LOUTH COUNTY COUNCIL

APPROPRIATE ASSESSMENT SCREENING REPORT

FOR

PROPOSED PLAYGROUND,

ST. DOMINIC'S PARK, DROGHEDA, CO. LOUTH

VOLUME III. APPENDICES

4th February 2026

DOCUMENT ISSUE STATUS

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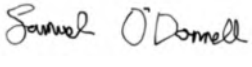
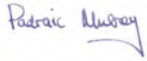
AUTHOR	Sam O'Donnell	Staff Ecologist		3/02/2026
MANAGING DIRECTOR	Padraic Mulroy	Project Director		4/02/2026

LIST OF APPENDICES

APP. NO.	DESCRIPTION
1	Desk Study Information on Topsoils, Subsoils, Geology, Hydrogeology, Hydrology, Borehole Drilling Data and Historical Data from EPA, OSI, www.catchment.ie.
2	*NPWS (2014) Site Synopsis: River Boyne and River Blackwater SAC 002299.* *NPWS (2021) Conservation Objectives: River Boyne and River Blackwater SAC 002299. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.* National Biodiversity Data Centre Species Data and 1km Grid Report
3	Uisce Eireann Public Water Supply, Stormwater Drainage and Foulwater Drainage Drawings for Drogheda in the Vicinity of the Site Upgrade Works at St. Dominic's Park, Rathmullen Road, Drogheda Surface Water Drainage Design Proposal

APPENDIX 1

DESK STUDY INFORMATION ON TOPSOILS, SUBSOILS, GEOLOGY, HYDROGEOLOGY, HYDROLOGY, BOREHOLE DRILLING DATA & HISTORICAL DATA GATHERED FROM OSI, EPA, GSI & WWW.CATCHMENT.IE

Results

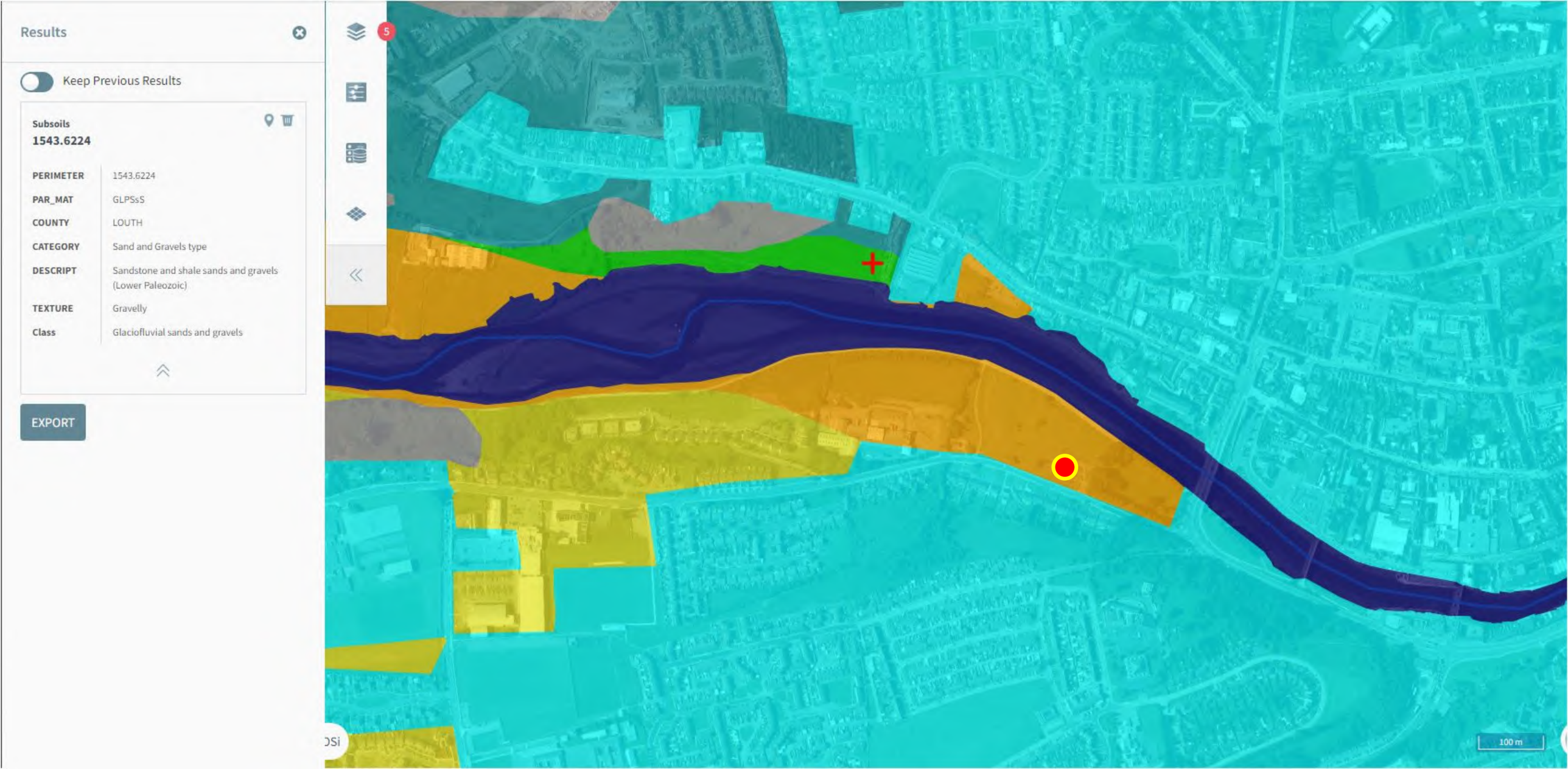
Keep Previous Results

Subsoils

2454.34471

PERIMETER	2454.34471
PAR_MAT	A
COUNTY	LOUTH
CATEGORY	Alluvium
DESCRIPT	Alluvium undifferentiated
TEXTURE	Variable
Class	Alluvium

EXPORT


Results
Keep Previous Results
Subsoils
1543.6224
PERIMETER 1543.6224
PAR_MAT GLPSsS
COUNTY LOUTH
CATEGORY Sand and Gravels type
DESCRIPT Sandstone and shale sands and gravels (Lower Paleozoic)
TEXTURE Gravelly
Class Glaciofluvial sands and gravels
EXPORT
5
100 m

Results

Keep Previous Results

Subsoils

845.57538

PERIMETER	845.57538
PAR_MAT	KaRck
COUNTY	LOUTH
CATEGORY	Other deposit type
DESCRIPT	Karstified limestone bedrock as surface
TEXTURE	n.a.
Class	Bedrock at or close to surface

EXPORT

Results

Keep Previous Results

Subsoils

1723.00744

PERIMETER	1723.00744
PAR_MAT	TLPSsS
COUNTY	LOUTH
CATEGORY	Till type
DESCRIPT	Sandstone and shale till (Lower Paleozoic)
TEXTURE	Clayey
Class	Tills (diamictons)

EXPORT

Results

SIS National Soils
Water body

SIS National Soils
Ballylanders

Association_Name	Ballylanders
Association_Unit	1100e
Association_Symbol	1100e
Texture_Substrate_Type	Fine loamy over shale or slate bedrock
Ha	278.50452509
Drainage	Well
Texture	Fine loamy
Depth	>80
SOC	128.26645735
URL	Link to More Information

SIS National Soils
Urban

SIS National Soils
River

EXPORT

Results

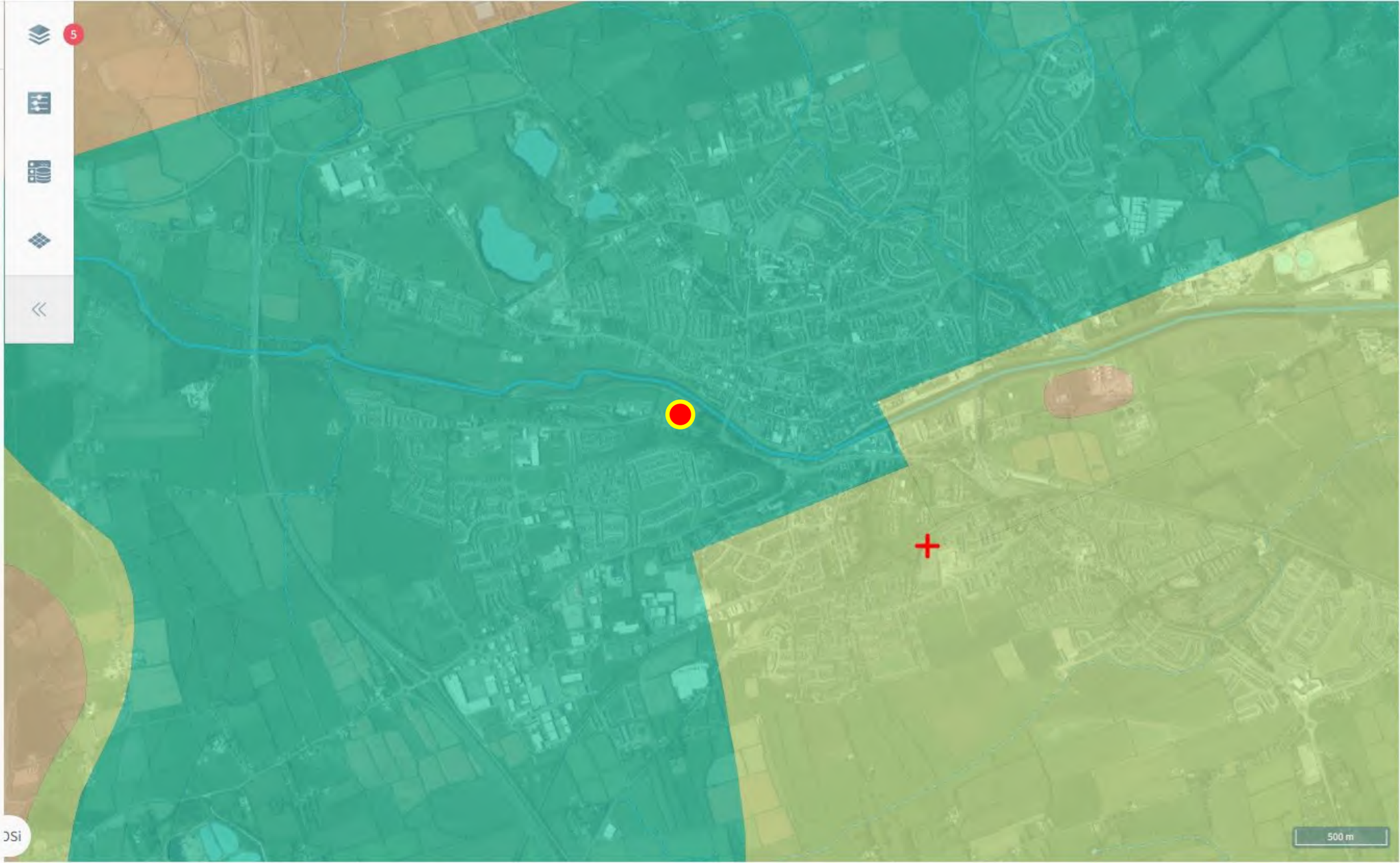
Keep Previous Results

GSI Bedrock Aquifer

Lm

AquiferCode	Lm
AquiferDesc	Locally Important Aquifer - Bedrock which is Generally Moderately Productive

EXPORT



Results

Keep Previous Results

GSI Bedrock Aquifer

Pl

AquiferCode	Pl
AquiferDesc	Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

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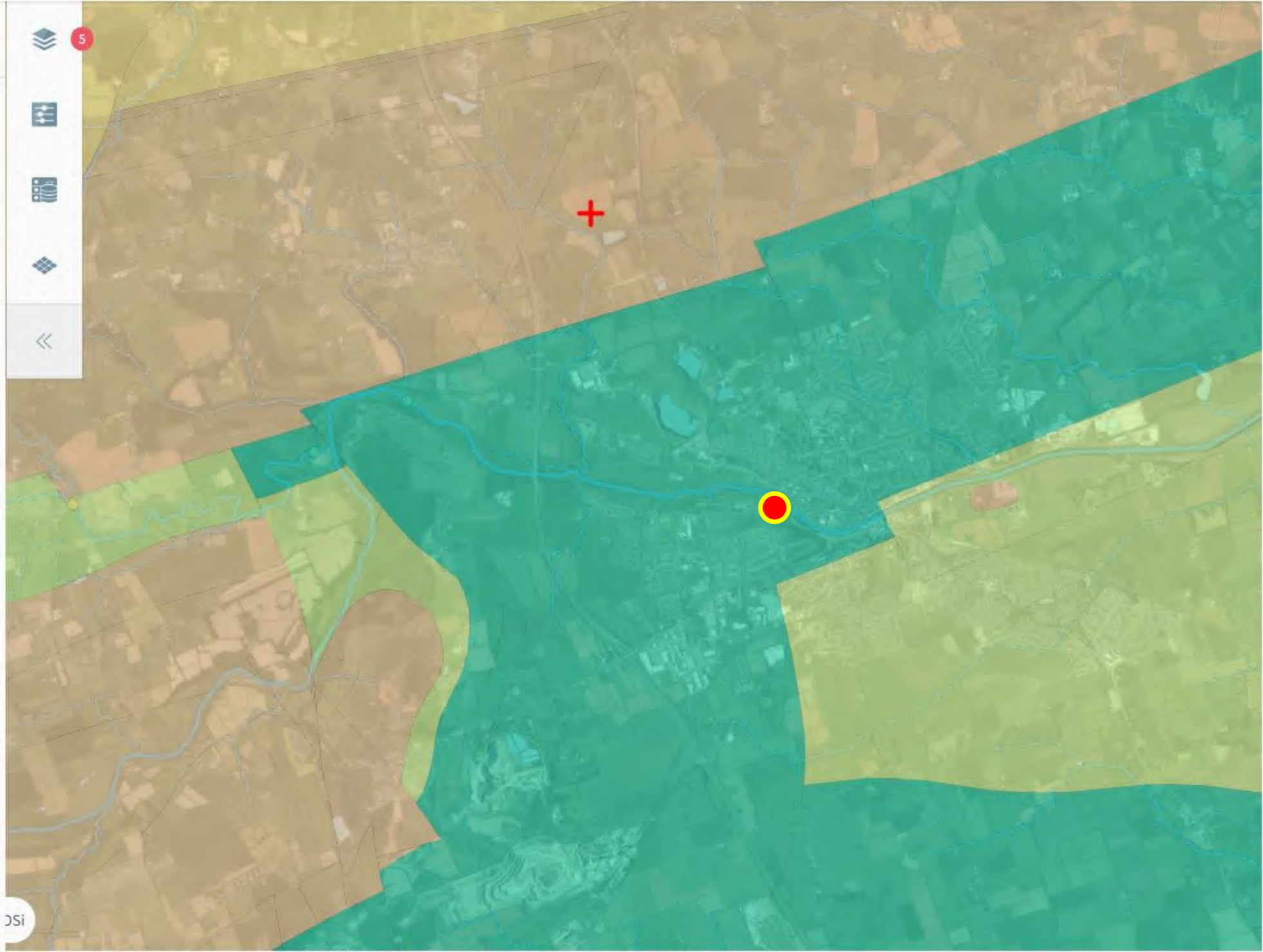

Results

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GSI Bedrock Aquifer

Pl

AquiferCode	Pl
AquiferDesc	Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

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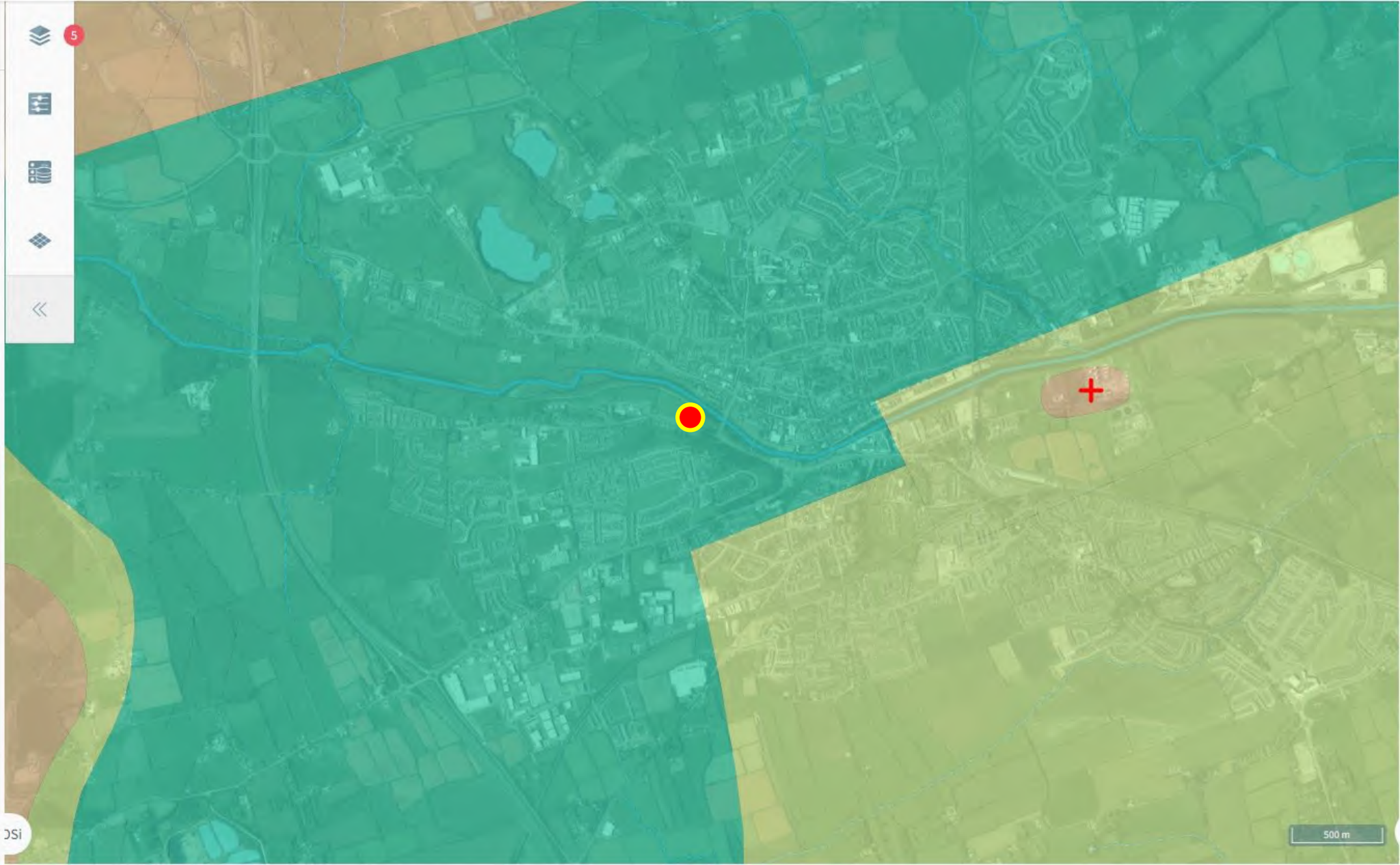

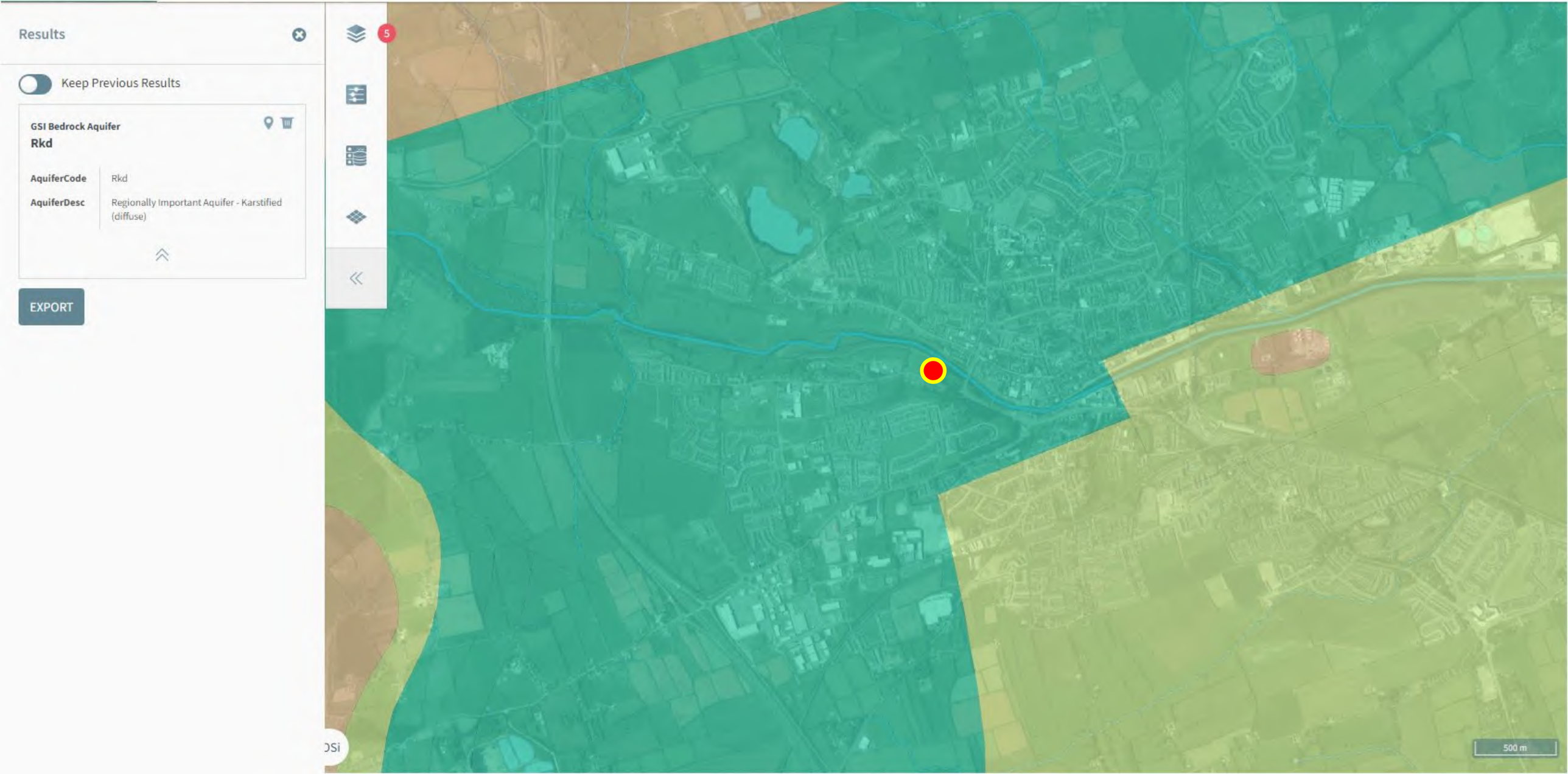
Results
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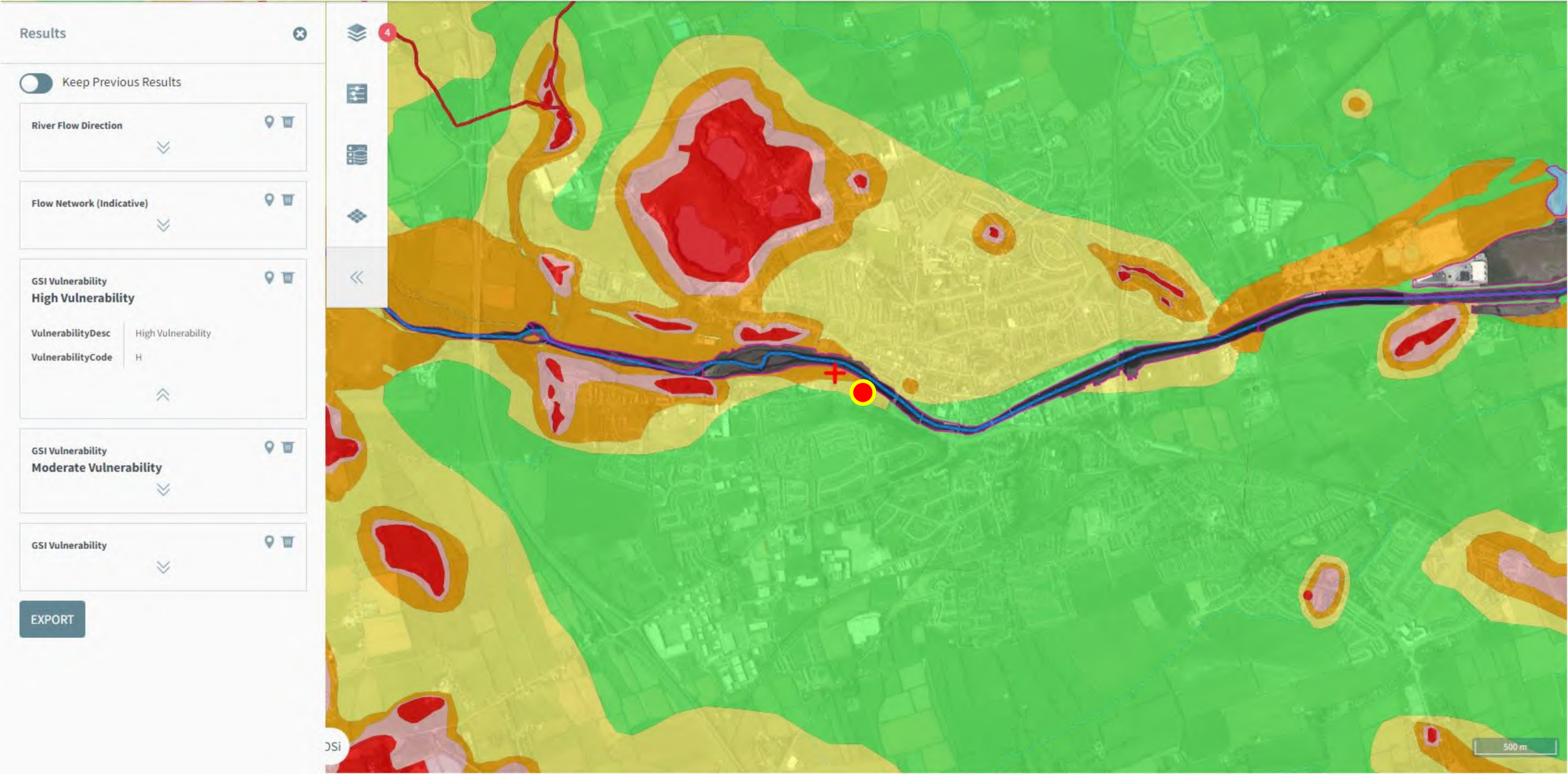
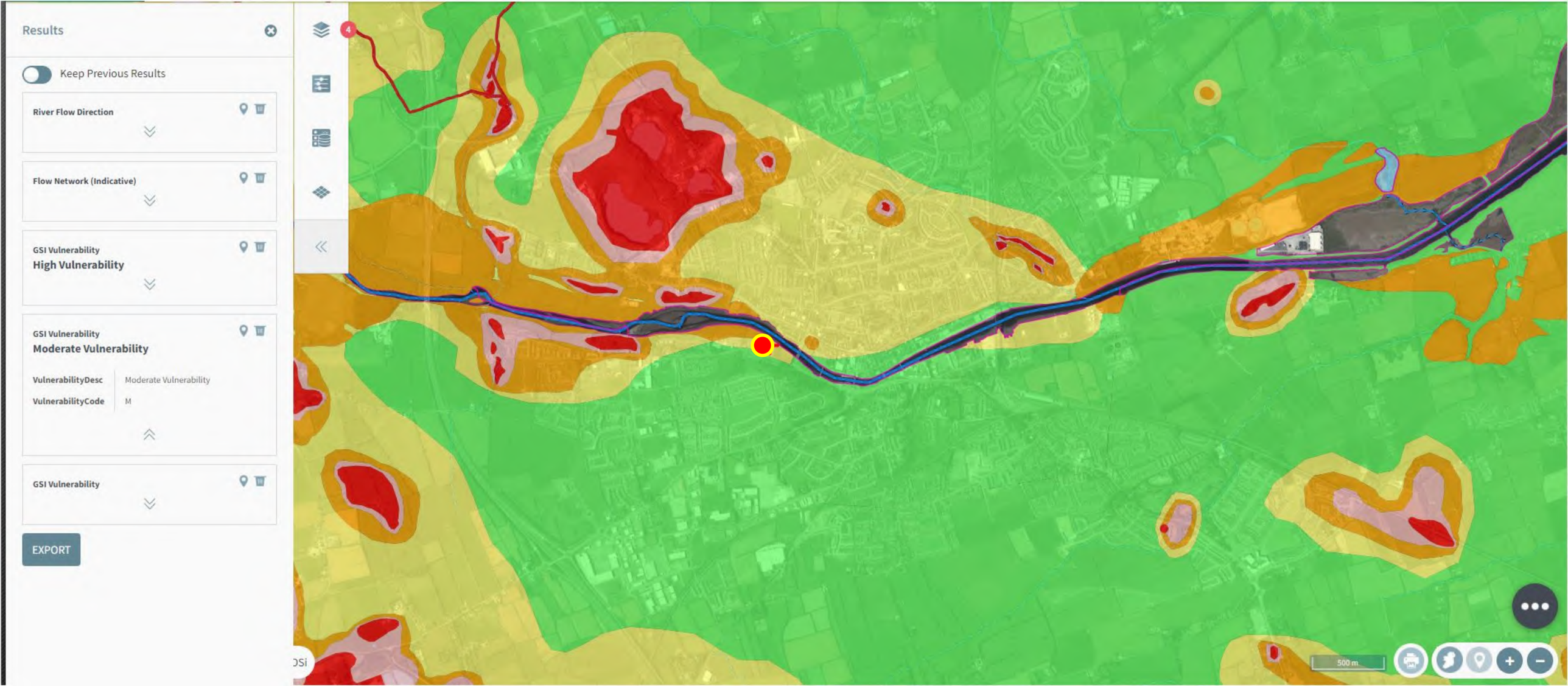
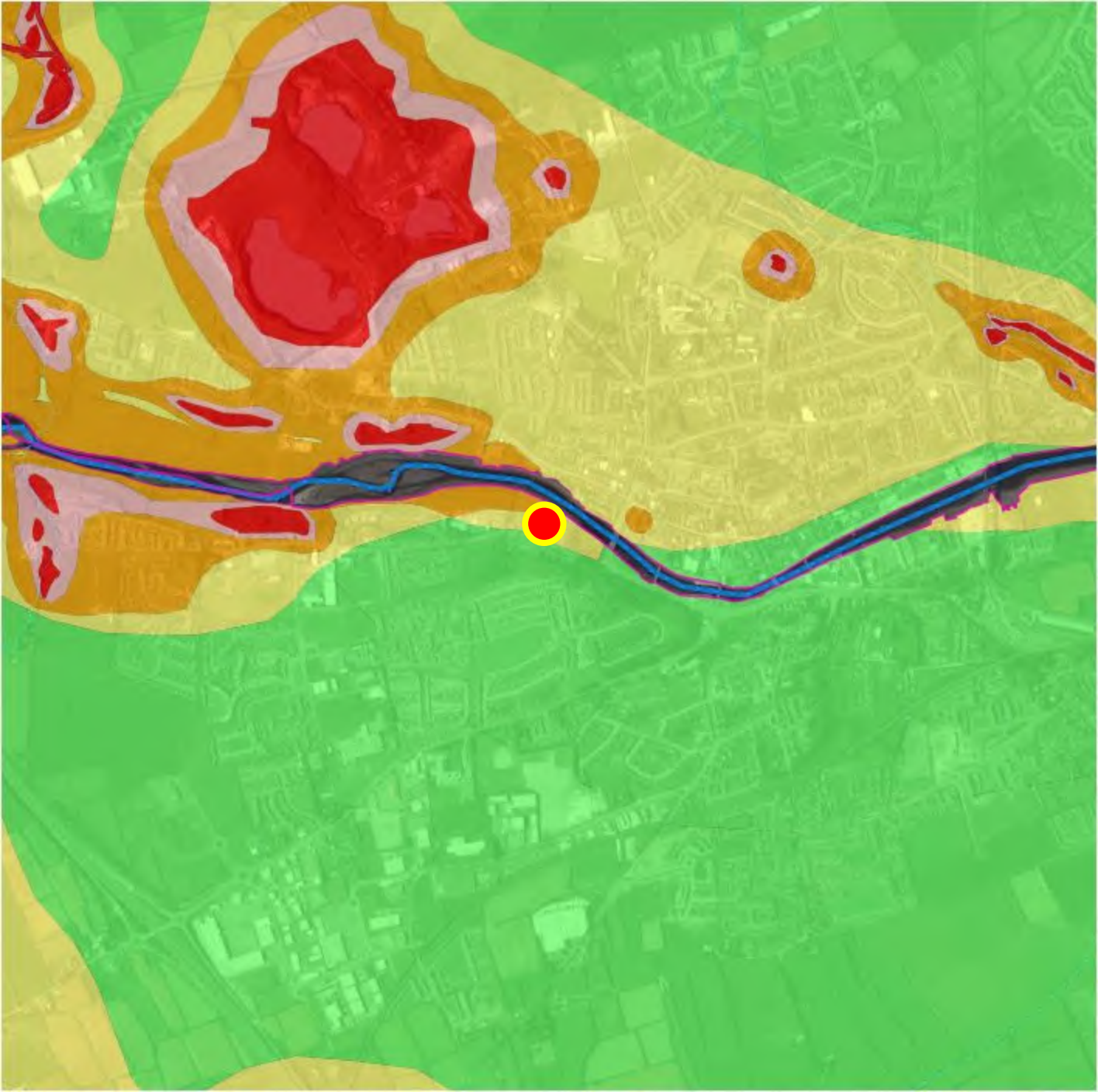
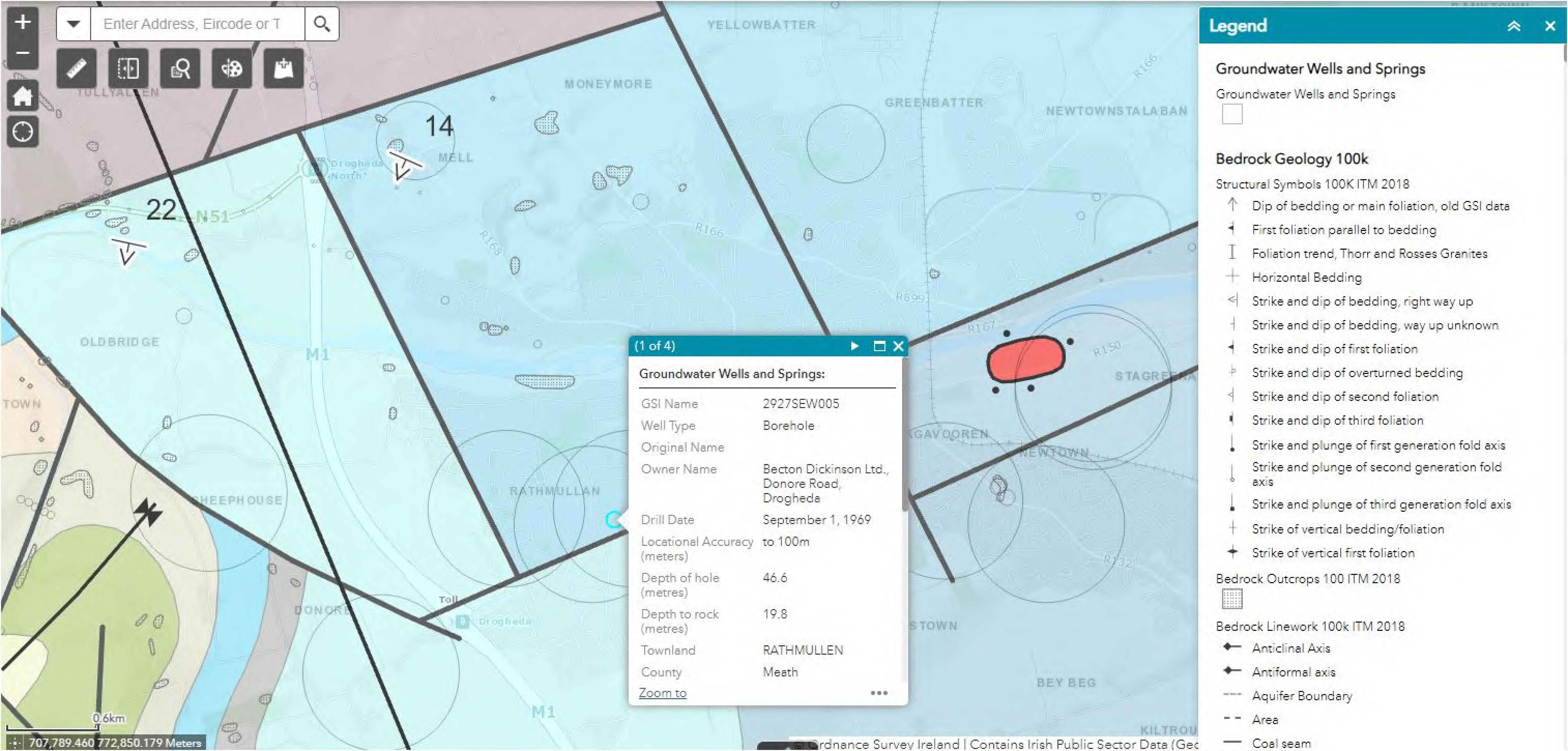
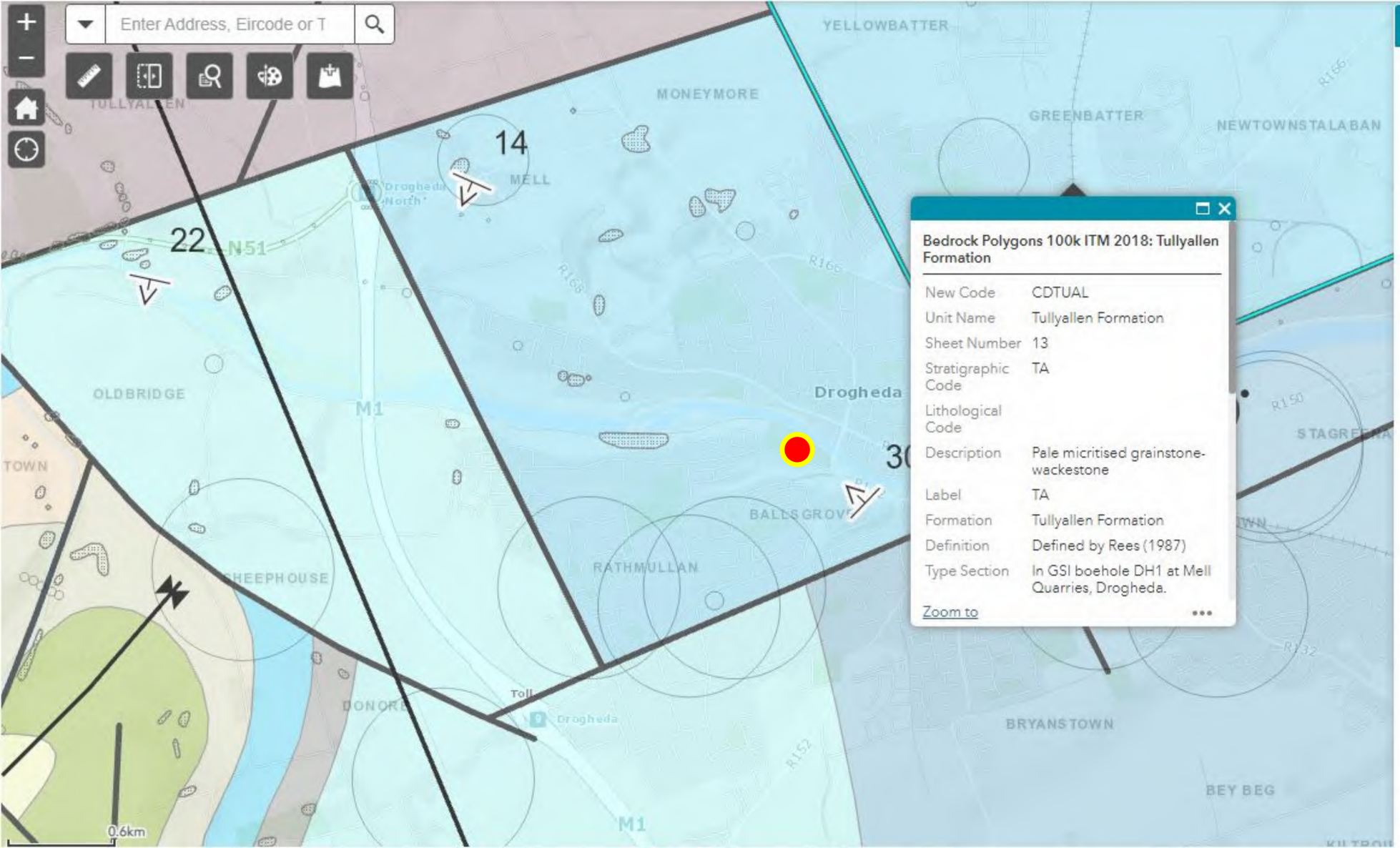
GSI Bedrock Aquifer
Rkd
AquiferCode
Rkd
AquiferDesc
Regionally Important Aquifer - Karstified (diffuse)
EXPORT
5
500 m


Results
Keep Previous Results
River Flow Direction
Flow Network (Indicative)
GSI Vulnerability
High Vulnerability
VulnerabilityDesc
High Vulnerability
VulnerabilityCode
H
GSI Vulnerability
Moderate Vulnerability
GSI Vulnerability
EXPORT
4
500 m


Results
Keep Previous Results
River Flow Direction
Flow Network (Indicative)
GSI Vulnerability
High Vulnerability
GSI Vulnerability
Moderate Vulnerability
VulnerabilityDesc
Moderate Vulnerability
VulnerabilityCode
M
GSI Vulnerability
EXPORT
4
500 m




Enter Address, Eircode or T
YELLOWBATTER
MONEYMORE
GREENBATTER
NEWTOWNSTALABAN
TULLYALLEN
14
MELL
22
N51
OLDBRIDGE
M1
TOWN
SHEEPHOUSE
RATHMULLAN
DONORE
Toll
Drogheda
GAVOOREN
NEWTOWN
STAGREENA
STOWN
BEY BEG
KILTROU
0.6km
707,789.460 772,850.179 Meters
© Ordnance Survey Ireland | Contains Irish Public Sector Data (Geo
(1 of 4)
Groundwater Wells and Springs:
GSI Name 2927SEW005
Well Type Borehole
Original Name
Owner Name Becton Dickinson Ltd., Donore Road, Drogheda
Drill Date September 1, 1969
Locational Accuracy (meters) to 100m
Depth of hole (metres) 46.6
Depth to rock (metres) 19.8
Townland RATHMULLEN
County Meath
Zoom to
Legend
Groundwater Wells and Springs
Groundwater Wells and Springs
Bedrock Geology 100k
Structural Symbols 100K ITM 2018
Dip of bedding or main foliation, old GSI data
First foliation parallel to bedding
Foliation trend, Thorr and Rosses Granites
Horizontal Bedding
Strike and dip of bedding, right way up
Strike and dip of bedding, way up unknown
Strike and dip of first foliation
Strike and dip of overturned bedding
Strike and dip of second foliation
Strike and dip of third foliation
Strike and plunge of first generation fold axis
Strike and plunge of second generation fold axis
Strike and plunge of third generation fold axis
Strike of vertical bedding/foliation
Strike of vertical first foliation
Bedrock Outcrops 100 ITM 2018
Bedrock Linework 100k ITM 2018
Anticlinal Axis
Antiformal axis
Aquifer Boundary
Area
Coal seam



Bedrock Polygons 100k ITM 2018: Tullyallen Formation

New Code	CDTUAL
Unit Name	Tullyallen Formation
Sheet Number	13
Stratigraphic Code	TA
Lithological Code	
Description	Pale micritised grainstone-wackestone
Label	TA
Formation	Tullyallen Formation
Definition	Defined by Rees (1987)
Type Section	In GSI boehole DH1 at Mell Quarries, Drogheda.

Zoom to

Legend

Groundwater Wells and Springs

Groundwater Wells and Springs

Bedrock Geology 100k

Structural Symbols 100K ITM 2018

- Dip of bedding or main foliation, old GSI data
- First foliation parallel to bedding
- Foliation trend, Thorr and Rosses Granites
- Horizontal Bedding
- Strike and dip of bedding, right way up
- Strike and dip of bedding, way up unknown
- Strike and dip of first foliation
- Strike and dip of overturned bedding
- Strike and dip of second foliation
- Strike and dip of third foliation
- Strike and plunge of first generation fold axis
- Strike and plunge of second generation fold axis
- Strike and plunge of third generation fold axis
- Strike of vertical bedding/foliation
- Strike of vertical first foliation

Bedrock Outcrops 100 ITM 2018

Bedrock Linework 100k ITM 2018

- Anticlinal Axis
- Antiformal axis
- Aquifer Boundary
- Area

Results

Keep Previous Results

River Flow Direction

IE_NB_06T010400

Flow Network (Indicative)

IE_NB_06T010400

GSI Gravel Aquifer

Lg

AquiferCode	Lg
AquiferDesc	Locally important gravel aquifer

EXPORT

Results

Keep Previous Results

Hydrometric Area
07

Hydrometic_Area	07
Hydrometric_Area_Name	Boyne
EU_CD	
DIST_CD	IEEA
AREAKM2	2694

EXPORT

Results

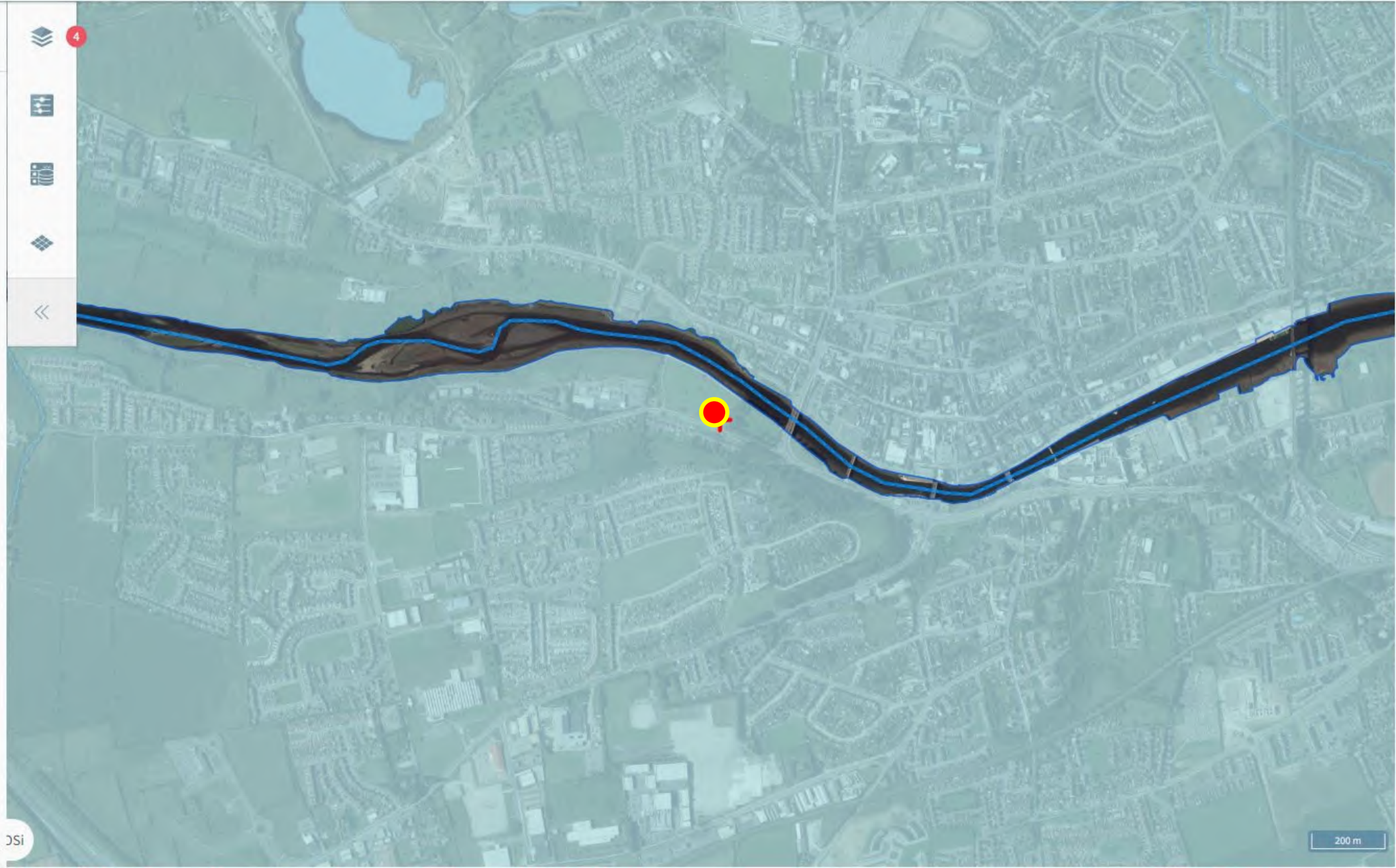
Keep Previous Results

WFD Catchments

07

Catchment_Id	07
Name	Boyne
Area_km2	2696.16629881
District_Code	IEEA

EXPORT



Results

Keep Previous Results

WFD River Sub Basins

STAGRENNAN_010

NAME	STAGRENNAN_010
EU_CD	IE_EA_07S320550
AREAKM2	26.08219471

EXPORT

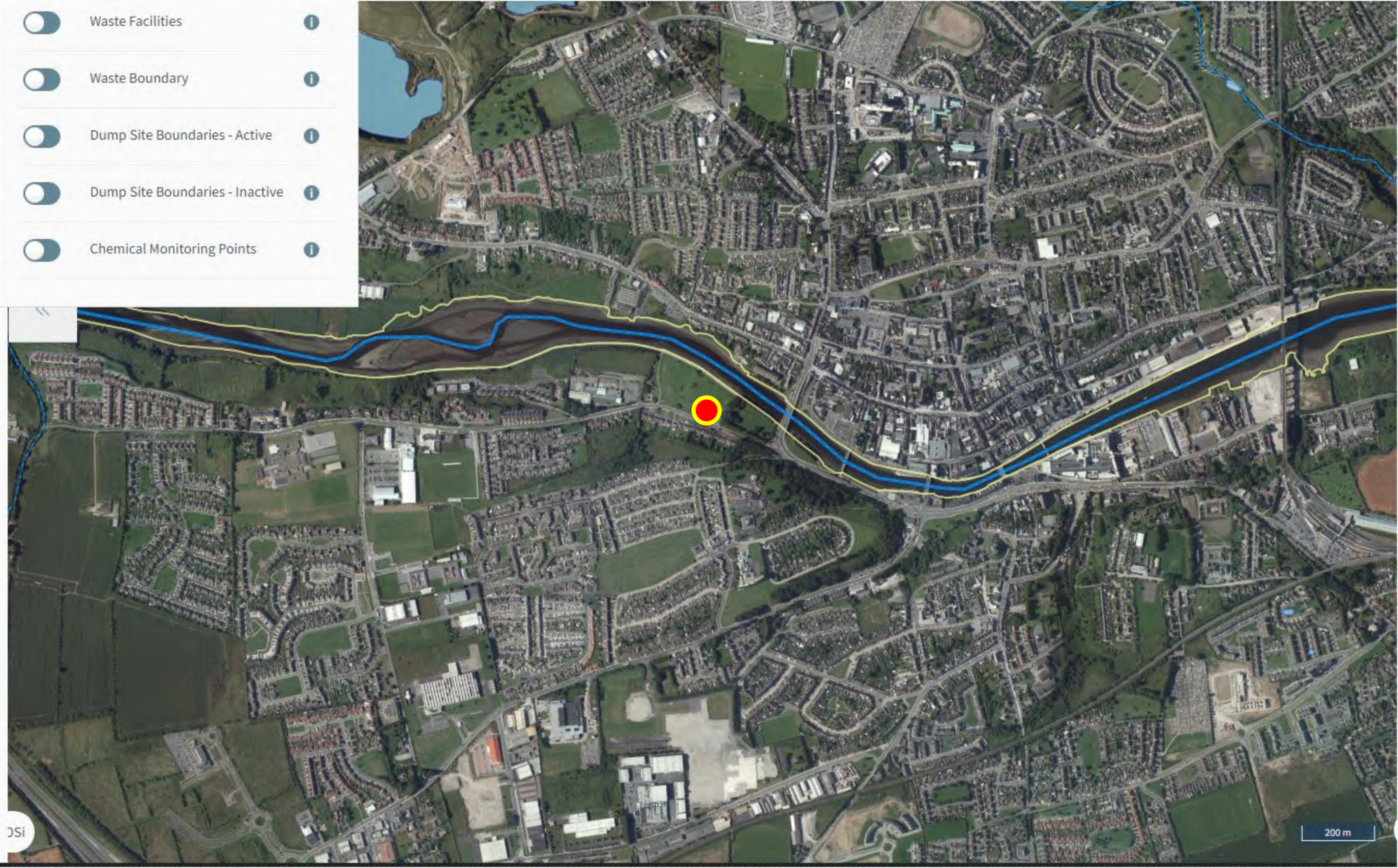
Waste Facilities

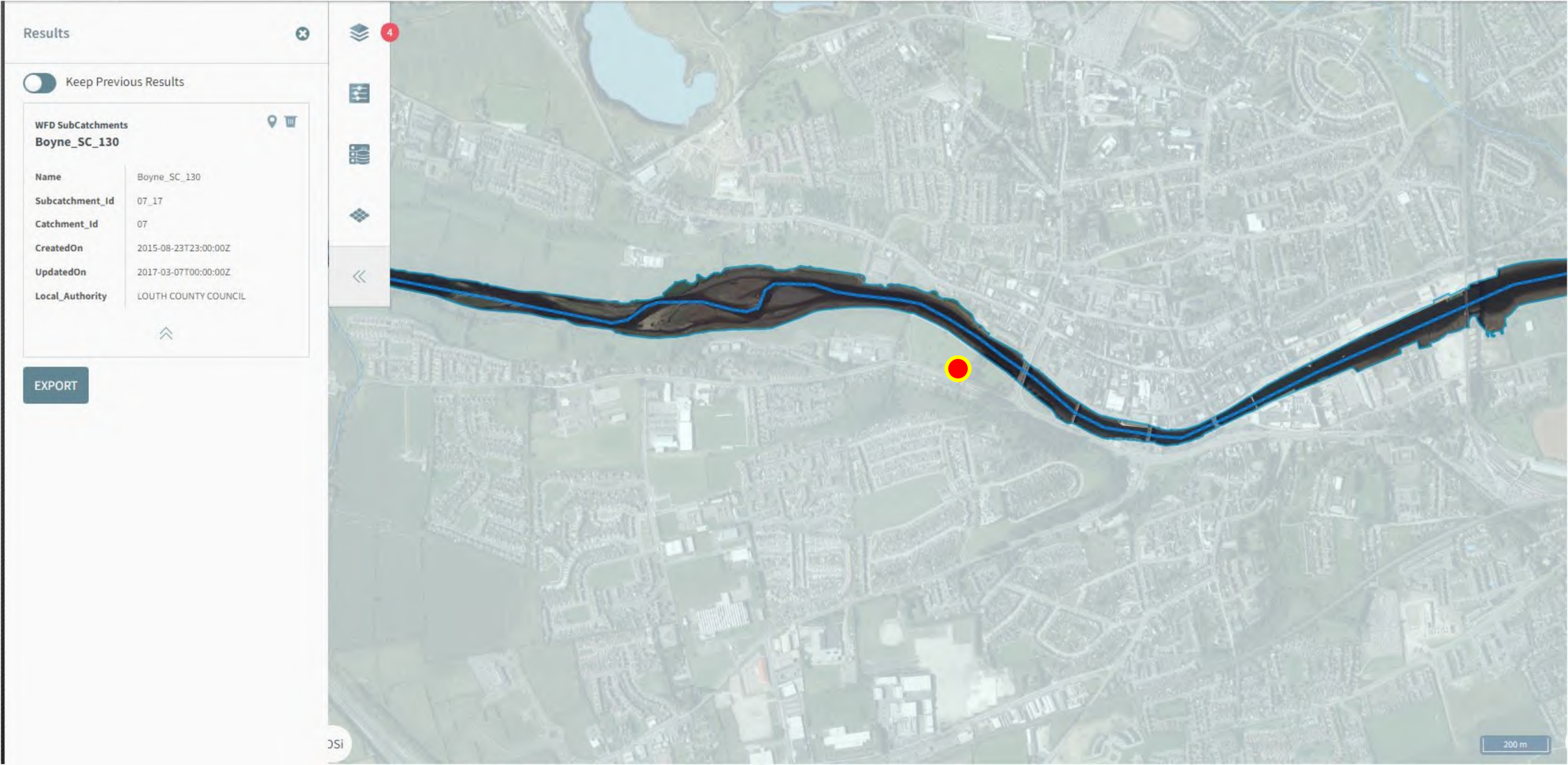
Waste Boundary

Dump Site Boundaries - Active

Dump Site Boundaries - Inactive

Chemical Monitoring Points




Results
Keep Previous Results
WFD SubCatchments
Boyne_SC_130
Name
Boyne_SC_130
Subcatchment_Id
07_17
Catchment_Id
07
CreatedOn
2015-08-23T23:00:00Z
UpdatedOn
2017-03-07T00:00:00Z
Local_Authority
LOUTH COUNTY COUNCIL
EXPORT
4
200 m

APPENDIX 2

NPWS (2014) SITE SYNOPSIS: RIVER BOYNE AND RIVER BLACKWATER SAC 002299.

NPWS (2021) CONSERVATION OBJECTIVES: RIVER BOYNE AND RIVER BLACKWATER SAC 002299. VERSION 1. NATIONAL PARKS AND WILDLIFE SERVICE, DEPARTMENT OF HOUSING, LOCAL GOVERNMENT AND HERITAGE.

NATIONAL BIODIVERSITY DATA CENTRE
SPECIES DATA AND 1KM GRID REPORT

SITE SYNOPSIS

Site Name: River Boyne and River Blackwater SAC

Site Code: 002299

This site comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers. These riverine stretches drain a considerable area of Meath and Westmeath, and smaller areas of Cavan and Louth. The underlying geology is Carboniferous Limestone for the most part, with areas of Upper, Lower and Middle well represented. In the vicinity of Kells Silurian Quartzite is present while close to Trim are Carboniferous Shales and Sandstones. There are many large towns adjacent to but not within the site, including Slane, Navan, Kells, Trim, Athboy and Ballivor.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7230] Alkaline Fens
[91E0] Alluvial Forests*
[1099] River Lamprey (*Lampetra fluviatilis*)
[1106] Atlantic Salmon (*Salmo salar*)
[1355] Otter (*Lutra lutra*)

The main areas of alkaline fen in this site are concentrated in the vicinity of Lough Shesk, Freehan Lough and Newtown Lough. The hummocky nature of the local terrain produces frequent springs and seepages which are rich in lime. A series of base-rich marshes have developed in the poorly-drained hollows, generally linked with these three lakes. Open water is usually fringed by Bulrush (*Typha latifolia*), Common Club-rush (*Scirpus lacustris*) or Common Reed (*Phragmites australis*), and this last species also extends shorewards where a dense stand of Great Fen-sedge (*Cladium mariscus*) frequently occurs. This in turn grades into a sedge and grass community (*Carex* spp. and Purple Moor-grass, *Molinia caerulea*), or one dominated by Black Bog-rush (*Schoenus nigricans*). An alternative aquatic/terrestrial transition is a floating layer of vegetation. This is normally based on Bogbean (*Menyanthes trifoliata*) and Marsh Cinquefoil (*Potentilla palustris*). Other species gradually become established on this cover, especially plants tolerant of low nutrient status e.g. bog mosses (*Sphagnum* spp.). Diversity of plant and animal life is high in the fen and the flora includes many rarities. Plants of interest include Narrow-leaved Marsh-orchid (*Dactylorhiza traunsteineri*), Fen Bedstraw (*Galium uliginosum*), Cowbane (*Cicuta virosa*), Frogbit (*Hydrocharis morsus-ranae*) and Least Bur-reed (*Sparganium minimum*). These species tend to be restricted in their distribution in Ireland. Also notable is the

abundance of aquatic stoneworts (*Chara* spp.) which are characteristic of calcareous wetlands.

The rare plant Round-leaved Wintergreen (*Pyrola rotundifolia*) occurs around Newtown Lough. This species is listed in the Red Data Book and this site represents its only occurrence in Co. Meath.

Wet woodland fringes many stretches of the Boyne. The Boyne River Islands are a small chain of three islands situated 2.5 km west of Drogheda. The islands were formed by the build-up of alluvial sediment in this part of the river where water movement is sluggish. All of the islands are covered by dense thickets of wet, willow (*Salix* spp.) woodland, with the following species occurring: Osier (*S. viminalis*), Crack Willow (*S. fragilis*), White Willow (*S. alba*), Purple Willow (*Salix purpurea*) and Rusty Willow (*S. cinerea* subsp. *oleifolia*). A small area of Alder (*Alnus glutinosa*) woodland is found on soft ground at the edge of the canal in the north-western section of the islands. Along other stretches of the rivers of the site Rusty Willow scrub and pockets of wet woodland dominated by Alder have become established, particularly at the river edge of mature deciduous woodland. Ash (*Fraxinus excelsior*) and Downy Birch (*Betula pubescens*) are common in the latter, and the ground flora is typical of wet woodland with Meadowsweet (*Filipendula ulmaria*), Wild Angelica (*Angelica sylvestris*), Yellow Iris (*Iris pseudacorus*), horsetails (*Equisetum* spp.) and occasional tussocks of Greater Tussock-sedge (*Carex paniculata*).

The dominant habitat along the edges of the river is freshwater marsh, and the following plant species occur commonly in these areas: Yellow Iris, Creeping Bent (*Agrostis stolonifera*), Canary Reed-grass (*Phalaris arundinacea*), Marsh Bedstraw (Galium palustre), Water Mint (*Mentha aquatica*) and Water Forget-me-not (*Myosotis scorpioides*). In the wetter areas Common Meadow-rue (*Thalictrum flavum*) is found. In the vicinity of Dowth, Fen Bedstraw (*Galium uliginosum*), a scarce species mainly confined to marshy areas in the midlands, is common in this vegetation. Swamp Meadow-grass (*Poa palustris*) is an introduced plant which has spread into the wild (naturalised) along the Boyne approximately 5 km south-west of Slane. It is a rare species which is listed in the Red Data Book and has been recorded among freshwater marsh vegetation on the banks of the Boyne in this site. The only other record for this species in the Republic of Ireland is from a site in Co. Monaghan.

The secondary habitat associated with the marsh is wet grassland and species such as Tall Fescue (*Festuca arundinacea*), Silverweed (*Potentilla anserina*), Creeping Buttercup (*Ranunculus repens*), Meadowsweet and Meadow Vetchling (*Lathyrus pratensis*) are well represented. Strawberry Clover (*Trifolium fragiferum*), a plant generally restricted to coastal locations in Ireland, has been recorded from wet grassland vegetation at Trim. At Rossnaree river bank on the River Boyne, Round-Fruited Rush (*Juncus compressus*) is found in alluvial pasture, which is generally periodically flooded during the winter months. This rare plant is only found in three counties in Ireland.

Along much of the Boyne and along tributary stretches are found areas of mature deciduous woodland on the steeper slopes above the floodplain marsh or wet woodland vegetation. Many of these are planted in origin. However the steeper areas of King Williams Glen and Townley Hall wood have been left unmanaged and now have a more natural character. East of Curley Hole the woodland has a natural appearance with few conifers. Broadleaved species include oaks (*Quercus* spp.), Ash, willows, Hazel (*Corylus avellana*), Sycamore (*Acer pseudoplatanus*), Holly (*Ilex aquifolium*), Horse-chestnut (*Aesculus hipposcastanum*) and the shrubs Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Elder (*Sambucus nigra*). South-west of Slane and in Dowth, some more exotic tree species such as Beech (*Fagus sylvatica*), and occasionally Lime (*Tilia cordata*), are seen. The coniferous trees Larch (*Larix* sp.) and Scots Pine (*Pinus sylvestris*) also occur. The woodland ground flora includes Barren Strawberry (*Potentilla sterilis*), Enchanter's-nightshade (*Circaea lutetiana*) and Ground-ivy (*Glechoma hederacea*), along with a range of ferns. Variation occurs in the composition of the canopy - for example, in wet patches alongside the river, White Willow and Alder form the canopy.

Other habitats present along the Boyne and Blackwater include lowland dry grassland, improved grassland, reedswamp, weedy waste ground, scrub, hedge, drainage ditch and canal. In the vicinity of Lough Shesk, the dry slopes of the morainic hummocks support grassland vegetation which, in some places, is partially colonised by Gorse (*Ulex europaeus*) scrub. Those grasslands which remain unimproved for pasture are species-rich, with Common Knapweed (*Centaurea nigra*), Creeping Thistle (*Cirsium arvense*) and Ribwort Plantain (*Plantago lanceolata*) commonly present. Fringing the canal alongside the Boyne south-west of Slane are areas with Reed Sweet-grass (*Glyceria maxima*), Great Willowherb (*Epilobium hirsutum*) and Meadowsweet.

The Boyne and its tributaries form one of Ireland's premier game fisheries and the area offers a wide range of angling, from fishing for spring salmon and grilse to seatrout fishing and extensive brown trout fishing. Atlantic Salmon (*Salmo salar*) use the tributaries and headwaters as spawning grounds. Although this species is still fished commercially in Ireland, it is considered to be endangered or locally threatened elsewhere in Europe and is listed on Annex II of the Habitats Directive. Atlantic Salmon run the Boyne almost every month of the year. The Boyne is most important as it represents an eastern river which holds large three-sea-winter fish from 20-30 lb. These fish generally arrive in February, with smaller spring fish (10 lb) arriving in April/May. The grilse come in July, water permitting. The river gets a further run of fish in late August and this run would appear to last well after the fishing season. The salmon fishing season lasts from 1st March to 30th September.

The Blackwater is a medium sized limestone river which is still recovering from the effects of the arterial drainage scheme of the 1970s. Salmon stocks have not recovered to the numbers that existed pre-drainage. The Deel, Riverstown, Stoneyford and Tremblestown Rivers are all spring-fed, with a continuous high volume of water. They are difficult to fish because some areas are overgrown, while others have been affected by drainage with resultant high banks.

This site is also important for the populations of two other species listed on Annex II of the E.U. Habitats Directive which it supports, namely River Lamprey (*Lampetra fluviatilis*), which is present in the lower reaches of the Boyne River, and Otter (*Lutra lutra*), which can be found throughout the site. In addition, the site also supports many more of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Pine Marten, Badger and Irish Hare. Common Frog, another Red Data Book species, also occurs within the site. All of these animals, with the addition of the Stoat and Red Squirrel, which also occur within the site, are protected under the Wildlife Act, 1976.

Whooper Swans winter regularly at several locations along the Boyne and Blackwater Rivers. Known sites are at Newgrange (approx. 20 in recent winters), near Slane (20+ in recent winters), Wilkinstown (several records of 100+) and River Blackwater from Kells to Navan (104 at Kells in winter 1996/97, 182 at Headfort in winter 1997/98, 200-300 in winter 1999/00). The available information indicates that there is a regular wintering population of Whooper Swans based along the Boyne and Blackwater River valleys. The birds use a range of feeding sites but roosting sites are not well known. The population is substantial, certainly of national, and at times international, importance. Numbers are probably in the low hundreds.

Intensive agriculture is the main land use along the site. Much of the grassland is in very large fields and is improved. Silage harvesting is carried out. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid river and to the lakes. In the more extensive agricultural areas sheep grazing is carried out.

Fishing is a main tourist attraction on the Boyne and Blackwater and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The Eastern Regional Fishery Board have erected fencing along selected stretches of the river as part of their salmonid enhancement programme. Parts of the river system have been arterially dredged. In 1969 an arterial dredging scheme commenced and disrupted angling for 18 years. The dredging altered the character of the river completely and resulted in many areas in very high banks. The main channel from Drogheda upstream to Navan was left untouched, as were a few stretches on the Blackwater. Ongoing maintenance dredging is carried out along stretches of the river system where the gradient is low. This is extremely destructive to salmonid habitat in the area. Drainage of the adjacent river systems also impacts on the many small wetland areas throughout the site. The River Boyne is a designated Salmonid Water under the E.U. Freshwater Fish Directive.

The site supports populations of several species listed on Annex II of the E.U. Habitats Directive, and habitats listed on Annex I of this Directive, as well as examples of other important habitat types. Although the wet woodland areas appear small there are few similar examples of this type of alluvial wet woodland remaining in the country, particularly in the north-east. The semi-natural habitats, particularly the strips of woodland which extend along the river banks, and the marsh and wet

grasslands, increase the overall habitat diversity and add to the ecological value of the site, as does the presence of a range of Red Data Book plant and animal species and the presence of nationally rare plant species.

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

River Boyne and River Blackwater SAC 002299

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2021) Conservation Objectives: River Boyne and River Blackwater SAC 002299. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editors: Rebecca Jeffrey and Christina Campbell
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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002299	River Boyne and River Blackwater SAC
1099	River Lamprey *Lampetra fluviatilis*
1106	Salmon *Salmo salar*
1355	Otter *Lutra lutra*
7230	Alkaline fens
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*

Please note that this SAC overlaps with Boyne Estuary SPA (004080) and River Boyne and River Blackwater SPA (004232). The SAC is also adjacent to Boyne Coast and Estuary SAC (001957). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manuals, No. 23
Year :	2006
Title :	A baseline survey of juvenile lamprey populations in the Boyne catchment
Author :	O'Connor, W.
Series :	Irish Wildlife Manuals, No. 24
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Ireland Red List No. 2: Non-marine molluscs
Author :	Byrne, A.; Moorkens, E.A.; Anderson, R.; Killeen, I.J.; Regan, E.C.
Series :	Ireland Red List series, NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 46
Year :	2010
Title :	Ireland Red List No. 4: Butterflies
Author :	Regan, E.C.; Nelson, B.; Aldwell, B.; Bertrand, C.; Bond, K.; Harding, J.; Nash, D.; Nixon, D.; Wilson, C.J.
Series :	Ireland Red List series, NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manuals, No. 76
Year :	2013
Title :	Results of a monitoring survey of old sessile oak woods and alluvial forests
Author :	O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals, No. 71

Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	in prep.
Title :	The monitoring and assessment of four EU Habitats Directive Annex I woodland habitats
Author :	Daly, O.H.; O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals
Year :	in prep.
Title :	Scoping study and pilot survey of fens
Author :	O'Neill, F.H.; Perrin, P.M.; Denyer, J.; Martin, J.R.; Daly, O.H.; Brophy, J.T.
Series :	Irish Wildlife Manuals

Other References

Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2011
Title :	Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland
Author :	Gargan, P.G.; Roche, W.K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.
Series :	Journal of Applied Ichthyology, 27 (Suppl. 3): 66-72

Year :	2011
Title :	Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23-25 June 2010
Author :	Bobbink, R.; Hettelingh, J.P.
Series :	RIVM report 680359002, Coordination Centre for Effects, National Institute for Public Health and the Environment (RIVM)
Year :	2011
Title :	The Fen Management Handbook
Author :	McBride, A.; Diack, I.; Droy, N.; Hamill, B.; Jones, P.; Schutten, J.; Skinner, A.; Street, M. (eds.)
Series :	Scottish Natural Heritage, Perth
Year :	2015
Title :	Behaviour of sea lamprey (*Petromyzon marinus* L.) at man-made obstacles during upriver spawning migration: use of telemetry to access efficacy of weir modifications for improved passage
Author :	Rooney, S.M.; Wightman, G.D.; O Conchuir, R.; King, J.J.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 115B: 1-12
Year :	2015
Title :	Common standards monitoring guidance for freshwater fauna. Version October 2015
Author :	JNCC
Series :	Joint Nature Conservation Committee, Peterborough
Year :	2016
Title :	Irish Vegetation Classification: Technical Progress Report No. 2
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre
Year :	2016
Title :	National Programme: Habitats Directive and Red Data Book Species Summary Report 2015
Author :	Gallagher, T.; O'Gorman, N.M.; Rooney, S.M.; Coghlan, B.; King, J.J.
Series :	IFI/2016/1-4344. Inland Fisheries Ireland
Year :	2018
Title :	Irish Vegetation Classification: Technical Progress Report No. 4
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre
Year :	2021
Title :	The Status of Irish Salmon Stocks in 2020 with Catch Advice for 2021
Author :	Gargan, P.; Fitzgerald, C.; Kennedy, R.; Maxwell, H.; McLean, S.;Millane, M.
Series :	Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries

Spatial data sources

Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91E0 (map 3)
Year :	2018
Title :	Woodland Monitoring Survey 2017-2018
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91E0 (map 3)

7230 Alkaline fens

To maintain the favourable conservation condition of Alkaline fens in River Boyne and River Blackwater SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Alkaline fen has not been mapped in detail for River Boyne and River Blackwater SAC and thus the exact total current area of the qualifying habitat in the SAC is currently unknown. The main areas of alkaline fen in the SAC are documented to occur in the vicinity of Lough Shesk, Freekan Lough, Newtown Lough in the upper reaches of the Stonyford River. At Lough Shesk, the habitat is particularly well-represented and there is a good example of succession from open water to fen-type habitat (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See the notes for habitat area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat in NPWS (2013). See also Bobbink and Hettelingh (2011). Increased nutrients can lead to changes in plant and invertebrate species through competition and subsequent structural changes to micro-habitat. These nutrients favour growth of grasses rather than forbs and mosses and leads to a higher and denser sward
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time
Ecosystem function: hydrology - groundwater levels	Water levels (centimetres); duration of levels; hydraulic gradients; water supply	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Fen habitats require high groundwater levels (i.e. water levels at or above the ground surface) for a large proportion of the calendar year (i.e. duration of mean groundwater level). Fen groundwater levels are controlled by regional groundwater levels in the contributing catchment area (which sustain the hydraulic gradients of the fen groundwater table). Regional abstraction of groundwater may affect fen groundwater levels
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural, drainage conditions	Drainage, either within or surrounding the fen habitat, can result in the drawdown of the groundwater table. The depth, geometry and density of drainage (hydromorphology) will indicate the scale and impact on fen hydrology. Drainage can result in loss of characteristic species and transition to drier habitats
Ecosystem function: water quality	Various	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus, with the latter tending to be the limiting nutrient under natural conditions. Water supply should be also relatively calcium-rich
Vegetation composition: community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The entire diversity of alkaline fen vegetation communities present in the SAC is currently unknown. Information on the vegetation communities associated with alkaline fens is provided by O'Neill et al. (in prep.). See also the Irish Vegetation Classification (Perrin, 2018; www.biodiversityireland.ie/projects/ivc-classification-explorer)

Vegetation composition: typical brown mosses	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical brown moss species	For lists of typical bryophyte species, including high quality indicator species, see O'Neill et al. (in prep.). Species recorded at Lough Shesk and Newtown Lough include: *Calliergon giganteum, Scorpidium scorpioides, Campylium stellatum, Bryum pseudotriquetrum, Fissidens adianthoides, Scorpidium scorpioides, Calliergonella cuspidata* and *Ctenidium molluscum* (NPWS internal files)
Vegetation composition: typical vascular plants	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical vascular plant species	For lists of typical vascular plant species for the different vegetation communities, including high quality indicators, see O'Neill et al. (in prep.). Typical species recorded in the habitat in the SAC include black bog-rush (*Schoenus nigricans*), dioecious sedge (*C. dioica*) and common butterwort (*Pinguicula vulgaris*) (NPWS internal files)
Vegetation composition: native negative indicator species	Percentage cover at a representative number of monitoring stops	Cover of native negative indicator species at insignificant levels	Negative indicators include species not characteristic of the habitat and species indicative of undesirable activities such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. Native negative indicators may include *Anthoxanthum odoratum, Epilobium hirsutum, Holcus lanatus, Juncus effusus, Phragmites australis* and *Ranunculus repens*. See O'Neill et al. (in prep.)
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%	Attribute and target based on O'Neill et al. (in prep.). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on O'Neill et al. (in prep.). Scrub and trees will tend to invade if fen conditions become drier
Vegetation composition: algal cover	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of algae less than 2%	Attribute and target based on O'Neill et al. (in prep.). Algal cover is indicative of nutrient enrichment from multiple sources (McBride et al., 2011)
Vegetation structure: vegetation height	Percentage cover at a representative number of monitoring stops	At least 50% of the live leaves/flowering shoots are more than either 5cm or 15cm above ground surface depending on community type	Attribute and target based on O'Neill et al. (in prep.). While grazing may be appropriate in this habitat, excessive grazing can reduce the ability of plant species to regenerate reproductively and maintain species diversity, especially if flowering shoots are cropped during the growing season
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of disturbed bare ground not more than 10%	Attribute and target based on O'Neill et al. (in prep.). While grazing may be appropriate in this habitat, excessive areas of disturbed bare ground may develop due to unsuitable grazing regimes. Disturbance can include hoof marks, wallows, human footprints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for peatlands
Physical structure: tufa formations	Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	Attribute and target based on O'Neill et al. (in prep.)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	This includes species on the Flora (Protection) Order, 2015 and/or Red Lists (Byrne et al., 2009; Regan et al., 2010; Lockhart et al., 2012; Wyse Jackson et al., 2016, etc.). The Near Threatened species (Wyse Jackson et al., 2016) round-leaved wintergreen (*Pyrola rotundifolia*) has been recorded in the habitat around Newtown Lough in the SAC (NPWS internal files)
Transitional areas between fen and adjacent habitats	Hectares; distribution	Maintain adequate transitional areas to support/protect the alkaline fen ecosystem and the services it provides	In many cases, fens transition to other wetland habitats. It is important that the transitional areas between fens and other habitats are maintained in as natural condition as possible in order to protect the functioning of the fen

91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* in River Boyne and River Blackwater SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. See map 3 for surveyed woodland areas	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* is present within River Boyne and River Blackwater SAC. As part of the National Survey of Native Woodlands (NSNW), the sub-sites Grove Island (NSNW site code 688) and Yellow Island (752) were surveyed by Perrin et al. (2008). Yellow Island (code 752) was also included in national monitoring surveys (O'Neill and Barron, 2013; Daly et al., in prep.). Map 3 shows the minimum area of alluvial forests within the SAC, which is estimated to be 16.7ha (Perrin et al., 2008; Daly et al., in prep.). It is important to note that further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. The surveyed woodland locations are shown on map 3	Distribution based on Perrin et al. (2008) and Daly et al. (in prep.). It is important to note that further unsurveyed areas may be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage; metres; centimetres	Total canopy cover at least 30%; median canopy height at least 7m; native shrub layer cover 10-75%; native herb/dwarf shrub layer cover at least 20% and height at least 20cm; bryophyte cover at least 4%	The target aims for a diverse structure with a canopy containing mature trees, shrub layer with semi-mature trees and shrubs, and well-developed field layer (herbs, graminoids and dwarf shrubs) and ground layer (bryophytes). Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	The Boyne River Islands are an example of gallery forests of willows (Salicion albae), which occur alongside river channels and on river islands, where tree roots are almost continuously submerged (Daly et al., in prep.). Grove Island (NSNW site code 688) and Yellow Island (752) were assigned by Perrin et al. (2008) to the *Salix triandra – Urtica dioica* vegetation type (2h) of the *Fraxinus excelsior – Hedera helix* group. This corresponds to the *Salix fragilis – Calystegia sepium* sub-community (WL3Di) of the Irish Vegetation Classification (Perrin, 2016; www.biodiversityireland.ie/projects/ivc-classification-explorer)
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes of target species for 91E0* woodlands and other native tree species occur in adequate proportions to ensure survival of woodland canopy	The target species for 91E0* are alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and willows (*Salix* spp.). Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)

Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river and lake floodplains, but not for woodland around springs/seepage areas. Much of the river channel within the SAC was subject to arterial drainage schemes. Natural flood-plains now exist along only limited stretches of river (NPWS internal files)
Woodland structure: dead wood	Number per hectare	At least 19 stems/ha of dead wood of at least 20cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence; population size	No decline in distribution and, in the case of red listed and other rare or localised species, population size	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red listed and other rare or localised species
Woodland structure: indicators of overgrazing	Occurrence	All five indicators of overgrazing absent	There are five indicators of overgrazing within 91E0*: topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, severe recent bark stripping, and trampling (Daly et al., in prep.)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover at least 90% of canopy; target species cover at least 50% of canopy	The target species for 91E0* are alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and willows (*Salix* spp.) (Daly et al., in prep.; O'Neill and Barron, 2013)
Vegetation composition: typical species	Occurrence	At least 1 target species for 91E0* woodlands present; at least 6 positive indicator species for 91E0* woodlands present	A variety of typical native species should be present, depending on woodland type. The target species for 91E0* are alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and willows (*Salix* spp.). Positive indicator species for 91E0* are listed in Daly et al. (in prep.) and O'Neill and Barron (2013)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent	Negative indicator species (i.e. any non-native species, including herbaceous species) should be absent or under control. The canopy at Grove Island (NSNW site code 688) and Yellow Island (752) is dominated by a range of *Salix* spp. (*S. cinerea, S. triandra, S. fragilis, S. viminalis*) (Perrin et al., 2008). Although the latter two are not native to Ireland, an exception is made for these species where they occur within gallery woodland (Daly et al., in prep.). Perrin et al. (2008) recorded some sycamore (*Acer pseudoplatanus*) in the canopy at Grove Island (NSNW site code 688). Daly et al. (in prep.) found that the recent arrival of the invasive non-native herb Himalayan balsam (*Impatiens glandulifera*) at Yellow Island (752) has caused significant negative impacts to the alluvial forest habitat
Vegetation composition: problematic native species	Percentage	Cover of common nettle (*Urtica dioica*) less than 75%	Common nettle (*Urtica dioica*) is a positive indicator species for 91E0* but, in some cases, it may become excessively dominant. Increased light and nutrient enrichment are factors which favour proliferation of common nettle (Daly et al., in prep.)

1099 River Lamprey *Lampetra fluviatilis*

To restore the favourable conservation condition of River Lamprey (*Lampetra fluviatilis*) in River Boyne and River Blackwater SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage of river accessible	Restore access to all water courses down to first order streams	Artificial barriers can block or impede the passage of upstream migrating lamprey, thereby restricting access to spawning areas (Gargan et al., 2011; Rooney et al., 2015). There are a number of weirs along the lower sections of the Boyne main channel, the most substantial of these are located at Slane and downstream of Navan at Blackcastle. Efforts to trap adult river lamprey were undertaken at four locations throughout the catchment during November 2014 to April 2015. This was augmented in April 2015 by an extensive fyke-netting survey (n=26 sites). No adult river lamprey were encountered, with the only record to date being a dead individual from the River Boyne at Slane in late March 2015 (Gallagher et al., 2016). On the Boyne main channel, there is ideal spawning habitat both upstream and downstream of the weir at Blackcastle but spawning has not been observed at these locations to date
Distribution of larvae	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	Not less than 50% of sample sites with suitable habitat positive for larval brook/river lamprey	It is not possible to distinguish between larval brook and river lamprey in the field and they are therefore considered together in assessing conservation status. A survey of the Boyne catchment in 2015 recorded n=583 *Lampetra* spp. larvae from n=102 sites (Gallagher et al., 2016). As stated, the weirs in the lower main stem are a significant impediment to river lamprey passage and, for this reason, these larvae are considered to be mainly, if not all, brook lamprey. To achieve favourable condition *Lampetra* spp. should, as a minimum, be present in not less than 50% of all sampling sites surveyed with suitable habitat present within the natural range (JNCC, 2015). *Lampetra* spp. larvae were recorded from 72% of sites indicating a pass for this target. Distribution remained similar to a 2005 survey (O'Connor, 2006) although larvae continued to be absent from the Boycetown and Skane Rivers, as well as the upper reaches of the Kells Blackwater system
Population structure of larvae	Number of age/size classes	At least three age/size classes of larval brook/river lamprey present	The target of at least three age/size classes is based on guidance from JNCC (2015). Larvae typically range from 10-150mm in length and this corresponds to up to six age classes. A broad range of size classes (12-153mm), including young-of-year larvae, was recorded from the 2015 Boyne catchment-wide survey indicating a pass for this target. However, given the issue of artificial barriers on the River Boyne, it is likely that this value pertains to brook lamprey, as previously stated
Larval lamprey density in fine sediment	Larval lamprey/m²	Mean density of brook/river larval lamprey in sites with suitable habitat more than 5/m²	A target mean density of more than 5/m² larvae in sites with suitable habitat is required to achieve favourable condition (JNCC, 2015). In the Boyne survey a mean density of 6/m² *Lampetra* spp. larvae (n=583) was obtained. A number of tributaries did not achieve a pass for this target, including the Athboy/Tremblestown, Boycetown, Deel, Skane and Stonyford Rivers. Again, the overall mean density value is most likely indicative of the status of brook lamprey in the Boyne catchment

Extent and distribution of spawning nursery habitat	m^2 and occurrence	No decline in extent and distribution of spawning and nursery beds	This target is based on spawning and nursery bed mapping during targeted larval lamprey monitoring surveys. River lamprey spawn in clean gravels in flowing water where they excavate shallow nests. While coarse substrate is required for spawning, the close proximity of nursery areas comprising mainly sand/silt are necessary for the development of larvae. The 2015 Boyne survey recorded adequate spawning and nursery habitat availability within the catchment (Gallagher et al., 2016). However, the sequence of weirs in the lower main channel of the Boyne represents a significant impediment to upstream passage. In addition, this lower section of river is in a degraded hydromorphological state with impounding and, therefore, poor habitat availability for spawning

1106 Salmon *Salmo salar*

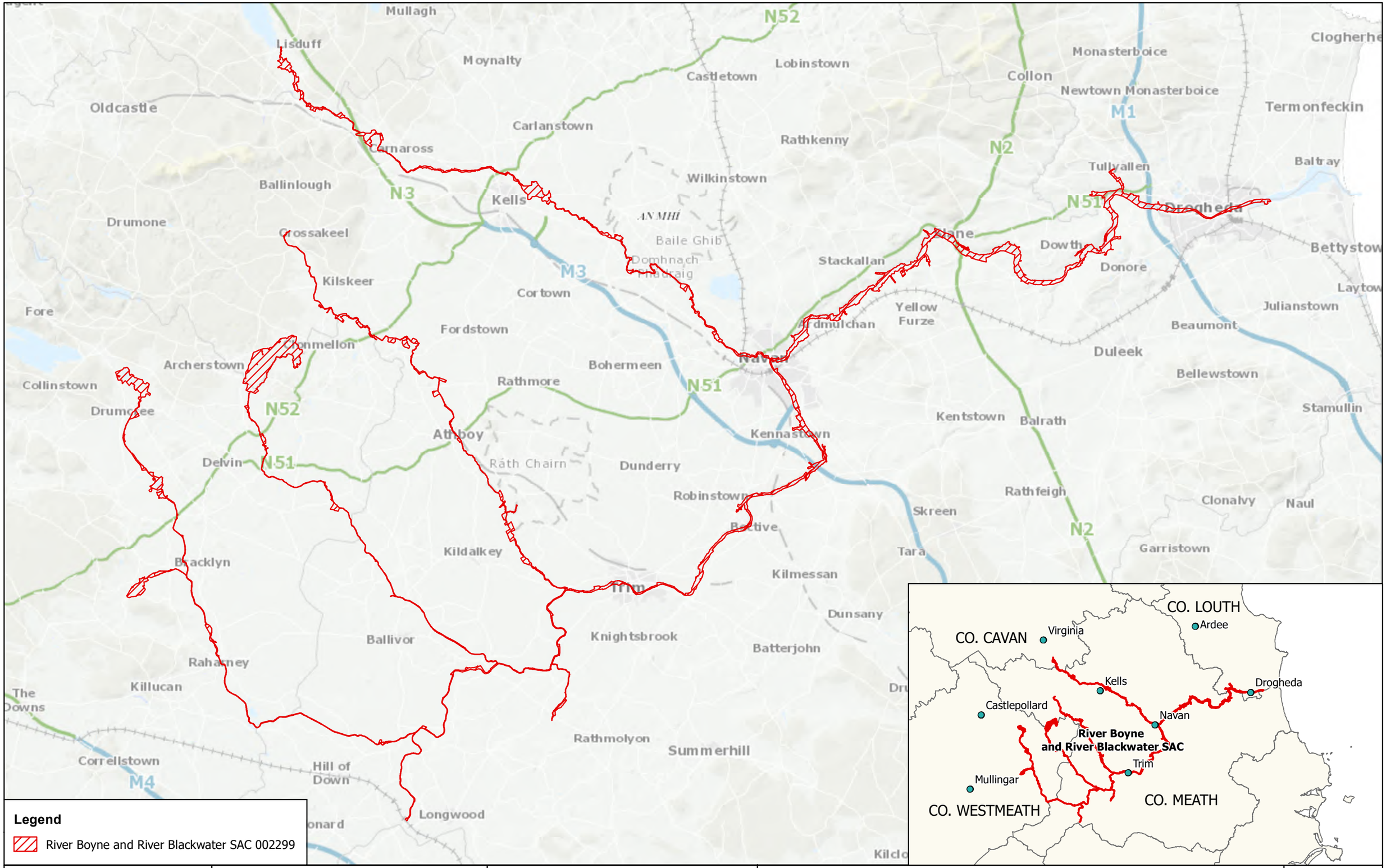
To restore the favourable conservation condition of Atlantic Salmon (*Salmo salar*) in River Boyne and River Blackwater SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. There are multiple barriers to fish migration in the Boyne system
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Technical Expert Group on Salmon's (TEGOS) annual model output of CL attainment levels. See Gargan et al. (2021) for further details. Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Boyne is significantly below its CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. There is restricted habitat for salmon in the Boyne and habitat rehabilitation programmes have been undertaken in sections of the catchment
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter (*Lutra lutra*) in River Boyne and River Blackwater SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 447.6ha along river banks/ lake shoreline/around ponds	No field survey. Areas mapped to include 10m terrestrial buffer, identified as critical for otters (NPWS, 2007), along rivers and around water bodies
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 263.3km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 31.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m, e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



Legend

River Boyne and River Blackwater SAC 002299

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
RIVER BOYNE AND RIVER BLACKWATER SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

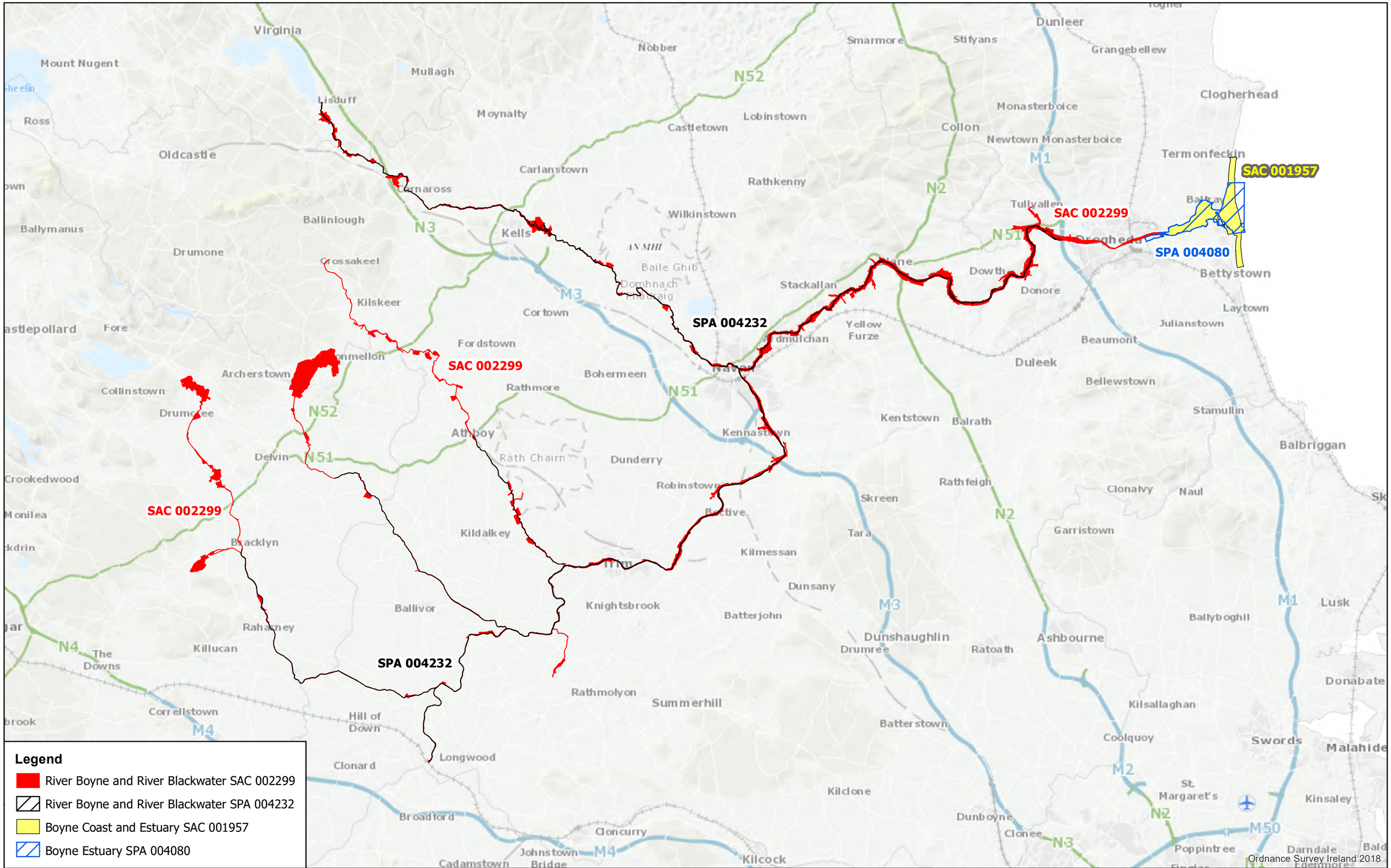
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 002299; version 3.02.
CO. CAVAN / LOUTH / MEATH / WESTMEATH

0 2 4 8 Kilometres

N

Date: January 2021



Legend

- River Boyne and River Blackwater SAC 002299
- River Boyne and River Blackwater SPA 004232
- Boyne Coast and Estuary SAC 001957
- Boyne Estuary SPA 004080

Ordnance Survey Ireland 2018

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2:
RIVER BOYNE AND RIVER BLACKWATER SAC
CONSERVATION OBJECTIVES
OVERLAPPING / ADJACENT SITES

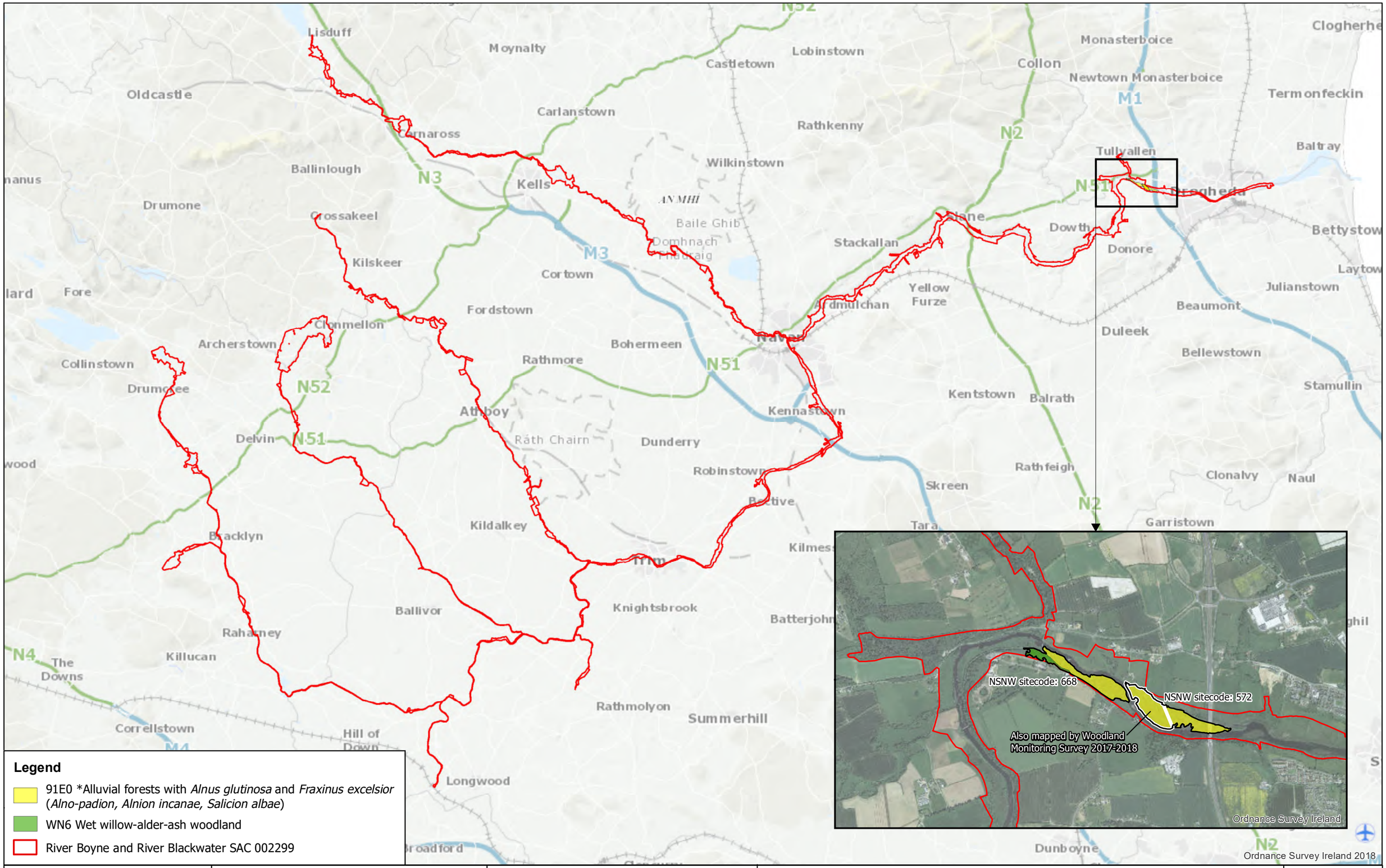
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 002299; version 3.02.
CO. CAVAN / LOUTH / MEATH / WESTMEATH

0 2.5 5 10 Kilometres

N

Date: January 2021



Legend

- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-padion, Alnion incanae, Salicion albae*)
- WN6 Wet willow-alder-ash woodland
- River Boyne and River Blackwater SAC 002299

Ordnance Survey Ireland 2018

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 3:
RIVER BOYNE AND RIVER BLACKWATER SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 002299; version 3.02.
CO. CAVAN / LOUTH / MEATH / WESTMEATH

0 2 4 8 Kilometres

N

Date: January 2021

Birds of Ireland - O084751

Name	Birds of Ireland
Grid Resolution	100
Grid	O084751
Site	Drogheda
Dataset	Birds of Ireland
Survey	
Precision	100m
Recorder	David Duffy

Zoom to

60 m

Scale: 1:2500 - Resolution: 100m

708010, 775434

Find address or place

Zoom to

Birds of Ireland - O083753

Dataset	Birds of Ireland
Survey	
Precision	100m
Recorder	David Duffy
Determiner	
Taxon	Apus apus
Common Name	Common Swift
Date	23/05/2019

60 m

Scale: 1:2500 - Resolution: 100m

708030, 775474

Find address or place

Zoom to

1 of 15

National Bat Database of Ireland - O084751

Name	National Bat Database of Ireland
Grid Resolution	100
Grid	O084751
Site	Undisclosed
Dataset	National Bat Database of Ireland
Survey	All Ireland Daubentons Bat Waterways Survey
Precision	Undetermined
Recorder	Tina Aughney
Determiner	
Taxon	Myotis daubentonii
Common Name	Daubenton's Bat
Date	15/08/2009

Additional Attributes:

Determiner name	Tina Aughney
Survey name	All Ireland Daubentons Bat Waterways Survey
Type of roost	Transect

60 m

Scale: 1:2500 - Resolution: 100m

708045, 775470

Find address or place

Zoom to

3 of 15

National Bat Database of Ireland - O084751

Name	National Bat Database of Ireland
Grid Resolution	100
Grid	O084751
Site	Undisclosed
Dataset	National Bat Database of Ireland
Survey	All Ireland Daubentons Bat Waterways Survey
Precision	Undetermined
Recorder	Tina Aughney
Determiner	
Taxon	Nyctalus leisleri
Common Name	Lesser Noctule
Date	21/08/2009

Additional Attributes:

Determiner name	Tina Aughney
Survey name	All Ireland Daubentons Bat Waterways Survey
Type of roost	Transect

60 m

Scale: 1:2500 - Resolution: 100m

707939, 775473

Find address or place

Zoom to

4 of 15

National Bat Database of Ireland - O084751

Name	National Bat Database of Ireland
Grid Resolution	100
Grid	O084751
Site	Undisclosed
Dataset	National Bat Database of Ireland
Survey	All Ireland Daubentons Bat Waterways Survey
Precision	Undetermined
Recorder	Tina Aughney
Determiner	
Taxon	Pipistrellus pipistrellus sensu lato
Common Name	Pipistrelle
Date	21/08/2009

Additional Attributes:

Determiner name	Tina Aughney
Survey name	All Ireland Daubentons Bat Waterways Survey
Type of roost	Transect

60 m

Scale: 1:2500 - Resolution: 100m

707931, 775473

Find address or place

Zoom to

15 of 15

National Bat Database of Ireland - O084751

Name	National Bat Database of Ireland
Grid Resolution	100
Grid	O084751
Site	Undisclosed
Dataset	National Bat Database of Ireland
Survey	All Ireland Daubentons Bat Waterways Survey
Precision	Undetermined
Recorder	Tina Aughney
Determiner	
Taxon	Pipistrellus pygmaeus
Common Name	Soprano Pipistrelle
Date	01/08/2010

Additional Attributes:

Determiner name	Tina Aughney
Survey name	All Ireland Daubentons Bat Waterways Survey
Type of roost	Transect

60 m

Scale: 1:2500 - Resolution: 100m

707885, 775493

Find address or place

Species list for O0875

Quality of information

The National Biodiversity Data Centre makes every effort to ensure the quality of the information available on this website and updates the information regularly. Before relying on the information on this site, however, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes. The National Biodiversity Data Centre cannot guarantee and assumes no legal liability or responsibility for the accuracy, currency or completeness of the information.

To assist the Centre in the provision of high quality information, should you identify an error in any of the information provided, please notify the Centre and every effort will be made to rectify the error.

Grid square	Species group	Species name	Record count	Date of last record	Title of dataset	Designation
Custom	bird	Alpine Swift (Apus melba)	1	23/03/2010	Rare birds of Ireland	
Custom	bird	Common Swift (Apus apus)	4	01/07/2021	Swifts of Ireland	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Custom	bird	Goldcrest (Regulus regulus)	1	13/11/2016	Birds of Ireland	
Custom	bird	House Sparrow (Passer domesticus)	1	05/08/2018	Birds of Ireland	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Custom	bird	Laughing Gull (Larus atricilla)	1	07/12/1991	Rare birds of Ireland	
Custom	bird	Rosy Starling (Sturnus roseus)	1	28/05/2012	Rare birds of Ireland	
Custom	bird	Ruddy Shelduck (Tadorna ferruginea)	1	31/12/1892	Rare birds of Ireland	
Custom	fern	Hart's-tongue (Phyllitis scolopendrium)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	fern	Wall-rue (Asplenium ruta-muraria)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Alder (Alnus glutinosa)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	American Willowherb (Epilobium ciliatum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	

Custom	flowering plant	Annual Meadow-grass (Poa annua)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Atlantic Ivy (Hedera hibernica)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Autumn Hawkbit (Leontodon autumnalis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Barren Brome (Anisantha sterilis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Beaked Hawk's-beard (Crepis vesicaria)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Bittersweet (Solanum dulcamara)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Black Medick (Medicago lupulina)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Bramble (Rubus fruticosus agg.)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Bread Wheat (Triticum aestivum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Broad-leaved Dock (Rumex obtusifolius)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Butterfly-bush (Buddleja davidii)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Custom	flowering plant	Callitriche aggregate	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Calystegia sepium subsp. sepium	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Cat's-ear (Hypochaeris radicata)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Celery-leaved Buttercup (Ranunculus sceleratus)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Charlock (Sinapis arvensis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Clustered Dock (Rumex conglomeratus)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	

Custom	flowering plant	Cock's-foot (Dactylis glomerata)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Coltsfoot (Tussilago farfara)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Bent (Agrostis capillaris)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Chickweed (Stellaria media)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Couch (Elytrigia repens)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Knapweed (Centaurea nigra)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Mouse-ear (Cerastium fontanum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Nettle (Urtica dioica)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Orache (Atriplex patula)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Ragwort (Senecio jacobaea)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Common Sorrel (Rumex acetosa subsp. acetosa)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Creeping Bent (Agrostis stolonifera)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Creeping Buttercup (Ranunculus repens)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Creeping Thistle (Cirsium arvense)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Cut-leaved Crane's-bill (Geranium dissectum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Cymbalaria muralis subsp. muralis	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Daisy (Bellis perennis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Dove's-foot Crane's-bill (Geranium molle)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Elder (Sambucus nigra)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	

Custom	flowering plant	False Oat-grass (Arrhenatherum elatius)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Festuca rubra agg.	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Field Forget-me-not (Myosotis arvensis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Field Madder (Sherardia arvensis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Flax (Linum usitatissimum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Great Willowherb (Epilobium hirsutum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Greater Plantain (Plantago major)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Greater Pond-sedge (Carex riparia)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Groundsel (Senecio vulgaris)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Hawthorn (Crataegus monogyna)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Hedge Mustard (Sisymbrium officinale)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Hedge Woundwort (Stachys sylvatica)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Hemlock Water-dropwort (Oenanthe crocata)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Herb-Robert (Geranium robertianum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Himalayan Cotoneaster (Cotoneaster simonsii)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Hoary Willowherb (Epilobium parviflorum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	

Custom	flowering plant	Japanese Knotweed (Fallopia japonica)	3	26/04/2022	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Custom	flowering plant	Keeled Garlic (Allium carinatum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Knotgrass (Polygonum aviculare)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Lapsana communis subsp. communis	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Meadow Buttercup (Ranunculus acris)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Meadow Vetchling (Lathyrus pratensis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Oat (Avena sativa)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Oxeye Daisy (Leucanthemum vulgare)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Pellitory-of-the-wall (Parietaria judaica)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Perennial Rye-grass (Lolium perenne)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Perennial Sow-thistle (Sonchus arvensis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Pineappleweed (Matricaria discoidea)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Prickly Sow-thistle (Sonchus asper)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Procumbent Pearlwort (Sagina procumbens)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Red Bartsia (Odontites vernus)	2	20/08/2022	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	

Custom	flowering plant	Red Clover (Trifolium pratense)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Red Dead-nettle (Lamium purpureum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Red Valerian (Centranthus ruber)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Redshank (Persicaria maculosa)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Reed Canary-grass (Phalaris arundinacea)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Ribwort Plantain (Plantago lanceolata)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Rough Meadow-grass (Poa trivialis)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Rumex crispus subsp. crispus	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Rumex crispus subsp. littoreus	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Sea Aster (Aster tripolium)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Sea Club-rush (Bolboschoenus maritimus)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Sea Mayweed (Tripleurospermum maritimum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Sea Plantain (Plantago maritima)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Selfheal (Prunella vulgaris)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Shepherd's-purse (Capsella bursa-pastoris)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Short-fruited Willowherb (Epilobium obscurum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Silverweed (Potentilla anserina)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Soft-rush (Juncus effusus)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Spear Thistle (Cirsium vulgare)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	

Custom	flowering plant	Sweet Vernal-grass (Anthoxanthum odoratum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Sycamore (Acer pseudoplatanus)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Custom	flowering plant	Taraxacum aggregate	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Timothy (Phleum pratense)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Tufted Vetch (Vicia cracca)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Two-rowed Barley (Hordeum distichon)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Water-cress (Rorippa nasturtium-aquaticum)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	White Clover (Trifolium repens)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Wild Angelica (Angelica sylvestris)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Wild Celery (Apium graveolens)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Wild-oat (Avena fatua)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Yarrow (Achillea millefolium)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Yellow Iris (Iris pseudacorus)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	flowering plant	Yorkshire-fog (Holcus lanatus)	1	12/07/2014	Irish Vascular Plant Data - Paul Green	
Custom	insect - moth	Anthophila fabriciana	1	29/08/2018	Moths Ireland	
Custom	insect - moth	Common Grass-veneer (Agriphila tristella)	1	29/08/2018	Moths Ireland	
Custom	insect - moth	Emmelina monodactyla	1	29/08/2018	Moths Ireland	
Custom	insect - moth	Latticed Heath (Chiasmia clathrata)	1	10/06/1965	Moths Ireland	
Custom	insect - moth	Red Underwing (Catocala nupta)	1	03/08/2006	Moths Ireland	

Custom	insect - moth	Silver Y (Autographa gamma)	1	29/08/2018	Moths Ireland	
Custom	insect - true bug (Hemiptera)	Anthocoris confusus	1	30/09/1931	True Bugs (Heteroptera) of Ireland	
Custom	insect - true bug (Hemiptera)	Common Damselbug (Nabis (Nabis) rugosus)	1	08/09/1931	True Bugs (Heteroptera) of Ireland	
Custom	terrestrial mammal	Daubenton's Bat (Myotis daubentonii)	12	03/09/2014	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Custom	terrestrial mammal	European Otter (Lutra lutra)	3	14/01/2018	Mammals of Ireland 2016-2025	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Custom	terrestrial mammal	Lesser Noctule (Nyctalus leisleri)	3	21/08/2009	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Custom	terrestrial mammal	Pipistrelle (Pipistrellus pipistrellus sensu lato)	3	21/08/2009	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Custom	terrestrial mammal	Red Fox (Vulpes vulpes)	1	01/09/2015	Atlas of Mammals in Ireland 2010-2015	

Custom	terrestrial mammal	Soprano Pipistrelle (Pipistrellus pygmaeus)	5	01/08/2010	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Custom	terrestrial mammal	West European Hedgehog (Erinaceus europaeus)	2	20/04/2021	Hedgehogs of Ireland	Protected Species: Wildlife Acts

Background

The National Biodiversity Data Centre is committed to the goals and principles of making biodiversity data openly and universally available. This commitment is given on the understanding that the provision of data will further the conservation of biological diversity.

This spreadsheet provides a summary of the data contained in the National Biodiversity Data Centre, maintained by the National Biodiversity Data Centre, for the given area of your query.

Use of this information is encouraged for decision making, research and sharing knowledge on Ireland's biodiversity. When using this information, please note:

- The information contained in this spreadsheet can only be considered a guide to the conservation importance or value of a given area, as the available data is unlikely to be systematic or complete.
- Absence of records of threatened or protected species from an area does not imply that they are not present within the given area. Their absence may be due to lack of adequate surveys of the area.
- The interpretation of the information generated in this query should be undertaken by a qualified ecologist to ensure its meaning is not misunderstood.
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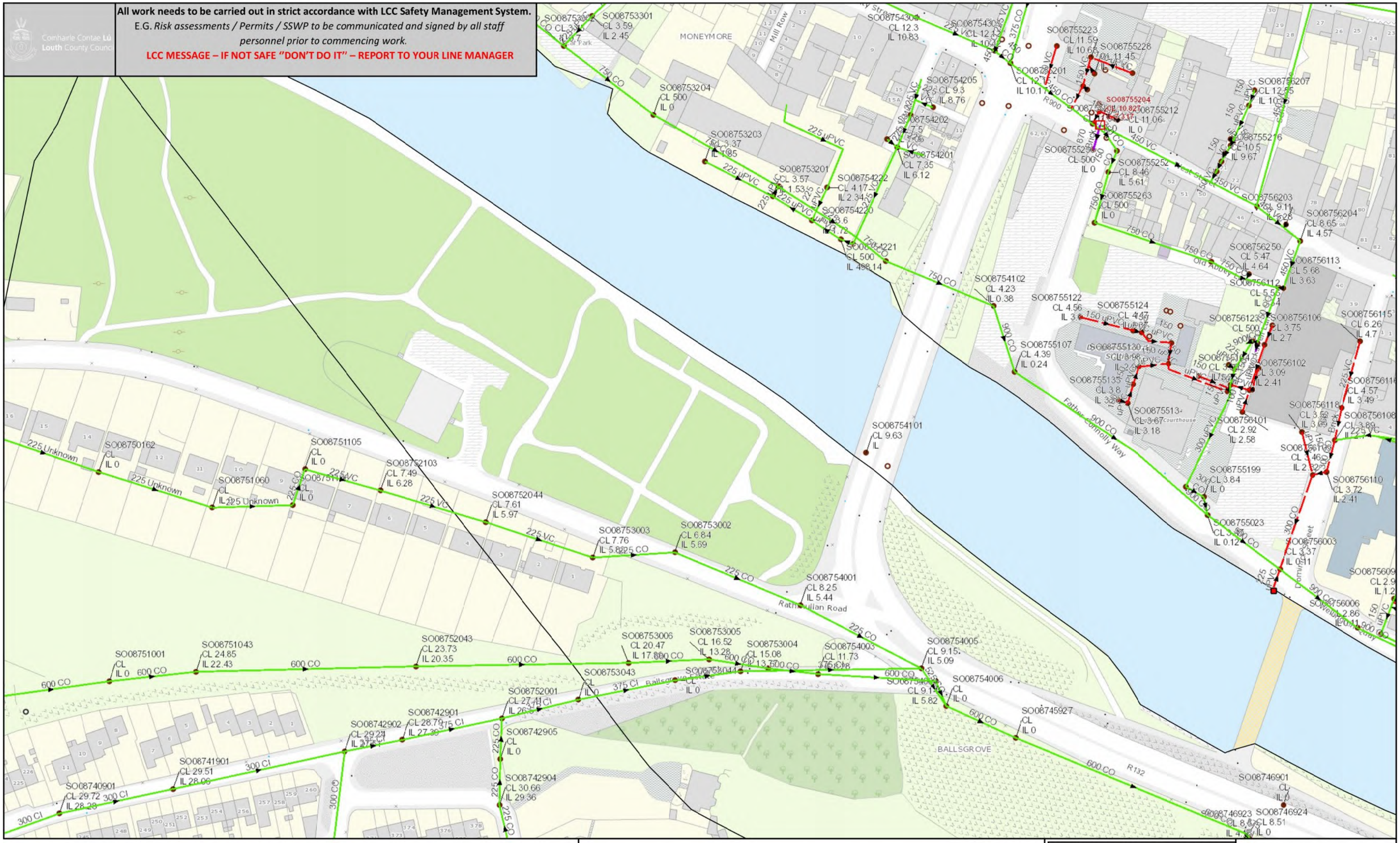
APPENDIX 3

UISCE EIREANN PUBLIC WATER SUPPLY, STORMWATER DRAINAGE AND FOULWATER DRAINAGE DRAWINGS FOR DROGHEDA IN THE VICINITY OF THE SITE

UPGRADE WORKS AT ST. DOMINIC'S PARK, RATHMULLEN ROAD, DROGHEDA
SURFACE WATER DRAINAGE DESIGN PROPOSAL

Comhairle Contae Lú
Louth County Council

All work needs to be carried out in strict accordance with LCC Safety Management System.
E.G. *Risk assessments / Permits / SSWP to be communicated and signed by all staff personnel prior to commencing work.*
LCC MESSAGE – IF NOT SAFE "DON'T DO IT" – REPORT TO YOUR LINE MANAGER



IRISH WATER NOTICE

WRONG IMAGE PATH!

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Legend

Surface	Standard	Overflow	Unknown	Unknown	Lamphole	Rodding Eye	Standard
Surface	Other; Unknown	Soakaway	Combined	Combined	Standard	Flushing Structure	Other; Unknown
Surface	Gully	Other; Unknown	Foul	Foul	Other; Unknown	Other; Unknown
Surface	Standard	Storm Culverts	Overflow	Overflow	Outfall	Sewer Flow Control Valves
Cascade	Other; Unknown	Storm Clean Outs	Unknown	Unknown	Overflow	Treatment plant
Catchpit	Vent/Col	Combined	Combined	Cascade	Soakaway	Pump station
Hatchbox	Other; Unknown	Foul	Foul	Catchpit	Standard Outlet	Catchpit
Lamphole	Outfall	Overflow	Overflow	Hatchbox	Other; Unknown	Gully

0 15 30 45 m
1cm = 15.33 m

For LCC Staff Internal Use Only

Map Title : St. Dominic's Park playground

Plot Date: 18-Jan-2023

Created By: ldowdall

Comhairle Contae Lú
Louth County Council

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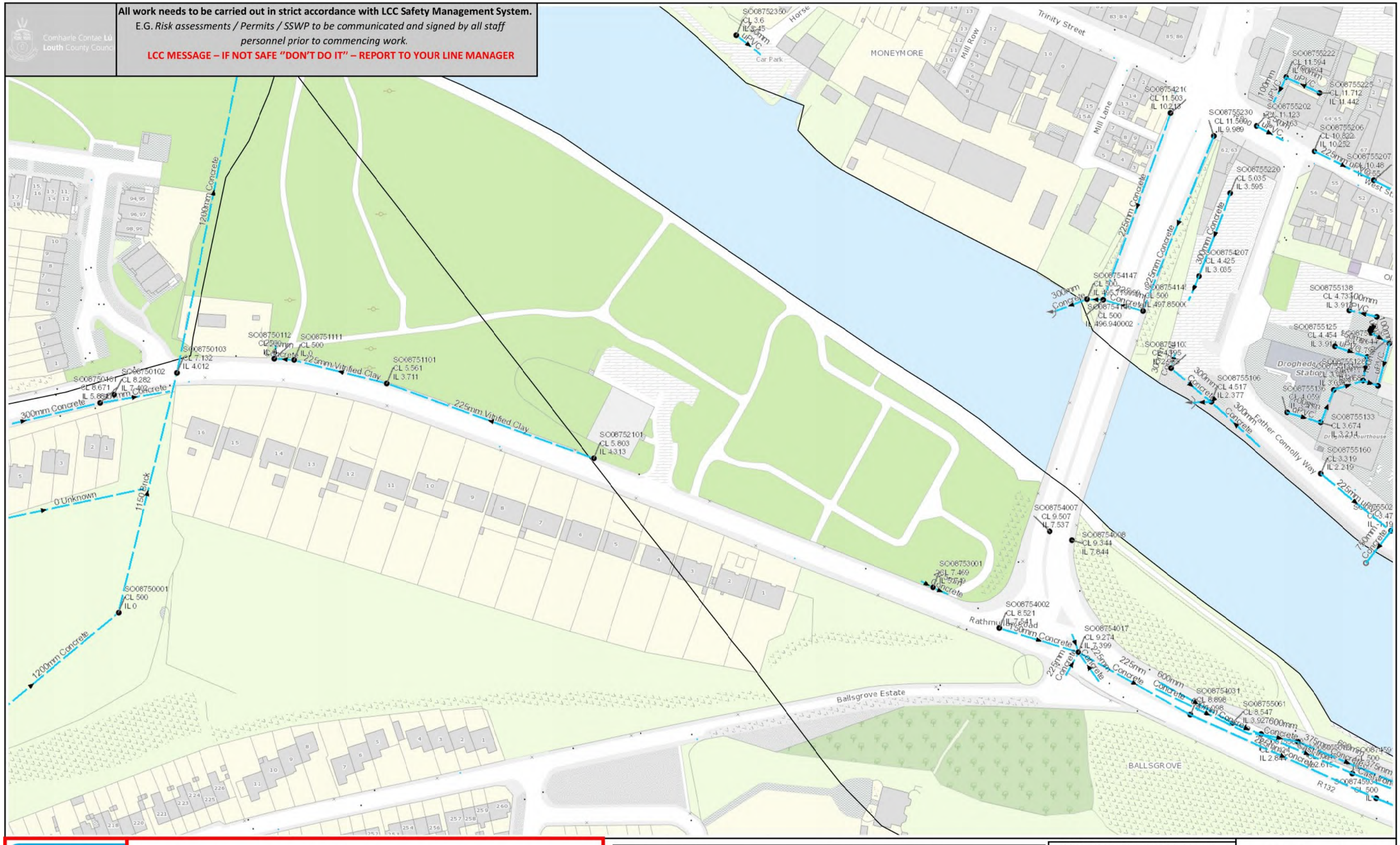

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IW Storm Layers

- IW_Storm_SurfaceFittings
- IW_Storm_OpenDrains
- IW_Storm_Chambers
- IW_Storm_SurfaceWaterMains
- IW_Storm_Culvert
- IW_Storm_Clean_outs
- IW_Storm_Detention_Areas
- IW_Storm_Discharge_Points
- IW_Storm_Inlet

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0 15 30 45 m
1cm = 15.33 m

For LCC Staff Internal Use Only

Map Title : St. Dominic's Park playground

Plot Date: 18-Jan-2023

Created By: ldowdall

Comhairle Contae Lú
Louth County Council

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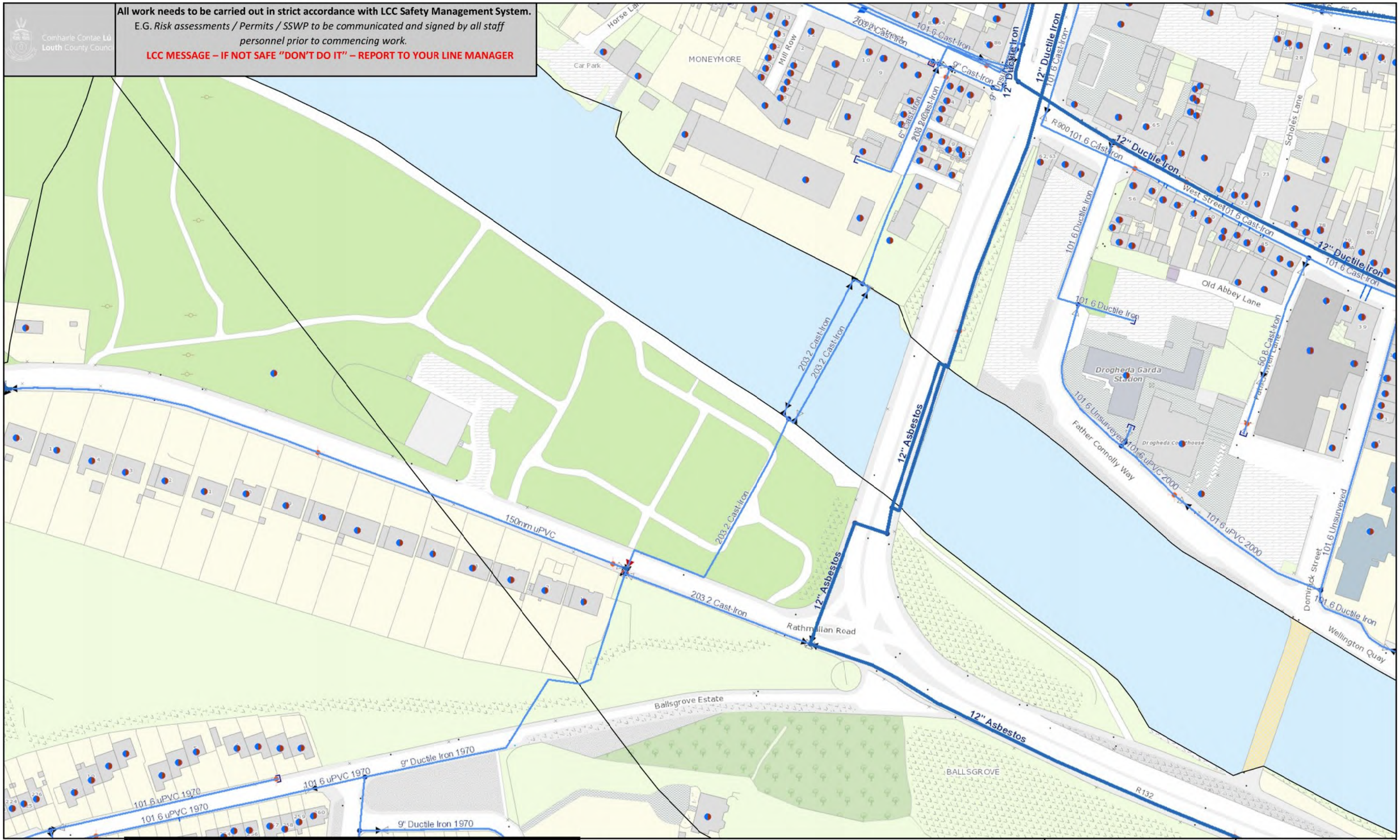

WRONG IMAGE PATH!

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Legend

Non-return	Part Closed	Source	Pump Stations	Pressure Monitoring Point	Water Casings
Hydro	Open	District (Boundary Meter)	Water Network Structures	Untreated	
Orifice Plate	Closed	Fire Hydrant	Abstraction Point	Potable Water	
PRV	Part Closed	Fire Hydrant/Washout	Kisok	Untreated	
PSV	Air Control Valves	Washout	Water Service Connections	Potable Water	
Other	Water Stop Valves	Treatment Plant	Cap	Irish Water	
Open	Meter	Potable	Other Fitting	Non IW	
Closed	Group Scheme	Raw Water	Water Distribution Chambers	Water Abandoned Lines	

0 15 30 45 m
1cm = 15.33 m

For LCC Staff Internal Use Only

Map Title : St. Dominic's Park playground

Plot Date: 18-Jan-2023

Created By: ldowdall

Comhairle Contae Lú
Louth County Council

UPGRADE WORKS AT ST. DOMINIC'S PARK, RATHMULLEN ROAD, DROGHEDA

SURFACE WATER DRAINAGE DESIGN PROPOSAL

P. HERR & ASSOCIATES
CIVIL ENGINEERS & BUILDING SURVEYORS

Floor 3, Block 4.
Quayside Business Park
Dundalk, Co. Louth
Tel: (042)9330019
E-Mail: info@pherr.ie

JANUARY 2026

CONTENTS

1.0 SITE DISCRIPTION

1.1 St. Dominick's Park is a public park located along the south banks of the Boyne River at Rathmullen, Drogheda, Co. Louth. The location of the site is shown on Fig.1.1

1.2 The central feature of the park is a children's playground with associated car park facility. The existing layout of this area is shown on Fig.1.2

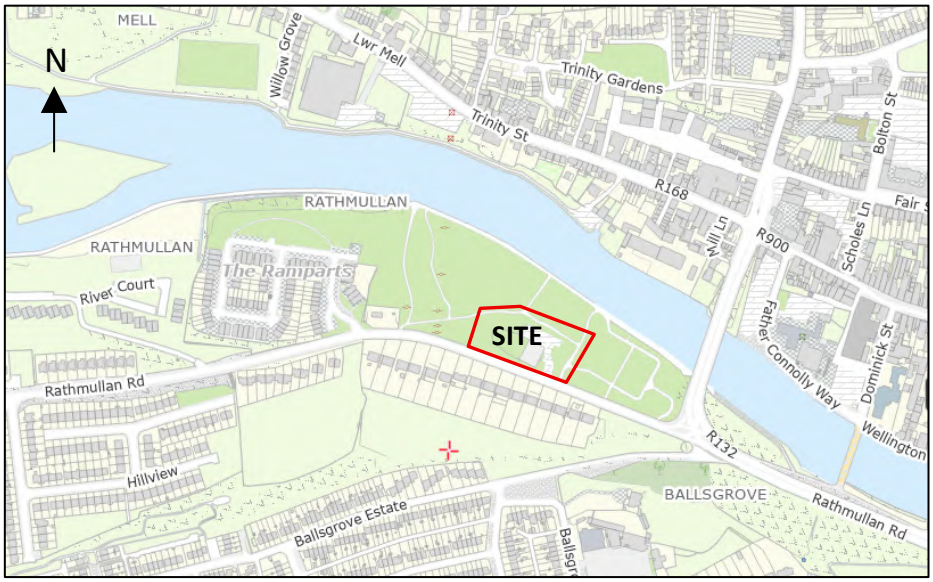


Fig.1.1 – Site Location Map

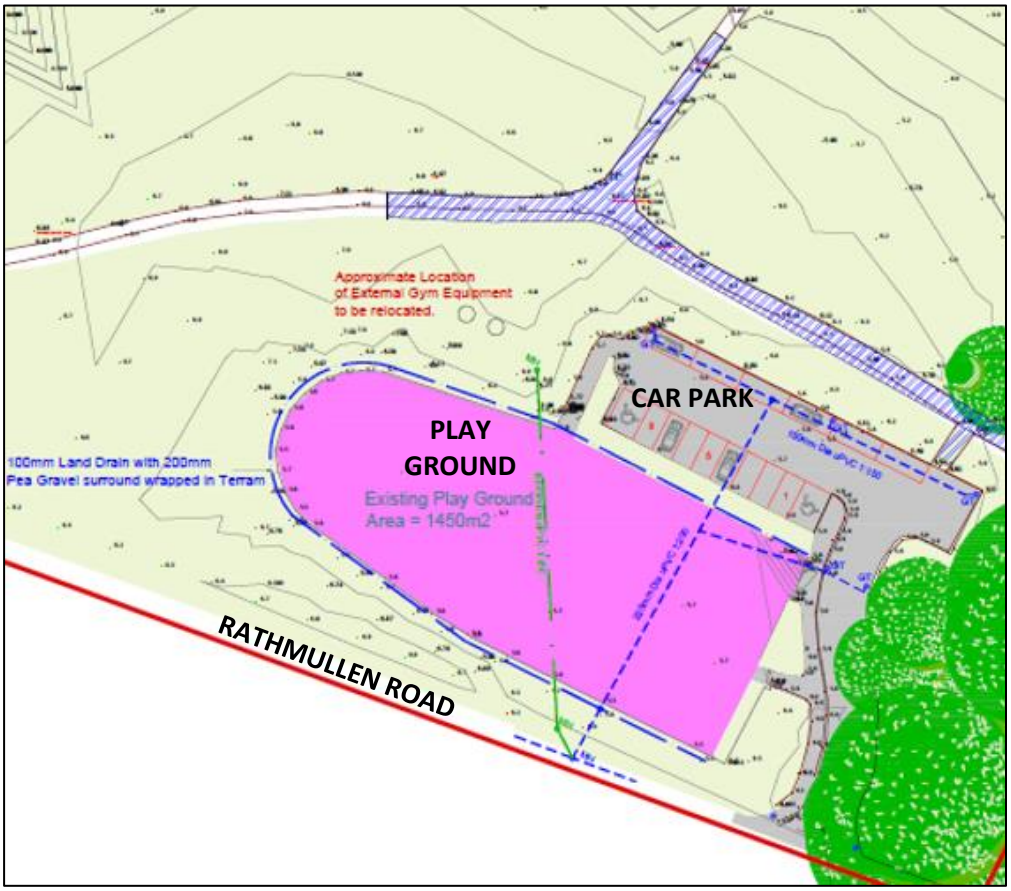


Fig.1.2 – Existing Site Layout

2.0 PROPOSED DEVELOPMENT

2.1 It is proposed to upgrade the existing facility by extending the playground, extending the car park, providing cycle parking facilities and installing Eco-Toilets.

2.2 The proposed Site Layout is shown on Fig.2.1

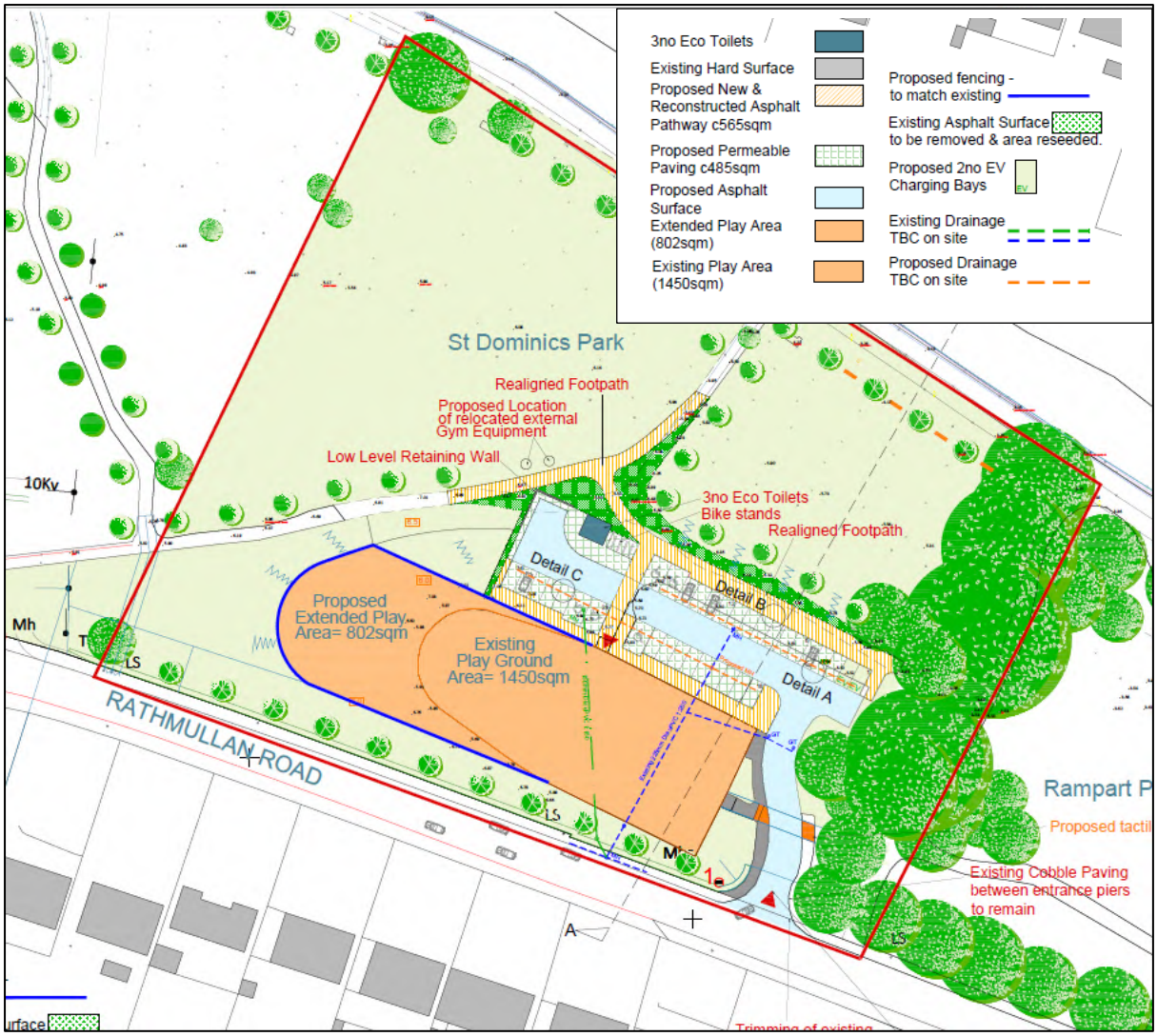


Fig.2.1 – Proposed Site Layout

3.0 INFILTRATION CHARACTERISTICS OF THE UNDERLYING SUB-SOIL

3.1 The infiltration characteristics of the underlying sub-soil at the site was determined by excavating a test hole (2.3m x 0.8m x 1.7m deep) within the site and carrying out an infiltration test in accordance with BRE 365. The test hole was located within the strip of grass to the north of the existing playground and south of the existing car park as shown on Fig.3.1. Views of the test hole are shown on Fig. 3.2

3.2 The subsoil was found to comprise of
0m – 0.30m Topsoil
0.3m – 1.3m Gravelly clay with cobbles
1.3m – 1.7m Silty Clay

No rock nor ground water was encountered in the test hole

3.3 The initial rate of water level drop was good with a drop of 0.17m within 40 minutes. The rate then significantly reduced with a further reduction of only 0.13m recorded over the next 120 minutes.

3.4 The initial drop of water occurred within the gravelly clay layer of the subsoil with the reduction in infiltration rate happening once the water level dropped into the lower silty clay layer. In essence, the test results show reasonable infiltration within the upper layers of the subsoil (< 1.3m) and more modest infiltration within the lower layer of the subsoil (>1.3m)

3.5 Calculations , carried out in accordance with BRE365, estimate the infiltration rate in each layer to be as follows:

Sub-Soil Layer	***Infiltration rate (m/s)***
Upper Layer (< 1.3m)	2.49 x 10-5
Lower Layer (>1.3m)	6.80 x 10-6

3.6 Full details of the Infiltration Test are attached as Appendix 1

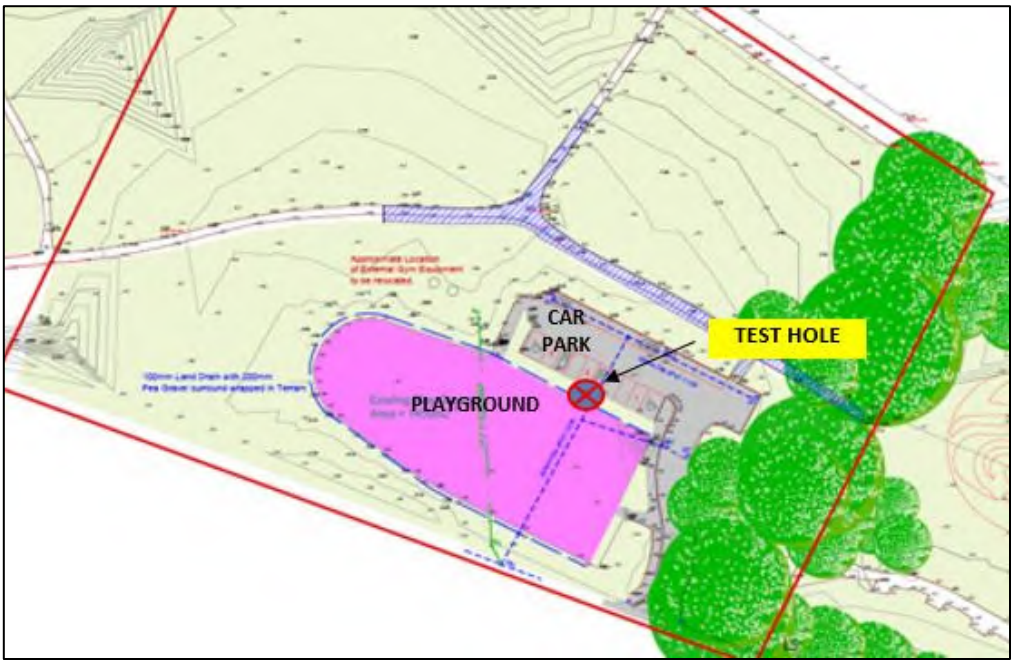


Fig. 3.1 – Test Hole Location






Fig. 3.2 – Views of Infiltration Test Hole

4.0 SURFACE WATER DRAINAGE DESIGN PROPOSAL

4.1 The low infiltration available within the sub-soil below 1.3m rules out the use of standard deep infiltration devices such as soakpits or soakage trenches to deal with surface water run-off generated from the development

4.2 It is therefore recommended that the surface water drainage proposal for the upgraded park facility avails of the favourable infiltration properties within the upper layer of the underlying sub-soil to the maximum possible extent through the construction of car park spaces and non-trafficked areas (footpaths, walkways, play area) using permeable surfaces as follows:

- Car park spaces – Permeable block paving Type 1
- New/Realigned Walkways – Permeable block paving Type 2 and/or porous asphaltic concrete
- Extended Play Area - porous asphaltic concrete

4.3 The selection of permeable paving is not deemed suitable for the access road and car park circulation aisles given it's the inferior structural strength. These surfaces should be constructed using standard asphaltic concrete material in accordance with DN-PAV-03021 (TII)

4.4 The crown of the access road shall be along its centreline with a 3% crossfall to each side. This crossfall shall continue into the car park spaces along each side. The cross fall shall allow run-off from the impermeable road carriageway to flow into the adjoining permeable car park space as shown on Fig. 4.1 and Fig.4.2.
Design Note: *It is an established design threshold that 1 sq.m of permeable surface can accommodate run-off from 2 sq.m of adjoining impermeable surface. The 0.6 : 1 ratio of impermeable surface area to permeable surface area proposed in this case is significantly below the 2 : 1 ratio threshold.*

4.5 The incorporation of permeable paving will meet SuDS objectives with respect to quantity, quality and amenity as follows:

- Quantity: Provides an underground storage area until full infiltrating of run-off into the sub-soil is completed

- Quality: Improves the quality of the water in two ways:
  - The stones within the sub-base act as a filter medium which remove heavy particles such as silt and heavy metals.
  - Over time microbial organisms begin to cultivate in the pavement which break down hydrocarbon leaks such as exhaust fumes and sump oil drips

- Amenity: visually differentiates parking areas from road surface. combines hard landscaping with a SuDS drainage solution

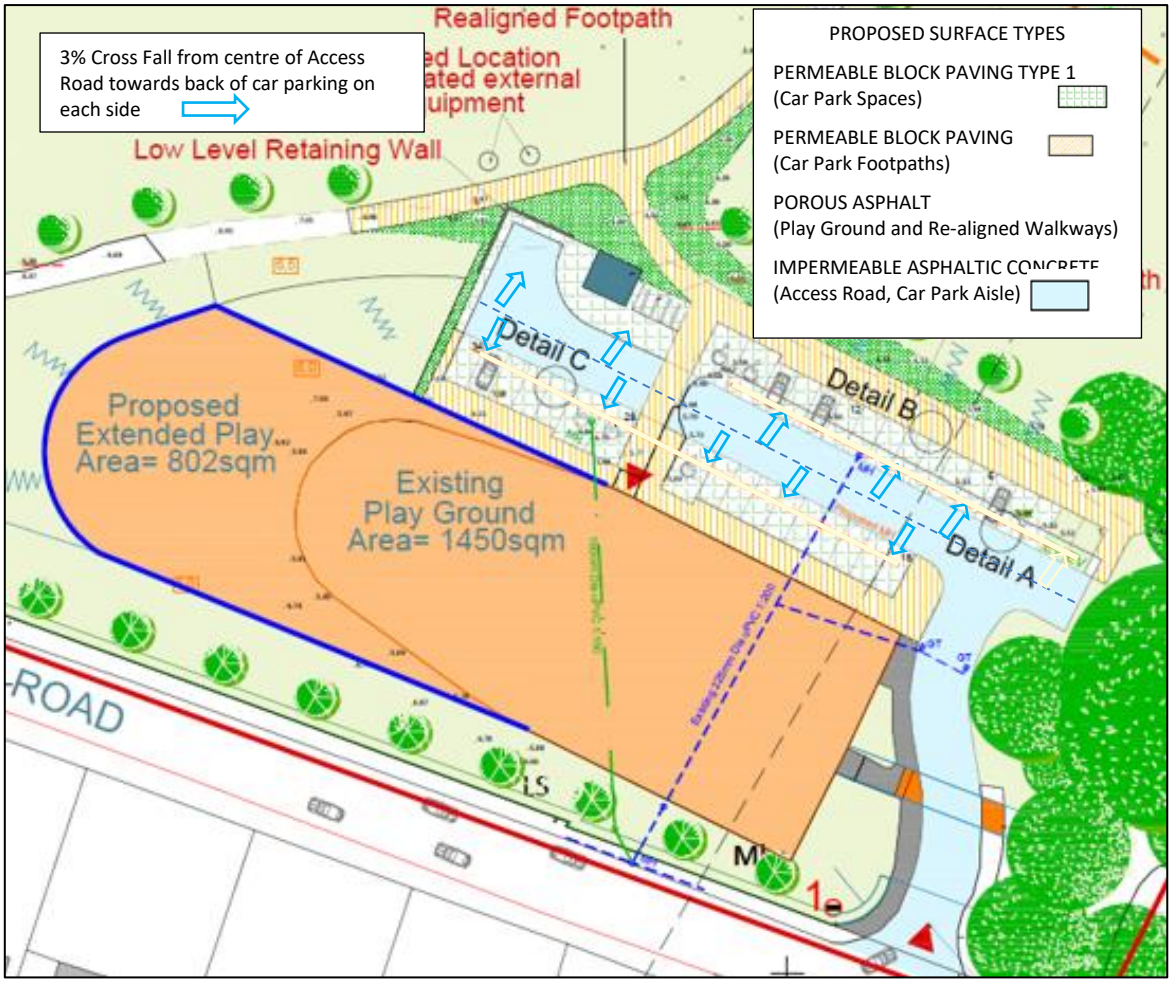
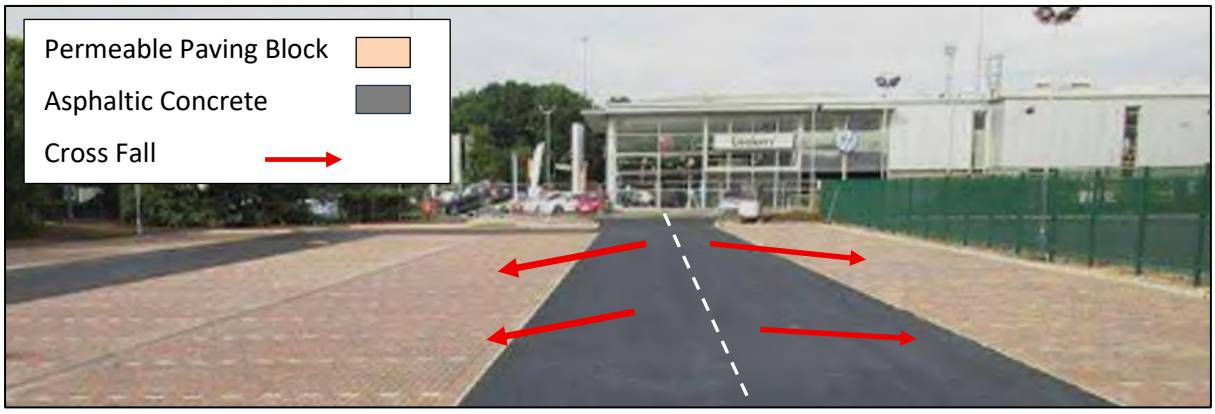


Fig.4.1 –Surface Water Proposal – Recommended Surface Types (Schematic only – NTS)



4.2 Proposed SW Design Proposal for Car Park – Indicative Only

5.0 DESIGN OF PERMABLE PAVING

(a) Design of Permeable Block Paving Type 1 – Car Park Spaces

(i) Structural Design

5.1 The structural design of the permeable paving is based on the methodology set out in Section 8.0 of 'Design & Construction of Concrete Block Permeable Paving' (Interpave). The key design issues are the strength of the sub-grade (CBR value) and the traffic loading to be placed on the surface. Relevant Design Charts are attached as Appendix 2

5.2 *Sub-Grade Strength* - The trial pit excavated within the site for the soil infiltration test identified the upper layers of the subsoil to be a gravelly clay. Such a material generally has a CGR as a poorly graded sand/gravel (SP classification). Soil of this classification generally has a CBR value in the range of 5% - 10%. It is proposed to adopt a lower value of CBR = 5% for design purposes.

5.3 *Traffic Loading* - A Traffic Loading Category of 3 ('small car arks subject to car and light van access') shall be adopted as per Table 4 of the Interpave design guide.

5.4 The appropriate permeable paving design from a structural perspective given the combination of a minimum CBR of 5.0 and a Traffic Loading of 3 e is as follows as per Table 4 of the Interpave Design Guid:

- 60mm permeable block paving , complying with BS EN1338:2003, on
- 50mm laying course (6.3mm – 2.0mm grit) complying with BS EN 13242 on
- 225mm Coarse Granular Aggregate (4/20mm) complying with BS EN 13242, on
- Non-woven permeable geotextile (Terram 1000 or similar)

(ii) Hydraulic Design

5.5 It has been determined that a 225mm sub-base depth is required from a structural perspective. It is necessary to determine whether the depth of storage available within the 225mm deep layer of coarse granular aggregate is sufficient from a hydraulic design perspective

5.6 Each car park space shall provide a $15m^2$ surface area of porous paving. The design allows for run-off the adjoining impermeable road carriageway ($10.0m^2$) to discharge into each car park space as per Fig. 4.1. In essence $15m^2$ of porous paving shall deal with run off from a total area of $25.0m^2$

5.7 It has been determined from the BRE 365 test that the sub-soil has an infiltration rate of 2.48×10^{-5}m/s. It is proposed to apply a Factor of Safety of 2.50 to this value and to base the design calculation of an infiltration rate of 1.0×10^{-5}m/s. On this basis, run-off shall infiltrate through the base of each car park space at a rate of $0.54m^3$/hr (1.0×10^{-5} m/s x 3600 x $15m^2$)

5.8 Run-off shall be stored within the 30% voids provided within the coarse aggregate in cases where the quantum of run-off exceeds the discharge rate of $0.54m^3$/hr through the base of each car park space. Calculations determining the storage required under a range of rainfall

events based on a 1 in 100 year rainfall return period and a further 20% allowance for climate change are as follows:

Storm Duration	*Rainfall 1 in 100 yea[1] (mm)*	*Rainfall + 20%*	*Contrib. Area per car park space (sq.m)*	*Total Vol of Rainfall (cu.m)*	*Rate of Discharge into underlying sub-soil per car park space (0.54 m^3/hr)*	*Storage Required Cu.m*
10 mins	16.7	20.0	25.0	0.50	0.09	0.41
15 min	19.6	23.5	25.0	0.59	0.13	0.46
30 mins	24.2	29.0	25.0	0.73	0.27	0.46
1 hour	29.8	35.8	25.0	0.90	0.54	0.36
2 hour	36.8	44.2	25.0	1.11	1.08	0.03
3 hour	41.6	49.9	25.0	1.25	1.62	-0.37
4 hour	45.4	54.5	25.0	1.36	2.16	-0.8

Note 1: Met. Eireann Data for Rathmullen - (Full Rainfall Data Set provided as Appendix 3)

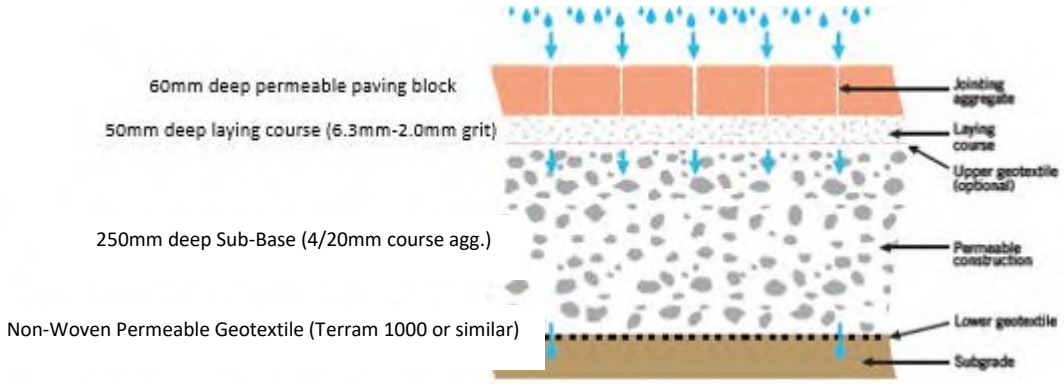
5.9 The calculations show that storage shall be required only during short intense rainfall events of less than 1 hour with a maximum storage requirement of 0.46m^3.
This equates to a stored water deeth of circa 105mm as follows:

- Depth of water stored (m) = 0.46/(15 x 0.3) = 0.102m (say 105mm)

5.10 This 105mm depth is less than the 225mm depth of coarse aggregate sub-base required under the pavement strength design criterion. However, design guides consider it prudent to have a freeboard of between 100mm - 150mm above the TWL of stored water and the top of the sub-base. The selection of a 145mm freeboard would give a 250mm depth of sub-base required from an hydraulic perspective (105mm + 145mm = 250mm). It is therefore necessary to increase the depth of porous sub-base from 225mm to 250mm ensure sufficient attenuation storage is provided in the stone later

5.11 The revised construction design for the permeable paved car park areas is as follows:

- 60mm permeable block paving , complying with BS EN1338:2003, on
- 50mm laying course (6.3mm – 2.0mm grit) complying with BS EN 13242 on
- 250mm Coarse Granular Aggregate (4/20mm) complying with BS EN 13242, on
- Non- woven permeable geotextile (Terram 1000 or similar)



5.12 The half empty time for the stored water shall be (0.46)(0.5)/(0.54) = 0.43 hours. This is significantly less than the design theshold of 24 hours and therefore acceptable

(b) Design of Permeable Block Paving Type 2 – Walkways

5.13 Permeable block paved walkways should have a similar design to that outlined above for car park spaces

- 60mm permeable block paving , complying with BS EN1338:2003, on
- 50mm laying course (6.3mm – 2.0mm grit) complying with BS EN 13242 on
- 250mm Coarse Granular Aggregate (4/20mm) complying with BS EN 13242, on
- Non- woven permeable geotextile (Terram 1000 or similar)

(c) Design of Permeable Asphaltic Concrete Surfaces

5.14 Any permeable asphalt surface should have the following layers:

- 60mm porous asphalt - PA 14 surf complying with BS EN 13108-7 and Chapter 6 of CC-SPW-00900 (TII) on
- 250mm Coarse Granular Aggregate (4/20mm) complying with BS EN 13242, on
- Non-woven permeable geotextile (Terram 1000 or similar)

6.0 PROVISION FOR EMERGENCY CONDITIONS / EXTREME RAINFALL EVENTS

6.1 It is noted that the current drainage of the car park area is via a standard surface water drainage network whereby run-off is collected in a series of road gullies and piped into a surface water drainage pipe that runs along the Rathmullen Road.

6.2 While the proposed surface water regime has a robust design its efficient operation is dependent on the performance of the permeable paving. This performance may be adversely impacted over time by the build up of grit and silt on the road surface.

6.3 It is therefore considered prudent that the existing surface water drainage infrastructure is retained and extended into the new car park area to act as an emergenct overflow route for run-off in the event of the performance of the permeable paving being reduced and/or to cater for extreme rainfall events. Road gullies should be located in optimum locations to capture run-off in the event that the permeable paving system is overwhelmed by extreme rainfall or its condition has deteriorated.

6.4 A schematic sketch of the proposed emergency back up arrangement is shown on Fig. 6.1

Fig.6.1 – Proposed Alterations of Existing SW Drainage Network to provide an emergency overflow route (Schematic only)

7.0 SUMMARY

7.1 Two different sub-soil types were encountered in the test hole excavated for the infiltration test

<1.3m Gravelly clay with cobbles

>1.3m Silty Clay

7.2 Calculations , carried out in accordance with BRE365, estimate the infiltration rate in each layer to be as follows:

Sub-Soil Layer	***Infiltration rate (m/s)***
Upper Layer (< 1.3m)	2.49 x 10-5
Lower Layer (>1.3m)	6.80 x 10-6

7.3 The low infiltration available within the sub-soil below 1.3m rules out the use of standard deep infiltration devices such as soakpits or soakage trenches to deal with surface water run-off generated from the development

7.4 It is therefore recommended that the surface water drainage proposal for the upgraded park facility avails of the favourable infiltration properties within the upper layer of the underlying sub-soil to the maximum possible extent through the construction of car park spaces and non-trafficked areas (footpaths, walkways, play area) using permeable surfaces as shown on Fig. 7.1 and as follows:

- Car park spaces – Permeable block paving Type 1
- New/Realigned Walkways – Permeable block paving Type 2 and/or porous asphaltic concrete
- Extended Play Area - porous asphaltic concrete

7.5 Design calculations, based on 1 in 100 year rainfall events (including a 20% allowance for increased rain due to climate change), determine the following construction detail for the surface types from a structural and hydraulic perspective:

(i) Permeable Block Paving Type 1 and Type 2 (Refer to Fig.7.2)

- 60mm permeable block paving , complying with BS EN1338:2003, on
- 50mm laying course (6.3mm – 2.0mm grit) complying with BS EN 13242 on
- 250mm Coarse Granular Aggregate (4/20mm) complying with BS EN 13242, on
- Non- woven permeable geotextile (Terram 1000 or similar)

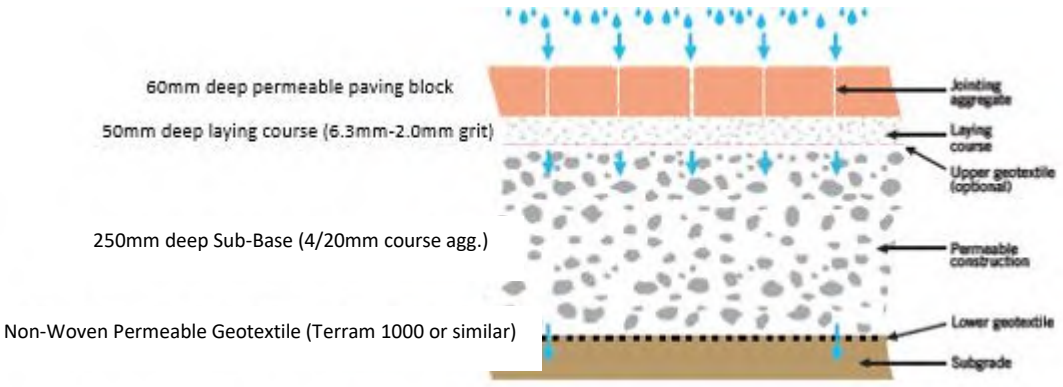


Fig.7.2 Recommended Construction Detail for Permeable Block Paving Surfaces Type 1 and Type 2

(ii) porous asphalt surface

- 60mm porous asphalt - PA 14 surf complying with BS EN 13108-7 and Chapter 6 of CC-SPW-00900 (TII) on
- 250mm Coarse Granular Aggregate (4/20mm) complying with BS EN 13242, on
- Non-woven permeable geotextile (Terram 1000 or similar)

7.6 It is recommended that the existing surface water drainage piped network is retained and extended, as shown on Fig.7.3, to offer an emergency overflow route for run-off in the event of the performance of the permeable paving being reduced and/or to cater for extreme events during which permeable paving system is overwhelmed by extreme rainfall or the infiltration capacity of the surface has deteriorated due to build up of grit/silt.

6.7 Overall, the design proposal represents a robust design solution that ensures that all generated surface water run-off shall be dealt with within the site in a manner that respects SuDs principles with respect to quantity, quality and amenity, but which also avails of existing infrastructure to offer an emergency overflow route for run-off in the event of a critical failure of the infiltration performance of the permeable surfaces.

Eamonn Mc Mahon

Eamonn Mc Mahon.
B.E., M.Eng Sc, Chartered Engineer
12/01/26

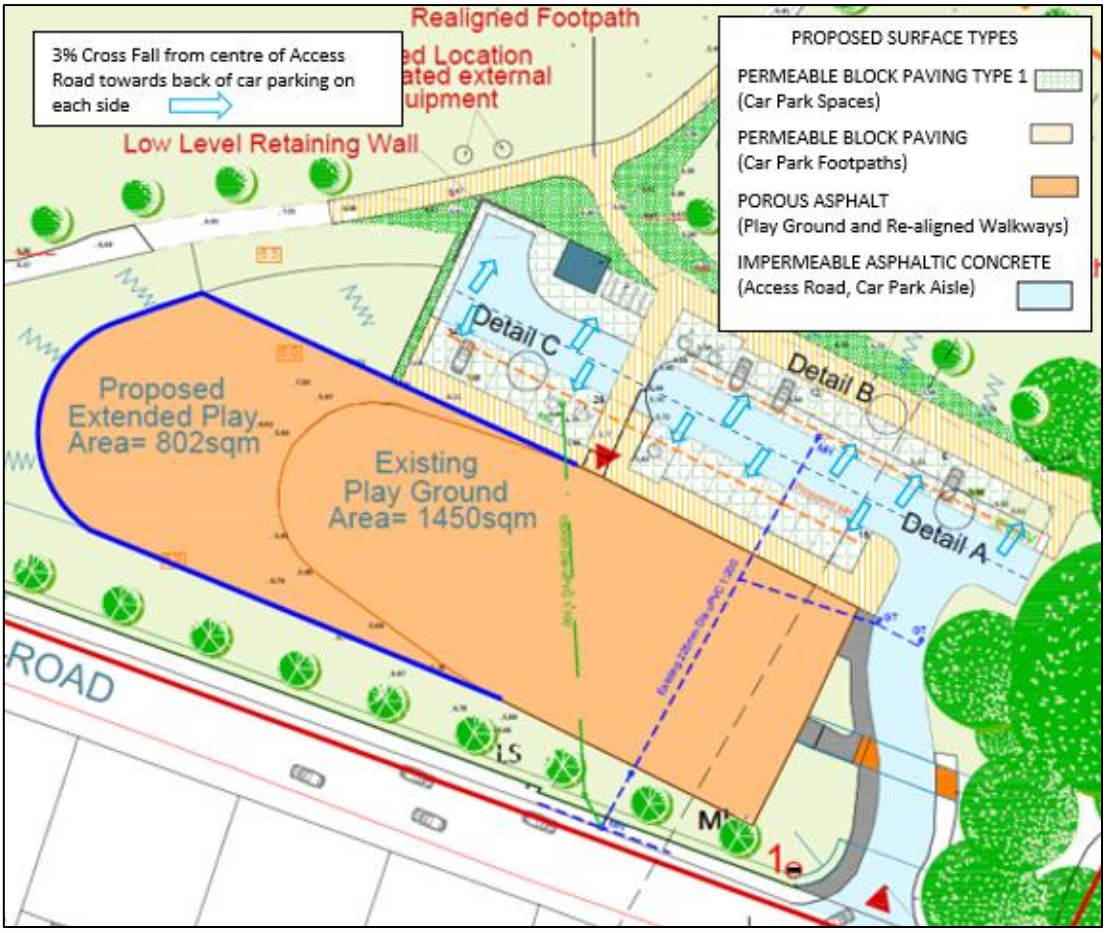


Fig.7.1 –Surface Water Proposal – Recommended Surface Types (Schematic only – NTS)

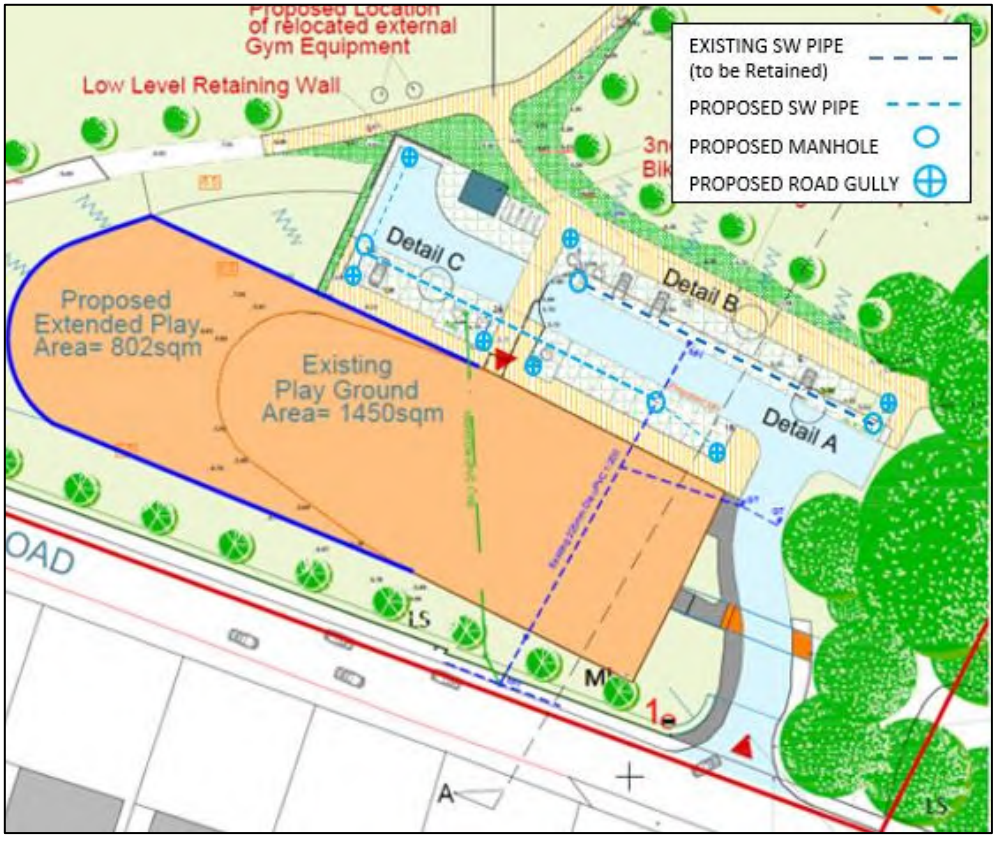


Fig.7.3 – Proposed Alterations to Existing SW Drainage Network (Schematic Only)

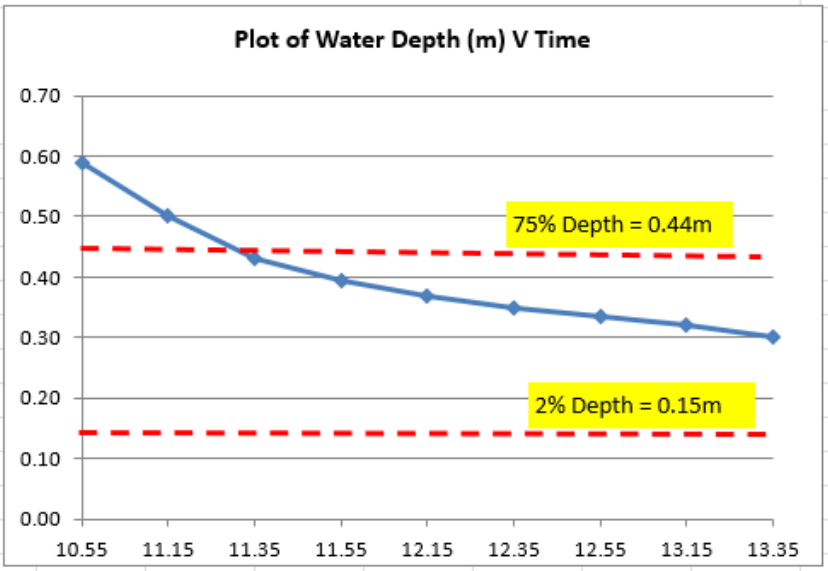
APPENDIX 1 – INFILTRATION TEST RESULTS AND CALCULATIONS

P. HERR & ASSOCIATES
CIVIL ENGINEERS & BUILDING SURVEYORS

BRE 365 INFILTRATION TEST AT ST. DOMINICS PARK, DROGHEDA, CO.LOUTH

Date: 03/12/25
Client: Louth Co. Co.
Test Carried Out by: Louth Co.Co
Test Hole Location: Grass Strip along north side of existing Play Area (south side of ex. Car Park)
Dimensions of Test Hole: 2.3m x 0.80m x 1.7m deep
Description of sub-soil: topsoil (0m - 0. 30m), gravelly clay with cobbles (0.30m - 1.3m), silty clay (>1.3m)
Depth to Groundwater: None encountered
Depth to Rock: No rock encountered

Time	*Depth of water(m)*
10.55	0.59
11.15	0.50
11.35	0.43
11.55	0.40
12.15	0.37
12.35	0.35
12.55	0.34
13.15	0.32
13.35	0.30



Calculations for Upper Layer of Subsoil
(Water drop from 0.89m - 0.43m)

	TEST DATA & RESULTS
Length of Test Hole (m)	2.3
Width of Test Hole (m)	0.8
100% depth water (m)	0.59
75% depth (m)	0.55
25% depth (m)	0.47
Time to drop 75% to 25% (mins)	21
Depth of water infiltrated during test period	0.085
Vol of water infiltrated during test period (m3)	0.1564
Surface Area through which water infiltrates during test period (m2)	4.9865
Soil Infiltration Rate (m/min)	0.00149
Soil Infiltration Rate (m/sec)	2.489E-05

Calculations for Lower Layer of Sub-Soil
Drop from 0.43m to 0.30m

	TEST DATA & RESULTS
Length of Test Hole (m)	2.3
Width of Test Hole (m)	0.8
100% depth water (m)	0.43
75% depth (m)	0.397
25% depth (m)	0.333
Time to drop 75% to 25% (mins)	70
Depth of water infiltrated during test period	0.064
Vol of water infiltrated during test period (m3)	0.11776
Surface Area through which water infiltrates during test period (m2)	4.103
Soil Infiltration Rate (m/min)	0.000410014
Soil Infiltration Rate (m/sec)	6.83356E-06

APPENDIX 2 – PERMEABLE PAVING- DESIGN CHARTS

Traffic category	Standard axles per day	msa	NRSWA[1] Road Type	Typical application
11	Areas with axle loads greater than permitted by the Construction and Use Regulations are not included in this document.			
10	≤8 000	≤60	0	Adopted highways and commercial/ industrial developments used by a high number of commercial vehicles
9	≤4 000	≤30	1	
8	≤1 500	≤10	2	Ports and airport landside
7	≤350	≤2.5	3	Bus stops and bus lanes
6	≤70	≤0.5	4	Adopted highways and other roads used by a moderate number of commercial vehicles Pedestrian areas subjected to regular overrun of commercial vehicles. Industrial premises Petrol station forecourts
5	≤7	≤0.05		Pedestrian areas subjected to occasional overrun of commercial vehicles Car parks receiving occasional commercial vehicular traffic Railway platforms excluding edge
4	1	N/A		Urban footways with no planned vehicular overrun Pedestrian areas used by light commercial vehicles, emergency vehicles and maintenance vehicles
3	0			Small car parks subject to car, light van and motorcycle access
2	0			Pedestrian and cycle areas, domestic driveways
1	0			Pedestrian-only areas, including domestic applications
0	0			No requirement (decoration)

Notes:

Traffic Loading Categories – Table 4 of the 'Interpave' Design Guide

Traffic category	Concrete paving units – minimum thickness	Laying course – nominal thickness	Base – HBCGA or AC	Sub-base – CGA or Type 3	Design basis
11		Areas with axle loads greater than permitted by the Road Vehicles (Construction and Use) Regulations (1986) as amended are not included in this document			
10		Site specific using Interpave guide for heavy duty pavements (Knapton, 2008)			Knapton (2008)
9		Site specific using Interpave guide for heavy duty pavements (Knapton, 2008)			Knapton (2008)
8	80 mm	50 mm	300 mm HBCGA or 220 mm AC32	150 mm	ICPI Permeable Design Pro
7	80 mm	50 mm	200 mm HBCGA or 130 mm AC32	150 mm	
6	80 mm	50 mm	125 mm HBCGA or 90 mm AC32	150 mm	
5	80 mm	50 mm	100 mm HBCGA or 70 mm AC32	150 mm	
4	80 mm	50 mm	--	300 mm	Knapton et al (2012) and ICPI Permeable Design Pro
3	60 mm	50 mm	--	225 mm	
2	60 mm	50 mm	--	150 mm	
1	60 mm	50 mm	--	100 mm	
0	60 mm	50 mm		Sufficient to provide suitable construction base	

Table 5: Typical construction thickness over subgrade with 5% CBR or greater.

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 308190, Northing: 275155,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.5,	4.0,	4.7,	5.2,	5.5,	6.7,	8.0,	8.9,	10.1,	11.2,	12.0,	13.2,	14.1,	14.9,	N/A ,
10 mins	3.6,	4.8,	5.5,	6.5,	7.2,	7.7,	9.4,	11.2,	12.4,	14.1,	15.5,	16.7,	18.4,	19.7,	20.8,	N/A ,
15 mins	4.2,	5.7,	6.5,	7.7,	8.5,	9.1,	11.0,	13.2,	14.6,	16.6,	18.3,	19.6,	21.6,	23.2,	24.5,	N/A ,
30 mins	5.5,	7.4,	8.4,	9.9,	10.8,	11.6,	14.0,	16.6,	18.2,	20.6,	22.6,	24.2,	26.6,	28.4,	29.9,	N/A ,
1 hours	7.3,	9.7,	10.9,	12.7,	13.9,	14.8,	17.7,	20.8,	22.8,	25.6,	28.0,	29.8,	32.6,	34.7,	36.5,	N/A ,
2 hours	9.7,	12.7,	14.2,	16.4,	17.8,	18.9,	22.4,	26.1,	28.5,	31.8,	34.6,	36.8,	40.0,	42.5,	44.5,	N/A ,
3 hours	11.4,	14.8,	16.5,	19.0,	20.6,	21.8,	25.7,	29.8,	32.5,	36.1,	39.2,	41.6,	45.1,	47.8,	50.0,	N/A ,
4 hours	12.8,	16.5,	18.4,	21.1,	22.8,	24.1,	28.3,	32.8,	35.6,	39.5,	42.8,	45.4,	49.2,	52.0,	54.4,	N/A ,
6 hours	15.1,	19.3,	21.4,	24.4,	26.4,	27.9,	32.5,	37.5,	40.6,	44.9,	48.5,	51.3,	55.4,	58.6,	61.1,	N/A ,
9 hours	17.8,	22.6,	24.9,	28.3,	30.5,	32.2,	37.3,	42.8,	46.3,	50.9,	54.9,	58.0,	62.5,	65.9,	68.7,	N/A ,
12 hours	20.0,	25.2,	27.8,	31.4,	33.8,	35.6,	41.2,	47.0,	50.8,	55.8,	60.0,	63.2,	68.0,	71.7,	74.6,	N/A ,
18 hours	23.6,	29.4,	32.3,	36.4,	39.1,	41.1,	47.2,	53.8,	57.8,	63.3,	68.0,	71.5,	76.7,	80.6,	83.8,	N/A ,
24 hours	26.5,	32.9,	36.0,	40.5,	43.3,	45.5,	52.1,	59.1,	63.4,	69.3,	74.3,	78.0,	83.5,	87.7,	91.1,	102.4,
2 days	32.5,	39.9,	43.6,	48.7,	52.0,	54.5,	62.0,	69.9,	74.8,	81.4,	87.0,	91.1,	97.3,	101.9,	105.7,	118.2,
3 days	37.4,	45.8,	49.8,	55.5,	59.2,	61.9,	70.2,	78.9,	84.3,	91.5,	97.5,	102.1,	108.8,	113.8,	117.9,	131.4,
4 days	41.8,	50.9,	55.3,	61.5,	65.5,	68.4,	77.4,	86.8,	92.6,	100.3,	106.8,	111.7,	118.9,	124.3,	128.6,	143.0,
6 days	49.6,	60.0,	65.1,	72.1,	76.6,	79.9,	90.1,	100.7,	107.2,	115.9,	123.2,	128.6,	136.7,	142.7,	147.5,	163.5,
8 days	56.5,	68.1,	73.7,	81.5,	86.4,	90.1,	101.4,	113.0,	120.2,	129.7,	137.6,	143.6,	152.4,	158.9,	164.2,	181.6,
10 days	62.9,	75.5,	81.6,	90.1,	95.5,	99.5,	111.7,	124.3,	132.0,	142.2,	150.9,	157.3,	166.7,	173.7,	179.4,	198.1,
12 days	68.8,	82.5,	89.1,	98.2,	104.0,	108.3,	121.3,	134.8,	143.1,	154.0,	163.2,	170.0,	180.1,	187.6,	193.6,	213.5,
16 days	80.0,	95.5,	102.9,	113.2,	119.7,	124.5,	139.2,	154.3,	163.5,	175.7,	186.0,	193.6,	204.8,	213.1,	219.7,	241.8,
20 days	90.4,	107.6,	115.8,	127.1,	134.3,	139.6,	155.7,	172.3,	182.4,	195.8,	207.0,	215.3,	227.5,	236.6,	243.8,	267.8,
25 days	102.6,	121.7,	130.9,	143.5,	151.4,	157.3,	175.1,	193.3,	204.5,	219.2,	231.5,	240.6,	254.0,	263.9,	271.9,	298.1,