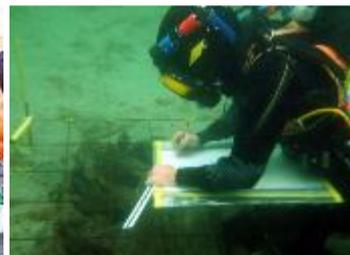


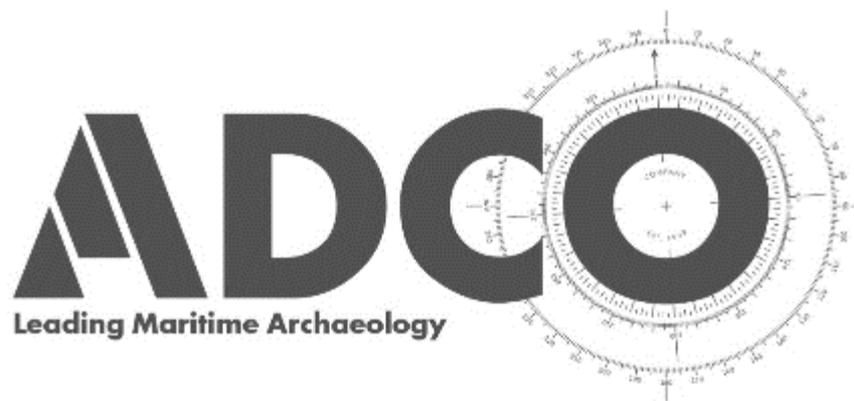
Appendix 12.2

Marine Dive Survey Report



**Underwater archaeological inspections
Arklow Waste Water Marine Outfall
Arklow, Co. Wicklow
17D0078, 17R0197**





**Underwater archaeological inspections
Arklow Waste Water Marine Outfall
Arklow, Co. Wicklow
17D0078, 17R0197**

09 July 2018

Project Director
Beverley Studios, Church Terrace, Bray, Co. Wicklow

Niall Brady
www.adco-ie.com

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Abbreviations

ADCO	The Archaeological Diving Company Ltd
CD	Chart Datum
DCHG	Department of Culture, Heritage and the Gaeltacht
E	Easting
EIS	Environmental Impact Statement
IH	Irish Hydrodata Ltd
N	Northing
NGR	National Grid Reference
NMS	National Monuments Service
SMR	Sites and Monuments Record
UAIA	Underwater Archaeological Impact Assessment

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Executive Summary

The Archaeological Diving Company Ltd (ADCO) was appointed by Irish Archaeological Consultancy Ltd on behalf of Irish Water to carry out an underwater archaeological inspection of a series of marine geophysical survey anomalies recorded within the area surveyed for the Arklow Sewerage Scheme, Marine Outfall.

Site survey was carried out in 25 April 2018 under licences 17D0078, 17R0197 granted to the report author.

A series of five anomaly locations were inspected, as well as an area of seabed to the north of the original survey area, and the toe of existing rock armour protection that forms the current shoreline.

None of the anomalies inspected are archaeological in nature, and no archaeological significant features or observations were made.

Archaeological survey was also carried out of the riverbed as part of the proposed Flood Relief Scheme, and this work included additional areas of inspection to those completed by ADCO previously for other aspects of the Sewerage Scheme. A number of additional observations have been made and are noted in the present report.

The underwater inspections were comprehensive and thorough.

Two lengths of marine outfall are proposed; a short outfall that will lie to the north, and a longer outfall that will measure 900m in length. Both outfalls will extend North-eastwards from the foreshore north of the mouth of the Avoca River, and will be inserted into trenched pipe routes. The existing revetment will be upgraded.

The report finds no archaeological constraint to the project proceeding.

Archaeological monitoring of the sea-bed and related disturbance works during construction is recommended, with the proviso to resolve fully any material of archaeological interest recovered at that point.

Recommendations are subject to the approval of the Depart of Culture, Heritage and the Gaeltacht (DCHG).

1.0 Introduction

The Archaeological Diving Company Ltd (ADCO) was appointed by Irish Archaeological Consultancy Ltd on behalf of Irish Water to carry out an underwater archaeological inspection of a series of marine geophysical survey anomalies recorded within the area surveyed for the Arklow Sewerage Scheme, Marine Outfall (Figure 1).

Site survey was carried out in 25 April 2018 under licences 17D0078, 17R0197 granted to the report author.

A series of five anomaly locations were inspected, as well as an area of seabed to the north of the original survey area, and the toe of existing rock armour protection that forms the current shoreline (Table 1, Figures 5–8).

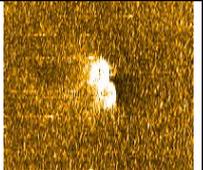
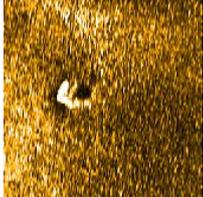
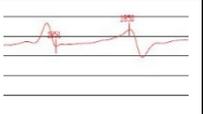
Ref	Anomaly	Latitude N	Longitude W	ITM E	ITM N	ING E	ING N	Image
ss2	Two conjoined tyres, 1.6m diameter each	52:47.7525	06:08.4401	725389	673274	325465	173234	
ss3	Rock? 1.5m long	52:47.7442	06:08.4707	725355	673256	325431	173216	
ss10	Rock? 3m long	52:47.8159	06:07.7742	726135	673410	326212	173371	
ss12	Rock? 2.5m long	52:47.7356	06:08.0452	725834	673254	325911	173214	
mg3	Fix 1850			725608	673219	325685	173179	

Table 1: Location marine geophysical survey anomalies inspected.

The weather was suitable for site work, but underwater visibility was poor, and a strong undercurrent existed.

In addition, further archaeological underwater survey was carried out within the river channel of the Avoca as part of the proposed Flood Relief Scheme. While the observations of that work will be reported on fully and separately, certain observations made in 2018 are summarised in the present report where the two schemes will share a similar development area. This includes the southernmost arches at Arklow Bridge, and areas of the river channel downstream of Arklow Bridge.

2.0 Proposed Development

The proposed marine outfall is part of the wider waste water treatment project for Arklow. Two lengths of outfall are proposed; a short outfall that will lie to the north, and a longer outfall that will measure 900m in length. The outfalls will extend East-Northeast from the foreshore in Ferrybank townland, north of the mouth of the Avoca River (Figure 2). The design anticipates trenching to cut the pipe trenches, and use of a bottom-pull method, float and flood method or horizontal directional drilling to install the outfall pipes.

The existing rock armour revetment adjoining the site would be upgraded as part of the proposed development.

3.0 Receiving Environment

The focus on this section relates to the known archaeological and cultural heritage assets of the foreshore and related marine environment within which the outfall will be placed. The receiving environment has been addressed previously in a report on the marine geophysical survey conducted for the present work.¹ There has been no substantive change to the works area. While the location overlies the original delta estuary of the River Avoca as recorded on the First Edition Ordnance Survey map (c. 1840), there are no clearly defined archaeological features observed in the area (Figures 3–4).

The current foreshore is defined by a substantial rock-armour feature that extends north from Arklow Harbour (Plates 1–2).

4.0 Methodology

¹ Niall Brady, 'Marine geophysical survey, Arklow Waste Water Marine Outfall, Arklow, Co. Wicklow. 16E0219', unpublished report of the Archaeological Diving Company Ltd., 2017.

The underwater inspections were completed by a team of archaeological divers operating Surface Supplied Diving Equipment and supported by a licensed dive-support vessel. The locations inspected are identified in Figure 5.

Three different set-ups were carried out within the marine area. Firstly, the geophysical anomaly locations were buoyed; the vessel anchored beside the marker buoy; the diver descended a swimline and conducted a circular search from the base of the marker buoy, extending up to 15m out from the marker buoy if necessary. A record of the seabed at each location was recorded, a metal-detector deployed if needed, and observations noted.

Secondly, an area at the north end of the development area lay outside the footprint covered by the geophysical survey. This lies close inshore. The dive plan consisted of a towed diver survey, commencing at the toe of the existing rock armour shoreline and proceeding seawards for approximately 100m, then returning inshore. The process was repeated and progressed from south to north, following a zig-zag route, to ensure comprehensive coverage of the dive area. Record was taken of observations made. The presence of a strong undercurrent meant that the use of the metal-detector was inhibited; and as the surface of the seabed also contained constant metal debris, the use of the detector was deemed to be unnecessary.

The third set-up was made to determine the route of the rock-armour toe, to address a query of the project engineers. The dive work commenced at the south end of the rock armour and moved north from here, observing and recording the seabed and the rock armour as the deployment progressed (Figures 6–7).

5.0 Observations

5.1 Geophysical anomalies

Side-scan sonar anomaly ss2, as indicated in Table 1, was considered in the geophysical survey report to be two conjoined tyres. The dive inspection identified a length of scrap metal in this location and determined that it was piece of an I-beam.

Anomaly ss3 was formerly considered to be a small rock. Dive inspection determined it was a modern metal stake, measuring 180-200mm high, and 40mm in diameter.

Anomaly ss10 was thought to be rock but dive inspection observed it to be a man-made box steel piece, much of which is buried in the surface sand. It lies 8-1-m away from the charted downline.

Anomaly ss12 was also thought to be rock. Dive inspection did not observe any particular object here but did record a dynamic seabed with sand undulations measuring between 1m and 5m in width. The object may well be buried by same.

Magnetometer anomaly mg3 was inspected because it lies on the route of the longer proposed outfall. A length of wire/steel cable was identified in this location.

5.2 Dive area to north

The seabed at the north end of the survey area contains a substantial amount of modern debris, apparently lying at random. The debris includes timber fragments and metal pieces and rock. A scour pocket was observed measuring 600mm wide by 1.8m long; an angle-iron frame was recorded at ITM 725445E 677329N; and a large rock was recorded at ITM 725414E 673337N.

There was no material or indication of archaeologically significant materials.

5.3 Rock Armour toe

The rock armour that extends north from the harbour and along the shoreline in front of the former industrial complex is a substantial feature that is constructed to combat aggressive easterlies and south-easterly storms. It is tightly fashioned, with little evidence of creep or displacement. The natural topography to its east/seaward side is defined by flat sand, which runs up directly to the rock armour and buries its full toe.

5.4 Additional observations within the Avoca River

In tandem with the marine survey, additional archaeological survey was carried out within the river channel as part of the archaeological assessment being acquired for the Flood Relief Scheme. ADCO's previous work for the Sewerage Scheme looked at the river channel next to the existing quaysides, with some cross-over points. Now it was possible to include more of the main river channel area as well as Arklow Bridge. The full report on this work is being prepared separately for the Flood Relief Scheme but certain observations can be noted in the present report where both schemes share common elements.

There are two new observations to highlight within the main channel of the Avoca downstream of Arklow Bridge (Figure 5). A ship's block constructed of wood was noted within the channel at a location upstream of the harbour, at ING 325056E 173125N, while a section of ship or boat wreckage was located a little upstream at ING 324977E 173248N, next to an existing foul outfall. The section of wreckage is an archaeological constraint and will need to be resolved in advance of works proceeding at this location.

Arklow Bridge was surveyed in detail and a comprehensive record of its elements is being compiled. Figure 8 presents a laser-scan image of the bridge's downstream elevation at its southernmost arches. In addition, the structural levels under the waterline were recorded using a Total Station and it is anticipated that this will provide a comprehensive and metrically accurate record of the standing structure.

5.4 Conclusions

The underwater marine inspection has been comprehensive and thorough. It has inspected marine geophysical anomalies located at and close to the proposed outfall locations; it has included an area to the north that lay outside the original geophysical survey area; and it has dived along the exposed foot of the rock-armoured foreshore. In no instance were archaeological features observed. The marine geophysical survey anomalies were inspected and in all but one instance were able to confirm the presence of an anomaly in the location, which is modern in nature.

In addition, further archaeological survey within the channel of the Avoca River has identified two new features and has completed an archaeological survey of Arklow Bridge.

6.0 Impacts

6.1 Outfalls

Both outfalls would be made of high density polyethylene (HDPE) and have an internal diameter of 600mm. The marine outfalls would be buried in trenches in the seabed. The seabed material would be removed to achieve the required depth and slope of the trench. The trenching would be carried out through the use of dredging barges that would be either anchored to the sea bed or jacked up using steel piles. It is anticipated that the excavated material would be left to the side of the trench and naturally disperse. The pipelines would be placed on top of a bedding layer and would be covered by rock backfill.

Excavation of the trenches represents capital dredging and will have direct and permanent impact on the seabed. Such work would require archaeological monitoring.

6.2 Revetment

The existing rock armour revetment adjoining the site would be upgraded as part of the proposed development. The alignment of the revetment would follow the existing shoreline on its northern and southern ends. The curve of the central part of the existing revetment would be slightly softened. The revetment would consist of a double layer of rock armour of 6-10tonnes (T) on an underlayer of 0.3 to 1T. The revetment would be 7.5mOD (i.e. approximately 1 to 3m above the level of the crest of the existing revetment) and its total width would be approximately 50m. Fill material would form the foundation of

the revetment and a geotextile layer would be placed between the underlayer and the fill material to provide an adequate interface.

Construction of the revetment will extend seawards into an area that has not been developed. Such works should be archaeologically monitored.

7.0 Recommendations

The report finds no archaeological constraint to the project proceeding.

7.1 Pre-construction recommendations

No further archaeological work should be necessary associated with the marine outfall locations and the revetment.

7.2 Construction phase recommendations

Archaeological monitoring licensed by the National Monuments Service at the Department of Culture, Heritage and the Gaeltacht is recommended, with the proviso to resolve fully any material of archaeological interest recovered at that point.

7.3 Management recommendations

An experienced maritime archaeologist will be appointed to advise the project team on archaeological and cultural heritage matters during construction. The archaeologist will acquire any consents required to conduct the work; and will supervise and direct the archaeological measures outlined above in Section 7.2.

THE TIME SCALE for the construction phase should be made available to the archaeologist, with information on where and when the various elements and ground disturbances and dredging will take place.

SUFFICIENT NOTICE. It is essential for the developer to give sufficient notice to the archaeologist/s in advance of the construction works commencing. This will allow for prompt arrival on site to undertake additional surveys and to monitor ground disturbances. As often happens, intervals may occur during the construction phase. In this case, it is also necessary to inform the archaeologist/s as to when ground disturbance works will recommence.

DISCOVERY OF ARCHAEOLOGICAL MATERIAL. In the event of archaeological features or material being uncovered during the construction phase, it is crucial that any machine work cease in the immediate area to allow the archaeologist/s to inspect any such material.

ARCHAEOLOGICAL MATERIAL. Once the presence of archaeologically significant material is established, full archaeological recording of such material is recommended. If it is not possible for the construction works to avoid the material, full excavation would be recommended. The extent and duration of excavation would be a matter for discussion between the client and the licensing authorities.

ARCHAEOLOGICAL TEAM. It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This would be complimented in the event of a full excavation. The team should include provision for an archaeological dive team, in the event that discoveries are made underwater during dredging.

SECURE SITE OFFICES and facilities should be provided on or near those sites where excavation is required.

SECURE WET AND DRY STORAGE for artefacts recovered during the course of the monitoring and related work should be provided on or near those sites where excavation is required.

ADEQUATE FUNDS to cover excavation, post-excavation analysis, and any testing or conservation work required should be made available.

MACHINERY TRAFFIC during construction must be restricted as to avoid any of the selected sites and their environs.

SPOIL should not be dumped on any of the selected sites or their environs.

PLEASE NOTE: All of the above observations and conclusions are based on the archaeological information and information supplied for the Arklow Sewerage Scheme, marine outfall provided. Should any alteration occur, further assessment would be required.

Recommendations are subject to the approval of the National Monuments Service at the Department of Culture, Heritage and the Gaeltacht.

8.0 Acknowledgements

ADCO acknowledges the assistance of Faith Bailey, IAC in preparing for this work. The dive team included Rex Bangerter, Brian MacAllister, Dan Lenehen, Simon Bennett and Liam O'Shea, coxswain. ADCO figures are prepared by Rex Bangerter. The report was written by Dr Niall Brady.



Plate 1: View looking north from Arklow Harbour at the rock-armoured foreshore from which the marine outfalls will extend.

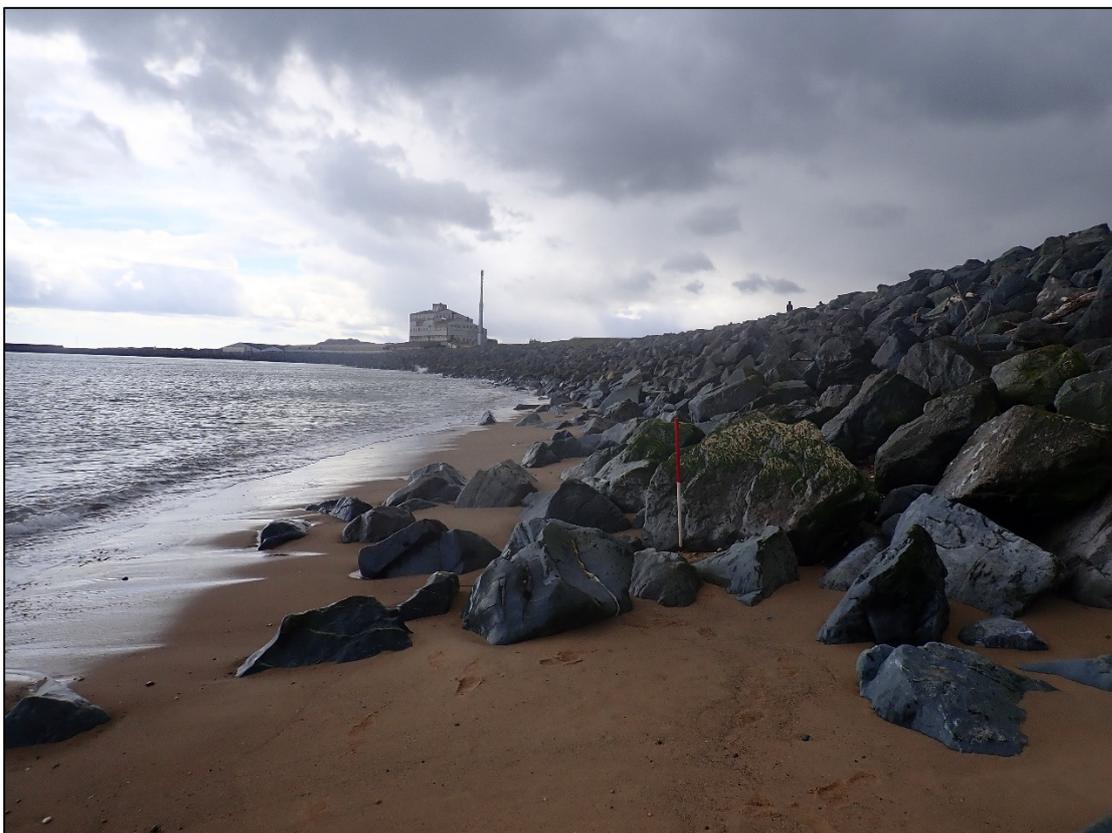


Plate 2: View looking south along toe of the rock-armoured foreshore at Low Water.



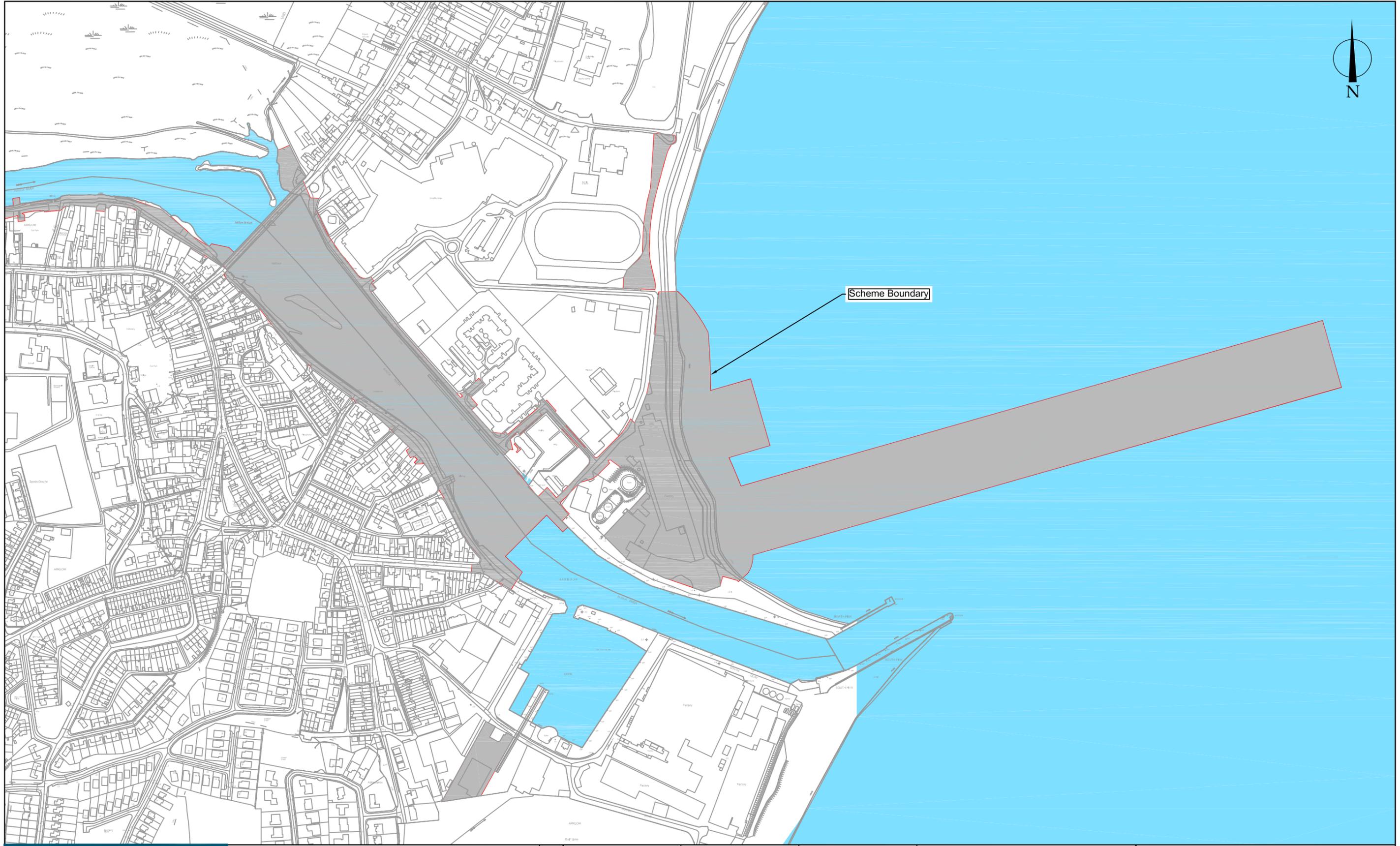
Notes
 Source: OSi Discovery Series (1:50,000) Mapping
 — Development Boundary

Title
 Figure 1- OS Map showing location and extent of the development boundary for the proposed Arklow Waste Water Scheme.

Client
 IAC Ltd./ Irish Water

A4

Project UAIA, Arklow Waste Water Scheme- Marine Outfall	Job/Exc No. 17D0078	Compiled by R.Bangerter	CAD reference Arklow_WWTP	Date 04.07.18	Scale 1:50,000	Drawing No. Figure 1
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Notes
 Source: ARUP Project Drawing, Arklow Scheme Boundary_19-06-2018

A3

Job/Exc No.
17D0078

Date
05.07.18

Compiled by
R.Bangerter

Scale
1:5000

CAD reference
Arklow_WWTP

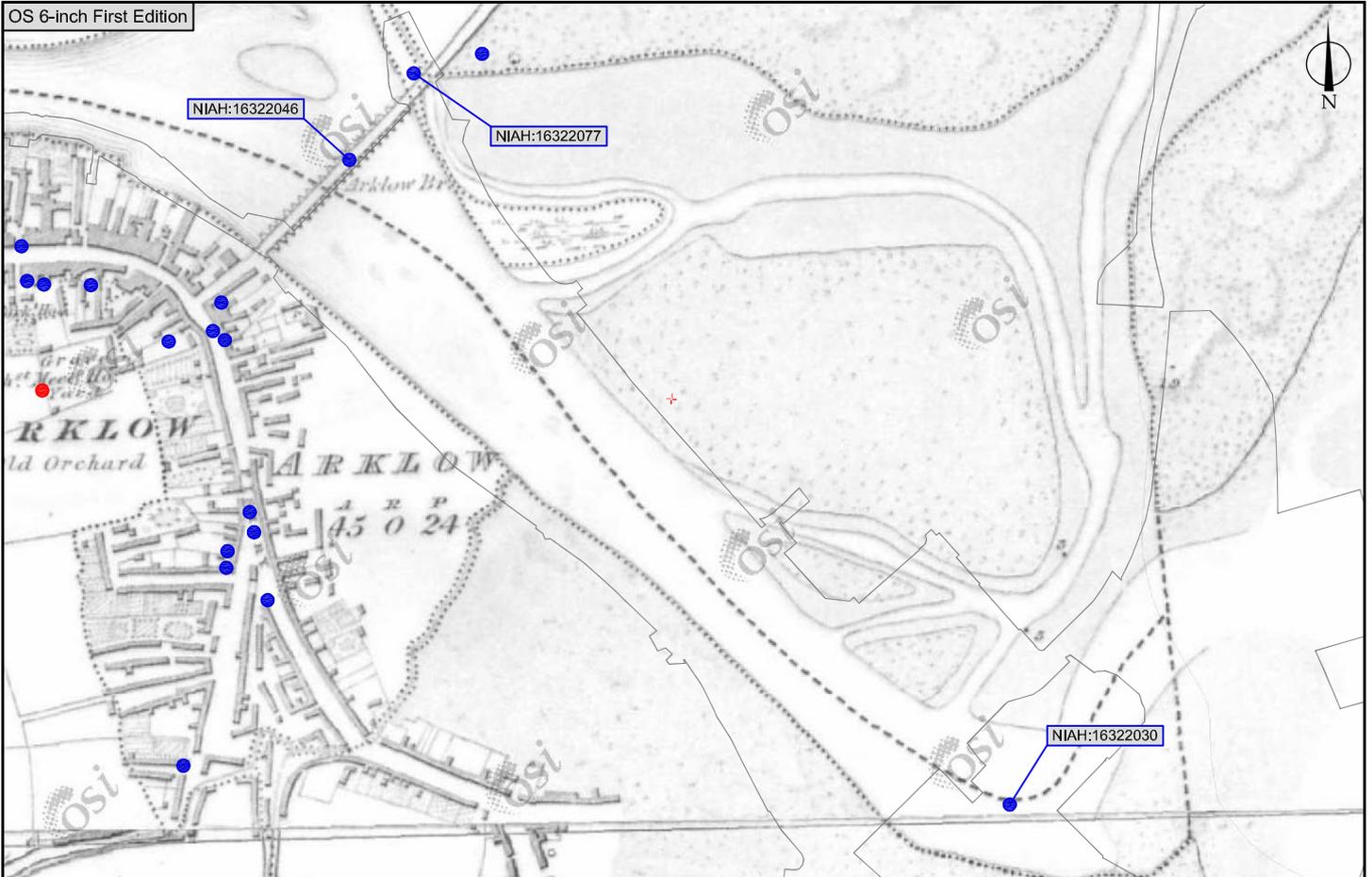
Drawing No.
Figure 2

Client
IAC Ltd./ Irish Water

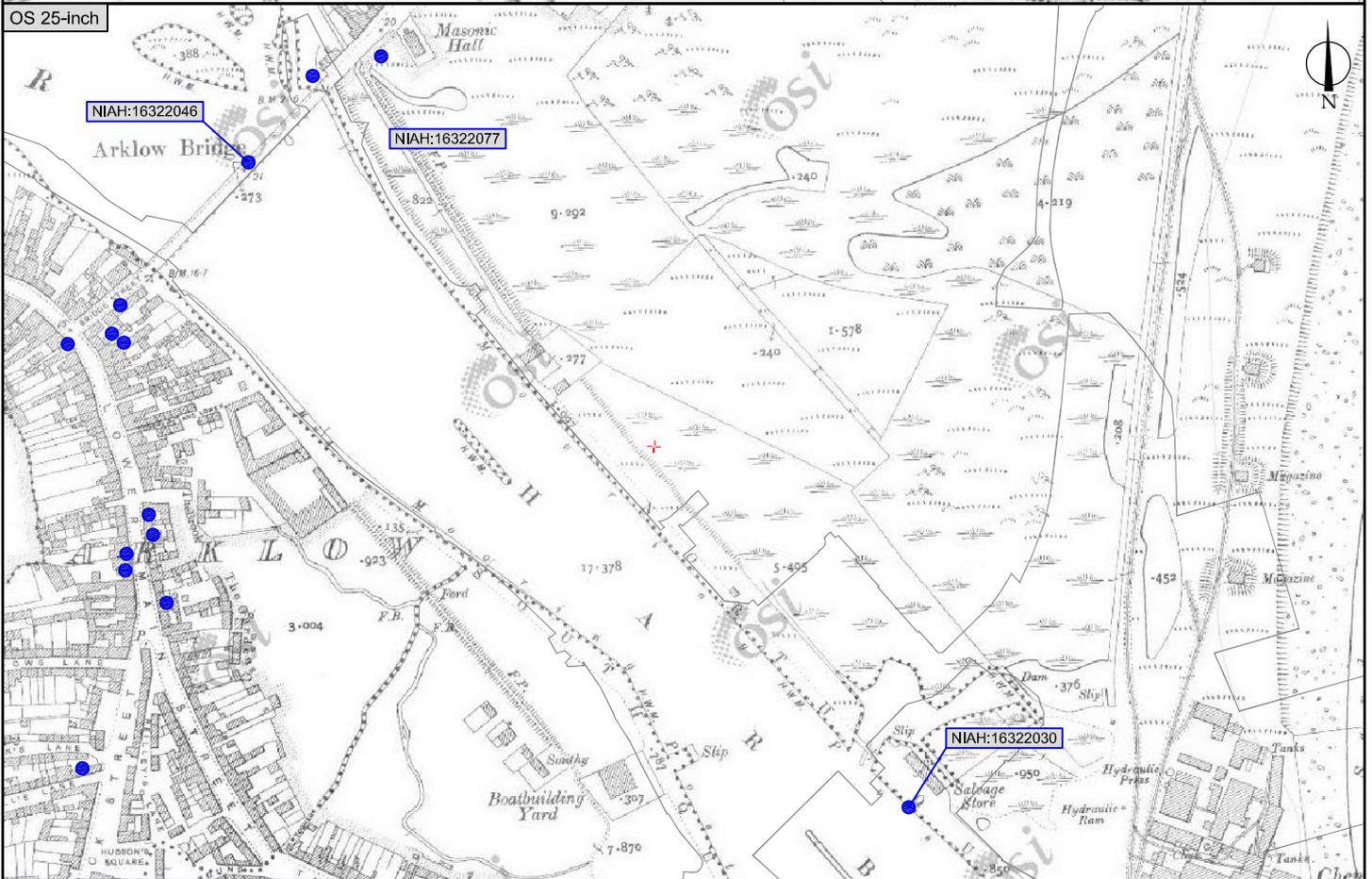
Project
UAIA, Arklow Water Water Scheme- Marine Outfall

Title
Figure 2- Project Drawing showing the boundary of the proposed Arklow Waste Water Scheme.

OS 6-inch First Edition



OS 25-inch



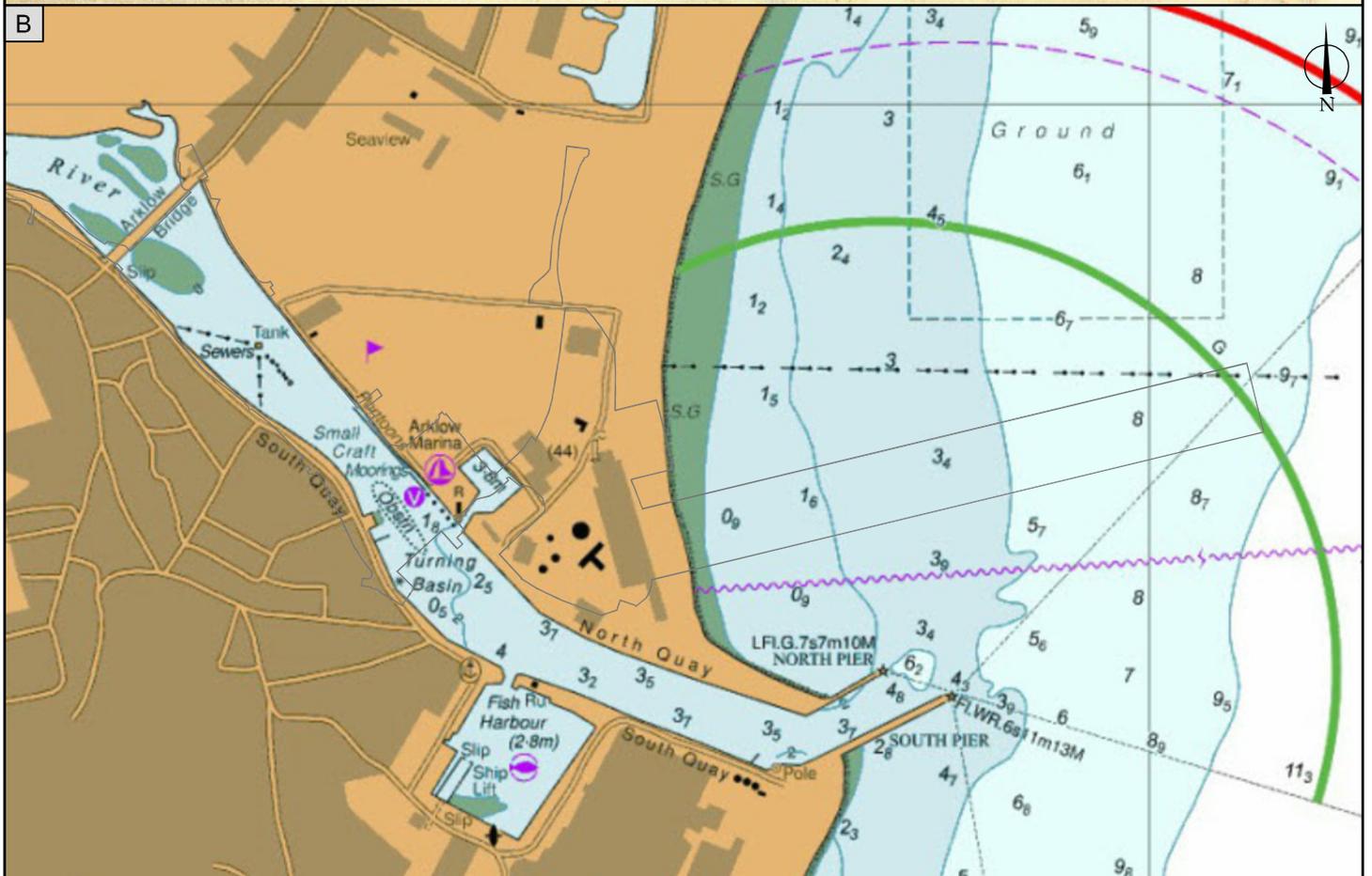
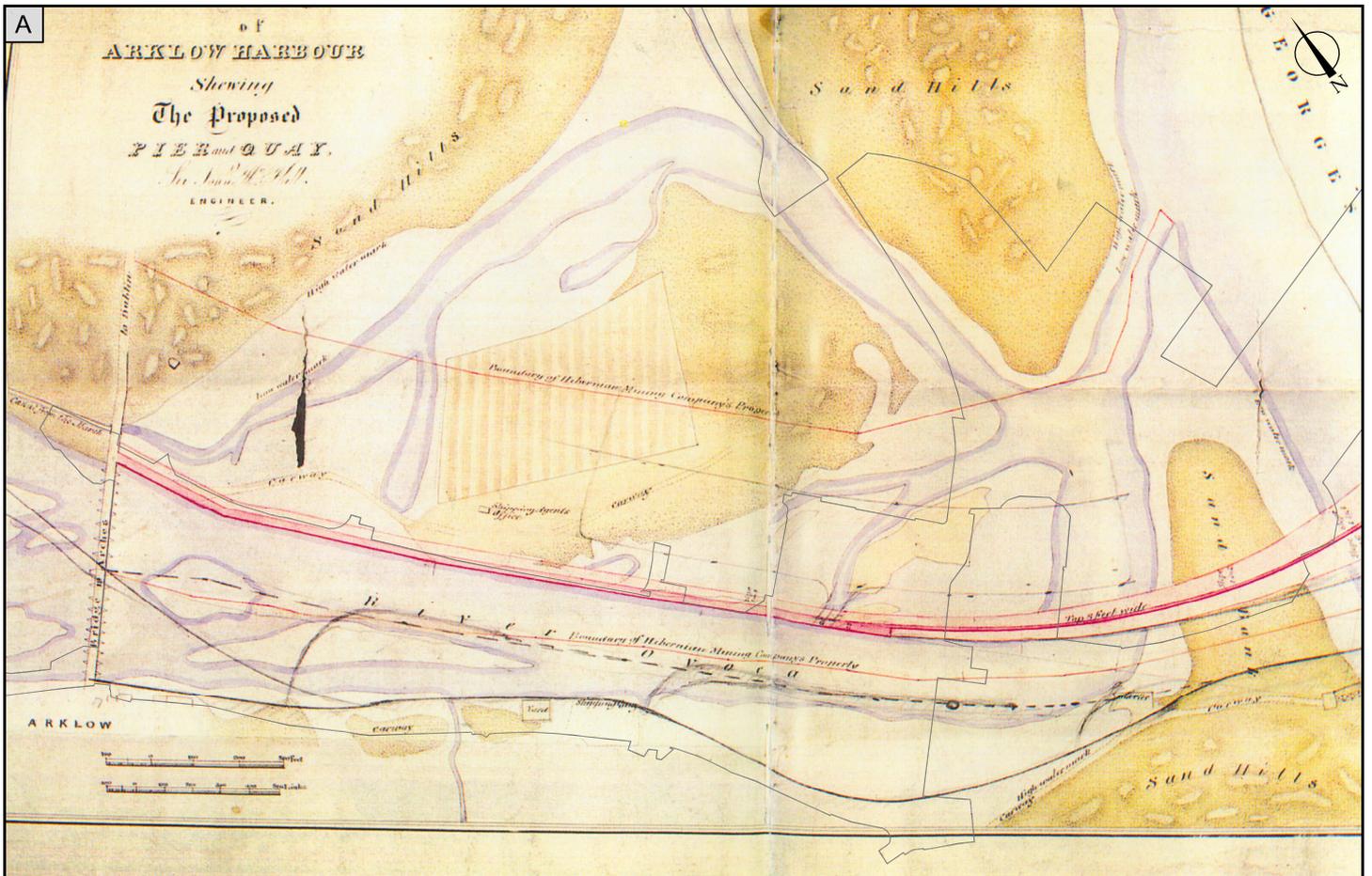
Notes
 Source: <http://wegis.archaeology.ie/historicenvironment/>

- SMR
- NIAH
- Development Boundary

Title
 Figure 3- Details from historic OSi mapping with SMR and NIAH sites located within the vicinity of the proposed development superimposed.

A4

Project UAIA, Arklow Waste Water Scheme- Marine Outfall	Job/Exc No. 17D0078	Compiled by R.Bangerter	CAD reference Arklow_WWTP	Date 08.07.18	Scale 1:5000	Drawing No. Figure 3
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Client
IAC Ltd./ Irish Water

Notes

— Development Boundary

Title

Figure 4-
A). Copy of a Nineteenth-century map of Arklow Harbour with development boundary superimposed.
B). Extract from Admiralty Chart of Arklow Harbour with proposed development boundary superimposed.

A4

Project
UAIA, Arklow Waste Water Scheme- Marine Outfall

Job/Exc No.
17D0078

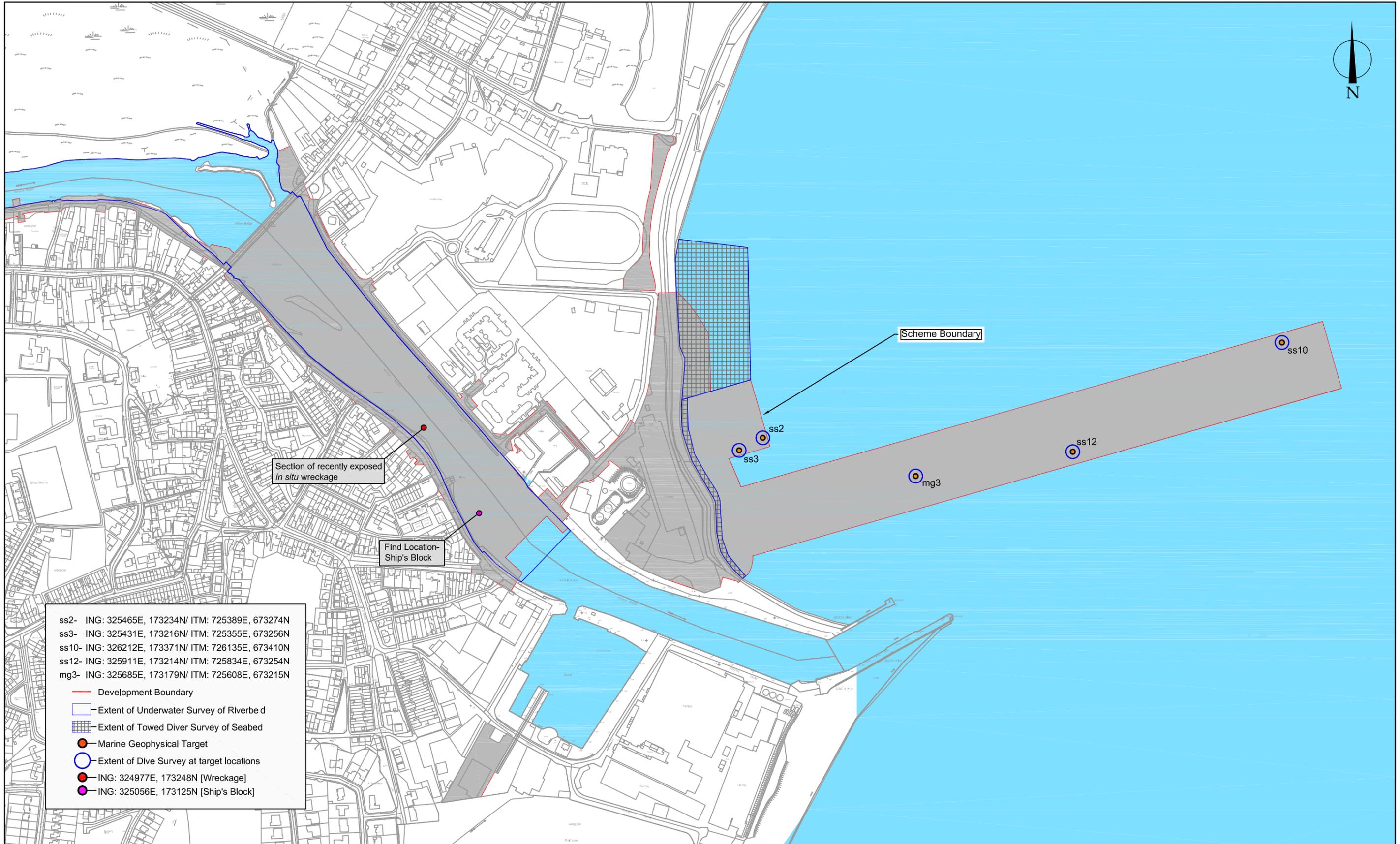
Compiled by
R.Bangerter

CAD reference
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Date
08.07.18

Scale
1:5000/ 1:10,000

Drawing No.
Figure 4



Notes
 Source: Figure adapted from ARUP Project Drawing, Arklow Scheme Boundary_19-06-2018

A3

Job/Exc No.
17D0078

Date
05.07.18

Compiled by
R.Bangertner

Scale
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CAD reference
Arklow_WWTP

Drawing No.
Figure 5

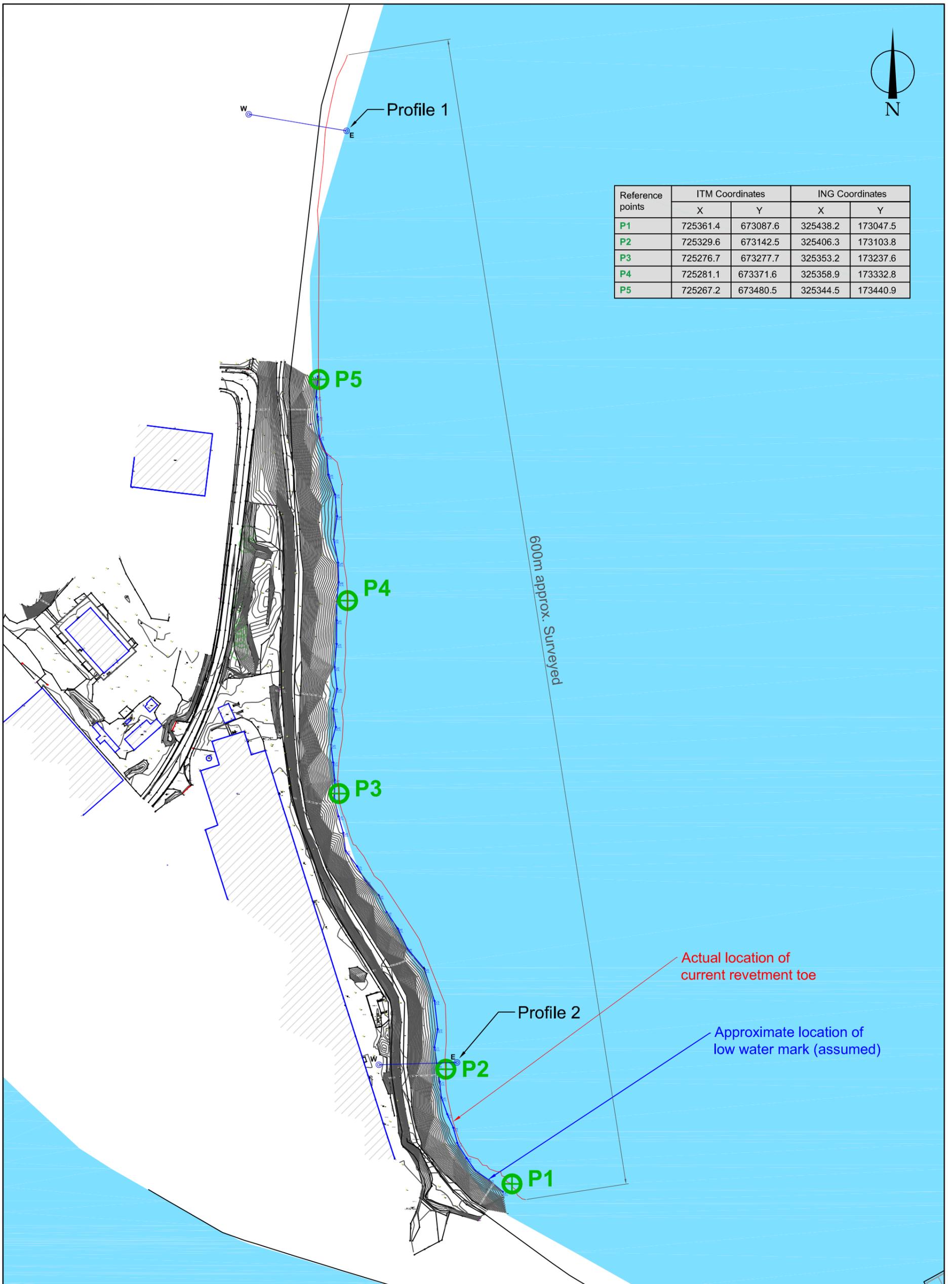
Client
IAC Ltd./ Irish Water

Project
UAIA, Arklow Water Water Scheme- Marine Outfall

Title
Figure 5- Extract from Project Drawing showing location of Marine Geophysical anomalies subject to dive inspection with extent of ADCO Survey Area and site observations superimposed.



Reference points	ITM Coordinates		ING Coordinates	
	X	Y	X	Y
P1	725361.4	673087.6	325438.2	173047.5
P2	725329.6	673142.5	325406.3	173103.8
P3	725276.7	673277.7	325353.2	173237.6
P4	725281.1	673371.6	325358.9	173332.8
P5	725267.2	673480.5	325344.5	173440.9



Notes
Source: ADCO DGPS survey data superimposed on mapping provided by Arup.

Title
Figure 6- DGPS Survey undertaken along toe of Rock Armour.

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IAC Ltd./ Irish Water

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UAIA, Arklow Waste Water Scheme- Marine Outfall

Job/Exc No.
17D0078

Compiled by
D. Copeland

CAD reference
Arklow_WWTP

Date
08.07.2018

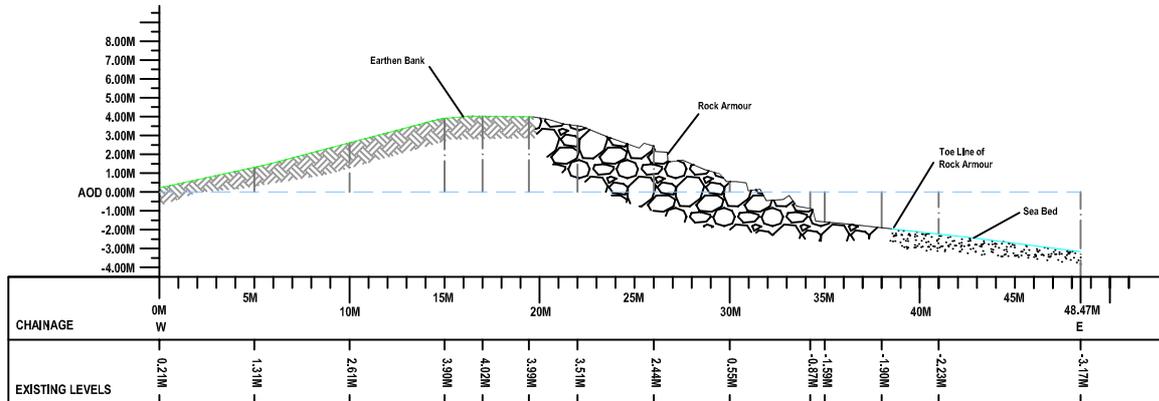
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Drawing No.
Figure 6

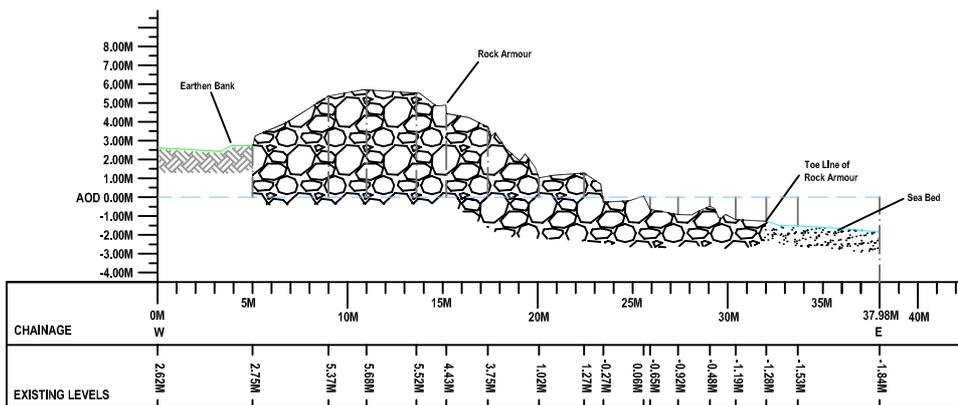
A3

[see Figure 7 for Profiles 1-2].

PROFILE 1



PROFILE 2



Notes
Source: ADCO DGPS Survey

Title
Figure 7- Profiles taken across body of Rock Armour at locations indicated in Figure 6.

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IAC Ltd./ Irish Water

A4

Project
UAIA, Arklow Waste Water Scheme-Marine Outfall

Job/Exc No.
17D0078

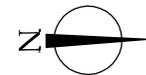
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D. Copeland

CAD reference
Arklow_WWTP

Date
08.07.18

Scale
1:400

Drawing No.
Figure 7



Notes
Source: ADCO Laser-scan survey

A4

Job/Exc No.
17D0078

Compiled by
D. Copeland

CAD reference
Arklow_WWTP

Client
IAC Ltd./ Irish Water

Title
Figure 8- Laser-scan imagery of southernmost arches of Arklow Bridge; taken on its downstream side.

Date
08.07.18

Scale
1:100

Drawing No.
Figure 8

Project
UAIA, Arklow Waste Water Scheme- Marine Outfall