factor in the abandonment of former thatched houses. Two of the stories in the collection recall Behy Castle (RMP SL034-001001-) which is in the east of the study area. Thomas Porter suggests that the castle was an O'Connor stronghold, whereas the detail in the HEV suggests it was a McDonagh castle. Kathleen Ingram mentioned a "little red man" carved on a stone adjacent to the castle, which is likely to refer to the sheela-na-gig (SL034-001002-) at Behy castle.

3.4 Designated Archaeological Heritage

There are no designated archaeological sites within the boundary of the proposed development site. In the wider 500m study area, there are three Recorded Monuments which are listed in Table 3 below with their locations shown in Figure 3. Further details relating to these sites, based on the online HEV, are presented in Appendix 2.

¹⁷ Available at: <http://downsurvey.tcd.ie/down-survey-maps.php#bm=Corran&c=Sligo> [Accessed: 21.06.23].

Table 3: Designated archaeological sites within the 500m study area.

Reference	Designation	Site Type	Townland	ITM	Distance
SL033-023----	RMP	Ringfort - rath	Cloonlurg	570658, 819207	440m
SL034-001001-	RMP	Castle - tower house	Behy	571763, 819363	410m
SL034-001002-	RMP	Sheela-na-gig	Behy	571780, 819358	410m

3.5 Areas of Archaeological Potential

There is one area of archaeological potential (AAP1) within the proposed development area. AAP1 comprises the greenfield area in the eastern two-thirds of the proposed development site. It is considered to be of medium to high archaeological potential due to its proximity to the excavated archaeological remains identified during the Construction Phase of the N4 Coolooney to Castlebaldwin (Section 3.7), as well as its proximity to the River Unshin. Archaeological test excavations and a geophysical survey were carried out on the eastern third of the site, which was used as a site compound during the construction of the N4 (See Section 3.7).

Table 4: Areas of Archaeological Potential

Reference	ITM (centroid)	Description	Archaeological Potential/Risk
AAP1	571243, 819477	Greenfield area within site boundary	Medium to high

3.6 Undesignated Cultural Heritage

Historical OS maps (first-edition six-inch and 25-inch, published in 1838 and 1913) and satellite imagery (Bing and Google Satellite) were consulted to identify where buildings or features of potential cultural heritage (CH) interest were located within the study area. These undesignated cultural heritage assets have been assigned a CH number and are listed in Table 5 with their locations shown in Figure 4–Figure 7.

Table 5: Undesignated cultural heritage assets within the study area.

Asset Ref.	Site Type	Townland	Source	ITM_E	ITM_N	Distance from Site Boundary
CH01	Cluster of houses	Drumfin	OS 6-inch map	571250	819664	140m
CH02	Village	Drumfin	OS 6-inch map	571163	819916	365m
CH03	Trig Station	Drumfin	OS 6-inch map	570933	819874	370m
CH04	Wooded feature	Cloonlurg	OS 6-inch map	570978	819310	176m
CH05	Structure	Cloonlurg	OS 6-inch map	570792	819047	495m
CH06	Structure	Cloonlurg	OS 6-inch map	570833	819015	485m
CH07	Structure	Drumfin	OS 6-inch map	571654	819239	385m
CH08	Structure	Drumfin	OS 6-inch map	571638	819260	363m

Asset Ref.	Site Type	Townland	Source	ITM_E	ITM_N	Distance from Site Boundary
CH09	School house	Drumfin	OS 6-inch map	571639	819293	355m
CH10	Structure	Drumfin	OS 6-inch map	571605	819292	322m
CH11	Structure	Drumfin	OS 6-inch map	571613	819321	322m
CH12	Structure	Drumfin	OS 6-inch map	571558	819343	259m
CH13	Cluster of houses	Drumfin	OS 6-inch map	571475	819436	128m
CH14	Structure	Drumfin	OS 6-inch map	571423	819427	114m
CH15	Structure	Drumfin	OS 6-inch map	571349	819449	24m
CH16	Cluster of houses	Drumfin	OS 6-inch map	571697	819771	424m
CH17	Benchmark	Drumfin	OS 25-inch map	571147	819927	425m
CH18	Benchmark	Drumfin	OS 25-inch map	571722	819203	463m
CH19	Mile Stone	Drumfin	OS 25-inch map	571601	819299	313m
CH20	Large House	Drumfin	OS 25-inch map	571693	819743	405m
CH21	Smithy	Drumfin	OS 25-inch map	571126	819925	374m
CH22	Kilmorgan School	Drumfin	OS 25-inch map	571129	820009	458m

3.7 Previous Archaeological Investigations

Archaeological testing and a geophysical survey were carried out in the western part of the site as part of the N4 Collooney to Castlebaldwin Archaeological Works during Construction Phase (Licence Nos. E005036, R000502), when this site was used as a temporary site compound. A number of geophysical anomalies and small-scale positive responses were detected during the geophysical survey. Twenty-seven test trenches were investigated across the site (Figure 9); however, no material of archaeological significance was noted (McKee, Smith & McCormack 2022, 49–50).

Two archaeological sites were excavated within the study area during the Construction Stage of the N4 Collooney to Castlebaldwin Road Development Project (Hardy *et al.* 2022). Cloonlurg 1¹⁸ was located c.100m from the edge of proposed development boundary, while Drumfin 7¹⁹ was c.205m from the site boundary. The remains at Cloonlurg 1 consisted of two burnt mounds and a timber-lined trough that were situated to the north of a narrow watercourse, a tributary of Drumfin River (Figure 8). Drumfin 7, which was 305m to northwest of Cloonlurg 1, consisted of a burnt mound and associated trough, as well as a possible food processing area. Further details about these investigations are included in Appendix 3.

¹⁸ DIER 2019:711. Registration No. E005051 (Ministerial Directions: A071).

¹⁹ DIER 2017:683. Registration No. E004881 (Ministerial Directions: A071).

In addition, several other prehistoric burnt mound sites were excavated during the Construction Stage of the N4 Collooney to Castlebaldwin Road Development Project (Hardy *et al.* 2022), which demonstrate the archaeological potential of this area.

3.8 Designated Built Heritage

There is one site recorded on the RPS within the study area, comprising Behy Bridge (RPS 77) (Table 6; Figure 3; Figure 6).²⁰

Table 6: Recorded architectural heritage sites within the study area.

RPS	Designation	Site Type	Townland	ITM (centre)	Approx. Distance
77	Protected Structure	Bridge	Behy	571704, 819186	450m

²⁰ SCC RPS: https://www.sligococo.ie/cdp/RecordProtectedStructures_2017_2023.pdf [Accessed: 23 June 2023].

4 Likely Impacts

4.1 Designated Archaeological Heritage

No impacts arising from the proposed development are predicted for any designated archaeological heritage assets.

4.2 Areas of Archaeological Potential

There is one area of archaeological potential (AAP1) within the proposed development area. AAP1 comprises the greenfield area in the eastern two-thirds of the proposed development site. It is considered to be of medium to high archaeological potential due to its proximity to the archaeological remains excavated during the Construction Phase of the N4 Coolooney to Castlebaldwin, and the River Unshin. AAP1 will be directly impacted by the proposed development.

4.3 Undesignated Cultural Heritage

No impacts are predicted for any of the undesignated cultural heritage assets (CH01–CH22).

4.4 Designated Built Heritage Sites

No impacts are predicted for any designated built heritage sites arising from the proposed development.

5 Conclusions and Recommendations

There is one area of archaeological potential (AAP1) within the proposed development area. AAP1 comprises the greenfield area in the eastern two-thirds of the proposed development site in proximity to the River Unshin. This CHIA recommends that a programme of non-intrusive geophysical survey is carried out in AAP1, owing to the potential for previously unrecorded archaeological remains. Furthermore, a programme of Construction Phase archaeological testing should be undertaken in AAP1 under licences issued by the National Monument Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH), over a minimum of 10–12% of AAP1.

All archaeological works should be carried out in accordance with the *Code of Practice for Archaeology agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and Transport Infrastructure Ireland* (2017).

The results of the geophysical survey and archaeological testing will be detailed in reports (as per conditions of the granting of licences) and will be used to inform an appropriate mitigation strategy for any further archaeological works that may be necessary. Such works could include archaeological monitoring, preservation *in situ*, and/or preservation by record (excavation). Appropriate time will need to be included in the programme of works for revisions to the Method Statement, licence details and liaison/consultation with the TII Project Archaeologist, as per the *Code of Practice for Archaeology*.

Recommendations in this report are subject to the agreement of the TII Project Archaeologist, the NMS of the Department of Housing, Local Government and Heritage, the National Museum of Ireland, and the local planning authority and should only be carried out in accordance with the necessary approvals. Please note that the statutory and local authorities may issue alternative and/or additional recommendations/conditions.

References

- Anon 1846. *The Parliamentary Gazetteer of Ireland, adapted to the new poor law franchise, municipal and ecclesiastical arrangements, and compiled with a special reference to the lines of railroad and canal communication as existing in 1844–45*. Vol. ii. D–M. Dublin: A. Fullarton & Co.
- Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI). 1999. *Framework and Principles for the Protection of the Archaeological Heritage*. Available at: <https://www.archaeology.ie/sites/default/files/media/publications/framework-and-principles-for-protection-of-archaeological-heritage.pdf> [Accessed: June 2023].
- Department of Heritage, Local Government, and Housing (DHLGH). 2021. *Archaeology in the Planning Process*. Available at: <https://www.archaeology.ie/sites/default/files/media/publications/archaeology-planning-process-pl13.pdf> [Accessed June 2023].
- EPA 2003. *Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements)*. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/EPA_Advice_Notes-on_Current-Practice-on-prep-EIS_2003.pdf [Accessed: June 2023].
- EPA 2022. *Guidelines on the Information to be contained in Environmental Impact Assessment Reports*. EPA. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf [Accessed: June 2023].
- Hardy, C., McKee, J., Smith, F. C., Marshall, S., Rice, K. & Ginn, V. 2022. Final Excavation Report for Cloonlurg 1 (E005051), N4 Collooney to Castlebaldwin Road Development Project (Construction Stage). Unpublished report by AMS for Roadbridge.
- Lewis, S. 1837. *A Topographical Dictionary of Ireland*. London: Lewis & Co.
- McKee, J., Smith, F.C., & McCormack, L. 2022. Archaeological Monitoring and Test Excavation Report for the N4 Collooney to Castlebaldwin Road Project (at Construction Stage). Unpublished report by AMS for Roadbridge.
- Ó Nualláin, S. 1989. *Survey of the Megalithic Tombs of Ireland, Vol. V, County Sligo*. Available at: <https://www.archaeology.ie/sites/default/files/media/publications/smi-vol-5-text.pdf> [Accessed: June 2023].
- Pender, S. 1939. *A Census of Ireland circa 1659, with supplementary material from the poll money ordinances (1660–1661)*. Dublin: The Stationery Office.
- Stout, M. 1997. *The Irish Ringfort*. Dublin: Four Courts Press.
- Wood-Martin, W.G. 1889. *History of Sligo, County and Town, Vol. 2*. Dublin: Hodges Figgis & Co.

Online Sources

- Virtual Record Treasury of Ireland. Available at: <https://virtualtreasury.ie/>. [Accessed: June 2023].
- Down Survey Project, Trinity College Dublin. Available at <https://downsurvey.tchpc.tcd.ie/down-survey-maps.php> [Accessed: June 2023].

Cartographic Sources

- First-Edition Six-Inch Ordnance Survey Map (Surveyed 1836, Published 1838).
- First-Edition 25-Inch Ordnance Survey Map (Surveyed 1911, Published 1913).

Figures

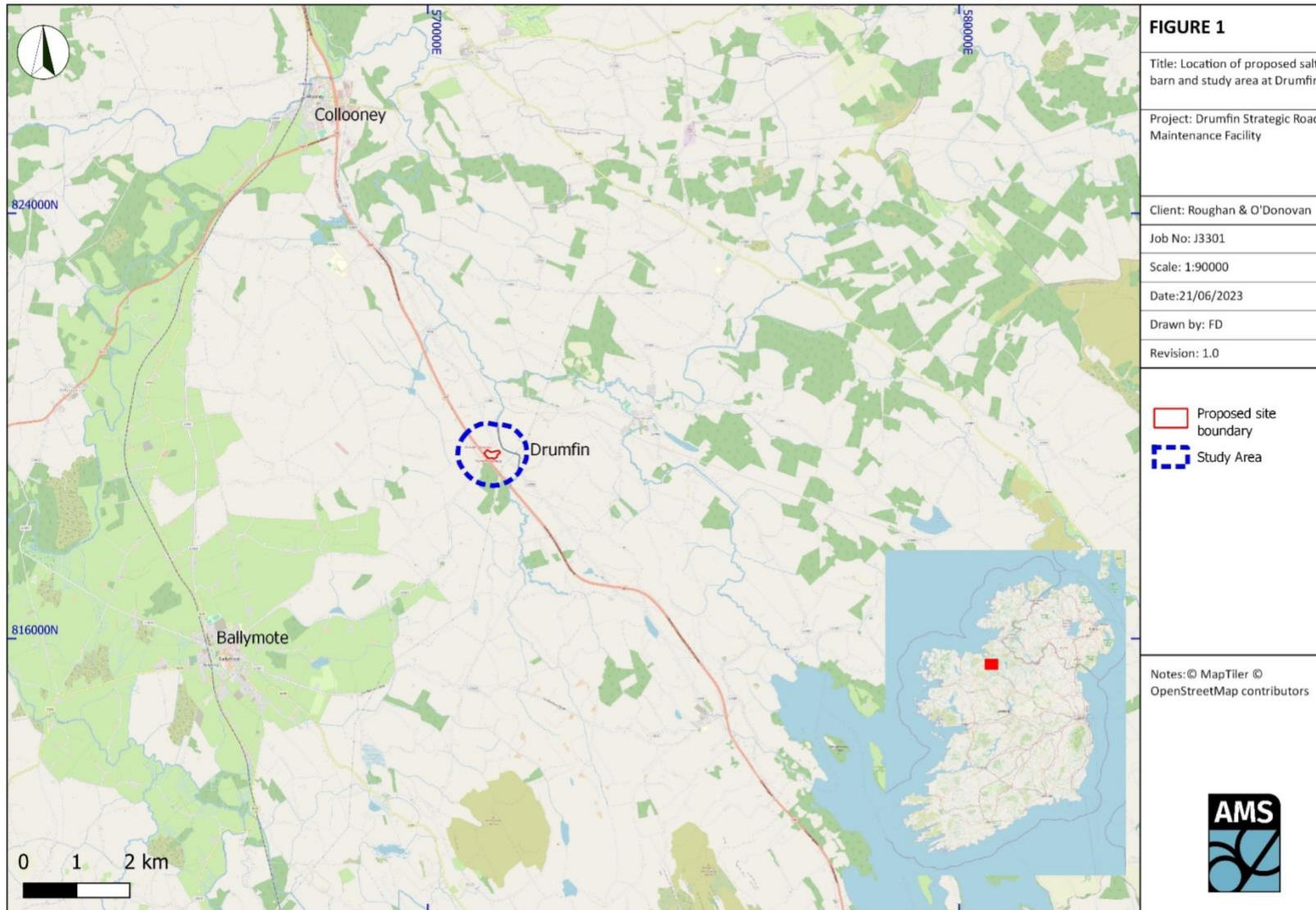


Figure 1: Site location.



Figure 2: Proposed site layout (drawing provided by client).

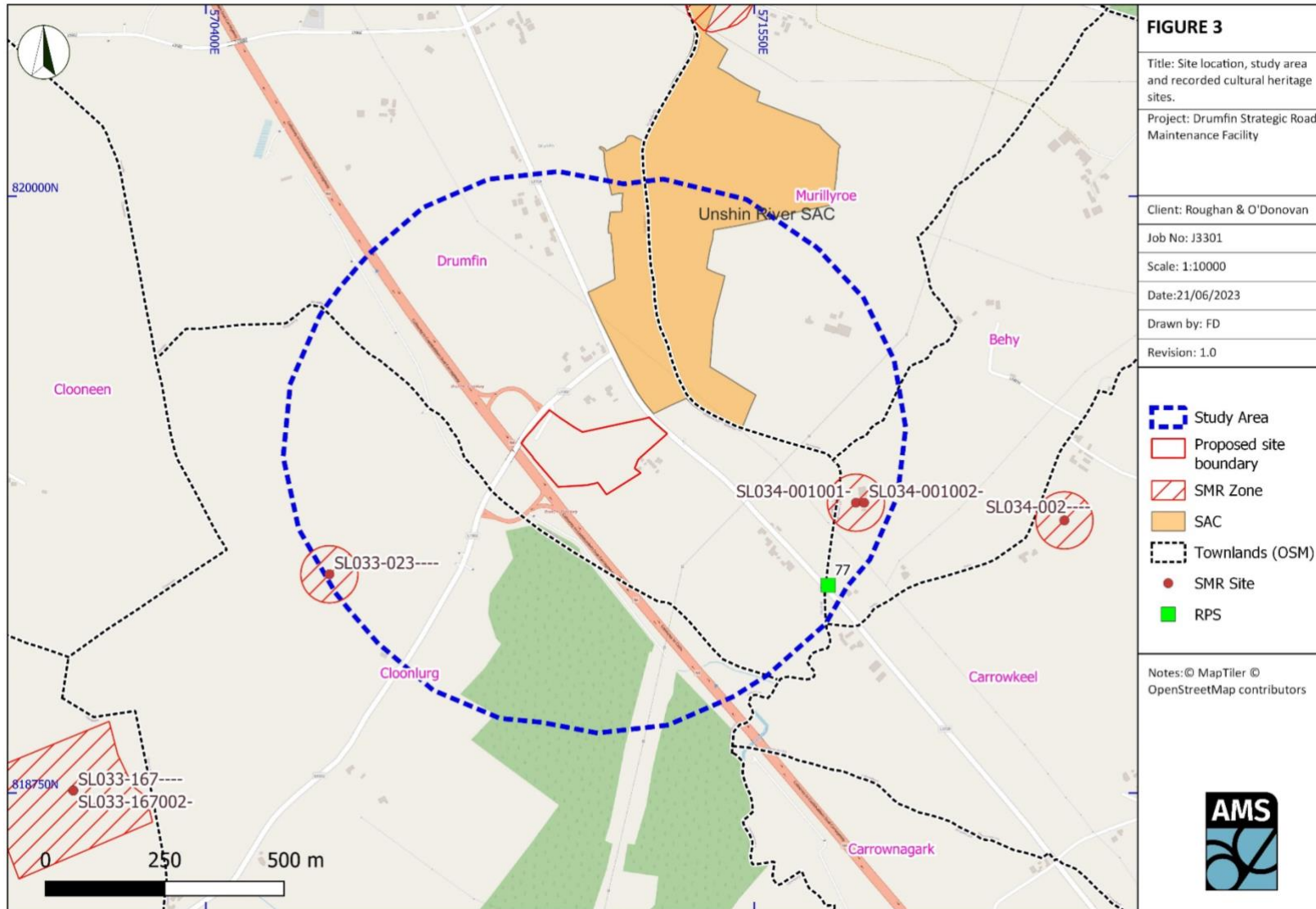


Figure 3: Site location, study area and designated cultural heritage assets.

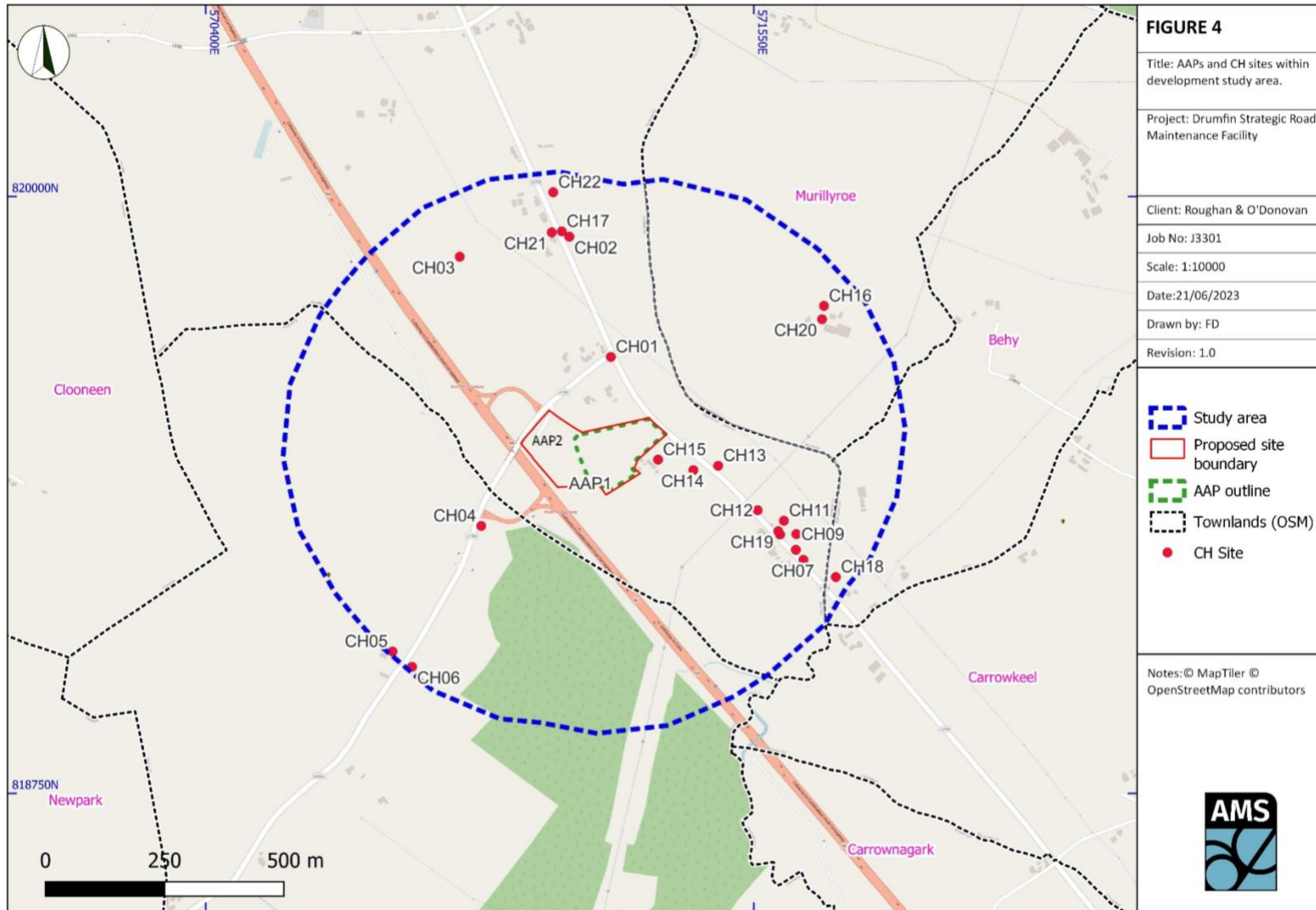


Figure 4: AAPs and CH sites within the study area.

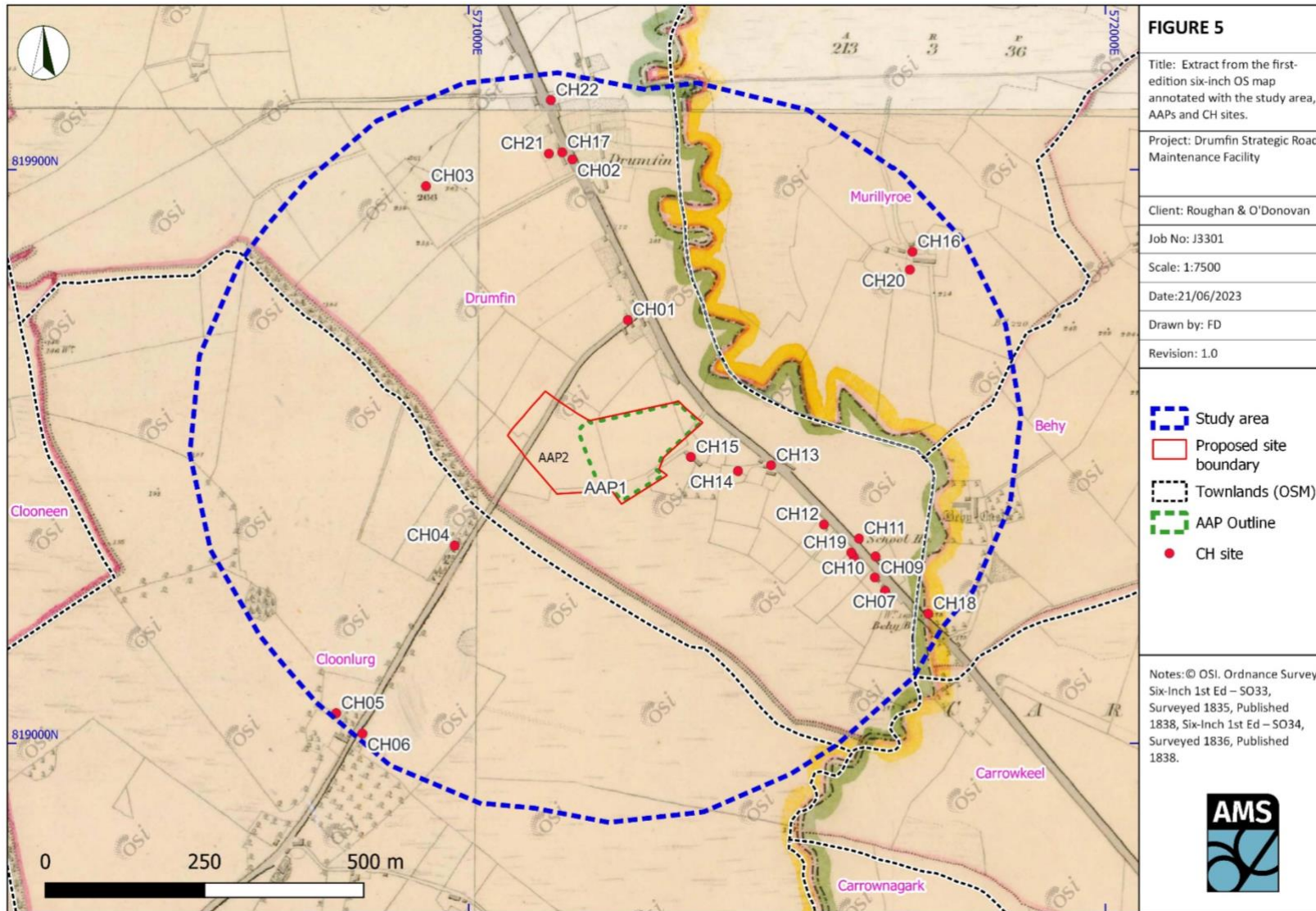


Figure 5: Extract from the first-edition six-inch OS map annotated with the study area, AAPs and CH sites.

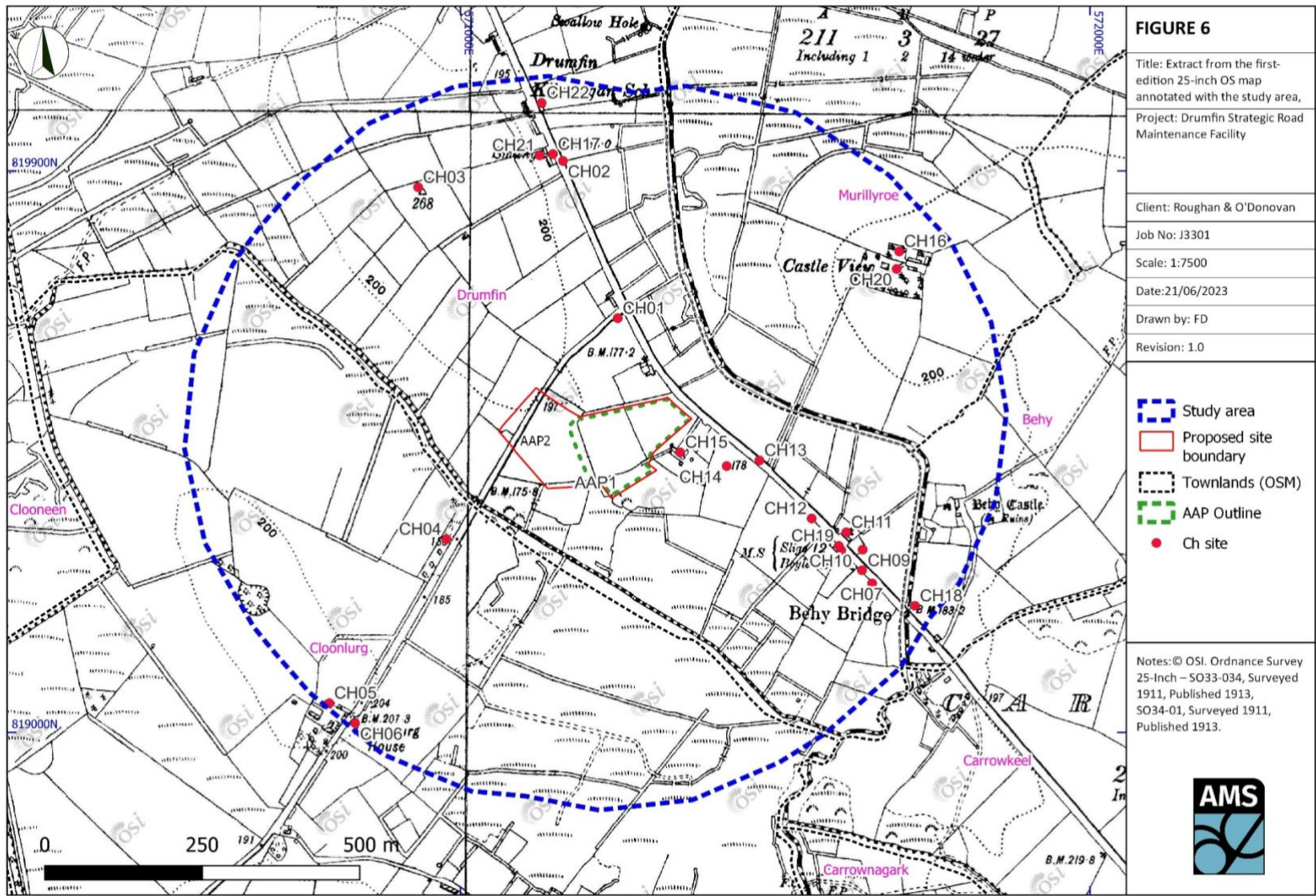


Figure 6: Extract from the first-edition 25-inch OS map annotated with the study area, AAPs and CH sites.

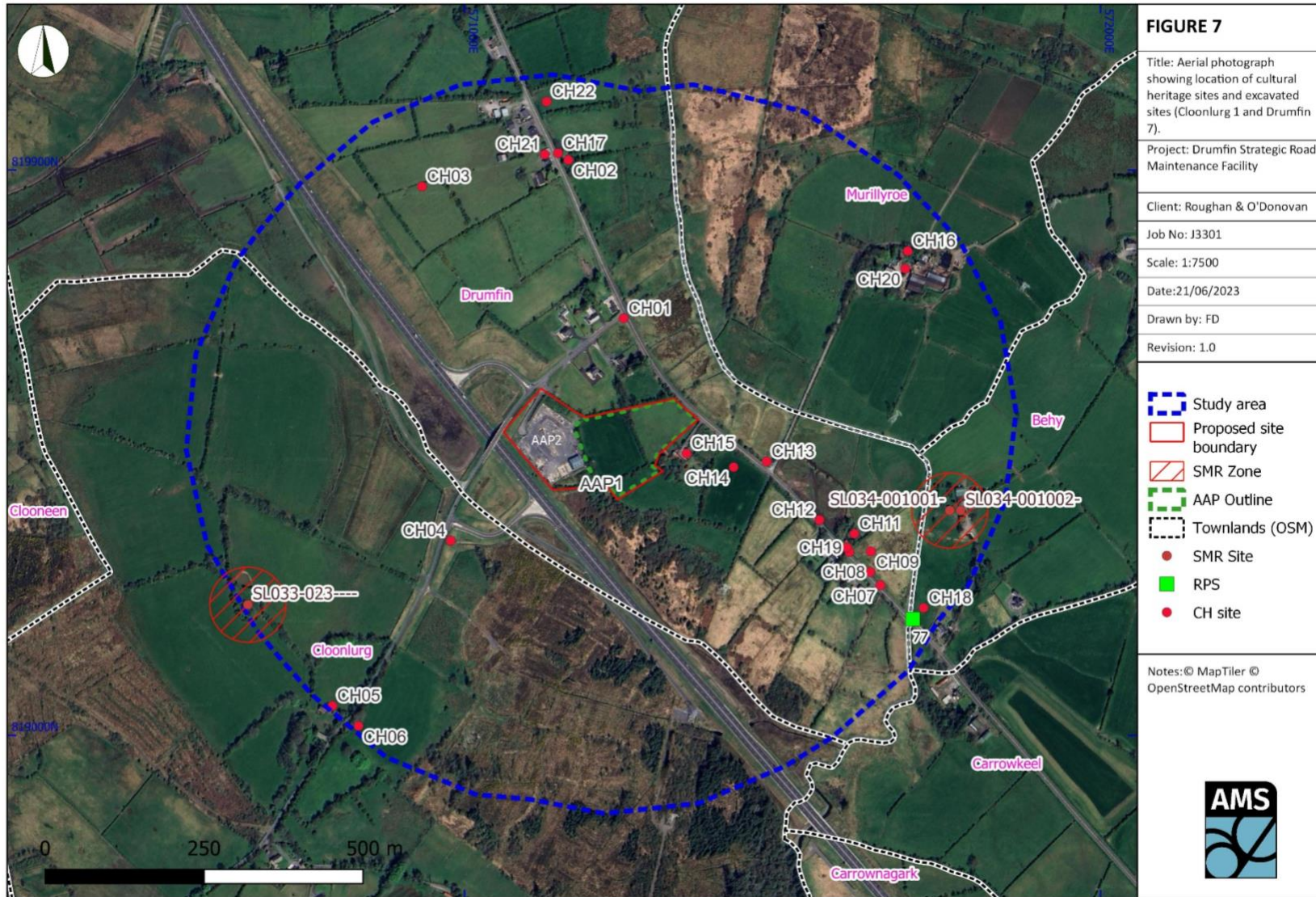


Figure 7: Aerial photograph showing location of cultural heritage assets and excavated sites (Cloonlurg 1 and Drumfin 7).

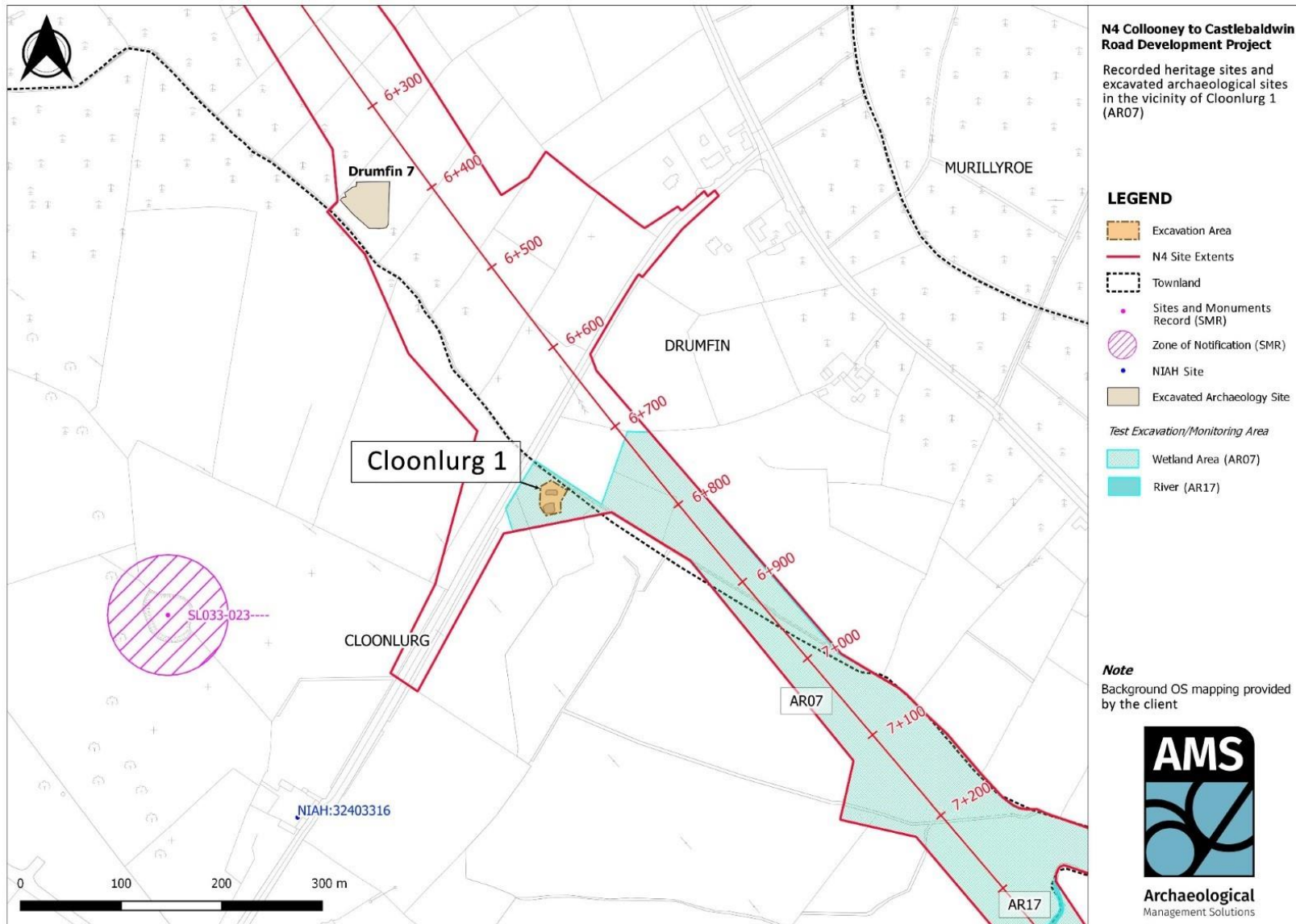


Figure 8: Location and extent of Cloonlurg 1 and Drumfin 7 excavation areas (Hardy et al. 2022, Figure 3)

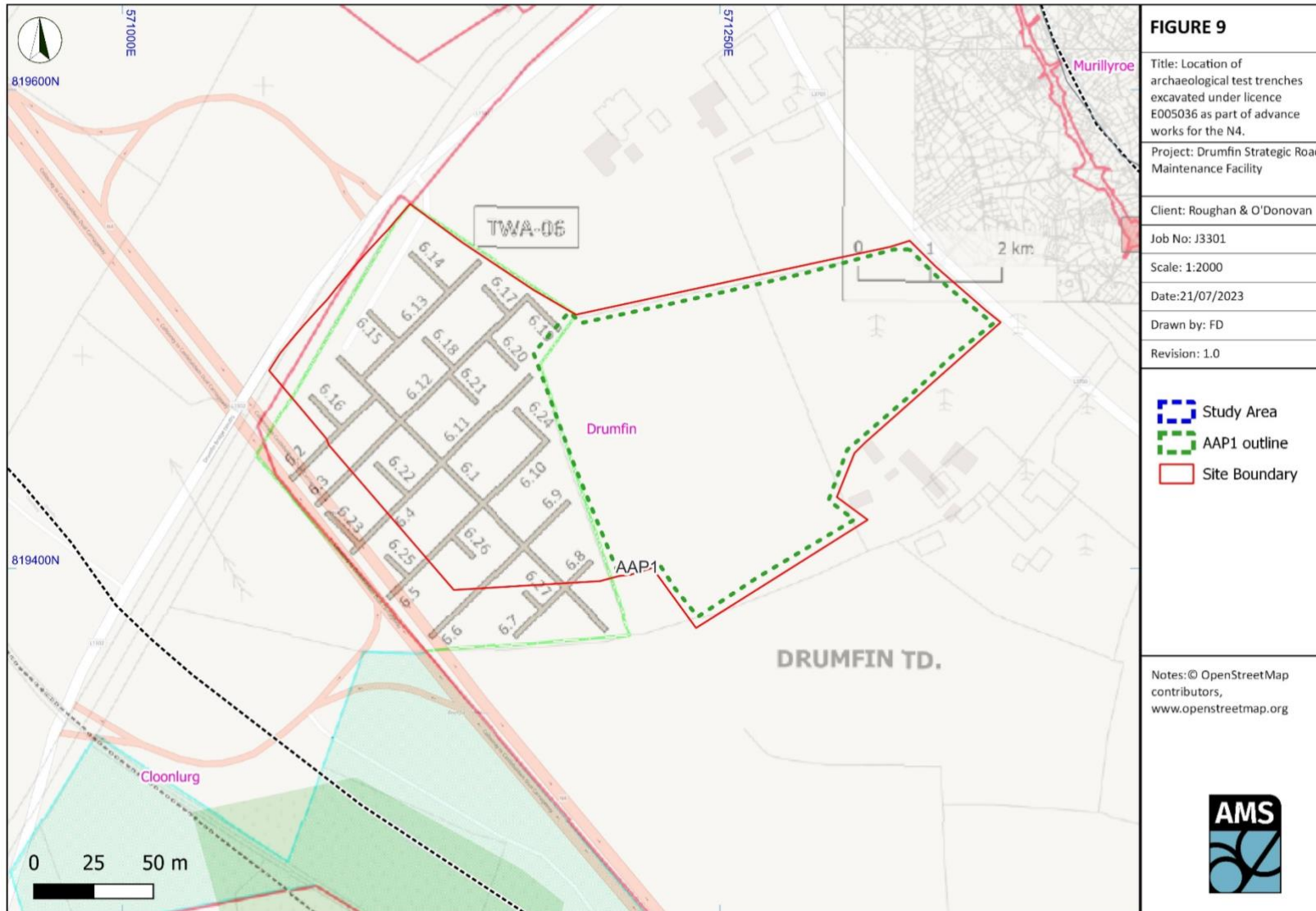


Figure 9: Location of archaeological test trenches excavated under licence E005036 as part of advance works for the N4.

Appendix 1: Extracts from IFC's Schools' Collection

Townland	Drumfin
Collector	Kathleen Ingram
Extract Detail	The mail coach road passes from Sligo through Drumfin to Dublin. This road was made in the time of Bianconi coaches. Before this road was made the old road went through Drumfin and crossed a ford at Behey and went on to Taunagh. That road is said to be the oldest road in Ireland. The river Unshin was crossed at Coopershill and Coolbock by fords. This road gives out branches to towns along its way.
Source	https://www.duchas.ie/en/cbes/4701732/4697072/4708893

Townland	Drumfin
Collector	Bobbie Lawson
Extract Detail	<p>My home is in the townland of Drumfin parish of Ballymote and barony of Tirrerrill. There are twenty-four families in it and about eighty people. There are three families named and four names Kerins. The majority of the houses are slated. There are not many people over seventy years and none of them speak Irish There are no story tellers in Drumfin. There were more houses in Drumfin formerly.</p> <p>The occupants emigrated to America and Australia, and the houses being thatched fell into ruins. The land of Drumfin is good and fairly hilly. There is no wood but on one side there is a bog which supplies the residents with plenty of turf. There are two small lakes which are drained by a small river. Another river divides the townland from the neighbouring townland. It is called Glashybeg.</p>
Source	https://www.duchas.ie/en/cbes/4701732/4697047/4708851

Townland	Drumfin
Collector	John Kerins
Extract Detail	<p>There was a man the name of Tom Healy one time who had his home somewhere in the neighbourhood of Ballymote. He was a fiddler and he went from house to house in the country places playing for dances. If he was not treated well at the places to which he went he used a charm he possessed to billet rats on them. He sent a plague of rats to two houses in Drumfin. Morrison was the name of one family and Meredith the other.</p> <p>Everybody was afraid of him and treated him as kindly as was possible. He lived about 70 years ago. John Kerins aged 84 that relates this story. He lives in Drumfin still.</p>
Source	https://www.duchas.ie/en/cbes/4701745/4698574/4724562

Townland	Drumfin
Collector	Paddy Ballentine
Extract Detail	There is a road leading from Riverstown to Drumfin which is about two miles long. It was steamrolled and tarred about five years ago. The ganger was Pat Mulhern and there was about thirty men working on it. The men were paid every three weeks. Some of the roads which were bad are being repaired now.
Source	https://www.duchas.ie/en/cbes/4701730/4696810/4708244

Townland	Drumfin
Collector	Josephine Meredith
Extract Detail	<p>In a fort in Doorla about two and a half miles from Collooney in the barony of Corran and in the parish of Ballisodare a pot of gold is supposed to be hidden under a rock. An attempt has been made to unearth it by Michael and William Jinks brothers who lived in Ardneaska Coolboc, in the barony of Corran and parish of Riverstown, both are now dead. After digging for a day and a half they decided to abandon their work because they had been told in their dream that a life would have to be lost before they could get the gold. The marks of the excavations are still visible.</p> <p>Lights were to be seen on this fort every night after midnight and carried to a tree a short distance off by the fairies who were supposed to be watching the gold [section of transcription missing] parish of Ballysadare, that golden treasure was concealed under a rock. An old man named John Sweeney of Knocknagrough, Drumfin, Parish of Ballysadare and Barony of Corran, dreamt three nights in succession that the treasure was there. He also dreamt that the digging in search for the treasure must commence after sunset and be completed before sunrise. A few nights afterwards, without acquainting anybody, not even his own people, he set off for the rock. When he reached it, he at once commenced his digging. He worked hard for some hours until he came upon a flag.</p> <p>Having laboured hard for a number of hours he felt fatigued so he sat down to have a smoke and rest. After a short while he fell asleep. The sun had risen a few hours when he awoke and to his surprise the flag had disappeared and a large round hole was to be seen. He at once believed that the treasure was hidden there and that the fairies had sent him to sleep and then stolen away the treasure.</p>
Source	https://www.duchas.ie/en/cbes/4701719/4695576

Townland	Drumfin
Collector	Kathleen Ingram
Extract Detail	<p>There are the ruins of an old castle in Behey, Drumfin, Ballymote, Co Sligo, it belonged to the O'Connors, kings of Connaught. It is in the Parish of Riverstown barony of Tirerrill and County of Sligo. It is three or four storeys high and at the top of the walls holes can be seen right down almost to the bottom. Half way down in these are flags, there are wall flowers growing on the flags. The walls are seven feet in breadth. There is one ornamental stone built in a house beside the castle, with a little red man carved on it. There was an old woman the name of Greene living near the castle. She dreamed several times that there would be a black dog or a cat watching it. She would have to go at twelve o'clock at night but she was afraid to go. Once there was a cart inside the castle, an old woman went out to the cart for eggs, when she came out of the castle one of the arches fell down on the cart but the woman escaped from it. The cart was broken with the tons of stones that fell down.</p>
Source	https://www.duchas.ie/en/cbes/4701732/4697075/4708900/

Townland	Drumfin
Collector	Mary Brady
Extract Detail	<p>There are the ruins of an old castle in the school district. It is said to be about five hundred years old. It was built by a chieftain called O'Connor who afterwards resided there. hence it got its name O'Connors Castle. it is derelict for the past one hundred years. It is situated in the townland of Drumfin, in the parish of Riverstown, in the barony of Tiercrell and in Co Sligo. Although the castle is now in ruins there is a house beside it and the O'Connor family reside there. The castle was not besieged or attacked at any time.</p>

Source	https://www.duchas.ie/en/cbes/4701745/4698591/4724598
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Townland	Drumfin
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Collector	Thomas Porter
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Extract Detail	There is the ruins of an old Church in Killmorgan grave yard. There is another Church or Abbey in ruins in Townagh grave yard, but there is not much of the two churches standing now. It is said that St. Patrick consecrated the first Bishop of Connaught in Townagh. It was burned down by Cromell. There is the ruins of an old castle in Behy near Drumfin. It belonged to the O Connors and it is still in their possession. It is supposed to be there for hundreds of years.
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Source	https://www.duchas.ie/en/cbes/4701750/4699001
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Appendix 2: Designated Archaeological Heritage

Reference No.	SL033-023----
Site Type	Ringfort - rath
Status	Recorded Monument
Townland	Cloonlurg
Coordinates (ITM)	570658, 819207
Description	<p>Scheduled for inclusion in the next revision of the RMP: Yes</p> <p>In undulating pasture, on a ridge. A circular area (int. diam. 37m) enclosed by two earthen banks with intervening and external fosses. The inner bank (Wth 2.5m; int. H 0.5m; ext. H 1.1m) and intervening fosse (Wth 2.2m) are evident all around. The outer bank (Wth 2.5m; int. H 0.8m; ext. H 1.2m to base of external fosse) is incorporated into a field boundary along the NW arc. The outer fosse (Wth 1.8m; D 0.2m) is best preserved at S. There is a wide entrance through the inner bank at S and a corresponding entrance (Wth 2m) through the outer bank with a causeway across the fosse. Some trees and bushes grow on the rath.</p>
Source	Historic Environment Viewer [online]. Available at: https://maps.archaeology.ie/HistoricEnvironment/

Reference No.	SL034-001001-
Site Type	Castle - tower house
Status	Recorded Monument
Townland	Behy
Coordinates (ITM)	571759, 819357
Description	<p>Scheduled for inclusion in the next revision of the RMP: Yes</p> <p>On the E side of a low rise skirted to the W by a stream. The remains consist of the NW corner (5.6m E-W; 2.6m N-S) of a tower now standing to two storeys, and a large block of masonry lying on the ground immediately to its SE. These are located towards the E end of a rectangular sod-covered platform (c. 30m N-S; c. 25m E-W) which may be the remains of a bawn. Immediately E of the platform are two 19th-century farm buildings which contain carved stones derived from the tower including a sheela-na-gig (SL034-001002-) and a pick-dressed quoin. The tower is built of roughly coursed limestone in a lime mortar; the walls are gently battered, but most of the quoins are missing. The ground floor had a window in its W wall but only its N side survives which contains part of a splayed gun loop. In the corner, at first-floor level, is a mural chamber the inside wall of which is gone. At this level was a large window embrasure in the N wall but only its W side survives. On the external face, 3m above present ground level, is a horizontal slit (0.8m x 0.25m) which may be an exit for a garderobe chute. A drawing by Grose (1791, vol. 1, 52) shows the tower much as it is today but with the fallen block then standing. Grose described it as 'a square tower' and noted that the castle had been used as a quarry during the building of a nearby house (see above). Traditionally known as a MacDonagh castle (Grose 1797, vol. 1, 52; McParlan 1802, 92; O'Rorke [1889], vol. 2, 236).</p>
Source	Historic Environment Viewer [online]. Available at: https://maps.archaeology.ie/HistoricEnvironment/

Reference No.	SL034-001002-
Site Type	Sheela-na-gig
Status	Recorded Monument
Townland	Behy
Coordinates (ITM)	571780, 819359
Description	<p>Scheduled for inclusion in the next revision of the RMP: Yes</p> <p>Built into the inside wall of a farm building immediately E of Behy Castle (SL034-001001-). A rectangular punch-dressed limestone block (0.85m x 0.45m) which was probably originally a quoin stone in the adjacent castle. Carved in low relief at one end of the stone is a full figure sheela-na-gig (L 0.35m), now painted pink, whilst at the other end is an 'X' picked out in three lines of pick marks. (O'Shaughnessy and Weaver 1992, 8; McMahon and Roberts 2001, 117-18).</p> <p>References:</p> <p>McMahon, J. and Roberts, J. 2001. <i>The Sheela-na-gigs of Ireland & Britain: the divine hag of the Christian Celts: an illustrated guide</i>. Mercier Press, Cork.</p> <p>O'Shaughnessy, J. and Weaver, M. 1992. 'Pretty in pink: a sheila-na-gig in Co. Sligo'. <i>Irish Association of Professional Archaeologists Newsletter</i> 15, 8.</p>
Source	Historic Environment Viewer [online]. Available at: https://maps.archaeology.ie/HistoricEnvironment/

Appendix 3: Previous Archaeological Investigations

Licence No.	DIER Ref.	Site Name	Author	Summary of Findings	Weblink
05E0305	2005:1354	Various townlands including Cloonlurg	Ken Wiggins	Groundwork relating to the construction of a 220/110kV transmission line by ESB International between substations at Flagford, Co. Roscommon, and Srananagh, Co. Sligo, was monitored. The work comprised the removal of topsoil where angle masts or intermediate pylons along the designated route were to be erected. All the monitoring took place at locations in County Sligo. No features or finds of archaeological significance were revealed at any of the monitored locations.	https://excavations.ie/report/2005/Sligo/0014378/
E005051 (Ministerial Directions A071)	2019:711	Cloonlurg 1	Colum Hardy	<p>An archaeological excavation was carried out at the site of Cloonlurg 1 in advance of construction of the N4 Collooney to Castlebaldwin Road Development Scheme in Co. Sligo between 23 April and 14 May 2019. The excavation was carried out on behalf of Roadbridge by Colum Hardy and James McKee of AMS. The site was discovered during testing (Reg No. E005036) undertaken by AMS in 2019 in the central section of the N4 Road Scheme in the townland of Cloonlurg.</p> <p>The archaeological remains at Cloonlurg 1 consisted of two burnt mounds situated adjacent to a narrow unnamed water channel (a tributary of Drumfin River). The first (Burnt Mound 1), consisting of three deposits (one of which was separated from the others by a peat horizon) was located to the south of the site. This mound was associated with a partially wood-lined trough, a number of stone deposits/features and a group of stakes (possibly a windbreak). This feature lay to the immediate north-west of the mound in the vicinity of a modern drain that truncated the edge of the mound. Burnt Mound 2 lay to the north of the site.</p> <p>Central to activities at Burnt Mound 1 was a trough with the partially surviving remnants of a wood lining. The trough was cut into a primary peat deposit found to the south of the site. It was orientated north-east to south-west and contained three fills of a similar composition consisting of heat-shattered stone in matrices of charcoal-rich sandy soil. The trough was sub-rectangular in plan, measured 2.34m in length, 1.11m in width and 0.39m in depth and contained the remains of a wood lining held in place by stakes/pegs.</p>	https://excavations.ie/report/2019/Sligo/0030298/

Licence No.	DIER Ref.	Site Name	Author	Summary of Findings	Weblink
				<p>The trough was surrounded by a burnt mound deposit, which was irregular in plan with a maximum length of 6.7m, a maximum width of 3.2m and a maximum depth of 0.2m. A second burnt mound deposit was located to the immediate north of this (almost abutting). This was sub-oval in plan, orientated west-south-west to east-north-east and measured 1.74 in length, 1m in width and 0.21m in depth. Both of these deposits were of similar composition consisting of heat-shattered stones in charcoal-enriched matrices and were sealed by a peat horizon which was indicative of a hiatus in the use of the site. This peat horizon, a loosely compacted dark blackish-brown spongey peat incorporating occasional heat-shattered stone, contained pieces of wood including sixteen worked timbers (it is possible that some of these had originally been used to line the trough). The deposit was sub-circular in plan measuring 11.75m by 11m with an average depth of 0.36m.</p> <p>Three stone deposits/features were also found in association with Burnt Mound 1, sealed by the same peat horizon. The first of these (comprising loose unburnt stone) was irregular in plan, measured 4.4m in length, 2.4m in width and 0.18m in depth and likely constituted a dump of raw material possibly for the next use of the trough. The other two stone deposits were possible stone surfaces (small working areas) which measured 0.95m in length, 0.35m in width and 0.17m in depth and 0.38m in length, 0.36m in width and 0.05m in depth.</p> <p>A second phase of activity was represented by a thicker layer of burnt mound material which comprised a single deposit of heat-shattered stones in a charcoal-enriched soil matrix. This material, which had similar horizon dimensions to the underlying secondary peat deposit sealing the first phase of activity (11.75m in maximum length and 11m in maximum width), was irregular in plan with an average depth of 0.34m.</p> <p>A group of six stakes, a large timber and other smaller wood elements were also found to the immediate north-west of Burnt Mound 1. A modern, L-shaped stone-filled field drain with maximum exposed dimensions of 9.8m by 0.4m and 0.42m in depth truncated the north-western edge of the burnt mound and likely also disturbed this group of wooden elements which have tentatively been interpreted as a wind-break.</p>	

Licence No.	DIER Ref.	Site Name	Author	Summary of Findings	Weblink
				<p>A second burnt mound, sealed by a peat deposit, was located to the north of the site, closer to the stream, which was defined by a single deposit comprising heat-shattered stones in a charcoal-enriched soil matrix. Burnt Mound 2 was sub-rectangular in plan and measured 9.4m in length by 5.1m in width with a maximum depth of 0.31m. No features were revealed beneath the burnt mound.</p> <p>Four lithics and a saddle quern were recovered from Cloonlurg 1 – the saddle quern and two chert flints were found within the primary peat deposit underlying Burnt Mound 1 and two worked flints were recovered from Burnt Mound 2. The burnt mounds most likely date to the Bronze Age or the Iron Age.</p>	
E004881 (Ministerial Directions A071)	2017:683	Drumfin 7	David McIlreavy	<p>Stage (iii) archaeological excavation was carried out at Drumfin 7 in advance of the N4 Collooney to Castlebaldwin Road Development, Co. Sligo. The site was discovered during Stage (i) archaeological testing and was assessed during Stage (ii) Pre-Excavation Services (Registration Number E4627). The excavation at Drumfin 7 recorded the remains of a burnt mound with associated trough.</p> <p>One intriguing element of the site appeared to be related to processing of some kind. This consisted of a heavily truncated pit partially lined with roundwoods (wicker) and organic filter material. Constructed around the same period, this primary activity area consisted of two stone platforms and a possible hurdle within the margins of a retreating water body. Three overlapping platforms consisting of reused worked roundwoods, brushwood and stone were recorded within the peat deposit.</p> <p>Within the roundwood, brushwood and stone platforms a range of depositional items were recorded including concentrations of hazelnuts, fruit (seeds), bone and chert debitage. Beetle remains in one of the platforms allude to a possible wider range of perishable items other than those recorded. The most significant inclusions within the platforms were fifteen twig sheaves.</p>	https://excavations.ie/report/2017/Sligo/0028958/

APPENDIX C

PHOTOMONTAGE

Photomontages

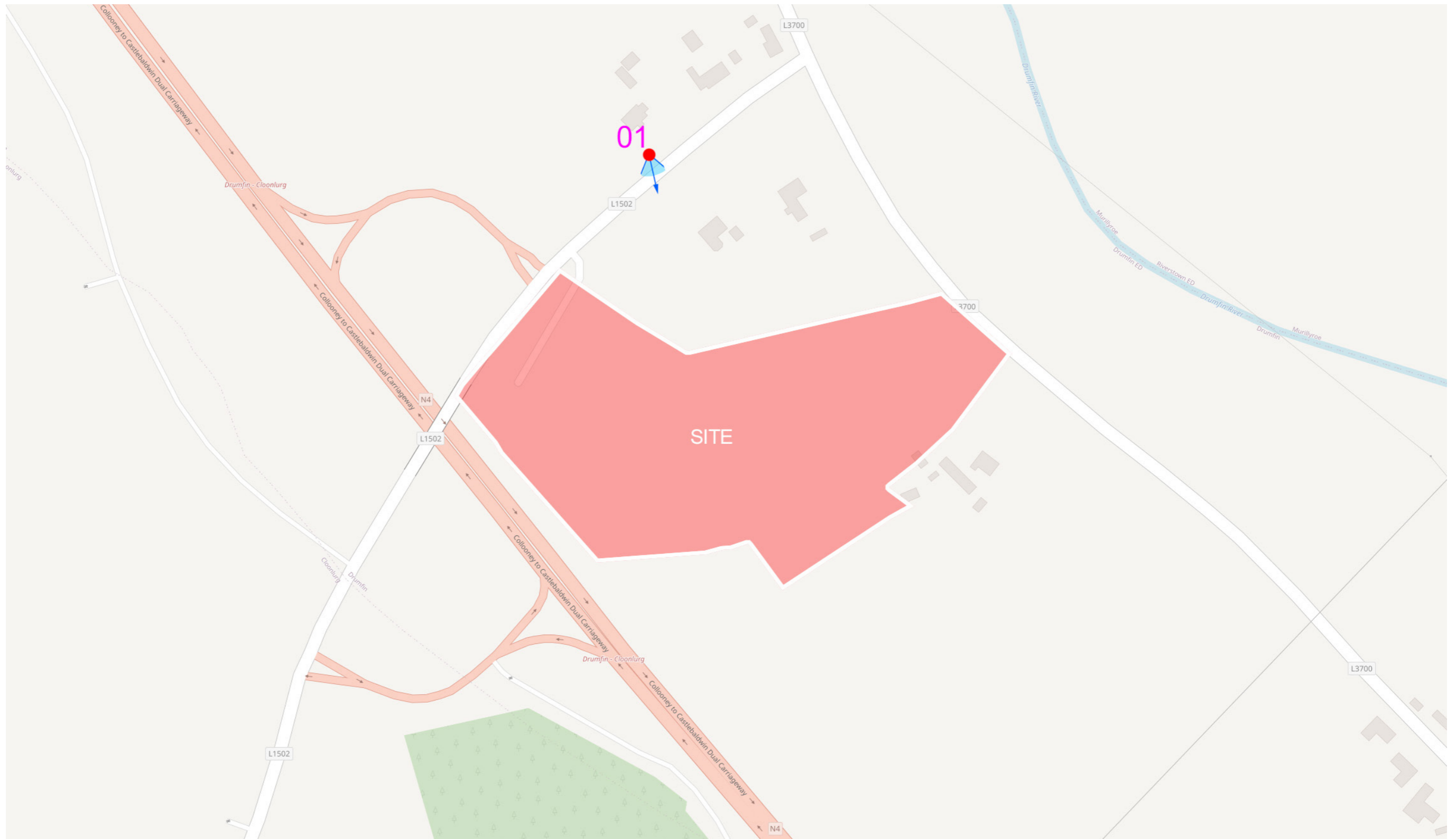
Strategic Road Maintenance Facility

At Drumfin/Cloonlurg

Photomontage Views

- PM01 L1502 Newpark looking South
- Existing
 - Proposed





Name	Camera Locations	Sligo County Council	
Status	Photomontage View Locations		
Scale	Not to Scale		
Strategic Road Maintenance Facility At Drumfin/Cloonlurg		Rev: 0	



Name PM01
 Status Existing
 Reference: L1502 Newpark looking South

**Sligo County
 Council**

Camera location
 571172,819610,57.3

Target Direction
 571172,819547,56.7

Camera Canon 6D
 Lens 24mm Tilt Shift
 HView Angle Nominal 74 degrees
 Date/Time: 16/07/2023 16:15


CSC | Chris
 Shackleton
 Consulting
www.shackleton.ie info@shackleton.ie

**Strategic Road Maintenance Facility
 At Drumfin/Cloonlurg**

Rev:
 0

Recommended viewing distance with both eyes is 240mm



Name PM01 Status Proposed Reference: L1502 Newpark looking South	Sligo County Council	Camera location 571172,819610,57.3	Camera Canon 6D Lens 24mm Tilt Shift HView Angle Nominal 74 degrees Date/Time: 16/07/2023 16:15	
Strategic Road Maintenance Facility At Drumfin/Cloonlurg		Rev: 0	Target Direction 571172,819547,56.7	

Photomontage Methodology / Method Statement

Work has been completed in accordance with best practice guidelines a summary of which are provided below.

Preparation

Prior to site visit camera locations were identified and located on digital map to enable GPS routing to the correct locations. The site was “scouted” for access using Google Streetview (c) Google.

Photography

- Photographs were taken on site at locations specified using a high-resolution professional digital camera. The Camera, a Canon 6D, is a full frame format (which corresponds to a traditional 35mm film format) as recommended by best practice guidelines.
- Images were taken in RAW format which provides the maximum flexibility in adjustment along with the best quality available, and with bracketed exposure. The images were stored with embedded camera/photo exif data.
- The camera was tripod mounted, spirit leveled and set at a nominal 1.6m above ground level
- The lens used was a 24mm Tilt Shift Lens. A 50mm lens was explored but the 24mm was felt to best show the scene in context.

Control

A series of survey points were captured on site for each photograph using Trimble R12 survey grade RTK-GPS. The following were measured:

- The camera position, plan and height
- Measured points of detail visible when the photograph was taken. On streetscape scenes points of detail (corners of buildings, poles, sign, white lines, structures, etc) are surveyed to provide an accurate orientation base where insufficient existing detail is available we supplement with either with red/white ranging rods or smaller orange cones placed in the camera’s field of view while taking the photograph.
- Regardless of the type of control the configuration shall be non-collinear with a good photogrammetric geometry. This ensures that computational analysis is convergent.

Setting up AVR Images

- Survey and OS mapping is imported into 3D software
- A calibrated virtual matching camera was created to match the physical one used to capture the image. The camera was snapped to the surveyed real-life camera locations. The individual photograph frames were loaded into the viewport background.
- Using in-built software algorithms the virtual camera was adjusted so the points of detail on the photograph and the surveyed points in real-life coalesce in the camera viewport. Once complete the virtual camera was be orientated so that it is identical to the physical camera that took the base photograph.
- Checks were made using the surveyed information and project mapping and cross referenced with the photographs to ensure they align.
- A Daylight system was then accurately introduced into the scene at its correct geo-referenced coordinates. Once the time/date and time zone is set the digital sky will match the position of the sun and shadows created by the same in the base photograph.

Verifiable Photomontage & Proposed development modelling

- The proposed development, structure, road works and earthworks was modeled up in 3D from the drawings provided by the Client / Design Team.
- The building was located in accordance with surveyed location and at the correct FFL.
- True life digital materials were designed and assigned to the 3D model elements using reference imagery provided by the client. Sophisticated real world rendering shaders were used in conjunction with the daylight system to produce final renders which will react in a verifiable manner to match the reference photographic base images.
- Finally, the new development image and the existing original photograph were merged with due care for any demolitions/removals, foreground / background existing objects, landscaping, lighting, shadows, etc. to produce a single believable and verifiable composite image.

Viewing instructions

These images are designed to be printed at A3 and taken to site to evaluate the impact of the development.

Images should be viewed with both eyes open from the locations indicated and held at the indicated distance from the viewer's eyes depending on the lens used. When held at arms length the viewer should be able to effectively focus not only on the photomontage in hand but also on the surrounding landscape which will give them a much wider field of view.

When used in this fashion the existing landscape will line-up and the photomontage will provide similar perspective and thus enable the viewer to visually evaluate the proposal.

