1509

ARLLWYSFA GANOL, LLANDUDNO/ GANOL OUTFALL, LLANDUDNO

Briff Gwylio Archeolegol/ Archaeological Watching Brief

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

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Briff Gwylio Archeolegol/ Archaeological Watching Brief

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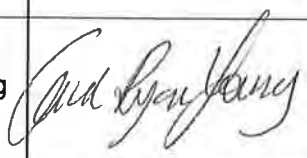
Originated by	Document Author	Carol Ryan Young		1/10/19
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CRYNODEB ANNHECHNEGOL

Dirprwyo Ymddiriedolaeth Archeolegol Gwynedd gan Arup i ymgymryd briff gwylio archeolegol yn ystod gwaith morol yn gysylltiedig gyda'r'r Gorsaf Pwmp Carthion Ganol – West Shore yn Llandudno. Roedd y cynllun i uwchraddio'r'r pibell arllwysfa carthion presennol ar draeth West Shore, Llandudno oherwydd bod y bibell 700mm diamedr 1.3km hir sy'n dadlwytho llifoedd ysbeidiol stormydd o'r West Shore mewn cyflwr atgyweiriad gwael.

Mae'r ardal o amgylch West Shore yn doreithiog mewn archeoleg o'r cyn-hanesyddol trwodd i'r cyfnod cyfoes. Tu fewn i'r ardal blaen traeth ei hun, mae yna faglau pysgod o'r ganol-oesoedd sydd gael ei gorchuddio gan y pibellau arllwysfa carthion o'r 19eg ganrif, cae clogfaen a magl pysgod a'i ddarganfod yn ystod yr asesiad archeolegol o'r cynllun hwn.

Roedd cyfanswm o 11 cloddfeydd ei ymgymryd ar hyd o'r bibell arllwysfa. Nid oedd archeoleg ei tharo tu fewn unrhyw o'r cloddfeydd. Ddaru damaid o bren ei adennill yn ystod y briff gwylio, sut bynnag roedd hwn ei ystyried fel pren drifft, er bod yn gywrain, nid oedd wedi dod o gyd-destun diogel.

NON TECHNICAL SUMMARY

Gwynedd Archaeological Trust was commissioned by Arup to undertake an archaeological watching brief during marine works associated with the Ganol – West Shore Sewage Pumping Station in Llandudno. The scheme was to upgrade the existing sewer outfall pipe on West Shore Beach, Llandudno as the existing 700mm diameter 1.3km long outfall pipe discharges the intermittent storm flows from West Shore and is in poor repair.

The area around the West Shore is rich in archaeology from the prehistoric through to the modern period. Within the foreshore area itself there are two medieval fish traps that are overlain by the 19th century sewer outfall pipes and a boulder field and possible fish trap discovered during the archaeological assessment for this scheme.

In total 11 excavations were undertaken along the length of the outfall pipe. No archaeology was encountered in any of the excavations. A piece of wood was recovered during the watching brief, however this had to be considered driftwood as, although worked, it did not come from a secure context.

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) was asked by Arup to undertake an archaeological watching brief during marine works associated with the Ganol - West Shore Sewage Pumping Station in Llandudno, Conwy County Borough (NGR SH76688225; Post Code: LL30 2QZ; Figure 01). The proposed scheme was to upgrade an existing sewer outfall pipe on West Shore Beach, Llandudno. The existing 700mm diameter 1.3km long outfall pipe discharges the intermittent storm flows from West Shore and is in poor repair. The works included repairing 11 known defects in the outfall, jetting of 1.3km of the outfall, and potential repair of the pipe in the first 330m if found to be incomplete. The scheme area is located on DCWW Drawing No. 4591_S_202-ARP-XX-ZZ-DR-CX-06000 (Figure 01).

The watching brief was completed in accordance with the following guidance:

1. *Standard and Guidance for Archaeological Watching Brief* (Chartered Institute for Archaeologists, 2014);
2. *Standard and guidance for the creation, compilation, transfer and deposition of archaeological archives* (Chartered Institute for Archaeologists, 2014);
3. *Updated Guidelines to the Standards for Recording Human Remains* (Chartered Institute for Archaeologists, 2017);
4. *Management of Archaeological Projects* (English Heritage, 1991);
5. *Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide* (Historic England, 2015); and
6. *Guidelines for digital archives* (Royal Commission on Ancient and Historical Monuments of Wales, 2015).

Gwynedd Archaeological Trust is certified to ISO 9001:2015 and ISO 14001:2015 (Cert. No. 74180/B/0001/UK/En) and is a Registered Organisation with the Chartered Institute for Archaeologists and a member of the Federation of Archaeological Managers and Employers (FAME).

2 FIELDWORK AIMS AND OBJECTIVES

The key aims and objectives of the archaeological mitigation were to:

- identify and record archaeological activity present on site. The outfall pipes cross two previously documented medieval fish traps (PRNs 14611 & 14612) and two possible fish traps (PRNs 77164 & 77209) identified during the archaeological assessment of the Ganol Outfall undertaken in advance of the marine licence application (Ryan Young, 2019). The objective would be to establish the date and nature of any archaeological remains identified and assess their implications for understanding the area, in conjunction with the known archaeological record; and
- if no archaeological activity is identified, establish why this may be the case.
- To place the results in context, reference shall be made to A Research Framework for the Archaeology of Wales Version 03, Final Refresh Document March 2017, specifically the Medieval 1070 to 1539 and the role of the fish traps in terms of the cultural and economic impact of the monasteries.

3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

The west shore at Llandudno lies at the foot of the Great Orme and is an area of foreshore and esturine sand flats located within the Creuddyn and Arllechwedd Historics Llandscape Character Area. Evidence of prehistoric activity is abundant on the Great Orme at Llandudno. Four human skeletons and animal bones, dating to the Upper Palaeolithic period, were discovered at Kendrick's cave (SH77988281) in the late 19th century along with a polished stone axe and some fragments of flint. There is also evidence for Neolithic activity on the Orme evidenced by the burial chamber at Llety's Filiast. Kendrick's Upper Cave (SH78008284) provides evidence for settlement on the Orme during the Bronze Age, a time when the copper ore of the Orme had been identified and exploitation of this resource had begun (Gwyn & Thompson, 1999).

The manor of Gogarth on the Great Orme was first granted by Edward I in 1279 to Bishop Anian I. The Bishop's manor was made up of three townships in Llandudno, Gogarth in the south, the area below the Orme (including the west shore) and the northern part of the Orme near St Tudno's church (Evans, 2004). It is at Gogarth that a substantial hall house was built consisting of two blocks. Block A dates to the 13th century and consists of a single stone built chamber with block B, a large hall and ancillary rooms, being added during the 14th century (Davidson, 2001).

On the West Shore there are two fish traps dating to the medieval period known as Gogarth West (PRN 14611) and Gogarth East (PRN 14612) and a sample of wood from Gogarth West has produced a date of 1500 (cal) (Bannerman, 2001). The foreshore area was part of the Bishops manor and it is hard to imagine that they did not profit in some way from activities undertaken on their land. During the archaeological assessment (Ryan Young, 2019) three new archaeological assets were identified on the west shore. A post medieval quarry jetty (PRN 77163), a possible fish trap (PRN 77164) and a possible fish trap/causeway (PRN 77209).

In the mid-19th century the development of Llandudno into a holiday resort began in earnest under the influence of the Mostyn Estate, with a planned street system which is characterised by wide boulevards and sea views and extended to the West Shore (Wynne Jones, 1975).The influx of people to the area necessitated an improved sewerage system with the Ganol Outfall pipes being constructed in 1845 & 1876 (Bannerman, 2001 & Hopewell, 2000).

An examination of the First to Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheet of the area (Sheets XI.5, XI.6 and XL.4; 1888 to 1890, 1900 and 1913 respectively; cf. Figure 02 for a reproduction the Third Edition) shows little variance between the three editions, with the outfall pipe, referred to as sewage pipe, visible on all three.

4 METHODOLOGY

An archaeological watching brief is defined by the Chartered Institute for Archaeologists as a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme results in the preparation of a report and ordered archive (CIfA, 2014). The groundworks were undertaken by Morgan Sindall in conjunction with Jones Bros Civil Engineering and began the 30th July 2019. Based on the method statement supplied by Morgan Sindall the groundworks included in the archaeological watching brief were:

- the excavation of small holes beneath the outfall pipe at 400m intervals to facilitate the fitting of stainless steel repair clamps at the camera and jetting insertion points, also beneath any other repair sites.

The watching brief monitored the groundworks to the limit of excavation, defined as either an archaeological horizon, the limit of excavation or the glacial horizon, whichever is encountered first. It is recommended that a toothless bucket is used, where practical, and that the archaeologist must be allowed to halt investigation works to investigate any archaeological deposits or features exposed.

- Photographic images were taken using a digital SLR (Nikon D40) camera set to maximum resolution (3008 × 2000 6.1 effective megapixels) in RAW format; a photographic record was maintained on site using GAT pro-formas (Appendix I) and digitised in *Microsoft Access* as part of the fieldwork archive and dissemination process. Photographic images were archived in TIFF format using Adobe Photoshop; the archive numbering system is from G2619_001 to G2619_061.
- During the watching brief all attendances and any identified features were recorded using GAT watching brief pro-formas;
- Working hours on site were determined by the tide timetable. This means that artificial lighting was required during twilight/night hours;

5 RESULTS

5.1 Introduction

Excavations adjacent to the outfall were undertaken during the lowest tides of the month so as to maximise the time available to complete the work and to be able to access the all the repair locations. Two separate spring tides were used, the first between the 30th July and the 2nd of August, and the second between the 29th August and the 31st August 2019. During the spring tide between the 30th July and the 2nd August, 11 excavations were undertaken marked 1-11 on Figure 03. These were to enable the cleaning of the pipe at the repair locations (Plate 01) and to take an accurate measurement of the diameter of the pipe (Plate 02). Due to the amount of stones located next to the pipe along the last third of the outfall, and its location furthest out to sea, excavation 12 was abandoned in favour of a plate repair rather than a collar (Plate 03). The second spring tide between the 29th August and the 31st August was used to fit the repair sections (Plate 04).

5.2 Excavation 1

Distance down outfall:	200m
Size of excavation:	8m x 6m
Maximum depth:	1.5m

Excavation 1 was dug in order to ascertain the condition of the first 300m of pipe and to establish if it was possible to excavate a stable enough hole for a collar with jetting access to be fitted. The excavation was constantly flooding and unstable. The excavation was abandoned at approximately 1.5m depth. In this area of the beach there was a c.1m depth of clean orange sand that gave way to a gravel and grey sand layer (Plate 05). There was no archaeology encountered in this area.

5.3 Excavation 2

Distance down outfall: 400m

Size of excavation: 2m x 6m

Maximum depth: 0.90m

Excavation 2 was situated in an area close to the possible fish trap (PRN 77164) recorded during the archaeological assessment (Ryan Young, 2019) (Plate 06). No evidence of fish traps were seen in the excavation. The sand in this area has been stained almost black in places from the bitumen coating on the outfall pipe with only around 10cm of clean orange sand sitting on top of black/grey stained material (Plate 07). There was no archaeology encountered in this area.

5.4 Excavation 3

Distance down outfall: 646m

Size of excavation: 5m x 5m

Maximum depth: 0.8m

Excavation 3 revealed a layer of orange sand with a maximum depth of 0.45m which gave way to a layer of black/grey bitumen stained material (Plate 08). There was no archaeology encountered in this area.

5.5 Excavation 4

Distance down outfall: 665m

Size of excavation: 5m x 4m

Maximum depth: 1.2m

Excavation 4 revealed a layer of orange sand with a maximum depth of 0.5m which gave way to a layer of grey sand with a maximum depth of 0.3m. These layers overlaid the black/grey bitumen stained material which contained frequent gravel inclusions (Plate 09). There was no archaeology encountered in this area.

5.6 Excavation 5

Distance down outfall: 733m

Size of excavation: 5m x 4m

Maximum depth: 1.1m

Excavation 5 revealed a layer of orange sand with a maximum depth of 0.5m which gave way to a layer of black/grey bitumen stained material which contained frequent gravel inclusions (Plate 10). There was no archaeology encountered in this area.

5.7 Excavation 6

Distance down outfall: 784m

Size of excavation: 6m x 6m

Maximum depth: 1.3m

Excavation 6 revealed a layer of orange sand with a maximum depth of 0.25m which gave way to a layer of black/grey bitumen stained material which contained frequent gravel inclusions (Plate 11). There was no archaeology encountered in this area.

5.8 Excavation 7

Distance down outfall: 801m

Size of excavation: 5m x 6m

Maximum depth: 1.5m

Excavation 6 revealed a layer of orange sand with a maximum depth of 0.25m which gave way to a layer of black/grey bitumen stained material which contained frequent gravel inclusions (Plate 12). There were a couple of tyres found within the upper part of the excavation. These are prevalent on the beach though it is unclear if they were dumped into the sea and have become trapped around the pipes or have been placed around the pipe for another purpose. There was no archaeology encountered in this area.

5.9 Excavation 8

Distance down outfall: 1042m

Size of excavation: 2m x 6m

Maximum depth: 1.0m

Excavation 6 revealed a layer of orange sand with a maximum depth of 0.4m which gave way to a layer of black/grey bitumen stained material which contained frequent gravel inclusions (Plate 13). There was no archaeology encountered in this area.

5.10 Excavation 9

Distance down outfall: 1118m

Size of excavation: 3m x 6m

Maximum depth: 1.1m

Excavation 9 was undertaken in an area where stones have collected to the south of the outfall pipe with some encrusted to the pipe itself (Plate 14). This is partly due to the metal and concrete remains associated with an obsolete connection between the 1845 and 1876 pipes (Plate 15). The orange sand is this area had a maximum depth of 0.3m and gave way to a layer of black/grey bitumen stained sand which contained frequent gravel inclusions and larger stones on the southern side of the pipe (Plate 16). During the watching brief on the 30th July 2019, a 3.5m long piece of timber was noted lying between excavations 9 and 10. It tapered along its length and was broken at both ends. There were worked holes spaced roughly 0.4m apart along its length, some square and some round (Plate 17). The wood was not noted during any of the previous visits and is not from a secure context therefore it is considered to be driftwood of unknown purpose. There was no archaeology encountered in this area.

5.11 Excavation 10

Distance down outfall: 1130m

Size of excavation: 3m x 6m

Maximum depth: 1.0m

Excavation 10 was undertaken in an area where stones have collected to the south of the outfall pipe with some encrusted to the pipe itself. The orange sand is this area had a maximum depth of 0.3m and gave way to a layer of black/grey bitumen stained sand which contained frequent gravel inclusions and larger stones on the southern side of the pipe (Plate 18). There was no archaeology encountered in this area.

5.12 Excavation 11

Distance down outfall: 1146m

Size of excavation: 3m x 6m

Maximum depth: 1.1m

Excavation 11 was undertaken in an area where stones have collected to the south of the outfall pipe with some encrusted to the pipe itself. The orange sand is this area had a maximum depth of 0.25m and gave way to a layer of black/grey bitumen stained sand which contained frequent gravel inclusions and larger stones (Plate 19 & 20). There was no archaeology encountered in this area.

5.13 Excavation 12

Distance down outfall: 1241m

Size of excavation: No excavation

Maximum depth: No excavation

As stated previously, this repair was achieved using a plate rather than a collar and therefore required no excavation due to the amount of stone surrounding the outfall in this area (Plate 03).

6 CONCLUSION

The area around the West Shore is rich in archaeology from the prehistoric through to the modern period. Within the foreshore area itself there are two medieval fish traps that are overlain by the 19th century sewer outfall pipes and a boulder field and possible fish trap discovered during the archaeological assessment for this scheme.

In total 11 excavations were undertaken along the length of the outfall pipe. No archaeology was encountered in any of the excavations. This is likely due to the location of the excavations in relation to the known archaeological assets and also the fact that the outfall pipes themselves create a barrier against which there is a build-up of material normally scoured away by the northern channel. It is worth noting that in one of the only known aerial photographs showing the Gogarth Fish Traps they cannot be seen on the northern side of the pipes but can be clearly seen to the south in the northern channel (Bannerman, 2001). A piece of wood was recovered during the watching brief, however this had to be considered driftwood as, although worked, it did not come from a secure context.

7 SOURCES CONSULTED

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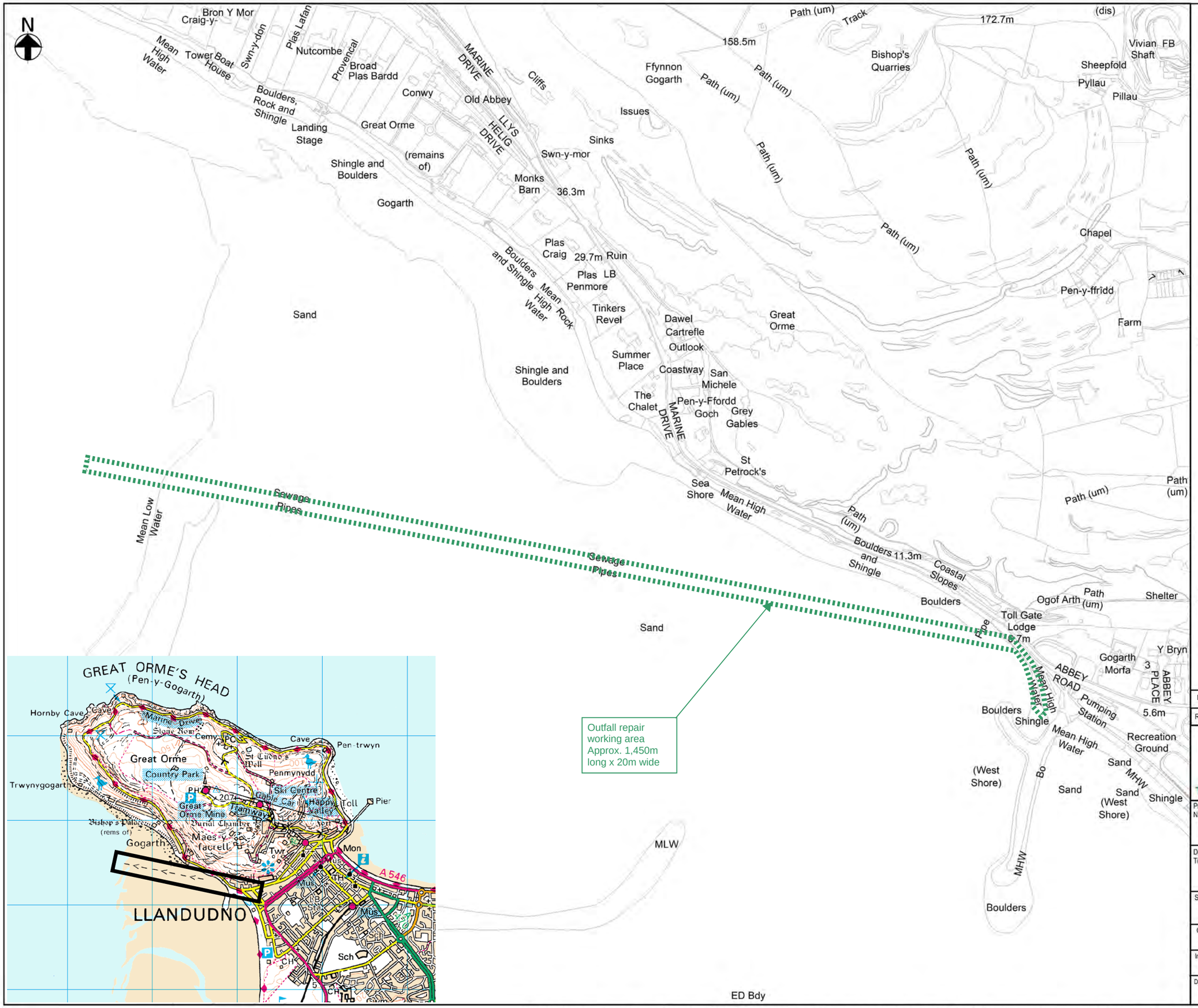
FIGURE 01

Reproduction of DCWW Drawing No. 4591_S_202-ARP-XX-ZZ-DR-CX-06000



A3

KEY

CONSTRUCTION WORKING AREA

NOTES

1. Grid reference SH769821

2. For details of all works to outfall onto the beach refer to drawing DCWW.4599.S.201-ARP-07-01-DR-CD-05101

0 25 50 100 150 200 Metres

Rev.	Date	Drawn.	Description.	Chkd.	Appd.	Date.
P1	22-10-18	AM	FOR INFORMATION	HM	DA	23-10-18

Capital Delivery Alliance
Cynghrair Cyflawni Cyfalaf
Ty Awen, Spooner Close, Coed Kernow, Newport, NP10 8FZ

Project Name. GANOL WEST SHORE SPS

Drawing Title. WEST SHORE SPS
OUTFALL REPAIR
OS PLAN

Suitability. FOR INFORMATION — Suitability Code. S2

Originator	Designer	Date.
HM	AM	22-10-18

Internal Project Number	Scale	Rev.
241529	1:5,000	P1

Drawing Number. 4591_S_202-ARP-XX-ZZ-DR-CX-06000

Gwynedd Archaeological Trust

Figure 02: Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheet XI.4, XI.5 and XI.6, published in 1913.

N

Date: 26/09/2019

Author: CRY

Office:

Drawing: G2619/F02

Scale: 1:5000@A4

Outfall pipes

0 200

metres

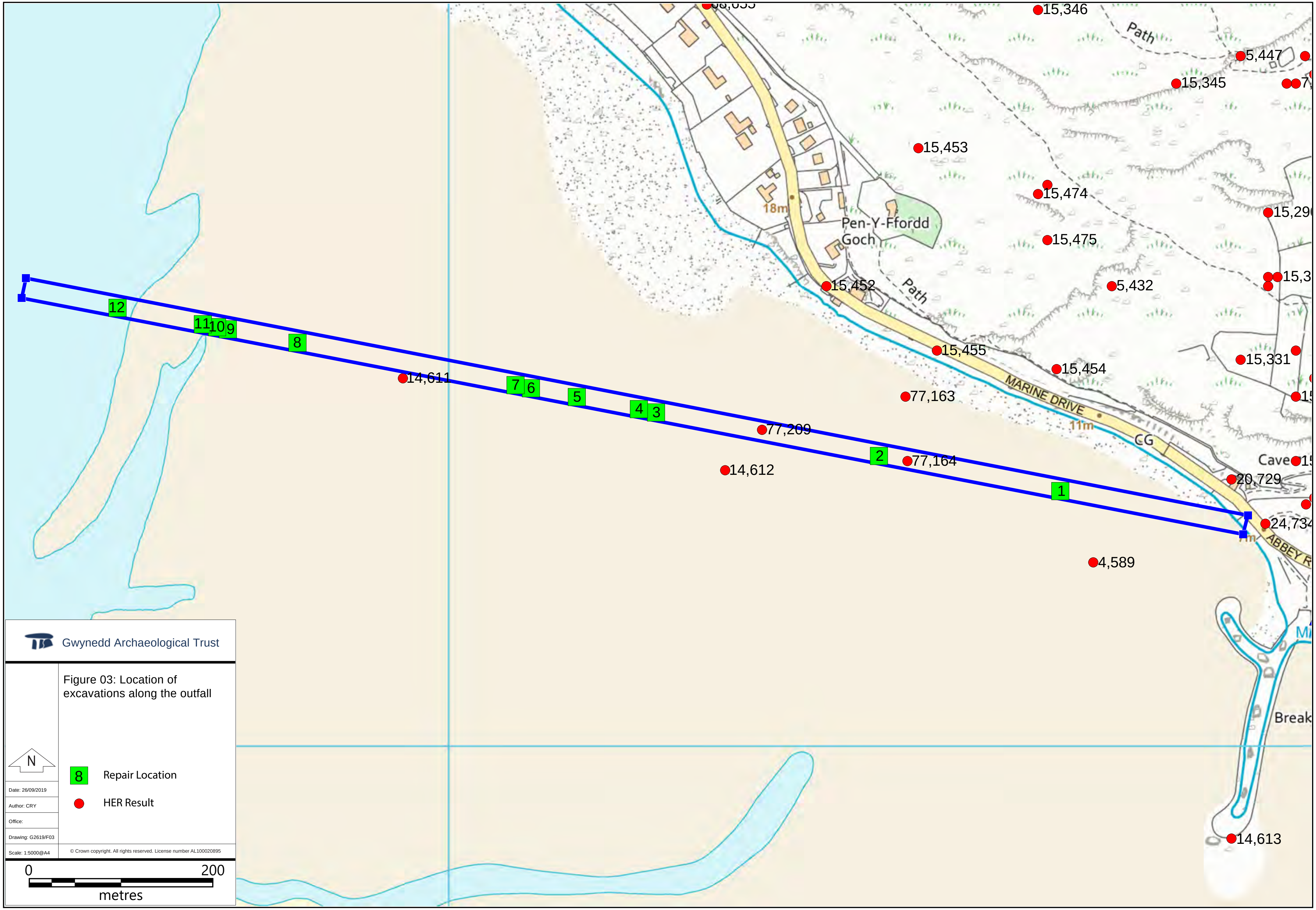


Figure 03: Location of excavations along the outfall

Plate 01: Cleaning a section of outfall; scale: 1x1m (archive reference: G2619_010).

Plate 02: Measuring a section of outfall; scale: 1x1m (archive reference: G2619_002).

Plate 03: Stones collected around the outfall; no scale (archive reference: G2619_026).

Plate 04: Fitting the repair section; no scale (archive reference: G2619_045).

Plate 05: Excavation 1; no scale (archive reference: G2619_032).

Plate 06: Excavation 2 in background with possible fish trap (PRN 77164) seen leading away from the southern most outfall pipe; scale: 1x1m (archive reference: G2619_028).

Plate 07: Excavation 2 showing bitumen stained sand; scale: 1x1m (archive reference: G2619_034).

Plate 08: Excavation 3 showing bitumen stained sand; scale: 1x1m (archive reference: G2619_036).

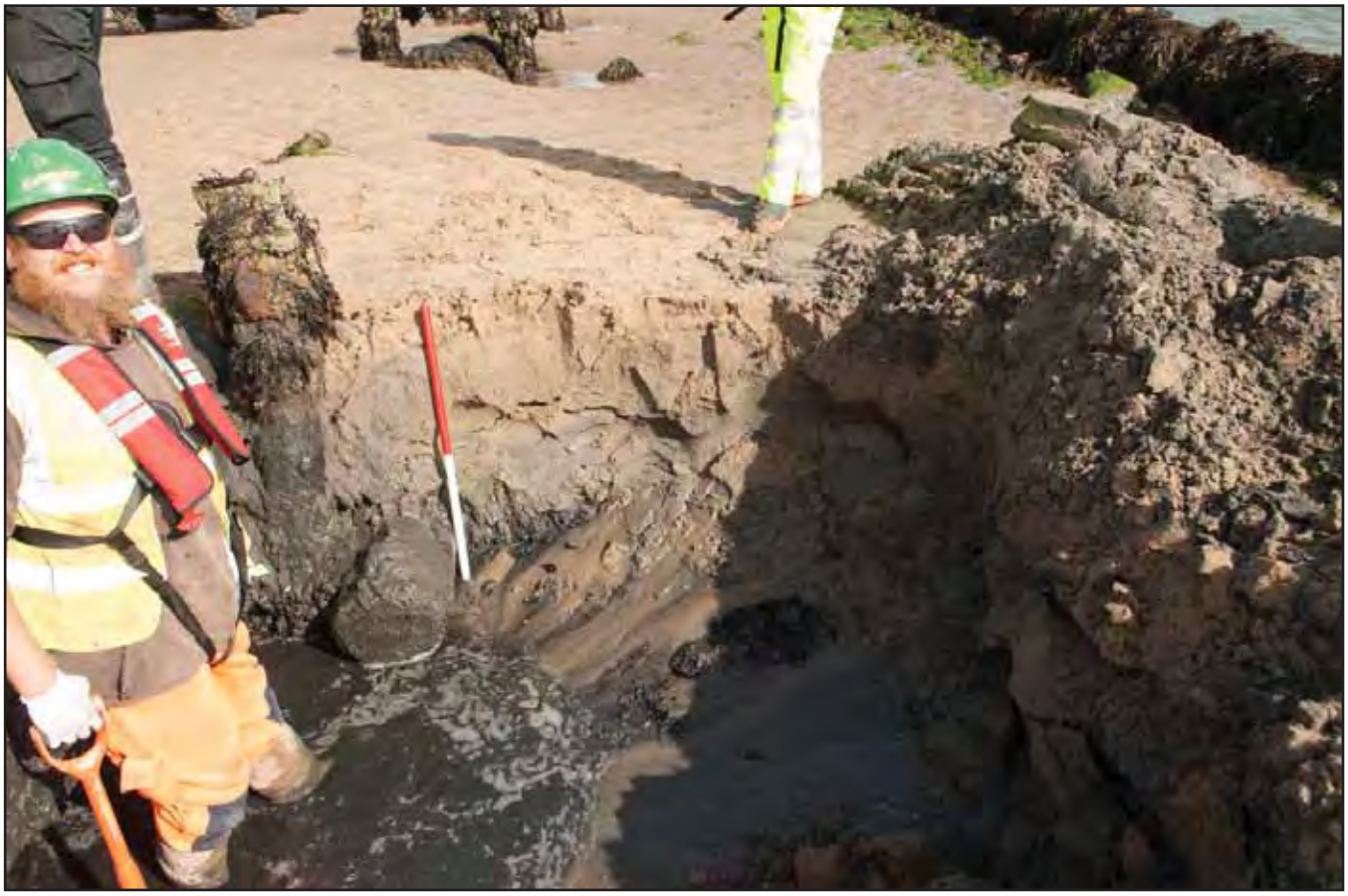


Plate 09: Excavation 4; scale: 1x1m (archive reference: G2619_035).

Plate 10: Excavation 5; scale: 1x1m (archive reference: G2619_039).

Plate 11: Excavation 6; scale: 1x1m (archive reference: G2619_041).

Plate 12: Excavation 7; scale: 1x1m (archive reference: G2619_043).

Plate 13: Excavation 8; scale: 1x1m (archive reference: G2619_014).

Plate 14: Stones encrusted to outfall pipe; scale: 1x1m (archive reference: G2619_019).

Plate 15: Stones collecting around obsolete pipe connextion; no scale (archive reference: G2619_052).

Plate 16: Excavation 9; no scale (archive reference: G2619_015).

Plate 17: Timber found between excavations 9 and 10; scale: 1x1m (archive reference: G2619_057).

Plate 18: Excavation 10; scale: 1x1m (archive reference: G2619_017).

Plate 19: Excavation 11; scale: 1x1m (archive reference: G2619_024).

Plate 20: Excavation 11 showing repair; scale: 1x1m (archive reference: G2619_061).

APPENDIX I

Gwynedd Archaeological Trust Photographic Metadata

PHOTO RECORD NUMBER*	DESCRIPTION*	CONTEXT NUMBER (S)	VIEW FROM	SCALE(S)	CREATOR OF DIGITAL PHOTO*	DATE OF CREATION OF DIGITAL PHOTO*	ORIGINATING ORGANISATION	PLATE
G2619_001	Hole 1 - Excavation		E	1x1m	Carol Ryan Young	31/07/2019	Gwynedd Archaeological Trust	
G2619_002	Hole 1 - Excavation		NE	1x1m	Carol Ryan Young	31/07/2019	Gwynedd Archaeological Trust	02
G2619_003	Hole 2 - Excavation NE side of 1876 pipe - working shot		E	-	Carol Ryan Young	31/07/2019	Gwynedd Archaeological Trust	
G2619_004	Hole 2 - Excavation NE side of 1876 pipe		NE	1x1m	Carol Ryan Young	31/07/2019	Gwynedd Archaeological Trust	
G2619_005	Hole 2 - Post ex		NW	1x1m	Carol Ryan Young	31/07/2019	Gwynedd Archaeological Trust	
G2619_006	Hole 3 - NE side excavation		E	-	Carol Ryan Young	31/07/2019	Gwynedd Archaeological Trust	
G2619_007	Hole 3 - Post ex		SW	1x1m	Carol Ryan Young	31/07/2019	Gwynedd Archaeological Trust	
G2619_008	Hole 4 - working shot NE side only excavated		E	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	
G2619_009	Hole 5 - mid ex		ESE	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	

PHOTO RECORD NUMBER*	DESCRIPTION*	CONTEXT NUMBER (S)	VIEW FROM	SCALE(S)	CREATOR OF DIGITAL PHOTO*	DATE OF CREATION OF DIGITAL PHOTO*	ORIGINATING ORGANISATION	PLATE
G2619_010	Hole 5 - post ex		SSW	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	01
G2619_011	Hole 5 - post ex		NNE	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	
G2619_012	Hole 5 - post ex		NE	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	
G2619_013	Hole 6 - post ex		ESE	-	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	
G2619_014	Hole 6 - post ex		NE	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	13
G2619_015	Hole 7 - post ex		NW	-	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	16
G2619_016	Hole 7 - post ex		NW	-	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	
G2619_017	Hole 8 - post ex		N	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	18
G2619_018	Hole 8 - post ex		SE	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	

PHOTO RECORD NUMBER*	DESCRIPTION*	CONTEXT NUMBER (S)	VIEW FROM	SCALE(S)	CREATOR OF DIGITAL PHOTO*	DATE OF CREATION OF DIGITAL PHOTO*	ORIGINATING ORGANISATION	PLATE
G2619_019	Hole 7 - post ex		SSW	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	14
G2619_020	Hole 8 - post ex		NNE	1x1m	Carol Ryan Young	01/08/2019	Gwynedd Archaeological Trust	
G2619_021	Hole 9 - Working shot (Dark)		NNE	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	
G2619_022	Hole 09 - Post ex (Dark)		NW	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	
G2619_023	Hole 10 - post ex		NNE	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	
G2619_024	Hole 10 - post ex		NW	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	
G2619_025	View down outfall to shore showing stone build up		NW	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	Front
G2619_026	View up outfall to position of hole not dug		E	-	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	03
G2619_027	View down outfall to beach		WNW	-	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	

PHOTO RECORD NUMBER*	DESCRIPTION*	CONTEXT NUMBER (S)	VIEW FROM	SCALE(S)	CREATOR OF DIGITAL PHOTO*	DATE OF CREATION OF DIGITAL PHOTO*	ORIGINATING ORGANISATION	PLATE
G2619_028	PRN 77164 and dig at Hole 9 (400m)	PRN77164	ESE	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	06
G2619_029	PRN 77164 Pos fish trap	PRN77164	NE	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	
G2619_030	Boulder field PRN 77209	PRN77209	NW	1x1m	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	
G2619_031	PRN 77163 Quarry Jetty	PRN77163	SW	-	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	
G2619_032	Hole 12 - Working Shot - abandoned due to depth		NNE	-	Carol Ryan Young	02/08/2019	Gwynedd Archaeological Trust	05
G2619_033	Hole 9 - working shot		SSW	-	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	
G2619_034	Hole 9 - to depth		SSW	1x1m	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	07
G2619_035	Hole 2 - to depth		ESE	1x1m	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	09
G2619_036	Hole 1 - to depth		ESE	1x1m	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	08

PHOTO RECORD NUMBER*	DESCRIPTION*	CONTEXT NUMBER (S)	VIEW FROM	SCALE(S)	CREATOR OF DIGITAL PHOTO*	DATE OF CREATION OF DIGITAL PHOTO*	ORIGINATING ORGANISATION	PLATE
G2619_037	Hole 1 - to depth working shot		SE	-	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	
G2619_038	Hole 2 - Placing repair section		NE	-	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	
G2619_039	Hole 3 - to depth		WNW	1x1m	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	10
G2619_040	Hole 3 - to depth		NE	-	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	
G2619_041	Hole 4 - to depth		NE	1x1m	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	11
G2619_042	Hole 4 - to depth		NW	1x1m	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	
G2619_043	Hole 5 - to depth		SW	1x1m	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	12
G2619_044	Hole 5 - to depth		SSW	-	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	
G2619_045	Hole 5 - Repair placement		NE	-	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	04

PHOTO RECORD NUMBER*	DESCRIPTION*	CONTEXT NUMBER (S)	VIEW FROM	SCALE(S)	CREATOR OF DIGITAL PHOTO*	DATE OF CREATION OF DIGITAL PHOTO*	ORIGINATING ORGANISATION	PLATE
G2619_046	Hole 4 - Taping repair section		NNE	-	Carol Ryan Young	29/08/2019	Gwynedd Archaeological Trust	
G2619_047	Hole 6 - mid ex		NE	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_048	Hole 6 SW side of pipe		NE	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_049	Hole 6		ESE	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_050	Hole 6		NW	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_051	Hole 7 - where two pipes once joined		NW	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_052	Hole 7 - showing both pipes		NW	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	15
G2619_053	Hole 8 - mid-ex		NE	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_054	Hole 8 - mid-ex		NE	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	

PHOTO RECORD NUMBER*	DESCRIPTION*	CONTEXT NUMBER (S)	VIEW FROM	SCALE(S)	CREATOR OF DIGITAL PHOTO*	DATE OF CREATION OF DIGITAL PHOTO*	ORIGINATING ORGANISATION	PLATE
G2619_055	Hole 8 SW side of pipe		NE	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_056	Timber pole - not in situ		-	-	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_057	Timber pole - not in situ		-	1x1m	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	17
G2619_058	Timber pole - not in situ		-	1x1m	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_059	Timber pole - not in situ		-	1x1m	Anne Marie Oattes	30/08/2019	Gwynedd Archaeological Trust	
G2619_060	Hole 10 - Post ex (Dark)		NE	1x1m	Carol Ryan Young	31/08/2019	Gwynedd Archaeological Trust	
G2619_061	Hole 10 - Repair being taped (Dark)		NNE	1x1m	Carol Ryan Young	31/08/2019	Gwynedd Archaeological Trust	

APPENDIX II

Reproduction of Gwynedd Archaeological Trust written scheme of investigation

GANOL OUTFALL,

WEST SHORE, LLANDUDNO

WRITTEN SCHEME OF INVESTIGATION FOR ARCHAEOLOGICAL WATCHING BRIEF

Prepared for

Arup

May 2019

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

	Role	Printed Name	Signature	Date
Originated by	Document Author	Carol Ryan Young		11/6/19
Reviewed by	Document Reviewer	John Roberts		11/06/19
Approved by	Principal Archaeologist	John Roberts		11/06/19

Revision History			
Rev No.	**Summary of Changes**	**Ref Section**	**Purpose of Issue**
1	Amend groundworks to be monitored. Specific comment on methodology for recording/protection of fish traps and night working.	3.1	GAPS Approval

GANOL OUTFALL, WEST SHORE, LLANDUDNO (G2619)

WRITTEN SCHEME OF INVESTIGATION FOR ARCHAEOLOGICAL WATCHING BRIEF

Prepared for *Arup,* May 2019

Historic Environment Record Enquiry Number GATHER1116 and Event Primary Reference Number 45432

CONTENTS

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by Arup to undertake an archaeological watching brief during marine works associated with the Ganol - West Shore Sewage Pumping Station in Llandudno, Conwy County Borough (NGR SH76688225; Post Code: LL30 2QZ; Figure 01). The proposed scheme is to upgrade an existing sewer outfall pipe on West Shore Beach, Llandudno. The existing 700mm diameter 1.3km long outfall pipe discharges the intermittent storm flows from West Shore and is in poor repair. The proposed works include repairing 6 known defects in the outfall, jetting of 1.3km of the outfall, and potential repair of the pipe in the first 330m if found to be incomplete. The scheme area is located on DCWW Drawing No. 4591_S_202-ARP-XX-ZZ-DR-CX-06000 (Figure 01). Details of the works to be undertaken and their location in relation to the known archaeological assets are shown on Figure 02 based on DCWW Drawing No 4599.S.201-ARP-07-01-DR-CD-05101. The work is scheduled to start on the 2nd September 2019 and last 7 weeks.

The watching brief will be completed in accordance with the following guidance:

1. *Standard and Guidance for Archaeological Watching Brief* (Chartered Institute for Archaeologists, 2014);
2. *Standard and guidance for the creation, compilation, transfer and deposition of archaeological archives* (Chartered Institute for Archaeologists, 2014);
3. *Updated Guidelines to the Standards for Recording Human Remains* (Chartered Institute for Archaeologists, 2017);
4. *Management of Archaeological Projects* (English Heritage, 1991);
5. *Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide* (Historic England, 2015); and
6. *Guidelines for digital archives* (Royal Commission on Ancient and Historical Monuments of Wales, 2015).

Gwynedd Archaeological Trust is certified to ISO 9001:2015 and ISO 14001:2015 (Cert. No. 74180/B/0001/UK/En) and is a Registered Organisation with the Chartered Institute for

Archaeologists and a member of the Federation of Archaeological Managers and Employers (FAME).

1.1 Fieldwork Aims and Objectives

The key aims and objectives of the archaeological mitigation are to:

- identify and record archaeological activity present on site. The outfall pipes cross two previously documented medieval fish traps (PRNs 14611 & 14612) and two possible fish traps (PRNs 77164 & 77209) identified during the archaeological assessment of the Ganol Outfall undertaken in advance of the marine licence application (Ryan Young, 2019). The objective would be to establish the date and nature of any archaeological remains identified and assess their implications for understanding the area, in conjunction with the known archaeological record; and
- if no archaeological activity is identified, establish why this may be the case.
- To place the results in context, reference shall be made to A Research Framework for the Archaeology of Wales Version 03, Final Refresh Document March 2017, specifically the Medieval 1070 to 1539 and the role of the fish traps in terms of the cultural and economic impact of the monasteries.

1.2 Monitoring Arrangements

The watching brief will be monitored by the Gwynedd archaeological Planning Service (GAPS); the content of this WSI and all subsequent reporting by GAT must be approved by GAPS prior to final issue.

The GAPS Archaeologist will need to be informed of the project timetable and of the subsequent progress and findings. This will allow the GAPS Archaeologist time to arrange monitoring visits and attend site meetings (if required) and enable discussion about the need or otherwise for further archaeological works (if required) as features of potential archaeological significance are encountered.

The curator contact details are: **01248 370926**.

1.3 Historic Environment Record

In line with the Gwynedd Historic Environment Record (HER) requirements, the HER will be contacted at the onset of the project to ensure that any data arising is formatted in a manner suitable for accession to the HER and follows the guidance set out in *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* (The Welsh Archaeological Trusts, 2018). The HER will be informed of the project start date, location including grid reference, estimated timescale for the work, and further relevant information associated with the project.

The GAT HER Enquiry Number for this project is GATHER1116 and the Event PRN is 45432. The GAT HER will also be responsible for sourcing the Primary Reference Numbers (PRN) for any new identified and recorded assets.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

The west shore at Llandudno lies at the foot of the Great Orme and is an area of foreshore and esturine sand flats located within the Creuddyn and Arllechwedd Historics Llandscape Character Area. Evidence of prehistoric activity is abundant on the Great Orme at Llandudno. Four human skeletons and animal bones, dating to the Upper Palaeolithic period, were discovered at Kendrick's cave (SH77988281) in the late 19th century along with a polished stone axe and some fragments of flint. There is also evidence for Neolithic activity on the Orme evidenced by the burial chamber at Llety's Filiast. Kendrick's Upper Cave (SH78008284) provides evidence for settlement on the Orme during the Bronze Age, a time when the copper ore of the Orme had been identified and exploitation of this resource had begun (Gwyn & Thompson, 1999).

The manor of Gogarth on the Great Orme was first granted by Edward I in 1279 to Bishop Anian I. The Bishop's manor was made up of three townships in Llandudno, Gogarth in the south, the area below the Orme (including the west shore) and the northern part of the Orme near St Tudno's church (Evans, 2004). It is at Gogarth that a substantial hall house was built consisting of two blocks. Block A dates to the 13th century and consists of a single stone built chamber with block B, a large hall and ancillary rooms, being added during the 14th century (Davidson, 2001).

On the West Shore there are two fish traps dating to the medieval period known as Gogarth West (PRN 14611) and Gogarth East (PRN 14612) and a sample of wood from Gogarth West has produced a date of 1500 (cal) (Bannerman, 2001). The foreshore area was part of the Bishops manor and it is hard to imagine that they did not profit in some way from activities undertaken on their land. During the archaeological assessment (Ryan Young, 2019) three new archaeological assets were identified on the west shore. A post medieval quarry jetty (PRN 77163), a possible fish trap (PRN 77164) and a possible fish trap/causeway (PRN 77209).

In the mid-19th century the development of Llandudno into a holiday resort began in earnest under the influence of the Mostyn Estate, with a planned street system which is characterised by wide boulevards and sea views and extended to the West Shore (Wynne Jones, 1975).The influx of people to the area necessitated an improved sewerage system with the Ganol Outfall pipes being constructed in 1845 & 1876 (Bannerman, 2001 & Hopewell, 2000).

An examination of the First to Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheet of the area (Sheets XI.5, XI.6 and XL.4; 1888 to 1890, 1900 and 1913 respectively; cf. Figure 03 for a reproduction the Third Edition) shows little variance between the three editions, with the outfall pipe, referred to as sewage pipe, visible on all three.

3 METHODOLOGY

3.1 Introduction

An archaeological watching brief is defined by the Chartered Institute for Archaeologists as a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive (CIfA, 2014). The groundworks will be undertaken by Morgan Sindall and is scheduled to begin on the 2nd September 2019. Based on the method statement (Appendix III) supplied by Morgan Sindall the groundworks included in the archaeological watching brief are:

- the excavation of small holes beneath the outfall pipe at 400m intervals to facilitate the fitting of stainless steel repair clamps at the camera and jetting insertion points, also beneath any other repair sites.

The watching brief will monitor the groundworks to the limit of excavation, defined as either an archaeological horizon, the limit of excavation or the glacial horizon, whichever is encountered first. It is recommended that a toothless bucket is used, where practical, and that the archaeologist must be allowed to halt investigation works to investigate any archaeological deposits or features exposed.

- Photographic images will be taken using a digital SLR (Nikon D40) camera set to maximum resolution (3008 × 2000 6.1 effective megapixels) in RAW format; a photographic record will be maintained on site using GAT pro-formas (Appendix I) and digitised in *Microsoft Access* as part of the fieldwork archive and dissemination process. Photographic images will be archived in TIFF format using Adobe Photoshop; the archive numbering system will start from G2619_001. When practical, a photographic ID board will be used during the watching brief inspection to record site code, image orientation and any relevant context numbers.
- During the watching brief all attendances and any identified features will be recorded using GAT watching brief pro-formas (Appendix II);
- Any subsurface features will be recorded photographically, with detailed notations and a measured survey (completed using a *Trimble* R8 GPS unit);

- Any archaeological features/deposits/structures encountered will be manually cleaned and examined to determine extent, function, date and relationship to adjacent activity. The following excavation strategy will generally apply: 50% sample of each sub-circular feature, 10% sample of each linear feature (terminal ends and intersection points with other features will be prioritised). However, if discrete features are identified these will be 100% excavated as will any exposed segments of linear features. Features such as burnt mounds, which comprise a spread of material rather than a cut feature, will be completed in quadrants (if fully extant within the groundworks area) or 100% excavated if present as a discrete spread. *In the event of the identification of extensive/complex remains (for example burials, structures or preserved wooden or organic artefacts), additional time, resourcing and costs may be required for GAT to complete an appropriate programme of works.*
- Working hours on site will be determined by the tide timetable. This means that artificial lighting will be required during twilight/night hours;
- Due to the constraints of working in the intertidal zone it may be necessary to pump water from features to allow them to be excavated;
- Any required plans or sections to be drawn at a minimum 1:10 scale using GAT A4 or A2 pro-forma permatrace. However, due to the time restraints for recording in the intertidal zone, 3D photogrammetry may be a more practical option;
- Should the remains of any fish traps be encountered they will be recorded via photogrammetry and, if possible, a sample of wood collected for dating purposes. They will also be recorded using traditional photography techniques, with detailed notations and a measured survey (completed using a *Trimble* R8 GPS Unit). They will be protected during construction via an archaeological watching brief;
- Should dateable artefacts, human remains and/or ecofacts be recovered, an **interim report** will be submitted summarising the results of the watching brief, along with an assessment of potential for analysis post-excavation project design (in line with the MAP2 process). *Additional time, resourcing and costs will be required to undertake any post-excavation programme of works.*

3.2 Human Remains

If any human remains identified are to be excavated, and cannot be preserved in situ this will take place under appropriate regulations and with due regard for health and safety issues. In order to excavate human remains, a Ministry of Justice licence is required under Section *25* of the Burials Act 1857 for the removal of any body or remains of any body from any place of burial. In accordance with the Ministry of Justice licence, recovered remains will be reburied once the investigation and/or assessment/analysis are complete.

Non-fragmented skeletal remains will be excavated using wooden tools and collected and stored in polyethylene bags (with appropriate references for context, grave number, et al) and placed in a lidded cardboard archive box (note: separate boxes for each grave) and stored in a suitable manner within GAT premises. If significant quantities of human remains are encountered, a human osteologist should be contacted and appointed to advise the team during the fieldwork. The osteologist will be an external appointment: Dr. Genevieve Tellier | Tel: 01286 238827 | email: northwalesosteology@outlook.com who will assist in devising the excavation, recording and sampling strategy for features containing human remains. The osteologist should also help to ensure that adequate post-excavation processing of human remains is carried out so that the material is in a fit state for assessment during the post-excavation stage. For inhumations, this will involve washing, drying, marking and packing.

If human remains are recovered that are deemed suitable for further assessment/analysis, this will be completed in accordance with the osteologist's requirements and with *Human Bones from Archaeological Sites Guidelines for producing assessment documents and analytical reports* (Chartered Institute for Archaeologists, 2017).

3.3 Ecofacts

Should any archaeological features and/or sealed deposits be identified that are deemed suitable for dating, ecofact samples will be taken. The sampling procedure will be informed by specialist advice upon discovery, particularly for waterlogged/organic deposits. The specialist contact will be Jackeline Robertson (AOC Archaeology | telephone: 0208 843 7380). The sampling strategy will also be undertaken in accordance with the principles set out in *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (Historic England, 2011).

3.4 Artefacts

Diagnostic artefacts will be retained for further examination and identification. Pottery sherds of 19th and 20th century date will be examined on site and the context from which they were retrieved noted but the sherds will not be retained. The artefacts will be treated according to guidelines issued by the UK Institute of Conservation (Watkinson and Neal 2001) in particular the advice provided within *First Aid for Finds* (Rescue 1999) and Historic England.

Any waterlogged artefacts (e.g. wood or leather) that are to be recovered for post-excavation assessment and analysis will be processed in accordance with *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage, 2011) and specifically in accordance with Brunning and Watson (2010) for waterlogged wood and Historic England (2012) for waterlogged leather. In such cases an external specialist will be contacted to agree an appropriate sampling and recovery strategy via Lucy Whittingham | Project Manager (post-excavation) | AOC Archaeology | telephone: 0208 843 7380 | email: lucy.whittingham@aocarchaeology.com).

All finds are the property of the landowner; however, it is Trust policy to recommend that all finds are donated to an appropriate museum (in this case Conwy Archive Service, Old Board School, Lloyd Street, Llandudno LL30 2YG), where they can receive specialist treatment and study. Access to finds must be granted to the Trust for a reasonable period to allow for analysis and for study and publication as necessary. Trust staff will undertake initial identification, but any additional advice would be sought from a wide range of consultants used by the Trust, including National Museums and Galleries of Wales at Cardiff.

All finds of treasure must be reported to the coroner for the district within fourteen days of discovery or identification of the items. Items declared Treasure Trove become the property of the Crown, on whose behalf the Portable Antiquities Scheme acts as advisor on technical matters, and may be the recipient body for the objects.

The Treasure Valuation Committee, based at the British Museum, and informed by the Portable Antiquities Scheme, will decide whether they or any other museum may wish to acquire the object. If no museum wishes to acquire the object, then the Secretary of State will be able to disclaim it. When this happens, the coroner will notify the occupier and landowner that he intends to return the object to the finder after 28 days unless he receives

no objection. If the coroner receives an objection, the find will be retained until the dispute has been settled.

GAT will contact the landowner (via client) for agreement regarding the transfer of artefacts, initially to GAT and subsequently to the relevant museum (Conwy Archive Service). A GAT produced pro-forma will be issued to the landowner where they are given the option to donate the finds or to record that they want them returning to them once analysis and assessment has been completed. Artefacts will be transferred to the Conwy Archive Service in accordance with their guidelines.

3.5 Fieldwork Archiving

Following the completion of the fieldwork, a programme of field work archiving will be completed based on following task list;

1. Pro-formas: all cross referenced and complete;
2. Photographic Metadata: completed in *Microsoft Access* and cross-referenced with all pro-formas;
3. Sections: all cross referenced and complete;
4. Survey data: downloaded using a Computer Aided Design package;
5. Plans: all cross referenced and complete;
6. Artefacts (if relevant): quantified and identified; register completed;
7. Ecofacts (if relevant): quantified and register completed;
8. Context register (if relevant): quantified and register completed.

All data will be processed, final illustrations will be compiled and a report will be produced which will detail and synthesise the results.

4 REPORTING

Following completion of the stages outlined above, a report will be produced within one month incorporating the following:

1. Non-technical summary (Welsh and English)
2. Introduction
3. Aims and objectives
4. Background
5. Methodology
6. Results
7. Conclusions and further recommendations
8. List of sources consulted.
9. Appendix I – approved GAT project design
10. Appendix II – photographic metadata

Should dateable artefacts and ecofacts be recovered, an **interim report** will be submitted summarising the results, along with an assessment of potential for analysis written scheme of investigation (in line with the MAP2 process).

Illustrations will include plans of the location, site plans and sections. Historical maps, when appropriate and if copyright permissions allow, will be included. A draft copy of the report will be sent to GAPS and to the client prior to production of the final report.

Dependant on the outcome of the archaeological watching brief the *Research Framework for the Archaeology of Wales* will be consulted to help to provide context and to help inform the archaeology identified within the site boundary.

5 DISSEMINATION AND ARCHIVING

A full archive including plans, photographs, written material and any other material resulting from the project will be prepared. The archaeological watching brief outlined in this written scheme of investigation is expected to commence in July 2019. A draft report will be submitted within one month of fieldwork completion; a final report will be submitted to the Historic Environment within six months of submitting the draft report.

On completion, the following dissemination will apply:

- A digital report will be provided to the client and GAPS (draft report then final report);
- A paper report plus a digital report will be provided to the regional Historic Environment Record, Gwynedd Archaeological Trust within six months of project completion (final report only). If appropriate, digital information such as the project database, GIS table(s) and photographs, will also be submitted to the required standards set out in *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* (Version 1.1); and
- A digital report and archive (including photographic and drawn) data will be provided to Royal Commission on Ancient and Historical Monuments, Wales (final report only), in accordance with the *RCAHMW Guidelines for Digital Archives Version 1*. Digital information will include the photographic archive and associated metadata.

6 PERSONNEL

The project will be managed by John Roberts, Principal Archaeologist GAT Contracts Section with attendances on-site undertaken by a GAT Project Archaeologist(s). The Project Archaeologist will be responsible for the archaeological watching brief on site, including all field management duties, e.g., GAPS/client/consultant liaison, artefact, osteologist or palaeo-environmentalist liaison (if relevant). The Project Archaeologist will be responsible for completing all on site pro-formas and the fieldwork archive itemised in para. 3.2. The Project Archaeologist will also be responsible for submitting a draft final report (or interim report) for project manager review and approval. The report will then be submitted as per the arrangements defined in para. 5.

7 HEALTH AND SAFETY

The GAT Project Archaeologist(s) will be CSCS certified. Copies of the site specific risk assessment will be supplied to the client and sub-contractor prior to the start of fieldwork. Any risks and hazards will be indicated prior to the start of work via a submitted risk assessment. All GAT staff will be issued with required personal safety equipment, including high visibility jacket, steel toe-capped boots and hard hat. All GAT fieldwork is undertaken in accordance with the Trust's Health and Safety Manual, Policy and Handbook which were prepared by Ellis Whittam. All work will be undertaken in accordance with the client and site contractors Health and Safety requirements.

8 SOCIAL MEDIA

One of the key aims in the GAT mission statement is to improve the understanding, conservation and promotion of the historic environment in our area and inform and educate the wider public. To help achieve this, GAT maintains an active social media presence and seeks all opportunities to promote our projects and results. With permission, GAT would like the opportunity to promote our work on this scheme through our social media platforms. This could include social media postings during our attendance on site as well as any postings to highlight results. In all instances, approval will be sought from client prior to any postings.

Any social media will be with the agreement of DCWW comms.

9 INSURANCE

Public/Products Liability

Limit of Indemnity- £5,000,000 any one event in respect of Public Liability

INSURER Aviva Insurance Limited

POLICY TYPE Public Liability

POLICY NUMBER 24765101CHC/UN/000375

EXPIRY DATE 21/06/2019

Employers Liability

Limit of Indemnity- £10,000,000 any one occurrence.

The cover has been issued on the insurers standard policy form and is subject to their usual terms and conditions. A copy of the policy wording is available on request.

INSURER Aviva Insurance Limited

POLICY TYPE Employers Liability

POLICY NUMBER 24765101 CHC / UN/000375

EXPIRY DATE 21/06/2019

Professional Indemnity

Limit of Indemnity- £5,000,000 in respect of each and every claim

INSURER Hiscox Insurance Company Limited

POLICY TYPE Professional Indemnity

POLICY NUMBER 9446015

EXPIRY DATE 22/07/2019

10 SOURCES CONSULTED

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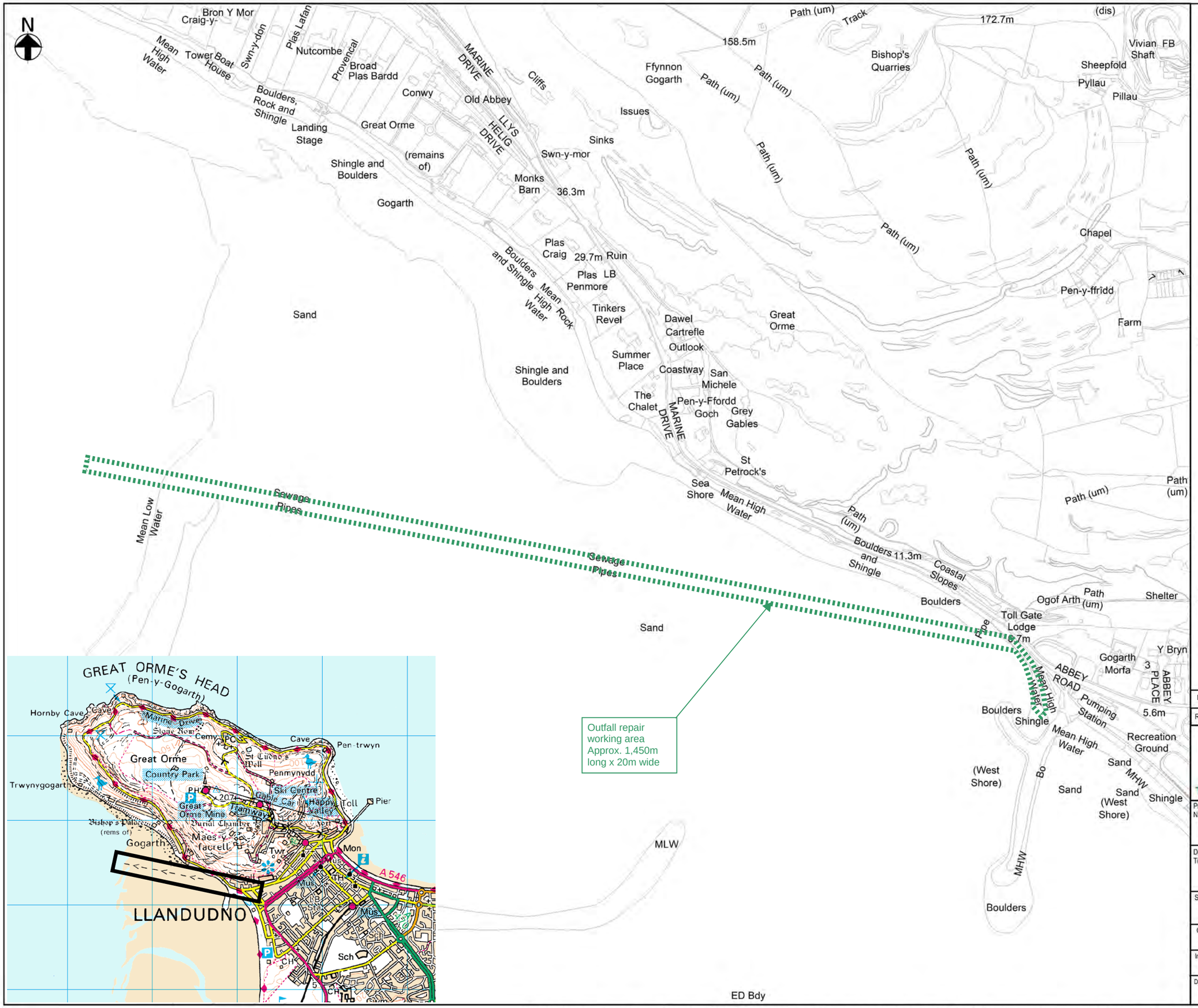
FIGURE 01

Reproduction of DCWW Drawing No. 4591_S_202-ARP-XX-ZZ-DR-CX-06000



A3

KEY

CONSTRUCTION WORKING AREA

NOTES

1. Grid reference SH769821

2. For details of all works to outfall onto the beach refer to drawing DCWW.4599.S.201-ARP-07-01-DR-CD-05101

0 25 50 100 150 200 Metres

Rev.	Date	Drawn.	Description.	Chkd.	Appd.	Date.
P1	22-10-18	AM	FOR INFORMATION	HM	DA	23-10-18

Capital Delivery Alliance
Cynghrair Cyflawni Cyfalaf
Ty Awen, Spooner Close, Coed Kernow, Newport, NP10 8FZ

Project Name. GANOL WEST SHORE SPS

Drawing Title. WEST SHORE SPS
OUTFALL REPAIR
OS PLAN

Suitability. FOR INFORMATION — Suitability Code. S2

Originator	Designer	Date.
HM	AM	22-10-18

Internal Project Number	Scale	Rev.
241529	1:5,000	P1

Drawing Number. 4591_S_202-ARP-XX-ZZ-DR-CX-06000

FIGURE 02

Location of archaeological features in relation to planned repairs, based on DCWW Drawing No: 4599.S.201-ARP-07-01-DR-CD-05101. Scale: 1:5500@A4.

Example of previous repairs to the outfall

New inline Tideflex valve on 27" dia outfall.
Outfall end only visible at very low tides.

MMO License likely required for beach works

Clear and inspect condition of first 330m of outfall, which is currently buried.
Survey strategy to determine condition of pipe to be defined by Morgan Sindall.

14,611

77,163

77,209

77,164

14,612

Length to be cleaned 330 m

Repair 6 known small holes in crown of pipe.
Allow for 3 additional repairs.
Each repair to consist of removing rusted plates and replace with new PE sheets 300mm x 300mm. Each bolted with 4no stainless steel self taping bolts to outfall.

Jet and clean 1.3km of outfall.
In addition, allow for chain flail cleaning as well.

Allow for replacement of 3m length of 27" pipe with a 27" "Hatchbox" pipe, with connections to existing pipe pieces, to allow access for jetting and camera

Allow for replacement of one 10m length of 27" dia pipe with connections to existing pipe pieces.

Replacement screen at Llandudno West Shore Pumping Station - see other drawings

FIGURE 03

Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets XI.5, XI.6 and XI.4, published in 1913, with location of assessment/evaluation area outlined red. Scale: 1 to 5000@A4.


Gogarth Abbey
Gogarth Abbey (Remains of)
Gogarth
Pen-y-fron
The Chalet
Landing Stage
Pen-y-ffridd-goch
Sailors' Home
St. Petrock's
High Water Mark of Ordinary Tides
MAES-Y-FACRELL
PEN-Y-FFRIDD
Pant-y-ffridd
Pen-y-ffridd Villa
Invalids' Walk
Ogof Arth
Gravel Pit
Pen-morfa Lodge
Gogarth Abbey Hotel
Pen-y-morfa Cottages
L.W.M.O.T.
Lake
Shelter
Quarry
Cromlech

APPENDIX I

Gwynedd Archaeological Trust Photographic Metadata pro-forma

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Digital Photographic Record

Include main context numbers for each shot, drawing numbers for sections and any other relevant numbers for cross referencing.
Delete any unwanted photos **immediately** from the camera. Regularly upload photographs to computer.

Project Name:			Project Number:				
Photo No.	**Sub - Division**	**Description**	**Contexts**	**Scales**	**View From**	**Initials**	**Date**

APPENDIX II

Gwynedd Archaeological Trust Watching Brief pro-forma

YMDDIRIEDOLAETH ARCHAEOLEGOL GWYNEDD ARCHAEOLOGICAL TRUST		
WATCHING BRIEF DAY RECORD		*Date*
Project name	*Project number*	*Compiler*
Location		
Description		
Times of travelling and on-site		
Drawn record details		
Photographic record details		

APPENDIX III

Morgan Sindall Method Statement

West Shore Pumping Station, Llandudno

Short Sea Outfall Survey and Repairs

Methodology for Carrying out and Completing – Jetting, CCTV and Chain Flailing activities to the West Shore Pumping Station existing Short Sea Outfall

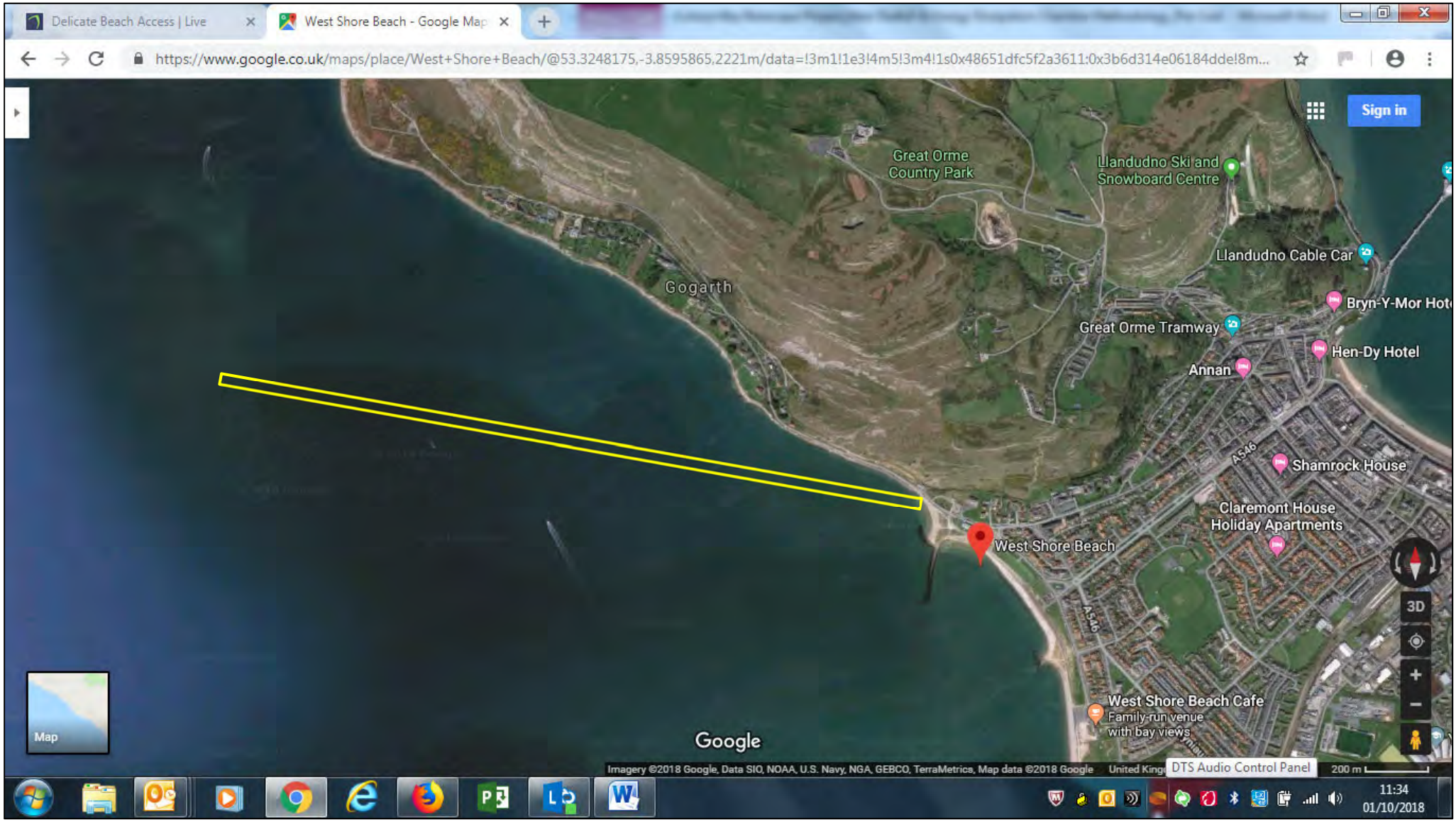
- Access Arrangements
- Jetting, CCTV and Chain Flailing
- General Working Arrangements

Access Arrangements

- A temporary roadway access system is required to enable the necessary items of plant and machinery required to survey and make the required repairs to the existing Short Sea Outfall associated with the West Shore Pumping Station.
- It is proposed to install and utilise a system of Trackway temporary aluminium road system similar that in the photographs below to access across the beach and alongside the Short Sea Outfall.

- The aluminium Trackway system is laid out ahead by a small excavator or lorry mounted crane working systematically out from already ‘as-laid’ panels until a roadway system has been established.
- Resistance from tidal forces will be achieved by siting heavy kentledge concrete blocks onto the Trackway surface to weigh it down between tides. Numbers and spacings of the concrete kentledge blocks will be indicated by a temporary works design carried out in advance of the works.
- The Trackway access road system will be laid down from the existing promenade surfacing, through the dunes and onto the upper beach level all as depicted in the screenshots and photographs below.
- An ecologist will have pre-attended site to establish any existing ecological and environmental constraints that will need to be addressed by the site team during Trackway installation – this may involve a watching brief or similar supervision as may be determined and advised.
- All plant and equipment necessary for the jetting, CCTV and chain flailing operation will only access the works by the Trackway and will remain on the aluminium surface throughout utilising key passing places that will be provided along the length of the temporary roadway.
- Working hours will be determined by the tide timetable and all mobile plant, tools, equipment and any materials required will be removed at the end of each shift.
- On completion of the works, which is anticipated to take up to 3 weeks, the temporary Trackway aluminium roadway system and all concrete kentledge blocks will be removed from site.
- Removal is the opposite process of installation and will be carried out in the reverse direction from the end of the short sea outfall back towards the shoreline and upper beach level.
- Installation and removal of the Trackway temporary aluminium roadway system is anticipated to take 3 days for each process, so 6 days in all to complete installation and removal.
- The works are planned to take place early in the Spring of 2019

Trackway Installation onto the Upper Beach Level



Trackway Installation from the Upper Beach Level to the end of the Short Sea Outfall

Approximate depiction of Trackway Route from the Upper Beach Level to the end of the Short Sea Outfall – Approximately 2000 metres

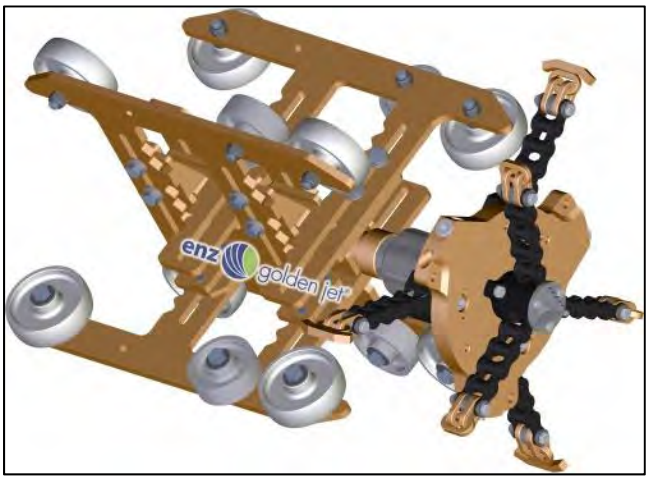
Jetting, CCTV & Chain Flailing Operations

- On completion of the installation of the Trackway temporary roadway system as depicted and described above, the survey and cleansing operations can begin.
- A mobile lorry mounted jetting unit will be deployed to jet and flush the existing short sea outfall at pre-determined access points approximately 400m apart

- Utilising and re-cycling sea water, the jetting unit using high pressure heads will systematically jet clean each 400m length by flushing and vacuuming the inside of the existing short sea outfall pipe. The sands retrieved from the pipe line will be deposited next to the trackway onto the existing shore such that the incoming tide will sufficiently spread and disperse the material.
- CCTV cameras, similar to the pictures below, will then be introduced into the pipeline at the pre-determined access points to record and capture images of the inside wall of the pipeline for technical analysis and designer recommendations.

- A site van, similar to the one pictured below, will be utilised by the site team to transport the CCTV camera imaging equipment and the data recording apparatus.

- The existing short sea outfall pipeline is known to be heavily encrusted with barnacles which is in turn reducing the functionality of the pipeline and reducing the optimum flow rates able to be achieved. It is suspected that chain flailing will be required to remove and scour clean the inside diameter of the pipeline.
- Based on the images captured and the designer recommendations, all or parts of the existing short sea outfall will require chain flailing to remove the build-up on the inside wall of the pipeline to achieve a smooth hydraulically efficient bore.
- Using the same lorry mounted jetting unit pictured above, a specialist chain flail head will be attached to the jetting hose, similar to the ones depicted below, which will travel along each 400m section of pipeline scouring clean the inside wall of the pipeline.



- The debris will be jetted backwards to the insertion point where a vacuum pipe will suck up the material for disposal to a licensed tip off site.

Camera Insertion Points

- Along the existing short sea outfall there have, in the past, been holes cut in the crown of the pipeline which will (a) possibly be enlarged for camera/jetting head insertion and/or (b) be repaired on completion whether used for camera insertion or not.
- The photos below are an example of such holes which, if fall at the desired 400m interval, will be enlarged and utilised for camera insertion – if these pre-existing holes do not fall at the desired spacing they will be ignored and repaired as part of the short sea outfall rehabilitation exercise.

- Holes will be required at 400m intervals and will be opened up as new or existing holes enlarged depending on the distances currently insitu.
- Whether enlarging the existing holes or cutting new holes, the process will be the same. A portable 'cut off' Stihl saw or similar will be used to cut a hole in the crown of the pipe approximately 600mm long and half the diameter of the pipe. The section of pipe will be transported along the Trackway for disposal to tip off site.

- Upon completion of the jetting and cleaning works each access hole will be required using a pre-made stainless steel clamp, similar to the one depicted below.

- The stainless steel clamps will be pre-made off site and delivered to the required location along the existing pipeline utilising the temporary Trackway roadway system.
- A small hole may need to be excavated beneath the Short Sea Outfall pipeline to facilitate all round access for the fitting of the stainless steel repair clamp. As required, excavations beneath the pipeline will be carried out by an 8t or 13t 360 degree rubber tracked or wheeled backacter and the sand arisings will be side cast and deposited onto the existing shore such that the incoming tide will sufficiently spread and disperse the material.
- The outside diameter of the pipe will be pressure washed clean to remove any corrosion, encrustations and seaweed prior to fitting of the repair clamps.
- The clamp will be positioned and fitted by two men utilising hand tools only.
- One camera insertion point, the first one, is at a position meaning that it is currently under sand in the upper beach area and will require a sheeted pit in order to safely provide access for the camera, jetting heads and the repair clamp to be fitted.
- The sheeted pit and installation method are as described and pictured below.

- The sheeted pit will be provided using lightweight trench sheets and hydraulic manhole braces similar to the depiction below.
- The sheeted pit will be constructed using traditional dig and push installation techniques

- The sheeted pit will be constructed using an 8t or 13t 360 degree rubber tracked or wheeled backacter working from the Trackway temporary roadway or on the shoreline of the upper beach level.

- The sand excavated will be loaded directly into a 6t dumper and taken to a higher level for re-use once the jetting, CCTV and repair clamp have been completed. Any other sand excavated during the works would be reinstated at the end of each working shift to reduce damage to the inter-tidal habitats.
- The component parts of the sheeted pit will be disassembled and removed from site on the temporary roadway.
- The sand will be brought back from storage and used to backfill the first access point excavation.

General Working Arrangements

i) Vehicle parking for workers and visitors will be in a designated area within the site compound area

ii) Deliveries and offloading of materials will take place off Abbey Road and from within the limits of a fully fenced working area on the existing promenade, with minimal quantities of fuels, materials etc. taken onto the foreshore.

iii) Re-fuelling of equipment will not take place on the beach.

iv) There will be a sufficient secure storage area for plant and materials at the place of work – minimising plant and traffic movements on open public highway

v) While the public will be excluded from the vicinity of the work area, we have a duty of care towards the health and wellbeing of our own employees, and as such we will use dust suppression techniques during the construction activities in accordance with the site-specific mitigation measures for sites according to the Institute of Air Quality Management (IAQM) guidance[1]. The following measures from the IAQM guidance are relevant:

- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas;
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;

vi) We are working towards a target of Zero to Landfill, and over the last year achieving a recycling rate of over 99% meaning that around 0.8% of the waste we produced went to landfill. We will work with recycling centres in the area to ensure that any arisings as a consequence of our construction works are able to be safely stored and transferred for subsequent sorting and processing for re-use.

[1] Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf

vii) Public use of the beach will remain possible but we will take steps to exclude all members of the public from our working areas by means of pedestrian barriers and/or 2m high security 'Heras' type fencing.

In addition to the above, we will follow the best practices described below during the construction period:

- all works machinery, equipment and PPE will be in a good clean, serviceable condition and will be inspected at the start of each shift
- The works will be carried out in accordance with the principles described in PPG5 & PPG6
- Works are programmed to be carried out outside the bathing water season
- Use of silt run off prevention measures [bales/sand bags/silt netting]
- Waste management plan & documenting & traceability of waste & recycling utilising registered carriers & receivers
- Use of materials suitable for marine environment, & timing of works to suit tidal times and movements
- Secure bunded storage of fuels, oils and chemicals in accordance with The Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016
- The storage and use of hazardous chemicals would be in accordance with the Control of Substances Hazardous to Health (COSHH) Regulations (1998).
- Emergency Spill Response plan will be in place, including an un-announced emergency drill.
- A pre-construction survey will be undertaken of all areas within construction footprint to identify the location of any invasive species (including marine algae and fauna). An Invasive Species Management Plan for preventing the spread of any invasive species will be produced and included within the final method statement. Implementation of these requirements should be undertaken through site set up and provision of Toolbox Talks for all personnel prior to works commencing. Guidance on the control of invasive species[2] [3] would also be followed if any invasive species identified during the pre-construction survey are likely to be affected by the construction.

[2] Natural England, Department for Environment, Food & Rural Affairs (Defra) and Environment Agency (2014) How to identify, control and dispose of plants that can harm livestock and the environment.
[3] Global Invasive Species Database (2005) Species profile: *Sargassum muticum* http://www.iucngisd.org/gisd/species.php?sc=727 [Accessed 8th October 2018]

Gwynedd Archaeological Trust
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