Transect 2

1080p Video Rname	Combined Video Name	Video Length (combi)	Video Quality (combi)	Transect	Date	Designated Biotope	EUNIS Biotope	Start Time (24hr)	End Time (24hr)	Start Video Run Time	End Video Run Time	Still extraction	Start Depth (m)	End Depth (m)	Substrate Type	Fauna Present	Key Algae Present		Notes
Transect_2_1080p_Only	Transect_2_Combined_Video	11:13:00	Good-Poor	T2	02/12/2019	Infralittoral muddy sand (SS.Ssa.IMuSa) (Level 4)	A5.23	12:30:47	12:33:20	01:44	06:51	04:00	10.3	10.1	Sand	Gobidae (Frequent), *Callionymus lyra* (Occasional), *Ascidella aspersa* (Frequent), burrows in the sand, Liocarcinus depurator (Occasional)	*Fucus* sp., *Halidrys siliquosa, diatom film*	Low	Scars in the sediment surface - possibly from anchors. Cerastoderma shells & unattached/dead algae.
Transect_2_1080p_Only	Transect_2_Combined_Video	11:13:00	Good-Poor	T2	02/12/2019	Infralittoral muddy sand (SS.Ssa.IMuSa) (Level 4) & litter patch	A5.23 & litter	12:33:20	12:33:35	06:51	07:20	07:05	10.1	9.7	Sand	*Ascidella aspersa* (Occasional), Gobidae (Frequent)	*Fucus serratus, Saccharina latissima*	Low	Encusted bottles (Spirobranchus, Cirripedia) and lots of litter at 06:51 - plastic & glass. No boulders or bedrock visible but increase in large algae.
Transect_2_1080p_Only	Transect_2_Combined_Video	11:13:00	Good-Poor	T2	02/12/2019	Infralittoral muddy sand (SS.Ssa.IMuSa) (Level 4)	A5.23	12:33:35	12:33:53	07:20	07:57	07:35	9.7	7.8	Sand	*Ascidella aspersa* (Abundant), Gobidae (Frequent), burrows in the sand	*Saccharina latissima, Fucus* serratus, *Halirys siliquosa*	Low	*Ascidella aspersa* v. dense patches
Transect_2_1080p_Only	Transect_2_Combined_Video	11:13:00	Good-Poor	T2	02/12/2019	Infralittoral mixed sediment (SS.SMx.Imx) (Level 4)	A5.43	12:33:53	12:34:12	07:57	08:33	08:10	7.8	5	Sand, pebbles, bedrock	*Ascidella aspersa* (Frequent)	*Saccharina latissima, Chondrus crispus, Ulva* sp., *Fucus serratus* , Corallinaceae crusts, indet. rhodophyta	Low	Graduallyincreasing grain size and amount of foliose red algae
Transect_2_1080p_Only	Transect_2_Combined_Video	11:13:00	Good-Poor	T2	02/12/2019	Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR) (Level 3)	A3.123	12:34:12	12:34:46	08:33	09:43	09:00	5	2.6	Sand, gravel, boulders	*Homarus gammarus* (Occasional), Spirobranchus (Frequent), Porifera (Occasional), Spiorbidae (Occasional)	*Saccharina latissima, Laminaria* sp., *Chondrus crispus,* Corallinaceae crusts, foliose rhodophyta, *Fucus serratus,Halidrys siliquosa,*	Low	Lots of particulates in the water column, Laminaria in bad winter condition so unable to ID to species.
Transect_2_1080p_Only	Transect_2_Combined_Video	11:13:00	Good-Poor	T2	02/12/2019	Fucus serratus and red seaweeds on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser.R) (Level 6)	A1.2141	12:34:46	12:35:14	09:43	10:39	10:10	2.6	2.1	Boulders, bedrock	Spiorbidae (Common), Gobidae (Occasional) Cirripedia (Occasional), *Steromphala cineraria* (Occasional), *Littorina obtusata* (Occasional), encrusting bryozoa (Occasional)	*Fucus serratus, Laminaria* sp. *Ulva* sp., *Corallinaceae crusts,*	Low	
Transect_2_1080p_Only	Transect_2_Combined_Video	11:13:00	Good-Poor	T2	02/12/2019	Breakwater fouling community		12:35:14	12:35:26	10:39	11:03	10:50	2.1	1.4	Artificial structure (rock)	*Patella vulgata* (Common), Cirripedia (Abundant), Porifera (Occasional)	Green algal film on structure	Low	

Transect 3

1080p Video Rname	Combined Video Name	Video Length (combi)	Video Quality (combi)	Transect	Date	Designated Biotope	EUNIS Biotope	Start Time (24hr)	End Time (24hr)	Start Video Run Time	End Video Run Time	Still extraction	Start Depth (m)	End Depth (m)	Substrate Type	Fauna Present	Key Algae Present	Energy (high, med, low)	Notes
Transect_3_1080p_Only	Transect_3_Combined_Videos	9:30:00	Good-Poor	T3	02/12/2019	Infralittoral muddy sand (SS.Ssa.IMuSa) (Level 4)	A5.23	12:43:00	12:46:00	00:20	05:38	03:30	13.5	12.3	Sand	*Callionymus lyra* (Common), Gobidae (occasional), gastropoda (Rare), *Ascidella aspersa* (Frequent), *Ophiuroidea* (Rare) Sertulariidae (Rare), *Liocarcinus depurator* (Occasional), burrows	*Halidrys siliquosa, Saccharina latissima, Fucus serratus, Chondrus crispus*	Low	Litter (plastic bag) @ 04:13. Hard to take biotope ID further because we can't verify benthic fauna such as amphipod communities. C. lyra very abundant - moreso than at T1 & T2.
Transect_3_1080p_Only	Transect_3_Combined_Videos	9:30:00	Good-Poor	T3	02/12/2019	Infralittoral mixed sediment (SS.SMx.Imx) (Level 4)	A5.43	12:46:00	12:46:43	05:38	07:04	06:30	12.3	4.9	Sand, gravel, pebbles	*Ascidella aspersa* (Abundant), Spiorbranchus (Occasional), *Calliionymus lyra* (Frequent), Sertulariidae (Occasional)	Saccharina latissima, Fucus serratus, Chondrus crispus, Ulva sp.,	Low	*A. aspersa* very abundant.
Transect_3_1080p_Only	Transect_3_Combined_Videos	9:30:00	Good-Poor	T3	02/12/2019	Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR) (Level 3)	A3.123	12:46:43	12:47:32	07:04	08:45	08:00	4.9	2.8	Boulders, bedrock, gravel;	Serulariidae (Occasional), Spiorbidae (Frequent), Labridae (juv.) (Frequent), Porifera (Rare), Spirobrancus sp. (Frequent), *Scyliorhinus canicular* (Frequent)	Saccharina latissima, Laminaria sp., Fucus serratus, Chondrus crispus, Ulva sp., indet. foliose rhodophyta (possibly Cryptopleura), Corallinaceae crusts	Low	Fishing line present
Transect_3_1080p_Only	Transect_3_Combined_Videos	9:30:00	Good-Poor	T3	02/12/2019	Breakwater fouling community	Breakwater	12:47:32	12:47:47	08:45	09:15	09:00	2.8	0.4	Artificial structure (rock)	*Patella vulgata* (Common), Cirripedia Abundant), Porifera (orange encrusting) (Rare)	*Green algal film*	Low	Really hard to make out sponge - possibly just rock colouring or rust?

Transect 4

1080p Video Name	Combined Video Name	Video Length (combi)	Video Quality (combi)	Transect	Date	Designated Biotope	EUNIS Biotope	Start Time (24hr)	End Time (24hr)	Start Video Run Time	End Video Run Time	Still extraction	Start Depth (m)	End Depth (m)	Substrate Type	Fauna Present	Key Algae Present	Energy (high, med, low)	Notes	
Transect_4_1080p_Only_2_Parts	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	*Virgularia mirabilis* and *Ophiura* spp. with *Pecten maximu* s on circalittoral sandy or shelly mud (SS.Smu.CSaMu.VirOphPmax) (Level 5)	A5.354	12:56:50	13:00:17	00:50	07:44	02:11	13.7	13.7	Sand	*Ophiuroidea* (Frequent), Gobiidae (Frequent), Calliostoma lyra (Occasional) burrows, *Virgularia mirabilis* (Frequent), *Ascidella aspersa* (Frequent), *Maja squinado* (12:59:02 1080) (Occasional)	Indet branched rhodophyta	Low	Camera very close to the seabed! No P. maximus.	
Transect_4_1080p_Only_2_Parts	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	Infralittoral muddy sand (SS.Ssa.IMuSa) (Level 4)	A5.23	13:00:17	13:01:20	07:44	09:50	08:20	13.7	9.4	Sand	*Ascidella aspersa* (Common)	*Laminaria sp., Chondrus crispus, Saccharina latissima, Ulva sp., Fucus serratus, indet. Rhodophyta*	Low	Litter & dead crab toward end of section	
Transect_4_1080p_Only_2_Parts	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	Infralittoral mixed sediment (SS.SMx.Imx) (Level 4)	A5.43	13:01:20	13:01:49	09:50	10:48	10:15	9.4	5.6	Sand, gravel	*Ascidella aspersa* (Common)	*Fucus serratus, Chondrus crispus,*	Low		
Transect_4_1080p_Only_2_Parts	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR) (Level 3)	A3.123	13:01:49	13:01:59	10:48	11:09	10:55	5.6	5.2	Boulders, gravle, sand	Hydrozoa (Common), Steromphala sp. (Rare), Gobidae (Occasional)	*Fucus serratus, Chondrus crispus, Ulva* sp., *Laminaria* sp., corallinacea crusts.	Low	Or biotope Mixed Laminaria hyperborea and Laminaria saccharina on sheltered infralittoral rock? (IR.LIR.K.LhypLsac)	Camera surfaced between these two so probably some overlap i.e. the latter part of the mixed section was covered twice
Transect_4_1080p_Only_2_Parts	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	Infralittoral mixed sediment (SS.SMx.Imx) (Level 4)	A5.43	13:13:57	13:14:54	12:34	14:27	13:25	10.3	5.3	Sand, gravel	Ascidella aspersa (Common), Gobiidae (Frequent), Spiorbiidae (Common), Sertulariidae (Frequent)	Halidrys siliquosa, Chondrus crispus, Fucus serratus	Low	Camera very close to the seabed!	
Transect_4_1080p_Only_2_Parts	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR) (Level 3)	A3.123	13:14:54	13:15:19	14:27	15:18	14:50	5.3	3.2	Sand, gravel, boulders	Ascidella aspersa (Frequent), Spiorbiidae (Common), Sertulariidae (Frequent), Porifera (orange encrusting) (Occasional), Ascidea mentula, (Occasional), Spirobranchus sp. (Common)	Halidrys siliquosa, Chondrus crispus, Fucus serratus, Dictoya dichotoma, Cryptopleura ramosa, corallinacea crusts, laminaria sp., Saccharina latissima, Rhodophyllis divaricata	Low		
Transect_4_1080p_Only_2_Parts	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	Fucus serratus and red seaweeds on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser.R) (Level 6)	A1.2141	13:15:19	13:15:29	15:18	15:38	15:25	3.2	2.8	Boulders, bedrock	Spiorbiidae (Common), Hydrozoa (Rare)	Fucus serratus, Osmundea pinnatifida, Laminaria sp., Chondrus crispus	Low	For a short diostance approaching the breakwater	
	Transect_4_Combined_Videos_2_Parts	15:59	Good-Poor	T4	02/12/2019	Breakwater fouling community		13:15:29	16:15:38	15:38	15:56	15:45	2.8	0.3	Artificial structure (rock)	*Patella vulgata* (Common), Cirripedia (Abundant)	Rhodophyta film	Low	1080 video is very reduced in screen size	

Transect 5

1080p Video Name	Combined Video Name	Video Length (combi)	Video Quality (combi)	Transect	Date	Designated Biotope	EUNIS Biotope	Start Time (24hr)	End Time (24hr)	Start Video Run Time	End Video Run Time	Still extraction	Start Depth (m)	End Depth (m)	Substrate Type	Fauna Present	Key Algae Present	Energy (high, med, low)	Notes
Transect_5_1080p_Only	Transect_5_Combined_Videos	06:00	Good-Poor	T5	02/12/2019	Virgularia mirabilis and Ophiura spp. with Pecten maximus on circalittoral sandy or shelly mud (SS.Smu.CSaMu.VirOphPmax) (Level 5)	A5.354	13:24:32	13:26:30	00:22	04:17	02:10	12.3	8.6	Muddy sand	*Acidella aspersa* (Abundant), *Virgularia mirabilis* (Frequent), Gobiidae (Common), burrows, *Callionymus lyra* (Frequent), Ophiuroidea (Common), Brachyura (Occasional), *Cerianthus lloydii* (Occasional)	Saccharina latissima (possibly unattached), Fucus serratus, Chondrus cripsus, Cryptopleura ramosa, Halidrys siliquosa	Low	No P. maximus.
Transect_5_1080p_Only	Transect_5_Combined_Videos	06:00	Good-Poor	T5	02/12/2019	Infralittoral mixed sediment (SS.SMx.Imx) (Level 4)	A5.43	13:26:30	13:26:39	04:17	04:35	04:25	8.6	5.9	Sand, gravel	*Acidella aspersa* (Common), gastropoda (Rare)	*Cryptopleura ramosa, Saccharina latissima*	Low	
Transect_5_1080p_Only	Transect_5_Combined_Videos	06:00	Poor	T5	02/12/2019	Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR) (Level 3)	A3.123	13:26:39	13:26:55	04:35	05:08	04:55	5.9	3.1	Boulders, bedrock, gravel	Spiorbiidae (Frequent), Hydrozoa (Occasional)	Saccharina latissima, corallinacea crust, indet. foliose rhodophyta, indet forked rhodophyta, Laminaria sp., Ulva sp., Fucus serratus	Low	Poor quality - high susp. sed.
Transect_5_1080p_Only	Transect_5_Combined_Videos	06:00	Poor	T5	02/12/2019	Fucus serratus and red seaweeds on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser.R) (Level 6)	A1.2141	13:26:55	13:27:08	05:08	05:33	05:15	3.1	2.4	Boulders, bedrock	Spiorbiidae (Abundant), Hydrozoa (Frequent)	Fucus serratus, Laminaria sp., idet. Rhodophyta	Low	
Transect_5_1080p_Only	Transect_5_Combined_Videos	06:00	Good-Poor	T5	02/12/2019	Breakwater fouling community		16:27:08	13:27:19	05:33	05:55	05:45	2.4	0.3	Artificial structure (rock)	*Patella vulgata* (Common), Cirripedia (Abundant), *Halichondria panicea* (Frequent)	Corallinacea crust	Low	

Transect 6

1080p Video Name	Combined Video Name	Video Length (combi)	Video Quality (combi)	Transect	Date	Designated Biotope	EUNIS Biotope	Start Time (24hr)	End Time (24hr)	Start Video Run Time	End Video Run Time	Still extraction	Start Depth (m)	End Depth (m)	Substrate Type	Fauna Present	Key Algae Present	Energy (high, med, low)	Notes
Transect_6_1080p_Only	Transect_6_Combined_Videos	09:21	Poor	T6	02/12/2019	Virgularia mirabilis and Ophiura spp. with Pecten maximus on circalittoral sandy or shelly mud (SS.Smu.CSaMu.VirOphPmax) (Level 5)	A5.354	13:37:05	13:39:51	00:34	06:06	03:10	11.7	8.7	Muddy sand	Virgularia mirabilis (Frequent), Gobiidae (Frequent), Callionymus lyra (Frequent), burrows, Liocarcinus (Occasional), Ophiuroidea (Occasional), Paguridae (Occasional)	Fucus serratus , Laminaria spp., indet Rhodophyta on cobble	Low	Patch of dense Fucus serratus , Laminaria spp. @ 04:28 for 5 secs (53.325654, -4.6262910, 12.2m depth). Some similarities to Seapens and burrowing megafauna in circalittoral fine mud. No *P. maximus* .
Transect_6_1080p_Only	Transect_6_Combined_Videos	09:21	Good-Poor	T6	02/12/2019	Infralittoral mixed sediment (SS.SMx.Imx) (Level 4)	A5.43	13:39:51	13:40:19	06:06	07:03	06:30	8.7	5.5	Mixed gravel & sand	Spirobranchus (Occasional), Hydrozoa (Occasional), Spiorbidae (Occasional)	Saccharina latissima, indet. Rhodophyta, Corallinacea crusts		
Transect_6_1080p_Only	Transect_6_Combined_Videos	09:21	Good-Poor	T6	02/12/2019	Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR) (Level 3)	A3.123	13:40:19	13:40:38	07:03	07:40	07:30	5.5	3.9	Sand, cobbles, boulders & bedrock	Acidella aspersa (Common), Spirobranchus (Common), Spiorbidae (Frequent), Sertulariidae (Frequent), Caridea (Occasional)	Saccharina latissima, indet. fan-shaped rhodophyta, Ulva sp., corallinacea crusts, indet. foliose rhodophyta, Chondrus crispus, Polyides rotunda	Low	Sertulariidae epiphytic on S. latissima. Piece of rope running across transect. Mixed with some infralittoral mixed seddiment
Transect_6_1080p_Only	Transect_6_Combined_Videos	09:21	Good-Poor	T6	02/12/2019	Laminaria digitata on moderately exposed sublittoral fringe rock (IR.MIR.KR.Ldig) (Level 5)	A3.211	13:40:38	13:40:46	07:40	07:56	07:50	3.9	3.3	Boulders & bedrock	Bryozoa (encrusting) (Occasional), Sertulariidae (Frequent)	Laminaria digitata, indet. Rhodophyta, Fucus serratus, indet. Fan-shaped rhodophyta	Low	L. digitata takes over from S. latissima as dominant here
Transect_6_1080p_Only	Transect_6_Combined_Videos	09:21	Good	T6	02/12/2019	Fucus serratus and red seaweeds on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser.R) (Level 6)	A1.2141	13:40:46	13:41:05	07:56	08:34	08:10	3.3	2.5	Boulders & bedrock	Spiorbidae (Common), Cirripedia (Occasional), encrusting bryozoa, hydrozoa,	Fucus serratus, indet. Fan-shaped rhydophota, corallinacea crusts, Palmaria palmata, Mastocarpus stellatus, Polyides rotunda	Low	Biotope present in the short approach to the breakwater wall
Transect_6_1080p_Only	Transect_6_Combined_Videos	09:21	Good	T6	02/12/2019	Breakwater fouling community	-	13:41:05	13:41:23	08:34	09:11	09:05	2.5	0.3	Artificial structure (rock)	Patella vulgata (Frequent), Cirripedia (Abundant), Hydrozoa (Occasional)	Corallinacea crust, Coarallina sp., Ulva sp., Fucus serratus, Palmaria palmata	Low	

Transect 7

1080p Video Name	Combined Video Name	Video Length (combi)	Video Quality (combi)	Transect	Date	Designated Biotope	Designated Biotope	Start Time (24hr)	End Time (24hr)	Start Video Run Time	End Video Run Time	Still extraction	Start Depth (m)	End Depth (m)	Substrate Type	Fauna Present	Key Algae Present	Energy (high, med, low)	Notes
Transect_7_1080p_Only	Transect_7_Combined_Videos	13:42	Good-Poor	T7	02/12/2019	*Virgularia mirabilis* and *Ophiura* spp. with *Pecten maximus* on circalittoral sandy or shelly mud (SS.Smu.CSaMu.VirOphPmax) (Level 5)	A5.354	13:51:17	13:56:49	00:01	11:06	04:58	11.8	8.7	Muddy sand	Virgularia mirabilis (Frequent), Ophiuroidea (Abundant), Ophiura spp. (Abundant) Gobiidae (Rare), Abra sp., (Occasional), numerous burrows, Phaxas pellucidus, Lagis tubes, stalked sponge (Rare),	Unattached rhodophyta, flat elongated ribbons of rhodophyta no veins, Halidrys siliquosa, Laminaria spp.	Low	Some stretches of video very poor. Some similarities to Seapens and burrowing megafauna in circalittoral fine mud. No *P. maximus* . Patch of algae and bedrock 53.3282348, -4.625093 @ 09:02 - 13:55:47
Transect_7_1080p_Only	Transect_7_Combined_Videos	13:42	Good-Poor	T7	02/12/2019	Infralittoral mixed sediment (SS.SMx.IMx) (Level 3)	A5.43	13:56:49	13:57:10	11:06	11:48	11:25	8.7	6.4	Sand, mud & gravel	Spirobranchus sp. (Frequent), Ascidella aspersa (Rare), Actiniaria (Frequent)	Indet. Wirey forked rhodophyta, Ulva sp., Saccharina latissima, Corallinacea crust	Low	
Transect_7_1080p_Only	Transect_7_Combined_Videos	13:42	Good-Poor	T7	02/12/2019	*Laminaria saccharina* and red seaweeds on infralittoral sediments (SS.SMp.KSwSS.LsacR)	A3.123	13:57:10	13:57:45	11:48	12:58	12:30	6.4	3.6	Pebbles, gravel, boulders & bedrock	Spirobranchus sp. (Frequent), indet. Annelida tubes (Rare), encrusting bryozoa	Saccharina latissima, Rhodophyllis divaricata, Ulva sp., Chondrus crispus, Corallinacea crust, Meredithia microphylla (?), Laminaria digitata, Palmaria palmata	Low	
Transect_7_1080p_Only	Transect_7_Combined_Videos	13:42	Good-Poor	T7	02/12/2019	Breakwater fouling community	-	13:57:45	13:27:00	12:58	13:27	13:10	3.6	0.3	Artificial structure (rock)	Patella vulgata, encrusting Bryozoa, Cirripedia - visibilty too poor to make assessments	Chondrus crispus, Corallinacea crust, Palmaria palmata, Cryptopleura ramosa	Low	Visibility at wall v. poor, ascent v. quick

Transect 8

1080p Video Name	Combined Video Name	Video Length (combi)	Video Quality (combi)	Transect	Date	Designated Biotope	EUNIS Biotope	Start Time (24hr)	End Time (24hr)	Start Video Run Time	End Video Run Time	Still extraction	Start Depth (m)	End Depth (m)	Substrate Type	Fauna Present	Key Algae Present	Energy (high, med, low)	Notes
Transect_8_1080p_Only	Transect_8_Combined_ Videos	11:20	Good-Poor	T8	02/12/2019	*Cerianthus lloydii* and other burrowing anemones in circalittoral muddy mixed sediment (SS.SMx.CMx.ClloMx) (Level 5)	A5.441	15:27:29	15:28:19	01:33	03:15	02:20	20.3	19.5	Muddy sand and gravel	Ophiura albida (Common) , Abra shells (mostly dead) (Abundant), Lanice tubes (?), Callionymus lyra (Occasional), burrows, Cerianthus lloydii (Occasional), stalked sponge (Rare)	Only v. rare unattached	Low	Sparse fauna
Transect_8_1080p_Only	Transect_8_Combined_ Videos	11:20	Good-Poor	T8	02/12/2019	Shipwreck	N/A	15:28:19	15:28:29	03:15	03:33	03:20	19.5	19.4	N/A	-	-	Low	No fauna of algae, relatively fresh wreck?
Transect_8_1080p_Only	Transect_8_Combined_ Videos	11:20	Poor	T8	02/12/2019	Circalittoral mixed sediment (SS.SMx.CMx) (Level 4)	A5.44	15:28:29	15:30:34	03:33	07:45	05:30	19.4	10.1	Mud, sand, gravel, pebbles (well mixed in places)	Callionymus lyra (Common), Ascidella adspersa (Occasional), Urticina felina (Occasional), borrows & tubes	Laminaria sp.	Low	Lots of dead Abra shells. No visible C. lloydii (though tubes apparent) though other species (C. lyra, A. adspersa) and habitat fit the biotope well. Large patches of well sorted coarse sand and mud with gravel. Discarded fishing pot with encrusting community (indet.) (07:27, 15:30:25, 53.3304185 -4.6183697). Scares on the seafloor.
Transect_8_1080p_Only	Transect_8_Combined_ Videos	11:20	Poor	T8	02/12/2019	Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR) (Level 3)	A3.123	15:30:34	15:32:12	07:45	11:02	10:00	10.1	4.3	Boulders & bedrock	Membranipora membranacea (Frequent), Electra pilosa (Occasional), Spirobranchus sp. (Occasional), Steromphala cineraria (Occasional), Obelia sp. (Occasional)	Laminaria digitata, Branching indet. rhodophyta, Saccharina latissima, Corallinacea crusts, Dilsea carnosa, Palmaria palmata, possibly Phyllophora crispa (?)	Low	Doesn't quite reach wall at end of transect. Poor water quality, high SS load.

Appendix 2 – Faunal presence and absence matrix from ROV video footage analysis in 2019

Appendix 2. Presence/absence of fauna identified in 4k ROV footage in each biotope section along transects surveyed at Holyhead in 2019.

Taxon Name	T1 zone 1	T1 zone 2	T1 zone 3	T1 zone 4	T2 zone 1	T2 zone 2	T2 zone 3	T2 zone 4	T2 zone 5	T2 zone 6	T2 zone 7	T3 zone 1	T3 zone 2	T3 zone 3
PORIFERA (encrusting)	0	0	0	0	0	0	0	0	1	0	0	0	0	1
PORIFERA (stalked)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halichondria panicea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HYDROZOA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sertulariidae	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Obelia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virgularia mirabilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actiniaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerianthus lloydii	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urticina felina	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spironbranchus sp.	0	0	0	1	0	0	0	0	1	0	0	0	1	1
Spiorbidae	0	0	0	0	0	0	0	0	1	1	0	0	0	1
Cirripedia	0	0	0	1	0	0	0	0	0	1	1	0	0	0
Liocarcinus	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Liocarcinus depurator	1	0	0	0	1	0	0	0	0	0	0	1	0	0
Homarus gammarus	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Brachyura	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paguridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maja squinado	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caridea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Steromphala sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Steromphala cineraria	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Patella vulgata	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Littorina obtusata	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Abra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaxas pellucidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRYOZOA (encrusting)	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Membranipora membranacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electra pilosa	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Ophiuroidea	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Ophiura	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiura albida	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidella aspersa	1	1	0	0	1	1	1	1	0	0	0	1	1	0
Ascidea mentula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gobiidae	1	0	0	0	1	1	1	0	0	1	0	1	0	0
Callionymus lyra	0	0	0	0	1	0	0	0	0	0	0	1	1	0
Pleuronectiformes	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Labridae (juvenile)	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Scyliorhinus canicular	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Taxon Name	T3 zone 4	T4 zone 1	T4 zone 2	T4 zone 3	T4 zone 4	T4 zone 5	T4 zone 6	T4 zone 7	T4 zone 8	T5 zone 1	T5 zone 2	T5 zone 3	T5 zone 4	T5 zone 5
PORIFERA (encrusting)	1	0	0	0	0	0	1	0	0	0	0	0	0	0
PORIFERA (stalked)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halichondria panicea	0	0	0	0	0	0	0	0	0	0	0	0	0	1
HYDROZOA	0	0	0	0	1	0	0	1	0	0	0	1	1	0
Sertulariidae	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Obelia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virgularia mirabilis	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Actiniaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerianthus lloydii	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Urticina felina	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spironbranchus sp.	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Spiorbidae	0	0	0	0	0	1	1	1	0	0	0	1	1	0
Cirripedia	1	0	0	0	0	0	0	0	1	0	0	0	0	1
Liocarcinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liocarcinus depurator	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Homarus gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyura	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Paguridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maja squinado	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Caridea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Steromphala sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Steromphala cineraria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Patella vulgata	1	0	0	0	0	0	0	0	1	0	0	0	0	1
Littorina obtusata	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaxas pellucidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRYOZOA (encrusting)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Membranipora membranacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electra pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiuroidea	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Ophiura	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiura albida	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidella aspersa	0	1	1	1	0	1	1	0	0	1	1	0	0	0
Ascidea mentula	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Gobiidae	0	1	0	0	1	1	0	0	0	1	0	0	0	0
Callionymus lyra	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Pleuronectiformes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labridae (juvenile)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scyliorhinus canicular	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxon Name	T6 zone 1	T6 zone 2	T6 zone 3	T6 zone 4	T6 zone 5	T6 zone 6	T7 zone 1	T7 zone 2	T7 zone 3	T7 zone 4	T8 zone 1	T8 zone 2	T8 zone 3	T8 zone 4
PORIFERA (encrusting)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PORIFERA (stalked)	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Halichondria panicea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HYDROZOA	0	1	0	0	1	1	0	0	0	0	0	0	0	0
Sertulariidae	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Obelia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Virgularia mirabilis	1	0	0	0	0	0	1	0	0	0	0	0	0	0
Actiniaria	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Cerianthus lloydii	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Urticina felina	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Spironbranchus sp.	0	1	1	0	0	0	0	1	1	0	0	0	0	1
Spiorbidae	0	1	1	0	1	0	0	0	0	0	0	0	0	0
Cirripedia	0	0	0	0	1	1	0	0	0	1	0	0	0	0
Liocarcinus	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Liocarcinus depurator	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Homarus gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyura	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paguridae	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Maja squinado	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caridea	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Steromphala sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Steromphala cineraria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Patella vulgata	0	0	0	0	0	1	0	0	0	1	0	0	0	0
Littorina obtusata	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abra sp.	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Phaxas pellucidus	0	0	0	0	0	0	1	0	0	0	0	0	0	0
BRYOZOA (encrusting)	0	0	0	1	1	0	0	0	1	1	0	0	0	0
Membranipora membranacea	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Electra pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ophiuroidea	1	0	0	0	0	0	1	0	0	0	0	0	0	0
Ophiura	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ophiura albida	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Ascidella aspersa	0	0	1	0	0	0	0	1	0	0	0	0	1	0
Ascidea mentula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gobiidae	1	0	0	0	0	0	1	0	0	0	0	0	0	0
Callionymus lyra	1	0	0	0	0	0	0	0	0	0	1	0	1	0
Pleuronectiformes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labridae (juvenile)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scyliorhinus canicular	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 3 – Faunal SACFOR abundance matrix from ROV stills analysis undertaken in 2019

Appendix 3. SACFOR abundance of fauna and algae identified in stills extracted from 4k ROV footage at Holyhead in 2019.
S = Superabundant, A = Abundant, C = Common, F = Frequent, O = Occastional, R = Rare (as per JNCC & Turner *et al* ., 2016)

Taxon Name	T1 Zone 1 (A5.23)	T1 Zone 2 (A5.43)	T1 Zone 3 (A3.123)	T1 Zone 4 (Breakwater)	T2 Zone 1 (A5.23)	T2 Zone 2 (A5.23 & litter)	T2 Zone 3 (A5.23)	T2 Zone 4 (A5.43)	T2 Zone 5 (A3.123)	T2 zone 6 (A1.2141)
Fauna										
PORIFERA	-	-	-	-	-	-	-	-	-	-
HYDROZOA	-	-	-	-	-	-	-	-	R	R
ANTHOZOA	-	-	-	-	-	-	-	-	-	-
Spirobranchus sp.	-	-	-	C	-	-	-	F	-	-
Spiorbidae	-	-	-	-	-	-	-	-	F	F
Cirripedia	-	-	-	A	-	-	-	-	-	-
Caridea	-	-	-	-	-	-	-	-	-	-
Patella vulgata	-	-	-	F	-	-	-	-	-	-
Steromphala sp.	-	-	-	-	-	-	-	-	-	-
BRYOZOA	-	-	-	-	-	-	-	-	O	-
Membranipora membranacea	-	-	-	-	-	-	-	-	-	-
Bugula sp.	-	-	-	-	-	-	-	-	-	-
Ophiura albida	-	-	-	-	-	-	-	-	-	-
Ascidella aspersa	-	-	-	-	-	-	C	O	-	-
Virgularia mirabilis	-	-	-	-	-	-	-	-	-	-
Gobiidae	-	-	-	-	-	-	-	-	-	-
Algae										
Sedimented turf	-	-	-	-	-	-	-	-	-	-
Diatom film	C	-	-	-	-	-	-	-	-	-
Fucus serratus	-	-	-	-	-	O	-	-	-	A
Saccharina latissima	-	-	C	-	-	R	C	-	A	-
Laminaria digitata	-	-	-	-	-	-	-	-	-	O
Filamentous brown	-	-	-	-	-	-	-	-	-	O
Coarallina crust	-	-	-	F	-	-	-	-	-	-
Palmaria palmata	-	-	-	-	-	-	-	-	-	-
Dasysiphonia japonica	-	-	-	-	-	-	-	-	-	-
Foliose rhodophyta	-	-	-	F	-	O	-	O	-	-
Fan-forming rhodophyta	-	-	-	-	-	-	-	-	-	F
Ulva sp.	-	-	-	-	-	-	-	-	-	O

Taxon Name	T2 zone 7 (breakwater)	T3 zone 1 (A5.23)	T3 zone 2 (A5.43)	T3 zone 3 (A3.123)	T3 zone 4 (breakwater)	T4 zone 1 (A5.354)	T4 zone 2 (A5.23)	T4 zone 3 (A5.43)	T4 zone 4 (A3.123)	T4 zone 5 (A5.43)
Fauna										
PORIFERA	-	-	-	-	-	-	-	-	-	-
HYDROZOA	-	-	-	-	-	-	-	-	-	-
ANTHOZOA	-	-	-	-	-	-	O	-	-	-
Spirobranchus sp.	-	-	-	F	-	-	-	-	-	-
Spiorbidae	-	-	-	O	-	-	-	-	-	-
Cirripedia	A	-	-	-	A	-	-	-	-	-
Caridea	-	-	-	-	-	-	-	-	-	-
Patella vulgata	C	-	-	-	C	-	-	-	-	-
Steromphala sp.	-	-	-	-	-	-	-	-	-	-
BRYOZOA	-	-	-	-	-	-	-	-	-	-
Membranipora membranacea	-	-	-	-	-	-	-	-	-	-
Bugula sp.	-	-	-	-	-	-	-	-	-	-
Ophiura albida	-	-	-	-	-	-	-	-	-	-
Ascidella aspersa	-	-	C	-	-	-	-	C	-	-
Virgularia mirabilis	-	-	-	-	-	C	-	-	-	-
Gobiidae	-	-	-	-	-	-	-	-	-	-
Algae										
Sedimented turf	-	-	-	-	-	-	-	-	-	-
Diatom film	-	-	-	-	-	-	-	-	-	-
Fucus serratus	-	-	-	-	-	-	-	-	-	-
Saccharina latissima	-	-	-	C	-	-	-	-	C	-
Laminaria digitata	-	-	-	F	-	-	-	-	-	-
Filamentous brown	-	-	-	-	-	-	-	-	-	-
Coarallina crust	-	-	-	-	-	-	-	-	R	-
Palmaria palmata	-	-	-	-	-	-	-	-	-	-
Dasysiphonia japonica	-	-	-	-	-	-	-	-	A	-
Foliose rhodophyta	-	-	-	-	-	-	-	-	-	-
Fan-forming rhodophyta	-	-	-	-	-	-	-	-	R	-
Ulva sp.	-	-	-	-	-	-	-	-	-	-

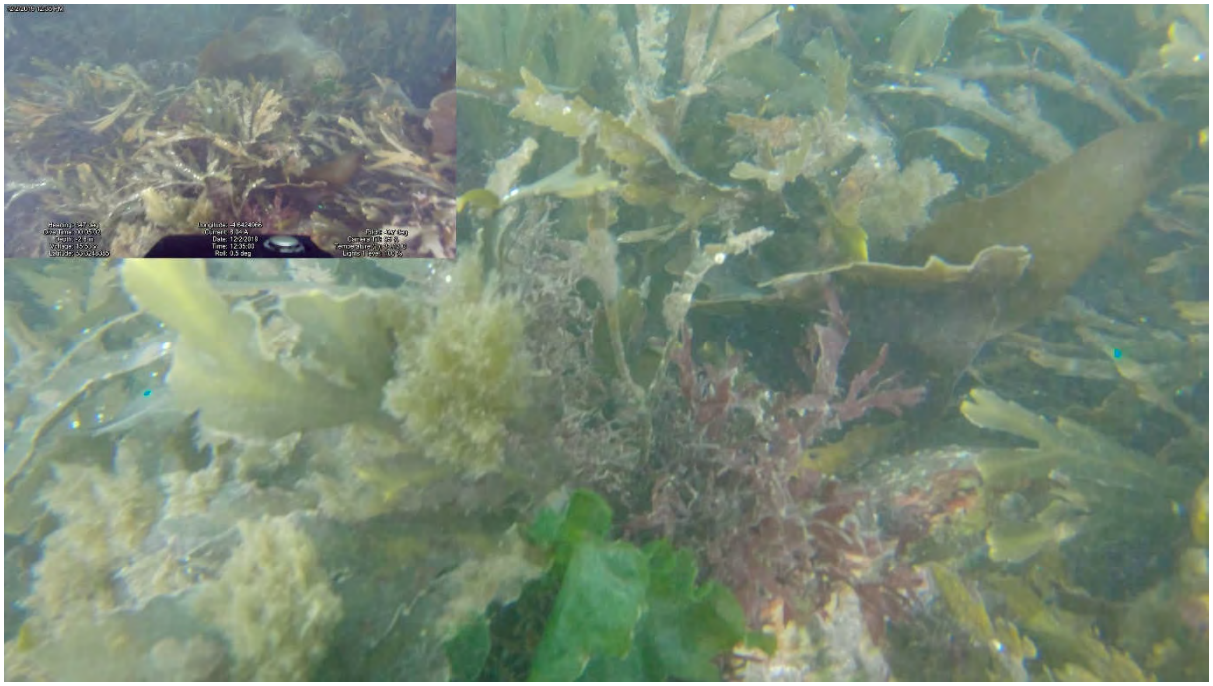
Taxon Name	T4 zone 6 (A3.123)	T4 zone 7 (A1.2141)	T4 zone 8 (breakwater)	T5 zone 1 (A5.354)	T5 zone 2 (A5.43)	T5 zone 3 (A3.123)	T5 zone 4 (A1.2141)	T5 zone 5 (breakwater)	T6 zone 1 (A5.354)	T6 zone 2 (A5.43)
Fauna										
PORIFERA	-	-	-	-	-	-	-	-	-	-
HYDROZOA	-	-	-	-	-	-	-	-	-	-
ANTHOZOA	O	-	-	-	-	-	-	-	-	-
Spirobranchus sp.	-	-	-	-	-	-	-	F	-	C
Spiorbidae	-	-	-	-	-	-	F	-	-	-
Cirripedia	-	-	S	-	-	-	-	S	-	-
Caridea	-	-	-	-	-	-	-	-	-	O
Patella vulgata	-	-	C	-	-	-	-	C	-	-
Steromphala sp.	-	-	-	-	-	-	-	-	-	-
BRYOZOA	O	-	-	-	-	-	-	-	-	O
Membranipora membranacea	-	-	-	-	-	-	-	-	-	-
Bugula sp.	-	-	-	-	-	-	-	-	-	O
Ophiura albida	-	-	-	-	-	-	-	-	-	-
Ascidella aspersa	-	-	-	-	-	-	-	-	-	O
Virgularia mirabilis	-	-	-	-	-	-	-	-	-	-
Gobiidae	-	-	-	-	-	-	-	-	-	O
Algae										
Sedimented turf	A	-	-	-	-	-	-	-	-	-
Diatom film	-	-	-	-	-	-	-	-	-	-
Fucus serratus	-	S	-	-	-	-	A	-	-	-
Saccharina latissima	-	-	-	-	-	-	-	-	-	-
Laminaria digitata	-	-	-	-	-	-	F	-	-	-
Filamentous brown	-	-	-	-	-	-	-	-	-	-
Coarallina crust	O	-	-	-	-	-	-	-	-	-
Palmaria palmata	-	-	-	-	-	-	-	-	-	F
Dasysiphonia japonica	-	-	-	-	-	-	-	-	-	-
Foliose rhodophyta	-	-	-	-	R	A	-	-	R	-
Fan-forming rhodophyta	R	O	-	-	-	-	O	-	-	-
Ulva sp.	-	-	-	-	-	-	-	-	-	O

Taxon Name	T6 zone 3 (A3.123)	T6 zone 4 (A3.211)	T6 zone 5 (A1.2141)	T6 zone 6 (breakwater)	T7 zone 1 (A5.354)	T7 zone 2 (A5.43)	T7 zone 3 (A3.123)	T7 zone 4 (breakwater)	T8 zone 1 (A5.441)	T8 zone 2 (wreck)
Fauna										
PORIFERA	-	-	-	-	-	-	-	-	-	-
HYDROZOA	-	-	-	-	-	-	-	-	-	-
ANTHOZOA	-	-	-	-	-	-	-	-	-	-
Spirobranchus sp.	F	-	-	-	-	-	-	-	-	-
Spiorbidae	-	F	F	-	-	-	-	-	-	-
Cirripedia	-	-	-	S	-	-	-	A	-	-
Caridea	-	-	-	-	-	-	-	-	-	-
Patella vulgata	-	-	-	C	-	-	-	C	-	-
Steromphala sp.	-	-	F	-	-	-	-	-	-	-
BRYOZOA	-	-	-	-	-	-	O	-	-	-
Membranipora membranacea	-	-	-	-	-	-	-	-	-	-
Bugula sp.	-	-	-	-	-	-	-	-	-	-
Ophiura albida	-	-	-	-	-	-	-	-	F	-
Ascidella aspersa	-	-	-	-	-	-	-	-	-	-
Virgularia mirabilis	-	-	-	-	C	-	-	-	-	-
Gobiidae	-	-	-	-	-	-	-	-	F	-
Algae										
Sedimented turf	-	-	-	-	-	-	-	-	-	-
Diatom film	-	-	-	-	-	-	-	-	-	-
Fucus serratus	-	R	S	-	-	-	-	-	-	-
Saccharina latissima	O	-	-	-	-	F	-	-	-	-
Laminaria digitata	-	S	-	-	-	-	O	O	-	-
Filamentous brown	-	-	-	-	-	-	-	-	-	-
Coarallina crust	-	-	-	-	-	-	O	-	-	-
Palmaria palmata	-	-	-	-	-	-	-	-	-	-
Dasysiphonia japonica	-	-	-	-	-	-	-	-	-	-
Foliose rhodophyta	O	-	-	-	-	-	O	O	-	-
Fan-forming rhodophyta	O	-	-	-	-	-	O	R	-	-
Ulva sp.	-	-	-	-	-	-	-	-	-	-

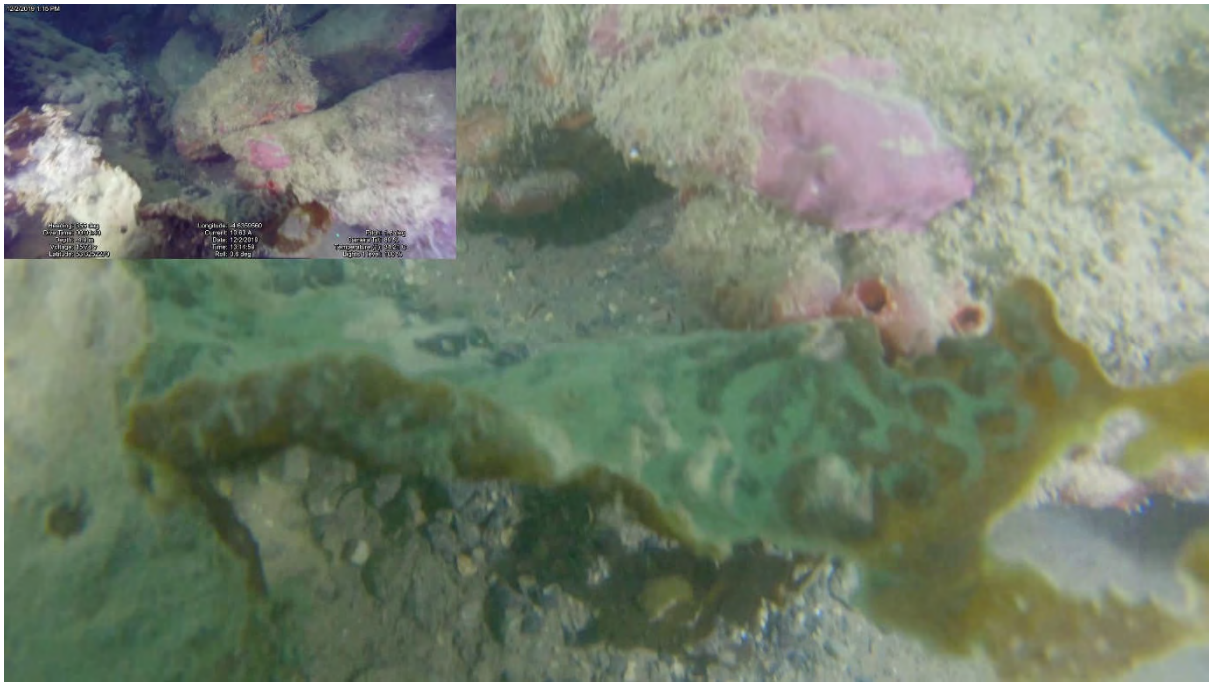
Taxon Name	T8 zone 3 (A5.44)	T8 zone 4 (A3.123)
Fauna		
PORIFERA	-	-
HYDROZOA	-	-
ANTHOZOA	-	-
Spirobranchus sp.	-	-
Spiorbidae	-	-
Cirripedia	-	-
Caridea	-	-
Patella vulgata	-	-
Steromphala sp.	-	-
BRYOZOA	-	-
Membranipora membranacea	-	C
Bugula sp.	-	-
Ophiura albida	-	-
Ascidella aspersa	-	-
Virgularia mirabilis	-	-
Gobiidae	-	-
Algae		
Sedimented turf	-	-
Diatom film	-	-
Fucus serratus	-	-
Saccharina latissima	-	-
Laminaria digitata	-	C
Filamentous brown	-	-
Coarallina crust	-	-
Palmaria palmata	-	-
Dasysiphonia japonica	-	-
Foliose rhodophyta	-	-
Fan-forming rhodophyta	-	-
Ulva sp.	-	-

Appendix Plate 1 – Example images of biotope types identified at Holyhead in 2019

Appendix Plate 1. Example images of biotopes identified at Holyhead in 2019 (stills extracted from 4k footage)



A1.2141 - *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser.R)



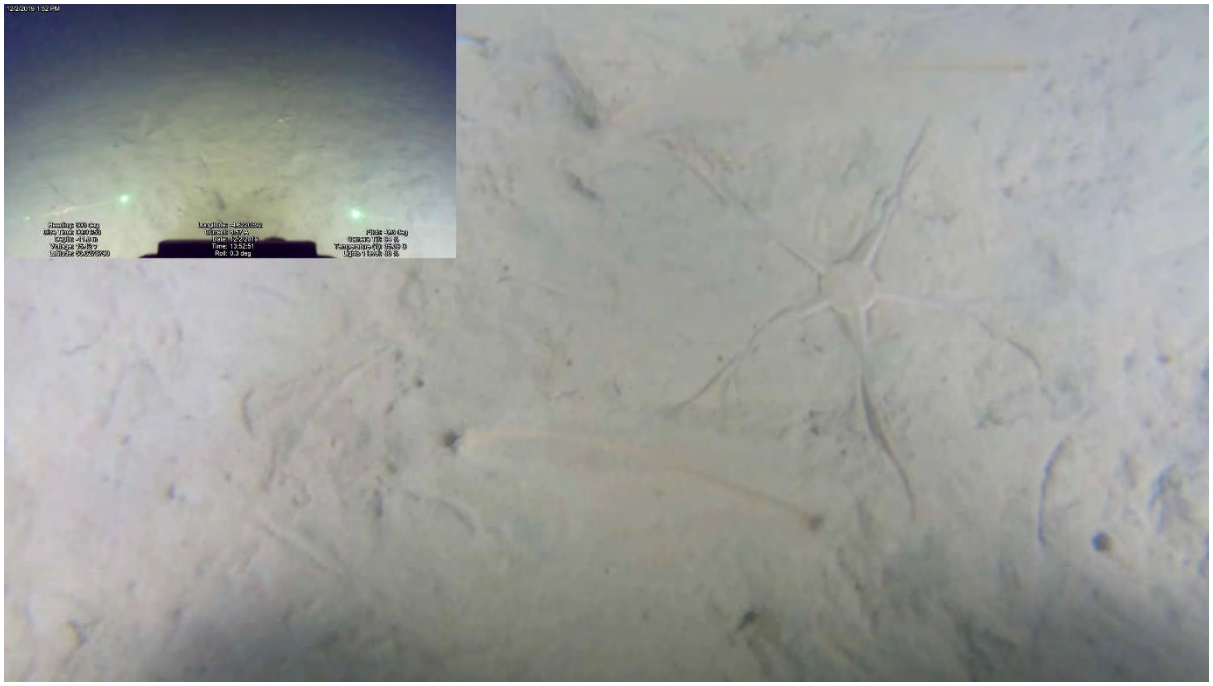
A3.123 - Kelp and red seaweeds (moderate energy infralittoral rock) (IR.MIR.KR)

Appendix Plate 1. Example images of biotopes identified at Holyhead in 2019 (stills extracted from 4k footage)

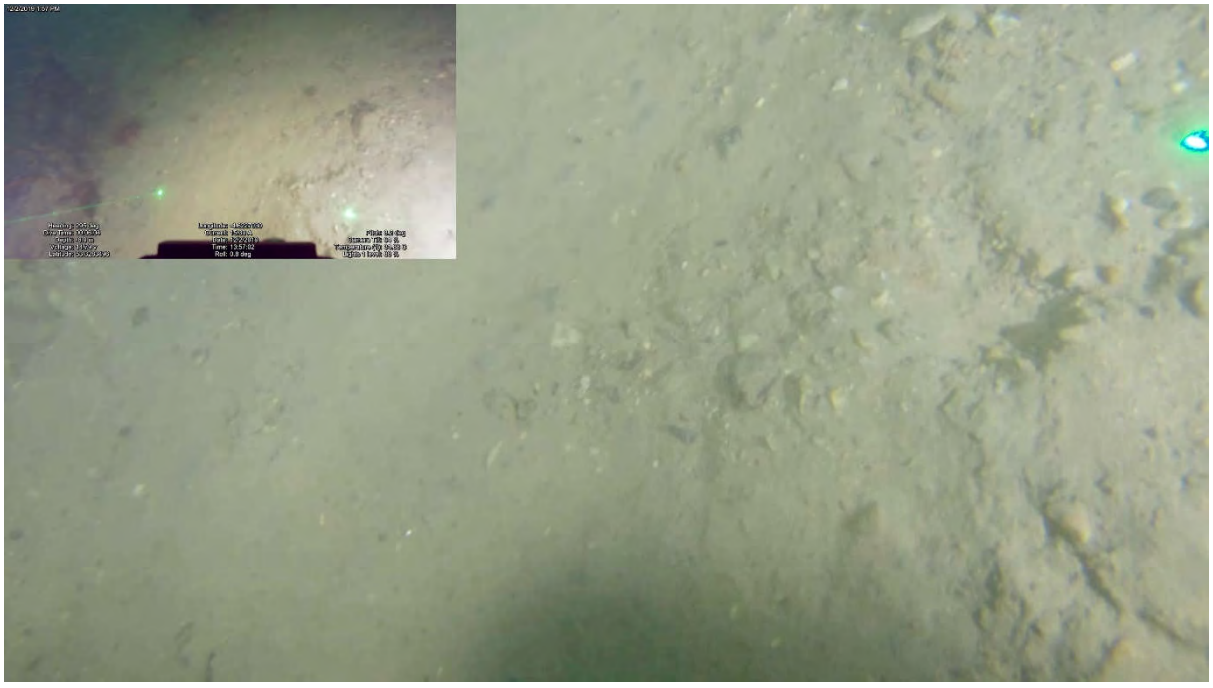
A3.211 - *Laminaria digitata* on moderately exposed sublittoral fringe rock (IR.MIR.KR.Ldig)

A5.23 - Infralittoral muddy sand (SS.Ssa.IMuSa)

Appendix Plate 1. Example images of biotopes identified at Holyhead in 2019 (stills extracted from 4k footage)



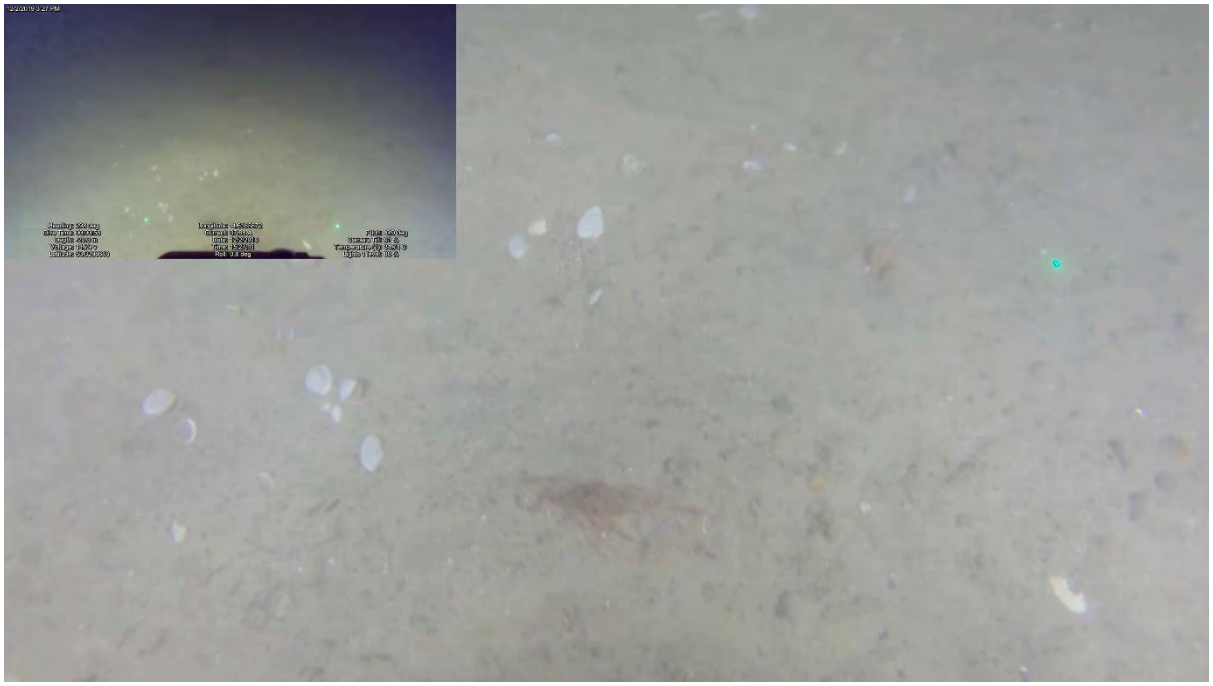
A5.354 - *Virgularia mirabilis* and *Ophiura* spp. with *Pecten maximus* on circalittoral sandy or shelly mud (SS.Smu.CSaMu.VirOphPmax)



A5.43 - Infralittoral mixed sediment (SS.SMx.Imx)

Appendix Plate 1. Example images of biotopes identified at Holyhead in 2019 (stills extracted from 4k footage)

A5.44 - Circalittoral mixed sediment (SS.SMx.CMx)



A5.441 - *Cerianthus lloydii* and other burrowing anemones in circalittoral muddy mixed sediment (SS.SMx.CMx.ClloMx)

About Carcinus Ltd

Carcinus Ltd is a leading provider of aquatic environmental consultancy and survey services in the UK.

Carcinus was established in 2016 by its directors after over 30 years combined experience of working within the marine and freshwater environment sector. From our base in Southampton, we provide environmental consultancy advice and support as well as ecological, topographic and hydrographic survey services to clients throughout the UK and overseas.

Our clients operate in a range of industry sectors including civil engineering and construction, ports and harbours, new and existing nuclear power, renewable energy (including offshore wind, tidal energy and wave energy), public sector, government, NGOs, transport and water.

Our aim is to offer professional, high quality and robust solutions to our clients, using the latest techniques, innovation and recognised best practice.

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Environmental Consultancy

Carcinus provides environmental consultancy services for both freshwater and marine environments. Our freshwater and marine environmental consultants provide services that include scoping studies, Environmental Impact Assessment (EIA) for ecological and human receptors, Habitats Regulations Appraisal (HRA), Water Framework Directive (WFD) assessments, project management, licensing and consent support, pre-dredge sediment assessments and options appraisal, stakeholder and regulator engagement, survey design and management and site selection and feasibility studies.

Ecological and Geophysical Surveys

Carcinus delivers ecology surveys in both marine and freshwater environments. Our staff are experienced in the design and implementation of ecological surveys, including marine subtidal and intertidal fish ecology and benthic ecology, freshwater fisheries, macro invertebrate sampling, macrophytes, marine mammals, birds, habitat mapping, River Habitat Surveys (RHS), phase 1 habitat surveys, catchment studies, water quality and sediment sampling and analysis, ichthyoplankton, zooplankton and phytoplankton.

In addition, we provide aerial, topographic, bathymetric and laser scan surveys for nearshore, coastal and riverine environments.

Our Vision

"*To be a dependable partner to our clients, providing robust and reliable environmental advice, services and support, enabling them to achieve project aims whilst taking due care of the sensitivity of the environment*"

11.2 Drop Down Video Survey Report

Ocean Ecology

Marine Surveys, Analysis & Consultancy

Holyhead Breakwater Refurbishment

Drop Down Video Survey

2020

REF: OEL_ROYHOL0819_TCR_SBT_V02

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Details

Version	Date	Description	Author(s)	Reviewed By
01	24/12/2020	First issue	Gary Robinson	Ross Griffin
02	15/04/2021	Revised draft following client comment	Gary Robinson	Gary Robinson

Updates

Section	Description	Page
Table 4	Presence of INNS changed from 'Yes' to 'No' for transects 005 and 006.	26
3.4.4	Text amended to remove reference to potential *D. vex* being present but confirm it cannot be ruled out.	34
Plate 6	Removed	36

Contents

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Abbreviations

DDV	Drop Down Video
EC	European Community
EIA	Environmental Impact Assessment
EOL	End of Line
ES	Environmental Statement
EUNIS	European Nature Information System
FOCI	Features of Conservation Interest
GPS	Global Positioning System
HD	High Definition
INNS	Invasive Non-Native Species
IoACC	Isle of Anglesey County Council
JNCC	Joint Nature Conservation Committee
MLW	Mean Low Water
MP	Megapixel
NRW	Natural Resources Wales
OBC	Outline Business Case
OEL	Ocean Ecology Ltd
OPP	Outline Planning Permission
OSPAR	Oslo-Paris Convention
PMF	Priority Marine Features
RHDHV	Royal Haskoning DHV
RIB	Rigid Inflatable Boat
SNCB	Statutory Nature Conservation Bodies
SOL	Start of Line
UK	United Kingdom
UTM	Universal Transverse Mercator
WGS	World Geographic System

Executive Summary

Ocean Ecology Limited (OEL) was commissioned by Royal Haskoning DHV (RHDHV) to undertake a Remotely Operated Vehicle (ROV) and Drop-Down Video (DDV) survey of Holyhead Breakwater, Holy Island as part of an ongoing Environmental Impact Assessment (EIA) process for the proposed Holyhead Breakwater Refurbishment Scheme (the Project). This survey focused on the seaward side of the breakwater following a previous survey commissioned by RHDHV of the leeward side of the breakwater.

The purpose of the survey was primarily to confirm the presence / absence of sublittoral rock habitat and identify other notable features such as sensitive habitats and species (e.g. *Virgularia mirabilis*) including Invasive Non-Native Species (e.g. *Didemnum vexillum*) on the breakwater, at the foot of the breakwater foundations and in the areas immediately adjacent to the breakwater. An additional objective of this survey was to inspect the footings of the breakwater bullnose for damage potentially sustained following storm Emma in March 2018. A total of 11 target DDV transects and one ROV inspection transect were identified to provide adequate coverage of the seaward side of the breakwater; eight on the west flank of the breakwater and three radiating out from the bullnose. The survey involved the collection of high-resolution seabed video and stills along transects using a bespoke DDV camera system. Following data collection, all images were analysed and assessed to determine the presence / absence of notable features.

A total of 22 European Nature Information System (EUNIS) habitats and biotopes were observed during the survey with each transect along the breakwater showing a similar succession of habitats with increased distance away from the breakwater wall and with increasing water depth. Immediately adjacent to the base of the breakwater, rock substrate was bare and devoid of fauna and flora. Moving away from the breakwater, kelp (*Laminaria hyperborea*) and foliose red seaweeds formed a band of kelp forest before transitioning into faunal dominated biotopes. Sediment areas were predominantly coarse / mixed sediments with some areas of dense brittlestar beds.

All sublittoral rock habitats observed were deemed to be representative Annex I 'Reef' habitats and eight habitats recorded were deemed to be representative of conservation interest. Kelp habitats were noted on all transects along the length of the breakwater and were most dense between 2m and 8m water depths aligning to existing habitat mapping. There were a number of observations of what was thought to potentially be colonies of the invasive non-native carpet sea squirt, *D. vexillum*, restricted to boulders immediately adjacent to the breakwater structure on two transects.

An ROV inspection of the breakwater bullnose structure identified several areas of possible structural damage for further investigation.

1. Introduction

1.1. Holyhead Breakwater Refurbishment Scheme

The Holyhead Breakwater Refurbishment Scheme (the Project) is being proposed by Isle of Anglesey County Council (IoACC) to refurbish the existing breakwater on Holy Island (Ynys Gybi) (Figure 1). The Isle of Anglesey County Council (IoACC) commissioned an Outline Business Case (OBC) in 2017, the aim of which was to identify a cost-effective, long-term and sustainable solution to the erosion of the rubble mound so that it can continue to provide a stable foundation for the superstructure.

1.2. Background Information

Holyhead Breakwater provides an area of sheltered water for the Port of Holyhead and Holyhead New Harbour and provides protection to the surrounding coastline from coastal erosion and flooding. The breakwater is formed by a wide rubble mound with a crest around the waterline and a vertical blockwork-walled superstructure on top. Over time the breakwater has been subject to considerable wave action, which has led to the displacement and erosion of the rock that makes up the rubble mound and, consequently, a loss of integrity of the rubble mound itself.

Following Environmental Impact Assessment (EIA) screening, it was determined that a full EIA would be required in order to gain planning permission for the Project from the IoACC. Additionally, in consultation with Natural Resources Wales (NRW) it was determined that an EIA is to be submitted, by agreement, in order to obtain a Marine Licence, thereby streamlining the consenting process for the scheme. The objectives of the EIA process are to ensure that environmental factors are considered throughout the project development and the decision-making process, and that potential significant environmental effects are identified and assessed.

As part of this process Royal Haskoning DHV (RHDHV) commissioned Ocean Ecology Limited (OEL) to undertake an ecological survey programme to better understand the biological communities associated with the seaward side of the breakwater and the sedimentary habitats immediately adjacent to it. This survey programme follows on from surveys commissioned by RHDHV on the leeward side previously undertaken by Carcinus Ltd (Carcinus).

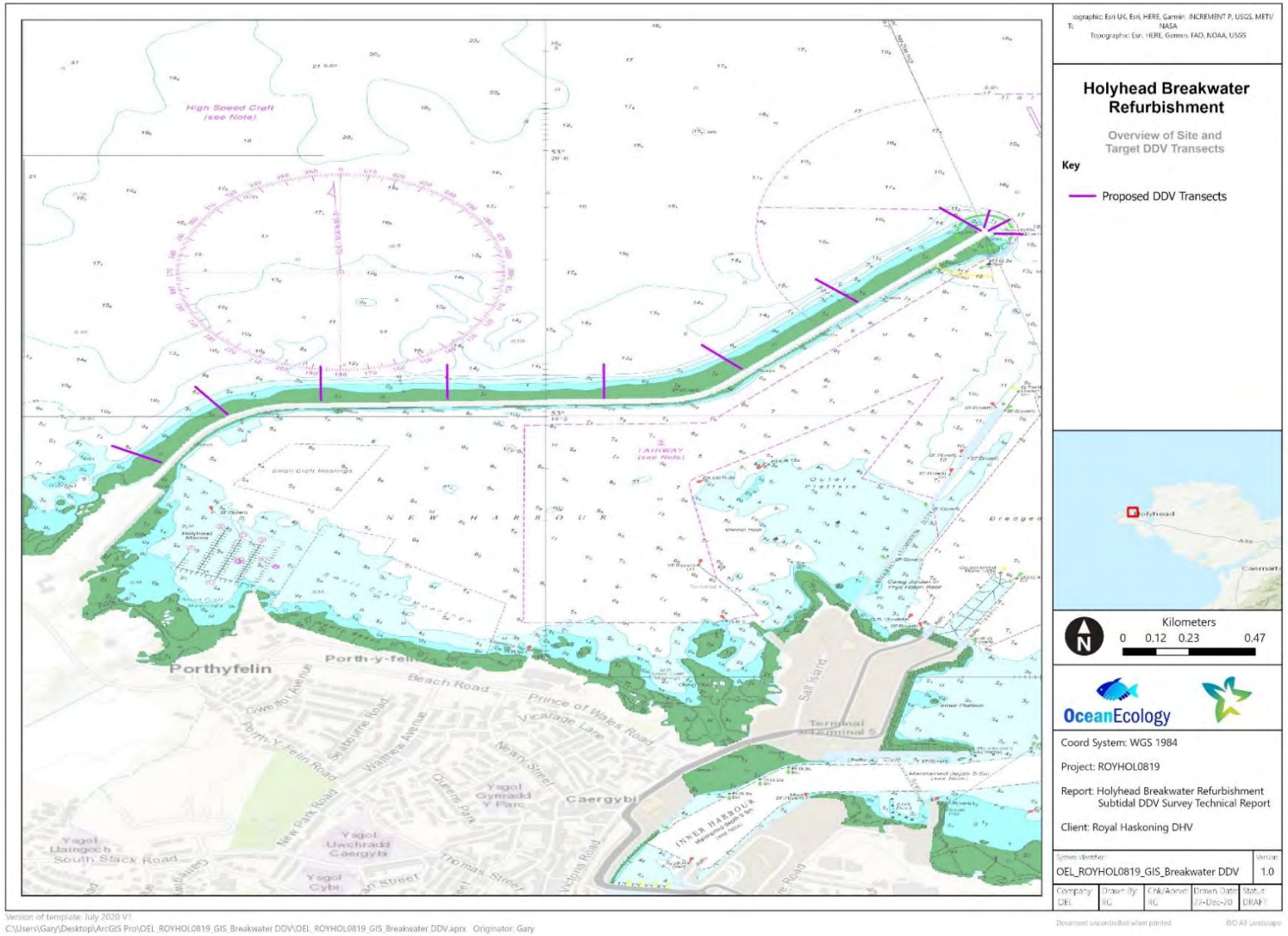

Figure 1. Holyhead Breakwater Refurbishment – proposed development area and target DDV transects on the seaward side.

1.3. Survey Objectives

As part of this survey programme, OEL were commissioned to undertake a subtidal Remotely Operated Vehicle (ROV) and Drop Down Video (DDV) survey of the breakwater to a) establish the main benthic habitats present b) characterise the associated marine biological communities and c) confirm the presence / absence of notable features including Annex I habitat and Invasive Non-Native Species (INNS) (e.g. *Didemnum vexillum*) and d) assess potential damage to the bullnose of the breakwater following storm Emma in March 2018. The survey area stretched the full length of the 2.4km long breakwater on the seaward side and included:

- Eight transects ~200m in length along the seaward side of the breakwater
- Three transects ~ 100m in length radiating out from the bullnose
- One damage inspection ROV transect of the breakwater bullnose

This report provides a summary of the survey methodologies employed, a description of the habitats encountered and a summary of notable features identified during the survey. An initial assessment of damage to the bullnose is also summarised following review of the ROV inspection imagery.

The proposed survey area and transect sampling design is provided in Figure 1**Error! Reference source not found.**.

1.4. Features of Interest

Several important and sensitive habitats are known to occur within and adjacent to Holyhead Breakwater and have the potential to occur within the survey area on the seaward side of the breakwater. These include subtidal rock habitats representative of Annex I 'Reef' habitats (both bedrock and stony)[1] and subtidal mud habitats representative of the OSPAR habitat 'Seapens and burrowing megafauna communities'. The invasive carpet sea squirt (*D. vexillum*) is also known to occur across the survey area.

1.4.1. Sublittoral Rock Habitats

Sublittoral rock habitats are highly diverse and widespread around the UK. The sublittoral area can be separated into two zones based on the dominant biological assemblage; the infralittoral (algal dominated) and the circalittoral (animal dominated). Subtidal rock habitats comprise bedrock, boulders and cobbles and faunal communities are strongly affected by the availability of light with shallow areas, as present on and in the vicinity of Holyhead Breakwater, typically

[1] It should be noted that the 'reef' habitats referred to throughout this report are not protected as designated features of a Natura 2000 site under the EC Habitats Directive but are referred to as 'Annex I habitat' in recognition of their contribution in achieving Favourable Conservation Status of Annex I reef habitat across the SAC network.

supporting various algal communities, predominantly kelp species and erect seaweeds with associated understory fauna.

1.4.1.1. Infralittoral rock and other hard substrata

Infralittoral sublittoral rock habitats, defined within the European Nature Information System (EUNIS) classification as those areas between the Mean Low Water (MLW) line and the maximum depth at which 1% light attenuation reaches the seabed. The upper limit is marked by the top of the kelp zone whilst the lower limit is marked by the lower limit of kelp growth or the lower limit of dense seaweed growth. In exposed conditions the kelp is *Laminaria hyperborea* whilst in more sheltered habitats it is usually *Saccharina latissima*; other kelp species may dominate under certain conditions. On the extreme lower shore and in the very shallow subtidal (sublittoral fringe) there is usually a narrow band of dabberlocks, *Alaria esculenta* (exposed coasts) or the kelps *Laminaria digitata* (moderately exposed) or *S. latissima* (very sheltered). Areas of mixed ground, lacking stable rock, may lack kelps but support seaweed communities.

1.4.1.2. Circalittoral rock and other hard substrata

Circalittoral rock is characterised by animal dominated communities (a departure from the algae dominated communities in the infralittoral zone). The circalittoral zone can itself be split into two sub-zones; upper circalittoral (foliose red algae present) and lower circalittoral (foliose red algae absent). Biotopes are broadly assigned to one of three energy level categories: high, moderate and low energy circalittoral rock with the seaward side of the breakwater likely to be high energy or moderate energy. The character of the fauna varies enormously and is affected mainly by wave action, tidal stream strength, salinity, turbidity, the degree of scouring and rock topography. Often rock faces are covered in mixed faunal turf composed of byrozoans and hydroids depending on energy levels and grazing pressure from animals.

1.4.1.3. Bedrock Reef (Annex I)

Bedrock reef habitat occurs where hard bedrock arises from the surrounding seabed, providing a stable habitat for attachment for a diverse range of epibiota. Bedrock reefs and associated biological communities can be highly variable due to the diverse nature of these habitats in terms of topography, structural complexity and exposure to tidal streams. In the photic zone communities associated with bedrock reefs are often dominated by attached algae, and often support various invertebrate species such as corals, sponges and sea squirts. These epibiotic communities further increase structural complexity and represent key prey items that in turn attract more mobile and commercially valuable species of fish and crustaceans.

1.4.1.4. Stony Reef (Annex I)

Stony reef habitats occur when stable hard substrata, namely cobbles and boulders > 64 mm in diameter, arise from the surrounding habitat creating a habitat colonised by a variety of fauna and flora. Numerous sites have been designated in UK waters to protect stony reef habitats and

associated communities. Such communities can be highly diverse, supporting assemblages of various coral, sponges, ascidians, fish and crustaceans. These associated communities vary dramatically according to environmental variables and may incorporate species that occupy a range of trophic levels. The complexity of habitat created by stony reefs often supports a higher abundance of mobile fauna such as echinoderms and various crabs, hermit crabs, and squat lobsters, as well as fish species for which these species represent key prey items. To be regarded as Annex I stony reef under the EC Habitats directive, areas of cobble/boulder substrate must meet a number of qualifying criteria as defined by Irving (2009) (Table 1). This guidance also suggests that "When determining whether an area of the seabed should be considered as Annex I stony reef, if a 'low' is scored in any of the four characteristics (composition, elevation, extent or biota), then a strong justification would be required for this area to be considered as contributing to the Marine Natura site network of qualifying reefs in terms of the EU Habitats Directive".

Table 1 Characteristics of Annex I 'stony reef' (from Irving (2009)).

Characteristic	Not a Reef	Low	Medium	High
Composition (proportion of boulders/cobbles (> 64 mm))	< 10 %	10-40 % matrix supported	40-95 %	> 95 % clast supported
Elevation	Flat seabed	< 64 mm	64 mm – 5 m	> 5 m
Extent	< 25 m^2	> 25 m^2		
Biota	Dominated by infaunal species			> 80 % of species present composed of epibiotal species

1.4.2. Sublittoral Sediment Habitats

1.4.2.1. Kelp and Seaweed Communities on Sublittoral Sediment

Shallow sublittoral sediments which support seaweed communities typically include the sugar kelp *S. latissima*, the bootlace weed *Chorda filum* and various red and brown seaweeds, particularly filamentous types. EUNIS Level 4 biotope 'A5.52 – Kelp and seaweed communities on sublittoral sediment', a Scottish Priority Marine Feature (PMF) is generally observed in sheltered waters, typical of the inner harbour but potentially present on the seaward side of the breakwater too, enabling seaweeds to grow on shells and small stones which lie on the sediment surface. A diverse range of fauna may be associated with these kelp and seaweed dominated habitats such as burrowing polychaete worms and bivalves, scavenging hermit crabs, crabs, starfish, fish and grazing top shells.

These habitats are generally found in shallow water (max. 20 m depth), on a wide variety of substrates (muddy sands and gravels through to cobbles and boulders) and in various environmental conditions. The generally sheltered nature of these habitats enables seaweeds to

grow on shells and small stones which lie on the sediment surface; some communities develop as loose-lying mats on the sediment surface.

1.4.2.2. Seapens (*Virgularia mirabilis*)

V. mirabilis is a long and slender seapen, growing up to 60 cm in length and usually off-white to yellow in colour. This sea pen is the most abundant and widespread of the British sea pen species, due partly to its tolerance of a wide range of sediments, salinities and temperatures (Jones et al., 2000). This species of sea pen has a highly muscular peduncle allowing it to burrow and retract completely into the sediment therefore thought likely to be less susceptible to damage from physical disturbance (Greathead et al., 2007).

V. mirabilis is a characteristic species of the 'Mud habitats in deep water' listed as a Habitat of Principal Importance' under Section 7 of the Environment (Wales) Act 2016, the OSPAR habitat: Sea-pen and burrowing megafauna communities and the shallow water variant EUNIS biotope – 'A5.343 - *Philine aperta* and *Virgularia mirabilis*' in soft stable infralittoral mud'. *V. mirabilis* has been recorded on numerous occasions previously in the vicinity of the Holyhead Breakwater.

1.4.3. Invasive Non-Native Species (*Didemnum vexillum*)

D. vexillum is an invasive colonial ascidian that has become established world-wide in temperate waters having originated in Japan (Stefaniak et al., 2012). It is now regarded as a nuisance species in North America, northern Europe, and New Zealand, following a global expansion since the 1970's (Griffith et al., 2009). *D. vexillum* colonises a variety of firm substrates and is particularly prevalent on coastal structures such as docks, pilings, marina pontoons and aquaculture equipment. It also colonises natural seabed habitat including rocks, cobbles and gravel, but is unable to establish colonies on mud, mobile sand, or other unstable substrates (Coutts, 2005; Valentine et al., 2007). It can also colonise other benthic organisms including other ascidians, algae and seagrasses forming sheet-like colonies and is capable of smothering large areas, posing a threat to native marine ecosystems (Veatch, 2009). Holyhead Harbour represents an active hub for both commercial and pleasure craft, providing numerous potential vectors to *D. vexillum*. In December 2008 (Griffith et al., 2009) examined the extent of *D. vexillum* within Holyhead Marina and the surrounding harbour area and found that *D. vexillum* formed dispersed colonies throughout the marina. Following storm Emma in March 2018, there remains concern that *D. vexillum* may have dispersed within the Holyhead Harbour area and potentially on the Holyhead Breakwater rubble mound.

As such, the seabed imagery collected during this survey underwent detailed review to determine the presence / absence of *D. vexillum* along Holyhead Breakwater and on the substrate immediately adjacent to the breakwater.

2. Methods

2.1. Sampling Rationale

A total of 11 target DDV transects were identified to provide adequate coverage of the seaward side of the breakwater; eight on the west flank of the breakwater and three radiating out from the bullnose (Figure 1). Sampled DDV transects and still image sample locations are presented in Figure 2.

2.2. Geodetic Parameters

All coordinates were based on World Geodetic System 1984 (WGS 1984) with projected grid coordinates based on Universal Transverse Mercator (UTM) zone 30N with a Central Meridian of 03˚E. A summary of geodetic and projection parameters is provided in Table 2.

Table 2 Details of geodetic datum parameters used for the Holyhead Breakwater Refurbishment survey, 2020.

Local geodetic Datum Parameters	
Datum	World Geodetic System 1984 (WGS 1984)
Spheroid	WGS 1984
Project Projection Parameters	
Grid Projection	Universal Transverse Mercator, Northern Hemisphere
UTM Zone	30 N
Central Meridian	03˚ 00′ 00″ East
Latitude of Origin	00˚ 00′ 00″ North
False Easting	500000.0 m
False Northing	0 m
Scale factor on Central Meridian	0.9996
Units	Metres

2.3. Field Methods

2.3.1. Survey Vessels

2.3.1.1. Vector

Seabed imagery was collected along the deeper sections of the transects where sedimentary habitat was thought to occur aboard the 21.6m MCA Workboard Cat 2 Eurocarrier 2009, *Vector* provided by Carmet Marine (Plate 1).

Plate 1 Survey vessel *Vector* used to undertake DDV of sediment areas adjacent to Holyhead Breakwater during the Holyhead Breakwater Refurbishment survey, 2020.

2.3.1.2. Deebuoys II

Shallow water seabed imagery was collected aboard the 5.4m Avon Searider RIB, *DeeBuoys II* provided by National Marine (Plate 2). The vessel was equipped with twin Suzuki DF40 outboard motors, shallow draft of <0.5m for shallow water work in the marina and close to the breakwater and provided a safe and stable platform with sufficient space for three surveyors and equipment.

Plate 2 Survey vessel *DeeBuoys II* being launched at Holyhead Marina to complete the Holyhead Breakwater survey, 2020.

2.3.2. Survey Equipment

2.3.2.1. Remotely Operated Vehicle

The breakwater bullnose Inspection imagery was collected using OEL's BlueROV II ROV equipped with a live-low latency HD video camera and four 1,500 lumen subsea lights with 10 levels of adjustable brightness. The BlueROV II was setup as a heavy configuration with four vertical T200 thrusters and four vectored T200 thrusters giving six degrees of freedom and increased buoyancy for added control. The BlueROV II has the best thrust-to-weight ratio in its class and provides an ideal ROV for operations in shallow to moderate waters, with a standard 100m depth rating.

A data tether was used for live video feed to topside camera unit which could be viewed by an experienced marine ecologist for real-time review of video imagery, image capture and assessment of the bullnose footings. Positioning was undertaken from the Deebuoys II which 'shadowed' the ROV (within 3m of horizontal position at all times) using ESRI ArcCollector on a Bad Elf GPS & GLONASS enabled tablet device along with a Garmin Etrex 10 GPS Unit for verification of positioning.

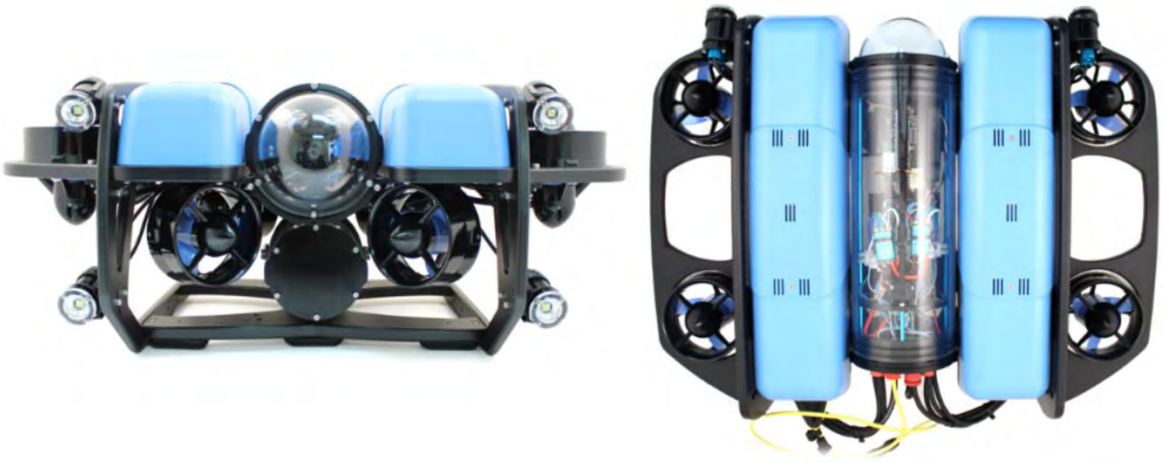

Plate 3 OEL's BlueROV II Remotely Operated Vehicle (ROV) used for inspection of Holyhead Breakwater bullnose.

2.3.2.2. Drop Down Video Camera

Seabed imagery along the majority of the transects was collected using OEL's ROVTech subsea camera system which obtained High Definition (HD) video and 20 Megapixel (MP) still images, mounted in a bespoke deployment frame for use onboard the *Deebuoys II*. A data umbilical was used for both deployment of the frame and live video feed to topside camera unit which could be viewed by an experienced marine ecologist for real-time review of video imagery, image capture and assessment of the seabed. Positioning was undertaken using ESRI ArcCollector on a Bad Elf GPS & GLONASS enabled tablet device along with a Garmin Etrex 10 GPS Unit for verification of positioning.

2.4. Drop-Down Video Sampling (Vector)

All transects were sampled in consideration of the Joint Nature Conservation Committee (JNCC) epibiota remote monitoring operational guidelines (Hitchin, Turner, & Verling, 2015). Images were taken at the start, middle and end of proposed transects only (approximately 75-100m spacing) to achieve high level coverage of the deeper water, soft sediment areas only. All video footage was reviewed live, *in situ* by the lead marine ecologist.

The camera system was deployed as follows:

- Vessel approached target location and alerted deck personnel to prepare crane, camera and umbilical when on position.
- Camera umbilical is run through a block on the crane boom.
- Camera raised and lowered into the water column to within 5 m of the seabed.
- Ecologist switched on video recording and the camera lowered until gently landing on the seabed at which point a positional fix was taken.
- The ecologist then waited for any suspended sediments in the field of view to disperse before taking an image.
- The camera was then raised from the seabed and moved to obtain more images of the surrounding area or, when sampling transects, the camera was moved along the transect at a set speed of usually 0.5 knots. Where possible the seabed was maintained in view at all times.
- Following the capture of the final image, the camera was lifted, video recording was stopped, and the camera was retrieved to the surface.
- The crane operator then took tension on the crane wire and the ecologist ensured the camera umbilical was free for recovery.
- The vessel master then confirmed sea conditions were suitable for retrieval and the camera system was recovered aboard.
- The camera frame was then lowered onto the deck and the tension released.
- The block holding the umbilical was detached from the crane boom.

2.5. Drop-Down Video Sampling (Deebuoys II)

Images were taken at 5-10m intervals, at the interface between different habitats and of any notable features along the transects. All video footage was reviewed live, *in situ* by the lead marine ecologist.

The camera system was deployed as follows:

- Vessel approached target location and survey personnel alerted to prepare camera and umbilical.
- Sea fastening on camera frame was released to allow deployment from the vessel.
- Camera lifted onto tubing ready for deployment and station ID picture taken.
- Video recording then lowered into the water on clearance from the skipper.

- Camera then lowered into the water column and to the seabed whilst vessel held on start position. Fix position taken on the seabed.
- The ecologist then waited for any suspended sediments in the field of view to disperse before taking an image and confirming with the skipper to move on.
- The camera was then raised from the seabed and the vessel moved along the transect at approximately < 1 knot collecting imagery and holding the vessel stationary on position every 5-10m. Where possible the seabed was always maintained in view.
- Following the capture of the final image, fix taken and the camera was lifted, video recording was stopped, and the camera was retrieved to the surface.
- Both surveyors then retrieved the camera to the water surface so visible using the umbilical.
- Once the camera was at the surface, the vessel was positioned to minimise pitch and roll (e.g. into wind / tide).
- The vessel skipper then confirmed sea conditions were suitable for retrieval and the camera system was recovered aboard with both surveyors lifting frame onto the tubes first before securing on the deck of the boat.
- Vessel manoeuvred to next transect location.

2.6. Remotely Operated Vehicle Sampling (Deebuoys II)

The on-board camera was configured to record continuous video, with the HD video being streamed in real-time. The ROV operator, acted as the pilot and monitored the live video feed to navigate the ROV along the bullnose wall and monitor survey parameters (e.g. visibility, camera angle, relative position). One other managed the tether and ensured the skipper was directed accordingly to keep the vessel within 3m of the horizontal position of the ROV at all times.

The ROV transect was completed as follows:

- The vessel was positioned at the eastern end of the bullnose frontage and held on position close to the bullnose wall.
- The ROV was then hand deployed from the vessel to the water surface upon which time it was armed and diving commenced. Deployment stopped when the ROV was at the seabed.
- Recording commenced and a position taken for the Start of Line (SOL) before the pilot slowly started flying the ROV along the base of the wall from East to West.
- Whilst flying the pilot was using the tilt function to view up and down the lower extent of the wall.
- The skipper of the vessel maintained communication with the tether manager and 'shadowed' the ROV along the transect.

- Once at the most western end of the bullnose frontage the ROV was brought up 2.5 – 3.0 m and the same transect was run in a West to East direction until the ROV had returned to the initial start location. An indicative ROV track is provided in Figure 8.
- Evidence of potential damage was investigated and notes were made by the personnel onboard the vessel.
- On completion of the transect, the ROV was surfaced and brought alongside the survey vessel. Once alongside and under the control of survey personnel, the ROV was disarmed and retrieved onboard by hand.
- Video data was downloaded and the ROV was checked for condition and operation before powering off.

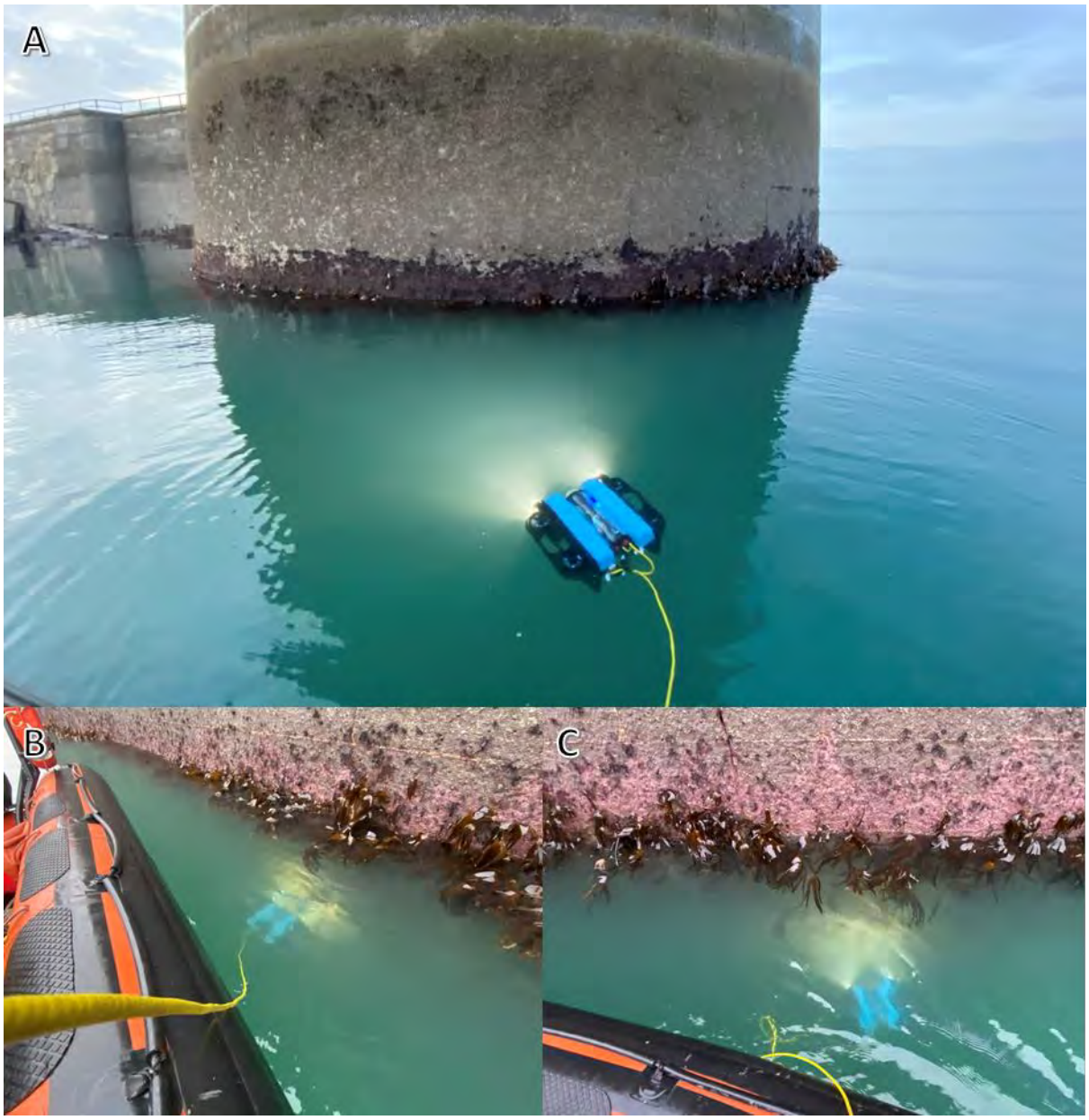

Plate 4 OEL's BlueROV II ROV sampling the Holyhead Breakwater bullnose A) BlueROV II approaching bullnose from the south B & C) BlueROV II inspecting bullnose wall below waterline.

2.6.1. Seabed Imagery Analysis

2.6.1.1. Transects

All seabed imagery analysis was undertaken in line with JNCC epibiota remote monitoring interpretation guidelines (Turner et al., 2016) and biotopes were assigned in line with the most recent JNCC guidance on assigning benthic biotopes (Parry, 2019).

Each video tow was scanned initially by eye rapidly (at approximately 4 x normal speed) to identify the main habitats prior to a thorough review to identify any notable features of interest, not captured by the still image samples. Analysis of still images was undertaken in two stages.

The first stage, "Tier 1", consisted of assigning substrate / sediment type to the whole image. Determination of sediment type, such as coarse, mixed, sand etc. was facilitated using the adapted Folk sediment trigon (Long, 2006) incorporated into a sediment category correlation table. Percentage gravel (defined as boulders, cobbles, shells, granules, dead / live maerl), sand and mud were used to determine and assign EUNIS broad scale habitats.

"Tier 2" used to identify the presence of notable taxa or features, evidence of burrowing, bioturbation or faunal tracks and other notable features such as anthropogenic impact (e.g. fishing gear / litter) or INNS.

2.6.1.2. Bullnose Inspection Transect

The bullnose inspection transect imagery was provisionally analysed for evidence of damage to the bullnose footings and wall structure. Imagery was reviewed in 0.5 x real-time and evidence of notable erosion or degradation of the wall infrastructure, cracking and missing concrete blocks was noted.

3. Results

3.1. Survey Progress

The survey was completed over two separate survey events. Seabed imagery of the sediment areas at the offshore end of transects 001 – 008 was collected aboard the Vector on the 21st July 2020 and the pre-determined transects 001 – 011 and the breakwater bullnose inspection transect were completed aboard the Deebuoys II on the 29th November 2020.

3.2. Seabed Imagery

All 11 proposed transects were sampled at least once which resulted in the collection of 213 minutes of video footage and 181 corresponding stills. Video and still imagery logs are provided in Appendix I and II.

3.3. EUNIS Habitats

A total of 22 EUNIS habitats and biotopes were observed during the survey (Table 3 and Plate 5). The most frequently observed biotopes were associated with sublittoral rock habitats which extended from the base of the breakwater wall to the sediment areas in deeper water ~ 100m from the breakwater, beyond the charted 10m depth contour.

Immediately adjacent to the base of the breakwater, rock substrate was bare and devoid of fauna and flora. Moving away from the breakwater, kelp (*Laminaria* sp.) and foliose red seaweeds biotopes including 'A3.11 - Kelp with cushion fauna and/or foliose red seaweeds', 'A3.113 - *Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock' and 'A3.116 - Foliose red seaweeds on exposed lower infralittoral rock' dominated to approximately 10m water depth. Beyond, biotopes were dominated by fauna with rock substrate being encrusting with bryozoan / hydroid turf and mixed faunal turf communities. The most commonly recorded biotopes were 'A4.13 - Mixed faunal turf communities on circalittoral rock' and 'A3.24 - Faunal communities on moderate energy infralittoral rock' and to a lesser extent 'A4.131 - Bryozoan turf and erect sponges on tideswept circalittoral rock' and 'A4.11 - Very tide-swept faunal communities on circalittoral rock'.

The sediment areas way from the breakwater were dominated by coarse / mixed sediments as well as areas of clean sands with sparse fauna. Coarse / mixed sediment habitats were dominated by the brittlestars *Ophiothrix fragilis* and/or *Ophiocomina nigra* and crinoid feather stars.

Observed habitats and biotopes are presented in Table 3 and Plate 5 and summary DDV transect descriptions with EUNIS classifications are provided in Table 4. Distribution and classification of EUNIS habitats and biotopes are presented spatially in Figure 3 to Figure 7.

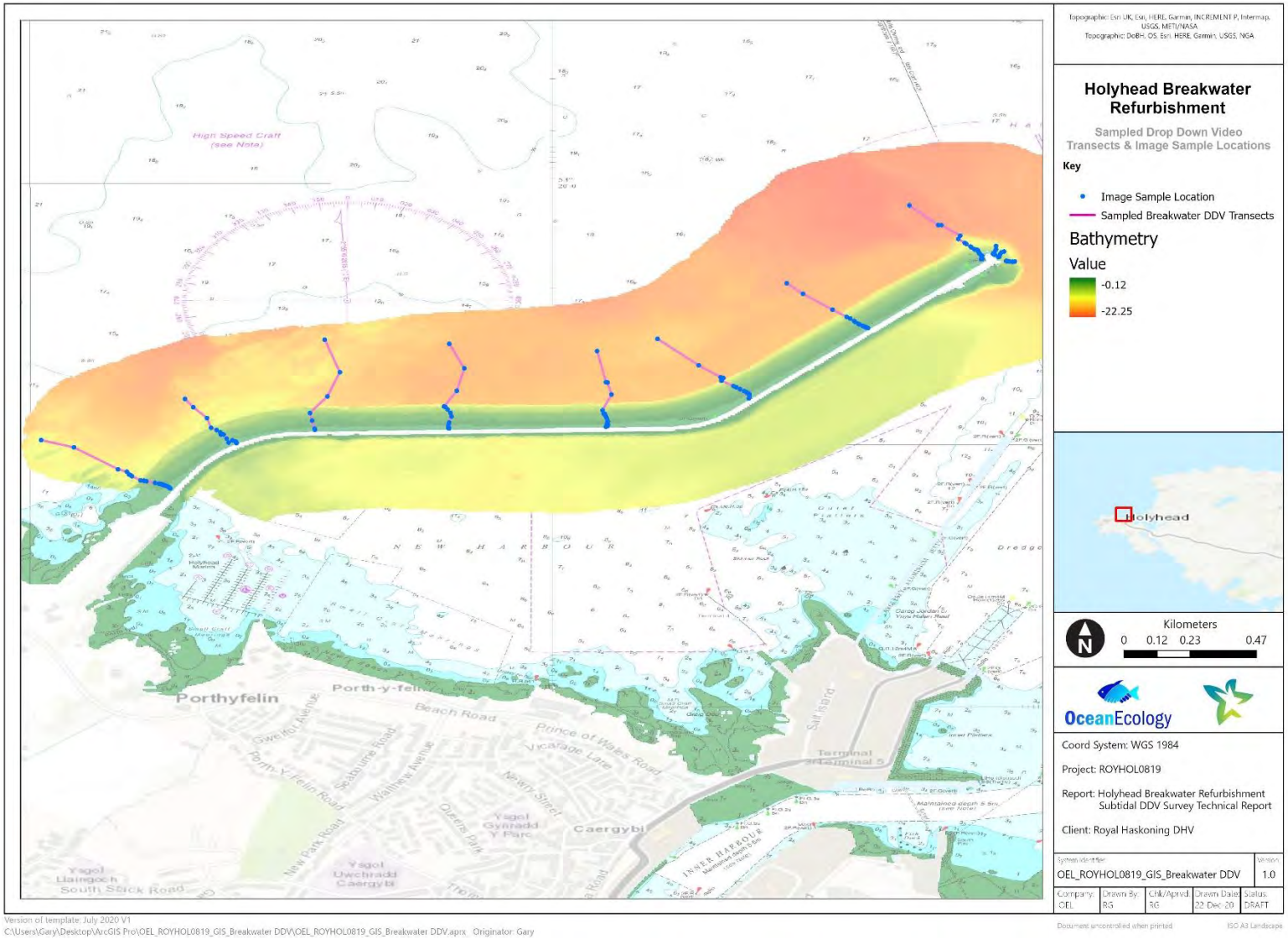

Figure 2 Sampled DDV transects and still sample locations on the seaward side of Holyhead Breakwater.

Table 3 Summary of the EUNIS classifications assigned during the Holyhead Breakwater Refurbishment survey, 2020. ***NB*** *EUNIS classifications assigned to bullnose ROV inspection transect underlined*.

BSH	EUNIS Code
A1.2	A1.21 - Barnacles and fucoids on moderately exposed shores A1.214 - Fucus serratus on moderately exposed lower eulittoral rock
A3.1	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.113 - Laminaria hyperborea forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock A3.116 - Foliose red seaweeds on exposed lower infralittoral rock A3.117 - Laminaria hyperborea and red seaweeds on exposed vertical rock A3.12 - Sediment-affected or disturbed kelp and seaweed communities A3.124 - Dense Desmarestia spp. with filamentous red seaweeds on exposed infralittoral cobbles, pebbles and bedrock
A3.2	A3.22 - Kelp and seaweed communities in tideswept sheltered conditions A3.222 - Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered tideswept infralittoral rock A3.24 - Faunal communities on moderate energy infralittoral rock
A3.7	A3.71 - Crustose sponges and colonial ascidians with Dendrodoa grossularia or barnacles on wave-surged infralittoral rock
A4.1	A4.11 - Very tide-swept faunal communities on circalittoral rock A4.13 - Mixed faunal turf communities on circalittoral rock A4.131 - Bryozoan turf and erect sponges on tideswept circalittoral rock A4.134 - Flustra foliacea and colonial ascidians on tide-swept moderately wave-exposed circalittoral rock
A4.2	A4.21 - Echinoderms and crustose communities on circalittoral rock
A5.1	A5.13 - Infralittoral coarse sediment A5.14 - Circalittoral coarse sediment
A5.2	A5.2 - Sublittoral sand
A5.4	A5.445 - *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment
A5.5	A5.521 - *Laminaria saccharina* and red seaweeds on infralittoral sediments

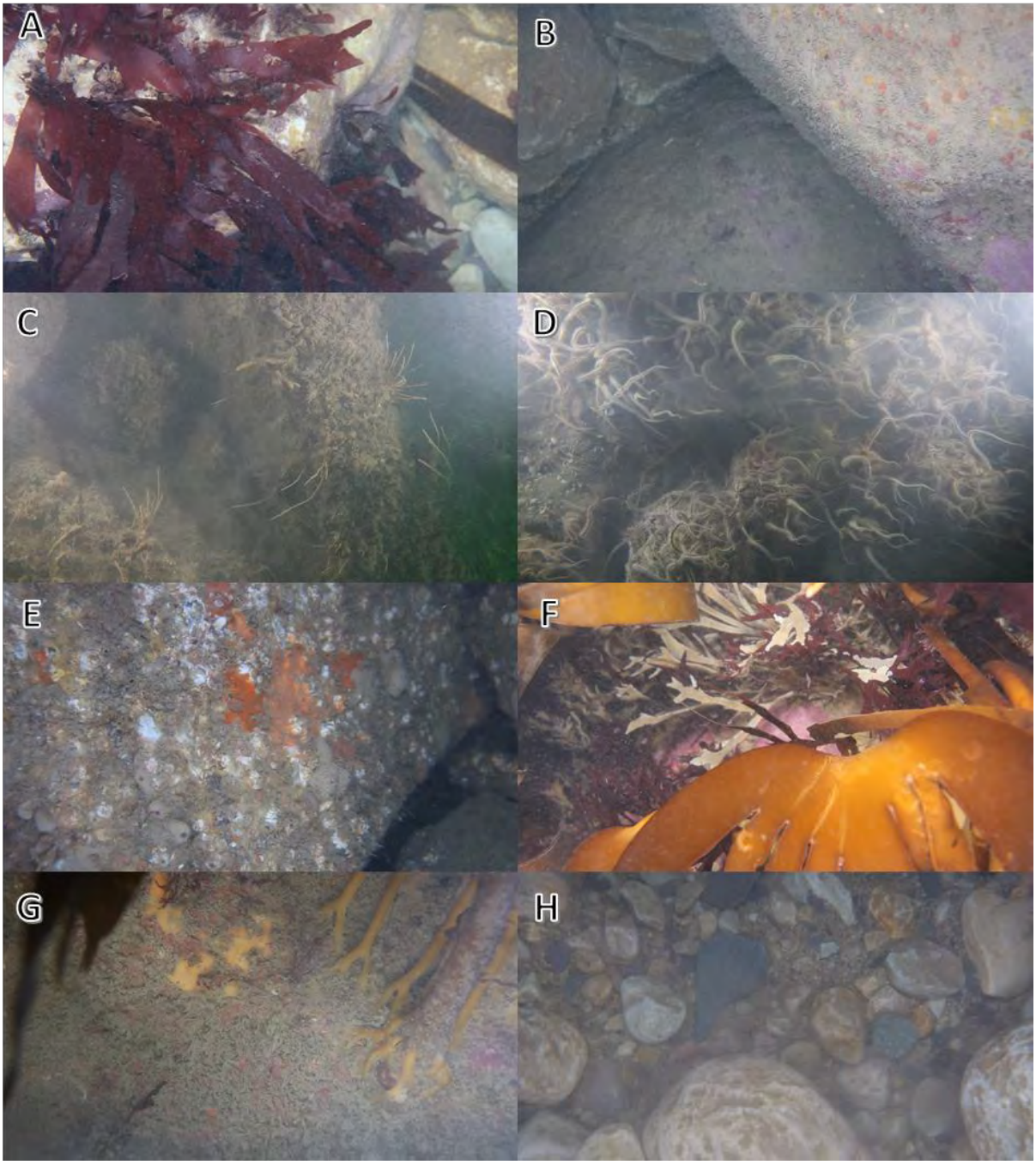

Plate 5 Example still images of EUNIS habitats and biotopes observed during the Holyhead Breakwater Refurbishment survey 2020. A) A3.116 - Foliose red seaweeds on exposed lower infralittoral rock B) A3.24 - Faunal communities on moderate energy infralittoral rock C) A4.131 - Bryozoan turf and erect sponges on tideswept circalittoral rock D) A5.445 - *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment E) A4.11 - Very tide-swept faunal communities on circalittoral rock F) A3.113 - *Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock G) A3.222 - Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered tideswept infralittoral rock H) A5.13 – Infralittoral coarse sediment.

Table 4 Summary of DDV transect data including EUNIS classifications assigned during the Holyhead Breakwater Refurbishment survey, 2020.

Transect	Video File	Point on Line	Video Coordinates		Length [m]	No. of Stills Analysed	EUNIS Description(s)	Fauna / Bioturbation / Debris	Annex I Reef?	Habitat FOCI	INNS?
			Easting [m]	Northing [m]							
001	ROYHOL0819_2020_001_17_0608	SOL	390129.5	5909711.8	320	26	A1.214 - *Fucus serratus* on moderately exposed lower eulittoral rock A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.113 - *Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock A3.116 - Foliose red seaweeds on exposed lower infralittoral rock A3.124 - Dense *Desmarestia* spp. with filamentous red seaweeds on exposed infralittoral cobbles, pebbles and bedrock A3.24 - Faunal communities on moderate energy infralittoral rock A4.131 - Bryozoan turf and erect sponges on tideswept circalittoral rock A5.13 - Infralittoral coarse sediment	Immediately adjacent to the structure, cobbles and boulders are bare with patches of the fucoid, *Fucus serratus* and limpets (*Patella* sp.). Moving away into deeper water dense patches of foliose red seaweeds with encrusting coralline algae dominate rock substrate. Band of kelp forest (*Laminaria hyperborea*) with understory of foliose red algae and occasional patches of dense *Desmarestia* sp. Beyond the band of kelp, mixed faunal turf communities dominate rock substrate before moving into a coarse sediment habitat with sparse fauna.	Yes	Yes	No
		EOL	390290.7	5909604.7							
	ROYHOL0819_DDV_T001_29_11_20_0542	SOL	390399.9	5909533.9							
		EOL	390309.2	5909595.2							
002	ROYHOL0819_2020_002_17_0609	SOL	390438.4	5909850.5	190	20	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.116 - Foliose red seaweeds on exposed lower infralittoral rock A3.124 – Dense *Desmarestia* spp. with filamentous red seaweeds on exposed infralittoral cobbles, pebbles and bedrock A3.22 - Kelp and seaweed communities in tideswept sheltered conditions A3.222 - Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered tideswept infralittoral rock A3.71 - Robust faunal cushions and crusts in surge gullies and caves A4.11 - Very tide-swept faunal communities on circalittoral rock A4.131 - Bryozoan turf and erect sponges on tideswept circalittoral rock A5.14 - Circalittoral coarse sediment	Cobbles and boulders are bare with patches of the fucoid, *F. serratus* and limpets (*Patella* sp.) adjacent to the breakwater structure. Moving away into deeper water dense patches of foliose red seaweeds with encrusting coralline algae and sponges dominate rock substrate. Band of kelp forest (*L. hyperborea*) with understory of foliose red algae and occasional patches of dense *Desmarestia* sp. Beyond the band of kelp, small area of mixed faunal turf communities and stunted growth red seaweeds dominate rock substrate before moving into a coarse sediment habitat with sparse fauna.	Yes	Yes	No
		EOL	390483.5	5909781.9							
	ROYHOL0819_DDV_T002A_29_11_20_0422	SOL	390527.2	5909693.4							
		EOL	390441.8	5909773.0							
	ROYHOL0819_DDV_T002B_29_11_20_0570	SOL	390544.0	5909691.4							
		EOL	390491.3	5909746.8							
003	ROYHOL0819_2020_003_17_0610	SOL	390740.0	5910054.0	320	7	A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.116 - Foliose red seaweeds on exposed lower infralittoral rock A4.13 - Mixed faunal turf communities on circalittoral rock	Adjacent to the structure, cobbles and boulders are bare with small patches of the fucoid, *F. serratus* and limpets (*Patella* sp.) but mainly dominated by dense foliose red seaweeds with encrusting coralline algae. Band of kelp forest (*L. hyperborea*) with	Yes	Yes	No
		EOL	390740.9	5909852.3							
	ROYHOL0819_DDV_T003_29_11_20_0429	SOL	390711.6	5909735.4							
		EOL	390665.0	5909837.3							

							A4.131 - Bryozoan turf and erect sponges on tideswept circalittoral rock	understory of foliose red algae and occasional patches of dense *Desmarestia* sp. Beyond the band of kelp, coarse pebble and stable cobble matrix with encrusting fauna.			
004	ROYHOL0819_2020_004_17_0611	SOL	391004.5	5910033.0	300	14	A1.21 - Barnacles and fucoids on moderately exposed shores A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.116 - Foliose red seaweeds on exposed lower infralittoral rock A4.11 - Very tide-swept faunal communities on circalittoral rock A4.131 - Bryozoan turf and erect sponges on tideswept circalittoral rock A5.445 - *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Immediately adjacent to the structure, cobbles and boulders are dominated by the barnacles (Balanoidea) and limpets (*Patella* sp.) with patches of *F. serratus* stunted in growth. Moving away into deeper water dense patches of foliose red seaweeds with encrusting coralline algae dominate rock substrate with occasional kelp. Band of kelp forest (*L. hyperborea*) with understory of foliose red algae and occasional patches of dense *Desmarestia* sp. Beyond the band of kelp, rock substrate is dominated by bryozoan / hydroid turf with red seaweeds before moving into a coarse sediment habitat with dense *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds, occasional Urticina sp.	Yes	Yes	No
		EOL	391016.1	5909865.7							
	ROYHOL0819_DDV_T004_29_11_20_0436	SOL	390996.6	5909733.5							
		EOL	390988.1	5909811.3							
005	ROYHOL0819_2020_005_17_0612	SOL	391317.6	5910000.2	270	20	A1.21 - Barnacles and fucoids on moderately exposed shores A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.113 - *Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock A3.116 - Foliose red seaweeds on exposed lower infralittoral rock A3.124 – Dense *Desmarestia* spp. with filamentous red seaweeds on exposed infralittoral cobbles, pebbles and bedrock A4.13 - Mixed faunal turf communities on circalittoral rock A5.14 - Circalittoral coarse sediment A5.445 - *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Adjacent to the structure, cobbles and boulders are dominated by the barnacles (Balanoidea) and limpets (*Patella* sp.) with patches of *F. serratus*. Moving away into deeper water dense patches of foliose red seaweeds with encrusting coralline algae dominate rock substrate with occasional kelp. Band of kelp forest (*L. hyperborea*) with understory of foliose red algae and occasional patches of dense *Desmarestia* sp. Amongst the kelp forest are areas of silted cobble and boulder devoid of growth. Beyond the band of kelp, rock substrate is sediment affected with red seaweeds before moving into a coarse sediment habitat with dense Ophiothrix fragilis and/or Ophiocomina nigra brittlestar beds.	Yes	Yes	No
		EOL	391344.6	5909845.8							
	ROYHOL0819_DDV_T005A_29_11_20_0451	SOL	391330.1	5909731.5							
		EOL	391334.5	5909738.9							
	ROYHOL0819_DDV_T005B_29_11_20_0459	SOL	391332.1	5909740.6							
		EOL	391308.6	5909806.3							
006	ROYHOL0819_2020_006_17_0613	SOL	391446.6	5910040.4	290	16	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.116 - Foliose red seaweeds on exposed lower infralittoral rock A5.14 - Circalittoral coarse sediment A5.2 - Sublittoral sand	Immediately adjacent to the structure, cobbles and boulders are bare with patches of the fucoid, *F. serratus* and limpets (*Patella* sp.). Moving away into deeper water dense patches of foliose red seaweeds with encrusting coralline algae dominate rock substrate. Band of kelp forest (*L. hyperborea*) with understory of foliose red algae and occasional patches of dense *Desmarestia* sp. Beyond the band of kelp, mixed faunal turf	Yes	Yes	No
		EOL	391583.7	5909898.2							
	ROYHOL0819_DDV_T006A_29_11_20_0473	SOL	391636.0	5909824.8							
		EOL	391604.6	5909869.0							
	ROYHOL0819_DDV_T006B_29_11_20_0486	SOL	391579.1	5909888.5							
		EOL	391577.7	5909901.7							

								communities with encrusting sponges and *Flustra foliacea* dominate rock substrate before moving into a coarse sediment habitat with coarse gravels, occasional *Crossaster papposus* and clean sands with sparse fauna.			
007	ROYHOL0819_2020_007_17_0614	SOL	391725.7	5910230.9	240	18	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.116 – Foliose red seaweeds on exposed lower infralittoral rock A3.24 - Faunal communities on moderate energy infralittoral rock A5.14 - Circalittoral coarse sediment	Immediately adjacent to the structure, cobbles and boulders are bare. Moving away into deeper water a band of kelp forest (*L. hyperborea*) with foliose red algae and occasional patches of dense *Desmarestia* sp. Beyond the band of kelp, mixed faunal turf communities including bryozoan / hydroid turf, ascidians and encrusting orange sponges dominate rock substrate before moving into a coarse sediment (coarse sands and gravels) with sparse fauna.	Yes	Yes	No
		EOL	391820.9	5910134.8							
	ROYHOL0819DDV_T007_29_11_20_0491	SOL	391894.7	5910068.4							
		EOL	391849.9	5910109.1							
008	ROYHOL0819_2020_008_17_0615	SOL	391992.3	5910500.7	250	28	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.113 - *Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock A3.116 – Foliose red seaweeds on exposed lower infralittoral rock A3.12 - Sediment-affected or disturbed kelp and seaweed communities A4.11 - Very tide-swept faunal communities on circalittoral rock A4.134 - *Flustra foliacea* and colonial ascidians on tide-swept moderately wave-exposed circalittoral rock A5.13 - Infralittoral coarse sediment A5.14 - Circalittoral coarse sediment A5.44 - Circalittoral mixed sediment A5.445 - *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Patchy kelp (*L. hyperborea*) with foliose red algae and occasional patches of dense *Desmarestia* sp. otherwise on clean cobble and boulder. Beyond the band of kelp, mixed faunal turf communities with encrusting sponges and *F. foliacea* dominate rock substrate before moving into a coarse sediment habitat with *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar. Rusted chain matrix and large, square concrete blocks present at the foot of the breakwater structure.	Yes	Yes	No
		EOL	392097.8	5910391.1							
	ROYHOL0819DDV_T008C_29_11_20_0519	SOL	392145.0	5910313.2							
		EOL	392093.6	5910379.4							
009	ROYHOL0819_DDV_T009_29_11_20_0585	SOL	392169.6	5910323.0	30	8	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds	Immediately adjacent to the structure, cobbles and boulders are bare with sporadic kelp fronds (*L. hyperborea*). Band of kelp forest (*L. hyperborea*) with foliose red algae. Beyond the band of kelp, consolidated rock and cobble substrate with faunal turf. Rusted chain matrix at the foot of the breakwater structure.	Yes	Yes	No
		EOL	392173.3	5910352.9							
010	ROYHOL0819_DDV_T010_29_11_20_0595	SOL	392178.7	5910315.3	25	10	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose	At the foot the breakwater structure, cobbles and boulders are bare with sporadic kelp fronds (*L. hyperborea*). Band of kelp forest (*L.*	Yes	Yes	No

		EOL	392189.6	5910332.4			red seaweeds A3.713 - Crustose sponges and colonial ascidians with *Dendrodoa grossularia* or barnacles on wave-surged infralittoral rock	*hyperborea*) with foliose red algae and areas of understory dominated by barnacles (Balanoidea) on rock. Beyond the band of kelp, consolidated rock and cobble substrate with faunal turf. Including ascidians (*Dendrodoa* sp.).			
011	ROYHOL0819_DDV_T011_29_11_20_0710	SOL	392193.6	5910299.1	20	14	A3.1 - Atlantic and Mediterranean high energy infralittoral rock A3.11 - Kelp with cushion fauna and/or foliose red seaweeds A3.116 – Foliose red seaweeds on exposed lower infralittoral rock A3.24 - Faunal communities on moderate energy infralittoral rock	At the foot of the breakwater, cobbles and boulders are bare. Band of kelp forest (*L. hyperborea*) with foliose red algae, grazing *Asterias rubens* and occasional patches of *Desmarestia* sp. Beyond the band of kelp, rock substrate is dominated by bryozoan / hydroid turf with red seaweeds.	Yes	Yes	No
		EOL	392211.8	5910296.4							

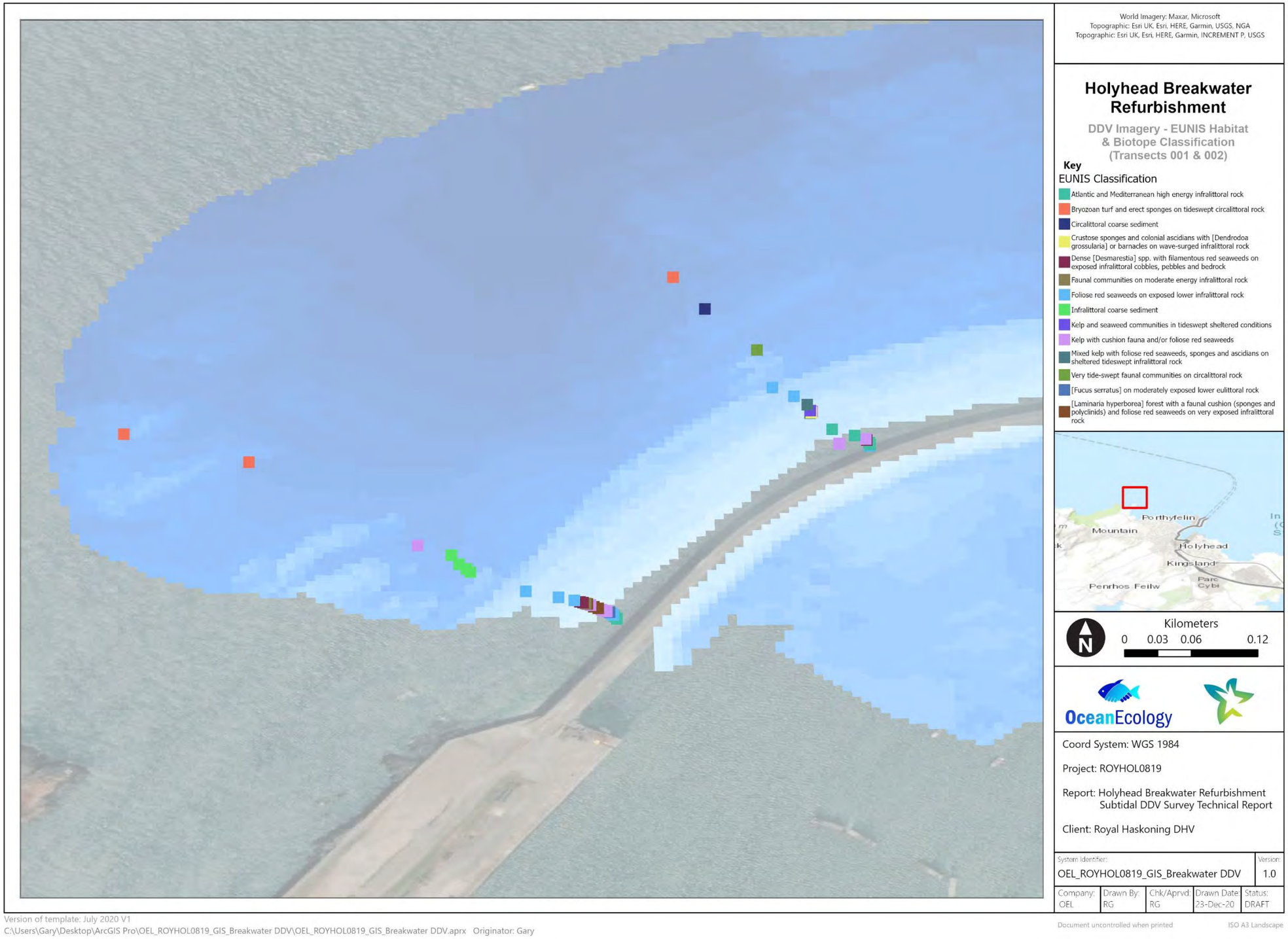

Figure 3 Distribution and classification of EUNIS habitats and biotopes during the Holyhead Breakwater Refurbishment survey, 2020 (Transects 001-002).

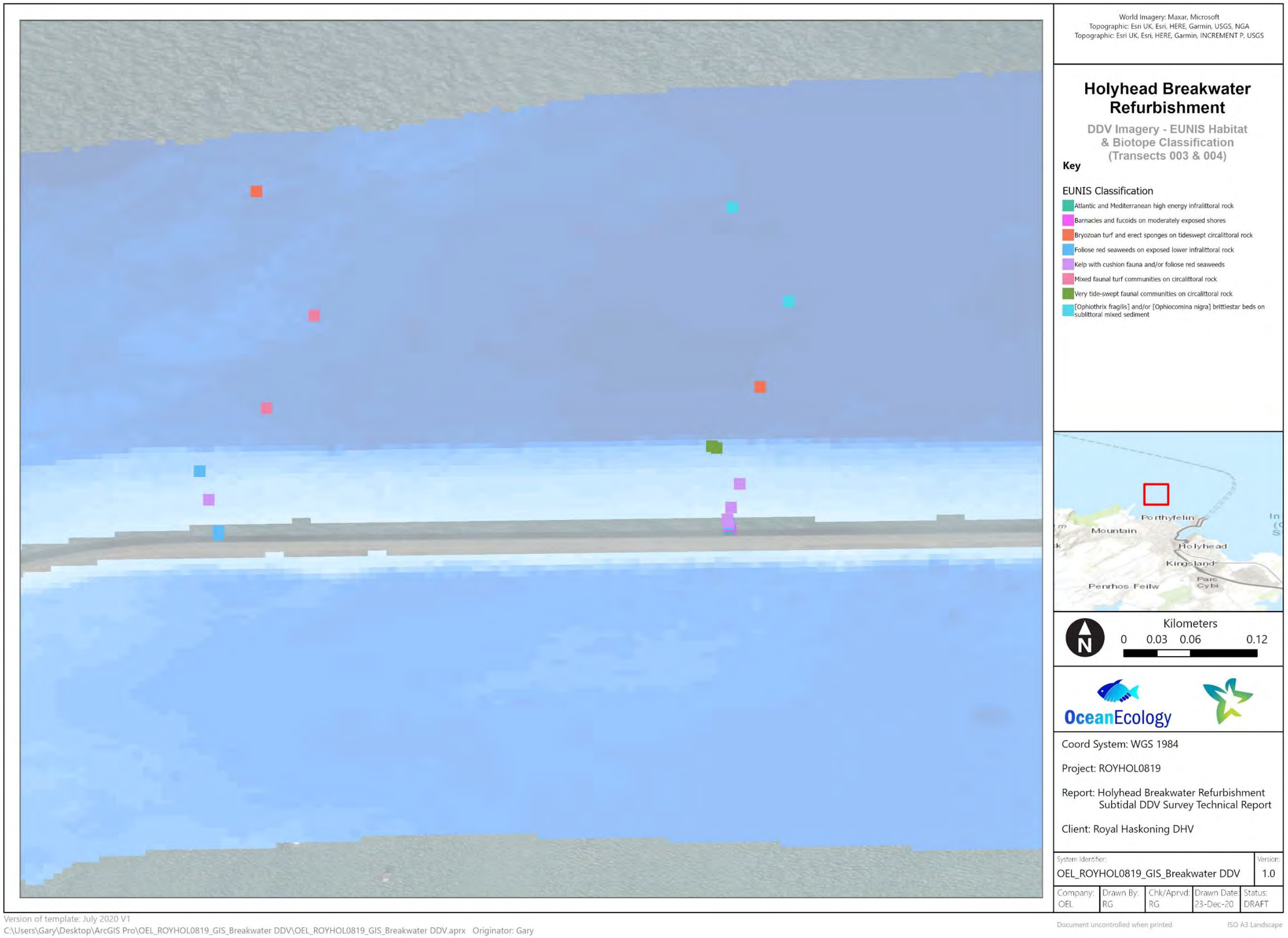

Figure 4 Distribution and classification of EUNIS habitats and biotopes during the Holyhead Breakwater Refurbishment survey, 2020 (Transects 003-004).

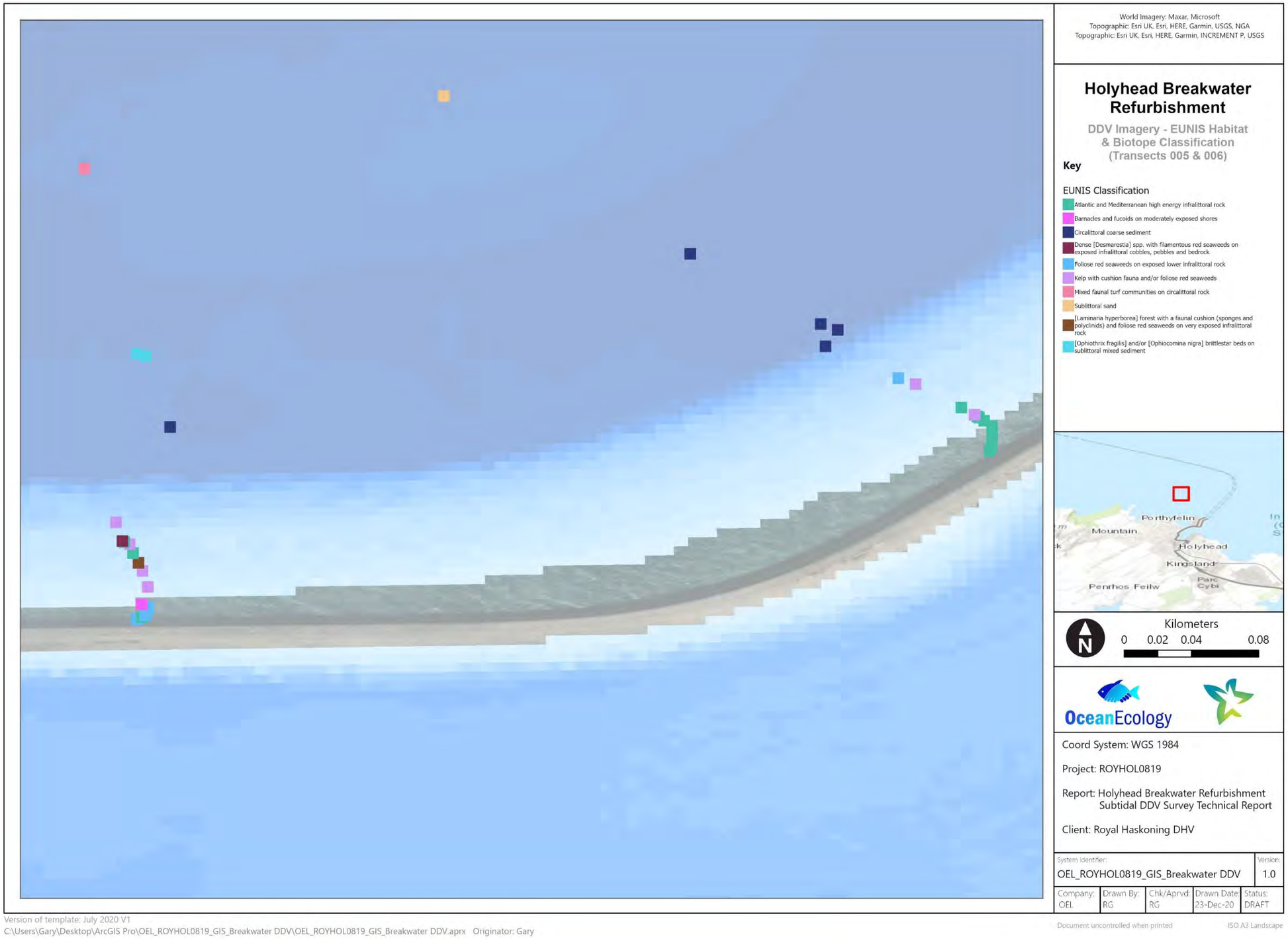

Figure 5 Distribution and classification of EUNIS habitats and biotopes during the Holyhead Breakwater Refurbishment survey, 2020 (Transects 005-006).

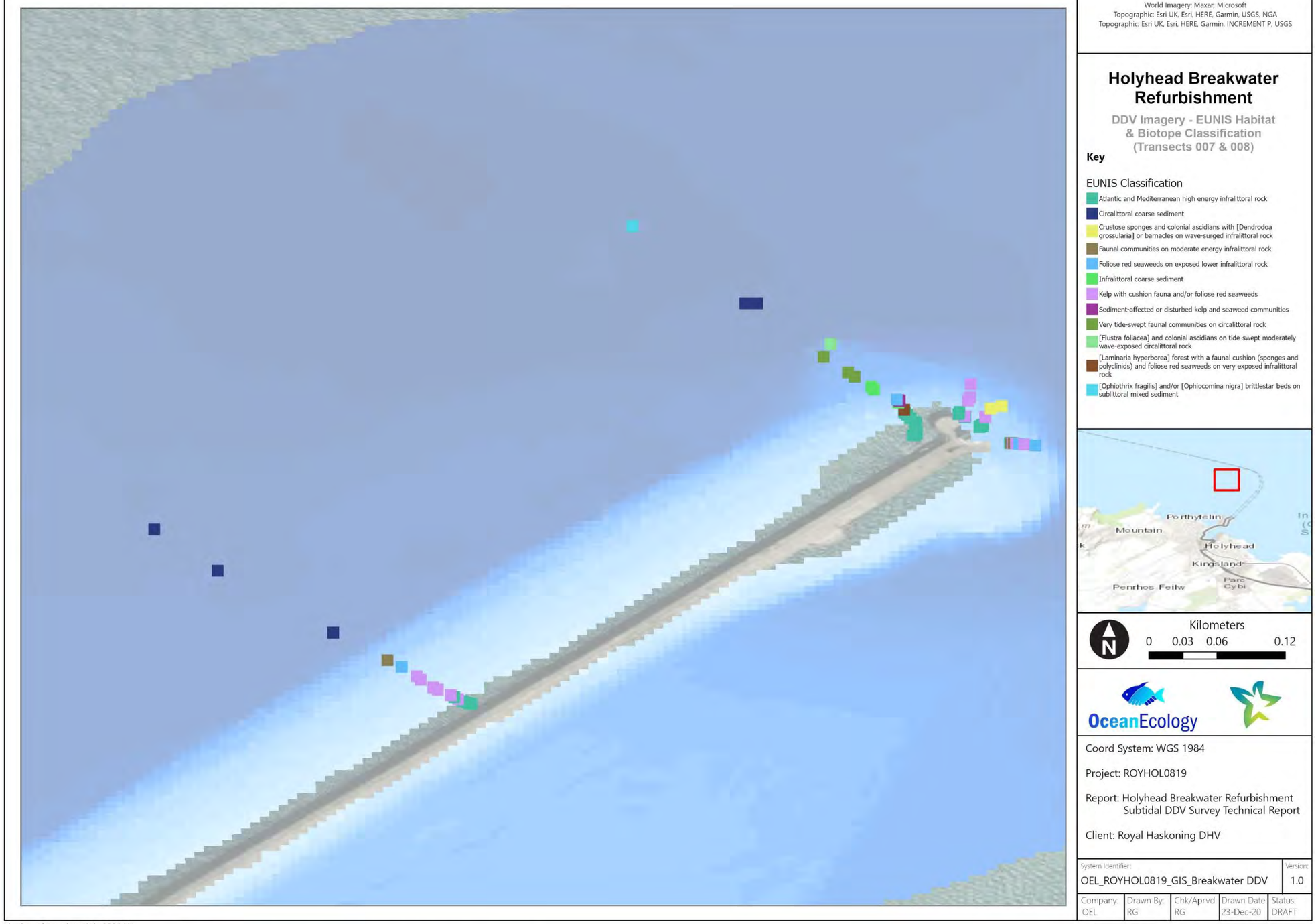

Figure 6 Distribution and classification of EUNIS habitats and biotopes during the Holyhead Breakwater Refurbishment survey, 2020 (Transects 007-008).

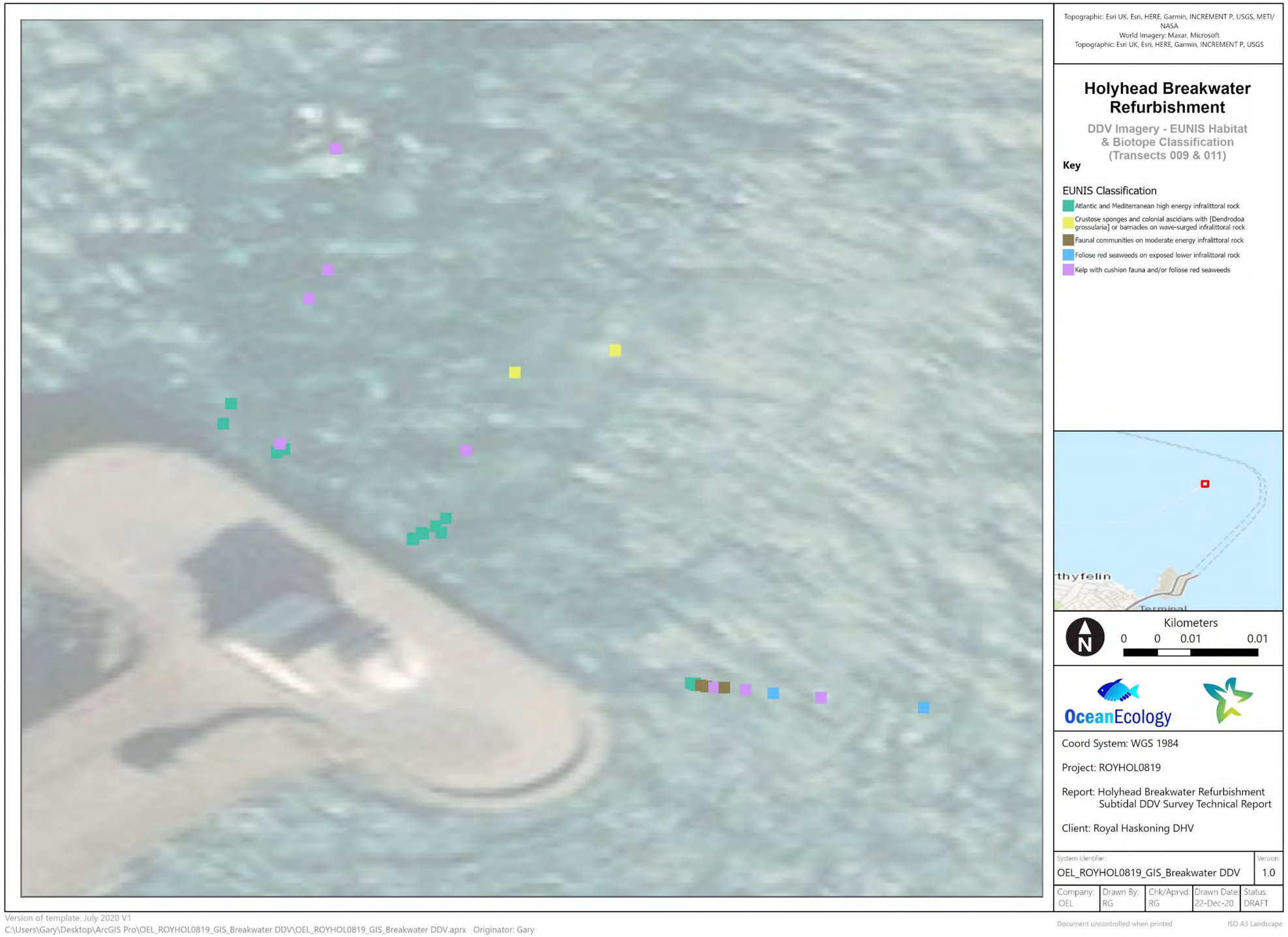

Figure 7 Distribution and classification of EUNIS habitats and biotopes during the Holyhead Breakwater Refurbishment survey, 2020 (Transects 009-011).

3.4. Notable Features

3.4.1. Sublittoral Rock Habitats

Sublittoral rock habitats were recorded in all 11 transects surveyed (Transects 001 – 011) and were deemed to represent Annex I 'Reef' habitats. Sublittoral rock habitats were present from the shallow sublittoral adjacent to the breakwater down to approximately 15m water depth where the habitat transitioned into sediment. Shallow sublittoral rock habitats (< 8m) were dominated by kelp and red seaweeds and deeper water sublittoral rock habitats were dominated by faunal communities including some areas of mixed faunal turf, dense *Flustra foliacea* and erect sponges.

No observations of Annex I biogenic reef forming species such as Ross worm (*Sabellaria spinulosa*) or horse mussel (*Modiolus modiolus*) were recorded.

3.4.2. Other Habitats of Conservation Interest

Eight habitats were recorded which were deemed to be representative of conservation interest as set out in Table 5. Of particular note was the band of kelp forest with red seaweeds and understory communities including coralline algal crusts, barnacles and encrusting sponges. This band was representative of the EUNIS Level 6 biotope – 'A3.2121 - *Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock' and was present on all transects indicating it is likely to extend the length of the breakwater on the seaward side. Kelp habitats were generally recorded between 2m and 8m water depth.

3.4.3. Seapens (Virgularia mirabilis)

There were no seapens (*V. mirabilis*), a characteristic species of the OSPAR habitat 'Seapens and burrowing megafauna communities', recorded during this survey.

3.4.4. Invasive Non-Native Species (*Didemnum vexillum*)

There were no confirmed observations of the carpet sea squirt *D. vexillum* recorded on the hard substrate surrounding the breakwater or on the rock matrix of the breakwater structure itself. However, the absence of *D. vexillum* cannot be ruled out. There were no other INNS recorded during the survey.

Table 5 List of representative HOCI present during the Holyhead Breakwater Refurbishment survey 2020.

EUNIS Code	EUNIS Description	ANNEX I	FOCI
A3.11	Kelp with cushion fauna and/or foliose red seaweeds	Yes	Representative of '*Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock'
A1.214	[Fucus serratus] on moderately exposed lower eulittoral rock	Yes	Representative of '*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders'
A3.113	[Laminaria hyperborea] forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock	Yes	Representative of '*Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock'
A3.222	Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered tideswept infralittoral rock	Yes	Representative of '*Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock'
A3.22	Kelp and seaweed communities in tideswept sheltered conditions	Yes	Representative of '*Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock'
A4.13	Mixed faunal turf communities on circalittoral rock	Yes	Representative of 'Mixed turf of bryozoans and erect sponges with *Dysidia fragilis* and *Actinothoe sphyrodeta* on tide-swept wave-exposed circalittoral rock'
A5.445	[Ophiothrix fragilis] and/or [Ophiocomina nigra] brittlestar beds on sublittoral mixed sediment	No	Representative of '*Ophiothrix* fragilis and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment'
A5.2	Sublittoral sand	No	Representative of 'Infralittoral mobile clean sand with sparse fauna'

3.5. Bullnose Inspection Transect

The bullnose ROV inspection transect was run from west to east on the intersection of the breakwater footings and the seabed and then from west to east approximately 3m above the seabed. Low visibility due to water clarity meant the ROV had to be flown within 0.5m of the wall and therefore the field of view was restricted. The seabed at the footing of the bullnose was a mosaic of coarse sediments, representative of 'A5.13 - Infralittoral coarse sediment' and clean, stable cobbles representative of 'A4.2 - Atlantic and Mediterranean moderate energy circalittoral rock'.

3.5.1. Biological communities

The lower footings of the bullnose were characterised by a turf of bryozoans and hydroids with occasional encrusting sponges and grazing echinoderms including *Asterias rubens* and *Crossaster papposus*, representative of *'A4.21 - Echinoderms and crustose communities on circalittoral rock'*. The upper section of transect was characteristic of the vertical rock wall biotope '*A3.117 - [Laminaria hyperborea] and red seaweeds on exposed vertical rock*' with red algae, occasional kelp fronds and a turf of bryozoans and encrusting sponges. There was no indication in the imagery obtained that the INNS, *D. vexillum* was present on the breakwater structure. Example images of observed biological communities is provided in Plate 6.

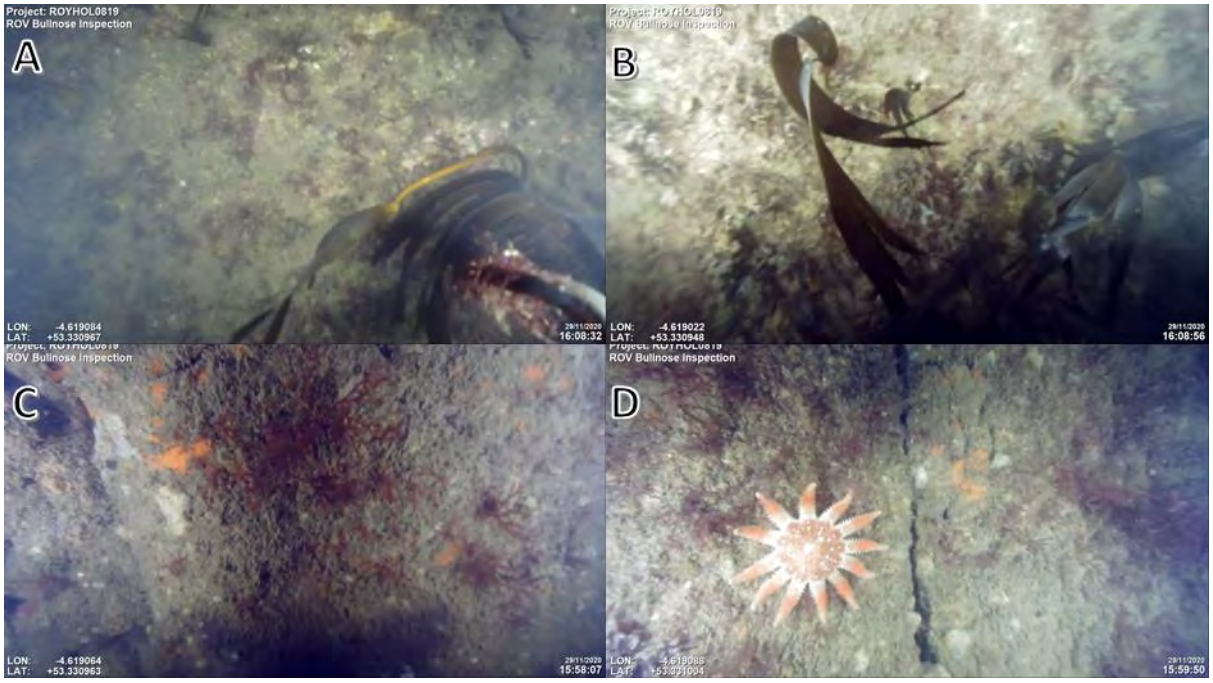

Plate 6 Biological communities identified on the breakwater bullnose during ROV inspection transect. A & B) A3.117 - *Laminaria hyperborea* and red seaweeds on exposed vertical rock C & D) A4.21 - Echinoderms and crustose communities on circalittoral rock.

3.5.2. Degradation of Structure

There were several observations of potential damage to the breakwater structure made during the inspection survey. Overall, the superficial condition of the structure appeared sound for large sections with the intersection between the breakwater footings and the seabed without damage however, some areas exhibited signs of possible scouring and undercutting where the lower block appeared to be unsupported in part (Plate 7 A – B). This was observed at several locations along the length of the bullnose structure but were restricted to small ~ 0.5m sections.

In addition, it appears that two of the bottom blocks have been dislodged from the main structure (Plate 7 C – D). These blocks appear to have been dislodged for some time as the exposed inner blocks are colonised with faunal turf communities. In both examples, a large, rusted chain matrix was observed to be laying scattered on the seabed, immediately adjacent to the location of the missing block sections.

Evidence of significant cracking of the central section of the breakwater structure above the waterline was also observed from the vessel. This crack was running vertically through 5-6 blocks of the bullnose (Plate 8).

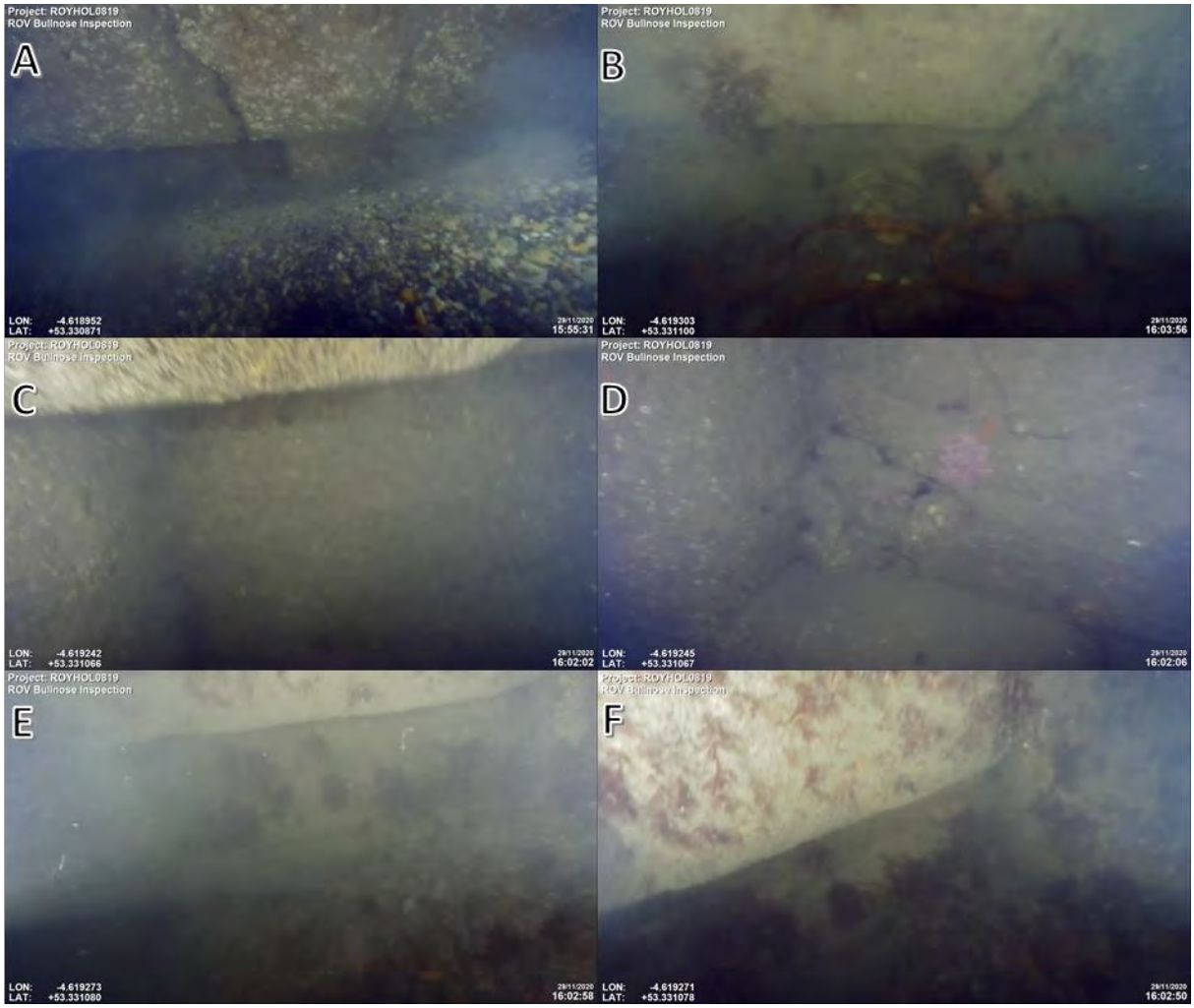

Plate 7 Evidence of potential underwater degradation of the breakwater bullnose structure A & B) undercutting and scour of the footings C - D) evidence of two missing blocks in the lower block structure with associated chain matrix on seafloor.

Plate 8 Evidence of cracking within the main bullnose structure above the waterline observed during ROV inspection transect.

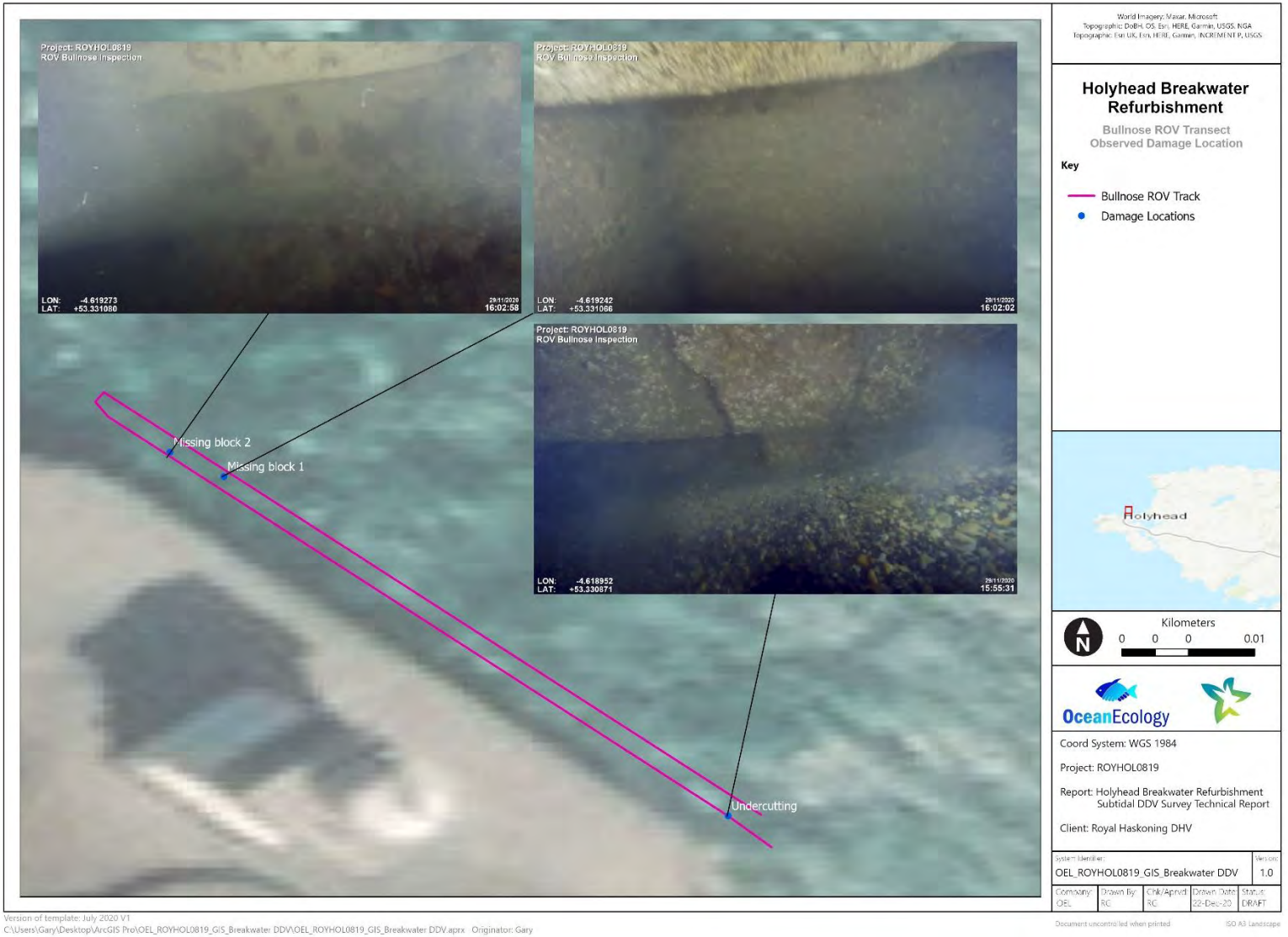

Figure 8 ROV Track and location of damage to breakwater structure observed during the Holyhead Breakwater Refurbishment survey, 2020.

4. Discussion & Conclusions

OEL were commissioned by RHDHV to undertake benthic ecology survey of Holyhead Breakwater, Holy Island as part of an ongoing EIA process for the proposed Holyhead Breakwater Refurbishment. This survey focused on the seaward side of the breakwater following a previous survey commissioned by RHDHV of the leeward side of the breakwater.

Video and still imagery were collected at all 11 proposed transect locations including an additional ROV inspection transect undertaken on the footings of the breakwater bullnose. Following data collection all images were analysed in the laboratory by an experienced marine ecologist who was also present in the field at the time of sampling. This ensured the assessment of the imagery against the project remit was consistent and further informed with in-situ field experience.

A total of 22 EUNIS habitats and biotopes were observed during the survey with each transect along the breakwater showing a similar succession of habitats with increased distance away from the breakwater wall . Immediately adjacent to the base of the breakwater, rock substrate was bare and devoid of fauna and flora. Moving away from the breakwater, kelp (*Laminaria* sp.) and foliose red seaweeds dominated to approximately 10m water depth. Beyond, biotopes were dominated by fauna with rock substrate being encrusting with bryozoan / hydroid turf and mixed faunal turf communities. The sediment areas way from the breakwater were dominated by coarse / mixed sediments as well as areas of clean sands with sparse fauna with some areas of dense brittlestar (*O. fragilis* and/or *O. nigra*).

All sublittoral rock habitats observed were deemed to represent Annex I 'Reef' habitats and eight habitats (rock and sediment) recorded were deemed to be representative of conservation interest including a band of kelp forest with red seaweeds and understory communities representative of the 'A3.2121 - *Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock'. Kelp habitats were noted on all transects throughout the length of the breakwater and most dense between 2m and 8m water depths aligning with existing EMODnet mapping.

There were a number of observations of what was thought to potentially be colonies of the invasive non-native carpet sea squirt, *D. vexillum*, restricted to boulders immediately adjacent to the breakwater structure on transects 005 and 006. Imagery was not conclusive due to the difficultly in identifying *D. vexillum* from visual means alone and the possibility of confusion with other similar appearing species (e.g. other *Didemnum* species, *Lissoclinum* spp., *Tridemnum* spp. and some sponges). In order to confirm whether these colonies were indeed representative of *D. vexillum*, a follow up dive survey would be required to either confirm presence in-situ or via laboratory examination of specimens collected.

Following an ROV inspection transect of the breakwater bullnose structure, there were several observations of potential degradation of the breakwater structure including possible

undercutting and scour of the footings between the block structure and the rubble mound the breakwater sites as well as missing blocks. Further investigation of the ROV imagery by an experienced engineer is recommended to confirm and assess these areas of potential damage.

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Appendix 14

Visual Setting

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14.1 Visual Appraisal Report

Holyhead Breakwater Refurbishment Scheme

Visual Appraisal

March 2020

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Report Number	Revision	Date Issued	Recipient
080-01-R1	00	26 March 2020	Royal HaskoningDHV
080-01-R1	01	01 May 2020	Royal HaskoningDHV
080-01-R1	02	12 May 2020	Royal HaskoningDHV

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Holyhead Breakwater Refurbishment Scheme

Visual Appraisal

1 Introduction

DRaW (UK) Ltd was appointed by Royal HaskoningDHV in September 2019 to undertake a visual appraisal of the proposed Holyhead Breakwater Refurbishment Scheme, located on Holy Island, west of the Isle of Anglesey. The appraisal includes the production of photomontage visualisations and forms part of the consenting requirement of the Competent Authority.

Methodology used in the preparation of the appraisal is based on the Guidelines for Landscape and Visual Impact Assessment, Third Edition (LI & IEMA 2013) (referred to as GLVIA3 in this appraisal).

The study comprised:

- Mapping the key landscape and visual constraints;
- Site visits to assess existing views and take photographs from key receptor locations;
- An appraisal of the predicted effects to visual receptors and key viewpoints, including protected sites; and
- Production of photorealistic visualisations to aid understanding of the visual effects arising from the proposed refurbishment works.

1.1 The Site

Proposed refurbishment works are located along the seaward and leeward sides of Holyhead Breakwater, a 'Z-plan' breakwater that extends across Holyhead Bay to the north of Holyhead town.

The site and study area adopted for the appraisal are shown on Drawing 01, Landscape Constraints.

1.2 The Proposed Development

The proposed refurbishment works include the placement of concrete armour units (Tetrapods) along the entire seaward face of Holyhead Breakwater, extending around the nose and then approximately 100m along the leeward edge of the breakwater. Each individual Tetrapod is approximately 4m in height. Tetrapods would be placed in rows running parallel to the breakwater and stacked in two interlocking layers of approximately 5.2m overall depth. The width of the Tetrapods would extend approximately 30m out from the breakwater on a gentle downward gradient. Tetrapods would be placed individually by marine plant. At the toe of the Tetrapods, an outer, double layer of interlocking 60t Chevron concrete armour units would be placed to prevent the Tetrapods being moved by breaking waves.

Tetrapods would extend approximately 1.1m above Mean High Water Spring level resulting in permanent visibility of units in closest proximity to the breakwater. At low tide the full 30m width of the Tetrapods would be visible, extending outwards from the breakwater.

Other works include the placement of a 10-15m wide Articulated Concrete Block Mattress (ACBM) on the leeward side of the breakwater. The ACBM would not be visible at low water. Small areas of loose rock armour would be placed at the end of the concrete armour units, alongside Soldiers

Point quay and at the head of the breakwater between the existing wall and inner side of the Tetrapods.

The delivery and storage of construction materials would be either to Salt Island or Soldiers Point quay. Fabrication of the concrete armament would also either be at Salt Island or Soldiers Point quay and would require the use of a concrete batching plant and associated ancillary features. Delivery and storage of materials at Salt Island and fabrication at Soldiers Point quay would require transportation of materials between the two sites.

Concrete armour units would be transported to the construction site by barge and placement of units would be undertaken by marine based plant, either a jack-up or floating barge with spud legs or other anchoring system.

1.3 Limitations

The method employed for the visual assessment provides a general overview and a preliminary indication of the appearance and likely effects of the proposed refurbishment works.

1.4 Information Sources

Information was obtained from the following sources:

Data Source	**Reference**
Landscape Institute & Institute of Environmental Management and Assessment.	Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (2013)
Ordnance Survey	Ordnance Survey 1-25000 digital and raster mapping
Aerial photography	Google Maps / Bing Maps
Ordnance Survey	Terrain 5 Digital Terrain Model data
Isle of Anglesey County Council / Gwynedd Council	Anglesey and Gwynedd Joint Local Development Plan 2011-2026 (July 2017)
NRW	LANDMAP, Visual & Sensory, 2016

2 Legislative and Policy Context

The Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026

The Local Development Plan includes the following polices relevant to the proposed development and/or landscape and visual issues:

Policy AMG1: Area Of Outstanding Natural Beauty Management Plans

Policy AMG 1 states: *'Proposals within or affecting the setting and/ or significant views into and out of the Areas of Outstanding Natural Beauty must, where appropriate, have regard to the relevant Area of Outstanding Natural Beauty Management Plan'.*

Policy AMG 4: Coastal Protection

Policy AMG 4 states: 'A proposal on the coast must not *cause unacceptable harm to…The built environment, or the landscape, or seascape character'… and*

'Priority is given to locations with close visual connection to current buildings or existing structures…'

Policy AT 1: Conservation Areas, World Heritage Sites and Registered Historic Landscapes, Parks and Gardens

Policy AT1 states: '*Proposals within or affecting the setting and/ or significant views into and out of Conservation Areas, World Heritage Sites and Registered Historic Landscapes, Parks and Gardens shown on the Constraints Map must, where appropriate, have regard to: Adopted Conservation Area Character Appraisals, Conservation Area Plans and Delivery Strategies….'*

3 Baseline Description

Drawing 01 Landscape Constraints shows the key landscape constraints and designations within the study area.

This section of the appraisal outlines the baseline visual condition of the site and its surroundings, against which the potential effects of the proposed refurbishment works can be identified.

3.1 Site Context

Study Area

The study area encompasses the northern shoreline of Holy Island and the primary settlement of Holyhead town with secondary settlements at Pont Hwfa and Llaingoch extending west towards Holyhead Mountain and Kingsland extending inland to the south.

Holyhead Port lies at the core of the town, defined by relatively dense settlement patterns that have emerged through the development of the port as a commercial hub and latterly as a leisure and tourism gateway to and from Ireland. The port character is strongly industrial and dominated by large ferry terminal buildings and the railway stations. Salt Island is partly reclaimed from the sea and extends the port facilities seawards into Holyhead Bay. Holyhead Breakwater extends across the bay to the north, providing essential shelter to both the town and the port. New Harbour is located between the leeward side of the breakwater and Salt Island. Holyhead Marina is located to the west of the harbour and has cruising vessel moorings. Marina landside facilities include apartments, shops, a sailing club and lifeboat station shop, part of the listed Trinity House workshops and office complex.

Newry Beach forms the southern shoreline to New Harbour. A wide concrete promenade allows views across the harbour. The beach margin is sheltered by grass banks to the south and elevated areas of open amenity grassland that are bisected by Beach Road. To the east of Newry Beach there are rocky and sandy sections of beach between jetties. Facilities include the Maritime Museum and a restaurant located in the former lifeboat house, also a listed building. To the east is Mackenzie Landing and an industrial complex of marine, boatyard facilities and the Coastguard Maritime Rescue centre.

Topography

Holy Island consists of low, undulating landforms, with characteristic and frequent rocky outcrops and knolls (Drawing 02 Aerial Photograph & Photograph Locations). Inland topography typically reaches between 10 meters Above Ordnance Datum (mAOD) to 35mAOD, rising towards the west of the study area and culminating in the rocky topped Holyhead Mountain. The mountain is the highest feature on Holy Island (and the Isle of Anglesey as a whole) and forms an important and highly distinct backdrop to most views.

Public Rights of Way

The long distance, Isle of Anglesey Coastal Path circumnavigates Anglesey and Holy Island, with the official start point at Holyhead. The path passes coastal margins to the north of Holyhead via existing tracks, public rights of way or minor roads. The route passes Newry Beach, to Soldiers Point (south west of the breakwater) and then on to the rocky headland of Ynys Wellt. It follows the northern shoreline, rising onto cliff tops immediately north of Holyhead Mountain. There is a relatively dense network of paths to the west of Holyhead and north of Llaingoch that extend across the foothills and peaks of Holyhead Mountain. Elevated paths obtain extensive panoramic views.

There are areas of Open Country to the west of Holyhead.

Designations

Designations within the relevant to the appraisal set out below and their locations are shown on Drawing 01.

Area of Outstanding Natural Beauty

The Anglesey Area of Outstanding Natural Beauty (AONB) lies partly within the study area. The site boundary is located 1.3km from the AONB boundary.

Planning Policy Wales, (Edition 10 para 6.3.7) advices '*Great weight should be given to conserving and enhancing the natural beauty of AONBs, and regard should be given to the wildlife, cultural heritage and social and economic well-being of the areas*'.

Conservation Area

There are three Conservation Areas within the study area: Holyhead Mountain Village, Holyhead Central and Holyhead Beach.

Most relevant to this assessment is the Holyhead Beach Conservation Area; the western boundary extends to Soldiers Point, approximately 200m from the site boundary.

The Holyhead Beach Conservation Area extends along the coast between Holyhead Old Harbour and Soldiers Point. The ability to obtain relatively uninterrupted views into and out of the area are considered to be important to its overall character. In particular the more open areas of parkland in the central zone that includes views from 'the upper and lower promenades towards the lively new harbour, enormous breakwater, harbour lighthouse and passing ferries, Holyhead Mountain and Quarry and Porthyfelin House and Soldier's Point'. Important views towards the Conservation Area include those from the sea (ferry passengers), from the breakwater, from New Harbour (towards the promenades and greens) and from Soldier's Point (also across New Harbour towards Trinity Yard Workshops and the greens beyond).

Listed Buildings

There are a number of important listed buildings both within and in proximity to the site boundary:

- Holyhead Breakwater (Grade II*);
- Lighthouse on Holyhead Breakwater (Grade II);
- Soldier's Point House and associated screen wall (Grade II);
- Porthyfelin House (Grade II); and
- Trinity House Office and workshops (Grade II).

Representative viewpoints used in this appraisal are considered to provide an indication of the likely effects upon views to and from listed buildings. It should be noted that issues relating to setting of listed buildings and specific visual effects are addressed separately.

The Breakwater and Environs

Holyhead Breakwater is the longest breakwater in the UK at just over 2.4km in length. The breakwater is a key feature within Holyhead Bay and provides shelter to a large tract of deep water to the north of Holyhead town and its harbours.

The breakwater is an example of major Victorian engineering, opened in 1873 after a 25 year construction period, employing 1300 men, forty of whom lost their lives. Its construction was to provide a 'roadstead' - a safe anchorage - to shipping that may be awaiting access to the harbour. The breakwater was a key factor in allowing increased shipping activity between Ireland and the UK and continues to serve a vital role in the maritime and shipping industry.

Holyhead Breakwater emerges from the north east of Soldiers Point; a rocky headland located to the north west of Holyhead. Soldiers Point quay forms the initial 300m section of the structure and is approximately 90m wide. The structure narrows to 17m in width and forms the main breakwater superstructure. The narrow 'Z' shape form of the jetty sweeps to the east in a gentle arc, follows a straight alignment (west – east) for approximately 780m and then sweeps to the north east and a 780m straight section, terminating at the walled lighthouse that stands on an ovoid shaped platform on the nose of the breakwater. The unusual, square, black and white lighthouse stands approximately 16m above the breakwater. It is an important navigational aid and forms a local landmark in views.

Figure 1 Holyhead Breakwater: stone parapet seaward wall, upper and lower landings.

The outer, seaward facing breakwater wall is constructed from massive 10 tonne limestone blocks, raised as a parapet that shelters an upper, masonry landing and lower landing on the leeward side. The parapet wall stands approximately 10mAOD, the masonry landing approximately 8.8mAOD and the lower landing at 4.2mAOD. During construction of the breakwater the lower landing area carried a railway track and was used to transport stone material from Holyhead Mountain. The track was later downsized for use by maintenance engines and then decommissioned in the 1980's with the use of wheeled maintenance vehicles. The lower landing is surfaced in stone aggregate and areas of stone flags on the approach to the lighthouse.

At low astronomical tide approximately 22m width of the rubble and rocky base to the breakwater becomes exposed on the seaward side and a narrow, intermittent margin of the base is seen on the leeward side. At average tides the breakwater walls are awash.

Figure 2 Holyhead Breakwater at low tide exposing the seaward rocky base

The breakwater is an important visual landmark, cultural heritage asset and recreational feature; the upper and lower landings provide elevated promenades that are often used by walkers, cyclists and fishermen drawn towards the lighthouse at the head of the breakwater.

Views from the breakwater

The breakwater provides a range of views that are experienced by numerous recreational visitors. Views shift focus on the outward and return journeys and can be attractive or dramatic, depending on weather and sea state. The initial section from Soldiers Point passes the ruined Soldiers Point House and the screen wall to the house (both Grade 2 Listed). There is a sense of neglect on the quayside approach with general waste, rough grassland, ponded stone aggregate surfaces, abandoned boats and material stockpiles detracting from the quality and character of the view (Drawing 4A, VP2). A large warehouse building and associated yard area emphasises the active working aspect of the quayside area. Views west from the quayside are across a rocky shoreline and pebble beach to the low cliff headland of Ynys Wellt. Contrasting views east are more urban in character, looking across Holyhead Marina to Orthios Jetty, the town and its port facilities.

Moving seaward along the breakwater views rapidly become more open and exposed. There is often the dramatic sound of waves breaking against seaward defences, the call of gulls and rush of the wind. The solidity of the breakwater structure and mass of the stonework become apparent although in context of the vast surrounding sea and sky above, its scale is diminished and the serpentine form retains a certain grace. Views are shifted from open seas to the north west then to the east and south east, across Holyhead Bay and distant land masses on Anglesey.

The wide stone parapet wall stands approximately 1.2m above the upper landing and looking directly out towards the sea, it prevents views down onto the base of the breakwater. The base and lower wall can be seen in views along the length of the breakwater, where the observer has sight of the opposing sweep of the wall (Figure 2).

The lighthouse at the head of the breakwater is the focal point of the outward journey. It is generally seen to sit below the distant land mass of Anglesey but the unusual square white tower with black band remains a distinct feature in the local scene and is the destination for recreational users of the breakwater. The head of the breakwater comprises of a lozenge shaped landing enclosed by a massive stone parapet wall. The area provides a full vista of the surrounding seascape and bay. Passenger ships pass close by, adding scale and drama to the scene. The head projects out into the seaward and leeward side of the breakwater allowing views back along the outer walls of the breakwater. The view along the near vertical, dark stone wall on the seaward side, draws the eye unavoidably to Holyhead Mountain (refer to Drawing 04A, VP3). Waves are often seen and heard crashing against the outer wall.

Figure 3 View from the lighthouse along the leeward breakwater

Inward views towards Holyhead include distant views to shipping and other features at Salt Island and the port. Ferries docked at Salt Island Terminals 3 & 5 are visible in the skyline, seen behind the Orthios Jetty that extends out into the sheltered waters of New Harbour. Holyhead town forms a low, rising horizon to the south (Figure 4). Holyhead Mountain is the dominant land mass to the south west forming a dramatic focal point on the return journey. The Snowdonia and Llyn Peninsula mountain ranges are seen on the far horizon to the south east.

Figure 4 Leeward breakwater view across New Harbour

Views north and north west are marked in contrast. Expansive and rougher open waters stretch out to the far horizon and there are distant views to The Skerries and lighthouse. Carmel Head and the low peak of Mynydd-y-Garn can be seen on Anglesey.

Views towards the breakwater

The breakwater is a significant visual feature seen from the town and coastal margins. Most outward views north from Holyhead capture something of the breakwater as it extends north eastwards across Holyhead Bay. In low level views from the coastline and Newry Beach the breakwater forms a low, uniform middle distant horizon (Drawing 4A, VP1). The raised leeward breakwater wall screens views to open sea beyond the bay, creating a clean divide between a vast sky above and expansive sea below. The eastern end is punctuated by the lighthouse, seen against a backdrop of low hills and the Anglesey coastline.

Landed views to the seaward facing breakwater walls are restricted to distant, elevated vantage points on Holyhead Mountain and coastal margins located immediately to the west of the breakwater; notably the relatively close range views from Ynys Wellt headland and the Isle of Anglesey Coastal Path (Drawing 04B, VP5 & 6). In elevated views the breakwater is seen clearly extending out across the bay (Figure 5), its distinct serpentine form draws the eye and is a key feature in the panoramic view. The seaward north-facing wall often appears dark and shadowed, contrasting with the sunlit south facing wall to the leeward side.

Figure 5 Elevated view from Holyhead Mountain

4 Visual Effects

4.1 Viewpoint Appraisal

The viewpoint appraisal was based on:

- Site observations made during visits undertaken in November 2019 and February 2020; and
- Zone of Theoretical Visibility (ZTV) analysis.

An assessment of visual effects was undertaken from 6 viewpoints, which were selected to represent typical views from key receptors at varying distances and orientations from the breakwater. From each viewpoint the following information is provided:

- A representative photograph;
- A description of the existing view; and
- A qualitative assessment of the predicted visual effects.

Representative viewpoint locations are shown on Drawing 01 and views illustrated in Drawings 04A and 04B (Appendix B). The assessment of representative viewpoints is provided in Appendix A.

To support the assessment process, computer generated photomontage views have been prepared from selected representative viewpoints to illustrate the appearance of the operational scheme. Proposed Tetrapod units have been computer modelled and an output render superimposed on the viewpoint photograph. The photomontage images illustrate the proposed scheme at low tide, revealing most of the Tetrapod units and as such they are considered to be worst case views. It should be noted that due to the undulating nature of the existing rubble mound, the Tetrapod units will be slightly less uniform than shown in the photomontages. Photomontage views 3, 4, 5 and 6 are shown on Drawings 05, 06, 07 and 08 respectively.

4.2 Zone of Theoretical Visibility

The ZTV analysis (Drawing 03) was undertaken to help identify:

- the area from which the proposed refurbishment works may be visible;
- locations of potential high sensitivity visual receptors; and
- the extent of the AONB that may be subject to visual effects.

The ZTV has been generated using target points located on the outward edges of the proposed Tetrapod units. The ZTV takes into account screening afforded by landform, buildings and significant vegetation belts. The ZTV does not take into account other minor, intervening features that, in combination, would further reduce visibility across the study area. The ZTV is therefore considered to represent a 'worst case' scenario.

4.3 Visual Receptors

High sensitivity visual receptors include:

- Communities or residents at home, where views contribute to the setting or visual amenity of the house or settlement;
- Travellers on recreational or scenic routes, (including public rights of way) where awareness of views is likely to be high; and
- People who are engaged in outdoor recreation, whose attention or interest is likely to be focussed on the landscape, or on particular views.

Specific high sensitivity receptors relevant to this appraisal include:

- Users of the Isle of Anglesey Coastal Path;
- Users of the breakwater; and
- Walkers and other recreational users of Holyhead Mountain.

4.4 Visual Detractors

Holyhead town and port are busy working environments that require large scale infrastructure and built facilities. Visual character of the town and surroundings is varied, with attractive features and views often compromised by functional features.

In the wider study area, there are notable visual detractors:

- Industrial and retail areas to the south east of Holyhead include the substantial former Anglesey Aluminium works and chimney stack that is visible for many miles across the landscape and is a prominent feature on the southern skyline;
- Busy road corridors leading into Holyhead and road junction to the south of the port; and
- On Salt Island three storage silos and the raised ro-ro vehicular ramps are often prominent in views.

4.5 Effects on Visual Receptors

This section summarises the predicted visual effects during construction and operational stages of the proposed development and is based on the representative viewpoint assessment tables (Appendix A). The appraisal of visual effects is determined by a combination of professional judgement, the sensitivity of the receptor and predicted magnitude of the effect.

The magnitude of visual effects will be dependent on several factors related to sea state, highlighted below.

- Height of tide will largely determine the visibility and prominence of the Tetrapods. Highest Astronomical Tide (HAT) would submerge between a third to two thirds of the Tetrapods. At Lowest Astronomical Tide (LAT) the full 30m width of Tetrapods and 10m wide concrete chevron units at the toe of the Tetrapods would be visible above the waterline. The full height of the Tetrapods on the seaward side against the Chevron units would also become exposed. At Mean Sea Level (MSL) the full width of the Tetrapods would be visible and approximately 3m height of Tetrapods above the waterline on the seaward side.
- A rough sea state and high wave height will affect visibility of Tetrapods. Wave action will intermittently reveal more or less of the Tetrapods, even at lower tides. The visual nature of the seas will be more dynamic with breaking waves and sea spray a constantly changing visual feature alongside the breakwater. In calm seas the scene will become more visually 'static' and the appearance of the Tetrapods is predicted to become more visually prominent.

In the long term, the visual prominence of Tetrapods would be reduced due to the effects of weathering, algal growth and general patination. Storm and exceptional sea conditions will cause a limited amount of displacement to some of the Tetrapods which will provide minor visual relief to the otherwise highly regimented, linear arrangement of the units.

Proposed concrete armament will be most visually prominent in the early operational phase, seen during daytime, at low tide and with calm sea states. This 'worst case' scenario has been assumed for the visual appraisal.

Construction Stage Visual Effects

Access to the breakwater would be prevented during construction. Predicted visual effects are therefore related to landside views from the coastline and landscape areas included within the ZTV envelope.

The use of Salt Island as a delivery facility and / or a fabrication centre is considered to incur the least potential adverse visual effects. Salt Island is the hub of ferry and freight activity and there are existing tall silo structures and other buildings located within the busy port. Numerous large ship movements and industrial portside features are integral to existing visual character. Proposed storage, fabrication and associated activity would be seen in context of the busy port and infrastructure and would not significantly contrast or conflict with existing visual character. Predicted visual effects would be minor and not significant in terms of Environmental Impact Assessment (EIA).

Use of Soldiers Point quay as a delivery facility and / or a fabrication centre would incur more significant visual effects. Although the quayside and adjoining area includes existing visual detractors (dilapidated walling to Soldier's Point House, large warehouse, general waste, material stockpiles etc) there is a perceived tranquillity to the relatively secluded location. The coastline to the west is rugged and attractive and there are views across the bay to hills on Anglesey. To the east, Orthios Jetty, the port and town have an urbanising influence on visual character, however overall view quality is moderate with attractive features in the distance countered by visually intrusive features in the foreground.

Proposed concrete batching facilities, storage areas, site compounds and other associated facilities on quayside would adversely affect close range visual receptors, in particular high sensitivity recreational receptors using the Isle of Anglesey Coastal Path, those accessing the coastal margins and the pebble beach area to the west of the quay. There would be adverse effects to users of the moorings to the east. Tall structures and crane activity would be seen in close proximity and high in the skyline. General background noise, vehicular and plant movement would further disrupt local visual and perceptual character.

Activity on the quayside would be seen in conjunction with construction activity along the breakwater, including movements of delivery barges and tall marine plant with lifting cranes placing the concrete armour units. Visual effects to receptors accessing coastal margins in close proximity to the quayside would be moderate adverse. Effects would be temporary and short term although would be considered significant.

In more distant views from the east at Newry Beach (Drawing 04A Viewpoint 1), predicted affects during construction would be minor and not present a significant change or contrast in the view. Similar, minor visual effects would be experienced from receptors in elevated areas of land within the AONB coastal margins and Holyhead Mountain to the west (Drawing 04B Viewpoint 6). The existing expansive panoramic scene encompasses attractive landscape / seascape and contrasting elements including Holyhead town, port and former aluminium works. In context of the range of varied features and activity within the view, effects of relatively distant proposed construction works would be minor or negligible adverse, and not significant in terms of EIA.

Operational Stage Visual Effects

There would be no significant effects to landside and coastal margin receptors that obtain views to proposed works on the leeward side of the breakwater. In low level views from the east, at Newry Beach, there would be negligible visual effects due to the overall distance and limited proposed works along the easternmost section of the breakwater. There would be no effect to views from Soldiers Point; proposed features would be screened by the quay and breakwater.

Predicted significant adverse visual effects are limited to close range landside receptors that obtain views to proposed permanent works on the seaward side of the breakwater and in views from the breakwater itself.

Views to the seaward side of the breakwater are limited to areas immediately west and south west of the landward section of the breakwater. The ZTV analysis (Drawing 03) indicates patchy or intermittent visibility to proposed structures from lower lying, gently undulating coastal margins and more uniform visibility from elevated, open landscape areas on the eastern flank of Holyhead Mountain.

The closest landside views are obtained from the small rocky headland of Ynys Wellt to the west of Soldiers Point quayside. The slightly elevated vantage point allows a clear view towards the north eastern arm of the breakwater where it extends away from the quay. At very low tide the full width of the proposed concrete armour structure would be visible and highly prominent in the middle distant view. Tetrapods would be seen high above the waterline and obstruct views to the lower breakwater wall (Drawing 07, Photomontage View 5). In context of the wider panoramic scene there would be

limited change in existing view character, however proposed features would be prominent, incurring a minor/ moderate adverse effect on the view and in the overall appearance of the breakwater. Views from the pebble beach to the east of Ynys Wellt would be slightly less adversely affected due to the lower elevation of the view, limited extent of visible breakwater and subsequent reduced prominence of proposed features.

Significant adverse visual effects are predicted to views experienced by recreational users of the breakwater, with the view from the head of the breakwater being most affected. The vantage point allows a clear view along most of the seaward side of the breakwater, extending approximately 1.8km into the distance. The full 40m width of the proposed concrete armour structure would be visible at very low tides, extending into the distance but also sweeping around the head of the breakwater affecting all outward views. In views from close to the parapet wall the concrete armour would dominate the foreground scene, with the upper section of the Tetrapods in relatively close proximity to the viewer (Drawing 05, Photomontage View 3). The scale, mass and regimented lines of the Tetrapods would contrast notably with the shadowed breakwater wall. Most of the lower section of the wall would be screened and its existing visual character, seen to rise up from a rocky base, would be significantly altered.

Views from the upper landing of the main trunk section of the breakwater would also be subject to significant visual effects. Views from alongside the parapet wall would allow a distant vista along the length of the breakwater with upper sections of the Tetrapods highly prominent. In outward views the Chevron units would be screened by the higher level of the Tetrapods. The full width of the concrete armament, including the Chevron units, would be seen in longitudinal views down the breakwater (Drawing 06, Photomontage View 4).

The predicted 'worst case' significance of effects in views from the breakwater is moderate adverse, with effects being permanent.

In the long term, the contrasting and stark appearance of new concrete armament would reduce slightly due to the effects of weathering, sea action and general patination of units. Displacement may also provide some visual relief to the regimented appearance of the units. The outer concrete mattress would be less visually prominent than the Tetrapods, discolouring and patinating more rapidly due to the increased sea exposure. Tetrapods on the outer, seaward, side would also discolour more rapidly and there would be a transition in appearance across the width of the concrete armament structure.

Predicted visual effects experienced by users of the breakwater assumes a worst case scenario. At higher tides and with increased sea action the visual effects of the concrete armament would be reduced. The existing perceptual characteristics experienced by receptors; a sense of exhilaration and exposure with a vast sky above and expansive seascape, would remain. Views to attractive hills, mountains and other features on the horizon would also be unaffected.

Views from the upper landing would be most affected where the viewer is in close proximity, looking over the parapet wall. In outward views from the *central* landing area the parapet wall would effectively screen foreground views down onto concrete armament (although would remain visible in distant, longitudinal views where the breakwater sweeps across the line of view).

Views across New Harbour from the sheltered lower landing area would remain largely unaffected with the exception of the final section of breakwater and views across the leeward section of concrete armament.

Effects on Views from the Area of Outstanding Natural Beauty

There would be no significant effects to views or the character of views from within the AONB. There would be no effect to distant coastal margins within the AONB on the leeward side of the breakwater. In more elevated views from Holyhead Mountain and the coastline (Drawing 08, Photomontage View

6) the effects of proposed works would be reduced due to the overall distance, expansive nature of the panoramic view and the numerous, varied features within the scene.

Effects on Views from Holyhead Beach Conservation Area

The western boundary of Holyhead Beach Conservation Area includes part of Soldiers Point. Close range views to construction activity and views to tall plant and structures on the quayside would present a notable source of local visual intrusion, partially obstructing views to the attractive distant horizon. Effects would be temporary and limited in extent to the conservation area in immediate proximity to the quayside. There would be no significant effects during the operational phase with distant views from Newry Beach and promenade limited to proposed works on the easternmost, leeward side of the breakwater.

Effects on Views from Listed Building (Lighthouse and Breakwater)

There would be significant adverse effects upon seaward views from the upper landing of the breakwater, specifically where the view receptor is in close proximity to the parapet wall. The head of the breakwater and base area of the lighthouse also allows a clear and uninterrupted view along both the seaward and leeward sides of the breakwater. Proposed Tetrapods would dominate the foreground scene, screening the lower half of the breakwater. This, combined with the substantial width of overall concrete armament structure relative to the modest height of the wall, would significantly and adversely affect views from the lighthouse and breakwater and diminish both the visual presence and character of the listed structures.

Compliance with Planning Policy Relating to Visual Issues

The proposed refurbishment works would not have significant effect upon the setting or visual resource relating to the AONB or Conservation Areas within the study area. In terms of coastal protection, proposals would not cause unacceptable harm to features relating to the built environment with proposed features appearing contiguous with existing structures.

In terms of the visual resource within the study area proposed works are considered to comply with the general requirements of planning policy.

5 Conclusions

Proposed refurbishment works to the Holyhead Breakwater are necessary to protect the existing breakwater structure and maintain safe waters within Holyhead Harbour. This report provides an appraisal of the predicted visual effects during the construction and operational phases of the proposed works. Assessment is based upon a series of ‘representative’ viewpoints that are included as tables in the report. Photomontages are used from selected representative viewpoints to illustrate the proposed refurbishment works.

Potential for significant visual effects would be limited to receptors located to the south and west of breakwater. These include recreational users of the Isle of Anglesey Coastal Path, the breakwater, walkers and other users of Holyhead Mountain.

During construction, the most significant adverse visual effects would be experienced by users of the coastal path and margins that are in close proximity to the proposed storage and manufacturing facilities located on Soldiers Point. Tall structures and crane activity would be seen high in the skyline, strongly affecting both local and distant views to surrounding, attractive features. More distant construction activity alongside the breakwater would not incur significant visual effects, seen

in context of the existing harbour and regular movements of vessels and other related activity. Construction stage effects would be short term and reversible.

During operational stages significant adverse visual effects have been identified. These specifically relate to close range, landside receptors on the rocky headland and beach to the west Soldiers Point (that obtain views to the seaward side of the breakwater) and in views obtained from the breakwater itself, in particular from the head of the breakwater looking towards Holyhead Mountain. Effects during operation would be permanent.

In the long term the visual prominence of concrete armament units would be slightly reduced due to the effects of weathering, sea action, general patination and limited displacement of Tetrapods.

The report further concludes that there would be no significant effects to views or the character of views obtained from within the Anglesey AONB.

Appendix A

Viewpoint Assessment Tables (Viewpoints 01 to 06)

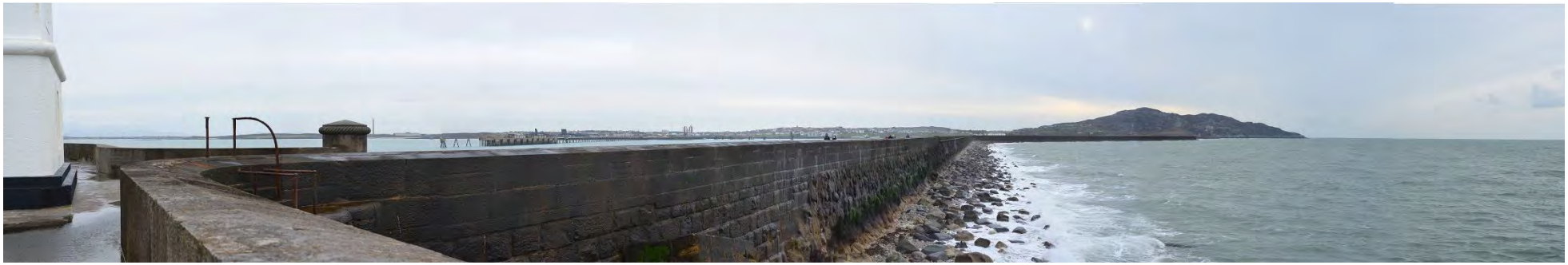
Viewpoint 1: Looking north from the promenade along Newry Beach within Holyhead Beach Conservation Area

Type of Viewer and Distance from the Site	Recreational users of the promenade (also part of the Isle of Anglesey Coastal Path), Newry Beach and local road users.	Distance from Site: 820m
Existing View	A wide and expansive view across New Harbour. Holyhead Breakwater forms a crisp, uniform middle distant horizon, punctuated by the lighthouse at its end. Rising ground on Anglesey to the north east forms part of the horizon including the prominent Mynydd-y-Garn. The Terminal 4 and Orthios Jetty are prominent in the view to the east with tall silos and other port facilities on Salt Island distracting features in the view. Perceived tranquillity is reduced due to vehicle noise along the Prince of Wales Road and port activity. Overall view quality is moderate; a combination of attractive features and visually prominent or cluttered elements that detract from the scene.	
Potential Changes to the View	Construction stage: Short term, temporary effects only. Glimpsed views to high level lifting cranes would be visible above the breakwater and seen in the skyline. A jack-up or floating barge would be visible on the leeward side of the breakwater during works to the eastern end of the breakwater and a supply vessel would be seen delivering supplies to the site. Location of a concrete batching plant on the Soldiers Point quay would be visible in the skyline. In context of the existing busy port activity and features, including numerous regular movements of large vessels, construction related activity would not present a significant change or contrast in the view. Operational Stage: At low tide and calm seas the Tetrapods would be visible along the end section of the leeward breakwater wall. Seen within this low level, distant view the Tetrapods would appear as a uniform, thin sliver at the base of the wall. New concrete would be lighter in hue than the breakwater wall and there would be some disparity in both colour and texture between the two surfaces. Longer term weathering, sea action and general patination of the Tetrapods would improve visual harmony. In context of the wider scene, proposed features would not be significant and incur negligible effect on the view and appearance of the breakwater.	

Viewpoint 2: Looking north east from Soldiers Point, alongside Soldier's Point House

Type of Viewer and Distance from the Site	Recreational users of the Isle of Anglesey Coastal Path and other recreational users heading to the breakwater.	Distance from Site: 215m
Existing View	The view is framed by earth banking and the dilapidated walling to Soldier's Point House. Foreground features (including general waste, rough grassland, abandoned boats and material stockpiles) significantly detract from the quality and character of the view. Orthios Jetty is prominent to the east and there are glimpsed views to shipping and other features at Holyhead Port. The far horizon beyond New Harbour is a combination of seascape, breakwater and rising ground on Anglesey. The lighthouse is prominent, set behind the central section of breakwater. Perceived tranquillity is good due to the relatively secluded location. Overall view quality is moderate with attractive features in the distance countered by visually intrusive features in the foreground.	
Potential Changes to the View	Construction stage: Short term, temporary effects only. Views to high level lifting cranes would be clearly visible above the breakwater and seen in the skyline, most prominent during works to the western section of the breakwater. A jack-up or floating barge would be visible on the leeward side during works to the eastern end of the breakwater. Location of a concrete batching plant on the Soldiers Point quay would be relatively prominent in the near distance and visible against the skyline. The static structure and associated ground level activity would be highly prominent in the view. In context of the existing harbour scene, numerous regular movements of vessels and general visual disorder, temporary construction related activity would not present a significant change in the overall view, however facilities located on the quayside and close range construction activity would be a notable source of local visual intrusion, partially obstructing views to the attractive distant horizon. Effects would be moderate adverse. Operational Stage: No effect. The existing breakwater would screen views to proposed concrete armour features.	

Viewpoint 3: Looking south west from the head of Holyhead Breakwater



Type of Viewer and Distance from the Site	Recreational users including walkers, cyclists and fishermen.	Distance from Site: Within site boundary
Existing View	An expansive, open and highly exposed view with a vast sky above and evocative call of gulls, shipping sounds and wind. Distant land masses on Anglesey are seen across Holyhead Bay. Holyhead Mountain is dominant to the west, forming a dramatic backdrop to the breakwater. The Snowdonia and Llyn Peninsula mountain ranges are seen on the far horizon to the south east. The former aluminium works stack and main building is highly prominent in the skyline. Holyhead town forms a low, rising horizon to the south. Ferries docked at Salt Island Terminals 3 & 5 are visible on the skyline, seen behind the Orthios Jetty. The solid black wall of the seaward breakwater extends out strongly to the south west, sweeping to the west towards Holyhead Mountain. Massive, existing concrete cuboids at the base of the breakwater are visible below. At low tide the rocky base to the breakwater is clearly visible. Perceived tranquillity is moderate due to large ferry activity. Overall view quality is high with the expanse of sea and land masses balancing the town and port features.	
Potential Changes to the View	Construction stage: No effect; there would be no public access along the breakwater during the construction period. Operational Stage (refer to Drawing 05, Photomontage View 3): The offset viewpoint from the head of the breakwater would allow a clear view directly down onto the concrete armour structure (including the outer chevron mattress), extending into the distance along most of its length. Tetrapods would cover the low tide rocky base to the breakwater and at 5.2m depth screen views to more than half the height of the breakwater wall. The upper surface of Tetrapods would be in much closer proximity to the observer than the existing base and as such significantly more prominent in the view. The scale, mass and regimented, engineered lines of the Tetrapods would be immediately apparent in the view and dominate the scene. At year 1 the Tetrapods would be appear lighter in hue than the breakwater wall and there would be clear contrast in both colour and texture between the two surfaces. These initial effects would be worst case and predicted to be significant and moderate adverse. Views to attractive features across the wider panoramic scene and overall perceptual characteristics of the view would remain largely unchanged. Longer term weathering, sea action and general patination of the Tetrapods would improve visual harmony. Limited displacement of units due to sea action would disrupt the regimented appearance of the Tetrapods.	

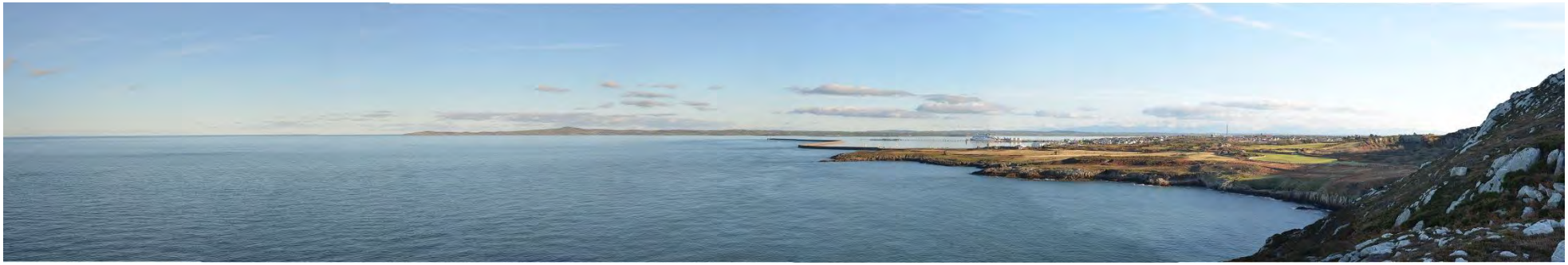
Viewpoint 4: Looking north east from Holyhead Breakwater

Type of Viewer and Distance from the Site	Recreational users including walkers, cyclists and fishermen.	Distance from Site: Within site boundary
Existing View	An expansive, open and highly exposed view with a vast sky above. The silhouetted wall of the seaward breakwater extends out strongly to the north east and bisects the view. The lighthouse marks a destination and provides a focal point to the view with the broad white band contrasting with the dark breakwater wall. The seaward view is across open sea to hills on the western margin of Anglesey. The Skerries are seen on the far horizon. The contrasting leeward view includes moored vessels, Orthios Jetty, docked ferries, structures and activity within Holyhead Port. The Snowdonia and Llyn Peninsula mountain ranges are seen on the far horizon to the south east. The former aluminium works stack and main building is highly prominent in the skyline. Holyhead town forms a low, rising horizon to the south. Ferries docked at Salt Island Terminals 3 & 5 are visible on the skyline, seen behind the Orthios Jetty. Perceived tranquillity is moderate due to large ferry activity. Overall view quality is high with the expanse of sea and land masses balancing the urban and port features.	
Potential Changes to the View	Construction stage: No effect; there would be no public access along the breakwater during construction activity. Operational Stage (refer to Drawing 06, Photomontage View 4): At low tide and calm seas the Tetrapods would be highly prominent, visible along the seaward side of the breakwater and extending into the distance to the north east and in the wider panorama to the south west. Tetrapods would cover the low tide rocky base to the breakwater. The upper surface of Tetrapods would be in much closer proximity to the observer than the existing base and the outer lines of concrete armour would be clearly visible above the parapet wall in perpendicular views away from the breakwater. Views towards the lighthouse would be compromised and its effect as a focal point diminished; the lighter colour Tetrapods would visually compete with relatively subtle form and markings of the lighthouse. These initial effects would be worst case and predicted to be significant and moderate adverse. Views to attractive features across the wider panoramic scene and overall perceptual characteristics of the view would remain largely unchanged. Longer term weathering, sea action and general patination of the Tetrapods would improve visual harmony. Displacement of units due to sea action would disrupt the regimented appearance of the Tetrapods.	

Viewpoint 5: Looking north from the Isle of Anglesey Coastal Path on Ynys Wellt headland

Type of Viewer and Distance from the Site	Recreational users of the Isle of Anglesey Coastal Path and land designated as Open Country	Distance from Site: 350m
Existing View	A slightly elevated and extensive view across Holyhead Bay. The varied rocky foreshore and coastal margins contrast with an expansive seascape. Holyhead Town and port are prominent to the south east seen against a backdrop of mountains on mainland Wales. Shipping activity and ancillary structures on Salt Island feature and the tall stack of the aluminium works is prominent to the south east. The strong serpentine shape of the breakwater reaches out across the bay towards Anglesey and a hilly backdrop that includes scattered white houses, a distant windfarm and holiday park. The black and white, square lighthouse is a focal point in the middle distance. A rugged and highly attractive coastal scene, dominated by the seascape and vast sky above. The sheltering arm of the breakwater gives visual separation between the harbour and open sea. Overall view quality is high with the expanse of sea and land masses dominating the view.	
Potential Changes to the View	Construction stage: Short term, temporary effects only. Views to high level lifting cranes would be clearly visible above the breakwater and seen in the skyline. A jack-up or floating barge would be visible on the leeward side of the breakwater during works to the eastern end of the breakwater and a supply vessel would be seen delivering supplies to the site. Location of a concrete batching plant on the Soldiers Point quay would be visible in the skyline. In context of the existing port scene, including numerous regular movements of vessels and general visual disorder, construction related activity would not present a significant change in the view. Operational Stage (refer to Drawing 07, Photomontage View 5): At low tide and calm seas the Tetrapods would be visible along the seaward breakwater wall. Seen within the middle distance view the Tetrapods would appear as a uniform, 'textured' band to the base of the wall, the full width of the concrete armour structure would be prominent seen extending around the eastern curve of the breakwater. There will be glimpsed views to concrete armament wrapping around the eastern head. More than half of the height of the breakwater wall would be screened by proposed concrete armour units. There would be disparity in both colour and texture between the two surfaces with the lighter colour concrete units contrasting with the dark breakwater wall. Longer term weathering, sea action and general patination of the Tetrapods would improve visual harmony. In context of the wider scene there would be limited change in overall view character, however proposed features would be highly noticeable in this localised view, incurring a minor moderate adverse effect on the view and the overall appearance of the breakwater.	

Viewpoint 6: Looking north from the Isle of Anglesey Coastal Path across Porth Namarch



Type of Viewer and Distance from the Site	Recreational users of the Isle of Anglesey Coastal Path.	Distance from Site: 1.45km
Existing View	An elevated and extensive view across Porth Namarch and Holyhead Bay. The varied rocky cliff and coastal margins contrast with an expansive seascape. Holyhead Town and port are seen to the east against a backdrop of Anglesey hills and mainland mountains. The former aluminium works stack and main building is highly prominent in the skyline. The silhouetted serpentine shape of the breakwater extends out from beyond Ynys Wellt headland. The breakwater gives visual separation between the harbour and open sea. A rugged and highly attractive coastal scene, dominated by the seascape and vast sky above. Overall view quality is high with the expanse of sea and land masses dominating the view and good tranquillity due to remoteness of the location.	
Potential Changes to the View	Construction stage: Views to high level lifting cranes, a jack-up or floating barge and supply vessel would be seen in the distance. Location of a concrete batching plant on the Soldiers Point quay would be visible, seen below the skyline against a backdrop of New Harbour and Orthios Pier. Construction works would visually integrate with existing port activity and features. In context of expansive panoramic view temporary construction related activity would present a negligible overall effect. Operational Stage (refer to Drawing 08, Photomontage View 6): At low tide and calm seas the Tetrapods would be visible along the seaward breakwater wall. Seen within the relatively distant view the Tetrapods would appear as a uniform, 'textured' band to the base of the breakwater wall. There would be glimpsed views of Tetrapods on the easternmost extent of the breakwater and wrapping around the lighthouse head. New concrete would be lighter in hue than the breakwater wall. Longer term weathering, sea action and general patination of the Tetrapods would improve visual harmony. In context of the wider scene, proposed features would be visible but incur negligible adverse effect on the view and overall appearance of the breakwater.	

Appendix B

Drawings

Drawing 01: Landscape Constraints

Drawing 02: Aerial Photograph & Photograph Locations

Drawing 03: Zone of Theoretical Visibility

Drawing 04: Existing Views

Drawing 05: Photomontage View 3

Drawing 06: Photomontage View 4

Drawing 07: Photomontage View 5

Drawing 08: Photomontage View 6