NEMO Link Landfall, Pegwell Bay:
Year 5 Post-Construction Monitoring Report

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Kenneth Pye Associates Ltd

Scientific Research, Consultancy and Investigations

NEMO Link Landfall, Pegwell Bay:

Year 5 Post-Construction Monitoring Report

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Contents

Summary

This report provides a summary of the results from the Nemo Link Year 5 June and October 2022 topographic and vegetation monitoring surveys and compares the results with those of previous pre-construction and post-construction surveys.

The results of the Year 5 topographic monitoring show that there has still been no recovery of the former high marsh ridge in the vicinity of the transition joint bay and that tidal incursion into the saline lagoon remains more frequent than before the cable installation works. However, maximum water levels are now lower than they were pre-construction because the Lagoon can drain more quickly into the cable corridor on the ebb tide. However, complete drying out of Lagoon is now less likely than pre-construction because the sediment 'lip' at the NE corner of the Lagoon is now higher than pre-construction, and drainage through the poorly defined creek system behind the petrol station is prevented.

There has been very limited sediment deposition within the landward part of the cable corridor since construction. Ground levels in this area showed a slight fall (c. 5 cm) in 2022 due to drying out and shrinkage of the ground during the relatively warm, dry summer of 2022.Sediment accretion has taken place along the seaward half of the cable corridor and near the marsh edge a new low ridge has increased in height by an average of 15 cm over the period of monitoring.

The topographic monitoring has indicated significant variation in the extent of standing water and largely unvegetated ground from survey to survey. Analysis of tide gauge and weather records indicates this reflects temporal variations in the frequency / magnitude of tidal incursion and of relatively warm and dry periods of weather.

The analysis of vegetation change through quadrat monitoring has been severely constrained by the relatively small number and locations of quadrats established before and immediately following the cable installation works, and in particular by the lack of systematic pre- and post-works data sets, and by limitations of the vegetation community zonation framework proposed in the Year 1 post works monitoring report. A direct comparison of pre- and post-works changes between quadrats located within and outside the works corridor has been severely constrained, and statistical comparison has not been possible. There has been relatively little change in the vegetation characteristics at those quadrat locations which have been undisturbed by the cable installation works, although there has been detectable change in areas along the marsh front which are influenced by natural patterns of sediment erosion and deposition. The vegetation within the quadrats on the landward side of the Lagoon affected by cable installation has now recovered with similar vegetation assemblages. Vegetation around the Lagoon has shown considerable variation due to variations in water levels which reflect the frequency / magnitude of tidal inundation and weather conditions. Overall, following the cable installation works the range of water level variation has been reduced. At the end of the five year monitoring period (October 2022) many of the Zone 2 quadrat locations were submerged but marginal saltmarsh vegetation was in a visibly healthy condition.

Monitoring of vegetation quadrats within the cable corridor has shown considerable variation between surveys but an overall trend towards a reduction in the extent of bare / thinly vegetated ground, particularly in the areas surrounding the three main pools, two of which existed prior to cable installation. The increase in vegetation cover has mainly involved colonization by annual *Salicornia* sp., perennial *Sarcocornia* sp. and *Spartina* sp. The vigour and year-year survival of these species has been affected by growing conditions, with 2020 and 2021 being favourable and 2022 relatively unfavourable.

Based on the results of the 5 years of post-construction monitoring it is concluded that there is no physical or biological mechanism by which the higher saltmarsh ridge can recover to its former state. However, the resulting increased frequency of tidal incursion are contributing to a less variable water level and salinity regime within the Lagoon which may bring net benefits to the marginal saltmarsh vegetation. Intervention to artificially re-build the ridge would bring few benefits and would risk further damage to the surrounding saltmarsh communities.

1.0 Report scope and purpose

1.1 This report provides a summary of the results from the Nemo Link Year 5 June and October 2022 topographic and vegetation monitoring surveys and compares the results with those of previous pre-construction and post-construction surveys.

1.2 The Nemo Link Interconnector is a joint venture between the UK National Grid and Belgium's electricity transmission company, Elia. The interconnector consists of approximately 130 km of sub-sea high voltage direct current (HVDC) cross-linked polyethylene (XLPE) cable with shorter sections of onshore cable which feed converter stations at either end.

1.3 The cable landfall on the English side is in Pegwell Bay, Kent. Within this area the sub-sea cable bundle is buried beneath the intertidal zone and joins the onshore cables in a Transition Junction Bay (TJB) located within an area of saltmarsh on the seaward side of Sandwich Road (Figure 1). The onshore cables run parallel with Sandwich Road towards Pegwell Bay Country Park and then onwards to a DC/AC Converter Station on the site of the former Richborough Power Station.

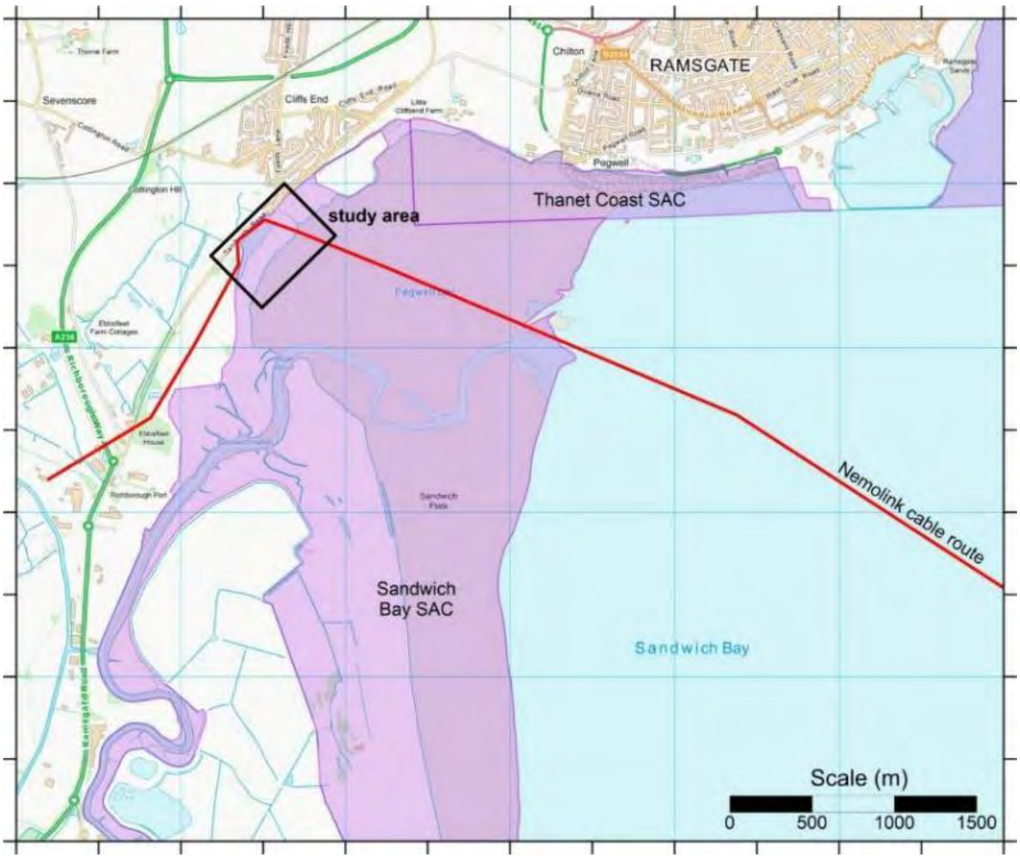


Figure 1. Location map showing the study area in Pegwell Bay (black rectangle) and indicative cable route

1.4 The cable route crosses several designated nature conservation areas, including the Sandwich Bay Special Area of Conservation (SAC), the Thanet Coast and Sandwich Bay Special Protection Area (SPA), the Thanet Coast and Sandwich Bay Ramsar site, the

Sandwich Bay to Hacklinge Marshes Site of Special Scientific Interest (SSSI), and the Sandwich and Pegwell Bay National Nature Reserve (NNR). Immediately to the south of the cable route landfall is the Pegwell Bay Country Park, managed by the Kent Wildlife Trust (see maps in Appendix 1).

1.5 The Marine Licence (L/2013/00373) issued by the Marine and Maritime Organization (MMO) in respect of the marine works included the following condition:

5.2.22 The licence holder must submit post-construction saltmarsh monitoring reports in the agreed format under licence condition 5.2.15 1,2,3,4 and 5 years following the completion of licenced activities within the intertidal zone unless otherwise agreed with the MMO.

1.6 In accordance with this condition, a *Saltmarsh Mitigation, Reinstatement and Monitoring Plan* (SMRMP) was developed by J-Power Systems, Version 4.0 of which was issued in January 2017 (J-Power Systems, 2017).

2.0 Environmental background and historical coastal development

2.1 Data contained in Admiralty Tide Tables indicates that Ramsgate has a mean spring tidal range of approximately 4.6 m, the level of mean high water spring tides (MHWS) being approximately 2.6 m ODN and the level of the highest astronomical tide (HAT) approximately 3.1 m ODN (Table 1). However, data obtained from hydrodynamic models reported in the Environment Agency's Coastal Boundary Study Update (EA, 2019) suggest a lower value for MHWS in the nearshore zone at Ramsgate (2.35 m ODN) and indicate a trend for the MHWS level to increase southwards in the direction of Sandwich (Figure 2). While the spatial trend indicated by the Coastal Boundary Study is likely to be correct, a consideration of geomorphological evidence, including saltmarsh elevations, suggests that the predicted levels are approximately 25 cm too low. Taking all available information into account, the best estimate level of MHWS at the Nemo Link cable route landfall (Point X) is 2.70 m ODN (and that of MHWN is 1.46 m ODN (Table 1).

Table 1. Mean tidal levels near Pegwell Bay, in metres above Ordnance Datum Newlyn, taken from 2022 Admiralty Tide Tables (ATT) and the three closest offshore points to Pegwell Bay from the Environment Agency Coastal Boundary Study 2018 Update (CBS, Environment Agency, 2019)

	Ramsgate (ATT)	Richborough (ATT)	Point 4382 (CBS)	Point 4384 (CBS)	Point 4386 (CBS)	Point X (estimated)
HAT	3.12	nd	2.75	2.84	2.93	3.22
MHWS	2.62	2.07	2.35	2.42	2.50	2.70
MHWN	1.42	1.37	nd	nd	nd	1.46
MSL	0.15	0.09	nd	nd	nd	0.15
MLWN	-1.18	-0.93	nd	nd	nd	-1.22
MLWS	-1.98	-1.23	nd	nd	nd	-2.05
LAT	-2.88	nd	nd	nd	nd	nd
CD	-2.58	-1.33	nd	nd	nd	nd

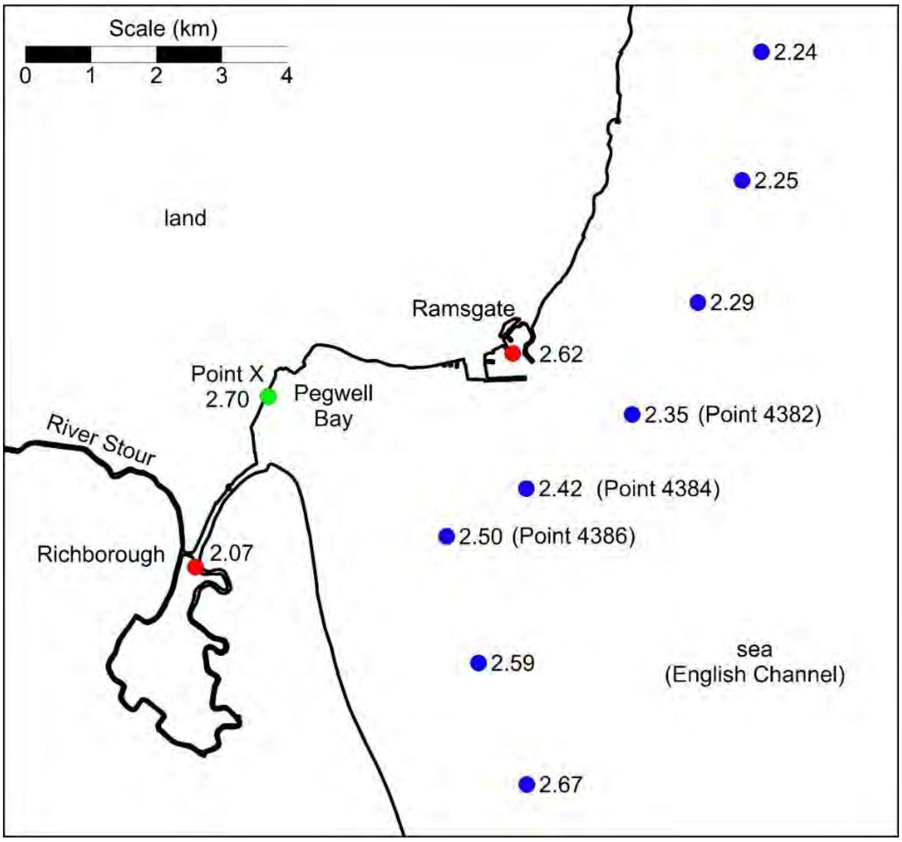


Figure 2. Levels of MHWS near Pegwell Bay, in metres above Ordnance Datum Newlyn, taken from 2022 Admiralty Tide Tables (red dots at the Standard Port of Ramsgate and the Secondary Port of Richborough), and from the Environment Agency Coastal Boundary Study 2018 Update (blue dots, Environment Agency, 2019). Point X (green dot) is inferred from mean levels at Ramsgate and elevations of vegetation types at the site

2.2 The coastal geomorphology of the Pegwell - Richborough - Sandwich area has experienced major changes over the last two millenia, in large part due to human interventions which have included the blocking and reclamation of the former Wantsum channel which once separated the Isle of Thanet from the rest of Kent, alterations to the course of the River Stour, and the development of coastal infrastructure between Richborough and Cliffsend. A number of historical maps and aerial photographs showing the recorded nature of changes in and around Pegwell Bay over the past 200 years are included in Appendix 1.

2.3 Saltmarshes (or 'saltings') have existed in the area for centuries, although most of the older marshes were reclaimed by the middle of the 19th century. Historically much of central Pegwell Bay was backed by a sandy beach and low dunes which are now occupied by the St Augustine's Golf Club, but in the southern part of the Bay, which is sheltered from southeasterly wave influence by the Sandwich spit complex, saltmarshes have dominated.

2.4 A route between Cliffsend and Ebbsfleet has existed for centuries but the modern embankment and road appears to have been constructed in the early19th century. The First Edition Ordnance Survey (OS) map shows a relatively wide belt of marshes extending all along the frontage between Ebbsfleet and Cliffsend, but the marsh zone narrowed progressively up until the early 1930s by which time it had been almost completely lost to erosion in the vicinity of the cable route and petrol station (Figure A1.28). Erosion of the toe of the road embankment north what is now the Country Park required the installation of a length of defence wall and elsewhere imported rubble was tipped along the high water mark.

2.5 Rapid expansion of saltmarsh within the southern part of Pegwell Bay occurred during the 1950s, linked to the spread of *Spartina* which was first recorded in the Stour Estuary in 1934 (Hubbard & Stebbings, 1967). By the late 1950s saltmarshes had extended to the east of its present limit near Ebbsfleet and formed a zone approximately 100m wide just to the south of the cable route. From that point the marsh edge curved inland to join the Sandwich Road embankment just east of the petrol station, but no marsh was present between this point and Cliffsend (Figures A1.15 & A1.30). Deposition of wave-transported sediment and wrack during a period of relative stability in this period led to the formation of a relatively high ridge along the marsh edge. Ponding of tidal waters behind the ridge following periodic overtopping events initiated the formation of the lagoon seen today.

2.7 During the period of accretion and marsh edge stability during the late 1950s and 1960s a landfill site was developed in the area now occupied by the Pegwell Bay Country Park, to the west of the lagoon. Following its closure in 1983 the landfill site was turned into a picnic site by Kent County Council. In the late 1950s a breakwater and slipway were also constructed to the east of the petrol station, and further land claim of the foreshore was undertaken to the east of Cliffsend in the late 1960s during construction of the Hoverlloyd International Hoverport. The concrete aprons were constructed on a foundation of imported colliery spoil. The terminal opened in April in 1969 and was finally closed in 1983, after which time the buildings were demolished. These changes encouraged the northward spread of saltmarsh vegetation in the area between the petrol station and the hoverport, and seaward movement of the marsh edge along a broad front (Figure A1.22). However, aerial photographs from the mid-1980s and early 1990s indicate that a corridor of degraded marsh existed to the east of the petrol station which receives discharge of land drainage waters and where even today the ground remains boggy and a residual pool remains.

2.8 To the southwest of the petrol station along the lagoon and Country Park frontage the edge of the established higher marsh has continued to erode up to the present, encouraged by a change in the position and orientation of the low water channel of the River Stour. The course of the channel across Pegwell Bay has varied considerably over time, in part due to natural process and in part due to dredging during the First and Second World Wars (Varrall, 2022; Figure A1.23). The navigational access to Ebbsfleet and Richborough was shortened and deepened by dredging during both the First and Second World Wars, but during the inter-war years and since the 1950s the channel reverted to a more natural meandering pattern. Long-term northward growth of the Sandwich (Shellness) spit (Robinson & Cloet, 1953) has also encouraged the formation of a sharp meander at Ebbsfleet which has cut into the marsh on its landward side. The northward growth of Shellness and the establishment of a pronounced meander pattern has caused the low water channel to take a southeasterly course, thereby allowing waves from the southeast to pass over an area of relatively deep water and impact directly on the marsh edge opposite the northern part of the Country Park and the southern end of the lagoon. Wave reworking of the tidal flats in this area has released a large number of cockle shells which have been moved landward, creating shell ridge 'chenier' along the established marsh edge. However, in the past 10 -15 years *Spartina* has colonized many of the mud mounds to seaward of the cheniers, creating a fragmented zone of pioneer marsh.

2.9 Before installation of the Nemo Link cables in October 2017 the 1950s high marsh ridge formed a continuous feature, decreasing in width and elevation towards the north (petrol station (Figure 2). Landward of the ridge there was a brackish lagoon which first developed in the 1960s. Before the cable installation works significant tidal flooding of the lagoon occurred only on the highest tides which overtopped the ridge and entered via areas of relatively low ground at its northern and southern ends. Once the water level had fallen below the lowest points in the crest of the ridge the remaining water remained trapped.

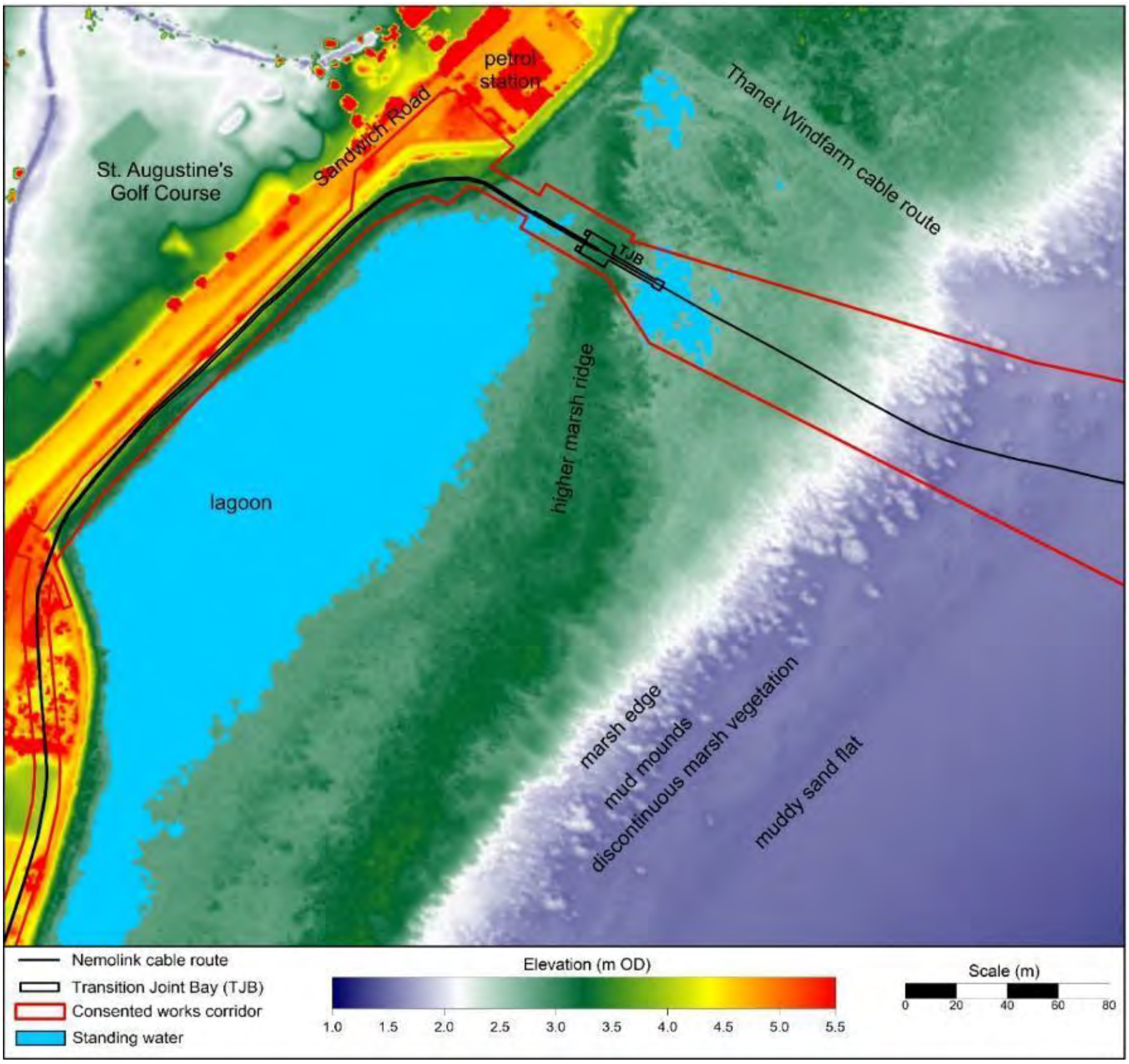


Figure 2. LiDAR DSM flown 4-17 December 2015, pre-works, with cable route, Transition Joint Bay and consented works corridor superimposed. The level of standing water in the lagoon behind the ridge at the time of the LiDAR survey was approximately 2.6 m ODN. Note the occurrence of two smaller pools of standing water on the seaward side of the higher marsh ridge

3.0 Sequence of previous topographic surveys

3.1 A pre-installation condition walkover and ground photographic survey of the intertidal area around the proposed transition joint bay (TJB) was undertaken by Balfour Beatty Power Transmission & Distribution Ltd on 19th April 2017 (Balfour Beatty, 2017). A topographic survey of the area was also undertaken on 26th April 2017 by Catsurveys Ltd. (2017). No immediate pre-construction vegetation survey was apparently undertaken but data are available for an earlier National Vegetation Classification (NVC) quadrat survey undertaken by TEP (2011) to inform the Environmental Statement.

3.2 The pre-construction survey undertaken on 26th April 2017 by Catsurveys Ltd. consisted of a relatively small number (129) of survey points and was largely restricted to a narrow swath along that part of the proposed cable route above the approximate level of MHWS. The distribution of survey points (Figure 3) suggests that the survey was conducted as a series of zig-zag lines across the proposed route, with only a small number of points on each line across the cable corridor.

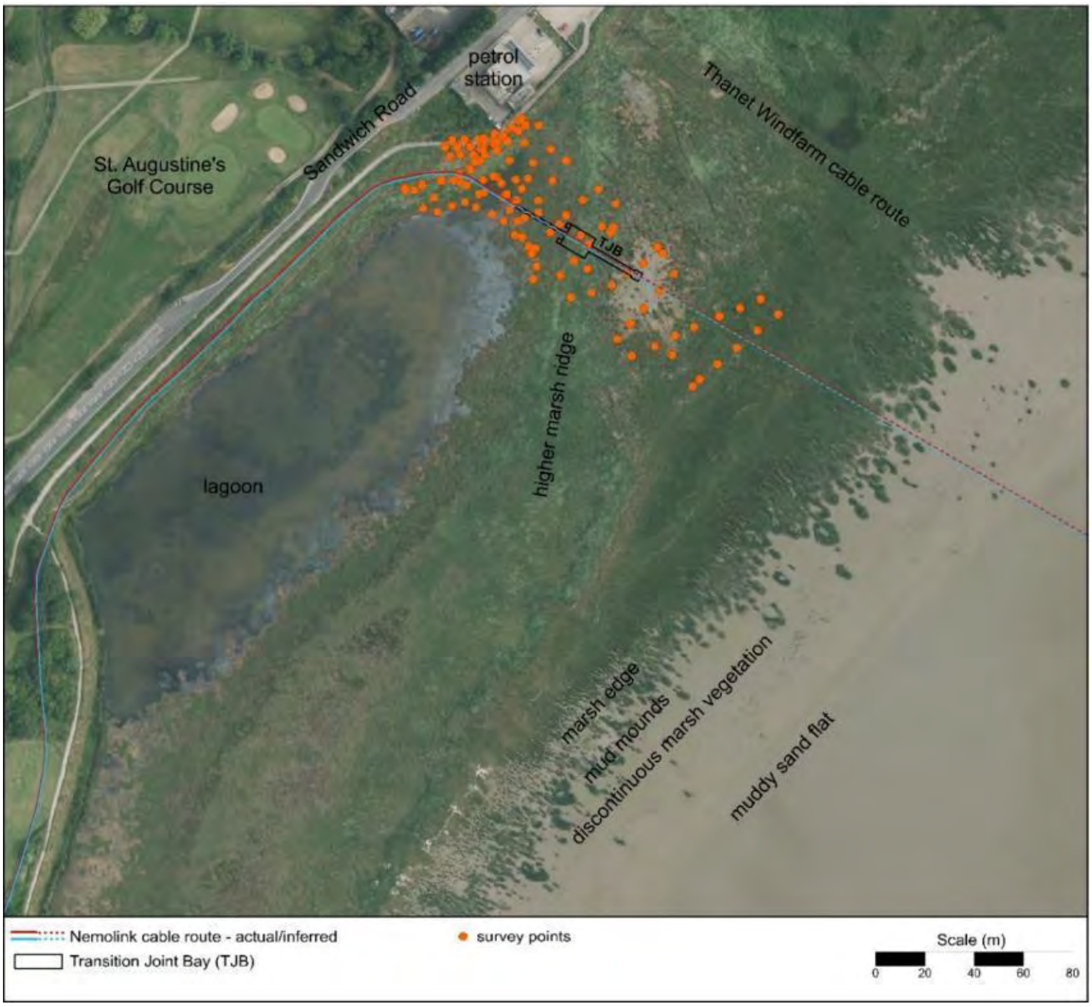


Figure 3. Locations of Catsurveys Ltd survey points on 26/04/2017, overlaid on rectified Google Earth aerial image flown 07/07/2016 (indicative cable route only)

3.3 During the period June - October 2018 post-works Year 1 NVC monitoring surveys were undertaken by Biocensus Ltd, and a topographic survey was undertaken by Sitech Surveying Services Ltd in June 2018. The results of both surveys are summarised in an overview report by Biocensus (2019). This report also provided a comparison between the Year 1 monitoring data and the pre-construction topographic survey and NVC quadrat survey data.

3.4 Biocensus reported that there was a section approximately along the cable route where the saltmarsh was lower in 2018 than before construction, the maximum recorded elevation difference being -28 cm. It was noted that an unplanned consequence of the works is more frequent flooding of the lagoon leading to changes in the marginal vegetation.

3.5 The post-construction survey in June 2018 by Sitech Surveying Services consisted of a slightly larger number (143) but more widely spaced points, extending between the sea defence line to just beyond the seaward marsh edge. The survey consisted of a series of shore-normal transects, running at a slight oblique angle to the cable route (Figure 4).

3.6 A comparison of the 2017 and 2018 topographic survey data showed a significant net lowering of the ground around the position of the TJB, and a slight increase in levels on either side of the former higher marsh ridge (Biocensus, 2019).

Figure 4. Locations of Sitech survey points in June 2018, overlaid on aerial image flown 16/05/2019, post works, indicative cable route only). Base image source: Google Earth

3.7 In April 2019 Kenneth Pye Associates Ltd (KPAL) was commissioned to undertake a further topographic survey to provide a better quantification of the topography within the cable corridor with a view to identifying options for possible remediation works. During the survey, carried out on 25 April 2019, several transects perpendicular and parallel to the cable route were surveyed, together with visible features such as the marsh edge, the tidal lagoon edge, and pools of standing water within the cable corridor (Figure 5). A comparison with the 2017 survey data showed that surface levels close to the TJB were up to 15 cm lower in April 2019. In other areas the ground level was 15 to 20 cm lower than before construction (note that the 2017 survey was low resolution, with relatively few survey points) Comparison between the crest of the ridge and the deepest parts of the pools within the cable corridor indicated a maximum elevation difference of c. 30 cm between April 2017 and April 2019.

Figure 5. Locations of KPAL survey points in April 2019, overlaid on aerial image flown 16/05/2019 (indicative cable route only). Source: Google Earth

3.8 Several pools of standing water were present along the line of the cable corridor in April 2019, during a period of generally dry weather. The 2018 annual monitoring report (Biocensus, 2019) does not specify whether areas of standing water were also present at the time of their survey in June (note the presence of standing water is depending both on the incidence of high tides and on rainfall events). In April 2019 the maximum depth of standing water in the pools was determined to be 20 cm. In each case water was impounded by areas of higher elevation. The sediments within the pools showed evidence of anoxic conditions, indicating prolonged water-logged conditions. Drier areas around the pools were characterized by relatively large numbers of *Salicornia* sp. seedlings; these were absent from the areas of standing water.

3.9 It was noted that areas of marginal vegetation around the brackish lagoon were dead or dying, and that decay of dead vegetation was contributing to the development of eutrophic conditions. The water level in the lagoon at the time of survey (at low tide) was approximately 2.56 m ODN, with evidence from water lines around the lagoon that the level had previously been up to 12 cm higher. These observations were considered consistent with more frequent tidal ingress into the lagoon and maintenance of high-water levels for a longer time period, but also that there were significant periods without tidal incursion and/or high rainfall when the lagoon could partially dry out. The level of the ground at the landward end of the cable corridor, landward of the TJB, was found to be 10 - 15 cm higher than pre-construction, with drainage from the lagoon in a north-easterly direction impeded to a greater degree than pre-construction. Several options for remediation works were identified in a draft report dated 29 May 2019 (KPAL, 2019) and were discussed during a telecon with MMO and Natural England in November 2019.

3.10 In May 2019 KPAL was commissioned to undertake the Year 2 post-construction monitoring surveys. Topographic and vegetation quadrat surveys were carried out in June 2019 and a further vegetation survey was undertaken in early October 2019. The survey results were summarised in a Year 2 Monitoring Report (KPAL, 2020a).

3.11 During the topographic survey on 21- 22 June 2019 a total of 724 points were surveyed using Leica Smartrover RTK GNSS equipment (Figure 6). Points were chosen to provide the best possible comparison with the previous 2017, 2018 and April 2019 surveys, with maximum coverage of the cable corridor and adjoining areas. The outlines of major topographic features, including the lagoon, areas of bare mud, pools of standing water and the intertidal access corridor to the north of the cable route, were also mapped (Figure 7).

3.12 A topographic survey was also carried out by KPAL on the 19th March 2020 in order to identify topographic changes which had occurred over the preceding stormy period, to map the extent of standing water, and to identify potential mitigation measures which could be used on the site. The profiles were re-surveyed (Figure 8), and the extent of standing water mapped (Figure 9).

3.13 The first 2020 annual monitoring survey was carried out on the 17th June (KPAL, 2020c). A total of 1195 points were surveyed using Leica Smartrover GS16 RTK GNSS equipment (Figure 10). Points were chosen to provide the best possible comparison with the previous 2017, 2018 and April 2019 surveys, with maximum coverage of the cable corridor and adjoining areas. The outlines of major topographic features, including the lagoon, areas of bare mud, pools of standing water and the intertidal access corridor to the north of the cable route, were also mapped (Figure 11).

Figure 6. Locations of survey points in June 2019, overlaid on Google Earth aerial image dated 16/05/2019 (indicative cable route only)

Figure 7. Standing water and unvegetated areas mapped during the KPAL ground survey on 21/06/2019 (estimated limits of lagoon shown in dashed lines from aerial photographs; indicative cable route only). Base Google Earth aerial image dated 16/05/2019

Figure 8. Locations of surveyed points on 19/03/2020, overlaid on Google Earth aerial image dated 16/05/2019

Figure 9. Standing water surveyed on 19/03/2020, including three significant pools within the construction corridor: A (maximum depth of 8 cm); B (maximum depth of 10 cm); and C (maximum depth of 15 cm). Other areas (D, E and F) were covered with water to a depth of less than 5 cm. Base Google Earth aerial image dated 16/05/2019

Figure 10. Locations of survey points on 15/06/2020, overlaid on aerial image dated 16/05/2019

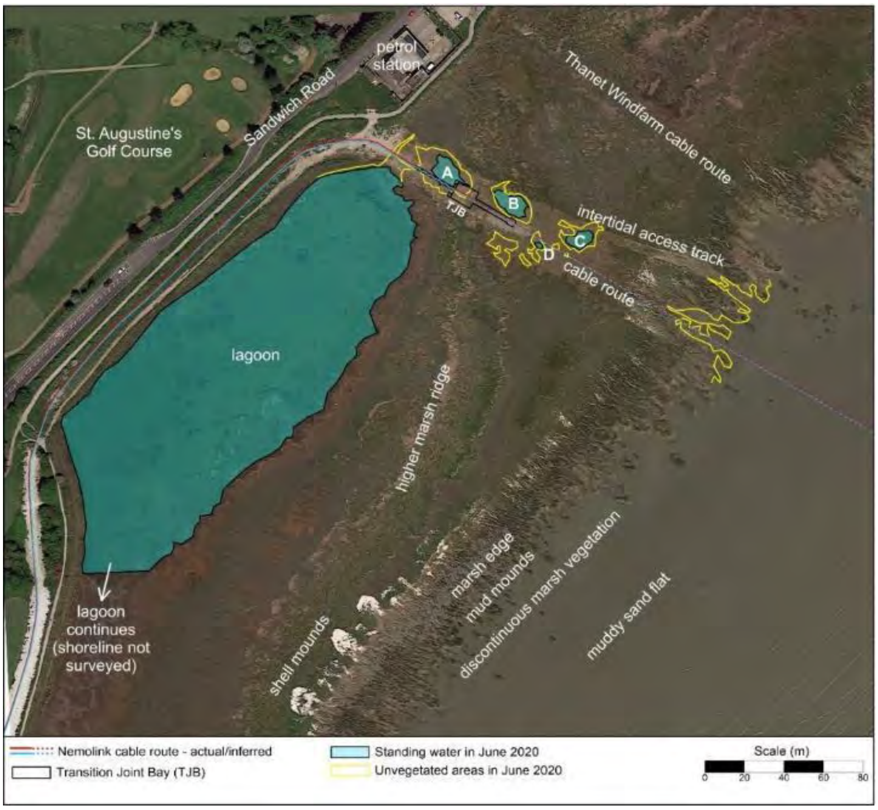


Figure 11. Standing water and unvegetated areas mapped during the ground survey on 15/06/2020. Base aerial image dated 16/05/2019

3.14 The first 2021 annual monitoring topographic survey was carried out on the 17th June 2021. Heavy rain and thunderstorms occurred during the previous night (16th to 17th June), with 30 mm of rain recorded at Manston, and a further 10.2 mm of rain on the morning of 17th June, stopping by 09:00 am. The weather became warm and humid, with occasional cloud and sea mist with sunny spells for the remainder of the survey, which was completed by 13:00.

3.15 Several tidal surges had occurred in the preceding days. The nearest Class A tide station at Dover working only intermittently during this period but recorded positive surge residuals of 0.47 m on the afternoon of 15th June and 0.41 m in the early morning (04:03 am BST) of 17th June. Assuming these surge residuals were also experienced at Pegwell Bay, overtopping of the marsh ridge and filling the lagoon and tidal ponds is likely to have occurred. The site was very wet during the survey with almost all formerly bare areas being covered with standing water, and many low-lying vegetated marsh areas also under standing water.

3.16 A total of 1289 points were surveyed using Leica Smartrover GS16 RTK GNSSS equipment. The distribution of points and features mapped are shown on Figures 12 and 13.

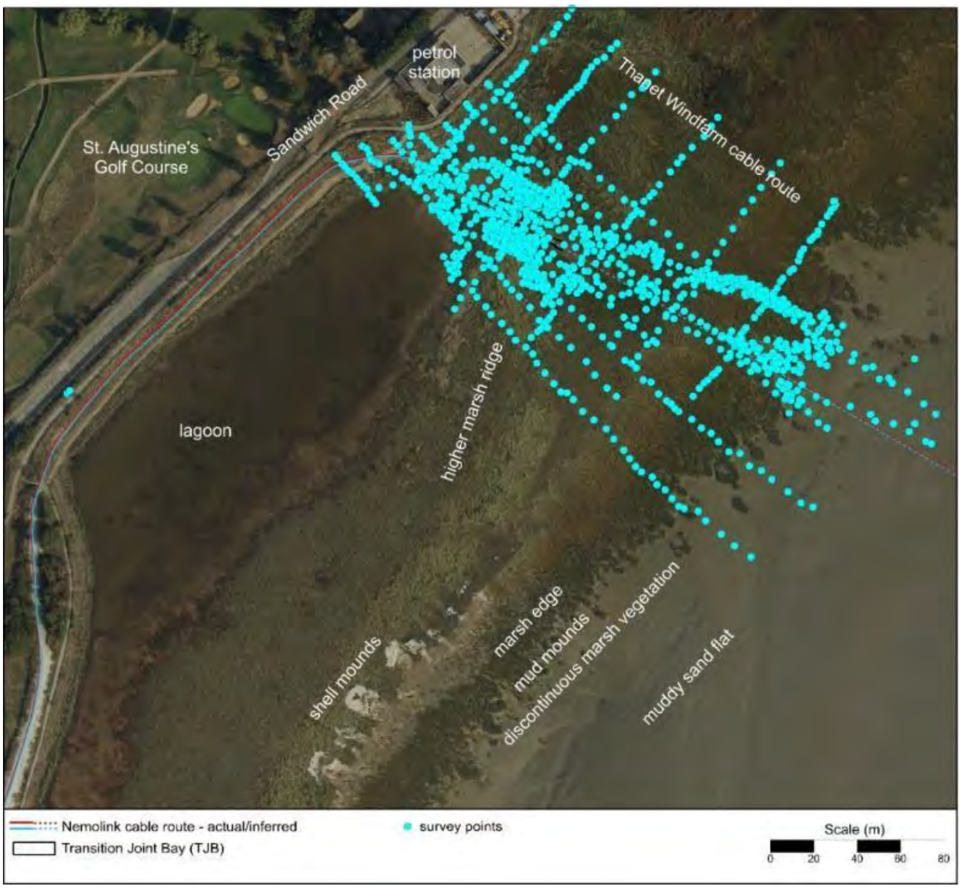


Figure 12. Locations of survey points on 17/06/2021, overlaid on aerial image dated 19/09/2020 (Channel Coast Observatory)

Figure 13. Standing water and unvegetated areas mapped during the ground survey on 17/06/2021. Base Google Earth aerial image dated 19/09/2020

3.17 The second 2021 monitoring RTK GNSS topographic survey was undertaken on 1st October, during a period of neap tides. There was heavy rain during the preceding night (30th September) and in the morning of the 1st October).

3.18 A total of 1502 points were surveyed using Leica Smartrover GS18 RTK GPNSS equipment. The distribution of points and features mapped are shown on Figures 14 and 15.

Figure 14. Locations of survey points on 01/10/2021, overlaid on aerial image 19/09/2020 (Channel Coast Observatory)

Figure 15. Standing water and unvegetated areas mapped during the survey on 01/10/2021. Base aerial image dated flown 19/09/2020 (Source: Channel Coast Observatory)

4.0 Results of the Year 5 topographic monitoring

4.1 The first 2022 annual monitoring topographic survey was carried out on the 8th and 9th June 2022. There was a light rain shower on 8th June (8.6 mm of rain recorded at Manston at 15:00), otherwise the weather was fine, warm and dry.

4.2 The survey was undertaken during a period of neap tides, with no significant surge, and high waters occurring at 18:41 BST on the 8th (1.62 m ODN) and 07:36 BST on 9th (1.52 m ODN). Neither of these tides overtopped the outer marsh ridge which has a crest elevation of 2.72 +/- 10 cm ODN.

4.3 A total of 1741 points were surveyed using Leica Smartrover GS16 RTK GNSS equipment. The distribution of points is shown on Figure 16. Selected photographs of topographic and hydrological features taken during the survey are included in Appendix 2.

Figure 16. Locations of points surveyed on 09/06/2022, overlaid on aerial imagery flown in March 2022

4.4 The likely errors associated with the survey, as specified by the instrument software, are shown in Table 1. Mean error in horizontal accuracy is likely to be 9.6 +/ 3.2 mm, and mean error in vertical accuracy is likely to be 8.5 +/- 1.8 mm.

Table 1. Summary of quality control error values and the Geometric and Vertical Dilution of Precision (GDOP and VDOP) values in the 1741 positions and elevations surveyed on 8th-9th June 2022. The Coordinate Quality (CQ) values indicate the likely error in coordinate space (in millimetres), while the DOP values provide a measure of the quality of the satellite constellation being used to calculate the positions (1.0 is perfect precision; 1.0-2.0 is considered excellent, 2-5 is considered good).

	1-D CQ (horizontal) (mm)	2-D CQ (vertical) (mm)	GDOP	VDOP
n	1741	1741	1741	1741
Mean	9.6	8.5	1.8	1.0
StDev	3.2	1.8	0.2	0.1
10th percentile	7.0	7.0	1.6	0.9
50th percentile	9.0	8.0	1.8	1.0
90th percentile	12.0	10.0	2.2	1.2
Max	40.0	26.0	2.6	1.4
Min	6.0	6.0	1.4	0.8

4.5 As in previous surveys, the extent of standing water and bare ground within and adjacent to the cable corridor was mapped (Figure 17).

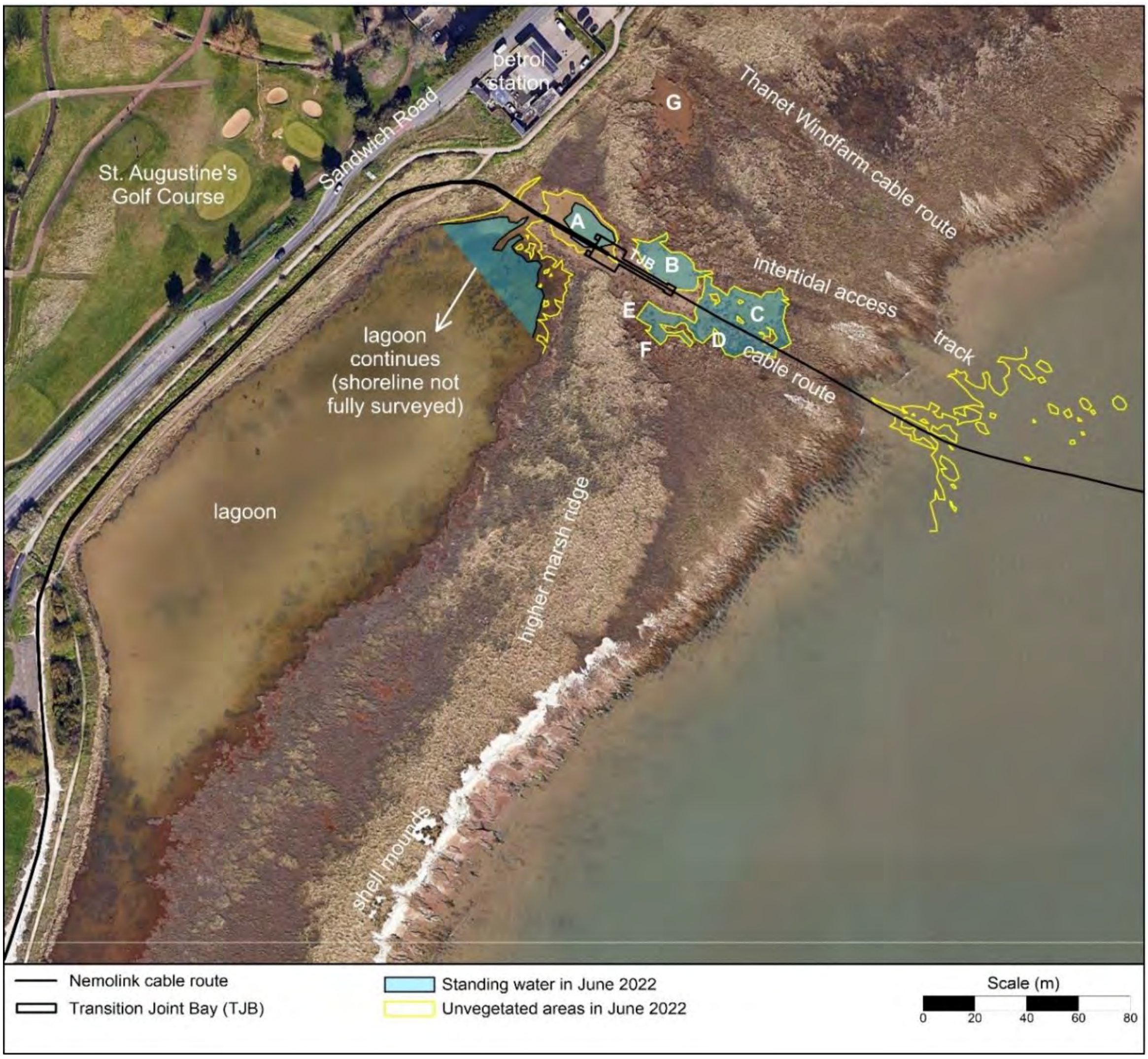


Figure 17. Standing water and unvegetated areas mapped during the survey on 09/06/2022. Base aerial photography flown March 2022

4.6 The second 2022 monitoring RTK GNSS topographic survey was undertaken on 4th October. The survey was undertaken during a period of neap tides, with no significant surge, with high water occurring at 06:28 BST reaching 1.52 m ODN, well below the level of the outer marsh ridge. However, standing water levels in the lagoon and tidal ponds was particularly high during this survey and standing water on the site was extensive. No rainfall was recorded at Manston during the preceding three days. It is likely, therefore, that standing water had been on the site since previous high spring tides on the 13th and 26th September (3.0 m ODN and 2.88 m ODN, respectively).

4.7 A total of 2260 points were surveyed using Leica Smartrover GS18 RTK GNSS equipment. The distribution of points is shown on Figure 18. Selected photographs during the survey are presented in Appendix 3.

Figure 18. Locations of points surveyed on 04/10/2022, overlaid on aerial imagery flown in March 2022

4.8 The likely errors associated with the survey, as specified by the instrument software, are shown in Table 2. Mean error in horizontal accuracy is likely to be 8.4 +/ 1.2 mm, and mean error in vertical accuracy is also likely to be 7.7 +/- 0.8 mm.

Table 2. Summary distribution of quality control error values and the Geometric and Vertical Dilution of Precision (GDOP and VDOP) values in the 2260 positions and elevations surveyed on 4th October 2022. The CQ values indicate the likely error in coordinate space (in mm), while the DOP values provide a measure of the quality of the satellite constellation being used to calculate the positions (1.0 = perfect precision; 1.0-2.0 = excellent, 2-5 = good)

	1-D CQ (horizontal)(mm)	2-D CQ (vertical) (mm)	GDOP	VDOP
n	2260	2260	2260	2260
Mean	8.4	7.7	1.9	1.0
St Dev	1.2	0.8	0.2	0.1
10th percentile	7.0	7.0	1.7	0.9
50th percentile	8.0	8.0	1.9	1.0
90th percentile	10.0	9.0	2.1	1.1
Max	17.0	18.0	2.2	1.2
Min	5.0	4.0	1.3	0.7

4.9 Since 2019 survey accuracy and precision have also been assessed by measurements of an Ordnance Survey (OS) benchmark on Sandwich Road (Table 3). The horizontal precision with which the benchmark has been measured has been 4 - 7 cm, while vertical precision has been 1 -2 cm. The elevation measured on 04/10/2022 was 5.233 m OD, while that recorded by the OS in 1976 was 5.243 m OD, a difference of 10 mm.

4.10 The outlines of major topographic features, including the lagoon, unvegetated areas and pools of standing water on the cable route and the intertidal access corridor were mapped, as during previous surveys (Figure 19). Points were also surveyed along profile lines within 0.5 to 1.0 m of the previous surveys (Figures 20 and 21).

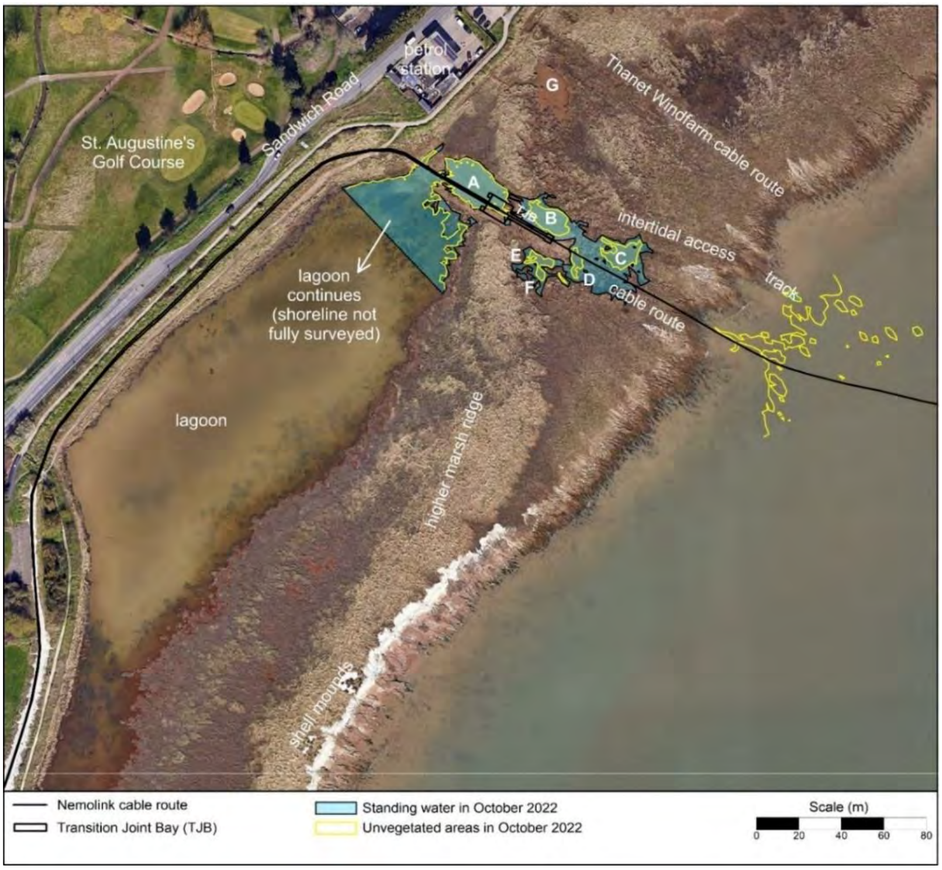


Figure 19. Standing water and unvegetated areas mapped during the survey on 04/10/2022. Base aerial photography flown March 2022

Table 3. Comparison of position and elevation of the OS benchmark on the side of Sandwich Road, surveyed by RTK GNSS on 21/06/2019, 19/03/2020, 15/06/2020, 17/06/2021, 01/10/2021, 08/06/2022 and 04/10/2022. The elevation and position reported by the OS in 1976 are also shown, although the benchmark is no longer maintained by the OS

Date	Measurement	**Easting**	**Northing**	**Elevation**	**1-D (height) CQ**	**2-D (position) CQ**
1976*		634370	163670	5.243		
21/06/2019	1	634370.383	163672.981	5.247	0.008	0.005
	2	634370.384	163672.980	5.245	0.007	0.005
	3	634370.384	163672.978	5.245	0.007	0.005
	4	634370.385	163672.972	5.244	0.017	0.009
	Average	634370.384	163672.978	5.245	0.010	0.006
	Stdev	0.001	0.004	0.001	0.005	0.002
19/03/2020	1	634370.389	163672.972	5.223	0.01	0.007
	2	634370.396	163672.973	5.226	0.01	0.006
	3	634370.388	163672.965	5.223	0.009	0.006
	4	634370.389	163672.967	5.221	0.009	0.006
	Average	634370.391	163672.969	5.223	0.010	0.006
	Stdev	0.004	0.004	0.002	0.001	0.001
15/06/2020	1	634370.387	163672.985	5.227	0.010	0.007
	2	634370.396	163672.994	5.226	0.009	0.006
	3	634370.389	163672.985	5.227	0.010	0.007
	4	634370.390	163672.990	5.226	0.009	0.006
	5	634370.391	163672.987	5.224	0.009	0.006
	6	634370.392	163672.989	5.225	0.009	0.006
	7	634370.393	163672.986	5.224	0.009	0.006
	8	634370.382	163672.982	5.226	0.009	0.006
	9	634370.397	163672.991	5.225	0.010	0.006
	10	634370.384	163672.979	5.224	0.009	0.006
	11	634370.395	163672.990	5.226	0.010	0.007
	Average	634370.391	163672.987	5.225	0.009	0.006
	St dev	0.005	0.004	0.001	0.001	0.000
17/06/2021	1	634370.414	163673.034	5.208	0.008	0.005
	2	634370.405	163673.005	5.207	0.008	0.005
	3	634370.403	163673.002	5.210	0.008	0.005
	4	634370.402	163673.009	5.208	0.009	0.006
	5	634370.404	163673.010	5.205	0.009	0.006
	6	634370.421	163673.076	5.208	0.007	0.005
	7	634370.432	163673.072	5.208	0.007	0.004
	8	634370.444	163673.072	5.211	0.006	0.004
	Average	634370.416	163673.035	5.208	0.008	0.005
	St dev	0.016	0.033	0.002	0.001	0.001
01/10/2021	1	634370.452	163673.039	5.232	0.008	0.007
	2	634370.451	163673.039	5.233	0.009	0.007
	3	634370.453	163673.040	5.235	0.009	0.007
	4	634370.453	163673.040	5.231	0.008	0.007
	5	634370.452	163673.041	5.232	0.009	0.007
	6	634370.454	163673.040	5.232	0.008	0.007
	7	634370.452	163673.042	5.235	0.009	0.007
	8	634370.452	163673.041	5.231	0.009	0.007
	9	634370.454	163673.040	5.231	0.008	0.007
	10	634370.453	163673.043	5.232	0.008	0.007
	Average	634370.453	163673.041	5.232	0.009	0.007
	St dev	0.001	0.001	0.002	0.001	0.000

Table 3 cont.

Date	Measurement	**Easting**	**Northing**	**Elevation**	**1-D (height) CQ**	**2-D (position) CQ**
08/06/2022	1	634370.372	163672.975	5.235	0.007	0.007
	2	634370.371	163672.974	5.232	0.006	0.007
	3	634370.371	163672.974	5.231	0.007	0.007
	4	634370.371	163672.973	5.236	0.006	0.007
	5	634370.370	163672.973	5.235	0.006	0.007
	6	634370.370	163672.974	5.236	0.007	0.007
	7	634370.370	163672.975	5.234	0.007	0.007
	8	634370.370	163672.974	5.233	0.006	0.007
	9	634370.370	163672.973	5.233	0.006	0.007
	10	634370.370	163672.975	5.232	0.007	0.007
	Average	634370.371	163672.974	5.234	0.007	0.007
	St dev	0.001	0.001	0.002	0.001	0.000
04/10/2022 07:30	1	634370.401	163672.971	5.240	0.008	0.007
	2	634370.401	163672.970	5.232	0.008	0.007
	3	634370.400	163672.968	5.230	0.006	0.007
	4	634370.399	163672.967	5.227	0.006	0.007
	5	634370.399	163672.967	5.236	0.007	0.007
	6	634370.398	163672.966	5.231	0.006	0.007
	7	634370.401	163672.968	5.229	0.007	0.007
	8	634370.399	163672.967	5.228	0.006	0.007
	9	634370.399	163672.967	5.231	0.006	0.007
	10	634370.401	163672.967	5.230	0.005	0.006
	Average	634370.400	163672.968	5.231	0.007	0.007
	St dev	0.001	0.002	0.004	0.001	0.000
04/10/2022 10:00	1	634370.461	163672.970	5.217	0.006	0.007
	2	634370.460	163672.969	5.222	0.006	0.007
	3	634370.460	163672.969	5.222	0.006	0.007
	4	634370.460	163672.969	5.223	0.006	0.007
	5	634370.460	163672.969	5.223	0.007	0.008
	6	634370.460	163672.969	5.222	0.006	0.007
	7	634370.460	163672.969	5.225	0.006	0.008
	8	634370.459	163672.968	5.222	0.006	0.007
	9	634370.459	163672.967	5.217	0.006	0.007
	10	634370.459	163672.968	5.220	0.006	0.007
	Average	634370.460	163672.969	5.221	0.006	0.007
	St dev	0.001	0.001	0.003	0.000	0.000
04/10/2022 14:40	1	634370.465	163672.976	5.233	0.008	0.007
	2	634370.465	163672.976	5.235	0.008	0.007
	3	634370.464	163672.978	5.235	0.010	0.007
	4	634370.464	163672.978	5.233	0.008	0.007
	5	634370.465	163672.979	5.236	0.008	0.007
	6	634370.464	163672.979	5.229	0.007	0.007
	7	634370.464	163672.980	5.234	0.008	0.007
	8	634370.463	163672.980	5.236	0.010	0.008
	9	634370.465	163672.979	5.231	0.009	0.007
	10	634370.463	163672.978	5.231	0.008	0.007
	Average	634370.464	163672.978	5.233	0.008	0.007
	St dev	0.001	0.001	0.002	0.001	0.000
	Average (all Oct 2022)	634370.441	163672.972	5.229	0.007	0.007
	St dev (all Oct 2022)	0.030	0.005	0.006	0.001	0.000

Table 3 cont.

		Easting	Northing	Elevation	1-D (height) CQ	2-D (position) CQ
Difference	21/06/19 to 04/10/22	0.057	-0.006	-0.016		
Difference	19/03/20 to 04/10/22	0.050	0.003	0.006		
Difference	15/06/20 to 04/10/22	0.050	-0.015	0.004		
Difference	17/06/21 to 04/10/22	0.025	-0.063	0.021		
Difference	01/10/21 to 04/10/22	-0.012	-0.069	-0.003		
Difference	08/06/22 to 04/10/22	0.070	-0.002	-0.005		
Difference	04/10/22 07:30 to 10:00	0.060	0.001	-0.010		
Difference	04/10/22 10:00 to 14:40	0.004	0.009	0.012		
Difference	04/10/22 07:30 to 14:40	0.064	0.010	0.002		

Figure 20. Positions of topographic profiles across, and broadly parallel with the cable corridor, surveyed in June and October 2022 (and preceding surveys by KPAL), superimposed on aerial imagery flown in March 2022 (source: Google Earth). Profiles 1 to 4 (blue) were chosen to coincide with selected previous pre-works (2017) survey points; Profiles 20 to 26 (yellow) were chosen to coincide with profiles surveyed in June 2018; Profiles 5 to 12 (white) were chosen to coincide with profiles surveyed in April 2019

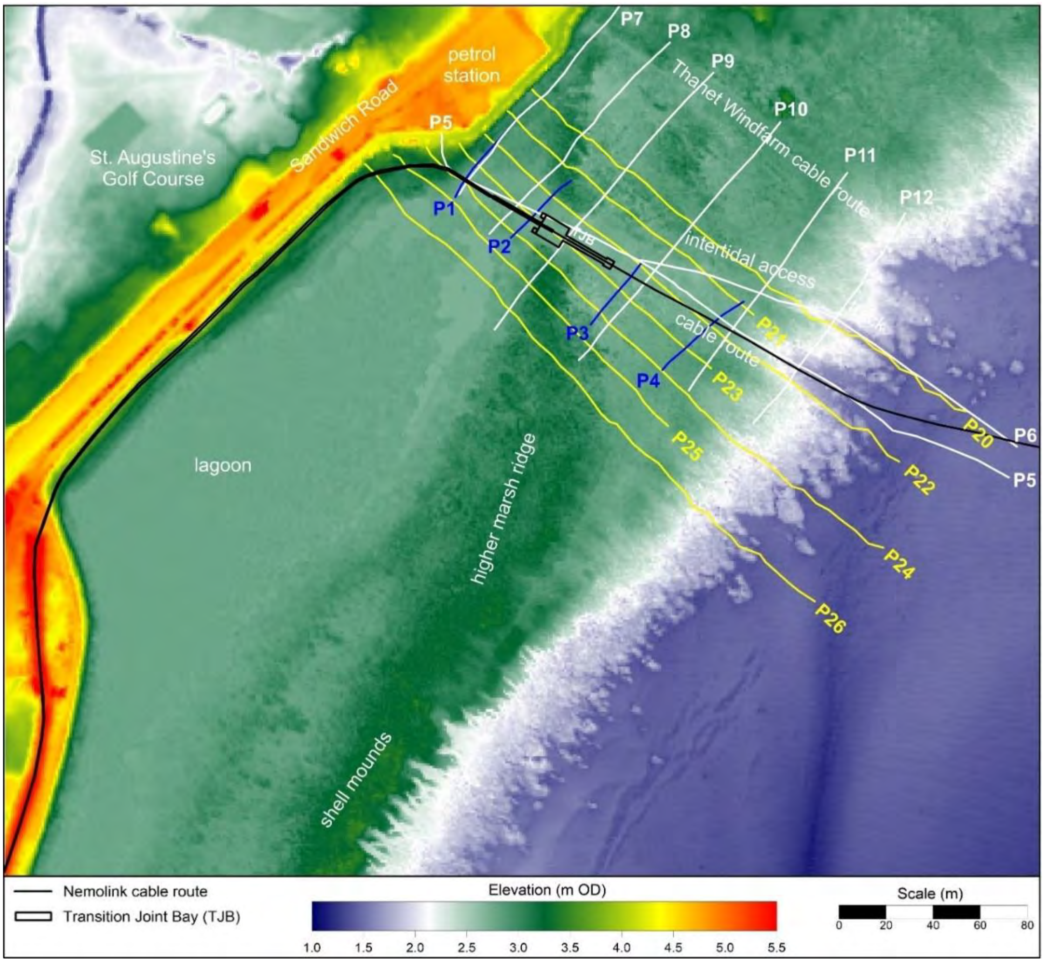


Figure 21. Positions of topographic profiles across and parallel with the cable corridor, surveyed in June and October 2022 (and preceding surveys by KPAL), superimposed on the LiDAR DTM flown 20/09/2020. Profiles 1 to 4 (blue) were chosen to coincide with selected previous pre-works (2017) survey points; Profiles 20 to 26 (yellow) were chosen to coincide with profiles surveyed in June 2018; Profiles 5 to 12 (black) were chosen to coincide with profiles surveyed in April 2019

4.11 Figure 22 provides a comparison of ground survey in 2017 (pre-works), April 2019, June 2019, June 2020 and October 2021 for profiles P1 - P4. The value of this comparison is limited by the short profile lengths and small number of data points surveyed in 2017. It should be noted that the original (pre-works) survey line P1 lies very close to a shallow drainage channel from the lagoon, draining towards the northeast. Much of profile line P2 crosses ground on the landward side of the high saltmarsh ridge and the TJB, and only the north-eastern end captures the high marsh ridge. Profiles P3 and P4 lie to seaward of the high marsh ridge. The data for P1 indicate that there was surface scour around the north-eastern end of the lagoon, where tidal flows enter and leave, between June 2020 and June 2021, but that subsequent gain in elevation occurred die to sediment accumulation in this area between June 2021 and October 2021. In part the changes in level in this area represent settlement and local reworking of sediment since cable installation.

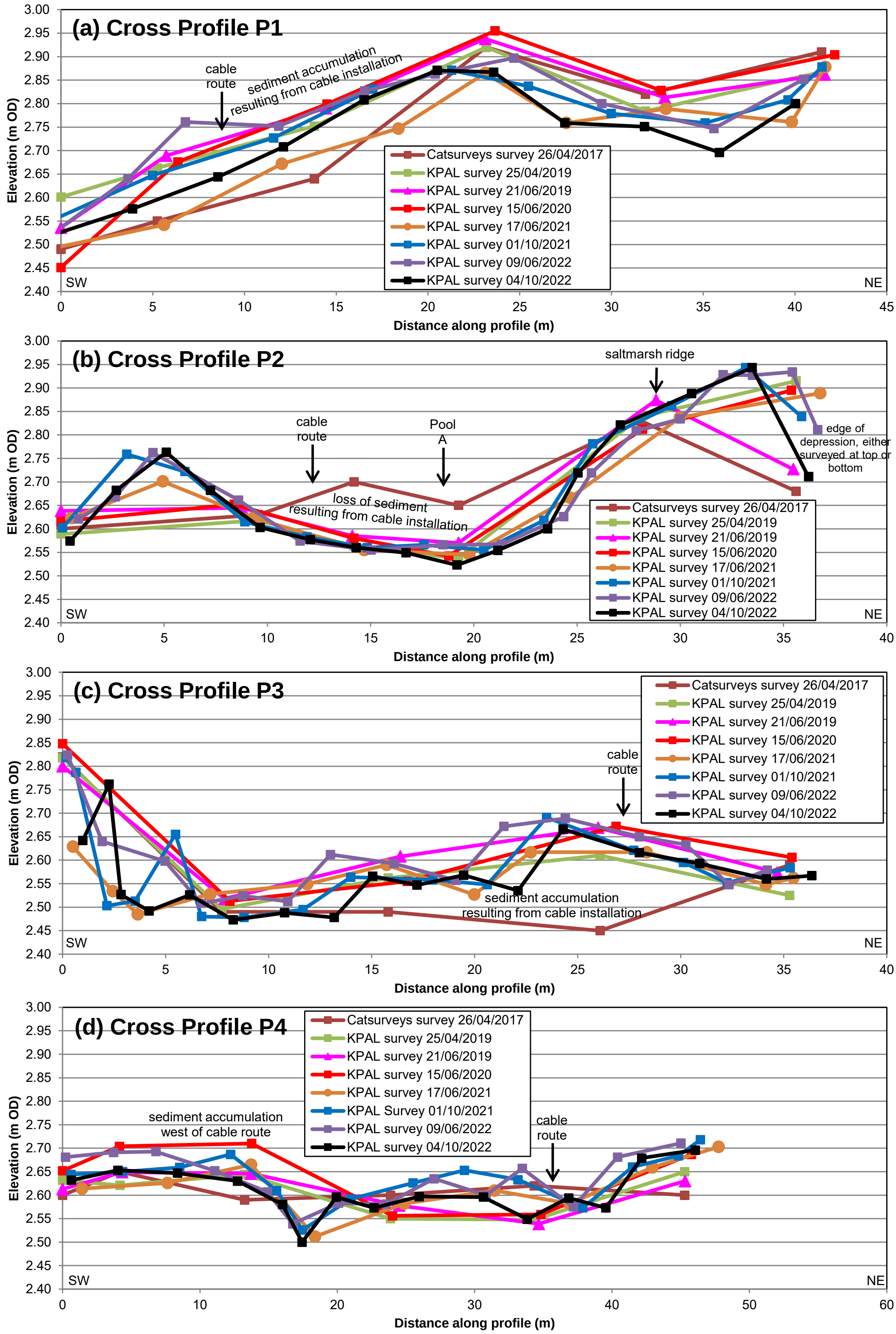


Figure 22. Comparison of Profiles P1 to P4 surveyed in on 26/04/2017, 25/04/2019, 21/06/2019, 15/06/2020, 17/06/2021, 01/10/2021, 09/06/2022 and 04/10/2022

4.12 Figure 23 compares the topographic levels in 2015 (estimated from airborne LiDAR survey), and ground topographic surveys in June 2018, June 2019, March 2020, June 2020, June 2021 and October 2021 along axial profiles P5 and P6 (the former along the approximate line of the cable route and the latter along the intertidal access track to the north). Enlargements of the landward part of these profiles are shown in Figure 24 and enlargements of the seaward parts shown in Figure 25. The main difference between 2015 (pre-works) and 2019 (Year 2 post-works) is a reduction in the elevation (by 30 +/- 10 cm) of the former high marsh ridge at chainage 70 - 100 m (Figures 23a & 24a). Since the June 2019 survey there has been an accumulation of sediment around Pool B, just seaward of the TJB on Profile 5 (c. 5 - 10 cm of accretion at chainage 110 - 120 m). Since June 2020 there has also been vertical accretion of 5 - 10 cm towards the seaward end of the cable route (c. chainage 180 m on Figure 23a) where there is now a well-vegetated ridge which provides greater impediment to tidal incursion into the lagoon. The zone of mud mounds and furrows to seaward of this ridge (chainage 210 to 250 m) is spatially variable in terms of elevation, and apparent differences between surveys are partly an artifact of slightly different point positions on different surveys (the difference in elevation between mounds and furrows is at least 20 -3 0 cm on a horizontal scale of 40 - 50 cm). This area is also subject to rapid change in actual level, reflecting mud abrasion by wave-induced shell movement and varying patterns of deposition of the shells themselves. On the upper beach a shallow water-filled runnel runs sub-parallel to the marsh edge; repeat surveys since 2019 have shown that its position and depth are variable, and in October 2021 the deepest part was centred at approximately chainage 280 m. This feature is natural and unrelated to the cable installation works.

4.13 There has also been sediment accretion of c. 10 cm between June 2020 and October 2021 towards the seaward end of the intertidal access track (c. chainage 180 m on axial profile P6; Figures 23b & 25b). A distinct, well-vegetated ridge is now present which acts to limit, but not entirely prevent, tidal incursion into the cable corridor and lagoon. The majority of the access corridor has also become fully vegetated since the June 2019 survey (see later botanical survey results). There appears to have been very little morphological change at the very end of the intertidal access track where wave action remains important in moving shells derived from the intertidal flats, and where there is a spatially complex pattern of sediment erosion and deposition. The runnel on the upper intertidal flat seaward of the marsh edge is also seen on Profile 6 around chainage 280 - 300 m). Landward of the developing seaward ridge, both axial profiles 5 and 6 show a reduction in topographic variation between June 2020 and October 2021 due to deposition of sediment in the lower parts of the corridor, including parts of the pools of standing water.

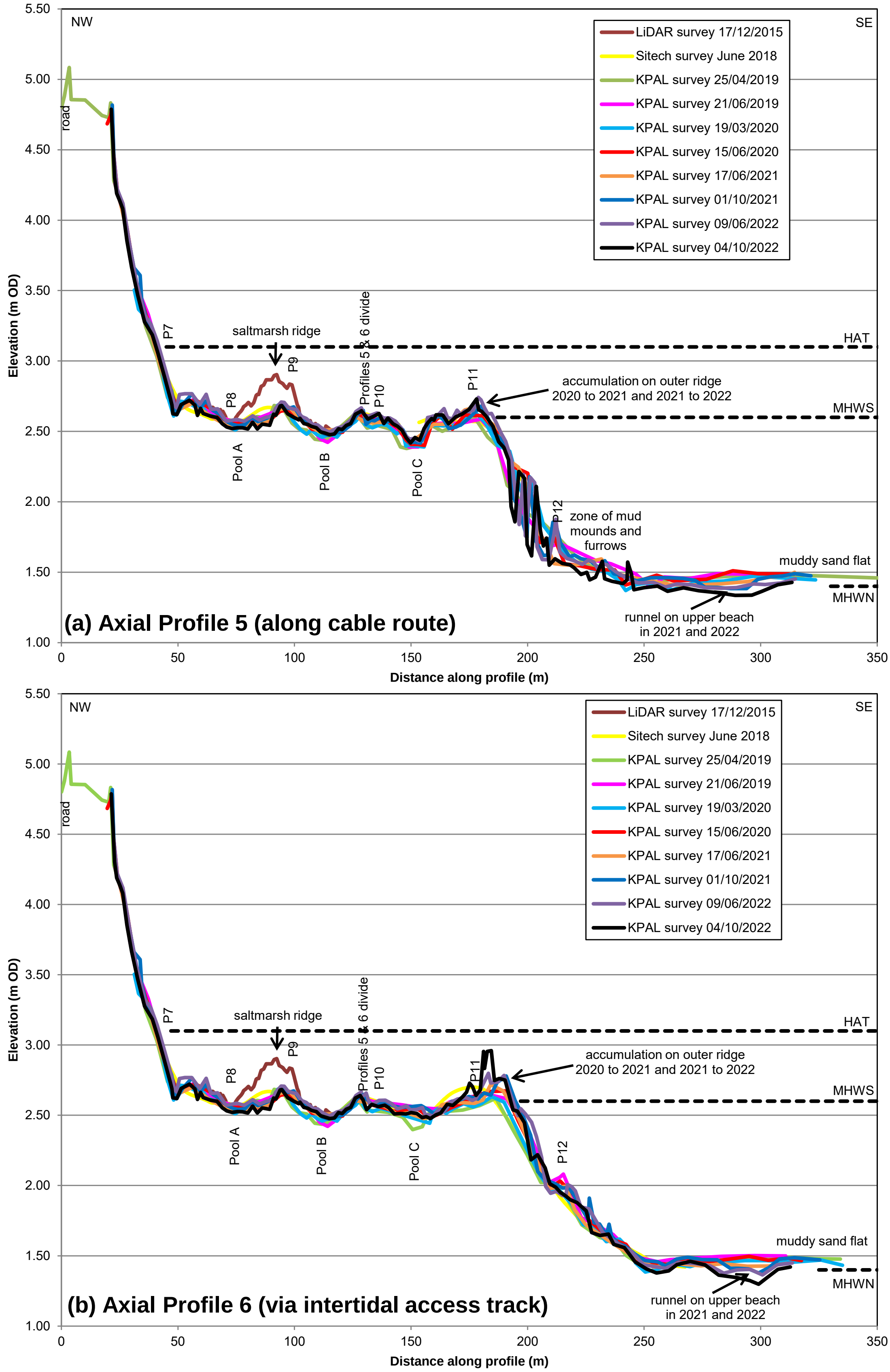
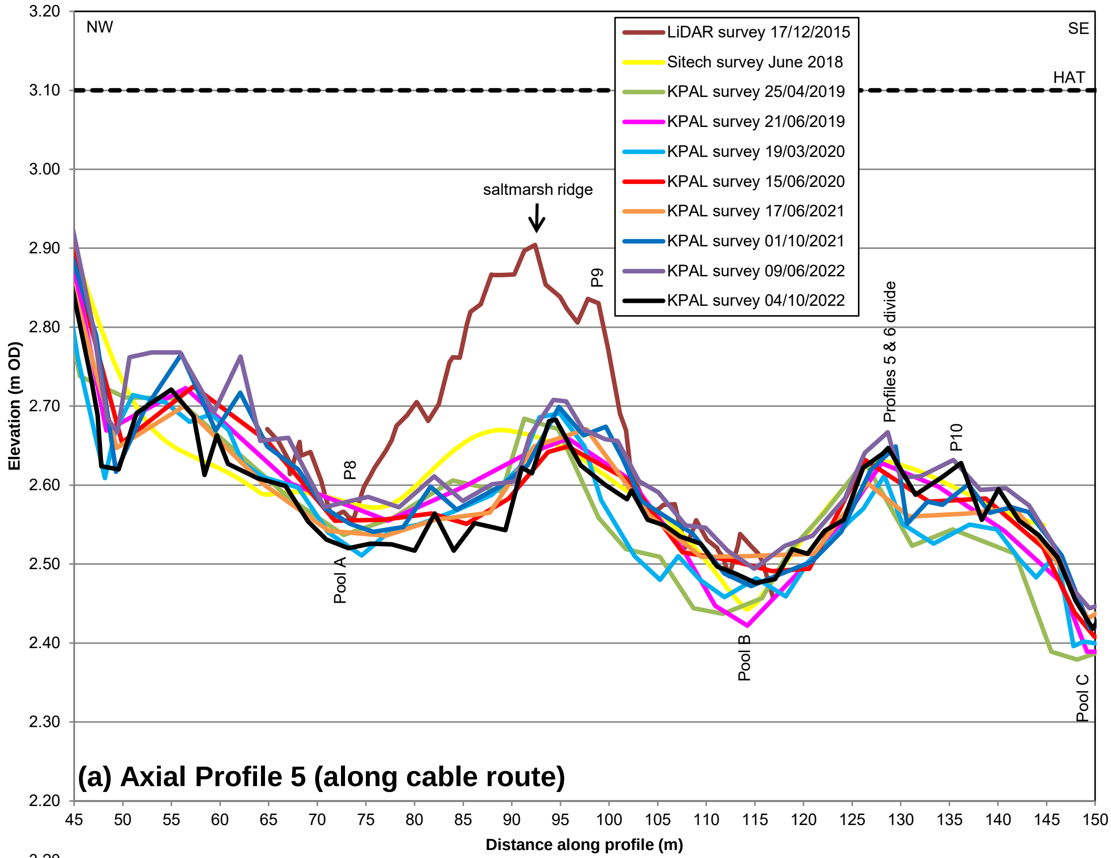


Figure 23. Comparison of profiles along the axes of the cable route (P5) and adjacent disturbed area on its northern side (P6) surveyed on 25/04/2019, 21/06/2019, 19/03/2020, 15/06/2020, 17/06/2021, 01/10/2021, 09/06/2022, 04/10/2022, and interpolated from LiDAR survey on 17/12/2015 and ground survey in June 2018



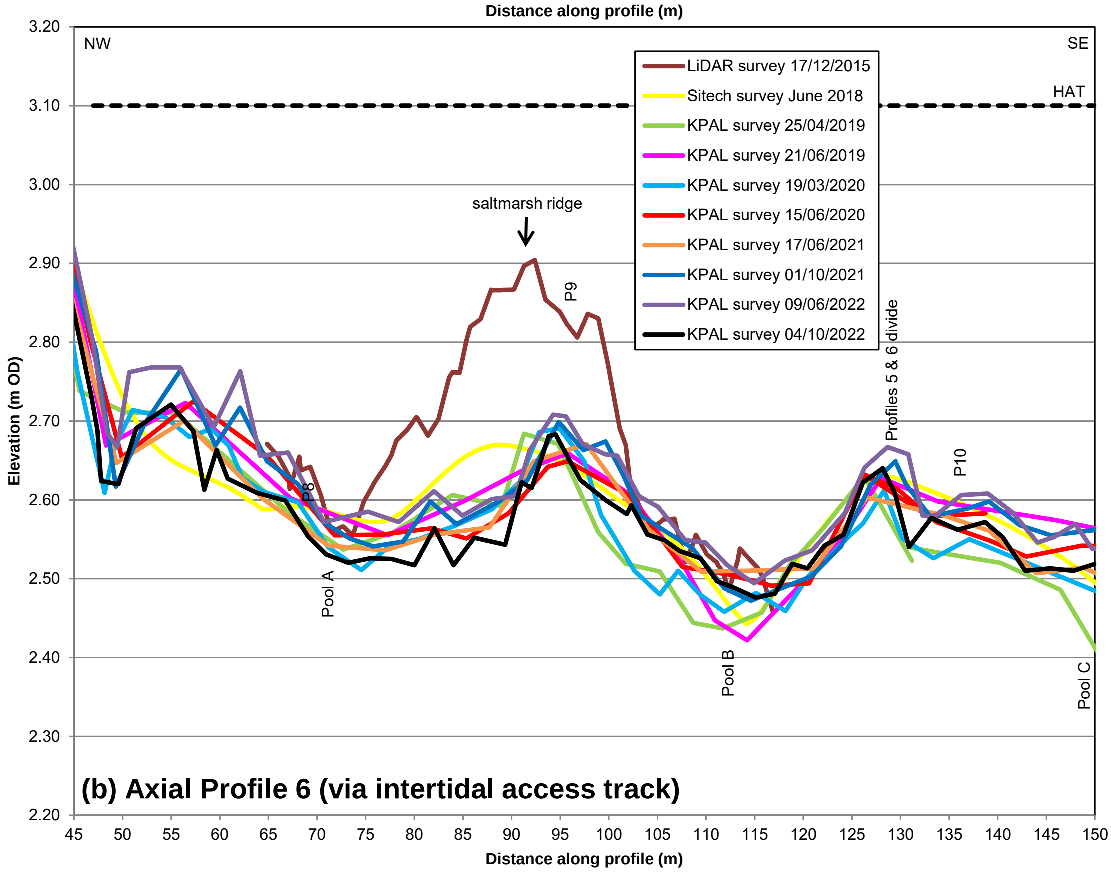


Figure 24. Expanded scale of Figure 4, so show the detail of the upper saltmarsh between 45 and 150 metres from the start of Profiles 5 and 6

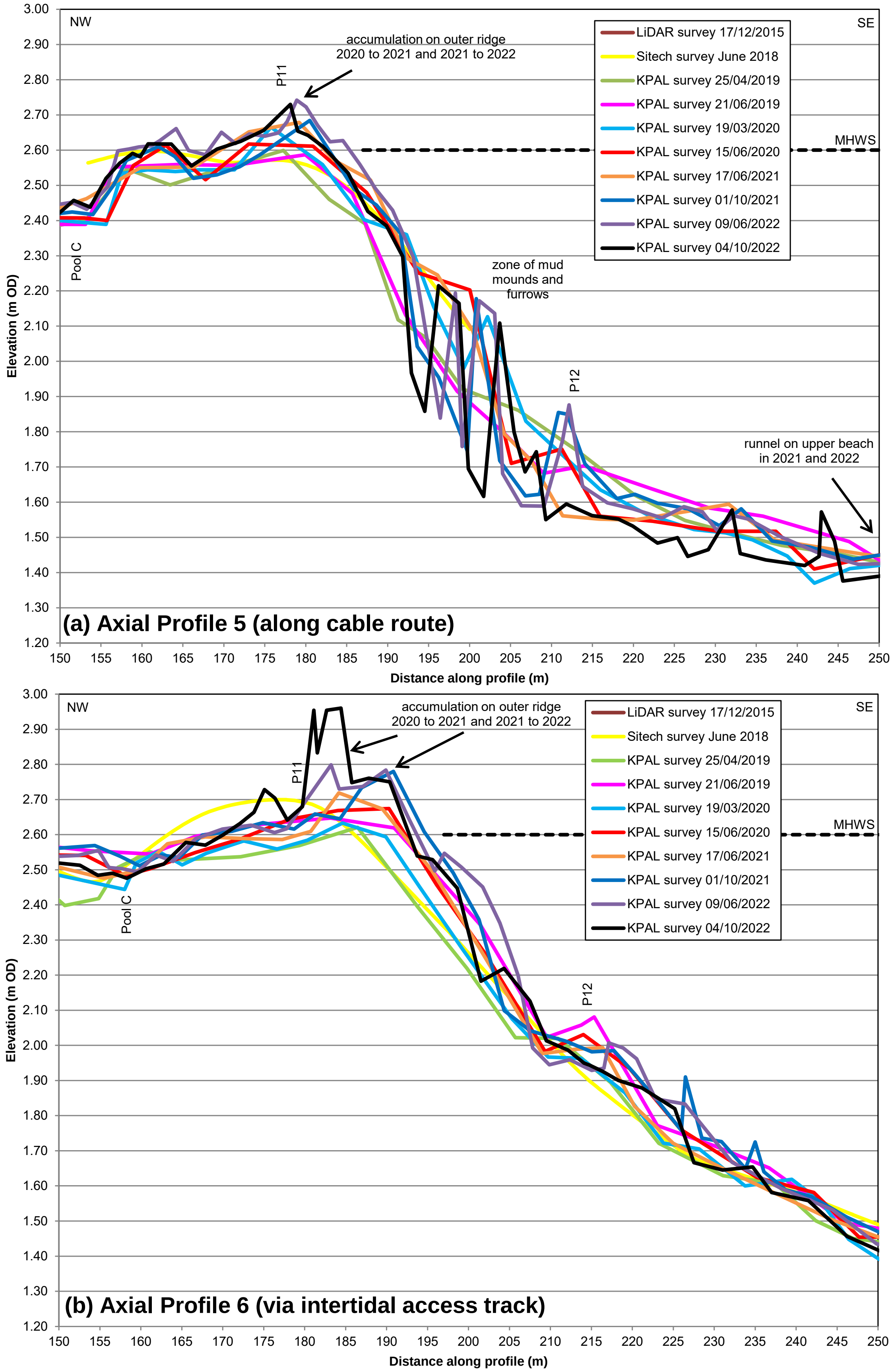


Figure 25. Expanded scale of Figure 4, so show the detail of the outer saltmarsh ridge and lower saltmarsh between 150 and 250 metres from the start of Profiles 5 and 6

4.14 Figures 26 & 27 provide a comparison of cross-profiles P7 - P12 based on points surveyed in April and June 2019, March and June 2020, and October 2021, and interpolated from the pre works survey in April 2017. Changes on Profile 7 and 8 are small, and largely within the errors associated with the exact positioning profile line on the ground (generally ±50 cm in the horizontal). The most significant changes occur on Profile P9 which crosses the cable route close to the TJB where there has been a reduction of approximately 25 cm between the 2017 pre-works survey and the first post-works survey in April 2019, after which the profile has shown slight accretion of c.5 cm. On the vegetated saltmarsh ridge at the SW end of Profile 9 there has been c. 10 cm of sediment accretion. The surface levels on Profiles 10 to 11 appear stable, with little accretion or erosion occurring in the cable route or intertidal access track. The average surface level along Profile 12 also appears stable, although there is small-scale spatial and temporal variability due to the undulating nature of the mud mounds and furrows.

4.15 Figures 28 & 29 compare longitudinal profiles P20 to P26 which were originally surveyed by Sitech Ltd in June 2018 and are mostly orientated broadly parallel to the cable route. Profiles P22 and P23 cross the cable corridor at an oblique angle. The majority of these profiles cross undisturbed vegetated marsh outside the cable corridor and show very little difference between the June 2018, June 2019, June 2020, June 2021 and October 2021 surveys, indicating very limited change on the natural marsh.

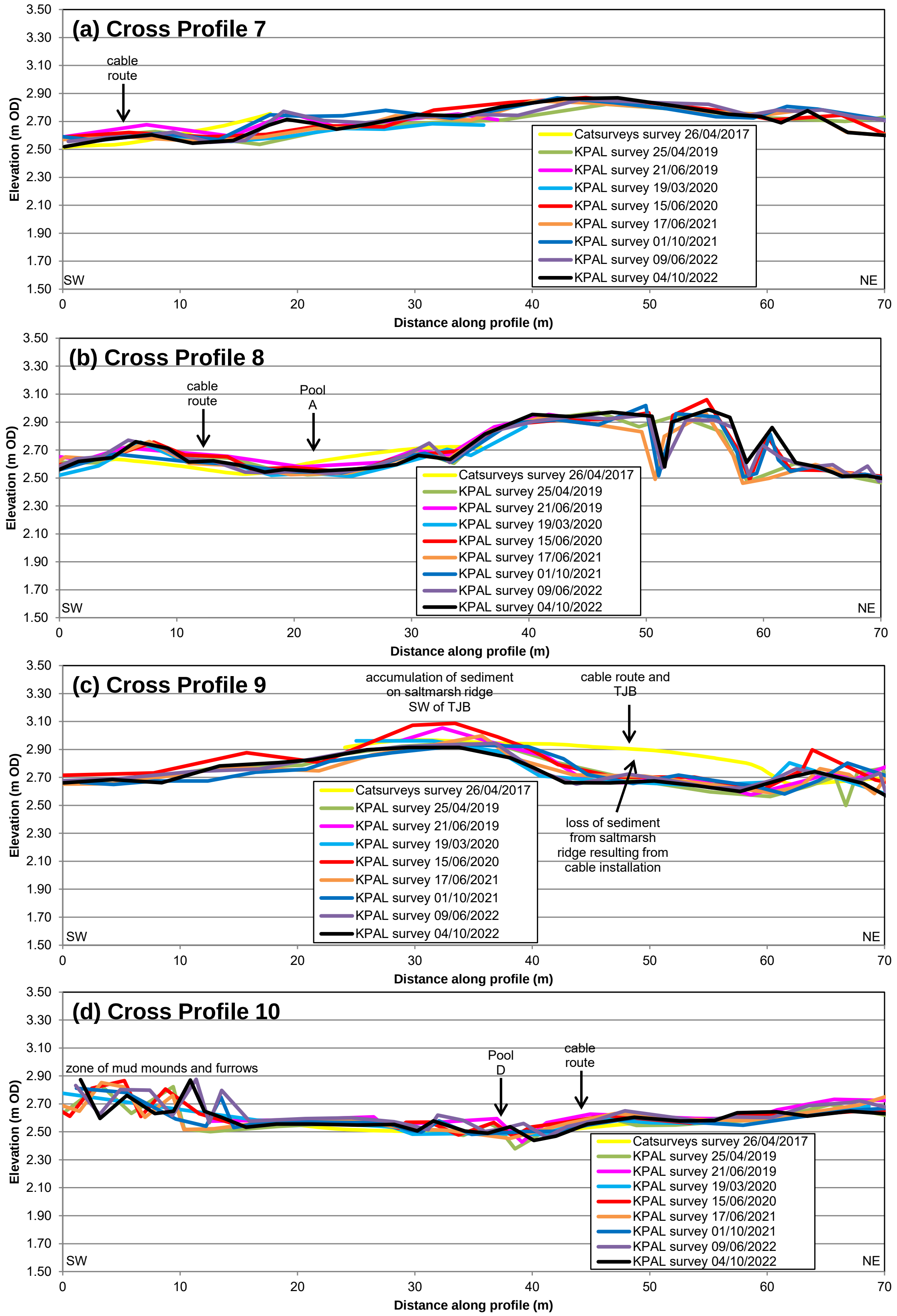


Figure 26. Comparison of Profiles 7 to 10 across the cable route and adjacent disturbed area surveyed on 25/04/2019, 21/06/2019, 19/03/2020, 15/06/2020, 17/06/2021, 01/10/2021, 09/06/2022 and 04/10/2022, and interpolated from Catsurveys survey on 26/04/2017

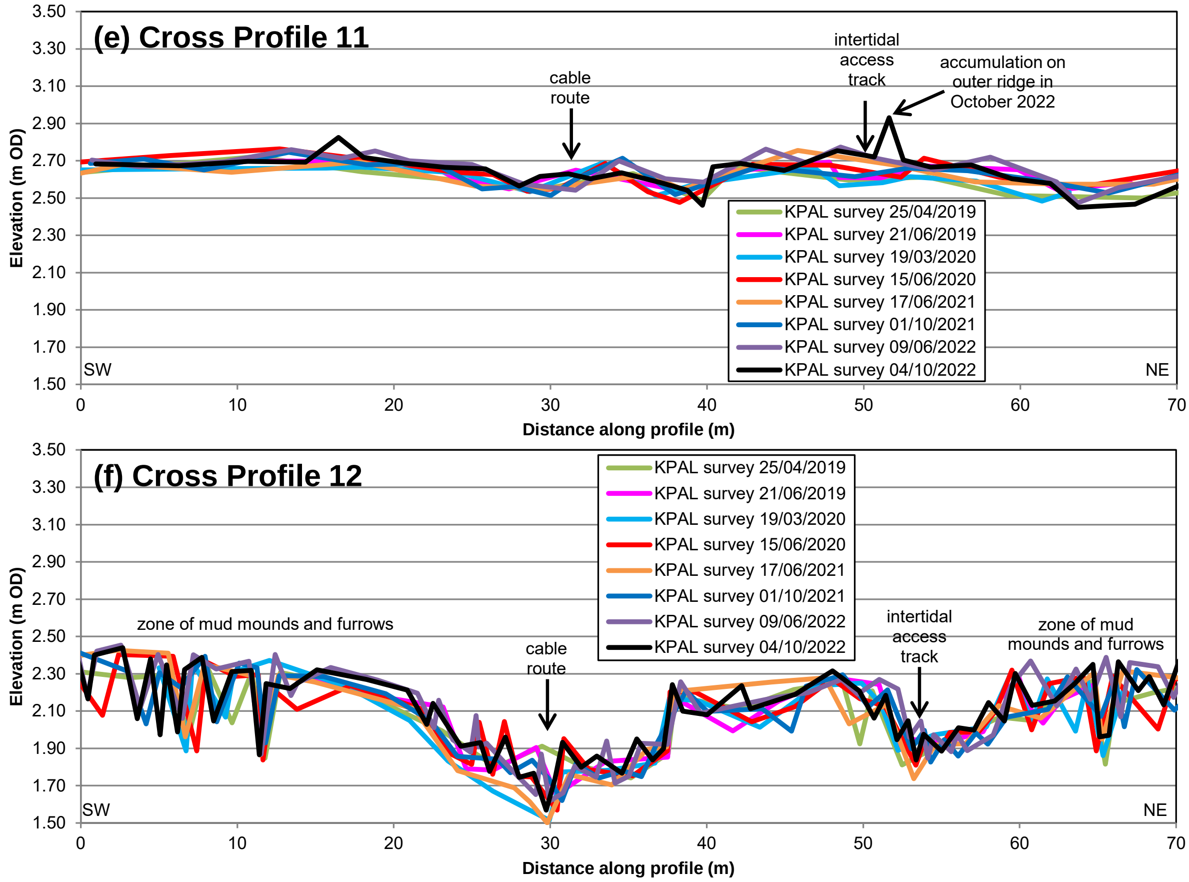


Figure 27. Comparison of Profiles 11 and 12 across the cable route and adjacent disturbed area surveyed on 25/04/2019, 21/06/2019, 19/03/2020, 15/06/2020, 01/10/2021, 09/06/2022 and 04/10/2022

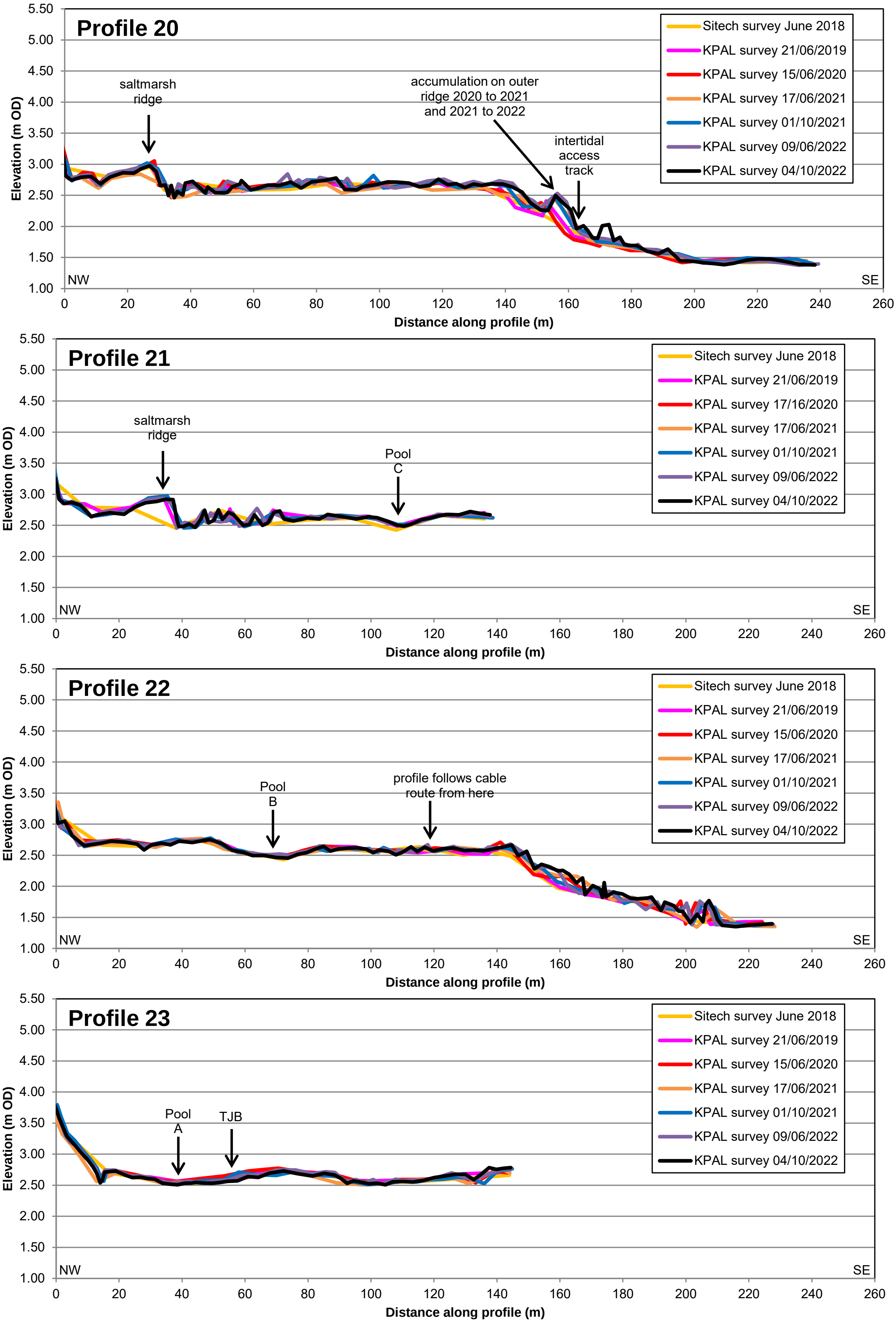


Figure 28. Comparison of Profiles P20 to P23 across the cable route and adjacent disturbed area, surveyed on 21/06/2019, 15/06/2020, 17/06/2021, 01/10/2021, 09/06/2022 and 04/10/2022 at the same locations as the ground survey in June 2018

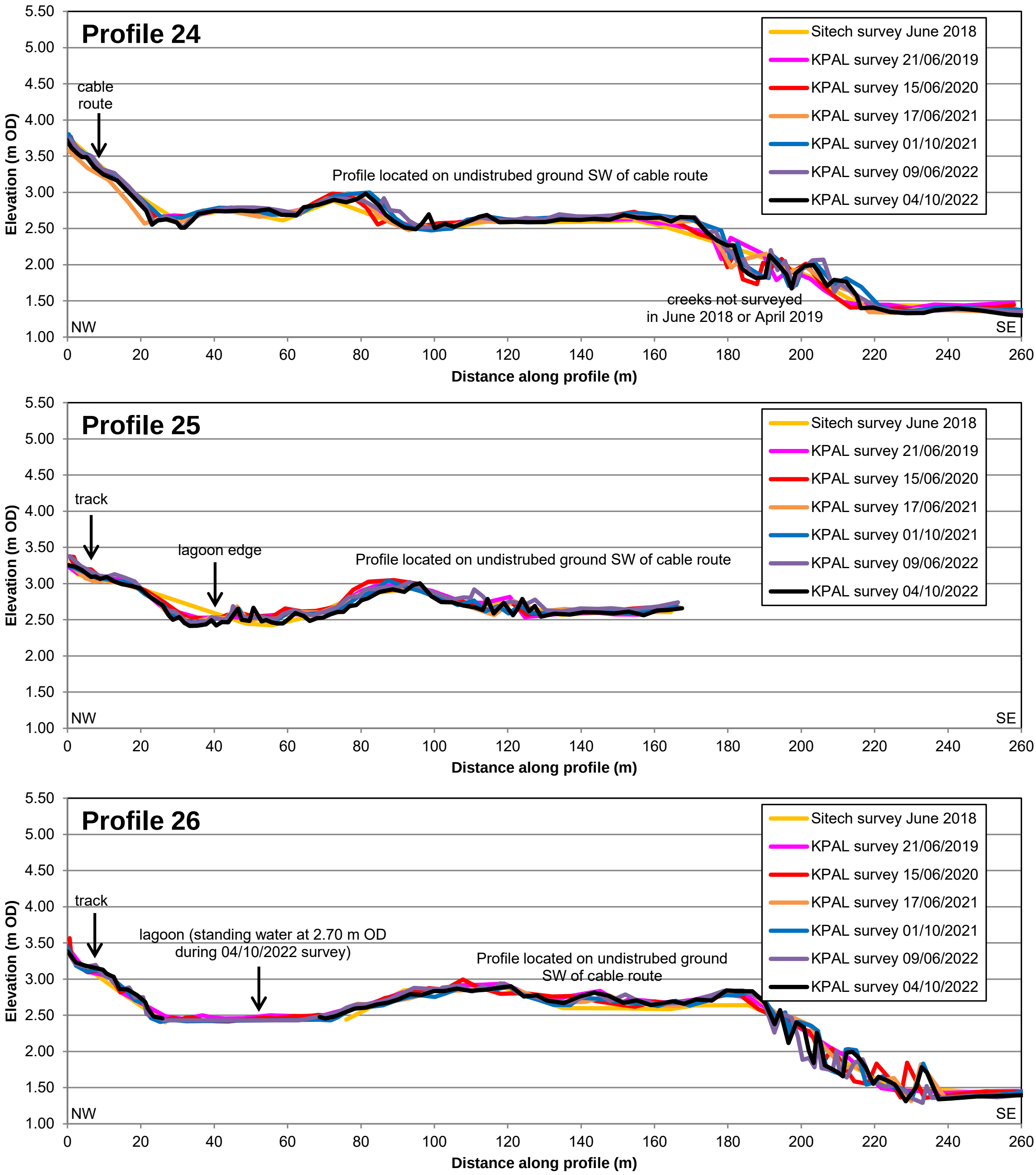


Figure 29. Comparison of Profiles P24 to P26 across the cable route and adjacent disturbed area, surveyed on 21/06/2019, 15/06/2020, 17/06/2021, 01/10/2021, 09/06/2022 and 04/10/2022 at the same locations as the ground survey in June 2018

4.16 The results of the October 2022 topographic monitoring show that the ground level within much of the cable route experienced a slight drop in elevation compared with Year 4 (2021). This is attributed to the unusually dry conditions experienced during the spring and summer of 2022 which led to drying out and shrinkage of the surface sediment (see below). An exception is provided by the crest of the new ridge forming close to the seaward edge of the marsh where there continued to be vertical accretion due to deposition of wave transported sediment and wrack.

4.16 The results of both field surveys and aerial photograph analysis indicate that the position of the vegetated marsh edge has changed little since 2019, and indeed there has been a spatially variable pattern of progradation and recession since 2013). The general et trend at the seaward end of the cable corridor since 1960 is one of progradation of the marsh edge (Figure 30). To the southwest of the cable corridor, opposite the lagoon, the position of the vegetated marsh edge has changed only slightly since 1960 but there has been significant recession of the cliff eroded in the established higher marsh sediments, and chenier ridges composed of wave-reworked cockle shells have become a prominent feature in the past 10 years (Figure 31).

4.17 Comparison of field survey and airborne LIDAR data at seven profile positions along the chenier ridge (Figure 31) have shown that the southern two thirds of the chenier ridge has both moved landward and grown in elevation since 2007 whereas at profiles P6 and P7, closest to the cable route, there has been little change (Figures 32 - 39).

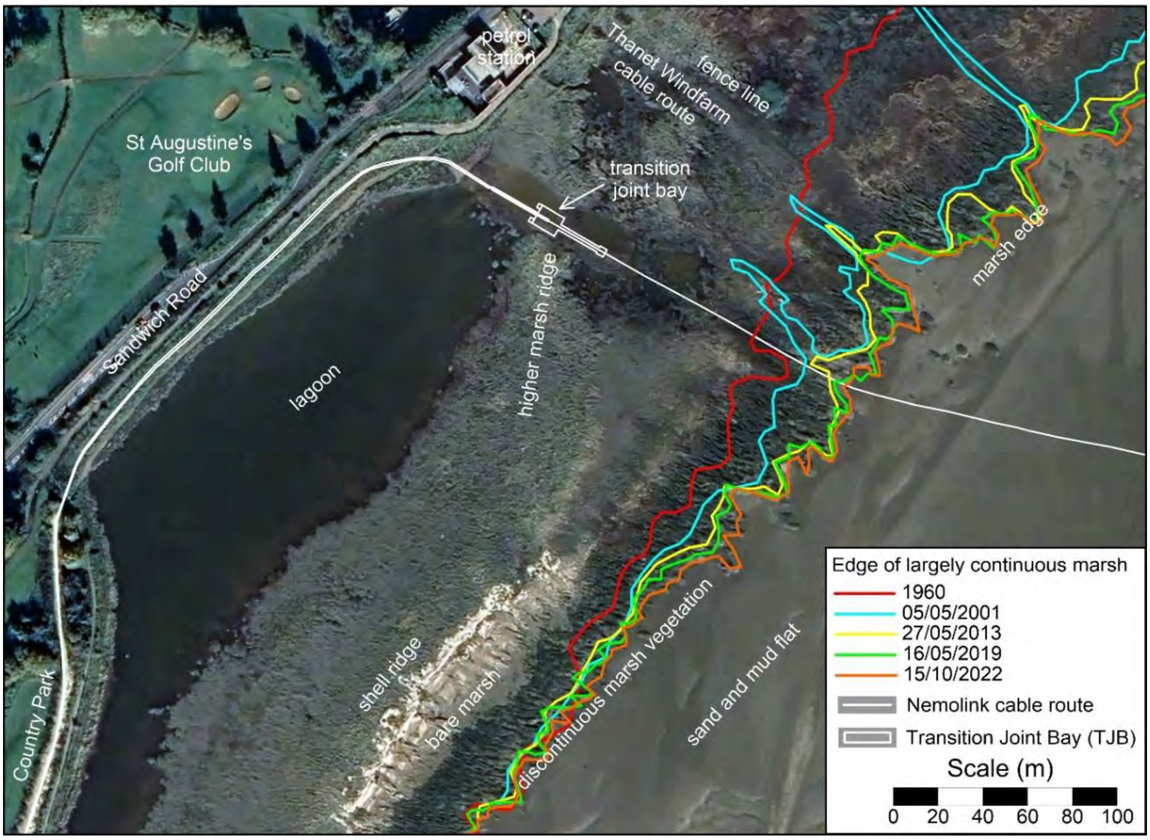


Figure 30. Position of the edge of the largely continuous marsh mapped from aerial photographic surveys between 1960 and 2022. Although the seaward limit has gradually moved seaward over this period, the edge has become more broken since 2013, with a bare area to the south of the cable route, with a chenier (shell ridge) on the landward side of the bare area. Base aerial image dated 04/10/22

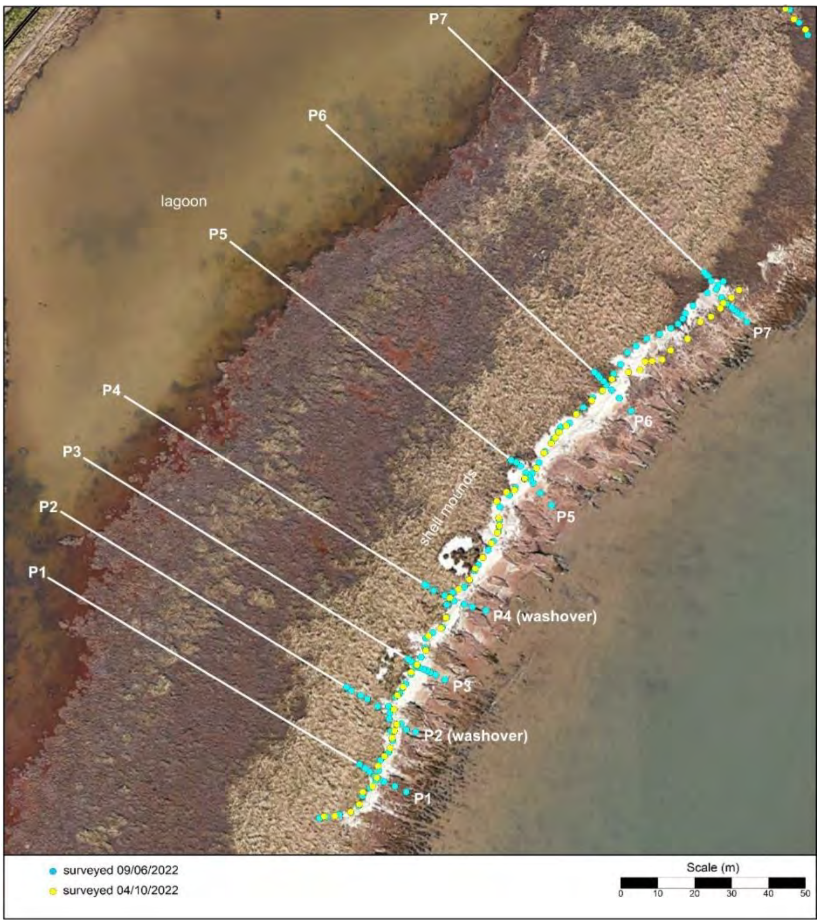


Figure 31. Points surveyed along the shell chenier at Pegwell Bay by ground RTK GNSS on 09/06/2022 (blue dots) and 04/10/2022 (yellow dots). Base aerial imagery flown March 2022

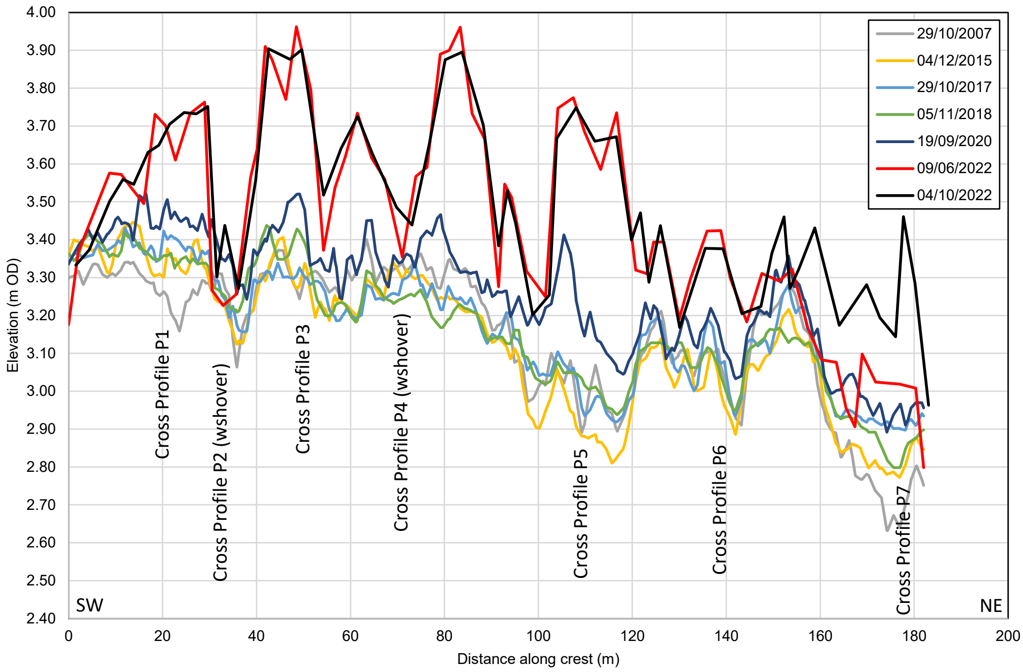


Figure 32. Topographic profile along the crest of the shell chenier from SW to NE at Pegwell Bay by airborne LiDAR (five surveys in 2007, 2015, 2017, 2018 and 2020) ground RTK surveys on 09/06/2022 and 04/10/2022

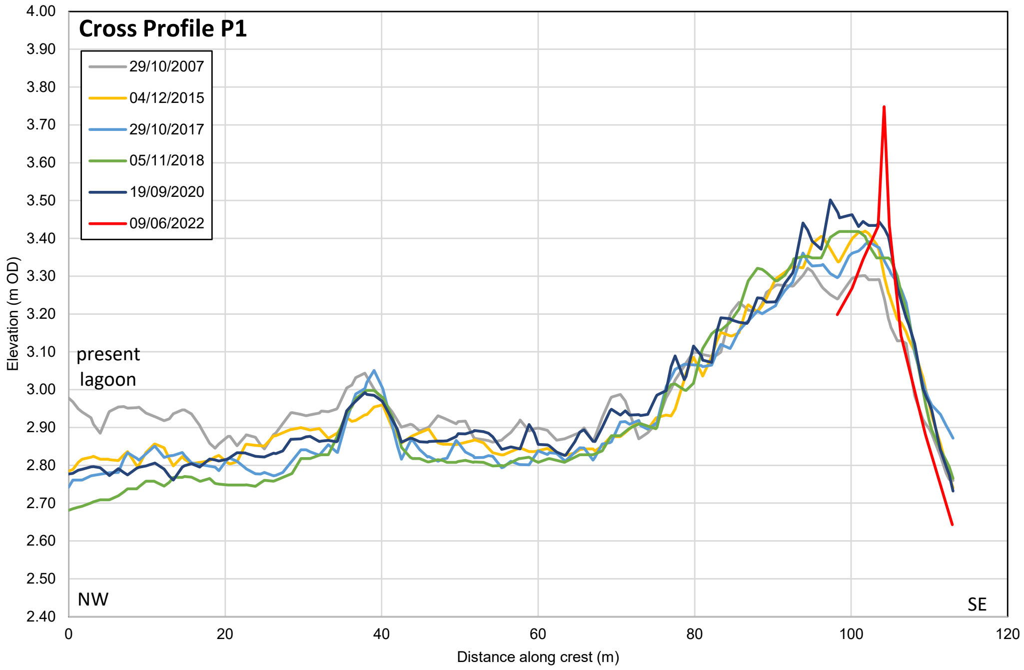


Figure 33. Change on topographic cross-profile P1

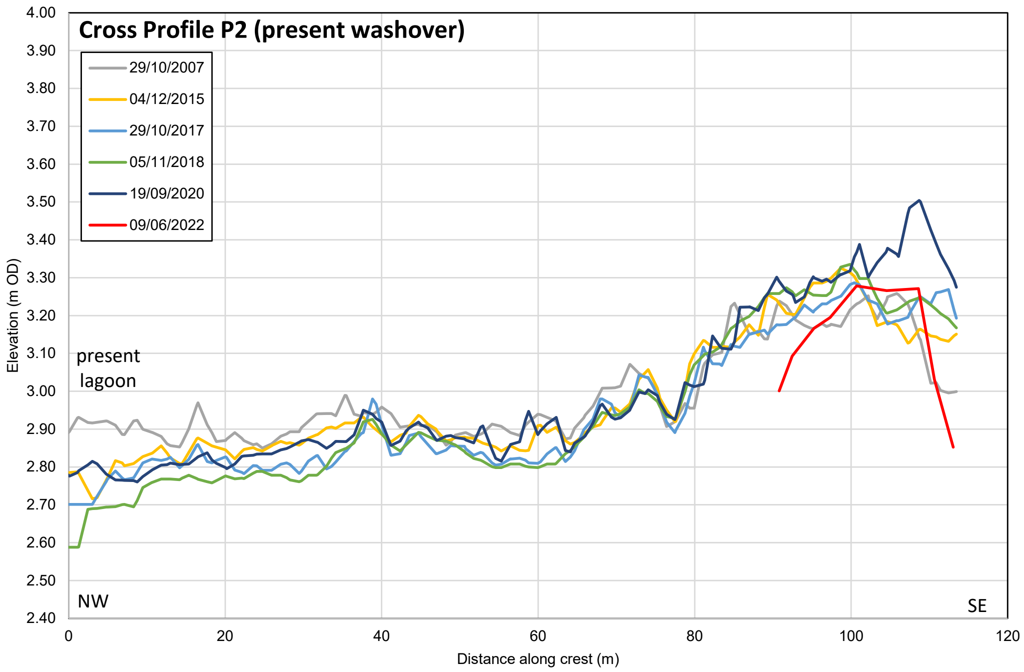


Figure 34. Change on topographic cross-profile P2

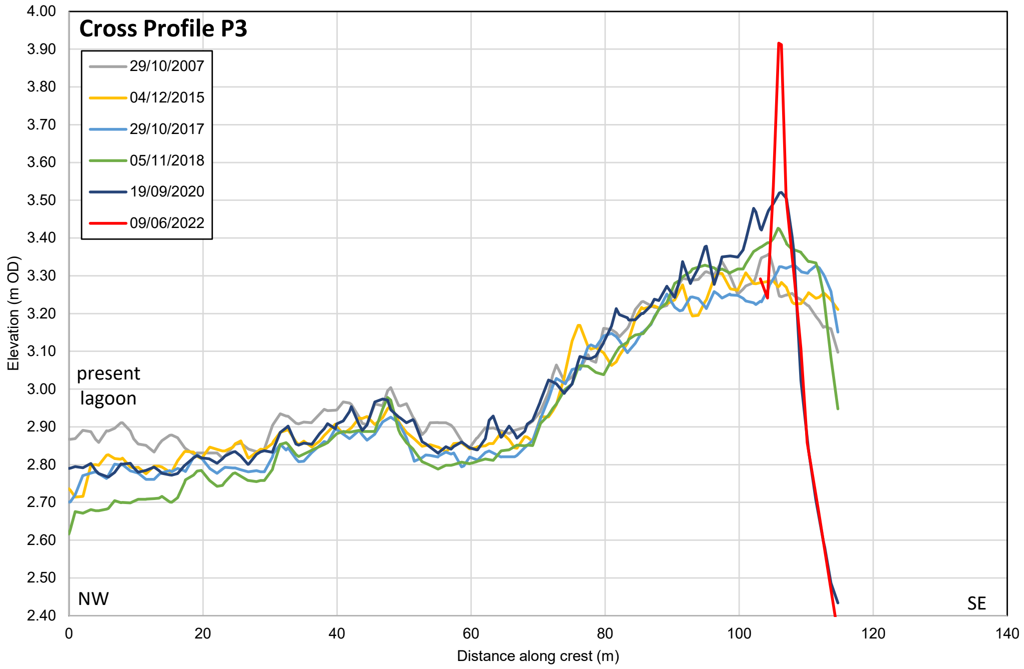


Figure 35. Change on topographic cross-profile P3

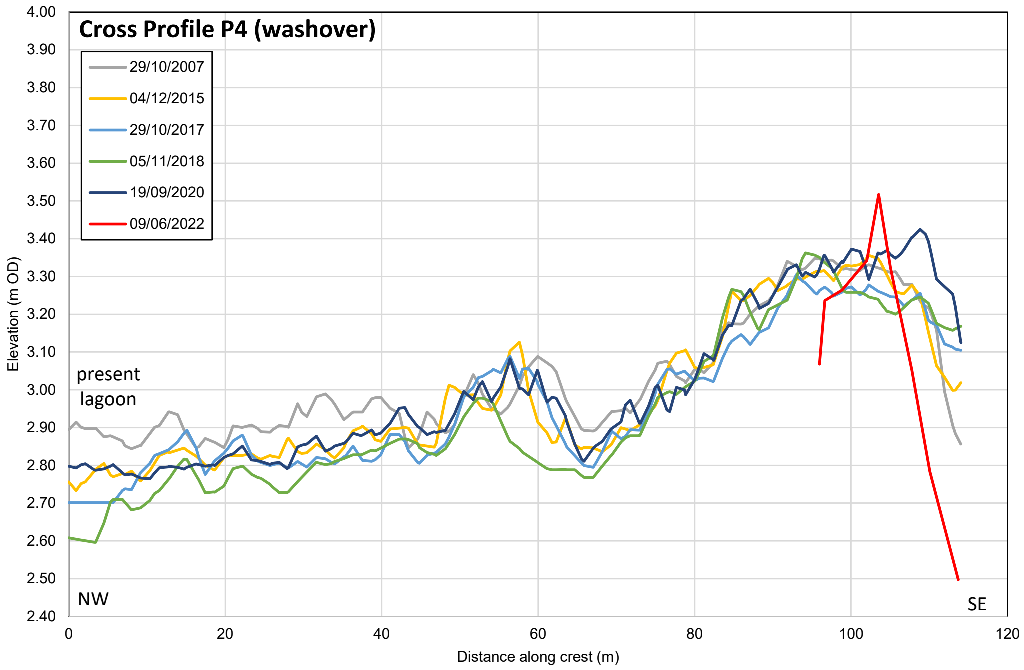


Figure 36. Change on topographic cross-profile P4

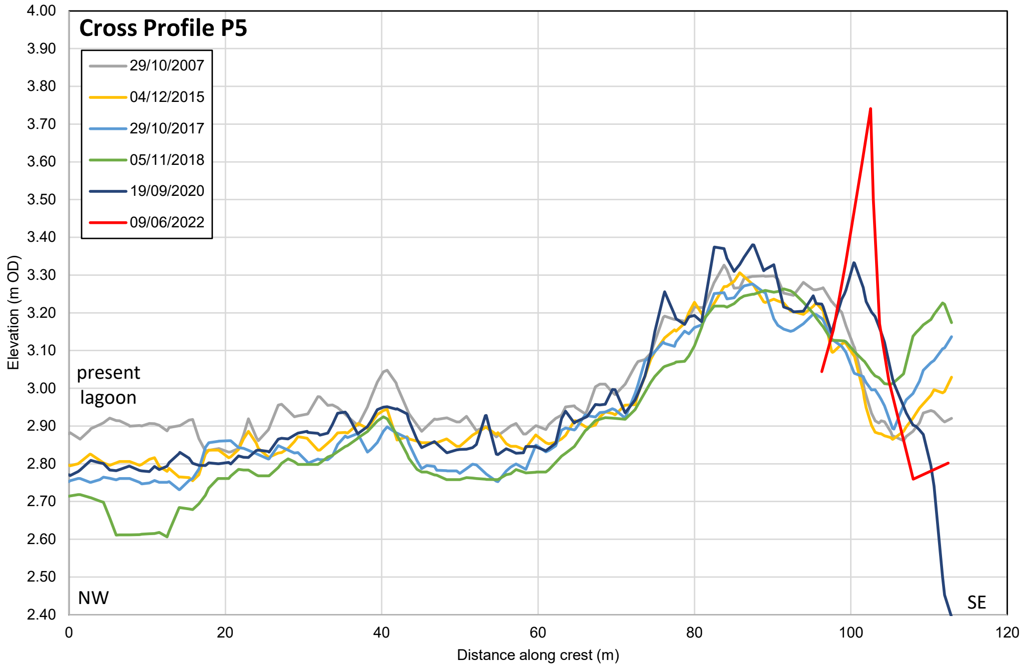


Figure 37. Change on topographic cross-profile P5

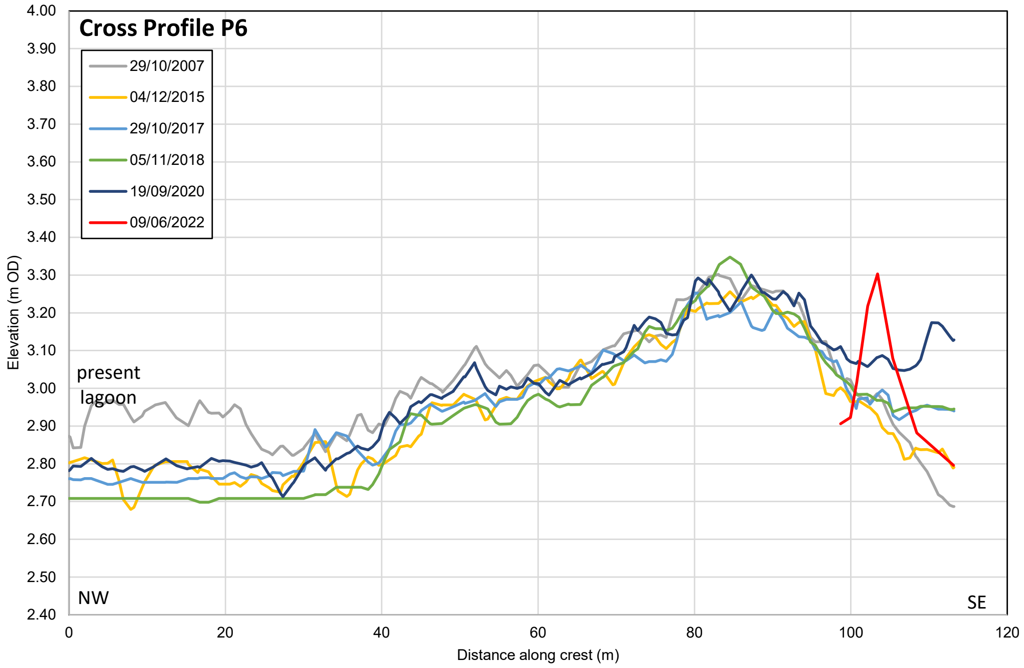


Figure 38. Change on topographic cross-profile P6

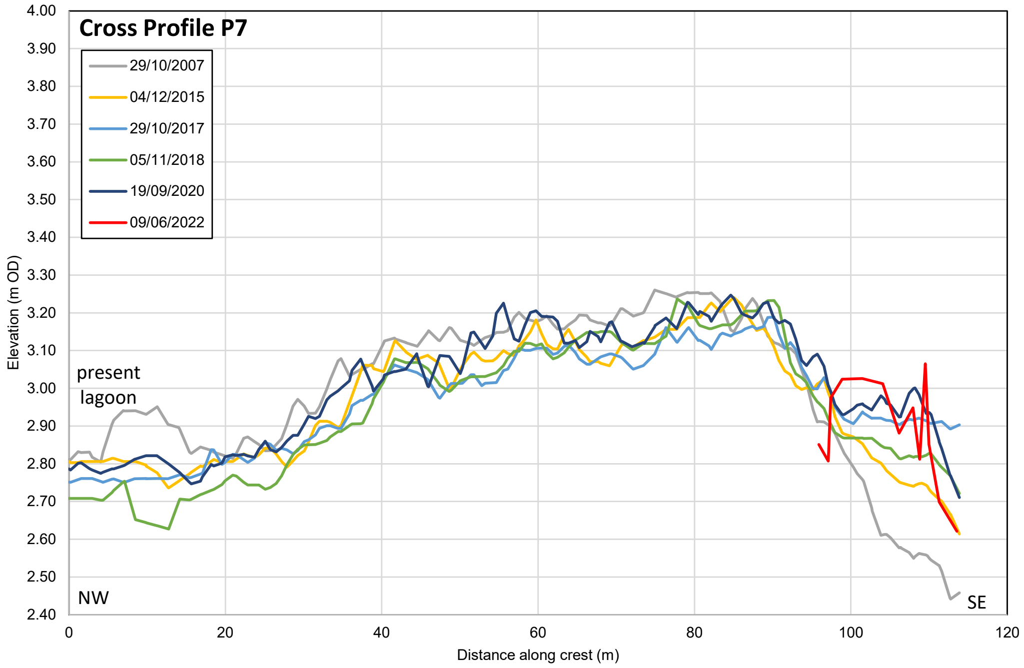


Figure 39. Change on topographic cross-profile P7

4.18 Changes in the elevation of the overall marsh system around the cable corridor have also been assessed by comparing publically available LiDAR data from aerial surveys in December 2015, November 2018 and September 2020. Checks on the accuracy of the LiDAR data were made by comparison with elevations measured by RTK GNSS on 'fixed' hard surfaces, including points on Sandwich Road (Figure 42), and the LiDAR data were adjusted based on the mean differences shown in Table 4.

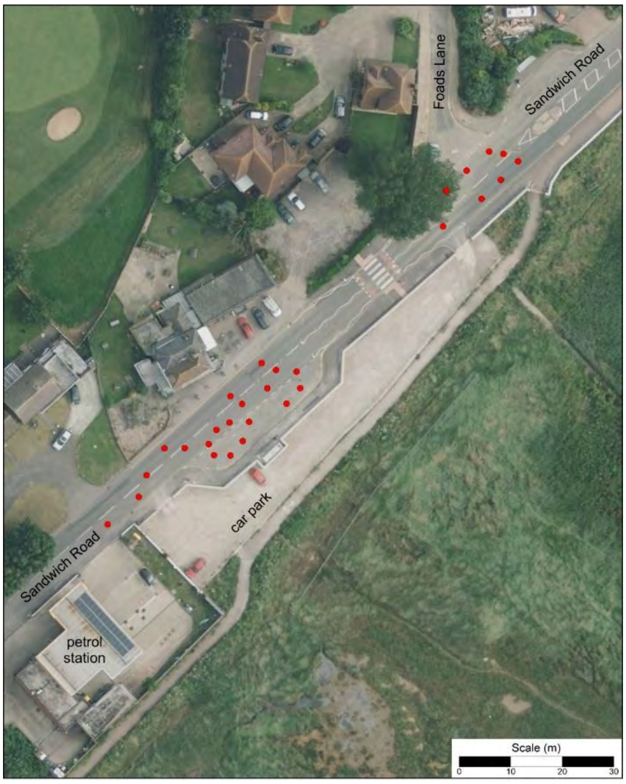


Figure 42. Points surveyed on the tarmac surface of Sandwich Road by ground RTK on 25/04/2019, used to calibrate airborne LiDAR data (red dots). Base aerial imagery flown 07/07/2016

Table 4. The elevation of 28 points surveyed on the tarmac surface of Sandwich Road by ground RTK on 25/04/2019, and the difference in elevation (in cm) of the same points surveyed four difference airborne LiDAR surveys.

Easting	Northing	Elevation ground RTK on 25/04/2019 (m ODN)	Difference (in cm) between airborne LiDAR DTMs and ground RTK on 25/04/2019			
			04/12/2015-17/12/2015	29/10/2017-07/12/2017	05/11/2018	19/09/2020-20/09/2020
634550.159	163849.241	4.712	3.5	5.1	-0.3	-6.1
634556.221	163854.587	4.693	0.8	6.5	-0.5	-4.1
634557.730	163858.785	4.761	0.1	4.5	-1.0	-5.4
634561.211	163864.024	4.726	3.7	4.9	-0.9	0.3
634565.121	163864.047	4.742	2.5	3.1	-1.5	-5.7
634569.794	163864.810	4.625	4.3	3.5	0.2	0.4
634573.793	163869.027	4.638	2.8	4.7	0.0	-3.4
634573.966	163874.121	4.714	3.8	4.7	-0.8	-3.8
634580.052	163880.567	4.652	5.1	6.6	-0.7	-1.0
634582.818	163879.230	4.663	3.4	5.2	-0.7	-3.1
634586.821	163878.895	4.545	4.8	5.2	0.5	0.0
634587.527	163875.688	4.489	5.3	6.2	-0.9	1.1
634584.875	163872.701	4.505	3.4	5.1	-2.0	-0.2
634581.140	163875.646	4.622	3.0	4.7	-1.1	-0.3
634576.238	163872.610	4.674	3.1	6.7	0.1	-3.2
634577.613	163869.151	4.548	3.2	5.1	-0.8	-0.7
634576.376	163865.411	4.528	2.9	6.2	-0.4	1.5
634571.272	163867.582	4.666	5.0	5.9	0.2	-0.2
634570.817	163862.682	4.554	5.6	6.7	-0.8	0.7
634573.972	163862.628	4.544	3.6	5.6	-1.7	-0.6
634622.684	163912.417	4.670	4.2	3.6	-2.5	0.1
634626.416	163916.101	4.701	3.1	3.2	-1.7	-1.7
634629.754	163919.687	4.722	5.0	4.3	0.5	0.0
634626.933	163921.118	4.782	2.3	4.8	-0.5	6.2
634624.146	163921.588	4.768	2.7	4.2	-1.1	0.3
634619.782	163917.901	4.739	3.2	3.1	-1.0	-2.4
634615.864	163913.987	4.700	2.6	5.1	-0.9	-9.8
634615.219	163907.063	4.670	2.6	3.6	-1.9	-1.4
		Mean:	3.4	4.9	-0.8	-1.5
		St dev:	1.3	1.1	0.8	3.0

4.19. Elevation difference maps between 2015 and 2018, 2018 and 2020 and between 2015 and 2020, are shown in Figures 43, 44 and 45, respectively. It should be noted that, although the comparison have been made by comparing digital surface models (i.e. filtered data from which buildings and other tall structures have been removed using filtering algorithms), some of the differences seen are due to changes on the height of short vegetation between LiDAR epochs. Nevertheless, major changes in elevation (green indicating increases and red indicating decreases) reflect physical changes in the surface. This the buried Nemo Link cables along the seaward edge of the Country Park, and the net lowering of the surface level of the cable route across the marsh south of the petrol station, are clearly evident in Figure 43. The landward movement of the marsh edge cheniers is also clearly evident. In September 2020 the surface level around the Transition Joint Bay, and in the more seaward part of the cable route (in the vicinity of Pool C), was still lower than in December 2015 but there had been some recovery to the pre-existing elevation in the area between (in the vicinity of Pool B). A general increase in the surface elevation behind the marsh edge is evident between the northeastern end of the chenier ridges and the Thanet OWF cable route.

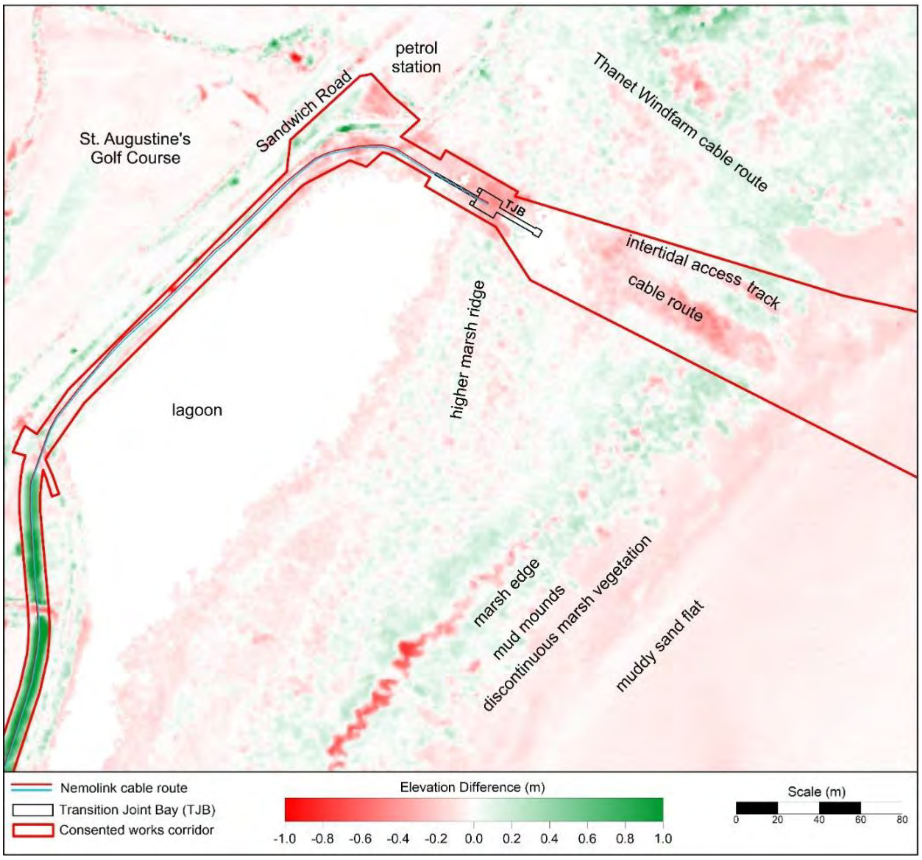


Figure 43. Elevation differences between LiDAR surveys on 04/12/2015 and 05/11/2018

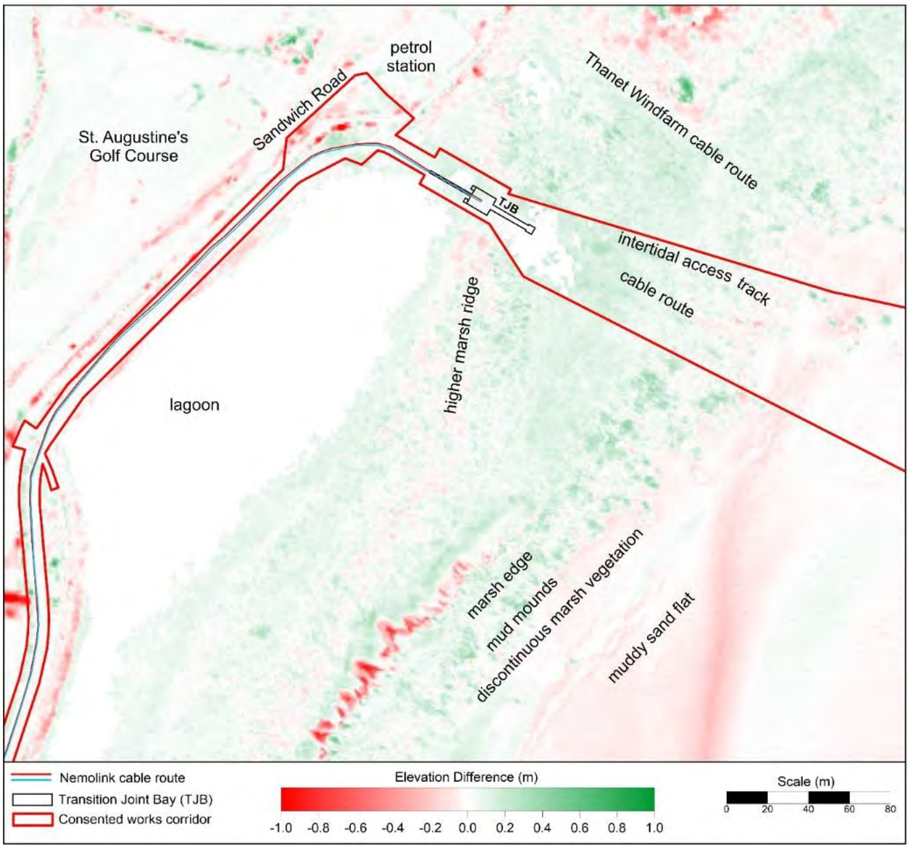


Figure 44. Elevation differences between LiDAR surveys on 05/11/2018 and 20/09/2020

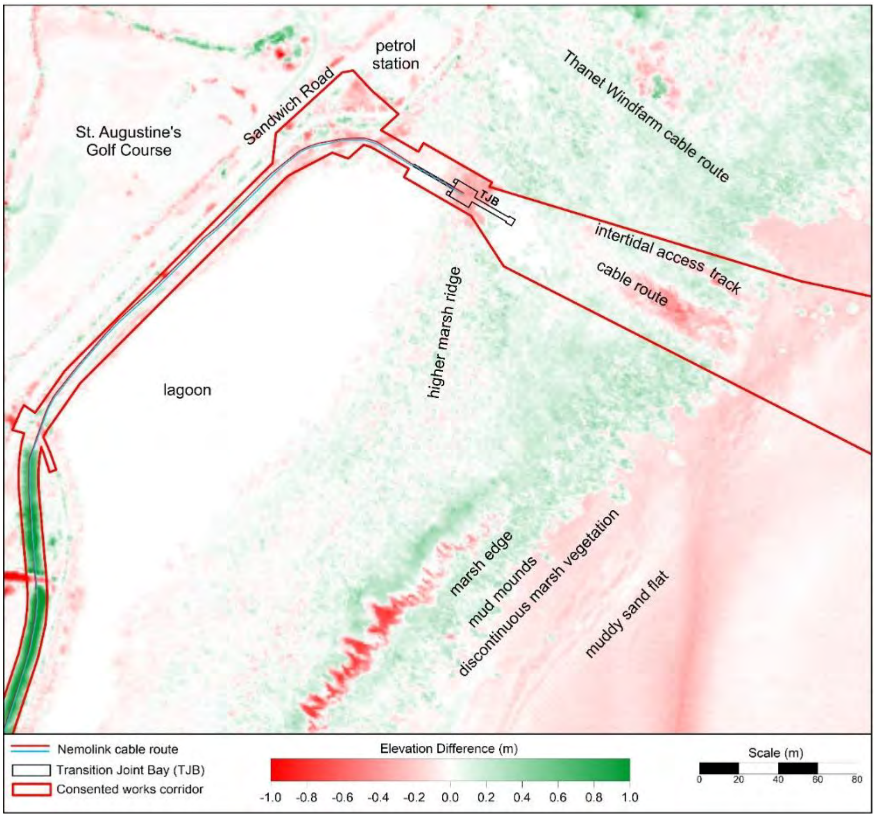


Figure 45. Elevation differences between LiDAR surveys on 04/12/2015 and 20/09/2020

4.20 Changes in elevation determined from RTK GNSS surveys of the cable corridor by KPAL between June 2019 and October 2022 are shown in Figures 46 and 47. It is evident from these figures that there has been a slight reduction in surface levels along the landward part of the cable route but a significant increase in levels at the seaward end, along both the cable route and the intertidal access track. Slight increases in levels around Pool B and Pool C are also evident. The net reduction in levels (of the order of 5 cm) along the landward part of the cable route are attributed mainly to drying shrinkage of the surface sediments during the drier summer months with few covering high tides, especially in the summer of 2022 prior to the October survey. Such shrinkage and compaction is unlikely to be fully reversible. Evidence of very localised scour by water flow was also observed around the 'lip' between the lagoon and Pool A, but no evidence of significant large scale current or wave-induced sediment scour was observed in any of the monitoring surveys.

4.21 Between 2015 and 2018 there was slight net lowering of the level of the tidal flats along the entire marsh frontage in this part of Pegwell Bay (Figure 43). This was due to a number of significant wave events which flattened the low-relief sand bars and runnels which often characterise the flats. This morphology was partially restored between 2018 and 2020 (Figure 44), but the pattern of net change between 2015 and 2020 reflects longer-term transfer of sediment from the tidal flats onto the frontal part of the marsh system. Since the sediment comprising the tidal flats is principally fine sand and coarse silt, it is deposited relatively quickly and close to the marsh edge and supply to the hind marsh area is very limited. Cockle shells reworked from the near-surface sediments of the flats are also moved landwards and are deposited on the marsh surface close to the edge.

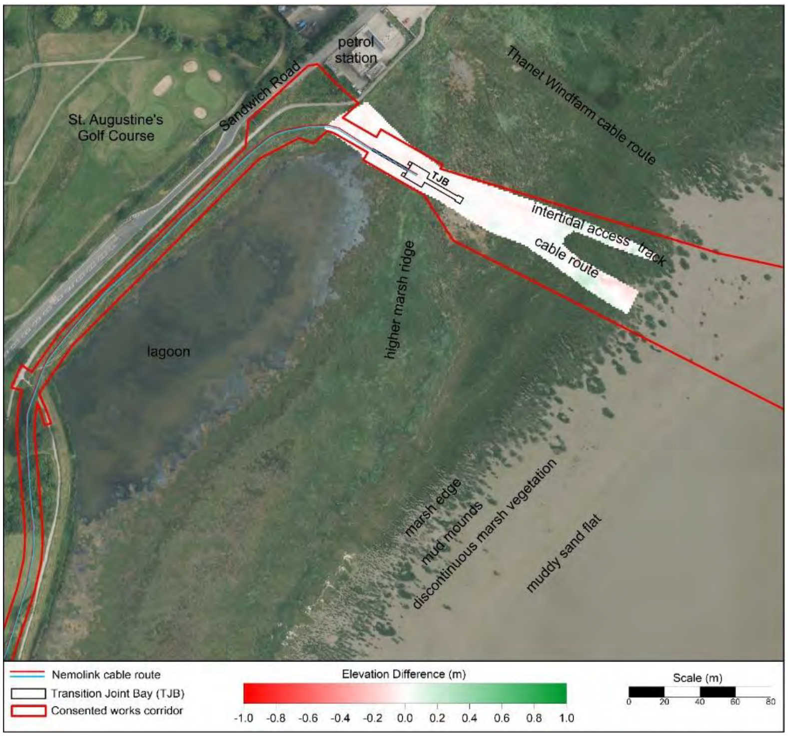


Figure 46 Elevation differences determined from ground RTK GNSS surveys on 21-22/06/2019 and 04/10/2022, on the same scale as LiDAR differences in Figures 43 to 45

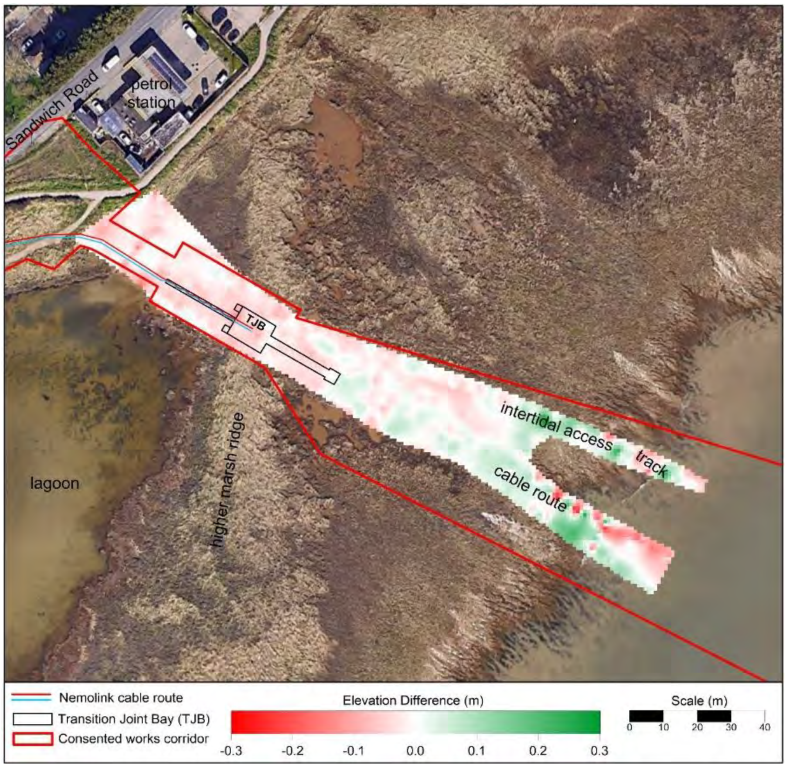


Figure 47. Enlarged image showing elevation differences along the cable route determined from between ground RTK GNSS surveys on 21-22/06/2019 and 04/10/2022. Note enhancement colour scale has been enhanced compared with Figure 46 in order to highlight the changes which have occurred

4.22 With respect to the cable route the main topographic difference between pre- installation and October 2022 lies in the surface elevation around the TJB (Figure 48). The elevation in this area remains 25 - 28 cm lower than pre-works, although even before installation the high marsh ridge in this area was slightly lower than on either side (Figure 49).

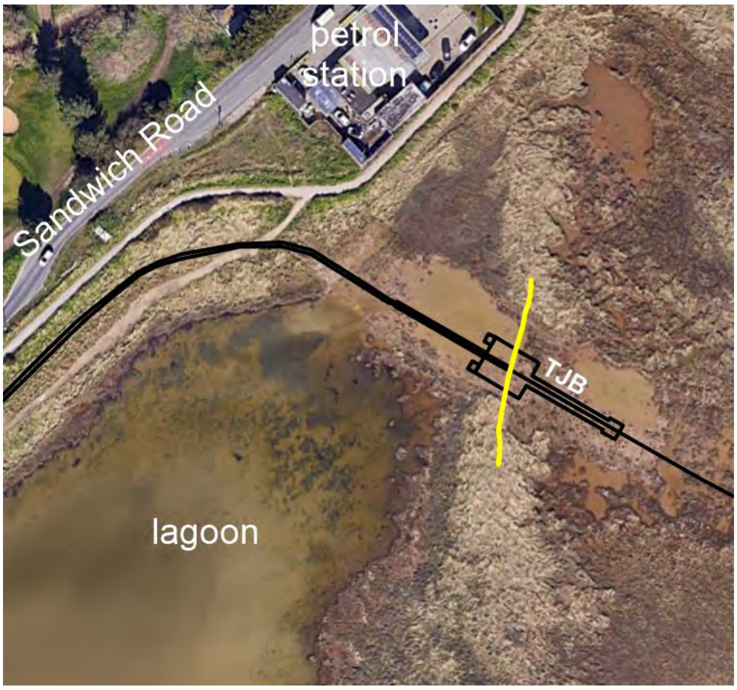


Figure 48. Aerial image flown in March 2022 showing the location of the topographic profile along the crest of the saltmarsh ridge and across the cable corridor (yellow line)

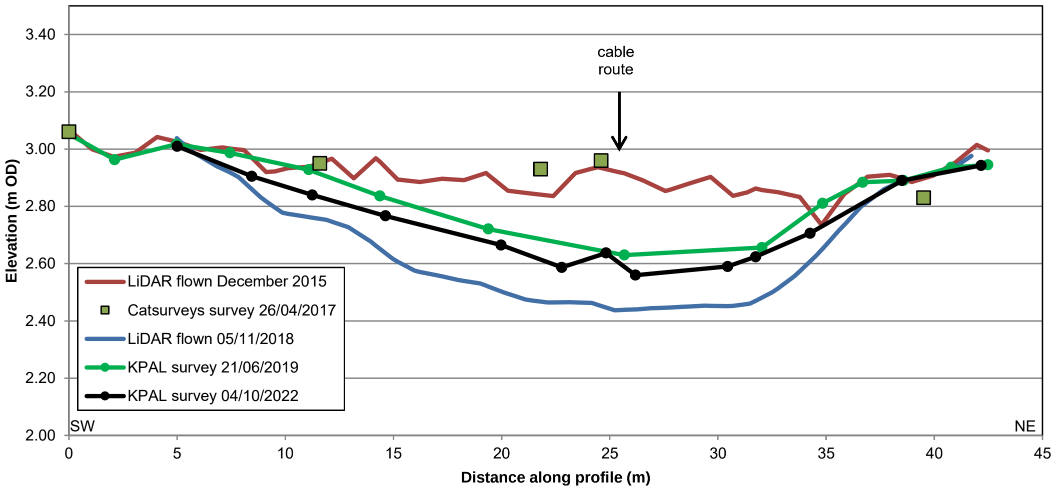


Figure 49. Topographic profile along the crest of the high saltmarsh ridge where it is crossed by the cable route, from SW to NE, surveyed by airborne LiDAR in December 2015 and 2018, ground survey by Catsurveys on 26/04/2017, ground RTK surveys by KPAL on 21/06/2019 and 04/10/2022

4.23 The average elevation of the new ridge developing at the seaward edge of the marsh is approximately 2.72 m ODN and the level of the 'lip' between Pool A and the Lagoon is approximately 2.65 m ODN. Before the cable installation works in October 2017 the level of the high marsh ridge at the location of the TJB is estimated to have been about 2.9 m ODN.

Tides exceeding 2.65 m ODN, which, when wave action is allowed for, are now likely to result in overtopping of the frontal marsh ridge and potential access of water into the Lagoon (Figure 50), occurred on numerous occasions between October 2017 and November 2022 (Figure 51 and Table 5). Approximately 50 tides exceeded 2.90 m ODN, the original elevation of the high marsh ridge in vicinity of the TJB, during this period.

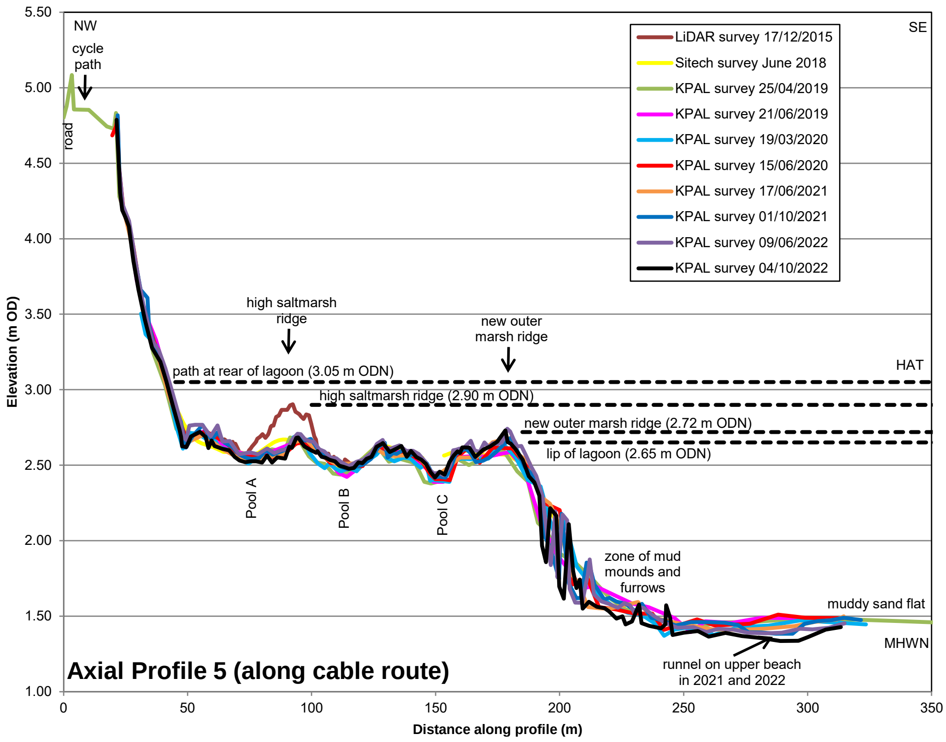


Figure 50. Profile along the cable route (Profile 5) showing the levels of main features on the site

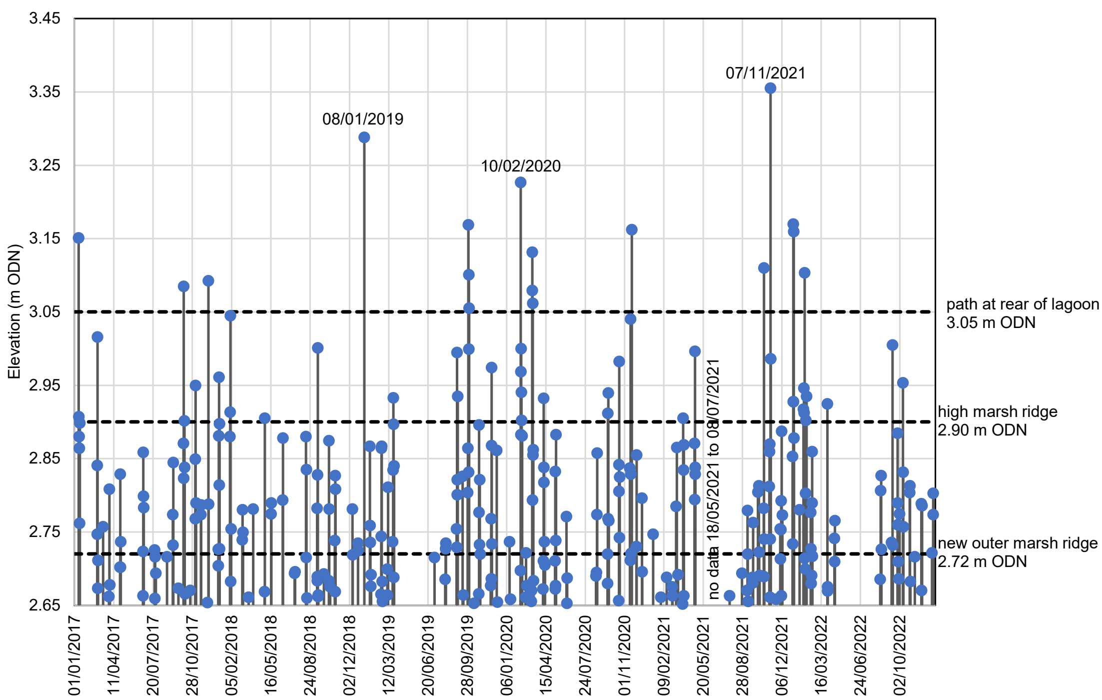


Figure 51. Occurrence of tides exceeding 2.65 m ODN at Point X Pegwell Bay during the period January 2017 to November 2022, based on recorded levels at Deal and conversion to Pegwell Bay. Original data source: Channel Coastal Observatory.

Table 5. Estimated elevations of tides exceeding 2.65 m ODN at Point X in Pegwell Bay during the period 1st January 2017 to 30th November 2022 inclusive, based on recorded levels at Deal and conversions to Pegwell Bay as shown in Table 1. Tides exceeding the 2.90 m ODN (the original elevation of the high marsh ridge near the TJB) are highlighted in Bold. Original data source: Channel Coastal Observatory.

Date and time	Elevation (m ODN)
07/11/2021 12:30	**3.36**
08/01/2019 12:20	**3.29**
10/02/2020 12:10	**3.23**
04/01/2022 12:20	**3.17**
30/09/2019 12:00	**3.17**
19/11/2020 14:00	**3.16**
05/01/2022 13:00	**3.16**
11/01/2017 22:20	**3.15**
11/03/2020 00:00	**3.13**
21/10/2021 11:30	**3.11**
01/02/2022 23:40	**3.10**
01/10/2019 12:40	**3.10**
08/12/2017 02:10	**3.09**
06/10/2017 11:10	**3.09**
11/03/2020 12:10	**3.08**
12/03/2020 12:50	**3.06**
02/10/2019 13:30	**3.06**
01/02/2018 23:50	**3.04**
16/11/2020 11:30	**3.04**
01/03/2017 00:40	**3.02**
13/09/2022 13:00	**3.00**
12/09/2018 12:50	**3.00**
12/02/2020 01:10	**3.00**
02/10/2019 01:00	**3.00**
29/04/2021 00:00	**3.00**
01/09/2019 12:20	**2.99**
08/11/2021 00:50	**2.99**
18/10/2020 11:50	**2.98**
29/11/2019 00:30	**2.97**
11/02/2020 00:30	**2.97**
04/01/2018 00:00	**2.96**
10/10/2022 11:20	**2.95**
05/11/2017 11:30	**2.95**
31/01/2022 10:50	**2.95**
12/02/2020 13:30	**2.94**
20/09/2020 13:00	**2.94**
03/09/2019 13:50	**2.94**
07/02/2022 03:10	**2.94**
23/03/2019 12:40	**2.93**
08/04/2020 23:40	**2.93**
03/01/2022 23:50	**2.93**
05/01/2022 00:20	**2.93**
31/03/2022 23:20	**2.92**
30/01/2022 09:10	**2.92**
01/02/2018 11:40	**2.91**
31/01/2022 22:30	**2.91**
19/09/2020 12:20	**2.91**
12/01/2017 10:50	**2.91**
30/04/2018 11:20	**2.91**
29/03/2021 23:50	**2.91**
13/02/2020 01:40	2.90
05/02/2022 01:40	2.90
08/10/2017 00:10	2.90
15/01/2017 00:40	2.90
05/01/2018 01:00	2.90
24/03/2019 01:00	2.90
27/10/2019 22:30	2.90
05/12/2021 11:30	2.89
26/09/2022 23:40	2.88
11/02/2020 12:30	2.88
10/05/2020 13:20	2.88
03/01/2018 12:30	2.88
14/02/2020 02:30	2.88

Date and time	Elevation (m ODN)
12/01/2017 23:20	2.88
31/01/2018 23:20	2.88
13/08/2018 12:30	2.88
15/06/2018 12:00	2.88
06/01/2022 01:00	2.88
10/10/2018 11:40	2.87
05/10/2017 11:00	2.87
27/04/2021 23:30	2.87
05/11/2021 11:00	2.87
01/04/2021 01:20	2.87
28/11/2019 12:00	2.87
23/01/2019 00:20	2.87
22/02/2019 00:50	2.87
13/03/2021 23:30	2.87
13/01/2017 11:40	2.86
21/02/2019 12:30	2.86
29/09/2019 11:20	2.86
13/03/2020 13:50	2.86
11/12/2019 10:20	2.86
04/11/2021 22:40	2.86
21/02/2022 01:40	2.86
25/06/2017 11:50	2.86
23/08/2020 14:00	2.86
13/03/2020 01:20	2.85
01/12/2020 11:20	2.85
02/01/2022 10:20	2.85
04/11/2017 23:20	2.85
09/09/2017 13:00	2.84
17/10/2020 11:10	2.84
28/02/2017 00:00	2.84
25/03/2019 14:10	2.84
08/10/2017 12:40	2.84
10/04/2020 00:20	2.84
29/04/2021 12:30	2.84
14/11/2020 09:50	2.84
14/08/2018 13:10	2.84
23/03/2019 00:30	2.83
31/03/2021 00:40	2.83
09/05/2020 00:00	2.83
01/10/2019 00:30	2.83
10/10/2022 23:40	2.83
28/04/2017 00:00	2.83
16/11/2020 23:40	2.83
30/04/2021 01:00	2.83
12/09/2018 00:30	2.83
27/10/2018 00:20	2.83
15/08/2022 13:30	2.83
15/09/2019 11:50	2.83
19/10/2020 12:40	2.83
05/10/2017 23:00	2.82
02/09/2019 13:10	2.82
29/10/2019 11:30	2.82
09/04/2020 12:00	2.82
04/01/2018 12:40	2.81
08/10/2021 12:10	2.81
28/10/2022 00:20	2.81
04/11/2021 10:20	2.81
10/03/2019 01:00	2.81
31/03/2017 01:00	2.81
27/10/2018 12:30	2.81
14/08/2022 12:40	2.81
17/10/2020 23:40	2.81
06/10/2021 10:50	2.80

Date and time	Elevation (m ODN)
28/09/2019 22:50	2.80
27/10/2022 12:00	2.80
04/02/2022 13:30	2.80
26/12/2022 13:20	2.80
02/09/2019 01:00	2.80
26/06/2017 00:20	2.80
15/12/2020 11:10	2.80
28/04/2021 12:00	2.79
14/06/2018 23:40	2.79
12/03/2020 00:40	2.79
04/12/2021 10:20	2.79
06/11/2017 12:10	2.79
17/05/2018 00:00	2.79
21/02/2022 14:20	2.79
26/09/2022 11:40	2.79
26/11/2022 00:10	2.79
08/12/2017 14:20	2.79
19/11/2017 11:40	2.79
28/11/2022 01:30	2.79
11/03/2021 22:00	2.79
26/06/2017 12:30	2.78
10/09/2018 11:20	2.78
20/10/2021 23:00	2.78
31/03/2018 23:30	2.78
11/10/2018 12:20	2.78
09/12/2018 12:10	2.78
05/03/2018 01:00	2.78
20/01/2022 00:10	2.78
09/09/2021 12:40	2.78
27/10/2019 10:10	2.78
17/02/2022 11:40	2.78
16/05/2018 11:50	2.77
01/10/2022 14:20	2.77
08/09/2017 12:30	2.77
18/11/2017 23:30	2.77
22/08/2020 13:20	2.77
26/12/2022 00:40	2.77
07/12/2021 13:00	2.77
05/06/2020 22:50	2.77
04/11/2017 10:50	2.77
27/11/2019 11:10	2.77
20/09/2020 00:40	2.77
21/09/2020 13:40	2.77
20/04/2022 01:10	2.77
24/09/2021 00:40	2.76
14/01/2017 12:20	2.76
27/09/2022 12:00	2.76
23/01/2019 12:40	2.76
15/03/2017 00:40	2.76
11/10/2022 12:00	2.76
04/02/2018 01:30	2.75
31/08/2019 11:40	2.75
01/12/2021 20:50	2.75
03/12/2021 22:30	2.75
06/03/2018 01:30	2.75
28/02/2017 12:30	2.75
12/01/2021 10:20	2.75
21/02/2019 00:00	2.74
19/10/2020 00:20	2.74
19/04/2022 00:20	2.74
22/10/2021 12:00	2.74
06/11/2021 11:40	2.74
04/03/2018 00:30	2.74

Table 5 continued

Date and time	Elevation (m ODN)
25/10/2018 11:20	2.74
10/05/2020 00:40	2.74
29/04/2017 00:40	2.74
21/03/2019 23:40	2.74
13/01/2020 00:20	2.74
11/04/2020 01:00	2.74
24/01/2019 01:00	2.74
11/09/2022 11:40	2.74
23/12/2018 23:40	2.73
04/08/2019 13:30	2.73
29/11/2019 12:30	2.73
02/01/2022 23:00	2.73
28/10/2019 23:20	2.73
09/09/2017 00:50	2.73
14/09/2022 13:40	2.73
30/11/2020 23:40	2.73
01/09/2019 00:30	2.73
05/01/2018 13:20	2.73
03/08/2019 12:40	2.73
18/02/2022 00:00	2.73
02/01/2018 11:00	2.73
16/08/2022 14:10	2.73
24/07/2017 11:40	2.73
23/12/2018 11:20	2.72
24/06/2017 23:20	2.72
09/10/2021 12:50	2.72
23/02/2020 23:30	2.72
23/12/2022 10:50	2.72
17/11/2020 12:00	2.72
30/10/2019 12:10	2.72
18/09/2020 11:30	2.72
10/09/2021 13:10	2.72
10/12/2018 00:30	2.72
22/02/2022 02:10	2.72
25/07/2017 12:30	2.72
24/08/2017 12:50	2.72
09/11/2022 11:20	2.72
14/08/2018 00:50	2.72
06/07/2019 13:40	2.72
02/02/2022 12:00	2.71
02/12/2021 09:00	2.71
02/03/2017 01:20	2.71
15/11/2020 23:40	2.71
08/04/2020 11:20	2.71
07/05/2020 23:10	2.71
19/04/2022 12:50	2.71
28/09/2022 12:30	2.71
12/04/2020 01:50	2.70

Date and time	Elevation (m ODN)
01/01/2018 22:40	2.70
26/04/2017 23:10	2.70
28/04/2017 12:20	2.70
08/03/2019 00:20	2.70
04/02/2022 01:00	2.70
09/02/2020 23:40	2.70
16/07/2018 13:30	2.70
15/12/2020 23:40	2.70
21/08/2020 12:30	2.69
27/07/2017 13:50	2.69
15/07/2018 12:40	2.69
26/08/2021 13:20	2.69
28/09/2018 01:00	2.69
26/01/2019 02:40	2.69
17/03/2021 01:10	2.69
10/10/2021 13:40	2.69
20/02/2022 01:10	2.69
20/08/2020 12:00	2.69
11/09/2018 12:00	2.69
21/10/2021 23:40	2.69
25/03/2019 01:50	2.69
16/02/2021 01:30	2.69
22/09/2021 12:10	2.69
08/06/2020 00:30	2.69
28/11/2019 00:00	2.69
29/09/2022 13:00	2.69
02/08/2019 12:00	2.69
13/08/2022 12:00	2.69
10/09/2018 23:50	2.68
11/10/2018 00:00	2.68
14/03/2020 02:00	2.68
02/02/2018 12:30	2.68
23/02/2019 01:30	2.68
29/10/2022 13:30	2.68
23/09/2021 12:30	2.68
19/09/2020 00:00	2.68
19/02/2022 01:00	2.68
01/04/2017 01:50	2.68
26/11/2019 10:40	2.68
26/02/2020 00:40	2.68
09/05/2020 12:30	2.68
25/01/2019 01:50	2.68
13/10/2018 13:50	2.68
02/03/2021 01:00	2.68
01/04/2022 23:40	2.68
01/03/2017 13:10	2.67
22/09/2017 12:20	2.67
07/04/2020 10:20	2.67

Date and time	Elevation (m ODN)
08/05/2020 11:40	2.67
22/10/2017 12:30	2.67
09/03/2020 10:50	2.67
08/09/2021 11:50	2.67
26/11/2022 12:30	2.67
01/04/2022 11:20	2.67
29/04/2018 23:00	2.67
26/10/2018 12:00	2.67
09/10/2017 13:20	2.67
26/10/2019 22:00	2.67
19/02/2019 23:10	2.66
13/09/2018 13:20	2.66
08/03/2019 12:00	2.66
17/09/2019 13:00	2.66
24/06/2017 11:00	2.66
03/03/2021 01:40	2.66
31/03/2021 13:00	2.66
26/07/2021 12:40	2.66
04/12/2021 23:00	2.66
30/03/2017 00:20	2.66
13/09/2018 01:10	2.66
20/03/2018 00:40	2.66
22/02/2020 23:10	2.66
01/02/2021 01:10	2.66
05/11/2021 23:30	2.66
15/08/2018 13:50	2.66
25/07/2017 00:10	2.66
15/01/2020 14:30	2.66
21/11/2021 12:00	2.66
16/10/2020 22:50	2.66
24/02/2019 02:20	2.66
08/03/2020 22:30	2.66
11/09/2021 13:50	2.66
13/12/2019 12:00	2.65
05/12/2017 12:00	2.65
14/10/2019 11:20	2.65
07/06/2020 12:10	2.65
28/03/2021 23:10	2.65
09/01/2019 01:00	2.65
19/02/2019 10:50	2.65
21/09/2020 01:30	2.65
04/03/2021 02:20	2.65
06/07/2020 11:50	2.65
03/11/2021 22:10	2.65
24/11/2018 11:30	2.65
19/05/2019 23:30	2.65

4.24 The ground topographic surveys undertaken by KPAL since April 2019 provide a snapshot of the extent of standing water and bare ground present at the times of the site visits, although the sequence of seasonal variation is not complete since topographic surveys were not requested on October 2019 and October 2020. However, for purposes of comparison the extent of water and of largely unvegetated ground (some covered by water) within a defined area of interest have been plotted side by side in Figures 52 & 53). This sequence of images also includes extent of standing water and bare ground based on a pre-works aerial photography dated July 2016, and an estimate of the immediate post works extent of bare ground and standing water based on a ground survey by KPAL in April 2019 and ground photographs taken in 2017 and 2018.

4.25 Prior to cable installation (July 2016) the extent of standing water within the defined area of interest, is estimated to have been 2061 m^2 while the area of bare ground was 1504 m^2 (Table 6). Immediately post construction, the extent of bare ground is estimated to have been much larger (c. 5400 m^2), although standing water was limited mainly to the northeast corner of the Lagoon (784 m^2). RTK GNSS mapping during the post works monitoring surveys by KPAL indicated quite large variations in the extent of standing water recorded, the range being 212m^2 in June 2019 to 3305m^2 in October 2022). The extent of largely unvegetated ground also showed wide variation, ranging from a maximum of 3958 m^2 in April 2019 to a minimum of 2111 m^2 in June 2020.

4.27 Monitoring of the water levels in the Lagoon and the pools within and adjacent to the cable corridor has shown a general relationship with the area extent of standing water, as would be expected. The lowest levels were recorded in June 2019 (2.43 m ODN in the Lagoon and c. 2.50 m ODN in the corridor pools) and the highest levels recorded in October 2022 (c. 2.69 m ODN in the Lagoon and c 2.65 - 2.67 m ODN in the corridor pools; Table 7).

4.28 Perhaps somewhat surprisingly, the water level in the Lagoon determined from 'adjusted' December 2015 LiDAR data was significantly higher (c. 2.80 m ODN); Pool A did not exist at this time but levels in Pool B and Pool A were similar to those recorded post cable installation (Table 7). Pool G, located to the north of the cable corridor, was found to be dry at the time of the April and June 2016 surveys, even though standing water was still present in the Lagoon and in the corridor pools. This is because Pool G retains a diffuse drainage linkage to the sea, whereas the previously existing (pre-works) linkage between the Lagoon and Pool G (via a small, poorly defined creek at the NE end of the lagoon), is no longer present due to raising of the ground level in this area on completion of the cable installation works.

4.29 The levels of standing water in the Lagoon and various pools are determined not only by the timing, frequency and extent of tidal inundation but also by weather condition, both precipitation and temperature (which is a major influence on evaporation rates). As part of this assessment meteorological data for Manston Airport have been examined for the period of interest (Tables 8 & 9; Figures 54 & 55). The data show that the summer (April – September) of 2021 was unusually cool and wet, while the summer of 2022 was warmer and drier than any of the other years since 2017. These conditions favoured vegetation growth during the summer of 2021, as indicated by the vegetation quad rat data (see below), while conditions in 2022 were less conducive to vegetation growth and indeed would have placed considerable stress on plants in locations which dried out. Despite the warm, dry condition, water levels in the main Lagoon did not fall as low in summer 2022 as in summer 2019, when extensive marginal plant death and exposed anoxic mud was recorded. This appears to be due to the combined effect of a relative dry late winter - spring and a lack of high tides exceeding 2.72 ODN in 2019 (Table 8 & Figure 51).

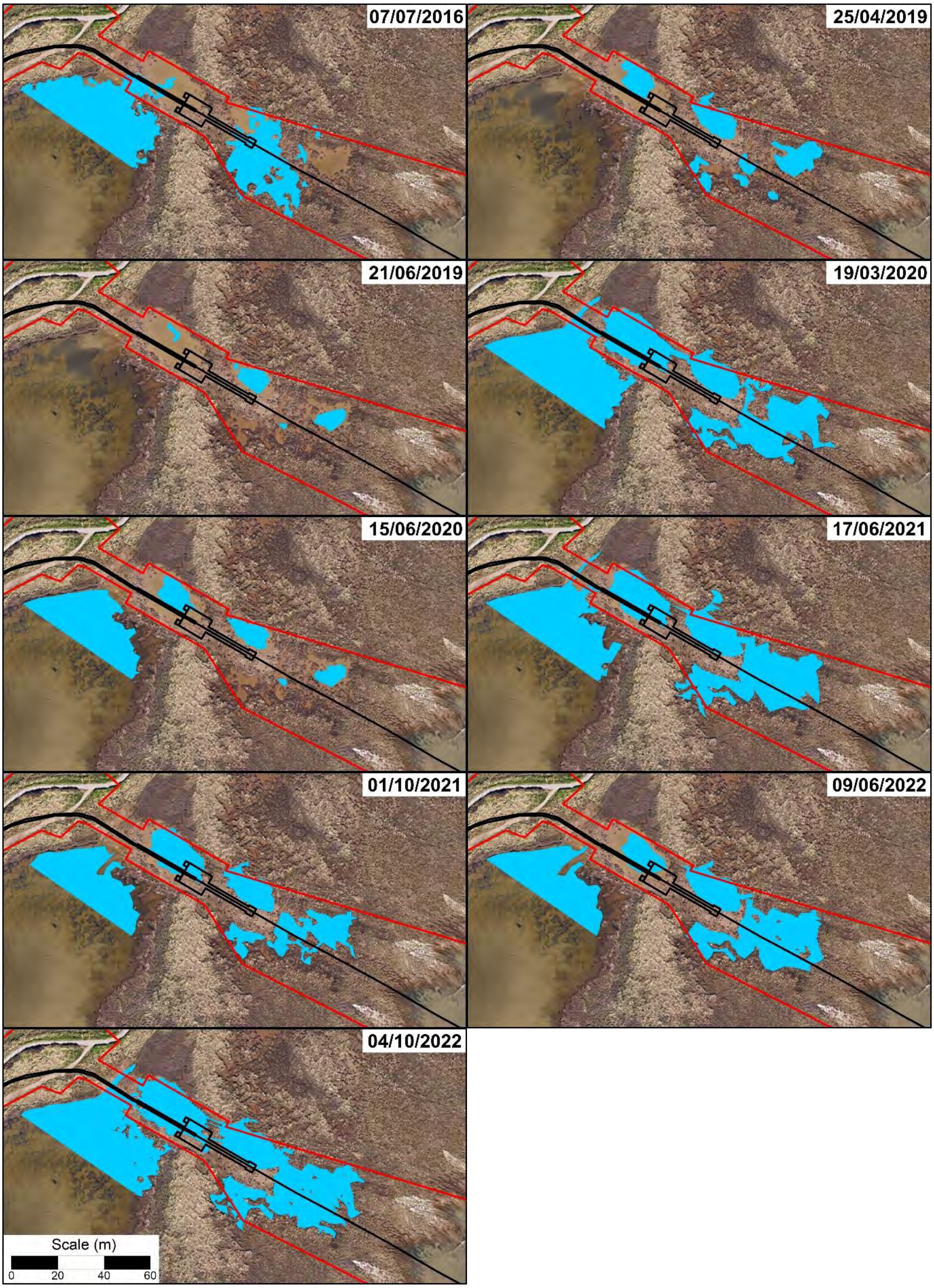


Figure 52. Areas of standing water, measured before the works by aerial photography flown on 07/07/2016, and by ground RTK surveys by KPAL in 2019 to 2022. The area of the lagoon is truncated between points 634498E 163763N and 634546 163729N for consistency between surveys.

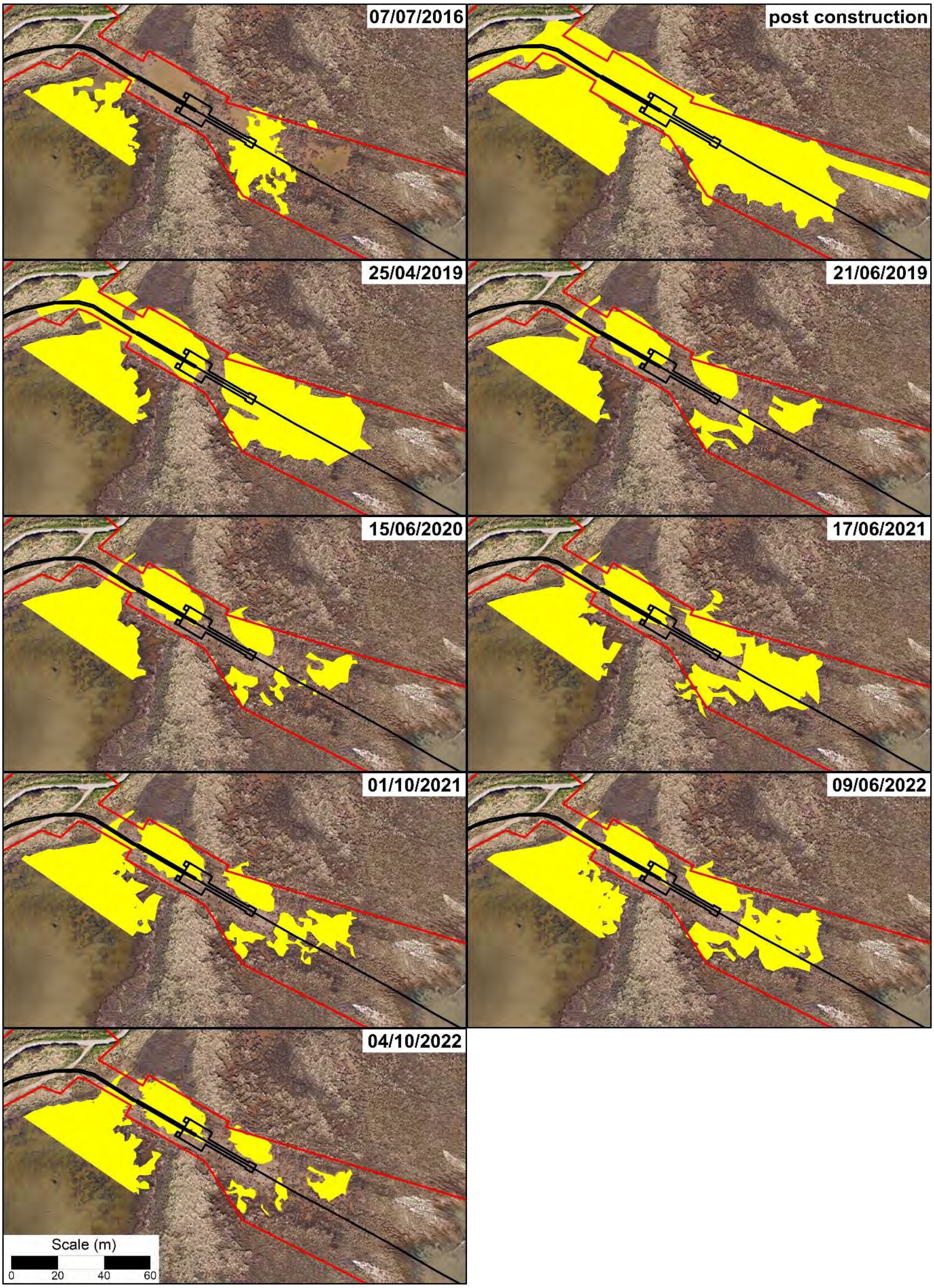


Figure 53. Largely bare unvegetated areas measured before the works by aerial photography flown on 07/07/2016, estimated maximum post construction extent from ground survey on 25/04/2019, and by ground RTK surveys by KPAL in 2019 to 2022. The area of the lagoon is truncated between points 634498E 163763N and 634546 163729N for consistency between surveys.

Table 6 Areas of standing water and bare largely unvegetated areas (in square metres) on the site, measured before the works by aerial photography flown on 07/07/2016, the likely maximum unvegetated extent immediately post construction from ground survey on 25/04/2019 and aerial photography flown on 07/07/2019, and by ground RTK surveys by KPAL in 2019 to 2022

Date	Area of standing water	Area which is unvegetated
07/07/2016	2061	1504
post construction	784	5420
25/04/2019	1714	3958
21/06/2019	212	2146
19/03/2020	3065	not surveyed
15/06/2020	1295	2111
17/06/2021	2867	3026
01/10/2021	1933	2503
09/06/2022	2285	2990
04/10/2022	3305	2058

Table 7. Water levels (in metres relative to Ordnance Datum Newlyn) in the lagoon and pools on the site, surveyed by Environment Agency LiDAR on 04/12/2015, and by ground RTK surveys by KPAL in 2019 to 2022

Date	Lagoon	Pool A	Pool B	Pool C	Pool G
04/12/2015	2.798	none	2.633	2.633	2.677
25/04/2019	2.597	2.619	2.576	2.535	dry (bed at 2.42)
21/06/2019	2.429	2.545	2.518	2.499	dry (bed at 2.42)
19/03/2020	2.676	2.649	2.585	2.517	not surveyed
15/06/2020	2.559	2.559	2.549	2.485	2.513
17/06/2021	2.628	2.633	2.651	2.647	2.690
01/10/2021	2.494	2.603	2.581	2.503	2.526
09/06/2022	2.530	2.575	2.618	2.616	2.595
04/10/2022	2.686	2.672	2.661	2.646	2.578

Table 8. Temperature and rainfall records for Manston for the period 2017 to 2022 inclusive. Monthly mean temperatures are calculated from daily maximum and daily minimum values; monthly rainfall totals are calculated from hourly rainfall totals. Source: UK Met Office.

Year	Month	Mean daily max temp (°C)	Mean daily min temp (°C)	Monthly rainfall (mm)
2017	Jan	6.3	0.7	48.2
	Feb	9.2	4.5	26.4
	Mar	13.0	6.0	17.2
	Apr	13.7	5.9	10.8
	May	17.9	9.8	57.8
	Jun	22.4	13.1	37.8
	Jul	22.8	14.5	74.2
	Aug	21.4	13.3	85.6
	Sep	18.3	11.1	37.0
	Oct	16.6	10.2	15.4
	Nov	10.5	4.7	31.6
	Dec	8.1	2.6	70.0
2018	Jan	8.9	3.3	68.2
	Feb	5.8	0.4	44.2
	Mar	8.5	2.5	77.4
	Apr	14.6	7.3	71.0
	May	17.0	9.0	43.4

Year	Month	Mean daily max temp (°C)	Mean daily min temp (°C)	Monthly rainfall (mm)
2020	Jan	9.3	4.2	30.2
	Feb	10.4	4.2	90.0
	Mar	10.3	4.3	45.2
	Apr	14.7	6.5	33.0
	May	18.1	8.7	6.8
	Jun	20.8	12.0	34.2
	Jul	22.2	13.3	32.8
	Aug	24.5	15.9	32.0
	Sep	20.5	12.1	40.0
	Oct	14.9	9.2	136.8
	Nov	12.6	7.1	35.0
	Dec	8.4	4.0	88.2
2021	Jan	6.4	1.7	120.3
	Feb	8.2	3.2	5.2
	Mar	10.6	4.0	40.0
	Apr	9.9	3.4	5.8
	May	14.8	7.0	66.4

	Jun	19.6	12.0	7.6		Jun	20.6	12.8	94.4
	Jul	24.9	15.0	21.8		Jul	21.8	13.8	26.0
	Aug	22.4	13.9	73.2		Aug	20.5	13.7	66.6
	Sep	18.8	11.3	45.2		Sep	20.9	13.3	16.2
	Oct	16.2	9.6	47.0		Oct	15.8	9.6	90.2
	Nov	11.3	6.5	108.8		Nov	10.8	5.9	29.4
	Dec	9.9	4.9	59.4		Dec	9.4	4.6	51.8
2019	Jan	6.7	1.9	29.4	2022	Jan	8.2	2.4	15.6
	Feb	10.7	3.6	21.0		Feb	10.7	3.8	32.8
	Mar	11.7	5.2	44.8		Mar	11.3	5.2	12.6
	Apr	12.8	5.9	20.4		Apr	13.1	6.2	6.6
	May	16.0	8.0	39.0		May	17.6	9.5	56.0
	Jun	20.2	12.0	63.0		Jun	20.5	11.7	27.2
	Jul	23.2	14.4	39.2		Jul	24.7	14.9	4.6
	Aug	23.7	13.9	22.0		Aug	24.5	15.8	21.4
	Sep	19.9	12.1	29.6		Sep	19.7	12.7	85.7
	Oct	15.1	9.4	101.2		Oct	17.6	11.2	31.6
	Nov	10.1	5.2	88.6		Nov	12.8	7.5	119.1
	Dec	9.5	4.1	79.2		Dec	8.2	2.8	58.0

Table 9. Temperature and rainfall records for Manston for the period 2017 to 2022 inclusive. Seasonal mean temperatures are calculated from daily maximum and daily minimum values; seasonal rainfall totals are calculated from hourly rainfall totals. Summer is calculated as April to September; Winter is calculated as October to March. Source: UK Met Office

Season	Mean daily max temp (°C)	Mean daily min temp (°C)	Monthly rainfall (mm)
2017 summer	19.4	11.3	303.2
2017-18 winter	9.7	4.0	306.8
2018 summer	19.6	11.4	262.2
2018-19 winter	11.1	5.3	310.4
2019 summer	19.3	11.1	213.2
2019-20 winter	10.8	5.2	434.4
2020 summer	20.1	11.4	178.8
2020-21 winter	10.2	4.9	425.5
2021 summer	18.1	10.7	275.4
2021-22 winter	11.0	5.3	232.4
2022 summer	20.0	11.8	201.5

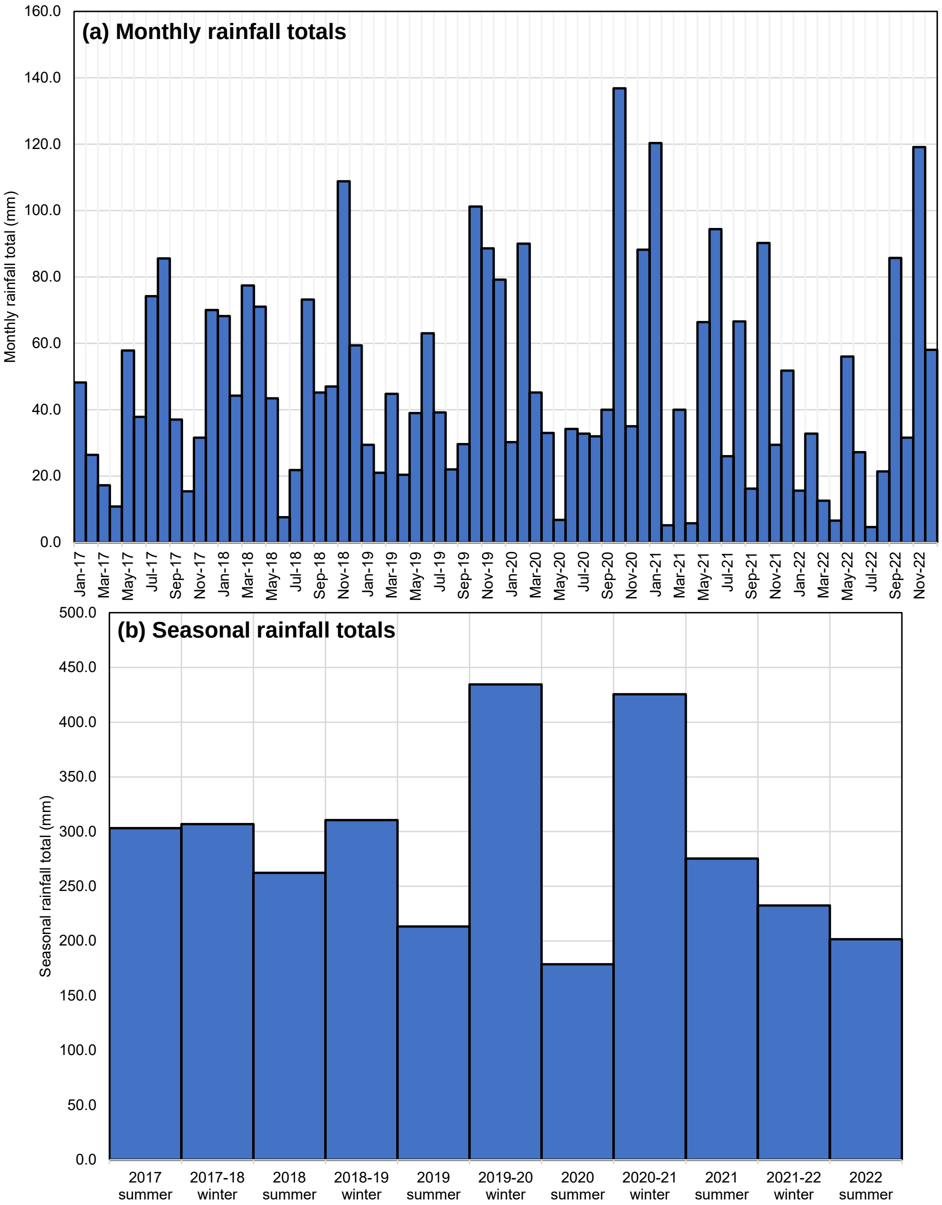


Figure 54. Monthly and seasonal (summer-winter) rainfall records for Manston for the period 2017 to 2022 inclusive, calculated from hourly rainfall totals. Source: UK Met Office. NB Summer = April to September; winter = October to March

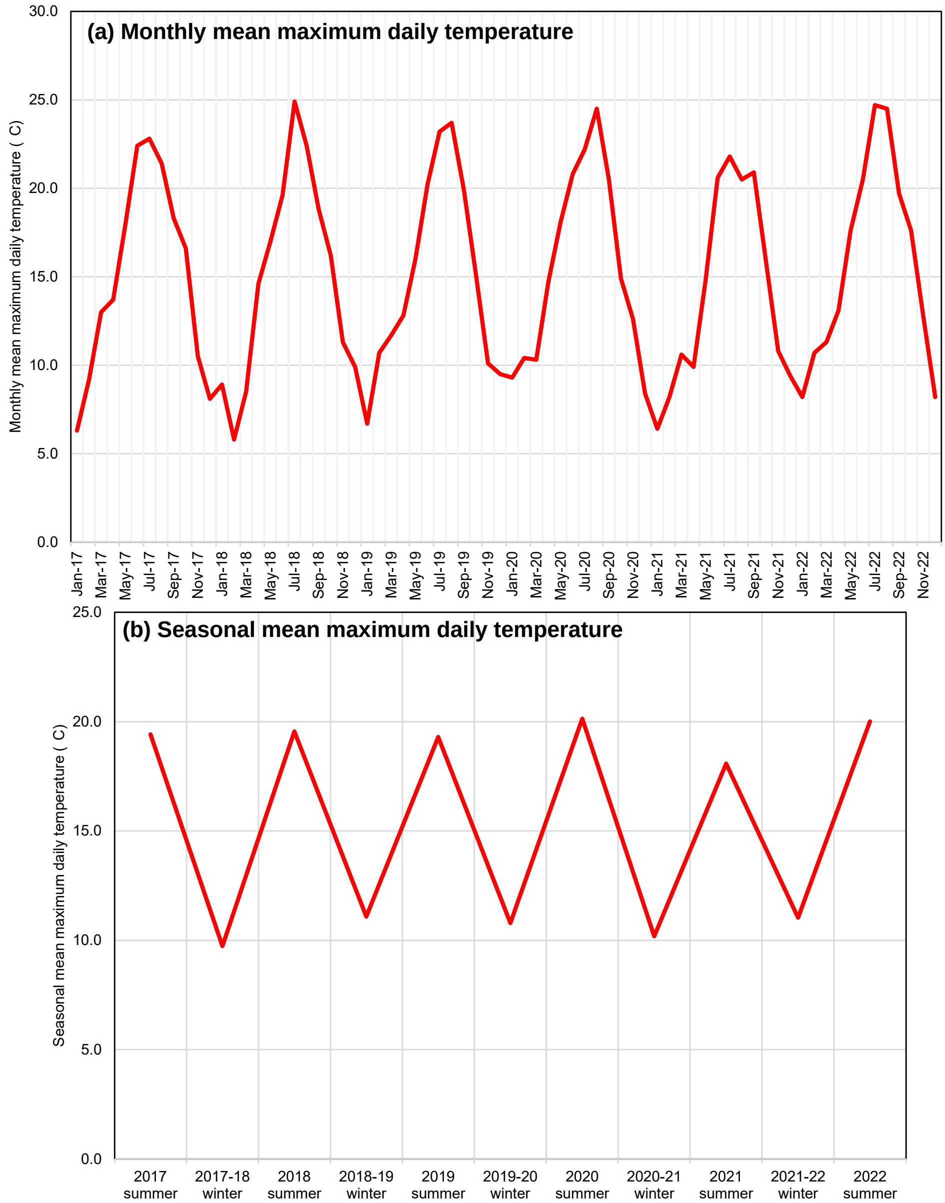


Figure 55. Monthly and seasonal (summer-winter) maximum daily temperature for Manston for the period 2017 to 2022 inclusive, calculated from daily maximum temperature records at 21:00 for the preceding 12 hours. Source: UK Met Office

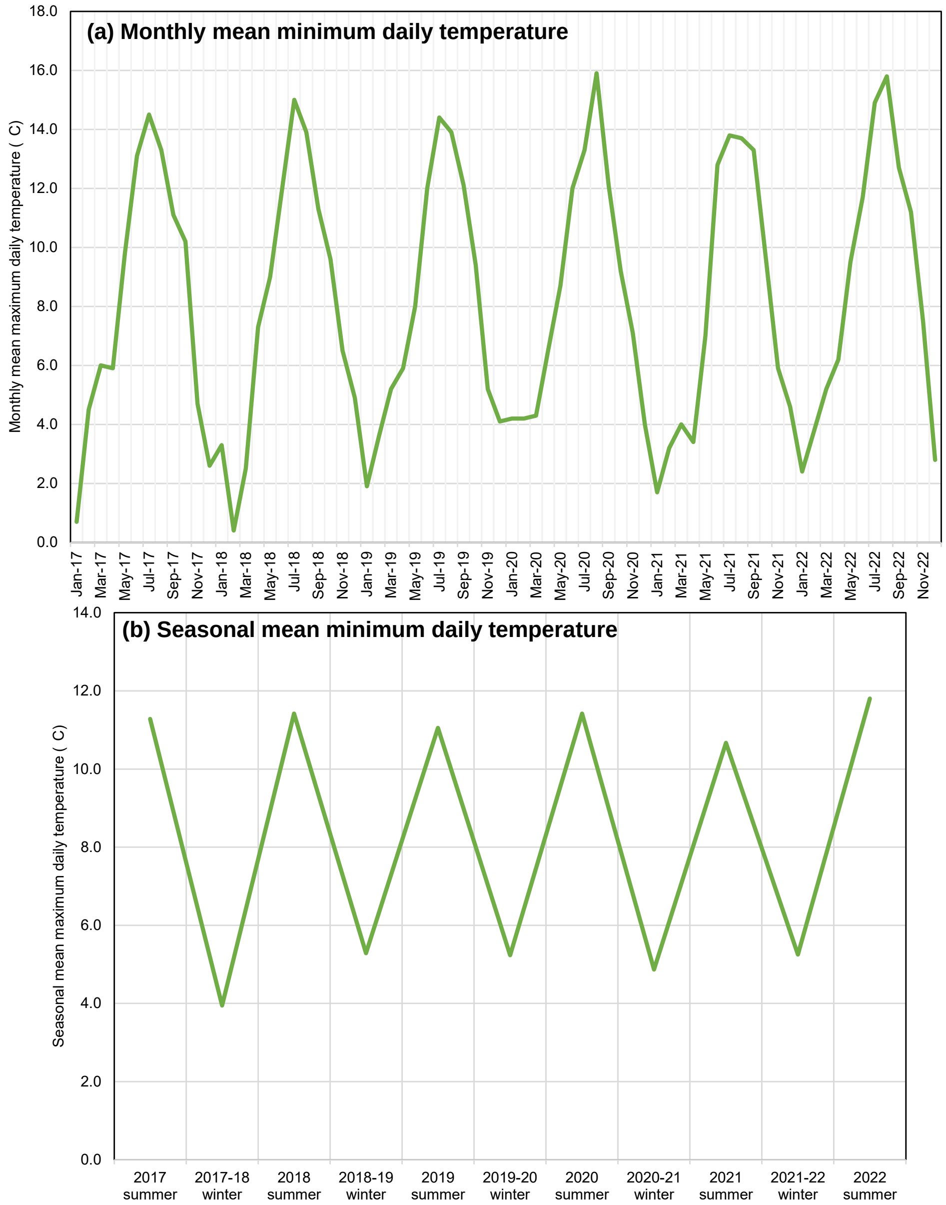


Figure 56. Monthly and seasonal (summer-winter) minimum daily temperature for Manston for the period 2017 to 2022 inclusive, calculated from daily minimum temperature records at 09:00 for the preceding 12 hours. Source: UK Met Office

5.0 Sequence of previous vegetation surveys

5.1 Baseline vegetation surveys were undertaken in 2011 by TEP to inform the Project Environmental Impact Assessment (EIA), including a National Vegetation Classification (NVC) survey of the saltmarsh across which the cable route was proposed. The northern limit of the vegetation survey limit appears to have been constrained by the presence to the north for the Thanet Offshore Windfarm cable corridor, which was under construction in 2011. The area covered by the TEP surveys extended between this limit and the Pegwell Bay Country Park to the south. As stated in the post-construction monitoring methodology (TUV SUD PMSS, 2018), the 2011 NVC Survey undertaken by TEP covered a broader section of the saltmarsh than the final construction corridor, and consequently, due to the low level of survey coverage within the cable route itself, a Before-After-Control-Impact

(BACI) approach to post-construction monitoring could not be applied. Consequently, the monitoring methodology assumes that "*saltmarsh composition within the cable corridor prior to construction, was broadly equivalent to saltmarsh composition of the same community type adjacent to the corridor. Recovery will therefore have been deemed to occur when saltmarsh composition within the corridor becomes comparable to that of the same community type outside the corridor*".

5.2 The post-construction survey programme aims to investigate the changes in the period since the installation of the cable route through the saltmarsh habitat in terms of the NVC communities present and the topography of the saltmarsh.

5.3 A total of 40 vegetation quadrats were surveyed by TEP in 2011, but only 2 quadrats were located within what was to become the cable landfall corridor. Based on this information, a preliminary saltmarsh zonation map was produced, with 8 zones (Table 10 and Figure 57).

5.4 Following cable installation, Year 1 NVC surveys were undertaken by Biocensus Ltd at monthly intervals between June and October 2018. These included the quadrats that were originally surveyed in 2011. In addition, the June, July, August and September 2018 surveys included a further 10 quadrats that were added to improve the coverage within the construction corridor. It should be noted that quadrat 4.6 was located close to the new quadrats 2.6., 2.7, 2.8 and 2.9, and well outside the original Zone 4, presumably reflecting the nature of the post- rather pre-works habitat. A further quadrat (8.6) on the landward edge of the lagoon was added during the October 2018 survey.

5.5 The Biocensus (2019) report suggested that the ecological zonation based on the TEP 2011 survey was a simplified representation and consequently an updated map was presented of the pre-construction vegetation pattern based on a visual interpretation of pre-construction aerial imagery. This updated pre-construction NVC map is reproduced as Figure 58 below. Independent assessment of aerial photographs from 2016 by KPAL has suggested that the revised zonation and system of quadrat numbering proposed by Biocensus has some serious limitations. However, for the purposes of comparison with the 2018 monitoring (Biocensus, 2019) their framework has been retained as far as possible in the presentation and interpretation of vegetation monitoring results presented below.

Table 10. Ecological zonation identified in the 2011 TEP survey, as updated and summarised by Biocensus, (2019). Quadrat numbers are given for the baseline survey (2011, 40 quadrats), the June-October 2018 surveys (10 additional quadrats), and quadrat 8.6 (surveyed in October 2018 only)

Zone	Description	Relevant sample points
Zone 1	Narrow strip between the road and fringes of a dried-out saltpan (Zone 2). Zone 1 supported a dense neutral grassland sward with patches of tall ruderal herbs and sea couch. In terms of NVC, the zone was categorised as an MG1a *Arrhenatherum elatius* grassland (*Festuca rubra* sub-community) / SM24 *Elymus pycnanthus* (*Elytrigia atherica*) saltmarsh mosaic.	1.1, 1.2, 1.3, 1.4, 1.5 (baseline)
Zone 2	Salt-pan (of bare cracked mud at the time of survey) supporting a fringe of common cord-grass (*Spartina anglica*) and sea purslane (*Atriplex portulacoides*). In terms of NVC, vegetation was attributed to the SM6 *Spartina anglica* community interspersed by patches of SM14 *Halimione (Atriplex) portulacoides* saltmarsh.	2.1, 2.2, 2.3, 2.4, 2.5 (baseline) 2.6, 2.7, 2.8, 2.9 (additional)
Zone 3	Sea aster (*Aster tripolium*) and sea purslane dominated fringe at the seaward edge of Zone 2. The vegetation was attributed to the SM12a *Aster tripolium* saltmarsh merging towards SM14 *Halimione portulacoides* saltmarsh.	3.1, 3.2, 3.3, 3.4, 3.5 (baseline)
Zone 4	A species-poor SM24 *Elymus pycnanthus* saltmarsh community (with a richer patch of SM26a *Inula crithmoides* (with *Puccinellia maritima, Salicornia* agg and *Limonium vulgare* at 4.1).	4.1, 4.2, 4.3, 4.4, 4.5 (baseline) 4.6 (additional)
Zone 5	A sea purslane dominated community attributed to SM14a *Halimione portulacoides* saltmarsh interspersed by patches of SM26b *Inula crithmoides* saltmarsh (*Elymus pycnanthus* sub-community).	5.1, 5.2, 5.3, 5.4, 5.5 (baseline)
Zone 6	Vegetation attributed to SM13a *Puccinellia maritima* saltmarsh with patches of SM14c *Halimione portulacoides* (*Puccinellia maritima* sub-community).	6.1, 6.2, 6.3, 6.4, 6.5 (baseline) 6.6, 6.7 (additional)
Zone 7	Leading seaward edge of the saltmarsh area comprising a broad but fragmented fringe of common cord-grass and glasswort (*Salicornia* spp.) and intertidal mud. The vegetation was attributed to a mosaic of SM6 *Spartina anglica* and SM8 *Annual Salicornia* saltmarsh.	7.1, 7.2, 7.3, 7.4, 7.5 (baseline) 7.6, 7.7, 7.8 (additional)
Zone 8	A narrow strip of vegetation bordering the north-western fringe of the saltpan. The quadrats sampled included S21 *Scirpus (Bolboschoenus) maritimus* swamp (8.1 & 8.2), a patch of SM16b *Festuca rubra-Juncus gerardii* saltmarsh (*Juncus gerardii* sub-community) (8.3) as well as SM24 *Elymus pycnanthus* saltmarsh (8.4 & 8.5).	8.1, 8.2, 8.3, 8.4, 8.5 (baseline) 8.6 (additional)

* Note: *Elymus pycnanthus* has been renamed as *Elytrigia atherica*; *Halimione portulacoides* is now *Atriplex portulacoides*; and *Scirpus maritimus* is now *Bolboschoenus maritimus*.

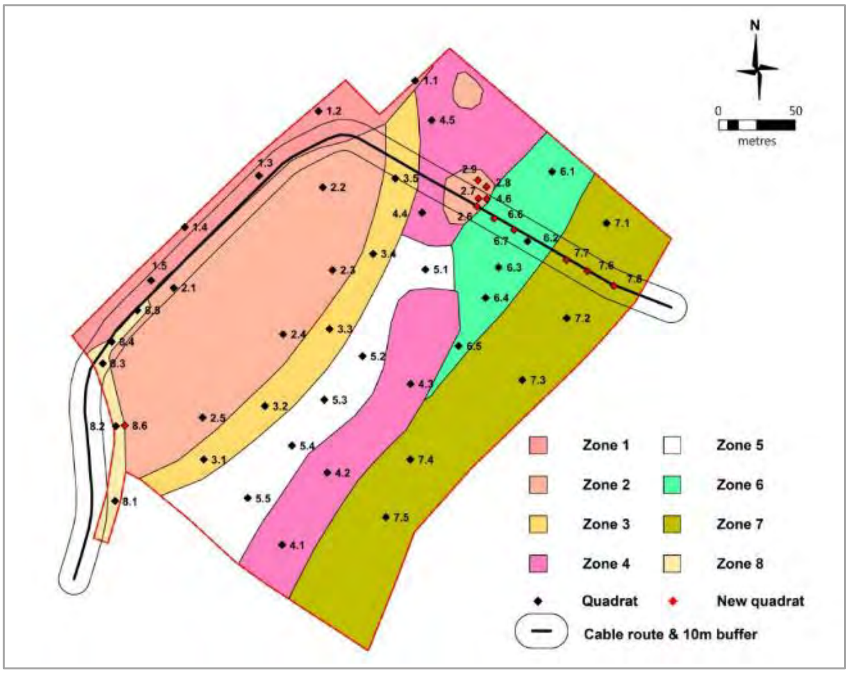
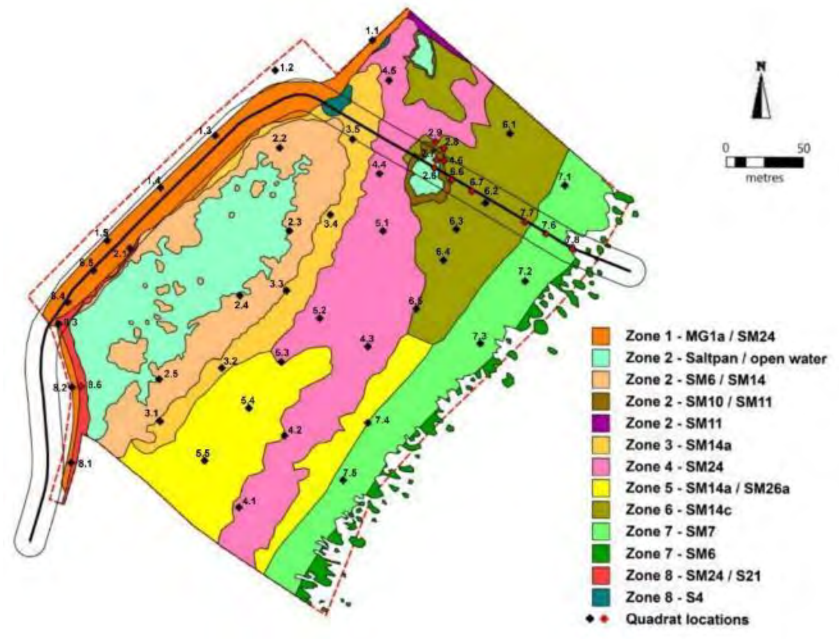


Figure 57. Ecological zonation in relation to the location of vegetation quadrats surveyed by TEP in 2011 (black diamonds) and Biocensus in 2018 (red diamonds); reproduced from report by Biocensus (2019)



NVC communities:
MG1a *Arrhenatherum elatius* grassland (Festuca rubra sub-community);
SM24 *Elytrigia atherica* saltmarsh;
SM6 *Spartina anglica* saltmarsh;
SM14 *Atriplex portulacoides* saltmarsh (SM14a *Atriplex portulacoides* dominant / SM14c *Puccinellia maritima* sub-community);
SM10 Transitional low-marsh with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda maritima*;
SM11 *Aster tripolium* var. discoideus saltmarsh;
SM26a *Inula crithmoides* on salt marshes with *Puccinellia maritima*, *Salicornia* agg and *Limonium vulgare*;
SM7 *Sarcocornia perennis* stands;
S21 *Bolboschoenus maritimus* swamp; and
S4 *Phragmites australis* swamp.

Figure 58. Pre-construction NVC communities, with revised ecological zonation, reproduced from Fig 4 in Biocensus (2019), with quadrat numbers added by KPAL

5.6 Two NVC quadrat surveys were competed by KPAL in 2019, one in June/early July and the second in October. The June survey was undertaken on 21 June 2019 and comprised a survey of the saltmarsh zones (Zones 2 to 7) with a second visit to survey the terrestrial habitats (Zones 1 and 8) undertaken on 9 July 2019. The second NVC quadrat survey was undertaken on 8 and 9 October.

5.7 During the June 2019 survey visit it was noted that, despite the additional quadrats surveyed in 2018, there were several areas of the construction corridor which lacked appropriate coverage of quadrats to provide a meaningful comparison of vegetation development between the corridor and the adjacent area of unaffected saltmarsh. Consequently, seven additional quadrats were established in the 2019 survey (Figures 59 & 60; Table 11). One additional quadrat was added in June 2020 (labelled 7.10A) where a displaced marker cane was found. Table 12 shows the location coordinates of the quadrats surveyed in June 2020, or in June 2019 where quadrats were inaccessible in June 2020, and again in June and October 2021.

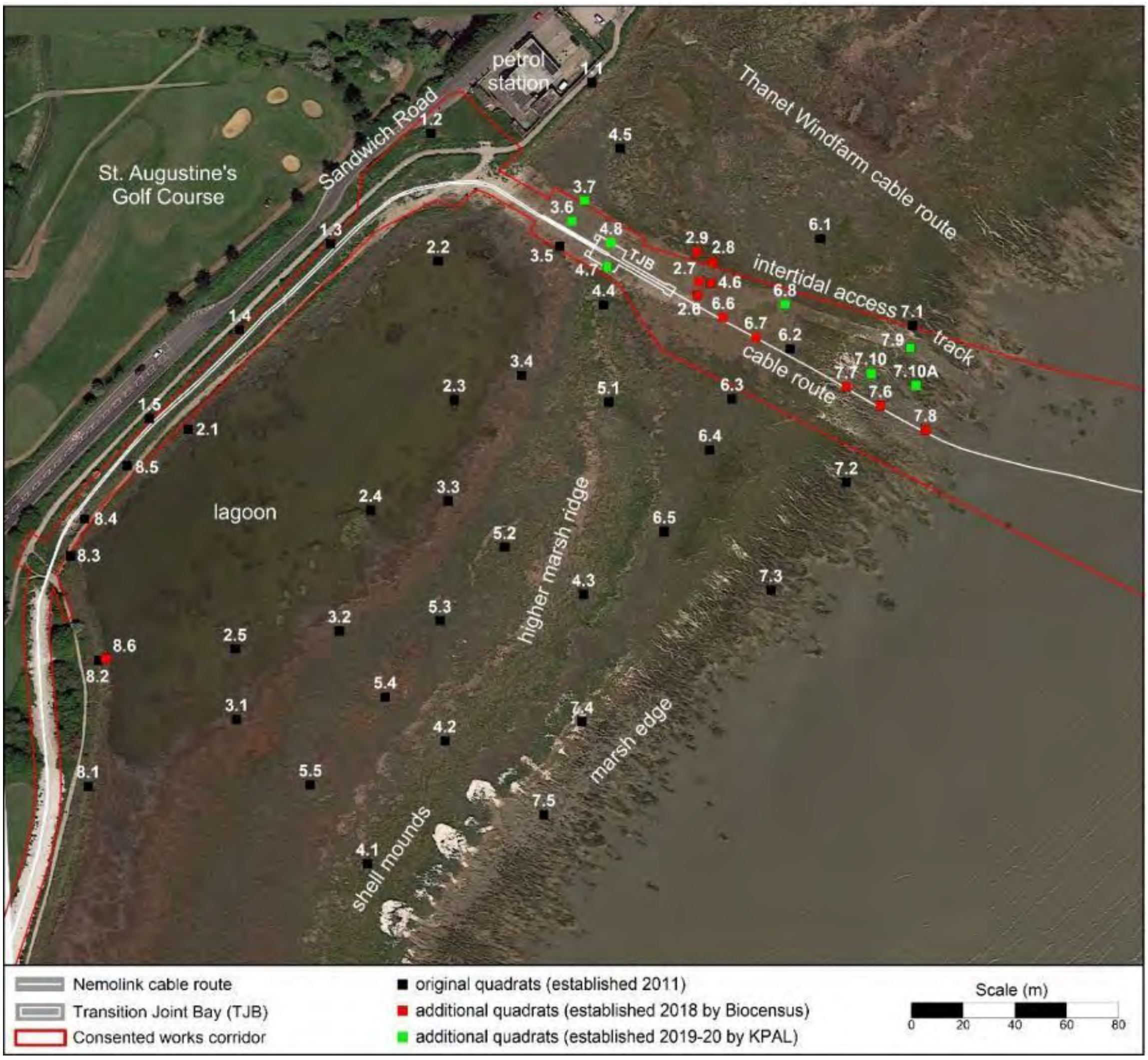


Figure 59. Locations of quadrats established in 2011 for baseline monitoring (40 original quadrats, black squares), additional quadrats established for the 18/06/2018 monitoring survey by Biocensus (11 additional quadrats, red squares), and 8 additional quadrats established for the 21/06/2019 and 15/06/2020 monitoring surveys (8 additional quadrats, green squares). Base aerial photography flown 16/05/2019 (source: Google Earth)

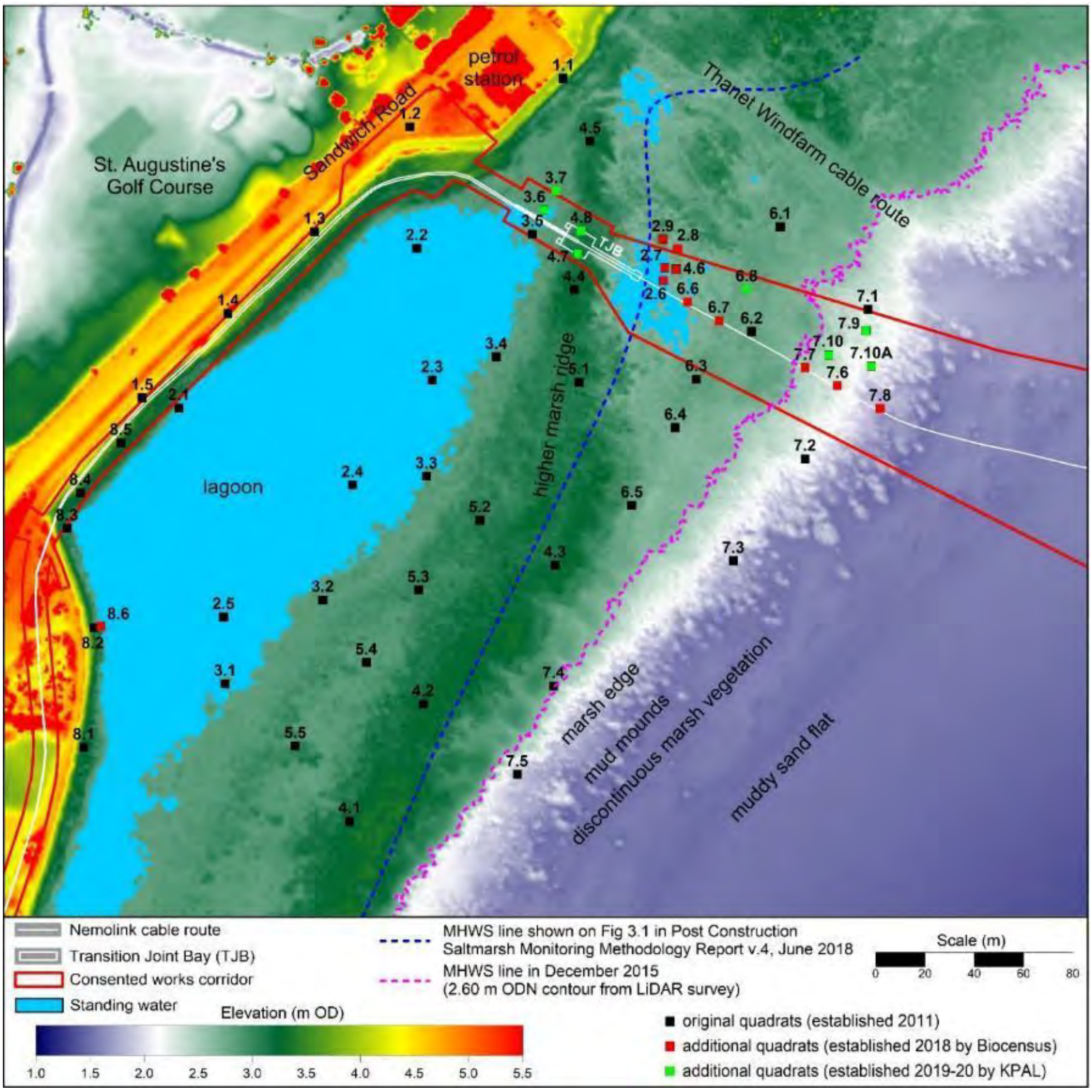


Figure 60. Locations of quadrats established in 2011 for baseline monitoring (40 original quadrats, black squares), additional quadrats established for the 18/06/2018 monitoring survey by Biocensus (11 additional quadrats, red squares), and 8 additional quadrats established for the 21/06/2019 and 15/06/2020 monitoring surveys (8 additional quadrats, green squares). Base LiDAR DTM flown on 04/12/2015 (source: DEFRA Open Government Data)

Table 11. Dates of quadrat surveys 2011-2021. The original 40 quadrats established in 2011 are shown in black. 11 additional quadrats established in 2018 by Biocensus are shown in red. 8 additional quadrats established in 2019-2020 by KPAL are shown in green. Quadrats which are located within the works corridor or immediately adjacent to it are indicated by grey shading. Quadrat 1.2 was inaccessible in 2020 as it was beneath road works on site at the time of survey. Quadrats 2.2, 2.3, 2.4 and 2.5 were inaccessible in 2020-21 as they were below the standing water level of the lagoon. The marker cane for quadrat 7.10 was found to have been moved on 15/06/20 – the new location was numbered as 7.10A. A replacement marker cane was installed at the previously surveyed position numbered as 7.10

Zone	08/11	18/06/18	18/07/18	20/08/18	27/09/18	18/10/18	21/06/19 & 09/07/19	08/10/19 & 09/10/19	15/06/20 & 9-10/10/20	16-17/06/21 & 01/10/21
1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	inaccessible	1.2
	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	open water	open water
	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	open water	open water
	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	open water	open water
	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	open water	open water
		2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
		2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
		2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
							3.6	3.6	3.6	3.6
							3.7	3.7	3.7	3.7
4	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
							4.7	4.7	4.7	4.7
							4.8	4.8	4.8	4.8
5	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
6	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
		6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
		6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
							6.8	6.8	6.8	6.8
7	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
		7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
		7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
		7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
							7.9	7.9	7.9	7.9
							7.10	7.10	7.10	7.10
									7.10A	7.10A
8	8.1		8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
	8.2		8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
	8.3		8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
	8.4		8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
	8.5		8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
						8.6	8.6	8.6	8.6	8.6
Totals	40	45	50	50	50	51	58	58	54	55

Table 12. Locations and elevations of the 59 marker canes for Quadrats renewed and re-surveyed on 15/06/2020. Quadrats which are located within the works corridor or in disturbed areas immediately adjacent to shaded grey

Quadrat	Description	Easting	Northing	Elevation (m OD)	1D QC	2DQC
1.1	On terrestrial edge of works corridor, on bank adjacent to footpath	634567.14	163820.42	3.833	0.010	0.006
1.2	Transition area of works corridor between road and footpath	634504.85	163800.75	4.684	0.011	0.006
1.3	Transition area of works corridor	634466.15	163758.19	3.901	0.011	0.006
1.4	Roadside verge	634431.05	163725.02	4.318	0.011	0.007
1.5	Transition area of works corridor	634396.21	163690.76	4.090	0.009	0.005
2.1	On W edge of lagoon – saltmarsh fringe	634411.14	163686.61	2.672	0.009	0.006
2.2	Inundated lagoon	634507.64	163751.49	2.427	0.009	0.007
2.3	Inundated lagoon	634513.88	163697.93	2.442	0.010	0.008
2.4	Inundated lagoon	634481.57	163655.42	2.438	0.009	0.007
2.5	Inundated lagoon	634429.24	163601.84	2.478	0.009	0.006
2.6	Central area of cable route corridor, seaward of TJB	634607.80	163738.27	2.686	0.011	0.008
2.7	Central area of cable route corridor, to seaward of TJB	634608.23	163743.63	2.614	0.010	0.007
2.8	On N edge of cable route consented works corridor	634613.57	163751.17	2.601	0.012	0.008
2.9	On N edge of cable route consented works corridor	634607.58	163755.08	2.547	0.011	0.007
3.1	Low-mid marsh, SE shore of lagoon, periodically inundated	634429.86	163574.72	2.587	0.009	0.007
3.2	Low-mid marsh, SE shore of lagoon, periodically inundated	634469.52	163608.81	2.689	0.009	0.006
3.3	Low-mid marsh, SE shore of lagoon, periodically inundated	634511.59	163658.90	2.622	0.008	0.006
3.4	Low-mid marsh, SE shore of lagoon, periodically inundated	634539.90	163707.42	2.649	0.008	0.007
3.5	Transitional low marsh, E end of lagoon, S edge of works corridor	634554.63	163757.23	2.765	0.009	0.005
3.6	In Inundated area of construction corridor to landward of TJB	634559.25	163766.95	2.555	0.009	0.007
3.7	In Inundated area of construction corridor to landward of TJB	634564.19	163774.74	2.617	0.010	0.008
4.1	High-marsh ridge, dominated by Sea Couch, SW of works corridor	634480.43	163518.94	2.986	0.011	0.007
4.2	High-marsh ridge, dominated by Sea Couch, SW of works corridor	634510.27	163566.44	3.031	0.008	0.006
4.3	High-marsh ridge, dominated by Sea Couch, SW of works corridor	634563.80	163622.84	2.937	0.007	0.006
4.4	High-marsh ridge, dominated by Sea Couch, SW of works corridor	634571.58	163734.65	2.985	0.011	0.008
4.5	High-marsh ridge, dominated by Sea Couch, NE of works corridor	634577.99	163794.93	2.880	0.009	0.007
4.6	Within disturbed area of works corridor, seaward of former high marsh ridge	634612.98	163742.99	2.596	0.012	0.008
4.7	On south edge of works corridor, in location of TJB	634573.01	163749.27	2.769	0.010	0.007
4.8	In central area of works corridor, in location of TJB	634574.42	163758.55	2.547	0.010	0.008
5.1	Transitional between Mid-marsh and High Marsh ridge	634573.52	163697.12	2.920	0.008	0.006
5.2	Mid-marsh E of lagoon, dominated by Sea Purslane and Sea Couch	634533.27	163641.12	2.849	0.010	0.008
5.3	Mid-marsh E of lagoon, dominated by Sea Purslane and Sea Couch	634508.34	163612.74	2.816	0.010	0.008
5.4	Mid-marsh E of lagoon, dominated by Sea purslane and sea couch	634487.19	163583.38	2.675	0.009	0.006
5.5	Mid-marsh E of lagoon, dominated by Sea purslane and sea couch	634458.33	163549.46	2.728	0.010	0.007
6.1	Mid-marsh seaward of ridge, dominated by Sea Purslane and Common Saltmarsh-grass	634655.24	163760.25	2.613	0.013	0.008
6.2	In central area of works corridor, seaward of TJB	634643.55	163717.68	2.541	0.011	0.007
6.3	Mid-marsh E of High-marsh ridge, dominated by Sea Purslane and Common Saltmarsh-grass	634621.11	163698.34	2.668	0.011	0.007
6.4	Mid marsh E of High-marsh ridge, dominated by sea purslane and Common Saltmarsh-grass, SW of works corridor	634612.61	163678.70	2.582	0.008	0.006
6.5	Mid marsh E of High-marsh ridge, dominated by Sea Purslane and Common Saltmarsh-grass, SW of works corridor	634594.98	163647.14	2.662	0.008	0.007
6.6	In central area of works corridor, seaward of TJB	634617.69	163729.73	2.541	0.012	0.007
6.7	In central area of works corridor, seaward of TJB	634630.33	163722.12	2.565	0.011	0.007
6.8	On north edge of works corridor	634641.59	163734.84	2.477	0.012	0.007
7.1	Low marsh dominated by Common Cord-grass and Perennial Glasswort	634690.76	163726.70	2.343	0.009	0.006
7.2	Low marsh dominated by Common Cord-grass and Perennial Glasswort	634665.26	163666.07	2.201	0.010	0.006
7.3	Low marsh in area of active erosion, dominated by Common Cord-grass and Perennial Glasswort	634636.16	163624.60	1.709	0.010	0.006
7.4	Low marsh in area of active erosion, SW of works corridor	634563.22	163573.85	2.612	0.009	0.005
7.5	Low marsh in area of active erosion, dominated by Common Cord-grass and Perennial Glasswort	634548.41	163537.94	1.935	0.008	0.005
7.6	In works corridor at seaward edge of marsh, between 7.7 and 7.8	634678.42	163695.69	1.560	0.010	0.006
7.7	In works corridor at seaward edge of marsh	634665.24	163703.02	2.142	0.010	0.006
7.8	In works corridor at seaward edge of marsh	634695.78	163686.42	1.579	0.011	0.007
7.9	In intertidal access track to NW of main works corridor	634690.09	163718.08	2.007	0.009	0.006
7.10	On north edge of works corridor	634674.81	163708.06	2.272	0.008	0.005
7.10A	On north edge of works corridor	634692.20	163703.57	1.926	0.009	0.005
8.1	Linear strip on NW fringe of lagoon, dominated by Sea Club-rush	634372.56	163548.90	2.849	0.009	0.006
8.2	At base of stone revetment, dominated by grassland species	634376.53	163597.39	2.922	0.010	0.007
8.3	Linear marsh habitats in NW corner of lagoon	634365.68	163637.78	2.950	0.011	0.007
8.4	Transition habitat adjacent to path, grassland	634371.18	163652.15	3.239	0.010	0.006
8.5	Transition habitat adjacent to path, grassland	634387.57	163672.52	3.383	0.009	0.006
8.6	Linear strip along W edge of lagoon, adjacent to Q8.2	634379.45	163598.13	2.767	0.010	0.006

5.8 Two NVC surveys were completed in 2021, one in June (June 16th/17th) and the second in October (October 1st). For both surveys, based on the experience of the previous surveys in 2019-20, it was decided to survey the intertidal quadrats using the same methodology but to undertake a reduced survey for the zones located on the landward side of the saline lagoon. For the quadrats in Zone 1 (1.1 to 1.5) and Zone 8 (8.1 to 8.6) habitat descriptions were made recording the habitat types present and the dominant species present. In addition, photographs were taken where possible to continue a photographic record of these quadrats. For the quadrats present within the saline lagoon (2.2 to 2.5), the locations of the quadrats were inaccessible due to the high water levels at the time of the surveys.

6.0 Results of the Year 5 vegetation monitoring and comparison with previous surveys

6.1 The vegetation monitoring surveys undertaken in 2022 replicated those undertaken in 2022. As in previous years, where the canes used to mark the positions of the 2m square quadrats were found to be missing they were replaced using the RTK-GNSS positional information from previous years. To provide consistency with previous surveys the canes were placed at the bottom left corner of each quadrat when the surveyor was standing with their back to the shoreline. The locations of the profiles surveyed, including an indication of those considered to be inside and outside the area affected by the cable installation works, are shown in Figure 61.

6.2 During each survey the presence and approximate percentage occurrence of each plant species was recorded within the quadrat, as well as additional information relating to the presence and depth of standing water, debris and bare ground.

6.3 Photographs were taken at each quadrat location to provide a consistent comparison with photographs taken during the 2018, 2019, 2020 and 2021 surveys. Photographs were taken of the quadrat itself, standing with back to the shore, and then in each of four directions: seaward, landward and to left and right along the coastline.

6.4 The complete set of quadrat data collected in the 2022 survey is presented in Appendix 4 which includes the comparable quadrat data from the 2018 - 2021 surveys to provide a year-on-year comparison. The quadrat data presented in Appendix 4 include the percentage cover of each species recorded within the quadrat; in addition, the data show if species were recorded in the marsh adjacent to the quadrat (indicated by a letter ‘A’), and if they were present only as dead plant material (indicated by a letter ‘X’). The photographs taken during the June and October 2022 surveys are presented in Appendices 5 & 6, respectively.

6.5 Quadrat data in 2019 were analysed using the MAVIS (Modular Analysis of Vegetation Information System) vegetation data analysis package (CEH, 2016). The MAVIS package was used to provide a ‘best-fit’ assessment of the vegetation present in each quadrat to the saltmarsh vegetation communities identified in the NVC (Rodwell, 2000). However, it should be noted that the NVC methodology derives plant communities based on multiple quadrats within an area of similar, contiguous vegetation, and that caution should be used in determining a NVC community from a single quadrat. Saltmarsh vegetation in particular can exhibit large degrees of variation over relatively short spatial scales that reflect the physio-geographical variation within intertidal environments. The 2020 quadrats were analysed using professional comparison of the species presence and cover abundance data obtained from the field surveys. It was concluded that the use of the MAVIS package would not provide additional information about changes in saltmarsh community composition and thus it was not used for the 2020, 2021 and 2022 data sets.

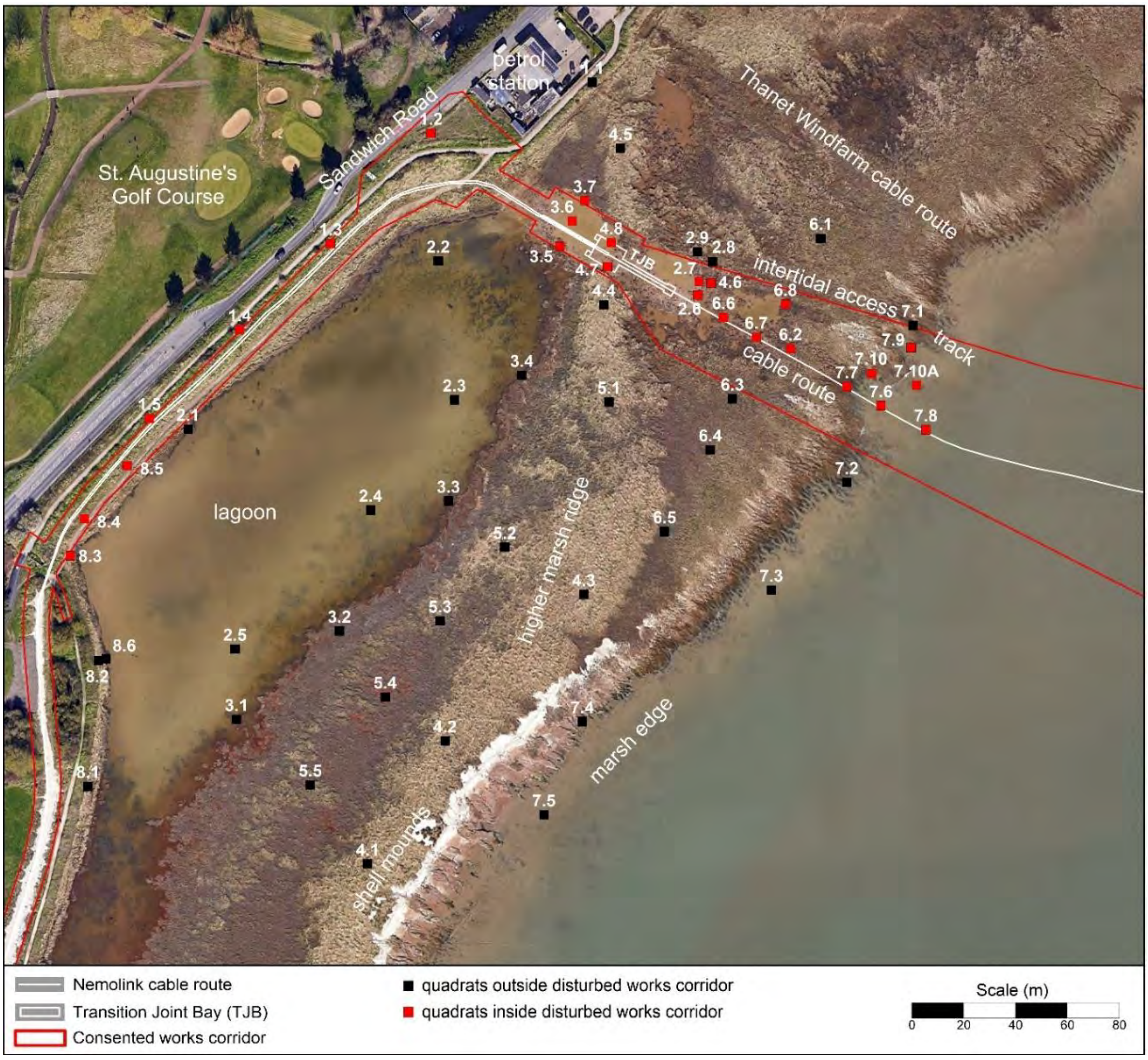


Figure 61. Locations of quadrats surveyed in 2022, with those inside the works corridor shown in red, and those outside the works corridor shown in black. Base aerial photography flown 16/05/2019 (source: Google Earth)

6.6. Summaries of the main vegetation features recorded within each ecological zone since 2018 are provided below.

Zone 1

Zone 1 - 2018 Summary

6.7 Narrow strip between the road and fringes of a dried-out saltpan (Zone 2). Zone 1 supported a dense neutral grassland sward with patches of tall ruderal herbs and sea couch. In terms of NVC, the zone was categorised as an MG1a *Arrhenatherum elatius* grassland (*Festuca rubra* sub-community) / SM24 *Elymus pycnanthus* (*Elytrigia atherica*) saltmarsh mosaic.

6.8 All quadrat locations with the exception of 1.1 & 1.4 were located on disturbed ground associated with the construction corridor. None of the disturbed ground communities fit particularly well with the NVC. This is not unexpected given the location of quadrats 1.2, 1.3 & 1.5 at a transitional point between saltmarsh and disturbed terrestrial habitat.

- Quadrat 1.1 is located between a sea couch dominated bank (SM24) and stand of common reed (S4) at the edge of the saltmarsh.
- Quadrat 1.2 is a transitional habitat on disturbed ground.
- Quadrat 1.3 is a transitional habitat with a substrate probably mixed with saline intertidal muds given that halophytes including *Atriplex littoralis* and *Salicornia ramosissima* were recorded from it.
- Quadrat 1.4 is a roadside verge probably best described as MG1 grassland with maritime influence.
- Quadrat 1.5 is a transitional disturbed ground habitat.

Zone 1 - 2019 Summary

6.9 The 2019 analysis was generally consistent with the 2018 survey, with quadrats located in the terrestrial fringe of the construction corridor. The habitats showed influences from the adjacent saltmarsh and the disturbed areas were indicative of open habitats that are colonising bare ground. The vegetation appeared to become more terrestrial and characteristic of grassland communities with fewer halophytes detected than in 2018. The quadrats in 2019 had a greater vegetation cover and height which may indicate the development of the vegetation community towards less open grassland or may be a result of a less extreme summer than in 2018.

Zone 1 - 2020 Summary

6.10 The 2020 survey recorded a more extensive grassland along the recolonised area to landward of the lagoon, in areas where vegetation has been re-established following disturbance. The cover of bare ground was significantly reduced compared with 2019, and the sward was becoming dense and typical of grass dominated sward. The community at Q1.3 and 1.4 showed affinities with MG1 with the maritime influence favouring the dominance of couch grasses over false oat grass.

Zone 1 - 2021 Summary

6.11 The type and extent of vegetation recorded during the 2021 survey was consistent with that present in the previous year. Most quadrats were dominated by a rank grassland sward characterised be common couch with abundant tall perennial species including fennel, wild carrot and ribbed melilot as well as remnant ruderal species such as oxeye daisy, lucerne and redshank. Q1.2 had been heavily disturbed during 2020 by ongoing water main works (unrelated to Nemo Link) and was slowly becoming colonised by vegetation.

Zone 1 - 2022 Summary

6.12. The vegetation present within the Zone 1 quadrats was consistent with that recorded in previous years. Quadrats 1.1 and 1.4, located adjacent to the footpath and road respectively represented relatively stable vegetation communities that exhibit no significant difference year on year, and are characterised by rank grassland with tall perennial vegetation developing. The vegetation present in the other quadrats (1.2, 1.3 and 1.5) are in varying degrees of sward succession developing towards a rank grassland with affinities with SM24 *Elytrigia atherica* and MG1 *Arrhenatherum elatius* communities, reflecting the transitional nature of the grassland located between saltmarsh and terrestrial habitats. Q1.2, which was disturbed in 2020, shows good recovery in the 2 season of growth following the clearance of all vegetation.

6.13 Table 13 provides a descriptive summary of the vegetation characteristics in each Zone 1 quadrat recorded in 2022 and provides a comparison with the descriptive summaries provided in earlier monitoring reports.

Table 13. Descriptions of 2022 Zone 1 Quadrats

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 1.1	**2019**: MG1b *Arrhenatherum elatius* grassland **2020**: Quadrat located on bank adjacent to petrol station and footpath. Dominated by sea couch *Elytrigia atherica* with abundant sea beet *Beta vulgaris* ssp. Maritima, Alexanders *Smyrnium olusatrum*, Common nettle *Urtica dioica* with scattered bramble and Common reed *Phragmites australis* and sea purslane *Atriplex portulacoides* becoming locally dominant along the foot of the bank. The common reed appears to be increasing in abundance compared to 2019 with a narrow channel clearly visible draining water from the main lagoon towards a smaller lagoon approx. 30m seaward from the bank. It is likely the vegetation on the bank itself would have a greatest affinity with the SM24 *Elymus pycnanthus* (*Elytrigia atherica*) saltmarsh mosaic rather than an MG1 grassland. **2021**: Vegetation on bank unchanged from 2020 survey, dominated by Sea couch and abundant to occasional herbaceous species as recorded previously. Common reed was similarly present along the base of the bank lining a narrow channel draining from the main lagoon area. Bank vegetation consistent with the SM24 NVC community.	No significant change in variation from 2021 surveys with bank vegetation dominated by Sea couch *Elytrigia atherica* with frequent False oat-grass *Arrhenatherum elatius*, and frequent – occasional herbaceous perennials including: Common nettle *Urtica dioica*, Alexanders *Smyrnium olusatrum*, Hogweed *Heracleum sphondylium*, bramble *Rubus fruticosus* agg., Sea beet *Beta vulgaris ssp. maritima*, and Hedge bedstraw *Galium mollugo,* Fennel *Foeniculum vulgare*, red fescue *Festuca rubra*, Cock's-foot, *Dactylis glomerata*, Common mugwort *Artemisia vulgaris*, Perennial wall-rocket *Diplotaxis tenuifolia* and Common mallow *Malva sylvestris.* Quadrat represents stable vegetation on transitional ecotone between saline influence marsh and terrestrial verge species. Bank vegetation has greatest affinity with SM24 *Elytrigia atherica* salt marsh with MG1 *Arrhenatherum elatius* grassland at top of bank adjacent to footpath. a

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 1.2	**2019**: OV19c 39.79 *Poa annua-Tripleurospermum inodorum* community **2020**: This quadrat had been disturbed by ongoing water mains works at the time of the June 2020 survey. And could not be accessed. In October, the ground had been reinstated but comprised a mosaic of bare ground with recently colonised annual plants. **2021**: Compacted ground and gradual colonisation by short ruderal species. Bare ground becoming colonised by perennial grass and herbaceous species including sea couch, common couch, annual meadow grass, Yorkshire fog, redshank, Prickly ox-tongue, ribwort plantain, and curled dock.	Vegetation continues to revegetate after disturbance in 2020. Developing into healthy but species-poor sward dominated by Perennial rye-grass, *Lolium perenne*, common couch *Elytrigia repens*, and red fescue with frequent ribwort plantain *Plantago lanceolata*, and occasional Sea beet, teasel *Dipsacus fullonum*, Cock's-foot, dandelion *Taraxacum officinalis* agg., Creeping bent *Agrostis stolonifera*, Prickly ox-tongue *Helminthotheca echioides* and Broad-leaved dock *Rumex obtusifolius*.
Quadrat 1.3	**2019:** OV19c 31.16 *Poa annua-Tripleurospermum inodorum* community **2020**: Q1.3 was present in dense rank grassland dominated by common couch *Elytrigia repens* on the verge of a cycle path. The grassland had colonised a more open habitat present previously and include a dense sward with red fescue *Festuca rubra*, Cock's-foot *Dactylis glomerata* and Sea couch all abundant, with occasional perennials including see beet, common mugwort *Artemisia vulgaris*, fennel *Foeniculum vulgare* and Black horehound *Ballota nigra*. **2021:** No material change in vegetation. Grassland sward present between two footpaths. Rank grass sward dominated by common couch with occasional sea couch and perennials including fennel, fat hen, oxeye daisy, and wild carrot	Grassland sward present between two footpaths. Rank, unmanaged grassland, with tall herbaceous perennials. Sward dominated by False oat-grass and Sea couch, with abundant Fennel, frequent Oxeye daisy *Leucanthemum vulgare*, and occasional Sea beet, Alexanders and Common mugwort. Grassland appeared to have greater abundance of sea couch with occasional Blackthorn *Prunus spinosa* and Perennial wall-rocket.
Quadrat 1.4	**2019**: OV23d 29.74 *Lolium perenne - Dactylis glomerata* Open Habitat **2020**: Dense grassland and tall herbaceous species adjacent to cycle path. Dominated by common couch with abundant fennel, sea beet, Alexanders black horehound, and bramble. Several blackthorn shrubs were present adjacent to the quadrat. **2021**: No material change in vegetation – roadside verge, dominated by common couch, Cock's-foot, with occasional perennial herbaceous species including fennel and greater knapweed	Roadside verge, between road and cyclepath. Narrow strip of vegetation with low bund adjacent to cyclepath Dominated by Sea couch, False oat-grass, with abundant Fennel, Oxeye daisy, frequent Alexanders, and occasional Hogweed, Common mallow, Greater knapweed *Centaurea scabiosa, Perennial wall-rocket* and common mugwort. Stable vegetation growing on verge next to road, consistent with MG1a *Arrhenatherum elatius* grassland with some coastal influences.
Quadrat 1.5	2019: OV23 23.71 *Lolium perenne - Dactylis glomerata* Open Habitat 2020: Grassland and tall herb community close to a footpath. Dominated by common couch, and red fescue, but with a sparser sward reflecting a higher degree of disturbance. The sward included numerous herbaceous species indicative of disturbance including oxeye daisy *Leucanthemum vulgare*, ribbed melilot *Melilotus officinalis*, Alexanders, and a relatively high cover of bare ground. 2021: No material change – grassland sward dominated by sea couch with abundant fennel, Alexanders, Betony, sea beet and ribbed melilot	No material change in vegetation Dense, unmanaged grassland vegetation adjacent to footpath. Dominated by Sea couch, Fennel and Alexanders, with occasional bramble, False oat-grass, Oxeye daisy, Sea beet and Betony *Stachys officinalis*. Grass spp. now dominant with negligible bare ground – established transitional grassland with affinities of both MG1 *Arrhenatherum elatius* and SM24 *Elytrigia atherica* communities.

Zone 2

Zone 2 - 2018 Summary

6.14 The vegetation of Zone 2 around the Lagoon was associated with the saltpan / saline lagoon fringe and attributed to the SM6 *Spartina anglica* community interspersed by patches of SM14 *Atriplex portulacoides* saltmarsh. In 2011, Quadrat 2.1 was still located at the edge of the saline lagoon whilst quadrats 2.2 to 2.5 were within a flooded part of the saline lagoon. The only vegetation associated with the lagoon apart from algae was beaked tasselweed (*Ruppia maritima*).

6.15 In 2011, the vegetation of Zone 2 (in the vicinity of quadrats 2.6 to 2.9) was associated with a minor salt pan and attributed to the SM6 *Spartina anglica* community interspersed by patches of SM14 *Atriplex portulacoides* saltmarsh.

6.16 In 2018 the quadrats were associated with the construction corridor or edge of it. Quadrat 2.6 is in the early stages of colonisation and appears closest to SM8 Annual *Salicornia* saltmarsh but statistically fits the transitional low-marsh community SM10 *Puccinellia* maritima, *Salicornia* spp. *Suaeda maritima*. This anomaly was probably the result of the mechanical disturbance during construction (creating minor topographical differences and seed bank mixing ultimately boosting the number of species present). The community was located in proximity to established saltmarsh best described as SM14c *Atriplex portulacoides* saltmarsh (*Puccinellia maritima* sub-community).

Zone 2 - 2019 Summary

6.17 The 2019 quadrats associated with the lagoon were consistent with those surveyed in 2018. However, no beaked tasselweed was recorded and it is possible that the lagoon had not been inundated sufficiently in 2019 for this species to become re-established.

6.18 It was noted that scattered *Spartina* seedlings were surviving around the lagoon and it is possible that the species was showing minor levels of recovery from the die-back evident in 2018.

6.19 The quadrats associated with the construction corridor (2.6 to 2.9) supported vegetation that was indicative of colonisation by pioneer saltmarsh species with a general increase in vegetation cover compared to 2018. The vegetation was characteristic of pioneer marsh and indicative of colonisation by annual *Salicornia*. It was noted that *Spartina anglica* increased in cover and was greater than in 2018, suggesting that further consolidation of this zone of the construction corridor could be facilitated by this species.

Zone 2 - 2020 Summary

6.20 The lagoon was fully inundated at the time of both 2020 surveys, thereby rendering the central lagoon quadrats inaccessible. There was limited *Spartina* around the shore of the lagoon and little evidence of shoreline growth, indicating that the lagoon had been inundated on a regular basis.

6.21 The quadrats associated with the construction corridor were broadly consistent with those surveyed in 2019 and the general pattern of vegetation was consistent with that found in 2019, the vegetation being characteristic of the SM8 and SM10 low marsh salt marsh communities. The increased cover of *Spartina* suggested that the species is assisting with the consolidation of the marsh.

Zone 2 - 2021 Summary

6.22 The lagoon quadrats were again inaccessible at the time of both 2021 surveys. It was noted from the shore that there were some clumps of beaked tasselweed present within the lagoon, perhaps reflecting the fact that the lagoon had not fully dried out in 2021 and that the summer had been less hot and dry than in previous years.

6.23 The quadrats within the cable route corridor showed a notable increase in cover of *Spartina anglica* and *Aster tripolium* and a general decrease in cover of *Atriplex portulacoides*, perhaps indicating a shift from a SM14 to a SM12 salt marsh community.

Zone 2 – 2022 Summary

6.24 No survey data was able to be collected from the quadrats located within the lagoon during both the June and October 2022 surveys; the water levels in the lagoon were high in both surveys with small clumps of beaked tasselweed visible in June. However, the majority of the lagoon appeared unvegetated. The shoreline quadrat (Q2.1) appeared to be similar in composition to that present in 2021, representing a fringe of saltmarsh vegetation across a transition from the lagoon itself, through low marsh annuals, mid-marsh perennial to a high marsh SM24 type community with *Elytrigia atherica* dominant.

6.25 The vegetation data from quadrats located within the construction corridor (Q2.6 – 2.9) are presented in Appendix 2 and show that the two quadrats associated with the central area of the corridor (2.6 and 2.7) were relatively unvegetated and inundated on both surveys. The quadrats had previously been subject to colonisation by *Spartina anglica* and *Puccinellia maritima*, but in 2022, this pattern was not evident, with *Spartina* in particular reducing in cover, perhaps due to stress arising from the hot, dry conditions experienced in the summer of 2022.

Table 14. Analysis of 2022 Zone 2 Quadrat Data

Quadrat	2019 -2021 descriptions	2022 Description
Quadrat 2.1	**2019**: NVC: SM25 34.11 *Suaeda vera* drift-line community **2020**: Pioneer low marsh species present along the shore of the lagoon. The assemblage included *Suaeda maritima*, *Spartina anglica*, *Salicornia* spp., and occasional sea aster *Aster tripolium*, with a thin strip of sea purslane and then a band of *Elytrigia atherica* up to the footpath approx. 4m wide. **2021**: No change in vegetation. Linear strip of salt marsh transition vegetation between lagoon edge and footpath. Transition from pioneer vegetation with Common cord-grass adjacent to lagoon shore, with Sea aster, Sea purslane, and *Suaeda* present and then a wide band of Sea couch dominated grassland.	No significant change in vegetation. Linear fringe of saltmarsh vegetation across shoreline gradient of landward side of lagoon.
Quadrat 2.2	2019: NVC: A13a 0.00 2020: No Analysis possible – bare mud / open water 2021: No Analysis possible – bare mud / open water	No Analysis possible – bare mud / open water
Quadrat 2.3	2019: NVC: A13a 0.00 2020: No Analysis possible – bare mud / open water 2021: No Analysis possible – bare mud / open water	No Analysis possible – bare mud / open water
Quadrat 2.4	2019: NVC: A13a 0.00 2020: No Analysis possible – bare mud / open water 2021: No Analysis possible – bare mud / open water	No Analysis possible – bare mud / open water
Quadrat 2.5	2019: NVC: A13a 0.00 2020: No Analysis possible – bare mud / open water 2021: No Analysis possible – bare mud / open water	No Analysis possible – bare mud / open water
Quadrat 2.6	2019: NVC: SM10 Transitional low-marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda maritima* *2020:* Consistent with the previous survey but with a potential increase in *Puccinellia maritima* and *Spartina anglica* 2021: Inundated with high proportion of open water in both surveys Reduction in *Puccinellia maritima* but consistent cover in *Salicornia* spp. and *Spartina anglica*.	Inundated with relatively high proportion of open water in both surveys, with generally consistent vegetation compared to 2021; no significant increase in perennial species. There was a notable decrease in cover of *Spartina anglica* between June and October with plants appearing stressed, potentially a result of the hot, dry weather experienced in July and August 2022.
Quadrat 2.7	2019: NVC: SM8 Annual *Salicornia* saltmarsh 2020: Consistent with 2019 survey – annual *Salicornia* spp dominant with slight increase in Aster *tripolium* and *Spartina anglica* 2021: Area of bare ground/open water with frequent inundation. Generally consistent but with continued increase of *Spartina anglica* cover indicating continued clonal growth.	Similar pattern of vegetation to Q2.6 with inundation of quadrat present in both surveys and reduced level of vegetation cover, particularly of perennial species, including *Puccinellia maritima* and *Spartina anglica*. Annual *Salicornia* spp remain dominant.

Quadrat	2019 -2021 descriptions	2022 Description
Quadrat 2.8	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: No change from 2019 survey 2021: Increase in cover of *Spartina anglica* to become co-dominant with *P. maritima*. Good cover of Aster in flower indicating a good year for this species.	2022: *Spartina anglica* remains co-dominant with *Puccinellia maritima*, and abundant cover of *Aster tripolium.*
Quadrat 2.9	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: No change from 2019 survey 2021: Increase in cover of *Aster* and *Puccinellia. maritima* and reduction in Sea purslane. Continued increase in *S. anglica*.	2022: *Spartina anglica* co-dominant with abundant *Puccinellia maritima* and frequent *Aster tripolium*, and *Atriplex portulacoides*, consistent with a SM14a community but with affinities with SM6 and SM13 communities.

Zone 3

Zone 3 - 2018 Summary

6.26 In 2011, Zone 3 was described as *Aster tripolium* and *Atriplex portulacoides* dominated vegetation attributable to SM12a *Aster tripolium* saltmarsh merging towards SM14 *Halimione portulacoides* saltmarsh.

6.27 The survey in 2018 found that quadrats 3.1 to 3.5 were located within a zone dominated by *Atriplex portulacoides* (SM14a) with patches of transitional vegetation often supporting *Aster tripolium*. However, although the rayed variety was found to be present, the rayless form of sea aster (*Aster tripolium var discoideus*) was considered to be dominant in 3.5 (SM11).

Zone 3 - 2019 Summary

6.28 The quadrats associated with Zone 3 habitats were consistent with those surveyed in 2018. In these quadrats (3.1 to 3.5) the vegetation was dominated by a zone with characteristics of SM14 *Atriplex portulacoides* dominated marsh and transitional marsh with particularly good cover of annual *Salicornia* and *Suaeda maritima*. The quadrats were inundated on the fringe of the lagoon during the October survey. These NVC communities are characteristic of low-mid marsh communities and representative of the Zone 3 marsh around a regularly inundated tidal lagoon.

6.29 The quadrats within the corresponding zone in the construction corridor (3.6 and 3.7) were generally bare ground with scattered individuals of *Salicornia* and *Spartina* showing initial stages of colonisation. These quadrats were characterised as SM8 Annual *Salicornia* saltmarsh or SM9/SM10 (Quadrat 3.7) and both are typical pioneer saltmarsh communities with the Transitional SM10 community indicative of a more stabilised community, with *Puccinellia* as a main constant species in the assemblage.

Zone 3 - 2020 Summary

6.30 The communities recorded in 2020 were broadly consistent to those identified in 2019 with a dominance of sea purslane the key characteristic. However, in several of the lagoon shore quadrats, notably, Q3.2, Q3.3 and 3.4 there was relatively low cover of annual saltmarsh species. The sediment appeared anoxic in these areas which were inundated at the time of both surveys, suggesting that the inundation may have limited germination.

6.31 The quadrats within the corridor were predominantly bare ground, consistent with the 2019 survey results. The quadrats were located in shallow pans and lacked vegetation regrowth.

Zone 3 - 2021 Summary

6.32 The Zone 3 communities recorded in 2021 included several quadrats with high cover of bare ground indicative of being located at the edge of the lagoon and high levels of inundation. A sea purslane dominated community remained at Q3.2 and 3.4 but in both of these there was an increase in cover of *Spartina anglica*. Annual *Salicornia*, particularly *S. ramosissima*, had become established in Q3.3 and 3.4.

6.33 The two quadrats within the inundated area of the cable corridor (6.6 and 6.7) were located in a shallow area of water in both surveys and this apparent high level of inundation had prevented establishment of any vegetation.

Zone 3 – 2022 Summary

6.34 The Zone 3 quadrats included sparsely vegetated quadrats along the shallow, seaward shore of the lagoon which were consistent with the previous year's survey; these quadrats generally comprised sparse cover of annual species, notably *Salicornia* and S*uaeda* with sea purslane dominant in those quadrats further from the lagoon and thus subject to reduced inundation (Q3.2 and 3.4). Quadrat 3.5, located on the edge of the construction corridor was generally unchanged although as noted elsewhere, the cover of *S. anglica* reduced between June and October, potentially due to stress arising from the high summer temperatures experience in summer 2022. The quadrats within the construction corridor (Q3.6 and 3.7) were again inundated on both survey dates, located within a shallow pan within the corridor.

Table 15. Analysis of 2021 Zone 3 Quadrat Data

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 3.1	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: Inundated with water at edge of lagoon inundation – relatively abundant *Salicornia* and *Suaeda* but sea purslane absent from quadrat 2021: Inundated by high water level of lagoon Very sparse vegetation in October only with few seedlings of *Salicornia* and one *S. anglica* shoot.	Inundated in October only; close to lagoon edge in June. Limited vegetation with *Salicornia ramosissima* present in October only. No evidence of recovery of *Atriplex portulacoides* or *Spartina anglica*.

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 3.2	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: Sea purslane dominant and very little cover of annual species - consistent with SM14a, but suggests inhibition of germination of annual seeds. 2021: No significant change in vegetation with dominant Sea purslane community. Increase in *S. anglica* cover	No significant change in vegetation with dense Sea purslane and no further increase in *S. anglica* cover
Quadrat 3.3	2019: NVC: SM10 Transitional low-marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda* maritima 2020: *Salicornia* and *Suaeda* only plant species present with sea purslane now absent. – high cover of plant debris in June 2020 from dead plant material and lack of germination of seeds in 2020 2021: Annual species only present on edge of lagoon with bare ground present in previously inundated area and annual *Salicornia* dominant along shoreline.	No significant change in vegetation. Sparse cover of annual Salicornia species with scattered *S. anglica* seedlings
Quadrat 3.4	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: Sea purslane dominant and sparse cover of annual species - consistent with SM14a 2021: Sea purslane less dominant than in 2020 with increase in cover of *Salicornia* and *S. anglica*	No significant change in vegetation. Marsh dominated by Sea purslane with abundant annual Salicornia and *Suaeda* maritima. Spartina appeared to decline between June and October, as noted generally in more open areas of construction corridor.
Quadrat 3.5	2019: NVC: SM10 Transitional low-marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda maritima* 2020: On south edge of corridor – on boundary of corridor and transition zone of lagoon shore. Mosaic of *Puccinellia maritima*, *Salicornia*, Sea aster and *Suaeda* consistent with SM10 community 2021: Consistent with SM10 community, but with increase in cover of *Aster* and *Spartina*	No significant change in vegetation, although relatively high proportion of annual *Salicornia* compared to previous year. Still consistent with SM10 community.
Quadrat 3.6	2019: NVC: SM8 23.72 Annual *Salicornia* saltmarsh 2020: No vegetation present – in shallow pan in construction corridor 2021: No vegetation present – inundated in both surveys.	No vegetation present – inundated in both surveys.
Quadrat 3.7	2019 NVC: SM9/SM10 *Suaeda maritima* salt-marsh community / Transitional low-marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda* maritima 2020: Quadrat located in corridor, inundated with shallow water on both surveys. No germination of annual species. Several *Spartina* rootstocks present in adjacent area with no sign of regrowth suggesting die-back of clones or adverse effects of long-term inundation 2021: No vegetation present – inundated in both surveys.	No vegetation present – inundated in both surveys.

Zone 4 - 2018 Summary

6.35 In 2011, Zone 4 was described as a species-poor SM24 *Elytrigia atherica* saltmarsh community (with richer patches of SM26 *Inula crithmoides*). The survey in 2018 found quadrats 4.1 to 4.5 located in species-poor SM24. Quadrat 4.6 was located in the construction corridor and supported vegetation dominated by *Salicornia* species. Quadrat 4.6 appeared to have the closest affinity to SM8 Annual *Salicornia* saltmarsh but statistically (probably due to its origins as a mechanically disturbed marsh) was considered closest to SM11 *Aster tripolium* saltmarsh.

Zone 4 - 2019 Summary

6.36 The quadrats associated with Zone 4 habitats were consistent with those surveyed in 2018. In these quadrats (4.1 to 4.5) the vegetation comprised almost monospecific stands of SM24 *Elytrigia atherica* with occasional patches of *Atriplex portulacoides*; no *Inula crithmoides* was recorded in the quadrats but was noted as a rare species in the general zone. SM24 is a characteristic drift line community and Zone 4 was present along the highest point of a shallow ridge between the bay on its seaward side and the lagoon to landward.

6.37 The Zone 4 quadrats in the construction corridor (4.6 to 4.8) comprised one quadrat surveyed in 2018 which had affinities with SM8 and SM11. In 2019, two additional quadrats were surveyed. In all three quadrats, the vegetation was characterised by annual *Salicornia* species but with the presence (at low cover) of individuals indicative of colonisation by transitional species. As noted in other sections of the construction corridor, *Spartina anglica* was becoming established and showed an increased cover in both Quadrats 4.6 and 4.7 compared to 2018. Quadrat 4.8 was dominated by bare ground and a shallow salt pan that was inundated during the October 2019 survey scattered individuals of *Salicornia* were present.

Zone 4 - 2020 Summary

6.38 The 2020 quadrats associated with Zone 4 habitats were consistent with those surveyed in 2018 and 2019, comprising monospecific stands of *Elytrigia atherica*.

6.39 The corridor quadrats provided evidence of increased cover or perennial species, particularly *Puccinellia maritima* and *Spartina anglica* in Q4.6 and Q4.7. In Q4.8, located within a shallow salt pan, *Salicornia* had not established in 2020, but a few scattered *Spartina* seedlings had persisted.

Zone 4 - 2021 Summary

6.40 The 2021 quadrats associated with Zone 4 habitats were consistent with those surveyed in 2018, 2019 and 2020, comprising monospecific stands of *Elytrigia atherica*.

6.41 The corridor quadrats provided evidence of continued consolidation of perennial species, particularly in Q4.6 and 4,8, where clonal growth of *Spartina* seedlings was evident.

Zone 4 – 2022 Summary

6.42 The Zone 4 quadrats outside the construction corridor (Q4.1-4.5) were consistent with the previous year's survey, comprising SM24 *Elytrigia atherica* saltmarsh located along the raised ridge, with plant debris partially covering the sward.

6.43 Two of the quadrats within the corridor (Q4.6 and 4.7) continued to show consolidation of the marsh cover by perennial species and a reduction in the proportion of bare ground/ open water. Quadrat 4.8, located in the centre of the corridor was inundated on both surveys, which may explain the reduced cover of vegetation present.

Table 16. Analysis of 2021 Zone 4 Quadrat Data

Quadrat	2019 and 2020 descriptions	2021 Description
Quadrat 4.1	2019: NVC: SM24 *Elytrigia atherica* saltmarsh 2020: No change in plant community in 2020 2021: No change – dominated by 100% cover of sea couch	No change – dominated by sea couch with strandline debris partially covering marsh in both surveys
Quadrat 4.2	2019: NVC: SM24 *Elytrigia atherica* saltmarsh 2020: No change in plant community in 2020 2021: No change – dominated by 100% cover of sea couch, with consistent cover of sea purslane	No significant change – sea couch and sea purslane co-dominant, with the latter increasing in cover compared to previous year
Quadrat 4.3	2019: NVC: SM24 *Elytrigia atheric*a saltmarsh 2020: No change in plant community in 2020 2021: No change – dominated by 100% cover of sea couch	No change – dominated by sea couch with strandline debris partially covering marsh in both surveys
Quadrat 4.4	2019: NVC: SM24 *Elytrigia atherica* saltmarsh 2020: No change in plant community in 2020 2021: No change – dominated by 100% cover of sea couch	No change – dominated by sea couch
Quadrat 4.5	2019: NVC: SM24 *Elytrigia atherica* saltmarsh 2020: No change in plant community in 2020 2021: No change – dominated by 100% cover of sea couch	No change – dominated by sea couch
Quadrat 4.6	2019: NVC: SM11 *Aster tripolium* var. *discoideus* salt-marsh community 2020: Quadrat on north side of corridor – recolonising low marsh species	Quadrat partially inundated on both surveys (60% water) with continued increase in *Puccinellia maritima; S. anglica* reduced in cover between June and October

Quadrat	2019 and 2020 descriptions	2021 Description
	Plant community characterised by *Salicornia* but with increasing cover of *Puccinellia maritima* and *Spartina anglica* indicative of consolidation of the marsh sward with an increase in the proportion of perennial species 2021: Continued consolidation with increase in *Puccinellia* and *Spartina* and decrease in cover of *Salicornia* spp.	
Quadrat 4.7	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: Quadrat on south edge of corridor, close to dense *Elytrigia atherica* community. Slight reduction in bare ground and increase in perennial species including seedlings of *Puccinellia maritima* and *Atriplex portulacoides.* 2021: Generally consistent with previous – no significant change in vegetation	Continued consolidation of marsh with reduction in bare ground – marsh dominated by *Atriplex portulacoide* and *Puccinellia maritima*,
Quadrat 4.8	2019: NVC: A13a 0.00 2020: Quadrat in centre of corridor – mostly bare with a few scattered *Spartina anglica* seedlings 2021: Quadrat predominantly bare ground but with increase in cover of S*partina anglica* consistent with clonal growth of seedlings	Quadrat fully inundated in October with only scattered *S. anglica* individual plants present, reducing in cover between June and October.

Zone 5

Zone 5 - 2018 Summary

6.44 In 2011, Zone 5 was described a sea purslane dominated community attributed to SM14a *Atriplex portulacoides* saltmarsh interspersed by patches of SM26b *Inula crithmoides* saltmarsh (*Elytrigia atherica* sub-community). The survey in 2018 found zone 5 to be a mosaic of *Elytrigia atherica* and *Atriplex portulacoides* with occasional *Inula crithmoides*. Quadrats 5.1 and 5.2 were located in relatively species-poor vegetation dominated by *Elytrigia atherica* and *Atriplex portulacoides* most closely resembling SM24. Quadrat 5.3 and 5.5 were located in a SM14a / SM26b mosaic and quadrat 5.4 in a small saltpan visually closest to SM10.

Zone 5 - 2019 Summary

6.45 The quadrats associated with Zone 5 habitats were consistent with those surveyed in 2018. All of these quadrats were located away from the construction corridor and comprised a species-poor sward dominated by *Elytrigia atherica* and *Atriplex portulacoides* with occasional *Inula crithmoides* present in the surrounding habitat. Four of the quadrats well almost identical, only Quadrat 5.4 exhibiting vegetation differences due to it being located within a small pan that supported standing water in October 2019; here the vegetation comprised a mosaic of *Atriplex portulacoides* and *Salicornia* species with a good cover of *Suaeda maritima*. This zone of the saltmarsh is considered to be relatively stable and slightly to landward of the top of the ridge which forms Zone 4.

Zone 5 - 2020 Summary

6.46 The quadrats associated with Zone 5 habitats were consistent with those surveyed in 2018 and 2019 and there was not apparent variation from the 2019 quadrat data.

Zone 5 - 2021 Summary

6.47 The quadrats associated with Zone 5 habitats were consistent with those surveyed in 2019 and 2020 with no material change in the vegetation composition.

Zone 5 – 2022 Summary

6.48 The quadrats associated with Zone 5 habitats were consistent with those surveyed in 2018 - 2021 with no material change in the vegetation composition.

Table 17. Analysis of 2021 Zone 5 Quadrat Data

Quadrat	**2019 and 2020 descriptions**	**2022 Description**
Quadrat 5.1	2019: NVC: SM26b *Inula crithmoides* salt marsh with *Elytrigia atherica* *2020:* No change - mosaic of sea purslane and sea couch with greatest affinity with SM24 community 2021: No change - mosaic of Sea purslane and sea couch	No change - mosaic of sea purslane and sea couch - greatest affinity with SM24 community
Quadrat 5.2	2019: NVC: SM24 *Elytrigia atherica* saltmarsh *2020:* No change - mosaic of Sea purslane and Sea couch with greatest affinity with SM24 community 2021: No change - mosaic of Sea purslane and Sea couch	No change - mosaic of sea purslane and sea couch - greatest affinity with SM24 community
Quadrat 5.3	2019: NVC: SM24 *Elytrigia atherica* saltmarsh *2020:* No change - mosaic of Sea purslane and Sea couch with greatest affinity with SM24 community 2021: No change - mosaic of Sea purslane and Sea couch	No change - mosaic of sea purslane and sea couch - greatest affinity with SM24 community
Quadrat 5.4	2019: NVC: SM14a 52.63 *Atriplex portulacoides* dominated saltmarsh 2020: No change – mosaic of Sea purslane with *Salicornia* and *Suaeda* in location of a small pan which was partly inundated in October 2020 2021: No change - mosaic of Sea purslane with *Salicornia* and *Suaeda* – inundated in June 2021 survey	No change - mosaic of sea purslane and sea couch - greatest affinity with SM14 community
Quadrat 5.5	2019: NVC: SM24 *Elytrigia atherica* saltmarsh *2020:* No change - mosaic of Sea purslane and Sea couch with greatest affinity with SM24 community 2021: No change - mosaic of Sea purslane and sea couch	No change - mosaic of sea purslane and sea couch - greatest affinity with SM24 community

Zone 6

Zone 6 - 2018 Summary

6.49 In 2011, Zone 6 was described as SM13a *Puccinellia maritima* saltmarsh with patches of SM14c *Atriplex portulacoides* (*Puccinellia maritima* sub-community).

6.50 Survey in 2018 found that quadrats 6.1, 6.3, 6.4 and 6.5 were located within an *Atriplex portulacoides* zone probably best described as SM14c although statistically they appear closer to SM14a. Quadrats 6.2, 6.6 and 6.7 fall within the construction corridor and are probably best assigned to SM8 (in transition to SM10 / SM11).

Zone 6 - 2019 Summary

6.51 The quadrats associated within the non-construction corridor Zone 6 habitats (6.1, 6.3, 6.4 and 6.5) were consistent with those surveyed in 2018. These quadrats were typical of an SM14 *Atriplex portulacoides* saltmarsh habitat with *Puccinellia maritima* also present as a constant species. SM14 is a low-mid marsh community and this zone formed a relatively wide zone on either side of the construction corridor between the pioneer zone and the low ridge supporting SM24 *Elytrigia atherica* marsh.

6.52 Within the construction corridor the vegetation comprised SM10 transition marsh, which is characterised by the presence of annual pioneer *Salicornia* and *Suaeda maritima* as well the perennial species, *Puccinellia maritima*. Quadrat 6.8, which was added in 2019, supported SM8 annual *Salicornia*. All corridor quadrats were considered to represent a transition between pioneer marsh (SM8) and low-mid marsh (SM10) and are likely to develop towards the more established SM14 community as the soil substrate becomes more stabilised.

Zone 6 - 2020 Summary

6.53 The quadrats associated within Zone 6 habitats outside the construction corridor (6.1, 6.3, 6.4 and 6.5) were consistent with those surveyed in 2018 and 2019 representing a SM14 *Atriplex portulacoides* saltmarsh habitat with *Puccinellia maritima* constant.

6.54 The construction zone quadrats were again typical of SM8 or SM10 low marsh communities but with an increasing cover of *Spartina* across all quadrats. This is indicative of an apparent increase in *Spartina anglica* cover at lower marsh levels in association with the construction corridor and suggests that *Spartina* is able to spread clonally within an area of relatively consolidated mud.

Zone 6 - 2021 Summary

6.55 The quadrats associated within Zone 6 habitats outside the construction corridor (6.1, 6.3, 6.4 and 6.5) were consistent with those surveyed in previous years showing an affinity for a SM14 *Atriplex portulacoides* saltmarsh habitat with *Puccinellia maritima* constant. It was noted that this zone, in common with other areas, showed a particularly good cover of *Aster tripolium*, which in the October survey was present in seed and appeared to have had a good growth year.

6.56 The construction zone quadrats were again typical of SM8 or SM10 low marsh communities but with further consolidation by *Spartina*. This was evident visually where the clonal growth of *Spartina* appeared to form a more or less continuous sward of vegetation across the cable route corridor. This consolidation was more apparent in this zone than the area to shoreward, potentially due to the increased deposition of tidally derived silt in Zone 6 and/or the relative difficulty of establishment of root fragments and the clonal spread of *Spartina* rhizomes in the compacted corridor sediment in Zones 3, 4 and 5.

Zone 6 – 2022 Summary

6.57 The quadrats outside the construction corridor (6.1, 6.3, 6.4 and 6.5) were generally consistent with those surveyed in previous years, showing an affinity for a SM14 *Atriplex portulacoides* marsh. *Aster tripolium* was abundant suggesting a tendency towards SM11/SM12 *Aster tripolium*, but with *Atriplex* still the dominant species. Both *Puccinellia* and *Spartina* showed reductions in cover between June and October.

6.58 The quadrats within the construction zone had reduced cover of perennial species between the June and October surveys, and were inundated on both surveys. The reduction in *Spartina* cover was most evident at Q6.6 (60% in June, reduced to 20% in October) and Q6.8 (reduced from 95% to 30%), and it was noted that the individual plants appeared senescent; it was not clear whether this is due to die-back of local populations or due to stress arising from extreme summer temperatures experience in summer 2022.

Table 18. Analysis of 2021 Zone 6 Quadrat Data**)**

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 6.1	2019: NVC: SM14c *Atriplex portulacoides* saltmarsh (*Puccinellia* sub-community) 2020: No change - mosaic of *Atriplex portulacoides* and *Puccinellia maritima* with good proportion of *Suaeda* 2021: No significant change in vegetation. Increase in *Puccinellia* and relatively high cover of *Aster tripolium*	No significant change in vegetation – increase in S. *anglica,* resulting in 35% cover in October survey. Mosaic dominated by sea purslane, Common saltmarsh-grass, and *Spartina*.
Quadrat 6.2	2019: NVC: SM10 Transitional low-marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda maritima* 2020: No major change – quadrat on edge of corridor with mosaic of *Salicornia*, *Puccinellia maritima* and *Spartina anglica*. Slight increase in cover of perennial species suggesting consolidation	Slight reduction in perennial species cover and increase in annual species, perhaps reflecting local erosion patterns and changes in inundation regime. Increase in *Salicornia* and *Suaeda*; reduction in cover of both *Puccinellia* and *Spartina* between June and October 2022.

Quadrat	2019 and 2020 descriptions	2022 Description
	of marsh habitat 2021: Consolidation of marsh with increase in cover of perennial species, *Puccinellia* and *Spartina* and reduction in annual *Salicornia* species.	
Quadrat 6.3	2019: NVC: SM11 *Aster tripolium* saltmarsh 2020: No change - mosaic of *Atriplex portulacoides* and *Puccinellia maritima* with low cover of *Aster tripolium* 2021: No significant change in vegetation, although slight increase in cover of *Puccinellia* and *Spartina*	No change in vegetation – mosaic dominated by *Atriplex portulacoides,* and *Puccinellia maritima.* Consistent with SM11 community.
Quadrat 6.4	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: No change - mosaic of *Atriplex portulacoides* and *Puccinellia maritima* 2021: No change - mosaic of *Atriplex portulacoides* and *Puccinellia maritima*	No change - mosaic of *Atriplex portulacoides* and *Puccinellia maritima*
Quadrat 6.5	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: No change - mosaic of *Atriplex portulacoides* and *Puccinellia maritima* with relatively abundant *Spartina anglica* 2021: No change - mosaic of *Atriplex portulacoides*, *Puccinellia maritima* and *Spartina anglica*	No change - mosaic of *Atriplex portulacoides*, *Puccinellia maritima* and *Spartina anglica*
Quadrat 6.6	2019: NVC: SM10 Transitional low-marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda* maritima 2020: Quadrat on south side of corridor. Increase in cover of *Spartina anglica* (from 20% in 2019 to 35% in 2020) Most of quadrat remains bare substrate. 2021: Consolidation of *Spartina* sward, with increase to 65% cover	Quadrat inundated on both survey dates. Spartina cover reduced between June and October – from 60% to 20%, indicative of reduced growth and/or die-back or erosion in 2020
Quadrat 6.7	2019: NVC: SM10 Transitional low-marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda* maritima 2020: Quadrat in corridor. *Spartina* and bare ground with increase in cover of *Spartina anglica* from 25% in 2019 to 50% in 2020 2021: Consistent vegetation with 25% cover of *Spartina anglica* and remainder as bare ground. Dynamic area of erosion and local changes in cover.	Quadrat inundated on both survey dates. Reduction in cover of Spartina between June and October
Quadrat 6.8	2019: NVC: SM8 Annual *Salicornia* saltmarsh 2020: Quadrat on north edge of corridor – showing good consolidation by *Spartina* with increase in cover from 70% to 90%. Reasonable cover of *Salicorni*a persists which is likely to show greater affinity for SM8 rather than SM6 *Spartina anglica* marsh. 2021: Increased consolidation of Spartina to 95% cover in Oct 21. *Salicornia* cover reduced	Quadrat inundated on both survey dates. Increased cover of Puccinellia and reduction of Spartina from 2021 levels and between June and October 2022.

Zone 7 - 2018 Summary

6.59 In 2011, Zone 7 was described as the seaward edge of the saltmarsh area with a fringe of common cord-grass, glasswort (*Salicornia* spp.) and intertidal mud. The vegetation was attributed to a mosaic of SM6 *Spartina anglica* and SM8 Annual *Salicornia* saltmarsh.

6.60 Survey in 2018 found a zone with ridges largely dominated by perennial glasswort (*Sarcocornia perennis*) and troughs dominated by *Spartina anglica*. This indicates the baseline data was incorrect and the zone should be described as SM7 *Sarcocornia perennis* saltmarsh with SM6 *Spartina anglica* saltmarsh (particularly at the extreme seaward edge).

6.61 Quadrats 7.1 to 7.5 sample the SM7 community whilst quadrats 7.6 to 7.8 fall with the construction corridor. The most seaward quadrat (7.8) comprised bare mud with a few shoots of *Spartina anglica* (SM6),and quadrats 7.6 and 7.7 were dominated by annual *Salicornia* species (SM8 in transition to SM10 / SM11).

Zone 7 - 2019 Summary

6.62 The 2019 quadrat data from Zone 7 corroborate the findings that the pioneer saltmarsh comprises vegetation that has a strong affinity with the SM7 *Sarcocornia perennis* saltmarsh, with localised areas supporting *Spartina anglica* and annual *Salicornia*. It was noted along the whole of the seaward edge that there were lateral erosion runnels which created the ridges and trough noted in 2018. These were characterised by exposed cockle shell deposits which may exacerbate this lateral erosion by abrading the sides of runnels and facilitating erosion. Landward to the pioneer zone, there were several areas of exposed cockle shells at the seaward edge of the ridge, particularly in the section to the southwest of quadrat 7.5.

6.63 Quadrats 7.1 to 7.5, outside the construction corridor, had a strong affinity for the SM7 *Sarcocornia perennis* community with the exception of Quadrat 7.4 which was most similar to the SM14 *Atriplex portulacoides* saltmarsh habitat; this quadrat was slightly landward of the other quadrats and on the edge of the transition to a more low-mid marsh level.

6.64 The quadrats in the construction corridor were generally consistent with the 2018 survey with Quadrats 7.6 to 7.8 showing a progression to landward along the construction corridor with scattered *Spartina* plants in Q7.8, an SM7 annual *Salicornia* community at Q7.6 and a transition to a SM7/SM10 community at Q7.7. To the north of the main construction corridor, it was noted that there was a narrow strip of modified pioneer vegetation, approximately 5m wide, that was similar to the construction corridor. A new quadrat was established here in June (Q7.9) and a further quadrat (Q7.10) was established in the pioneer saltmarsh further to the south within the modified corridor. The cover of *Spartina anglica* within Q7.10 was 90%, indicative of SM6 *Spartina anglica* marsh. Quadrat 7.9 resembled a SM8 annual *Salicornia* community with a high proportion of bare ground present.

Zone 7 - 2020 Summary

6.65 The 2020 survey results were consistent with the 2019 data and confirmed that this is a dynamic marsh area. The non-corridor quadrats at the south end of the marsh appeared to be exposed to lateral erosion as reported in the Year 2 monitoring report. In these areas, the lateral channels were partially filled by cockle shells which also form a low ridge to landward of Zone 7.

6.66 The quadrats within and adjacent to the construction corridor appeared to be more stable and while there were some cockle shells present within the marsh, the channels did not appear to be as dynamic in nature as those further to the south.

Zone 7 - 2021 Summary

6.67 The 2021 survey results were consistent with the quadrat data from the previous years and continued to highlight the dynamic nature of the seaward edge of the salt marsh. The non-corridor quadrats at the south end of the marsh continues to be subject to erosion of the ridge to shoreward with an area of bare mud present between an area with low mud cliffs where active erosion is occurring and a pioneer zone with *Spartina* clumps and ridges supporting *Sarcocornia perennis*.

6.68 The quadrats within and adjacent to the construction corridor appeared to be more stable and indicated that consolidation of the marsh surface was occurring within the corridor itself. The increased cover of *Spartina* in this area suggests a reduced level of erosion compared to the area to the south.

Zone 7 – 2022 Summary

Table 19. Analysis of 2021 Zone 7 Quadrat Data

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 7.1	2019: NVC: SM7 *Sarcocornia perennis* saltmarsh 2020: Quadrat on north side of small channel. No significant change in vegetation. *Spartina anglica* dominant with *Sarcocornia perennis* present 2021: Consolidation of marsh with slight increase in perennial species including *Sarcocornia, Spartina* and *Puccinellia*; vegetation still has affinity with SM7 community.	No significant change in marsh composition, but a reduction in sward height noted. No apparent reduction in cover of Spartina. SM6/SM7
Quadrat 7.2	2019: NVC: SM7 *Sarcocornia perennis* saltmarsh 2020: Quadrat on edge of pioneer low marsh No significant change in vegetation. 2021: No significant change in vegetation. Mosaic of *Spartina* and *Sarcocornia perennis*. Probably has affinity with SM7	No significant change in vegetation on edge of pioneer low marsh with mosaic of *Spartina* and *Sarcocornia perennis.* Cockle shells present on sediment surface beneath sward suggesting dynamic patter of erosion present. SM6/SM7
Quadrat 7.3	2019: NVC: SM7 *Sarcocornia perennis* saltmarsh	No significant change in vegetation – *Spartina* meadow with lower cover of Perennial glasswort . Channels present with cockles shells within, as well as deposited silt suggesting

Quadrat	2019 and 2020 descriptions	2022 Description
	2020: Quadrat in area with active erosion – *Spartina* dominant with exposed cockles present in narrow lateral channels 2021: No significant change in vegetation – less cockles evident that in 2020	dynamic area of deposition and erosion.
Quadrat 7.4	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: Very active area of erosion. Some *Atriplex portulacoides* still present – extensive cockle bed present on low marsh cliff approx. 5m to landward of quadrat 2021: Cane lost between June and October survey – active area of erosion. Area of quadrat almost devoid of vegetation in October 2021	Active area of erosion below low level cliff in saltmarsh with SM6 Spartina anglica meadow to seaward. No vegetation recorded with scattered fragments of SM14 (present in 2018-19) visible to left and right of quadrat
Quadrat 7.5	2019: NVC: SM7 *Sarcocornia perennis* saltmarsh 2020: Dynamic area at edge of marsh. Vegetation comprises dumps of *Spartina anglica* with lateral channels where erosion is occurring. Some filamentous algae present and substantial deposits of cockle shells, particularly on the slope demarcating the edge of the *Elymus* saltmarsh to landward Cockles present in June survey but mostly removed by October. Cane lost in October and approx. location of quadrat used to sample vegetation 2021: Cane lost. Area consistent with SM7 – mosaic of *Spartina* and *Sarcocornia*. Active area of erosion with cockle shell deposits in ridge to shoreward being exposed.	No change in vegetation – mosaic of *Spartina* and *Sarcocornia.* Quadrat located in SM6 meadow in pioneer zone. *Spartina* forming coalesced sward and with no apparent signs of die-back
Quadrat 7.6	2019: NVC: SM8 Annual *Salicornia* saltmarsh 2020: Quadrat located in corridor at seaward edge of marsh. Relative significant increase in *Spartina* cover compared to 2019 (from 10% to 60%) 2021: Continued increase in *Spartina* cover (from 60% to 80%) indicative of consolidation of clonal sward across cable route corridor.	No change in vegetation SM6 meadow with dominant Sparting anglica present with erosional channels present. *Spartina* forming coalesced sward and with no apparent signs of die-back
Quadrat 7.7	2019: NVC: SM7 *Sarcocornia perennis* saltmarsh 2020: Quadrat located in corridor to landward of Q7.6 No significant change in vegetation – low marsh with *Salicornia* and *Spartina* 2021: No significant change in vegetation in 2021 survey	No significant change in vegetation. Continued gradual increase in Perennial glasswort and no decrease in cover of Spartina. Mosaic of SM6 and SM7 communities
Quadrat 7.8	2019: NVC: No ID; *Spartina anglica* isolated shoots 2020: Quadrat in corridor at seaward edge of marsh (further than Q7.6) No significant change in vegetation. – scattered clumps of *Spartina anglica*. 2021: Increased cover of *Spartina* present (from 15 to 60%) indicative of consolidation of clonal sward across cable route corridor	Continued increase in Spartina cover, and reduction in bare ground, consistent with consolidation of Spartina sward. No significant change in vegetation
Quadrat 7.9	2019: NVC: SM7 *Sarcocornia perennis* saltmarsh 2020: Quadrat in small channel to north of main corridor, located near seaward edge of marsh. No significant change in vegetation with sparse low marsh species and quadrat mostly bare mud. 2021: No significant change in vegetation although slight increase in *Spartina* cover (to 10%)	No significant change in vegetation – continued increase in Spartina and Sarcocornia
Quadrat 7.10	2019: NVC: SM7 *Sarcocornia perennis* saltmarsh 2020: Quadrat on north edge of main corridor. No significant change in vegetation with *Spartina* clumps dominant with	No significant change in vegetation – slight decrease in Spartina cover, likely due to dynamic patterns of erosion within quadrat. Consistent with SM7 community

Quadrat	2019 and 2020 descriptions	2022 Description
	scattered *Salicornia* and *Sarcocornia perennis*. 2021: Increase in *Puccinellia* and *Sarcocornia* – consistent with SM7 community.	

Zone 8 - 2018 Summary

6.69 In 2011, Zone 8 was described as a narrow strip of vegetation bordering the north-western fringe of the saltpan. The quadrats sampled included S21 *Bolboschoenus maritimus* swamp (8.1 & 8.2), a patch of SM16b F*estuca rubra-Juncus gerardii* saltmarsh (*Juncus gerardii* sub-community) (8.3) as well as SM24 *Elymus pycnanthus* saltmarsh (8.4 & 8.5).

6.70 Survey in 2018 found quadrat 8.1 in a band of *Bolboschoenus maritimus* (S21). Quadrat 8.2 was located on a bank reinforced with concrete and did not easily fit into an NVC community. Given that this quadrat was previously described as S21 an additional quadrat was taken at the base of the slope bordering the saline lagoon. The quadrat was found to be split between a band of SM24 *Elytrigia atherica* and S21 *Bolboschoenus maritimus*. Plants of *Spartina anglica*, *Atriplex portulacoides* and *Puccinellia maritima* at the edge of the lagoon further confused statistical analysis of the quadrat.

6.71 Quadrat 8.3 encompassed a band of S21, then *Juncus gerardii* dominated vegetation before bare ground associated with the construction corridor (probably best described by S21 then SM16b before an area of disturbed ground).

6.72 Quadrats 8.4 and 8.5 currently support a transitional habitat associated with bare ground.

Zone 8 - 2019 Summary

6.73 The 2019 quadrats were analysed and found to support vegetation that did not have clear affinities with many of the NVC communities. This analytical confusion arises from two causes. Firstly, the vegetation around the lagoon edges comprised linear strips of vegetation that exhibit narrow zonation patterns with each zone being less than or equal to the spatial scale of the quadrat size; for linear vegetation it is preferable to evaluate each strip using linear quadrats that represent an equivalent area. Thus, at Q8.1 for example, the linear strips of *Bolboschoenus maritimus* and *Elytrigia atherica* are approximately 1m wide and extend along the lagoon shore; this results in a quadrat with affinities of both SM24 and S21 NVC communities. Secondly, analytical confusion arises from attempting to conclude community structure from a single quadrat (or linear quadrat). The NVC survey methodology recommends multiple quadrats from areas of contiguous vegetation to be used to provide analytical integrity.

6.74 Despite the analytical confusion inherent in the Zone 8 quadrats, the species assemblage in each quadrat is broadly consistent with the 2018 survey. The quadrats around the lagoon shoreline (Q8.1, 8.6 and 8.5) are broadly similar to those surveyed previously and suggest a stable lagoon edge habitat. The quadrats form the disturbed corridor (Q8.4 and 8.4) did not have clear affinities with any particular NVC community but were consistent with a transitional habitat colonising previously disturbed bare ground.

Zone 8 - 2020 Summary

6.75 The quadrats along the lagoon were considered to be consistent with the previous surveys undertaken in 2018 and 2019, with linear saltmarsh communities along the shoreline. The quadrats located adjacent to the footpath were subject to frequent disturbance from pedestrians and cyclists and displayed characteristics of established grassland with a dominance of grass species and a reduction in the presence of ruderal species.

Zone 8 - 2021 Summary

6.76 The quadrats along the north and west shore of the lagoon were considered to be consistent with the surveys undertaken in the previous years, with a linear strip of vegetation present along the shoreline of the lagoon. The quadrats located adjacent to the footpath were subject to frequent disturbance from pedestrians and cyclists and displayed characteristics of established grassland with a dominance of grass species and a reduction in the presence of ruderal species.

Zone 8 – 2022 Summary

Table 20. Descriptions of 2022 Zone 8 Quadrats

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 8.1	2019: NVC: SM24 *Elytrigia atherica* saltmarsh 2020: Quadrat at edge of lagoon at south end of short, adjacent to concrete bank Lagoon edge comprises an 8m wide strip of salt marsh from toe of sea wall to the water's edge. The lagoon was full on both surveys The quadrat comprised a mosaic of *Elytrigia atherica* and *Bolboschoenus maritimus* with a strip of low marsh species along the fringe of the lagoon including *Salicornia*, *Atriplex portulacoides* and *Spartina anglica* *2021:* No change in vegetation of quadrat, dominated by Sea couch and Club rush with a salt marsh fringes along the edge of the lagoon. The lagoon was full in the June survey, but had significantly reduced water levels in October.	No change in vegetation. Fringe of linear marsh vegetation dominated by sea clubrush *Bolboschoenus maritimus* and sea couch. narrow fringe of low marsh vegetation with *Spartina anglica* in good condition and abundant *Salicornia ramosissima* and Spear-leaved orache *Atriplex prostrata*.
Quadrat 8.2	2019: NVC: MG9b *Holcus lanatus-Deschampsia flexuosa* grassland **2020:** Grassland and tall herb species on sea wall with consolidated rock ad cement. Grass dominated assemblage with red fescue and common couch with occasional fennel, cock's-foot and occasional barren brome *Anisantha sterilis*. Herbaceous species were abundant with Dandelion, Prickly sow-thistle, Ribwort plantain growing between the rocks on the sea wall. **2021:** No change in vegetation. June survey undertaken after cooler, wetter spring than in previous years and thus vegetation had not died back – grass species included a diverse range of species including *Catapodium rigidum, Vulpia bromioides, Festuca rubra, Anisantha sterilis,* and *Anisantha madritensis*.	No change in vegetation. Grassland with perennial and annual vegetation, generally consistent with previous surveys

Quadrat	2019 and 2020 descriptions	2022 Description
Quadrat 8.3	2019: NVC: SM10 Transitional low-marsh vegetation with *Puccinellia*, *Salicornia* and *Suaeda* 2020: Quadrat on corner of lagoon, close to public footpath. Location was relocated in June but cane lost in October and position of quadrat estimated. Dense *Elytrigia atherica* growing on edge of lagoon with *Spartina anglica* on shoreline. Occasional *Bolboschoenus maritimus* was present among the Sea Couch. The transitional zone along the lagoon edge included occasional *Suaeda, Aster tripolium* **2021:** No change comprising transitional salt marsh along the lagoon edge dominated by *Elytrigia atherica*, with abundant *Juncus gerardii*, *Bolboschoenus maritimus* and occasional *Aster tripolium*. A fringe of low marsh species was adjacent to the lagoon with *Atriplex portulacoides*, *Spartina anglica*, *Salicornia ramosissima* and *Suaeda maritima*	No change with transitional salt marsh, in corner of lagoon adjacent to footpath. marsh dominated by Sea couch, with occasional Sea purslane, Sea aster, and *Suaeda maritima* along the waters edge. Vegetation appeared to have been eroded by high water levels with a reduced level of Common cord-grass present and a very slight erosional mud cliff of 2-3cm
Quadrat 8.4	2019: NVC: OV23 *Lolium perenne-Dactylis glomerata* community 2020: Worn grassland to west of footpath subject to regular disturbance. Grass species present included perennial rye-grass, red fescue and Common couch with locally abundant Stag's-horn plantain. Occasional perennial species present included Fennel and White clover. **2021:** Disturbed area of grassland adjacent to footpath. Cane lost, and quadrat location estimated. Sward with Common couch, Cock's-foot, Perennial rye-grass, Red fescue and Sea couch with abundant Stag's-horn plantain, White clover, and occasional Fennel and Oxeye daisy.	No change - Quadrat located in frequently disturbed area of grassland adjacent to heavily used footpath. sward dominated by red fescue and Sea couch with occasional Ribbed melilot *Melilotus officinalis*, Stag's-horn plantain *Plantago coronopus*, Sea fern-grass *Catapodium marinum*, Fern-grass, *Catapodium rigidum*, and rare oxeye daisy and Fennel. The sward was more or less closed..
Quadrat 8.5	2019: NVC: OV25b *Urtica dioica–Cirsium arvense* community 2020: Quadrat located to west of path. Dominated by Common couch, Red fescue with abundant Sea beet. Generally, species-poor and reflecting the dominance of grass species following colonisation of previously disturbed ground in 2018 and 2019. **2021:** No change in vegetation comprising coastal grassland dominated by Sea couch, Common couch, Cock's-foot, and occasional *Festuca rubra* with abundant herbaceous species including Fennel, Lucerne, hedge mustard Hop trefoil, *Lepidium latifolium*, and *Leucanthemum vulgare*	Quadrat located within grass-dominated verge adjacent to foot path and to landward side of path. Dominated by Sea couch, Cock's-foot, red fescue, and Common couch, with occasional Sea beet, Common bird's-foot-trefoil *Lotus corniculatus*, Stag's-horn plantain, and Salsify
Quadrat 8.6	2019: NVC: SM14a *Atriplex portulacoides* dominated saltmarsh 2020: Quadrat on lagoon shore adjacent to Q8.2 Shore vegetation forming 4-5m wide strip between toe of sea wall and lagoon edge. Dominated by *Elytrigia atherica* with occasional *Bolboschoenus maritimus* with the shoreline fringe featuring abundant *Atriplex portulacoides*, and *Spartina anglica*, *Suaeda* and *Salicornia* along the shore. **2021:** Quadrat on shore of lagoon, adjacent to Q8.2. Fringe of 4-5m wide vegetation with dense *Elytrigia atherica* and occasional *Bolboschoenus maritimus*, with a narrow fringe of low-mid saltmarsh species including *Suaeda maritima, Puccinellia maritima, Atriplex portulacoides*, and several flowering *Limonium vulgare* (in June). Some localised clumps of *Ruppia* present within the lagoon close to the shore.	No change in vegetation. Dominated by Sea purslane *Atriplex portulacoides* and Sea couch with abundant Sea clubrush, *Spartina anglica*, Sea aster and annual species including *Salicornia ramosissima*, *Saliconia europaea* and *Suaeda maritima*

7.0 Comparison of quadrats within the construction corridor with adjacent marsh areas

7.1 To provide a comparison of quadrats within the corridor with marsh habitats in adjacent areas, the habitat characteristics of quadrats are provided in the sections below. The quadrats are grouped according to their position on the marsh prior to the construction works, and with reference to the marsh zonation gradient described in the pre-construction and post-construction habitat surveys. Thus in Zone 3, for example, Quadrats 3.5, 3.6 and 3.7 (within or on the edge of the construction corridor) are compared to Quadrats 3.2, 3.3 and 3,4 (outside construction corridor) In this way, analysis of the saltmarsh assemblage within the quadrats has enabled a comparison to be made with the marsh communities located in the comparable marsh zone prior to the installation of the cable.

7.2 Due to the small number of quadrats in each zone available for comparison, and the high degree of spatial variation in marsh assemblages, a qualitative comparison of the salt marsh communities is provided on a quadrat by quadrat basis, rather than attempting to providing a quantitative assessment of mean or median values of vegetation characteristics. Comparison is made of the 2021 data with the values for the 2018-2020 surveys; a more detailed analysis of the data will be included in the Year 5 report to include comparison of vegetation characteristics within each specific quadrat and comparative analysis of the marsh development within and outside the construction corridor since cable installation.

Zones 1 and 8

7.3 The vegetation in Zones 1 and 8 have not been included within the comparison of the works corridor presented below. These Zones include quadrats distributed along the shoreward boundary of the marsh or located within the terrestrial area of the construction corridor and do not typically support saltmarsh communities. The Zone 1 quadrat data demonstrate that during the monitoring period, the vegetation has recovered from the disturbance experienced during the construction works. The relatively open grassland, characterised by annual ruderal species, that was present in 2018 and 2019 has gradually been colonised by perennial grass species (including Sea couch, Common couch, Red fescue and False oat-grass) and herbaceous species (e.g. Fennel, Alexanders, hogweed, oxeye daisy, and Perennial wall-rocket. These communities are relatively stable in composition although may be subject to intermittent disturbance from public recreational activities, or as in the case of Q1.2 in 2020, from disturbance arising from local construction activities.

7.4 The Zone 8 quadrats included several quadrats (Q8.1, 8.2, 8.3 and 8.6) located around the shore of the lagoon and demonstrate a relatively stable linear fringe of saltmarsh vegetation, that may vary slightly due to fluctuations in water level within the lagoon, but which has remained constant throughout the monitoring period. The remaining quadrats (8.4 and 8.5) were located in an area of the disturbed corridor adjacent to public footpaths and are broadly consistent with the Zone 1 quadrats discussed above.

Zone 2

7.5 The Zone 2 quadrats include four quadrats that were originally established within the lagoon and which have not been surveyed in subsequent site visits. On each visit these quadrats have either been fully inundated with relatively deep water, or have comprised unstable and unvegetated bare mud, and have been considered inaccessible without specialist equipment. A fifth quadrat, Quadrat 2.1, was located on the landward shore of the lagoon in a similar location Zone 1 and 8 quadrats, and has not been included in this comparative assessment for the reasons stated above.

Comparison of Zone 3 Quadrats

7.6 The comparison of Zone 3 quadrats presented in Table 21 below highlights the spatial variability in the saltmarsh assemblage present in the quadrats within this zone as well as the difference between the area within the construction corridor compared to the adjacent marsh. The two quadrats within the corridor (3.6 and 3.7) remain unvegetated and comprising open water or bare ground. The lack of vegetation establishment is evident with both quadrats associated with an inundated areas of mud within the construction corridor. Quadrat 3.5 on the edge of the construction corridor has shown a gradual decrease in the reduction of bare ground and an increase in the cover of perennial saltmarsh species, notably *Puccinellia maritima* and *Spartina anglica*, with *Atriplex portulacoides* becoming established in 2020 and 2021. The quadrats outside the construction corridor (illustrated by Q3.3 and 3.4) show variation in the level of inundation reflecting local differences arising from changes in the water level in the lagoon.

7.7 Table 22 below presents a summary of the temporal changes in vegetation exhibited within Zone 3 comparing the descriptions of the saltmarsh communities present in the pre-construction phase (2011 habitat descriptions reproduced in the 2018 Year 1 report) with the data from the survey undertaken soonest after construction was completed (Year 1 - 2018) and the most recent data (Year 5 - 2022).

Table 21. Comparison of Zone 3 Quadrats in Construction Corridor (grey Shading) with comparable quadrats in adjacent marsh area (SM14 and SM10 marsh communities). For each quadrat, the table presents the key vegetation characteristics and species cover of dominant species present in each zone in October only

Vegetation attributes	Oct-18					Oct-19					Oct-20					Oct-21					Oct-22				
Quadrats	3.3	3.4	3.5	3.6	3.7	3.3	3.4	3.5	3.6	3.7	3.3	3.4	3.5	3.6	3.7	3.3	3.4	3.5	3.6	3.7	3.3	3.4	3.5	3.6	3.7
Saltmarsh NVC community	SM14	SM10	SM10	-	-	SM14	SM10	SM10	-	-	SM14	SM10	SM10	-	-	SM14	SM10	SM10	-	-	SM14	SM10	SM10	-	-
Vegetation height (cm)	15	15	30	ns	ns	25	40	20	0	20	20	20	20	0	0	20	20	50	0	0	25	25	30	0	0
open water/bare ground	50	2	40	ns	ns	30	5	40	100	100	95	5	10	100	100	75	10	5	100	100	100	2	0	100	100
Atriplex portulacoides	20x	75	0	ns	ns	x	50	0	0	0	0	95	2	0	0	A	60	5	0	0	8	0	0	10	8
Puccinellia maritima	1	1	0	ns	ns	0	0	15	0	0	0	1	30	0	0	0	2	30	0	0	0	3	5	0	0
Salicornia sp	0	1	56	ns	ns	80	20	27	0	4	30	7	42	0	0	29	21	18	0	0	22	42	65	0	0
Spartina anglica	30x	2	1	ns	ns	2	3	5	0	A	0	10	2	0	0	A	20	50	0	0	1	0	2	0	0
Suaeda maritima	0	2	0	ns	ns	35	10	10	0	1	10	10	5	0	0	3	15	5	0	0	0	1	15	0	0

Summary of Changes in Zone 3 Vegetation

Table 22. Comparison of Zone 3 Vegetation descriptions from pre-construction surveys in 2011 and Year1 and Year5 surveys

Marsh Zone	Year		
Zone 3	**2011**	"Sea aster (*Aster tripolium*) and sea purslane dominated fringe at the seaward edge of Zone 2. The vegetation was attributed to the SM12a *Aster tripolium* saltmarsh merging towards SM14 *Halimione portulacoides* saltmarsh."	
	Year1 - 2018	"Quadrats 3.1 to 3.5 were located within a zone dominated by *Atriplex portulacoides* (SM14a) with patches of transitional vegetation often supporting *Aster tripolium*. However, although the rayed variety was found to be present, the rayless form of sea aster (*Aster tripolium var discoideus*) was considered to be dominant in 3.5 (SM11)." "The edge of the lagoon appears to have expanded and quadrats 3.1 to 3.5 now form its fringes" "The vegetation associated with quadrats 3.1 to 3.5 also appeared to be suffering from inundation with plants of *Spartina anglica* and *Atriplex portulacoides* visibly stressed and dying"	
		Unaffected Marsh: Q3.1 – 3.4 SM14 *Atriplex portulacoides* dominated saltmarsh	**Construction Zone:** Q3.5 SM11 *Aster tripolium* saltmarsh
	Year 5 - 2022	Q3.1 and 3.3 were on the edge of the lagoon and inundated or comprised bare mud. No recover from dieback of *Spartina anglica* and *Atriplex portulacoides,* noted in 2018 with variable over of annual *Salicornia* and *Suaeda* dependent on inundation levels. Q3.2 and 3.4 were further away from the lagoon and supported SM14 *Atriplex portulacoides* marsh, with variable levels of annual species.	Q3.5 Consolidation of marsh with increase in cover of annual species and mid marsh perennial species including *Aster tripolium*, *Puccinellia maritima*, and Spartina anglica. Vegetation has shown greatest affinity with SM10 Transitional marsh in all years of survey. Q3.6 and 3.7 both located in centre of construction corridor in shallow pan, which was inundated on most surveys. No vegetation present. Recovery of vegetation ongoing at Q3.5, however, Q3.6 and 3.7 remain unvegetated following the construction works.

Comparison of Zone 4 Quadrats

7.8 The Zone 4 identified in the pre-construction surveys comprised the high marsh ridge dominated by the SM24 *Elytrigia atherica* sea couch community, which formed a more or less monospecific community along the highest point of the salt marsh between the zonation to seaward and the saltmarsh communities to the north between the ridge and the lagoon. To provide a comparison of the Zone 4 quadrats, the data from 2 quadrats on either side of the corridor (Q4.4 and Q4.5) are presented with two quadrats from within the construction corridor (Q4.7 and 4.8). Quadrat 4.6 is not included here as it is located approx. 20m to seaward along the corridor; it is not clear why this quadrat was labelled as occurring within Zone 4 in the 2018 Biocensus report.

7.9 The quadrat data in Table 23 below demonstrate that the ridge has continued to be dominated by *Elytrigia atherica* throughout the four-year period. The quadrats within the construction corridor were added in 2019 to provide a direct comparison with the adjacent ridge, and the data for these quadrats indicate a clear difference between the quadrat on the edge of the corridor (Q4.7) and that in the centre (Q4.8). The former shows that the vegetation is becoming colonised by salt marsh, with a gradual increase in perennial species including *Atriplex portulacoides*, *Puccinellia maritima* and to a lesser extent *Spartina anglica*, forming a community with a greatest affinity for the SM10 or SM14a NVC community. The quadrat in the centre of the construction corridor (Q4.8) was still predominantly bare ground/open water but with a gradual increase in the cover of saltmarsh species, notable *Spartina anglica*.

Table 23. Comparison of Zone 4 Quadrats in Construction Corridor (Q4.7 and Q4.8 - grey Shading) with comparable quadrats in adjacent marsh area (Q4.4 and 4.5 – SM24 marsh communities). For each quadrat, the table presents the key vegetation characteristics and species cover of dominant species present in each zone in October only.
N.B. Although proximal to each other Q4.7 and Q4.8 show clear difference in vegetation due to their position on the south edge and centre of the construction corridor respectively

Vegetation attributes	**Oct-18**				**Oct-19**				**Oct-20**				**Oct-21**				**Oct-22**			
Quadrats	4.4	4.5	4.7	4.8	4.4	4.5	4.7	4.8	4.4	4.5	4.7	4.8	4.4	4.5	4.7	4.8	4.4	4.5	4.7	4.8
Saltmarsh NVC community	SM24	SM24			SM24	SM24			SM24	SM24			SM24	SM24			SM24	SM24		
Vegetation height (cm)	60	20	ns	ns	30	30	10	10	70	40	10	10	30	30	15	50	40	30	15	10
open water/bare ground (%)	0	0	ns	ns	0	0	75	100	0	0	50	100	0	0	25	100	0	0	10	100
Atriplex portulacoides	0	0	ns	ns	0	0	2	0	0	0	5	0	0	0	10	A	2	a	40	0
Elytrigia atherica	100	100	ns	ns	100	100	1	0	100	100	5	0	100	100	0	0	95	100	1	0
Puccinellia maritima	0	0	ns	ns	0	0	5	0	0	0	15	0	0	0	25	0	0	0	20	0
Salicornia sp	0	0	ns	ns	0	0	25	3	0	0	5	0	0	0	8	5	0	0	5	0
Spartina anglica	0	0	ns	ns	0	0	1	5	0	0	0	3	0	0	5	10	0	0	2	2
Suaeda maritima	0	0	ns	ns	0	0	5	0	0	0	3	0	0	0	3	A	0	0	2	0

Summary of Changes in Zone 4 Vegetation

A summary of changes in the Zone 4 quadrats is provided in Table 24 below:

Table 24. Comparison of Zone 4 Vegetation descriptions from pre-construction surveys in 2011 and Year 1 and Year 5 surveys

Marsh Zone	Year		
Zone 4	**2011**	"A species-poor SM24 *Elymus pycnanthus* saltmarsh community (with a richer patch of SM26a *Inula crithmoides* (with *Puccinellia maritima, Salicornia* agg. and *Limonium vulgare* at 4.1)."	
	Year1 - 2018	"Survey in 2018 found quadrats 4.1 to 4.5 located in species-poor SM24. Quadrat 4.6 was located in the construction corridor and supported vegetation dominated by *Salicornia* species. Quadrat 4.6 appeared to have the closest affinity to SM8 Annual *Salicornia* saltmarsh but statistically (probably due to its origins as a mechanically disturbed marsh) was considered closest to SM11 *Aster tripolium* saltmarsh."	
		Unaffected Marsh: Q4.1 – 4.5 SM24 *Elytrigia atherica* saltmarsh	**Construction Corridor:** Q4.6 SM11 *Aster tripolium* saltmarsh Q4.7-4.8 - not surveyed, quadrats added in 2019
	Year 5 - 2022	Q4.1 – 4.5 All quadrats outside the construction corridor comprised almost monospecific SM24 communities dominated by *Elytrigia atherica*. Q4.2 has consistently supported *Atriplex portulacoides* which appeared to have increased in cover in 2022 to become co-dominant with sea couch. The Zone 4 quadrats indicate that the vegetation along the highest points of the ridge is stable, with regular accumulation of senescent grass material through tidal deposition.	Q4.7 had increased cover of perennial mid marsh species with *Atriplex portulacoides* in particular increasing to 40% cover in the Oct 22 survey; combined, with continued reduction in bare ground/open water. This quadrat on the southern edge of the construction corridor is indicative of a SM14 *Atriplex portulacoides* saltmarsh. Q4.8, located in centre of construction corridor with almost no vegetation present – a few scattered individuals of Spartina which showed a reduction in cover between June and October surveys. Insufficient vegetation to evaluate NVC community.

Zone 5

7.10 The Zone 5 quadrats included five quadrats surveyed in 2011 which were all located outside the construction corridor. Subsequent surveys between 2018 and 2022 have consistently recorded a species-poor sward dominated by *Elytrigia atherica* and *Atriplex portulacoides* with occasional *Inula crithmoides* present in the surrounding habitat; Quadrat 5.4 exhibited vegetation difference due to its location within a small pan and being subject to regular inundation. No quadrats were present within the construction zone.

Summary of Changes in Zone 5 Vegetation

A summary of changes in the Zone 5 quadrats is provided in Table 25:

Table 25. Comparison of Zone 5 vegetation descriptions from pre-construction survey in 2011 and the Year1 and Year 5 post-construction surveys

Marsh Zone	Year		
Zone 5	**2011**	"A sea purslane dominated community attributed to SM14a *Halimione portulacoides* saltmarsh interspersed by patches of SM26b *Inula crithmoides* saltmarsh (*Elymus pycnanthus* sub-community)."	
	Year1 - 2018	"Survey in 2018 found zone 5 to be a mosaic of *Elytrigia atherica* and *Atriplex portulacoides* with occasional *Inula crithmoides*. Quadrats 5.1 and 5.2 were located in relatively species- poor vegetation dominated by *Elytrigia atherica* and *Atriplex portulacoides* most closely resembling SM24. Quadrat 5.3 and 5.5 were located in an SM14a / SM26b mosaic and quadrat 5.4 in a small saltpan visually closest to SM10.."	
		Unaffected Marsh: Q5.1-5.2 SM24 *Elytrigia atherica* saltmarsh Q5.3.Q5.5 - SM14a / SM26b mosaic Q5.4 – SM10 Transitional Marsh	**Construction Corridor:** No quadrats within construction corridor
	Year 5 - 2022	Q5.1-5.5 All quadrats except Q5.4are considered to represent the SM24 *Elytrigia atherica* community with a sward dominated by *Elytrigia atherica* with *Atriplex portulacoides* generally present as a co-dominant. Q5.4 was dominated by *Atriplex portulacoides* with abundant *Salicornia* reflecting its location in a shallow depression subject to increased inundation (referred to in the 2018 report as a small saltpan. This quadrat retained similarities with SM10 but the increased level of cover of *Atriplex portulacoides* indicates it is visually closest to SM14 saltmarsh.	No quadrats within construction corridor

Comparison of Zone 6 Quadrats

7.11 The Zone 6 quadrats surveyed in 2018 were considered consistent with a SM14c *Atriplex portulacoides* (*Puccinellia maritima* sub-community); this zone had been previously described in 2011 as SM13a *Puccinellia maritima* saltmarsh. These saltmarsh communities are generally differentiated by the dominance of the two main species present, and are typical mid-marsh communities. The quadrat data for the non-construction zone quadrats presented in Table 26 indicate that these quadrats had a strong affinity with the SM14 with the quadrats dominated by *Atriplex portulacoides* and *Puccinellia maritima*.

7.12 Within the construction corridor, the quadrats include one quadrat (6.2) on the edge of the corridor and three within the area affected by the works. The data from these quadrats indicate that there is a gradual colonisation of vegetation with *Spartina anglica* in particular becoming dominant in three of the four corridor quadrants, and only Q6.7 remaining dominated by bare ground/open water. This increase in cover of *Spartina* is consistent with the clonal growth of this species and may be facilitated by the relative increase in height of the marsh in this zone and the formation of a slight ridge across the corridor. The gradual colonisation by *Spartina* is likely to result in the development of a SM6 *Spartina anglica* marsh. The 2022 survey data indicated a reduction in the cover of Spartina between the June and October surveys. This trend was noted in the more open quadrats and not evident in the quadrats outside the construction corridor. It is not clear whether this reduction in cover is attributable to the extreme weather conditions experienced in 2022 or due to 'die-back' that has been experienced in *Spartina anglica* populations within southern Britain over the past few decades. The presence of apparently stressed *Spartina* plants with senescent vegetation present in early October suggests that die-back may be occurring and monitoring is recommended to determine whether the plants recover or the implications of continued dieback on the structure of the marsh within and adjacent to the construction corridor.

Table 26. Comparison of Zone 6 Quadrats within the construction corridor (Q6.2, Q6.6, Q6.7 and Q6.8 - grey shading) with comparable quadrats on the adjacent marsh (Q6.1, Q6.3, and Q6.4 – SM14 marsh communities); the percentage cover of key vegetation species present in October each year is shown

Vegetation attributes	**Oct-18**							**Oct-19**						
Quadrats	6.1	6.3	6.4	6.2	6.6	6.7	6.8	6.1	6.3	6.4	6.2	6.6	6.7	6.8
Saltmarsh NVC community	SM14	SM14	SM14	SM8/ SM10	SM10	SM10	-	SM14	SM14/ SM11	SM14	SM10 (SM8)	SM10/ SM6	SM10/ SM6	SM6
Vegetation height (cm)	20	25	25	25	10	15	ns	20	25	20	20	20	25	30
open water/bare ground (%)	2	0	0	60	100	98	ns	10	0	0	12	100	99	70
Aster tripolium	3	4	1	0	0	0	ns	4	5	2	A	0	0	0
Atriplex portulacoides	20	70	70	0	0	0	ns	25	80	90	0	0	0	0
Puccinellia maritima	40	25	35	1	1	1	ns	40	25	20	25	1	1	0
Salicornia sp	2	6	2	53	3	17	ns	2	1	0	80	3	7	13
Spartina anglica	3	0	A	3	3	5	ns	4	0	A	30	20	25	70
Suaeda maritima	15	3	A	0	0	0	ns	20	4	1	0	0	0	0

Vegetation attributes	**Oct-20**							**Oct-21**						
Quadrats	6.1	6.3	6.4	6.2	6.6	6.7	6.8	6.1	6.3	6.4	6.2	6.6	6.7	6.8
Saltmarsh NVC community	SM14	SM14	SM14	SM10/ SM6	SM10/ SM6	SM10/ SM6	SM8	SM14	SM14	SM14	SM10/ SM6	SM6	SM6	SM6
Vegetation height (cm)	25	20	15	35	25	30	30	50	30	15	40	50	25	50
open water/bare ground (%)	0	0	0	20	100	100	50	0	0	0	5	80	90	10
Aster tripolium	5	3	2	2	0	0	0	30	15	2	3	A	A	2
Atriplex portulacoides	70	100	95	0	0	0	0	50	80	90	0	0	0	0
Puccinellia maritima	30	20	20	40	0	5	5	80	70	60	75	2	3	15
Salicornia sp	4	0	0	40	5	14	45	2	2	0	32	0	3	2
Spartina anglica	5	5	1	70	35	50	90	10	10	1	80	65	25	95
Suaeda maritima	25	5	0	0	0	0	0	5	25	5	5	0	0	0

Vegetation characteristics	**Oct-22**						
Quadrats	6.1	6.3	6.4	6.2	6.6	6.7	6.8
Saltmarsh NVC community	SM14	SM14	SM14	SM10	SM6	SM10/S M6	SM6
Vegetation height (cm)	40	30	20	30	20	20	30
open water/bare ground (%)	1	0	0	30	100	100	80
Aster tripolium	30	20	2	5	0	a	3
Atriplex portulacoides	70	80	95	2	0	0	0
Puccinellia maritima	35	50	50	40	2	5	40
Salicornia sp	0	5	0	45	1	17	4
Spartina anglica	35	10	2	30	20	8	30
Suaeda maritima	10	20	4	30	0	2	12

Summary of Changes in Zone 6 Vegetation

A summary of changes in the Zone 6 quadrats is provided in Table 27 below:

Table 27. Comparison of Zone 6 Vegetation descriptions from pre-construction survey in 2011 and the Year1 and Year 5 post-construction surveys

Marsh Zone	Year		
Zone 6	**2011**	"Vegetation attributed to SM13a *Puccinellia maritima* saltmarsh with patches of SM14c *Halimione portulacoides* (*Puccinellia maritima* sub-community).."	
	Year1 - 2018	"Survey in 2018 found that quadrats 6.1, 6.3, 6.4 and 6.5 were located within an *Atriplex portulacoides* zone probably best described as SM14c although statistically they appear closer to SM14a. Quadrats 6.2, 6.6 and 6.7 fall within the construction corridor and are probably best assigned to SM8 (in transition to SM10 / SM11)."	
		Unaffected Marsh: Q6.1,6.3,6.4 & 6.5 SM14 *Atriplex portulacoides* saltmarsh	**Construction Corridor:** Q6.2 – SM10 Transitional marsh Q6.6/6.7 - SM8 (in transition to SM10 / SM11).
	Year 5 - 2022	Q6.1,6.3,6.4 & 6.5 SM14c *Atriplex portulacoides* saltmarsh (*Puccinellia* sub-community) Consistent classification of these quadrats within a sward dominated by *Atriplex portulacoide*s and *Puccinellia maritima*. No significant change in species assemblage	Q6.2 - SM10 Transitional marsh in transition to SM6 *Salicornia* spp. salt marsh – co-dominance of *Spartina* suggest coalescence of sward, despite reduction in cover of *Spartina* and *Puccinellia* in 2022. Q6.6 – SM6 – *Spartina* dominated marsh. However, reduction in *Spartina* cover within 2022, Q6.7 – SM10/SM6 – Inundated on both surveys – *Spartina* cover reduced from 50% in 2020 to 8% in October 2022. Q6.8 – SM6 – Increase in *Puccinellia* and decrease in Spartina.

Zone 7

Comparison of Zone 7 Quadrats

7.13 The Zone 7 quadrats represent the pioneer marsh zone closest to the shoreward edge of the salt marsh. This area of the marsh is dynamic and subject to significant levels of erosion and deposition. To provide a comparison, between the construction corridor and the adjacent areas of marsh. Table 28 below presents the data for three quadrats within the affected area of the construction corridor (Q7.6, 7.7 and 7.8) and three quadrats within the adjacent marsh outside the corridor.

7.14 Pioneer marsh zones are often variable in the cover of plant species colonising the bare sediment and are generally species-poor with just a few species present, as is evident in the summary data presented below. The quadrats located outside the construction corridor were typical of SM7 *Sarcocornia perennis* with *Spartina anglica* increasing in abundance over the period of study. These quadrats are considered to represent a mosaic of SM6 and Sm7 NVC communities, which are generally determined by the presence of each species as a constant. Fluctuations of species cover occur naturally as a result of lateral erosion caused by wave action and the abrasion of cockle shells, which is a feature of the marsh in this zone.

7.15 The quadrats within the construction corridor all show an increase in cover of *Spartina anglica* indicative of clonal development and coalescence to form a SM6 *Spartina anglica* saltmarsh community. In both the construction corridor and the non-corridor quadrats, the *Spartina* did not appear to show significant intra-annual reduction in cover, and it may be that these plants were not subject to the stresses experienced in the mid marsh quadrats or are not undergoing die-back at present. The formation of a *Spartina* sward across the construction corridor appears to be continuing and may result in consolidation of the marsh and changes in inundation patterns along the corridor. Nevertheless, a variable pattern of lateral erosion and accretion is present along the whole of the seaward edge of the marsh, with patterns of erosion appearing to be exacerbated by the presence of cockle shells. For example, at Q7.4 the quadrat was entirely bare ground in 2022, with a *Spartina* marsh to seaward of it, and a erosional mud cliff to landward below a cockle shell chenier.

Table 28. Comparison of Zone 7 Quadrats in Construction Corridor (Q7.6, Q7.7, Q7.8 - grey Shading) with comparable quadrats in adjacent marsh area (Q7.1, Q7.2, and Q7.3 – SM7 marsh communities). For each quadrat, the table presents the key vegetation characteristics and species cover of dominant species present in each zone in October only

Vegetation characteristics	**Oct-18**						**Oct-19**					
Quadrats	7.1	7.2	7.3	7.6	7.7	7.8	7.1	7.2	7.3	7.6	7.7	7.8
Saltmarsh NVC community	SM7	SM7	SM7	SM8	SM10	No ID/ SM6	SM7	SM7	SM7	SM8	SM7/ SM10	SM6
Vegetation height (cm)	20	35	30	2	20	1	20	40	30	15	25	10
open water/bare ground (%)	5	7	10	0	0	0	2	7	7	0	0	0
Salicornia sp	60	50	5	1	32	0	40	50	4	5	40	0
Sarcocornia perennis	15	10	8	0	0	0	25	15	10	0	2	0
Spartina anglica	15	30	70	2	3	2	60	70	80	10	70	5

Vegetation characteristics	**Oct-20**						**Oct-21**					
Quadrats	7.1	7.2	7.3	7.6	7.7	7.8	7.1	7.2	7.3	7.6	7.7	7.8
Saltmarsh NVC community	SM6/ SM7	SM6/ SM7	SM6	SM6	SM6	SM6	SM6/ SM7	SM6/ SM7	SM6	SM6	SM6/ SM7	SM6
Vegetation height (cm)	25	20	40	40	40	40	40	30	30	50	40	50
open water/bare ground (%)	2	20	32	52	12	100	0	30	40	35	6	70
Salicornia sp	35	25	2	2	65	0	20	15	2	3	50	0
Sarcocornia perennis	25	40	0	0	3	0	45	40	10	5	15	0
Spartina anglica	75	50	95	60	80	15	75	60	80	80	80	60

Vegetation characteristics	**Oct-22**					
Quadrats	7.1	7.2	7.3	7.6	7.7	7.8
Saltmarsh NVC community	SM6/ SM7	SM6/ SM7	SM6	SM6	SM6/ SM7	SM6
Vegetation height (cm)	20	20	30	60	30	60
open water/bare ground (%)	0	0	15	20	7	32
Salicornia sp	7	2	0	2	15	0
Sarcocornia perennis	70	50	10	8	20	0
Spartina anglica	80	70	80	85	80	80

Summary of Changes in Zone 7 Vegetation

A summary of changes in the Zone 7 quadrats is provided in Table 29 below:

Table 29 Comparison of Zone 7 Vegetation descriptions from pre-construction surveys in 2011 and Year1 and Year5 surveys.

<table>
<tr><th>Marsh Zone</th><th>Year</th><th></th><th></th></tr>
<tr><td>Zone 7</td><td>2011</td><td colspan="2">“Leading seaward edge of the saltmarsh area comprising a broad but fragmented fringe of common cord-grass and glasswort (Salicornia spp.) and intertidal mud. The vegetation was attributed to a mosaic of SM6 Spartina anglica and SM8 Annual Salicornia saltmarsh.).”</td></tr>
<tr><td></td><td>Year1 - 2018</td><td colspan="2">“Survey in 2018 found a zone with ridges largely dominated by perennial glasswort (Sarcocornia perennis) and troughs dominated by Spartina anglica. This indicates the baseline data was incorrect and the zone should be described as SM7 Sarcocornia perennis saltmarsh with SM6 Spartina anglica saltmarsh (particularly at the extreme seaward edge).
Quadrats 7.1 to 7.5 sample the SM7 community whilst quadrats 7.6 to 7.8 fall with the construction corridor. The most seaward quadrat (7.8) comprised bare mud with a few shoots of Spartina anglica (SM6), quadrat 7.6 and 7.7 were dominated by annual Salicornia species (SM8 in transition to SM10 / SM11).”</td></tr>
<tr><td></td><td></td><td>Unaffected Marsh:
Q7.1 – 7.5
SM7 Sarcocornia perennis saltmarsh</td><td>Construction Corridor:
Q7.6 SM8 Annual Salicornia saltmarsh
Q7.7 SM8 Annual Salicornia saltmarsh
Q7.8 Bare mud with scattered shoots of Spartina anglica (SM6)</td></tr>
<tr><td></td><td>Year 5 - 2022</td><td>Q7.1 SM6/SM7 Mosaic of Sparting and Sarcocornia
Q7.2 SM6/SM7 Mosaic of Spartina and Sarcocornia
Q7.3 SM6 Spartina dominant with low cover of Sarcocornia
Q7.4 No vegetation present - erosion
Q7.5 SM6/SM7 Mosaic of Sparti ng and Sarcocornia
No evidence of Spartin die-back noted</td><td>Q7.6 SM6 Spartina dominant with low cover of Sarcocornia
Q7.7 SM6/SM7 Mosaic of Spartina and Sarcocornia
Q7.8 SM6 Spartina consolidation continued
Q7.9 SM6/SM7 Mosaic of Spartina and Sarcocornia but with relatively high cover of bare ground
7.10 SM6/SM7 Mosaic of Spartina and Sarcocornia
7.10a SM6 Spartina dominant</td></tr>
</table>

2022 Summary

7.16 Overall, the 2022 survey results, summarised in Table 30 below, corroborate the general conclusions made in the Year 4 report. Water levels in the lagoon were relatively high during both the June and October 2022 surveys. The 2022 summer included periods of extreme hot weather in July and August.

7.17 The quadrat data continue to demonstrate the general patterns of zonation that characterise the marsh. However, the 2022 data demonstrate that there was a reduction in the cover of perennial species between the June and October surveys, whereas in previous years the annual growth of species such as *Spartina anglica* and *Puccinellia maritima* led to an increase in % cover between the surveys. The reduction in cover observed in 2022 did not appear to occur at lower marsh levels (e.g. in Zone 7) which experience frequent tidal inundation, and appeared to be more pronounced in higher areas associated with the construction corridor. The cause of this intra-annual reduction in cover is not certain, but may well be associated with the extreme temperatures, low rainfall and lack of high tides experienced in summer 2022 which favoured unfavourable edaphic conditions including drying out of the surface sediments (as evidenced by mud cracks within the pools and a slight reduction in ground surface elevations). However, it is also possible that the *Spartina* in particular may be experiencing localised dieback, as previously noted around the edge of the lagoon in 2018.

7.18 The corridor itself continues to support several shallow pools / salt pans comprising shallow inundation areas that generally consist of bare or thinly vegetated mud. These salt pans appeared to be relatively stable and have been present in similar locations and of a similar size throughout the monitoring period. Salt pans are a feature of salt marsh habitats and often form where topographical variations in the marsh profile can lead to retention of tidal water in shallow depressions. It was noted that on the incoming tide the salt pans and more diverse salt marsh topography associated with the low marsh were used by waders and wildfowl, including little egrets, heron, snipe, curlew and oystercatchers.

7.19 Despite the reduction in *Spartina* cover between June and October 2022, monitoring of the quadrats in vegetated areas of the cable corridor between 2019 and 2022 has shown a general increase in cover of perennial species since 2019. For example, in Zone 7, the most seaward area of the construction corridor has developed a pioneer zone saltmarsh that is visually consistent with that in adjacent areas outside the construction zone. This sward consolidation has contributed to an increase in marsh surface elevation within the corridor in Zones 6 and 7.

Table 30. Summary of 2022 vegetation survey in each Zone

Zone	Summary
1	Vegetation along landward edge of saltmarsh, and along terrestrial section of construction corridor. The vegetation has continued to develop towards a grassland dominated common couch with other grass species present including False oat-grass, red fescue and Cock's-foot. Tall perennial herbaceous species are a characteristic feature including fennel, Alexanders, wild carrot and ribbed melilot. Coastal species are limited to the fringes of the adjacent lagoon and where the grassland abuts the marsh itself
2	The lagoon quadrats were inundated with deep water and inaccessible in 2022. The presence of scattered clumps of beaked tasselweed (*Ruppia* sp.) was indicative of the lagoon remaining inundated and not drying out. The lagoon was generally lacking in salt marsh vegetation other than around a shoreline fringe. Within the construction corridor, the quadrats present to seaward of the TJB supported an increase in cover of *Spartina anglica* and *Aster tripolium* was increased and there was a general decrease in cover of *Atriplex portulacoides* perhaps indicating a shift in vegetation community from a SM14 to a SM12 salt marsh community
3	The quadrats located close to the lagoon shore supported relatively high cover of bare mud, indicative that the zone was recovering from anoxic soil conditions recorded in 2020. These quadrats generally comprised sparse cover of annual species, notably Salicornia and S*uaeda* with sea purslane dominant in those quadrats further from the lagoon and thus subject to reduced inundation (Q3.2 and 3.4). Quadrat 3.5, located on the edge of the construction corridor was generally unchanged although as noted elsewhere, the cover of *S. anglica* reduced between June and October. The quadrats within the construction corridor were again inundated within a shallow pan adjacent to the lagoon with no vegetation present.
4	The non-corridor quadrats continued to be dominated by monospecific stands of *Elytrigia atherica.* The quadrats within the construction corridor continued to show consolidation of

	the marsh cover by perennial species and a reduction in the proportion of bare ground/ open water. One quadrat, Q4.8 was inundated on both surveys and had reduced vegetation present. In addition, it was noted that outside the surveyed quadrats that clumps of *Sarcocornia perennis* were becoming established along the south side of the corridor on a relatively compressed area of substrate.
5	Zone 5 was unchanged supporting a species-poor sward dominated by *Elytrigia atherica* and *Atriplex portulacoides* with occasional *Inula crithmoides* present in the surrounding habitat. This community has a high affinity with the SM24 *Elytrigia atherica* saltmarsh and SM14a *Atriplex portulacoides* communities; this section appears to be relatively stable, with a mosaic of *Atriplex portulacoides* and annual saltmarsh species where there are pans with increased inundation. There are no Zone 5 quadrats associated with the construction corridor.
6	Outside the construction corridor, the vegetation continued to show an affinity for the SM14 *Atriplex portulacoides* saltmarsh habitat with *Puccinellia maritima* constant. Both *Puccinellia* and *Spartina* showed reductions in cover between June and October. The construction zone quadrats within the construction zone had reduced cover of perennial species between the June and October surveys and were inundated on both surveys. The reduction in *Spartina* cover was most evident at Q6.6 (60% in June, reduced to 20% in October) and Q6.8 (reduced from 95% to 30%), and it was noted that the individual plants appeared senescent; it was not clear whether this is due to die-back of local populations or due to stress arising from extreme summer temperatures experience in summer 2022.
7	The 2022 survey continued to reflect the dynamic nature of the seaward edge of the salt marsh. The non-corridor quadrats at the south end of the marsh continues to be subject to erosion of the ridge to shoreward with an area of bare mud present between an area with low mud cliffs where active erosion is occurring and a pioneer zone with *Spartina* clumps and ridges supporting *Sarcocornia perennis*. The quadrats within and adjacent to the construction corridor appeared to be more stable and indicated that consolidation of the marsh surface was occurring within the corridor itself. The increased cover of *Spartina* in this area suggests a reduced level of erosion compared to the area to the south
8	The quadrats along the north and west shore of the lagoon were considered to be consistent with the surveys undertaken in the previous years, with a linear strip of vegetation present along the shoreline of the lagoon. The quadrats located adjacent to the footpath were subject to frequent disturbance from pedestrians and cyclists and displayed characteristics of established grassland with a dominance of grass species and a reduction in the presence of ruderal species.

8.0 Conclusions

8.1 The results of the Year 5 topographic monitoring show that there has still been minimal topographic recovery of the former high marsh ridge in the vicinity of the transition joint bay and that tidal incursion into the saline lagoon remains more frequent than before the cable installation works were undertaken. However, maximum water levels in the Lagoon are now lower than they were pre-construction since the lagoon can also drain more quickly down the cable corridor on the ebb tide. Complete drying out of Lagoon is now less likely than pre-construction due to fact that the ‘lip’ at the northeastern corner of the Lagoon is now higher than it was pre-construction, and drainage through the poorly defined creek system behind the petrol station, leading to the small pool identified in this report as Pool G, is prevented.

8.2 There has been very limited sediment deposition within the landward part of the cable corridor since construction. Ground levels in this area showed a slight fall (c. 5 cm) in 2022 due to drying out and shrinkage of the ground during the relatively warm, dry summer of 2022.

8.3 Sediment accretion has taken place along the seaward half of the cable corridor and especially towards the marsh edge where a new low ridge is developing. This ridge has increased in average height by about 15 cm over the period of monitoring, and over time the continuation of this process may be expected to reduce the frequency of tidal inundation of the lagoon.

8.4 The topographic monitoring has indicated significant variation in the extent of standing water and largely unvegetated ground from survey to survey. Analysis of tide gauge and weather records indicates this reflects temporal variations in the frequency / magnitude of tidal incursion and of relatively warm and dry periods of weather.

8.5 The analysis of vegetation change through quadrat monitoring has been severely constrained by the relatively small number and locations of quadrats established before and immediately following the cable installation works, and in particular by the lack of systematic pre- and post-works data sets, and by limitations of the vegetation community zonation framework proposed in the Year 1 post works monitoring report (Biocensus, 2019). Owing to these limitations, a direct comparison of pre- and post-works changes between quadrats located within and outside the works corridor has been severely constrained, and statistical comparison has not been possible.

8.6. Despite the limitations, the vegetation quadrat monitoring has indicated that there has been relatively little change in the vegetation characteristics at those quadrat locations which have been undisturbed by the cable installation works, although there has been detectable change in areas along the marsh front which are influenced by natural patterns of sediment erosion and deposition.

8.7 The vegetation within the quadrats which were characterized by largely terrestrial vegetation communities on the landward side of the Lagoon (Zone 1) affected by cable installation have now completely recovered with broadly similar vegetation assemblages.

8.8 Vegetation around the margins of the Lagoon has shown considerable variation over the period of monitoring, largely due to variations in water levels which reflect the frequency / magnitude of tidal inundation, and also weather conditions. Overall, following the cable installation works the range of wate level variation has been reduced compared with the pre-works situation. At the end of the five year monitoring period (October 2022) many of the Zone 2 quadrat locations were submerged but marginal saltmarsh vegetation was in a visually healthy condition.

8.9 Monitoring of quadrats within the cable corridor has shown considerable variation between surveys but an overall trend towards a reduction in the extent of bare / thinly vegetated ground, particularly in the areas surrounding the three main pools (A , B and C) where the surface sediment are waterlogged for long periods (it should be noted that pools of standing water existed in the area of Pools B and C prior to cable installation). The increase in vegetation cover has so far mainly involved colonization by annual *Salicornia* sp., perennial *Sarcocornia* sp. and *Spartina* sp. However, the vigour and year-year survival of these species has been profoundly affected by variations in growing conditions, with 2020 and 2021 being favourable years and 2022 a relatively unfavourable year.

8.10 In the more seaward parts of the cable corridor and the intertidal access corridor a combination of sediment deposition (including wave-reworked cockle shells), reduced wave action and increased elevation of a newly forming marsh edge ridge has favoured the establishment of a range of marsh species, including annual *Salicornia* spp, *Spartina* spp., Atriplex *portulacoides* and, on slightly higher areas, *Puccinellia maritima*.

8.11 Based on the results of the 5 years of post-construction monitoring it is concluded that there is currently no physical or biological mechanism by which the higher saltmarsh ridge in the vicinity of the transition joint bay is likely to recover to its former state. However, the resulting increased frequency of tidal incursion are contributing to a less variable water level and salinity regime within the Lagoon which may bring net benefits to the marginal saltmarsh vegetation. The existence of a ‘gap’ in the higher saltmarsh ridge has no bearing on the effects of extreme high tides (exceeding 2.90 m ODN) which are able to overtop the remaining ridge in numerous places. Artificially re-building the ridge would be likely to bring few if any benefits to the functioning of the lagoon and its surrounding vegetation, and would risk further damage to the surrounding saltmarsh communities.

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Appendix 1

Conservation designations, historical maps and aerial photographs

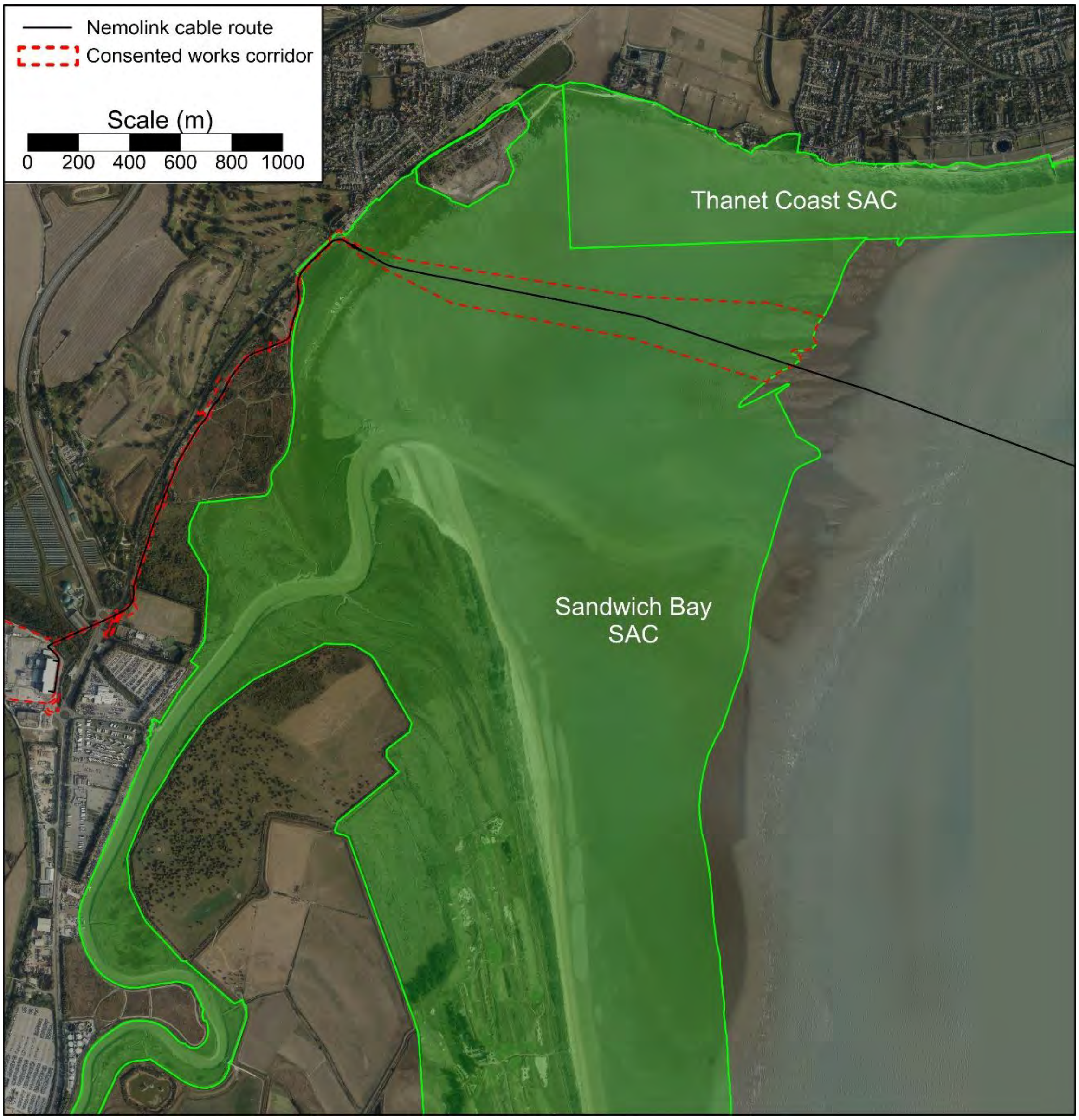


Figure A1.1 Areas within Pegwell Bay designated as a Special Area of Conservation (SAC, shaded green). Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

Figure A1.2 Areas within Pegwell Bay designated as a Special Protection Area (SPA, shaded green). Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

Figure A1.3 Areas within Pegwell Bay designated as a Site of Special Scientific Interest (SSSI, shaded green). Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

Figure A1.4 Areas within Pegwell Bay designated as a Ramsar site (shaded green). Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

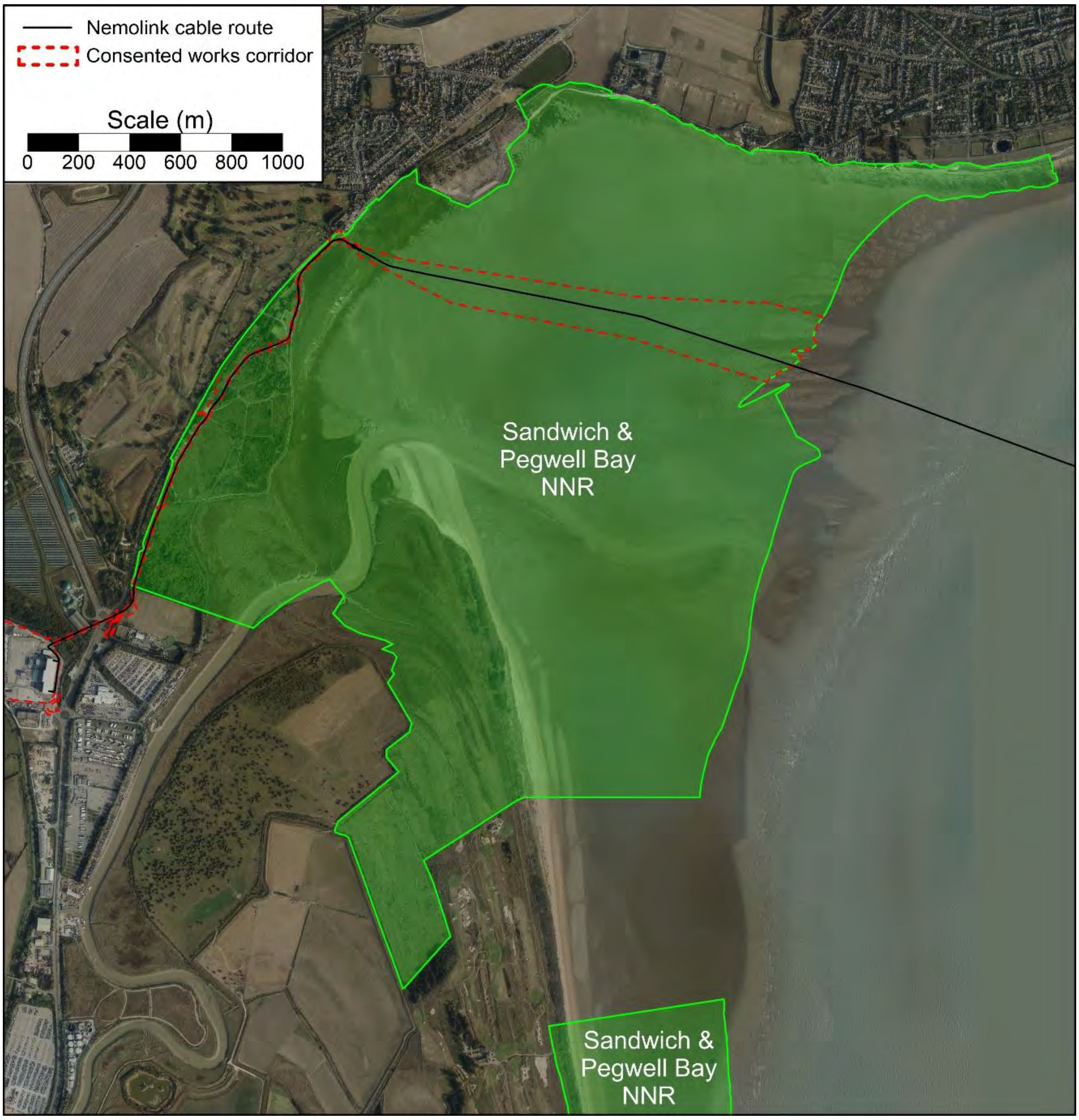


Figure A1.5 Areas within Pegwell Bay designated as a National Nature Reserve (NNR, shaded green). Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

Figure A1.6 Areas within Pegwell Bay designated as a Local Nature Reserve (LNR, shaded green). Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

Figure A1.7 Areas within Pegwell Bay managed by the Kent Wildlife Trust (shaded green). Note that the area is coincident with the National Nature Reserve. Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

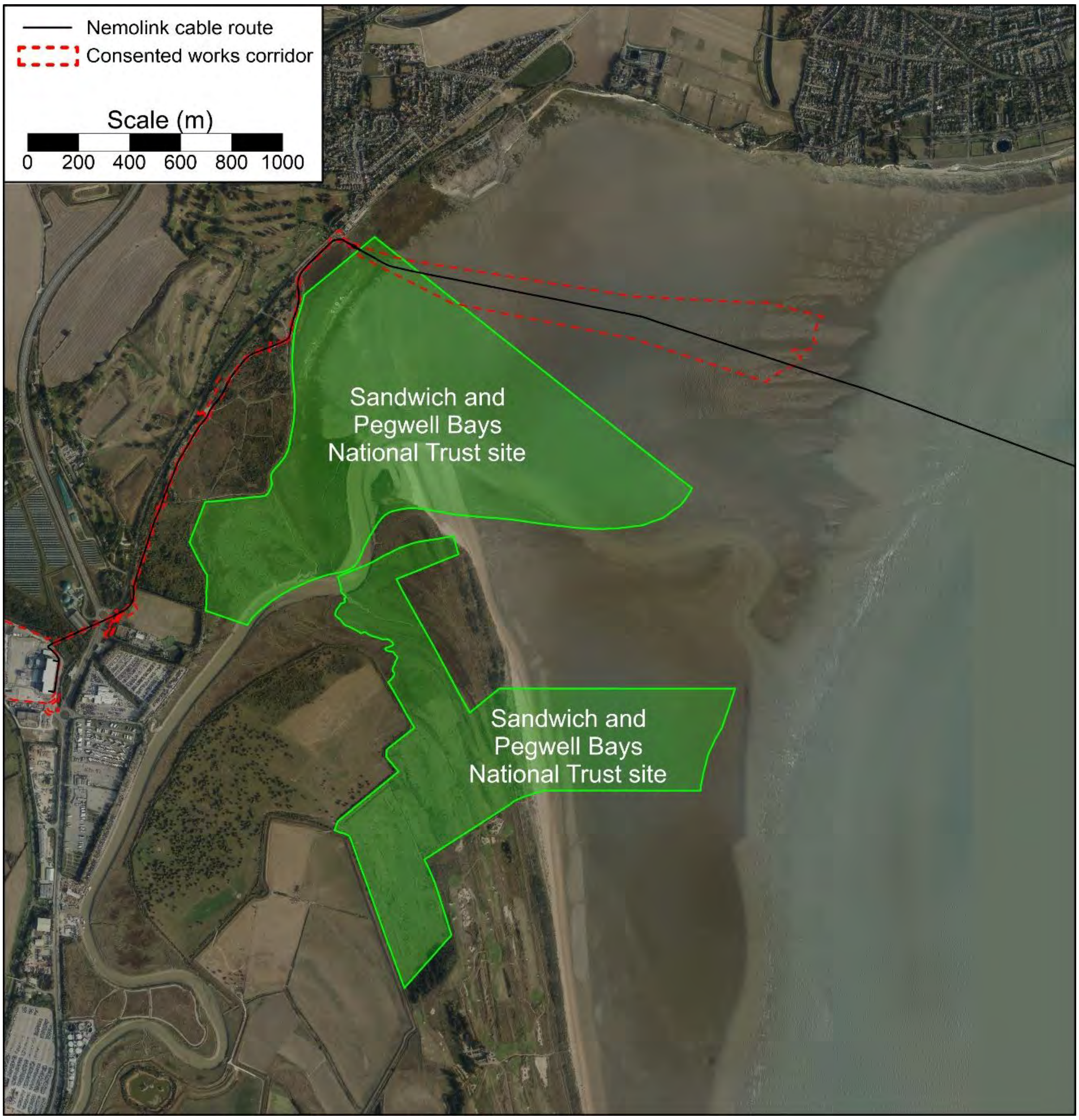


Figure A1.8 Areas within Pegwell Bay owned by the National Trust (shaded green). Source: DEFRA Data Services Platform. Base aerial photograph flown 19/09/2020, source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

Figure A1.9 One-inch 'Old Series' Ordnance Survey map (Sheet 3), First Edition, surveyed early 1800s, published 1819. Source: The National Library of Australia.

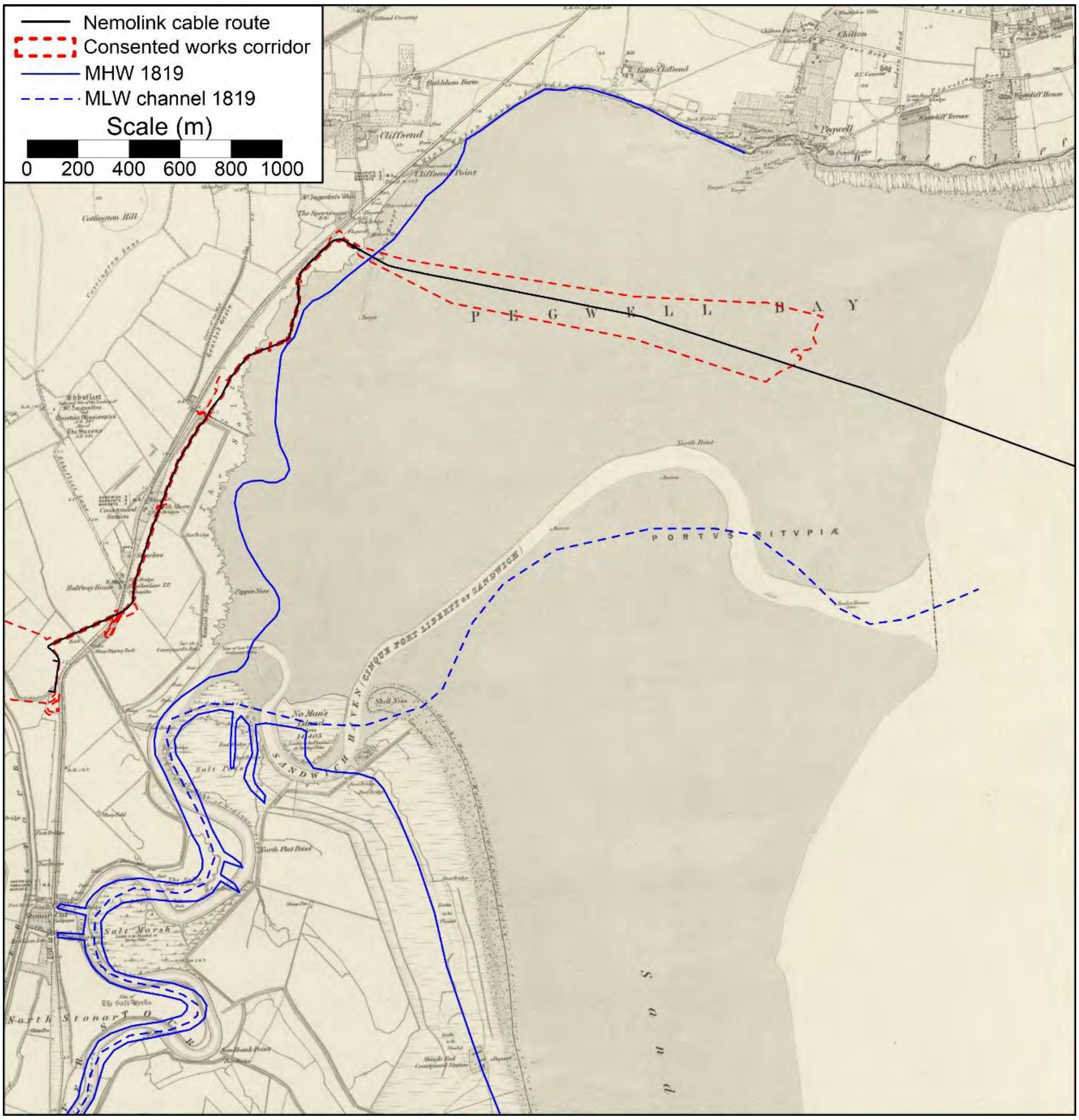


Figure A1.10 Six-inch 'County Series' Ordnance Survey map (Kent Sheet XXXVII), First Edition, surveyed 1872, published 1877. Blues lines show the positions of the MHW line and MLW channel from the preceding map epoch (1819). Source: The National Library of Scotland.

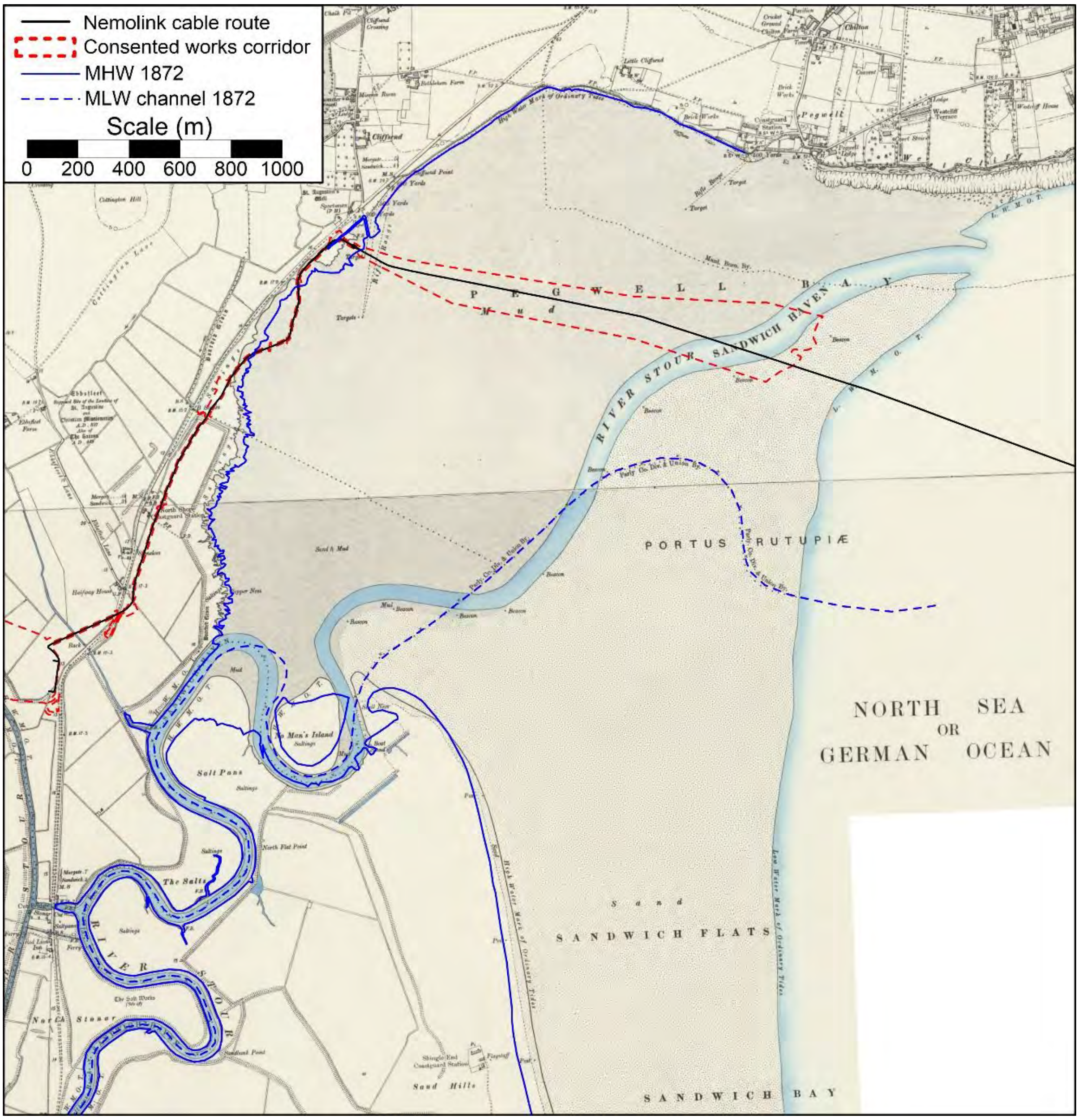


Figure A1.11 Six-inch 'County Series' Ordnance Survey map (Kent Sheets XXXVII.SE and XXXVII.NE), Second Edition, revised 1896-97, published 1898 and 1899. Blues lines show the positions of the MHW line and MLW channel from the preceding map epoch (surveyed 1872). Source: The National Library of Scotland.

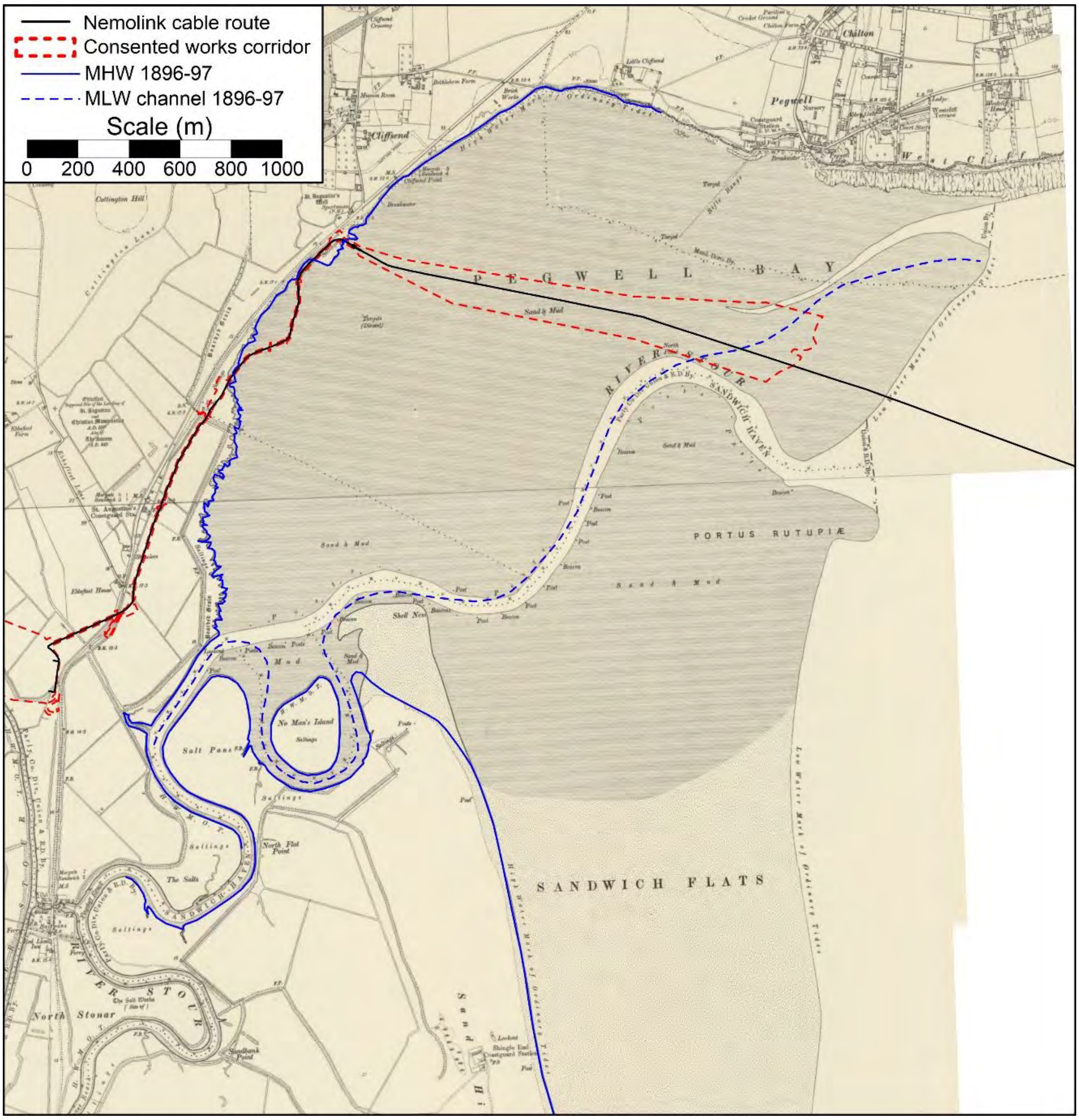


Figure A1.12 Six-inch ‘County Series’ Ordnance Survey map (Kent Sheets XXXVII.SE and XXXVII.NE), Third Edition, revised 1905, published 1908. Blues lines show the positions of the MHW line and MLW channel from the preceding map epoch (surveyed 1896-97), where different. Source: The National Library of Scotland.

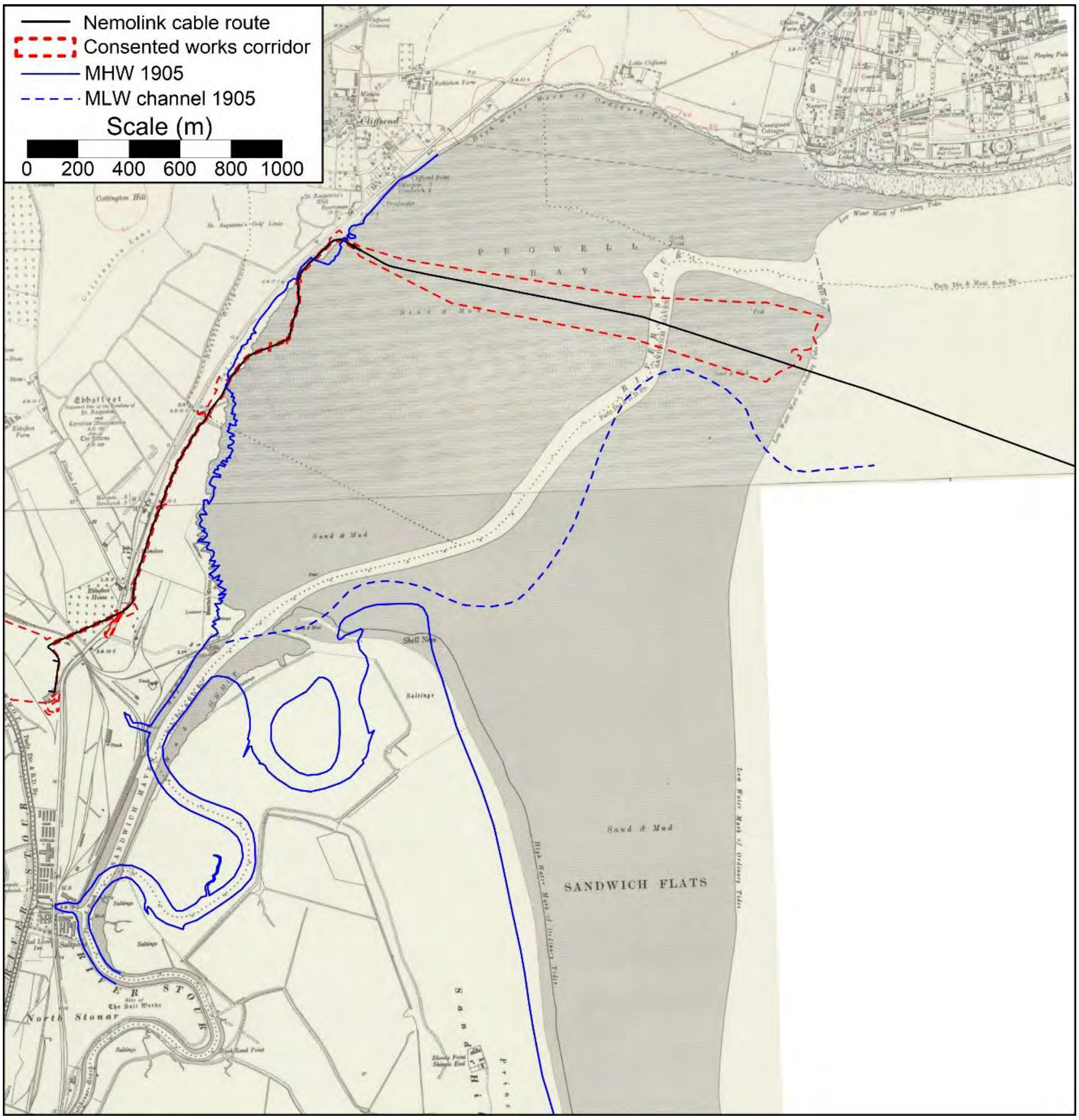


Figure A1.13 Six-inch 'County Series' Ordnance Survey map (Kent Sheets XXXVII.SE and XXXVII.NE), Edition of 1931, revised 1931, published 1934. Blues lines show the positions of the MHW line and MLW channel from the preceding map epoch (surveyed 1905), where different. Source: The National Library of Scotland.

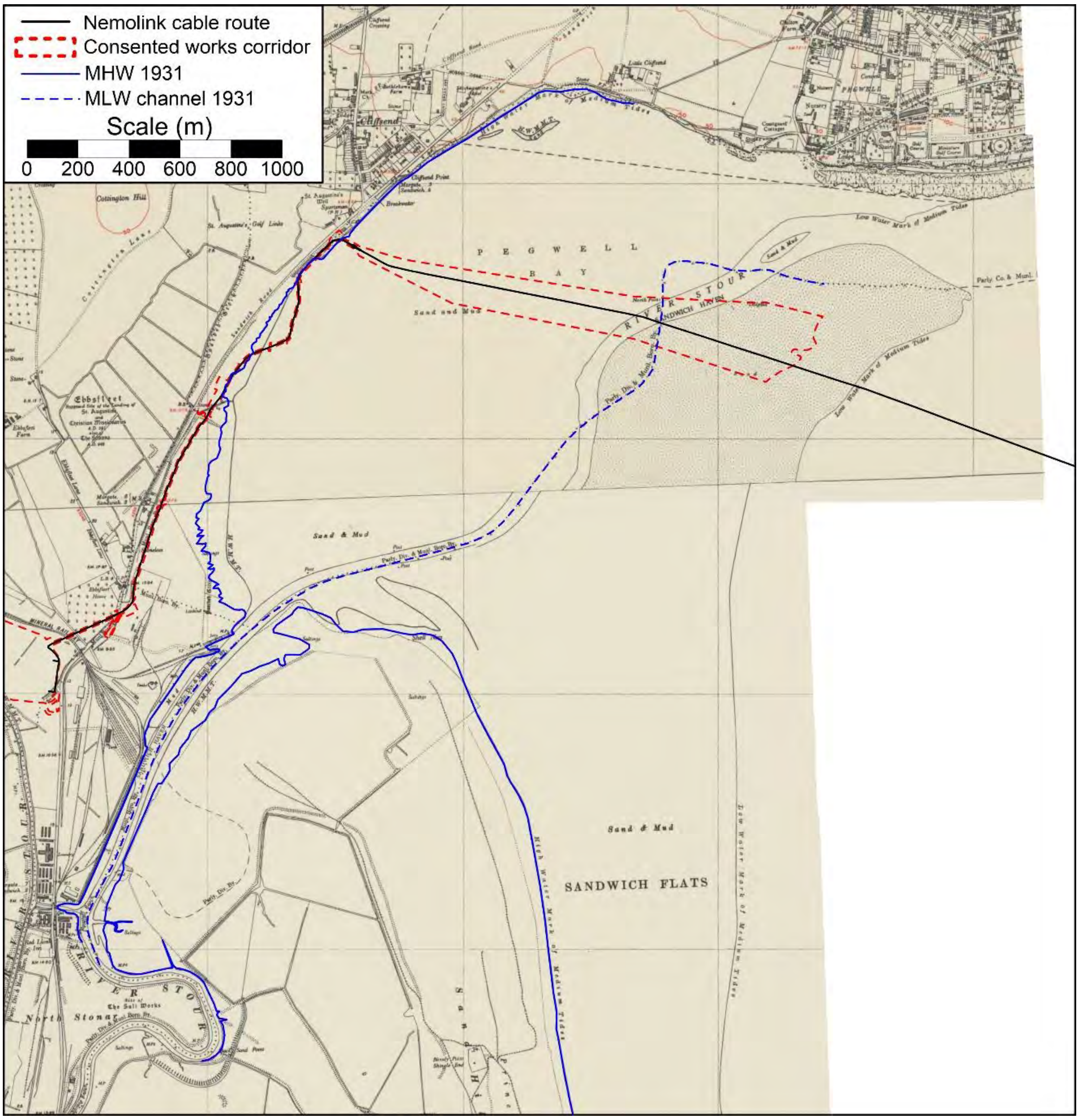


Figure A1.14 Six-inch 'County Series' Ordnance Survey map (Kent Sheets XXXVII.SE and XXXVII.NE), Provisional Edition, SE Sheet revised 1931-48 and published 1949, NE Sheet revised 1947-48 and published 1951. Blues lines show the positions of the MHW line and MLW channel from the preceding map epoch (surveyed 1931), where different. Source: The National Library of Scotland.

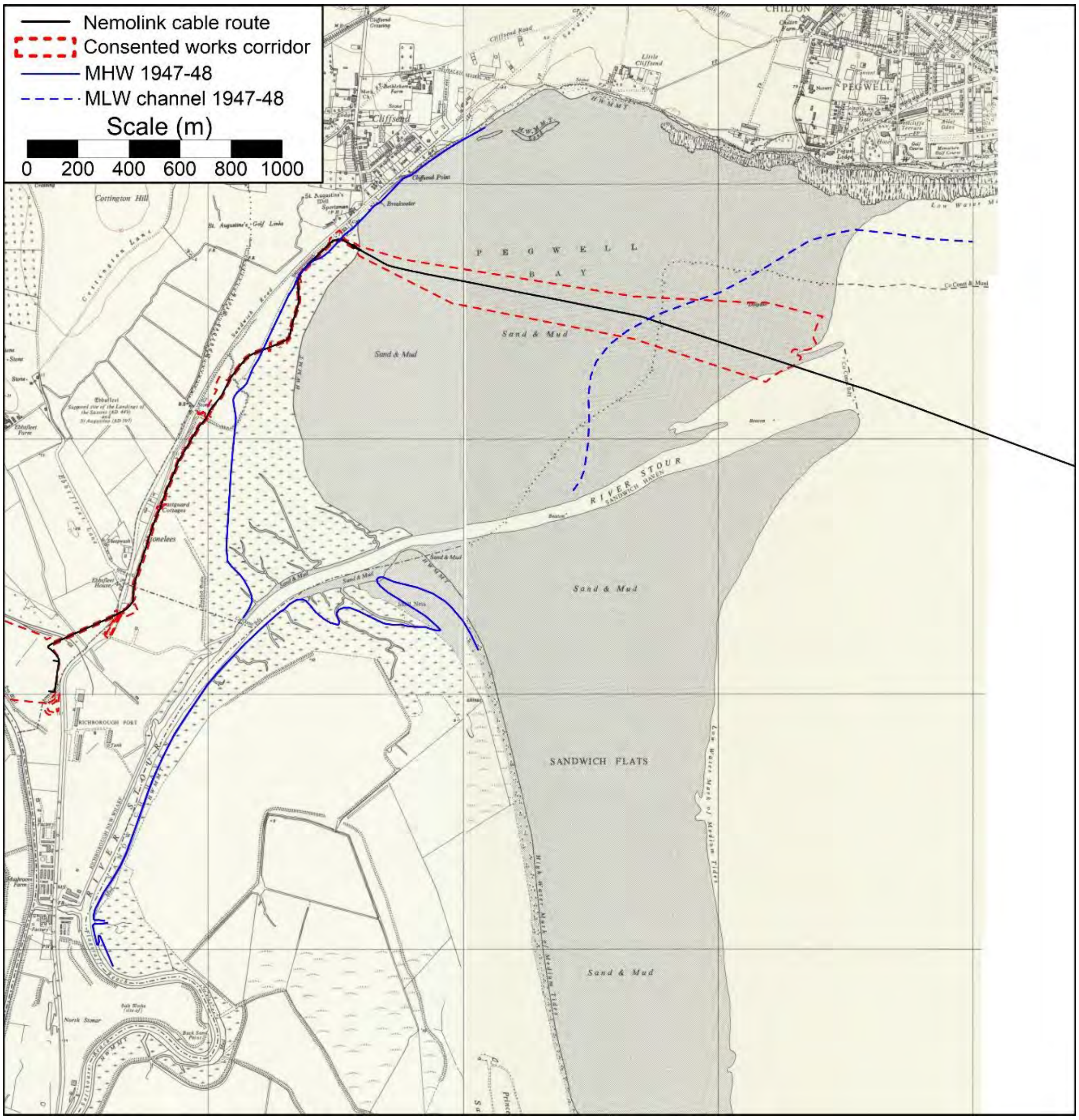


Figure A1.15 Six-inch Ordnance Survey map (National Grid Sheets TR36SW and TR36SE), SW sheet revised 1957-59 and published 1960, SE sheet revised 1955-59 and published 1961. Blues lines show the positions of the MHW line and MLW channel from the preceding map epoch (surveyed 1947-48), where different and where surveyed. Source: The National Library of Scotland.

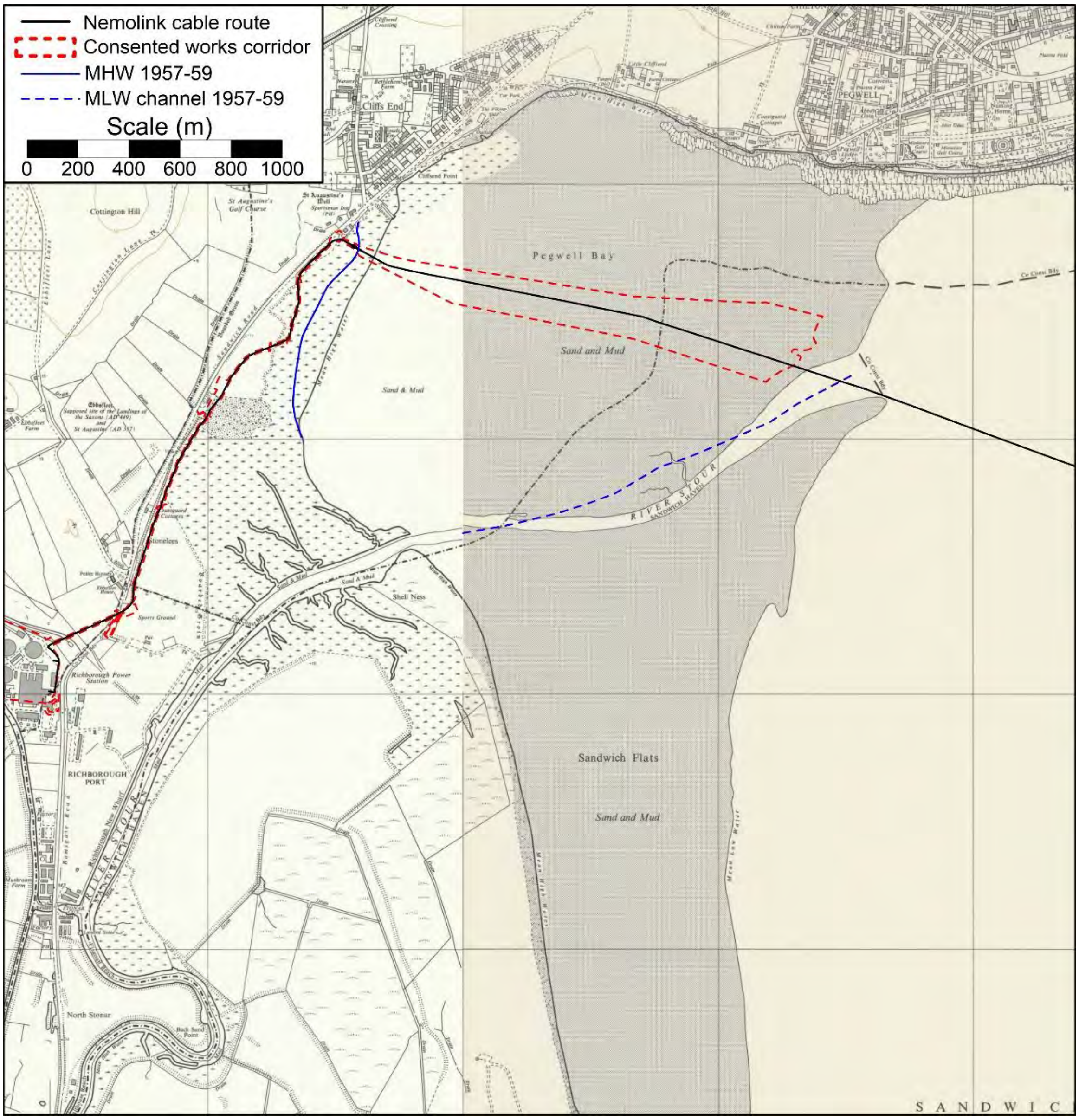


Figure A1.16 Six-inch Ordnance Survey map (National Grid Sheets TR36SW and TR36SE), SW sheet revised 1959-63 and published 1968, SE sheet revised 1959-61 with mean low water revised 1967 and published 1969. Blues lines show the positions of the MHW line and MLW channel from the preceding map epoch (surveyed 1957-59), where different and where surveyed. Source: The National Library of Scotland.

Figure A1.17 Aerial photograph flown 1985. Blues lines show the positions of the MHW line (surveyed 1957-1963) and MLW channel (surveyed 1967) from the preceding map epoch, where surveyed. Source: Google Earth

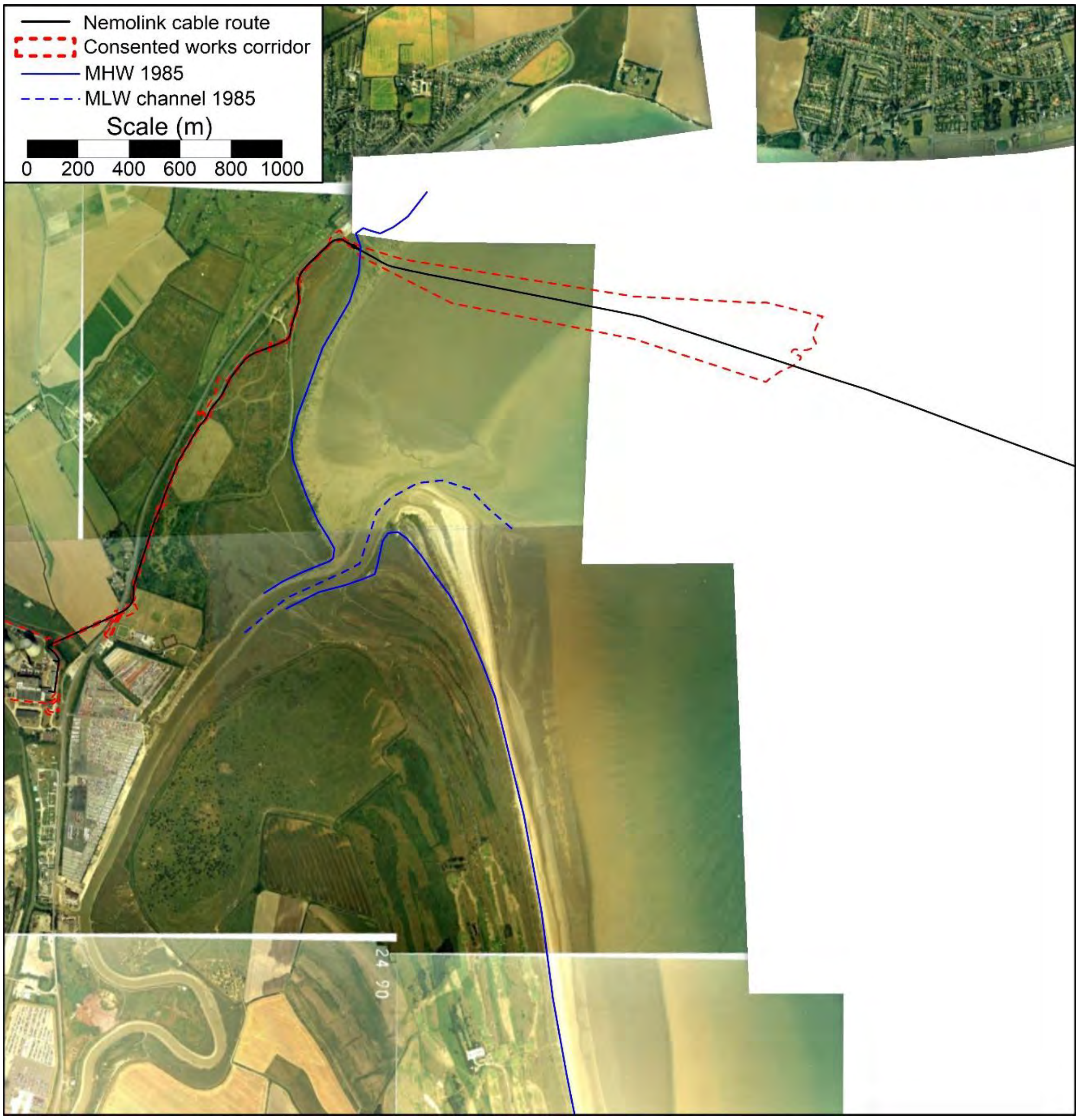


Figure A1.18 Aerial photograph flown 1990. Blues lines show the positions of the MHW line and MLW channel from the preceding aerial photograph (flown 1985), where different. Source: Google Earth

Figure A1.19 Aerial photograph flown 05/05/2001. Blues lines show the positions of the MHW line and MLW channel from the preceding aerial photograph (flown 1990), where different and where surveyed. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

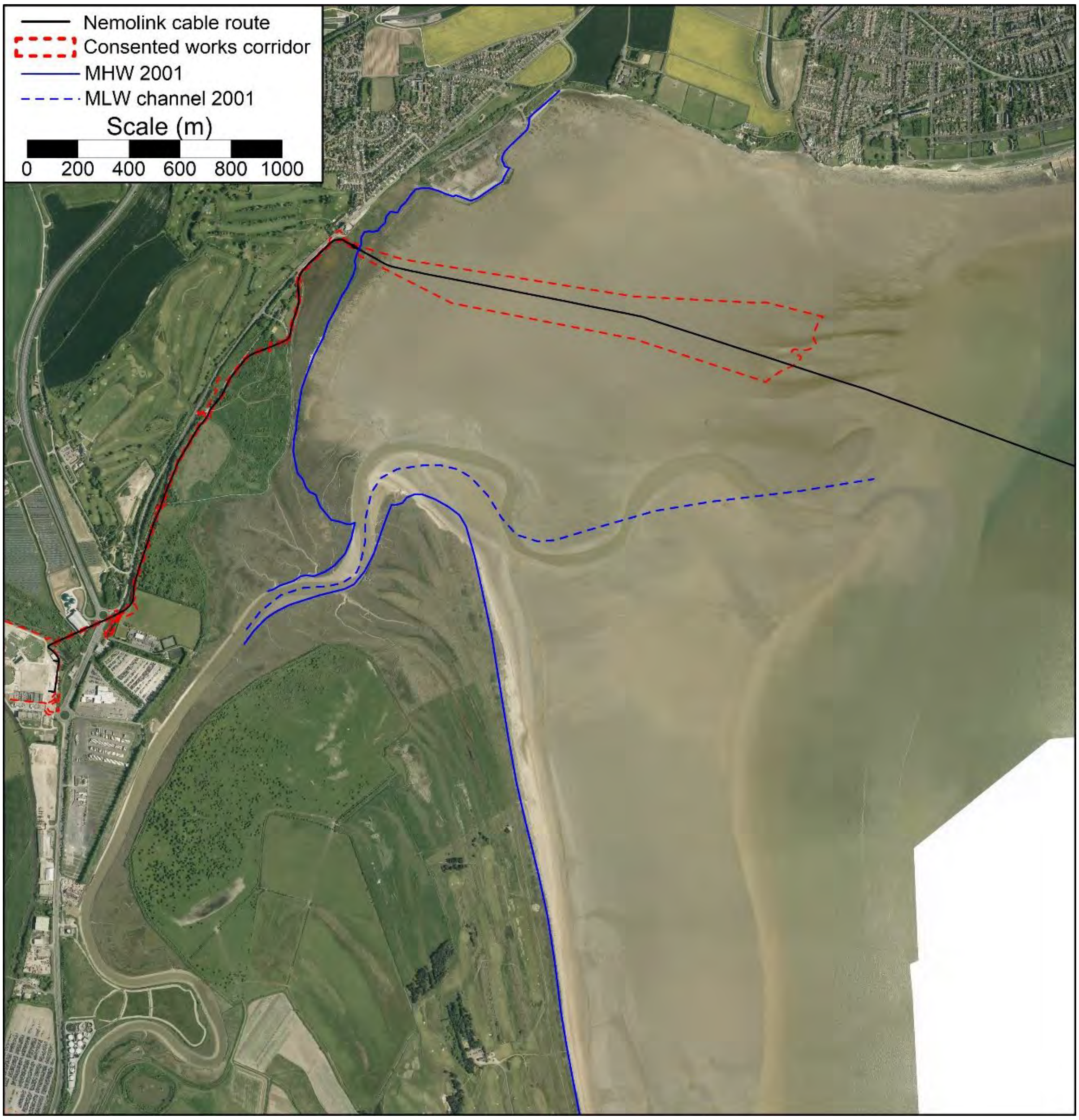


Figure A1.20 Aerial photograph flown 27/05/2013. Blues lines show the positions of the MHW line and MLW channel from the preceding aerial photograph (flown 2001), where different and where surveyed. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

Figure A1.21 Aerial photograph flown 19/09/2020. Blues lines show the positions of the MHW line and MLW channel from the preceding aerial photograph (flown 2013), where different and where surveyed. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

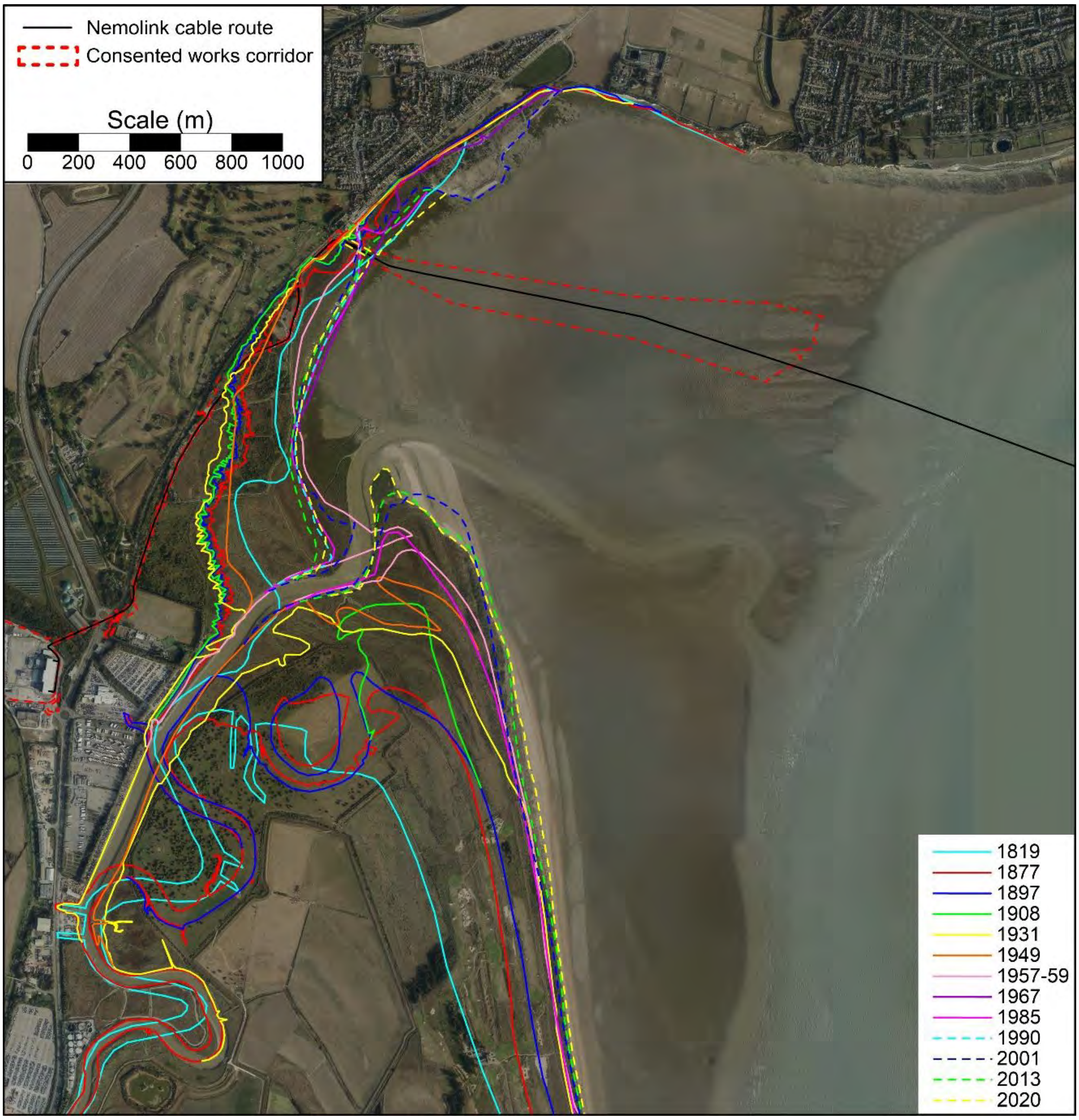


Figure A1.22 Aerial photograph flown 19/09/2020. Coloured lines indicate the position of the position of the mean high water (MHW) mark mapped from historical Ordnance Survey maps and aerial photographs. Aerial photograph source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

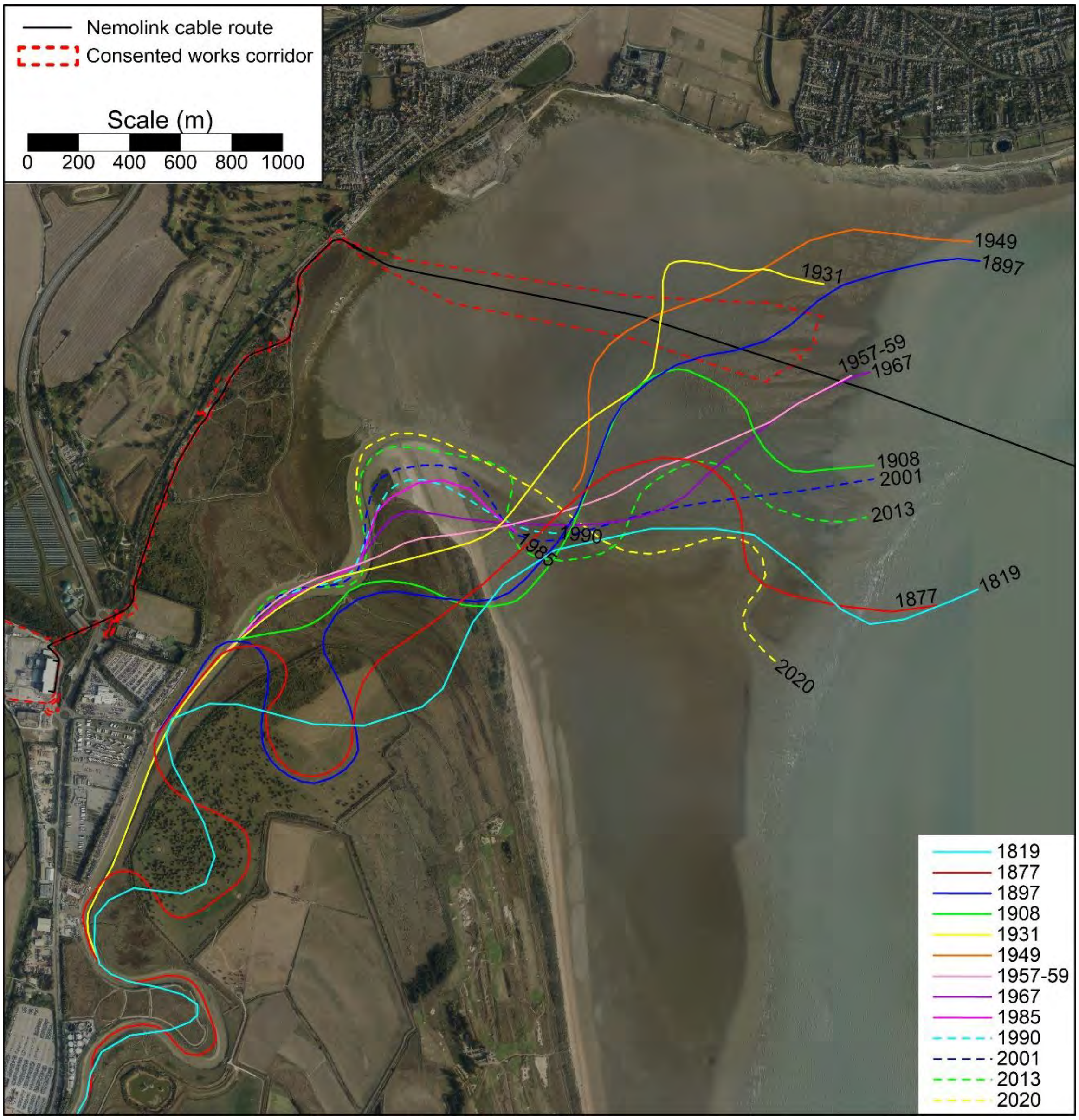


Figure A1.23 Aerial photograph flown 19/09/2020. Coloured lines indicate the position of the centreline of the low water channel mapped from historical Ordnance Survey maps and aerial photographs. Aerial photograph source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

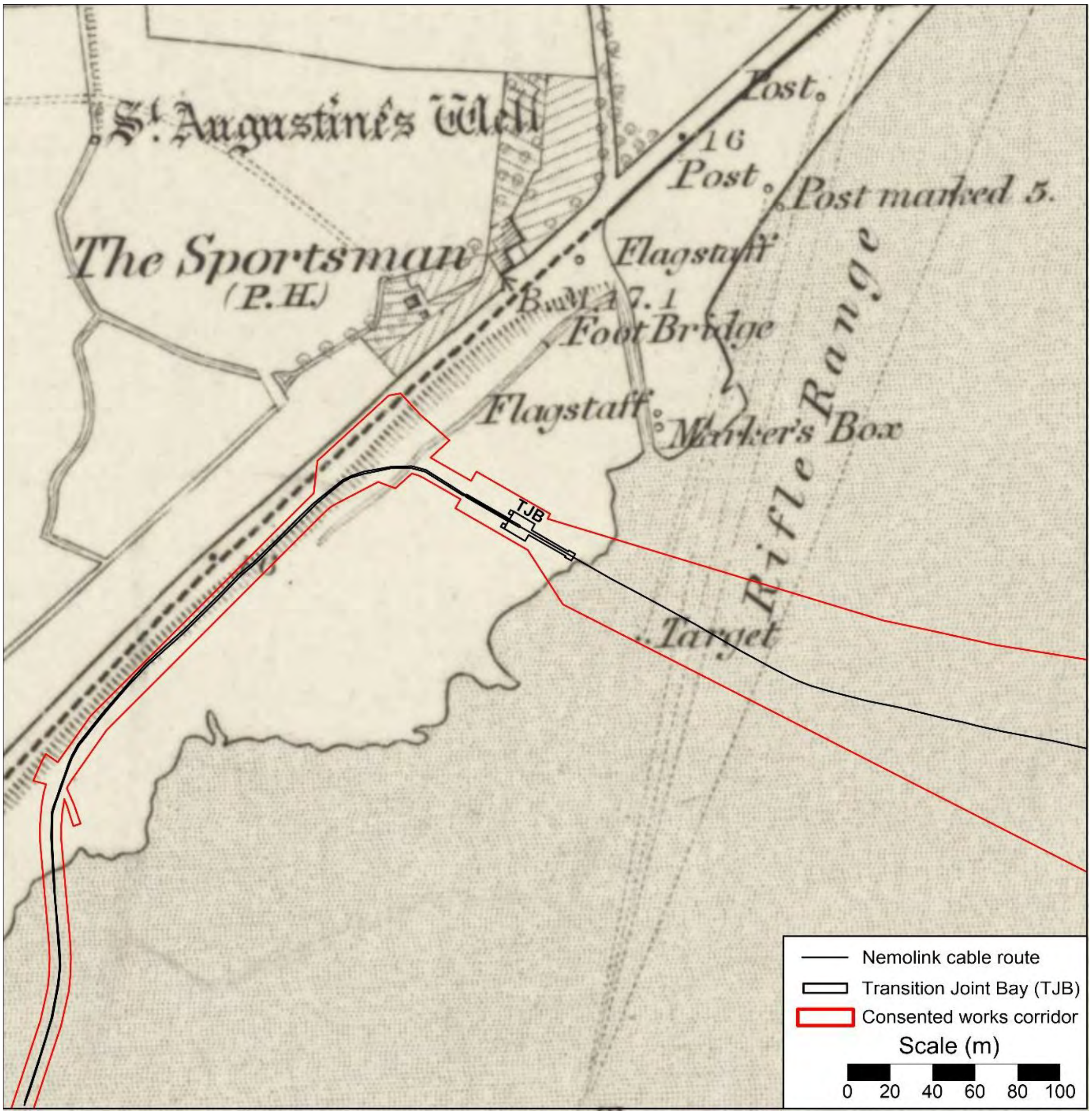


Figure A1.24 Six-inch Ordnance Survey map (Kent Sheet XXXVII.7), First Edition, surveyed 1872, published 1877. Source: The National Library of Scotland

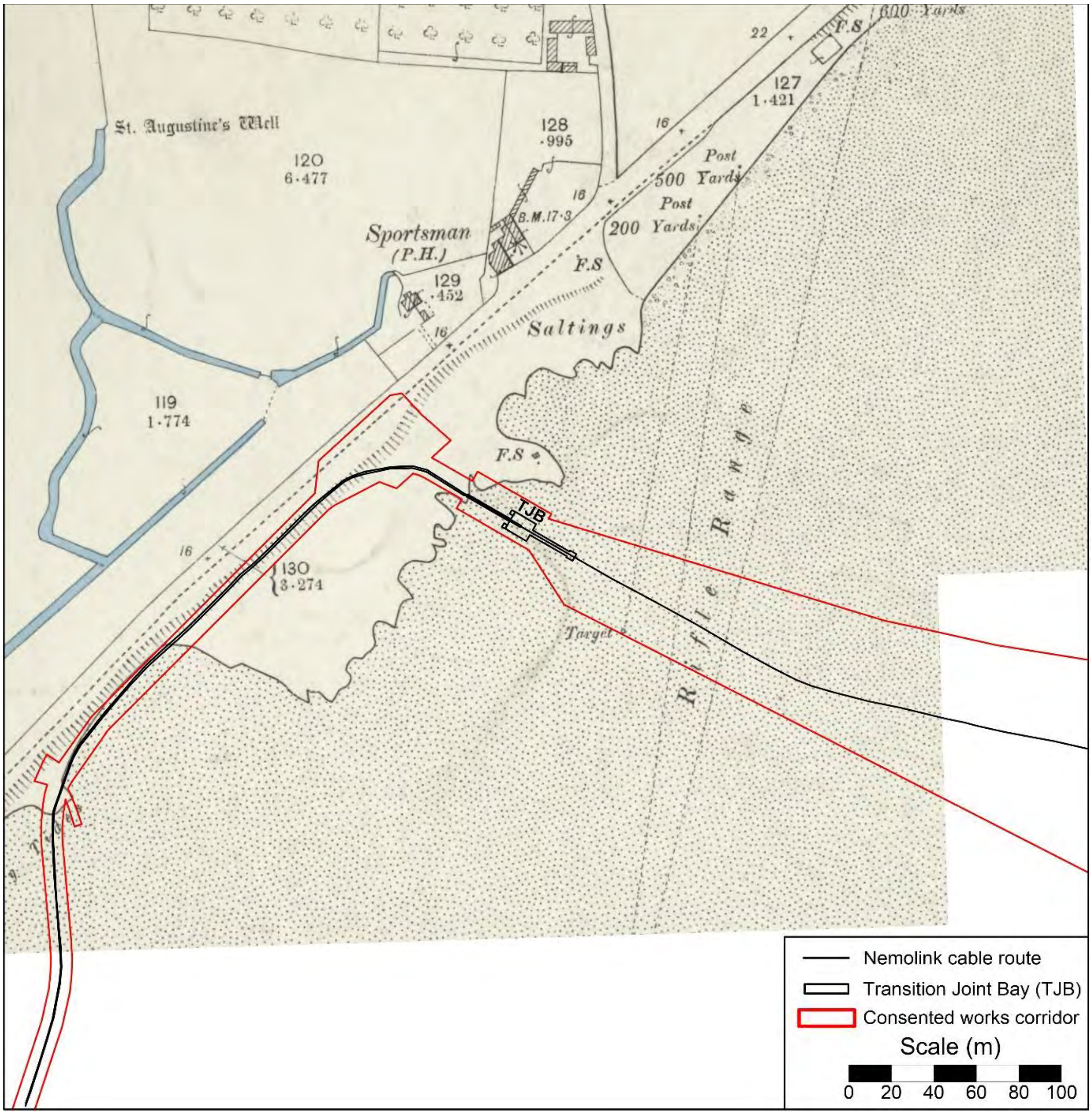


Figure A1.25 Twenty-five-inch Ordnance Survey map (Kent Sheet XXXVII.7), Second Edition, revised 1896, published 1898. Source: The National Library of Scotland

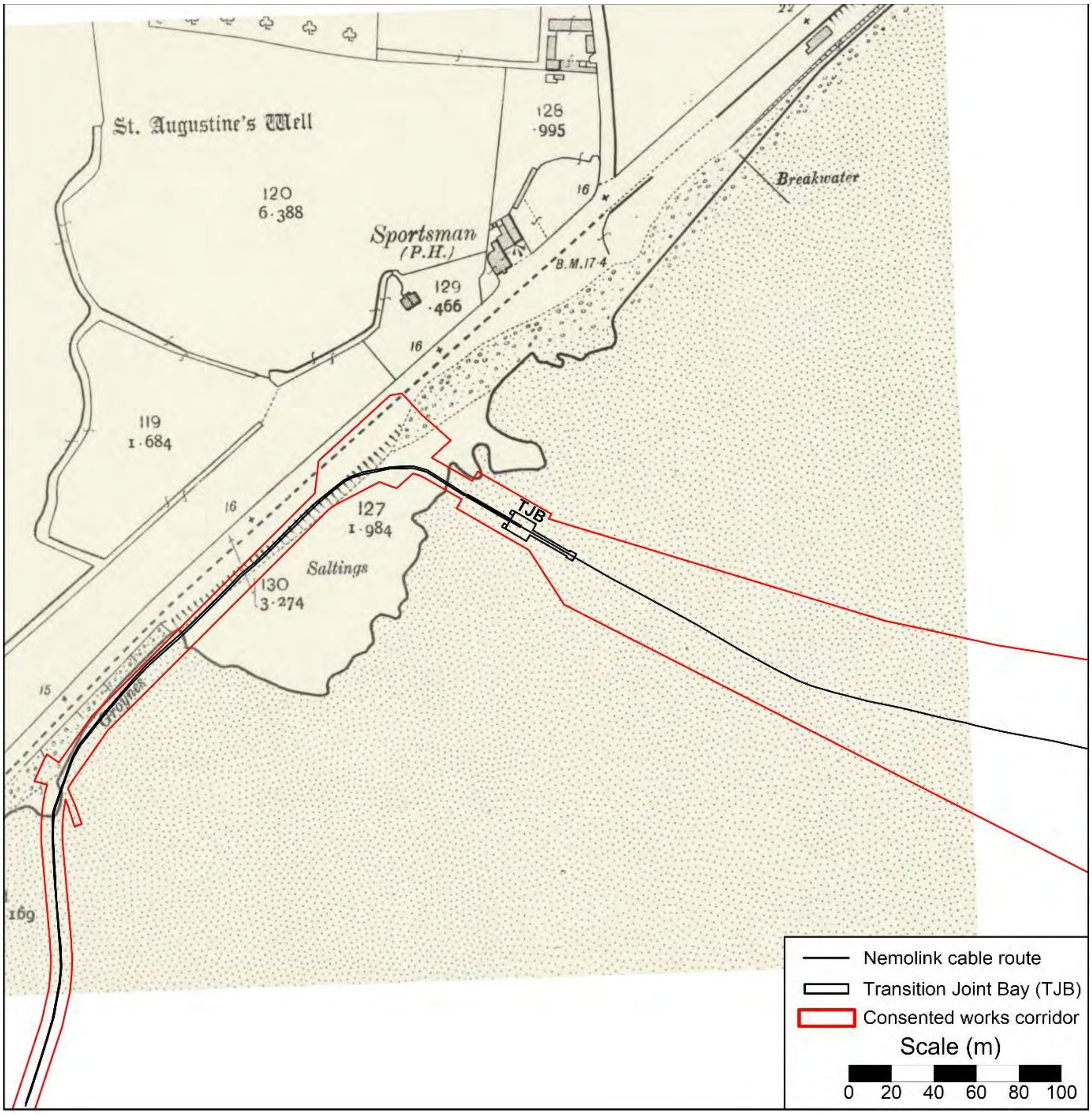


Figure A1.26 Twenty-five-inch Ordnance Survey map (Kent Sheet XXXVII.7), Third Edition, revised 1905, published 1907. Source: The National Library of Scotland

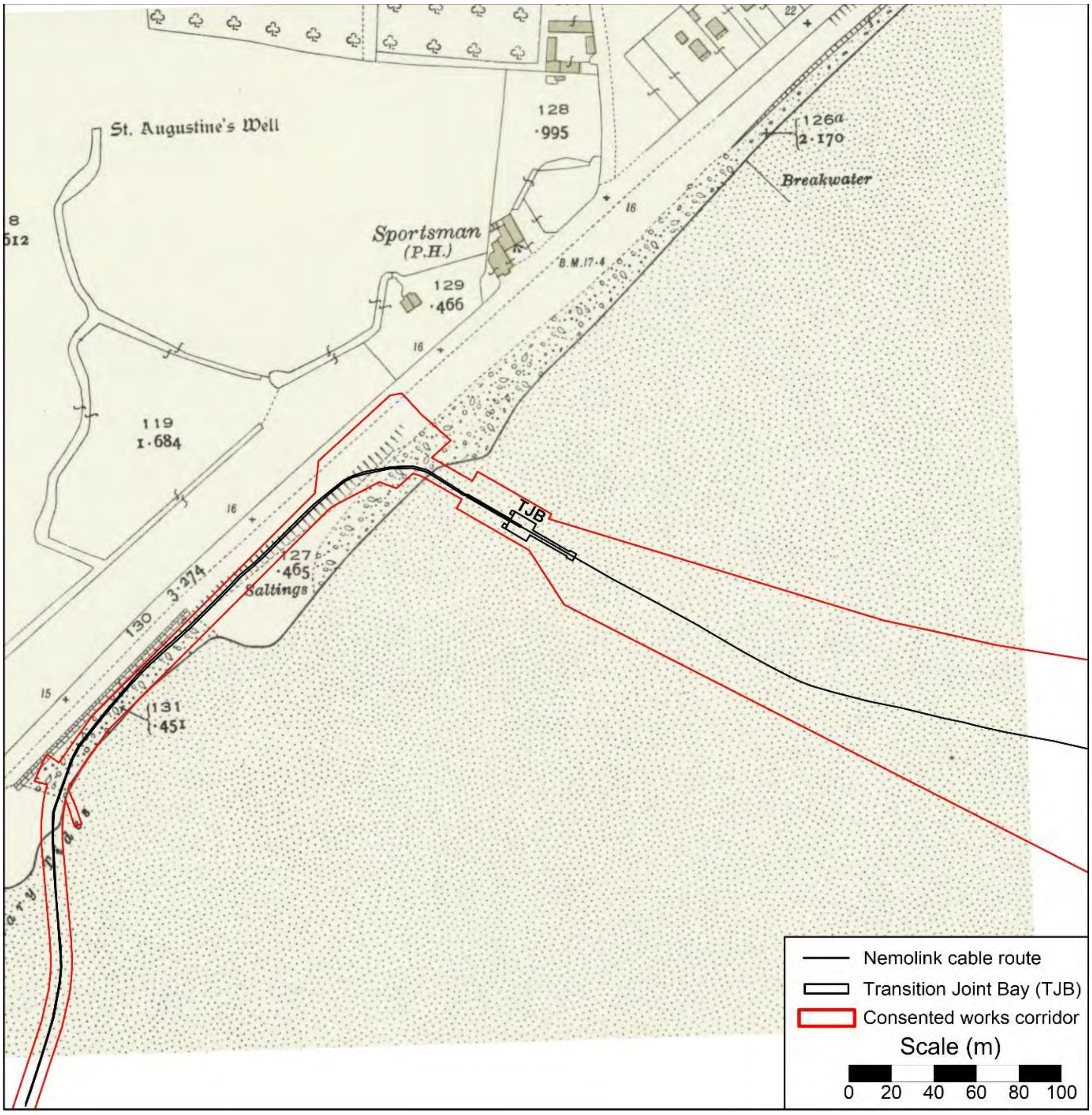


Figure A1.27 Twenty-five-inch Ordnance Survey map (Kent Sheet XXXVII.7), Edition of 1933, revised 1931, published 1933. Source: The National Library of Scotland

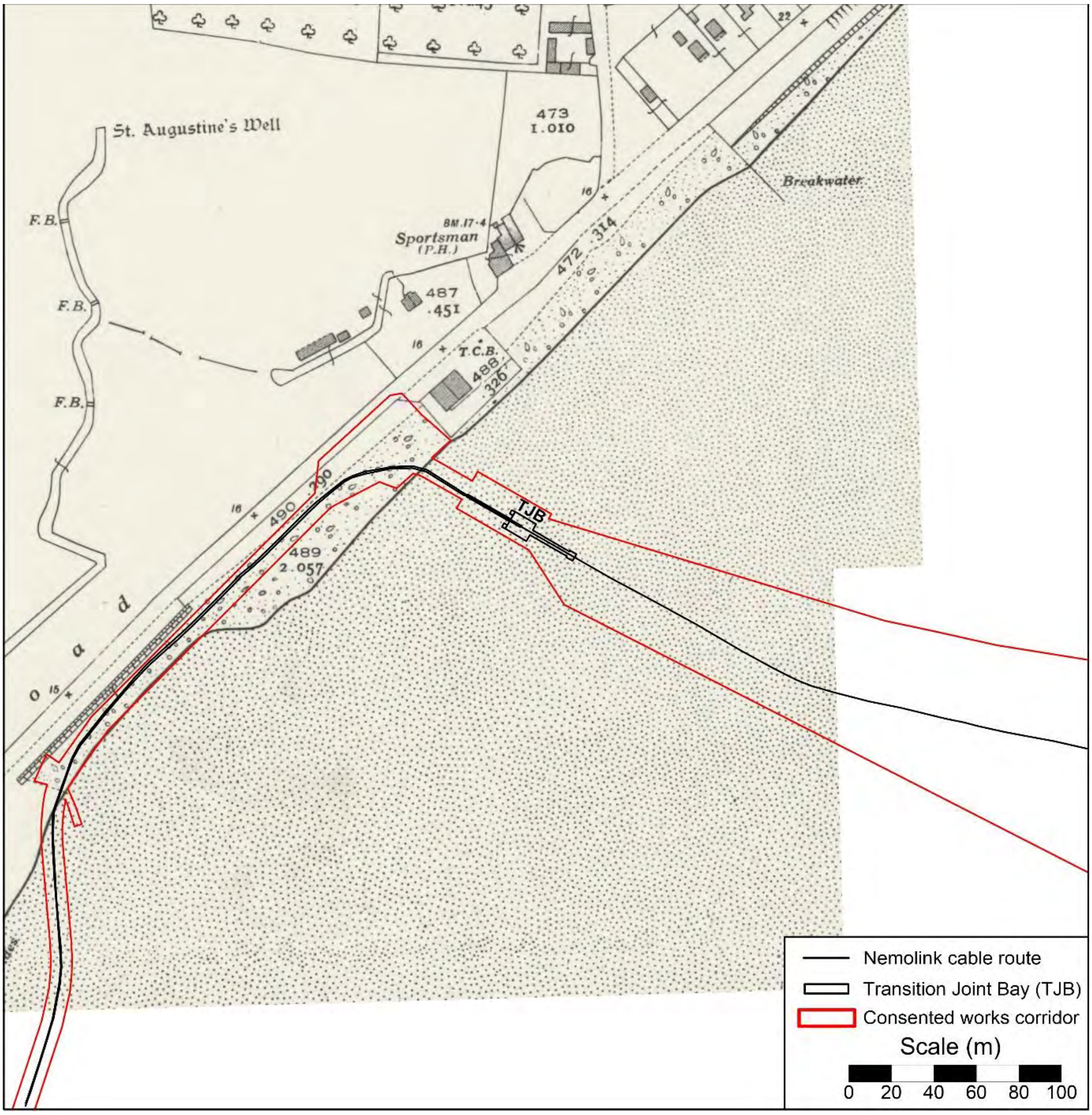


Figure A1.28 Twenty-five-inch Ordnance Survey map (Kent Sheet XXXVII.7), Revision of 1938, revised 1938-39, published 1946. Source: The National Library of Scotland

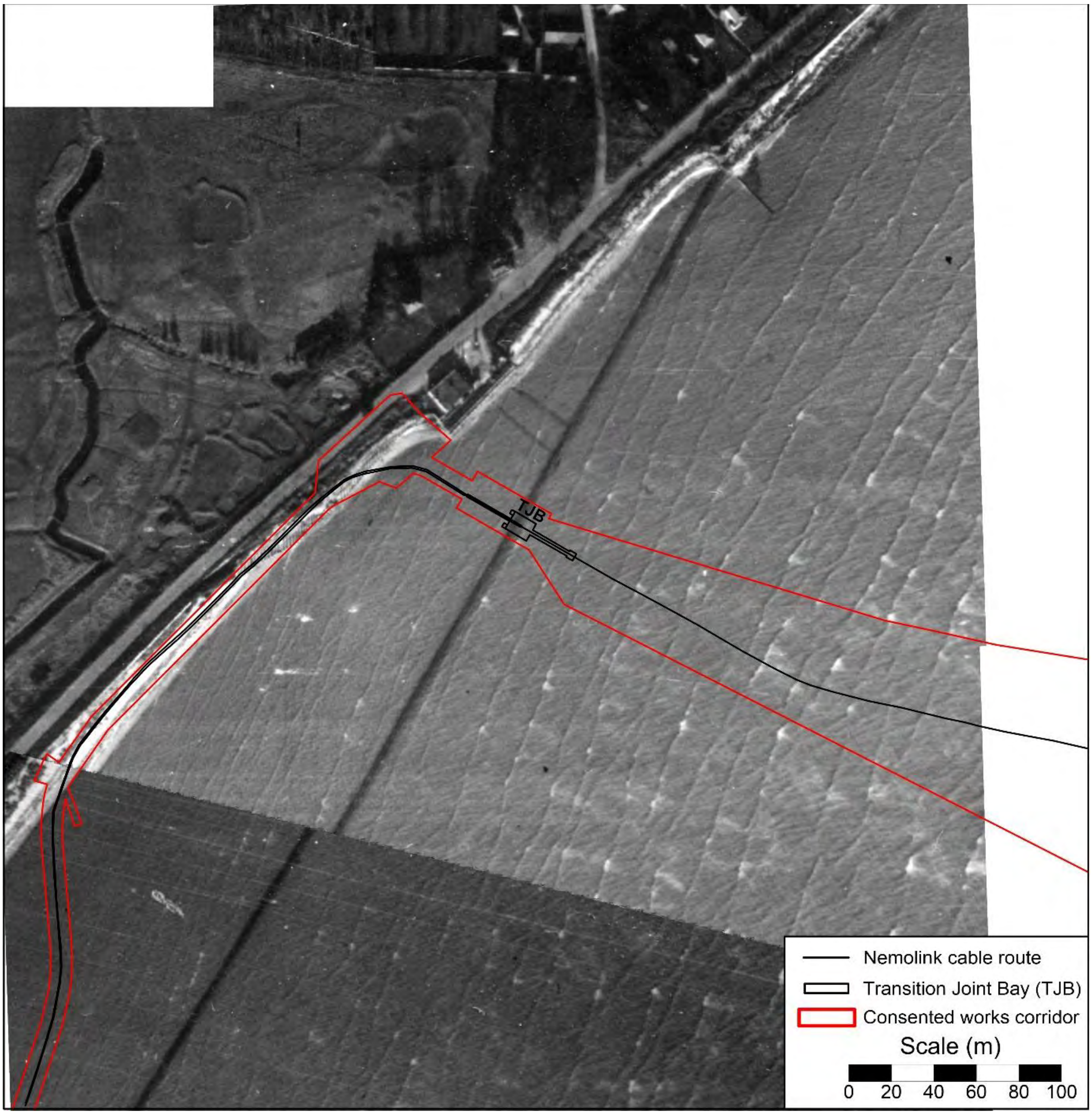


Figure A1.29 Aerial photograph flown 1940 by the RAF. Source: Google Earth

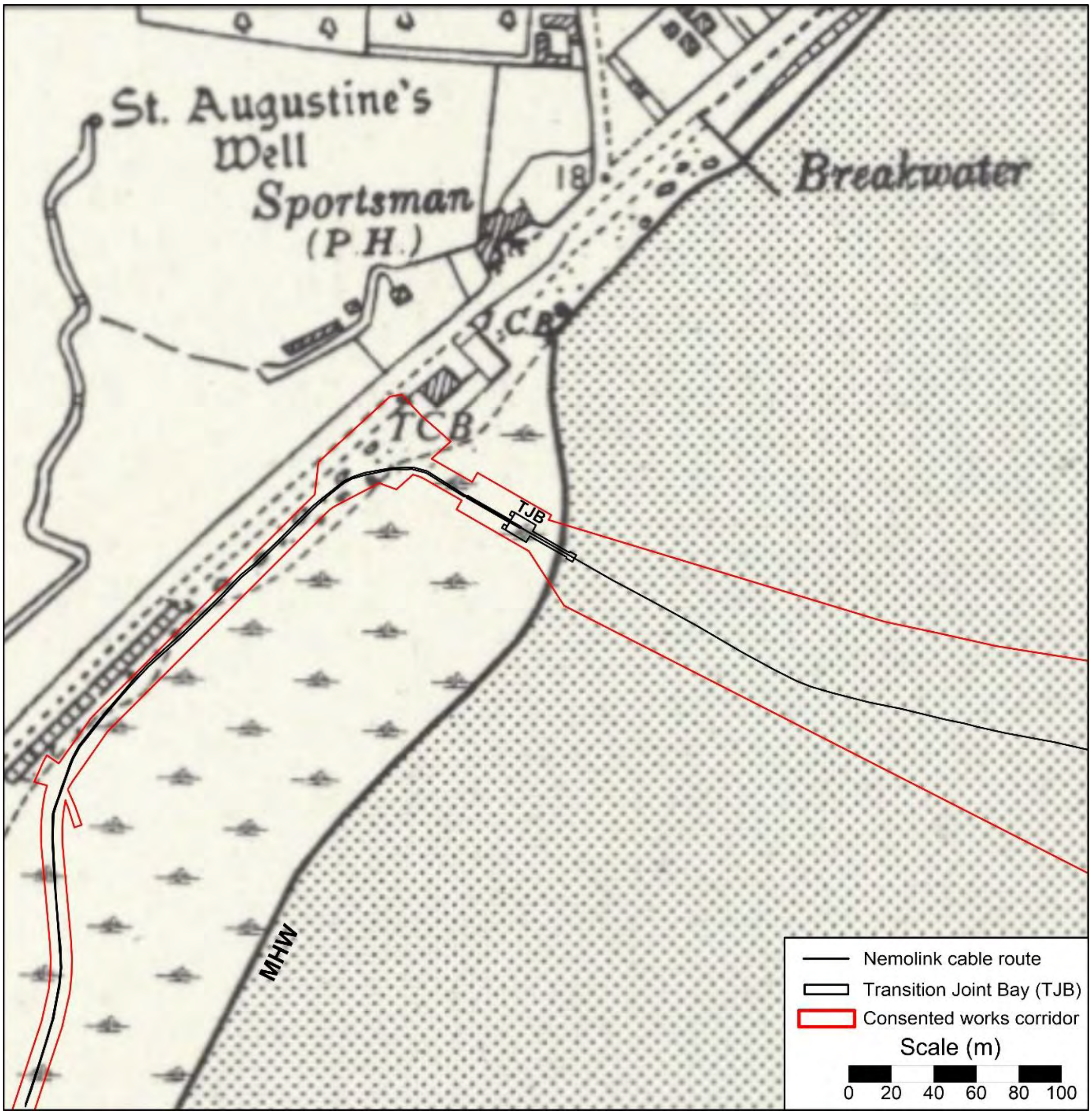


Figure A1.30 Six-inch Ordnance Survey map (National Grid Sheet TR36SW), revised 1957, published 1960. Source: The National Library of Scotland

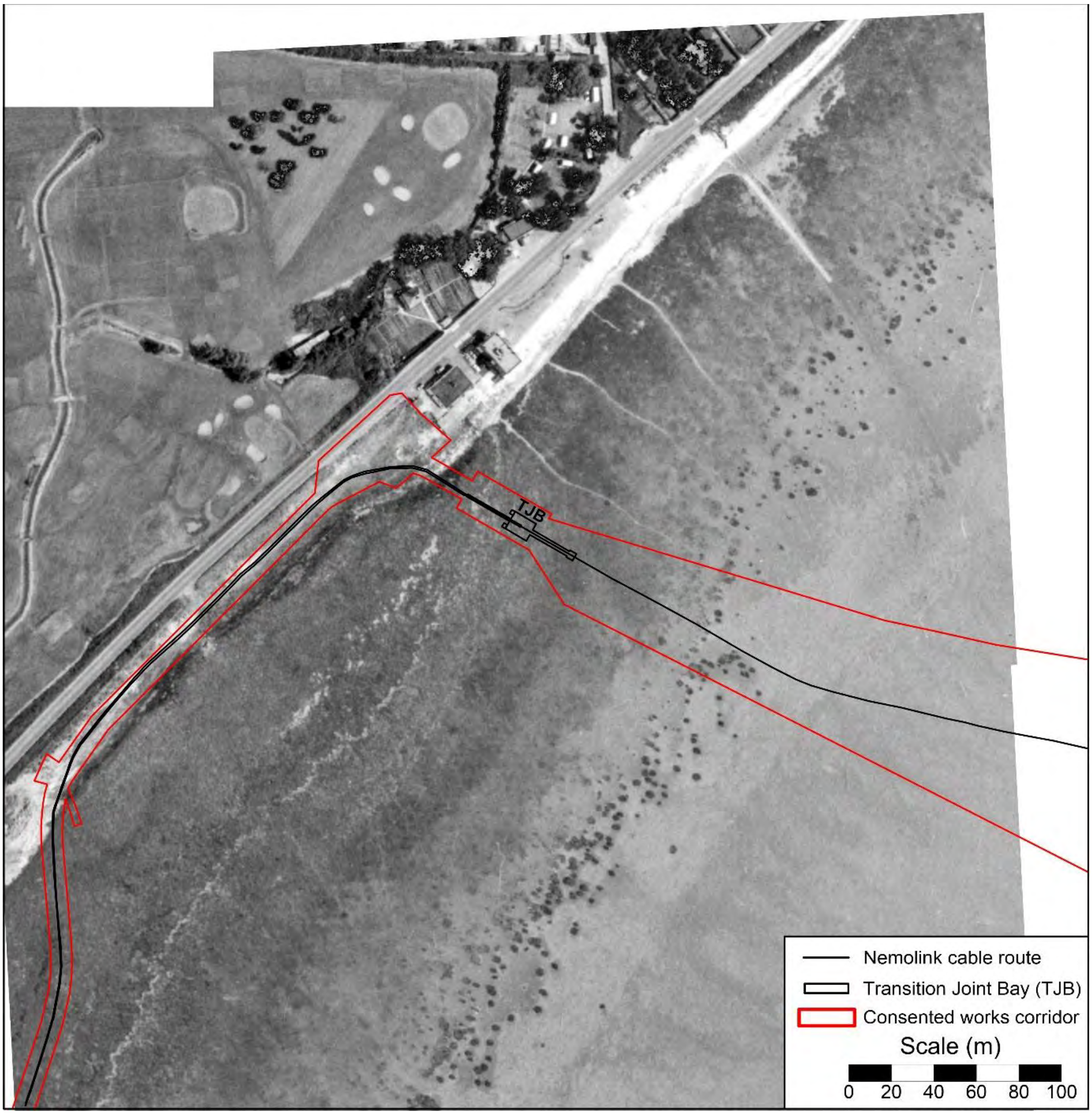


Figure A1.31 Aerial photograph flown 1960. Source: Kent County Council / Google Earth

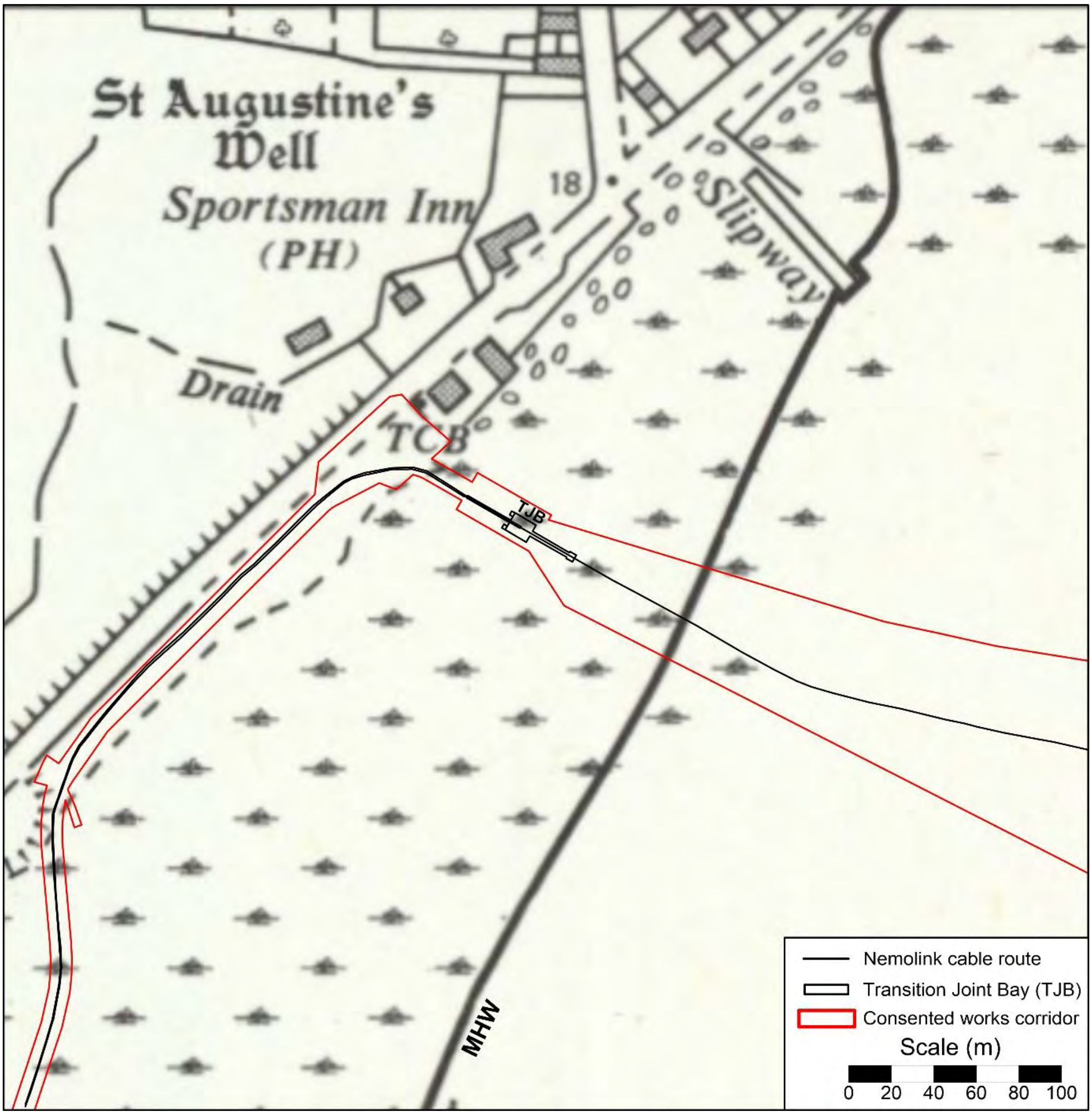


Figure A1.32 Six-inch Ordnance Survey map (National Grid Sheet TR36SW), revised 1963, published 1968. Source: The National Library of Scotland

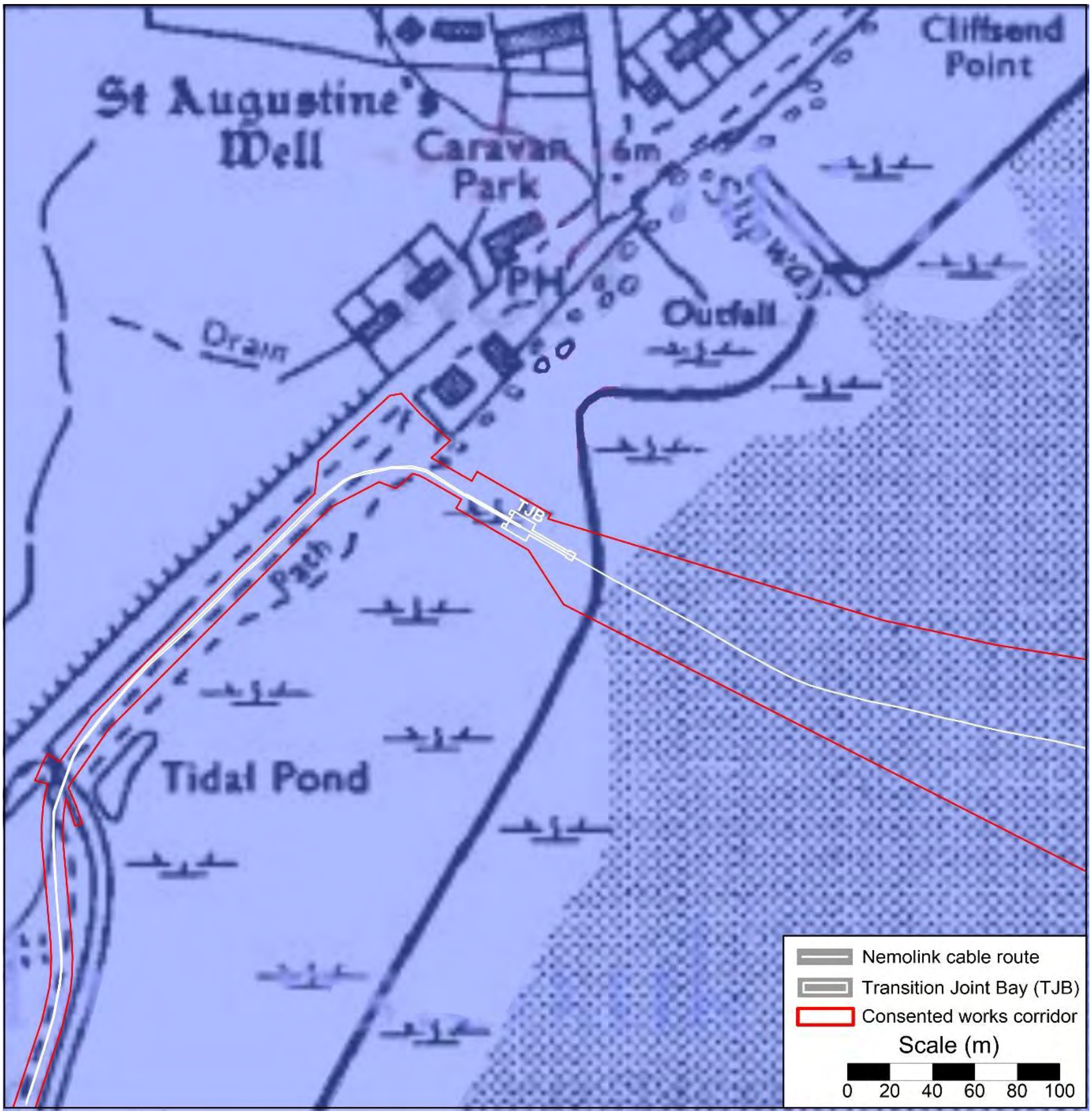


Figure A1.33 1:10,000 Ordnance Survey map, revised 1980, published 1982. Source: Landmark ProMap

Figure A1.34 Aerial photograph flown 1990. Source: Kent County Council / Google Earth

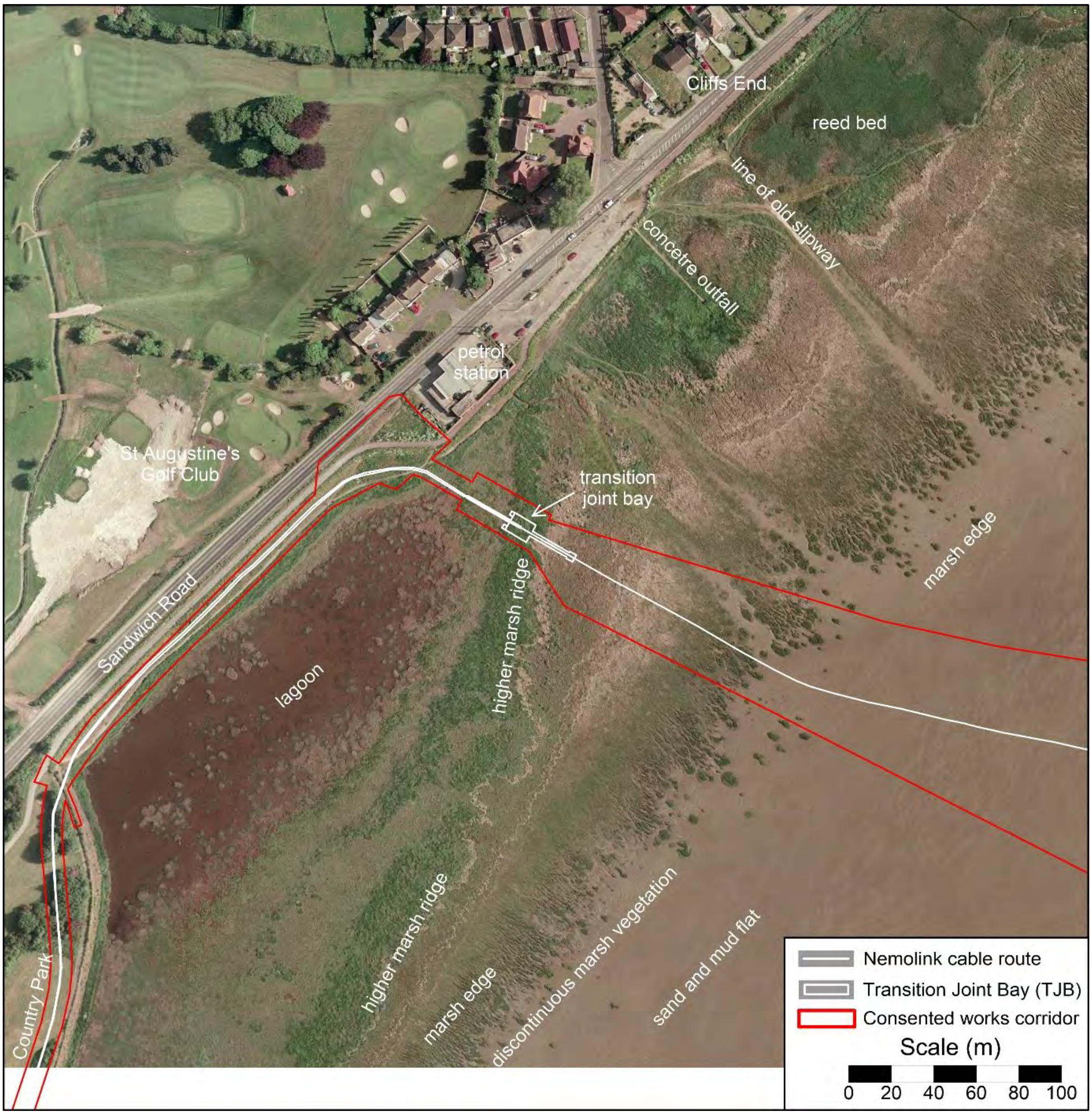


Figure A1.35 Aerial photograph flown 05/05/2001. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

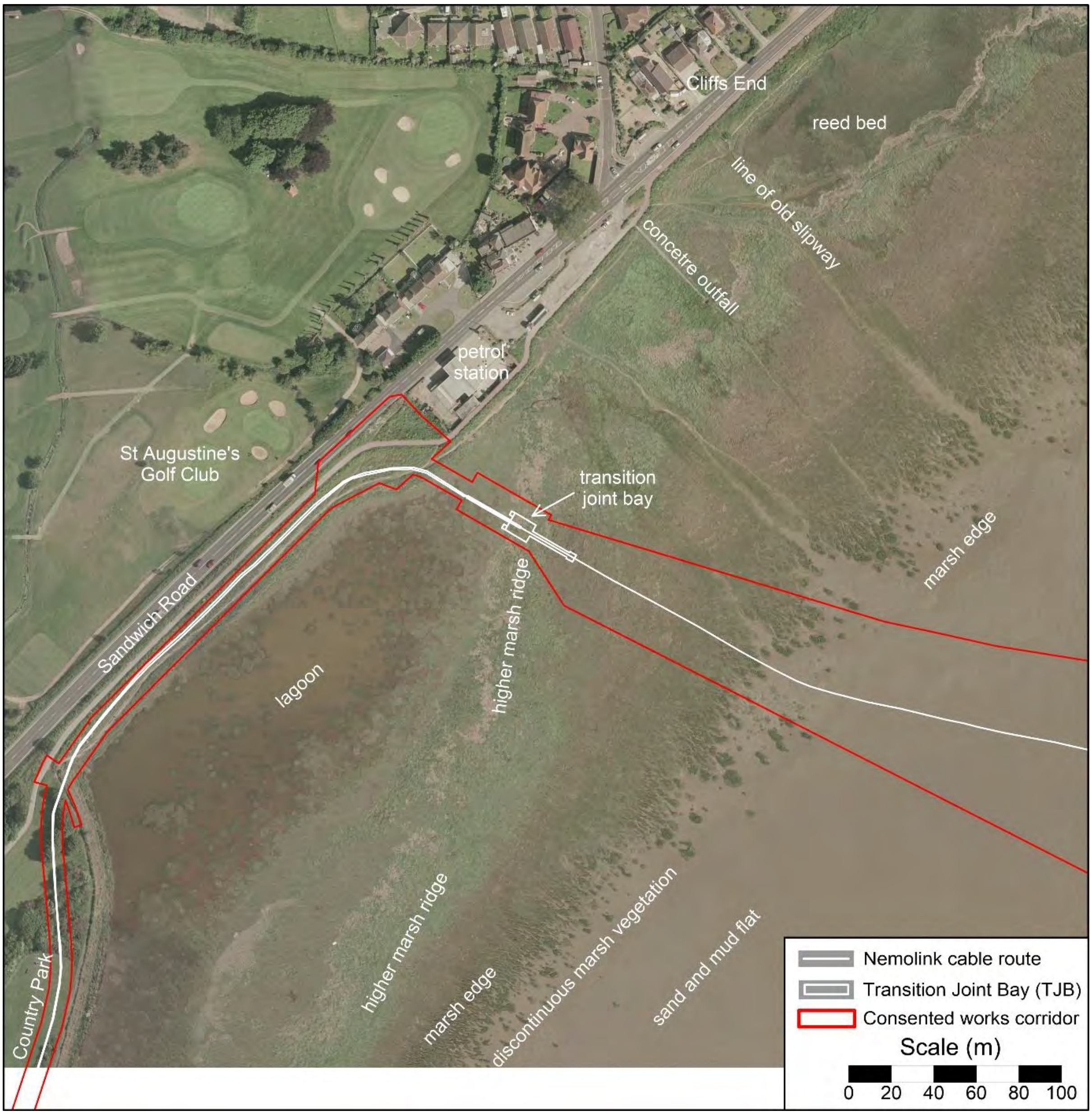


Figure A1.36 Aerial photograph flown 07/06/2005. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

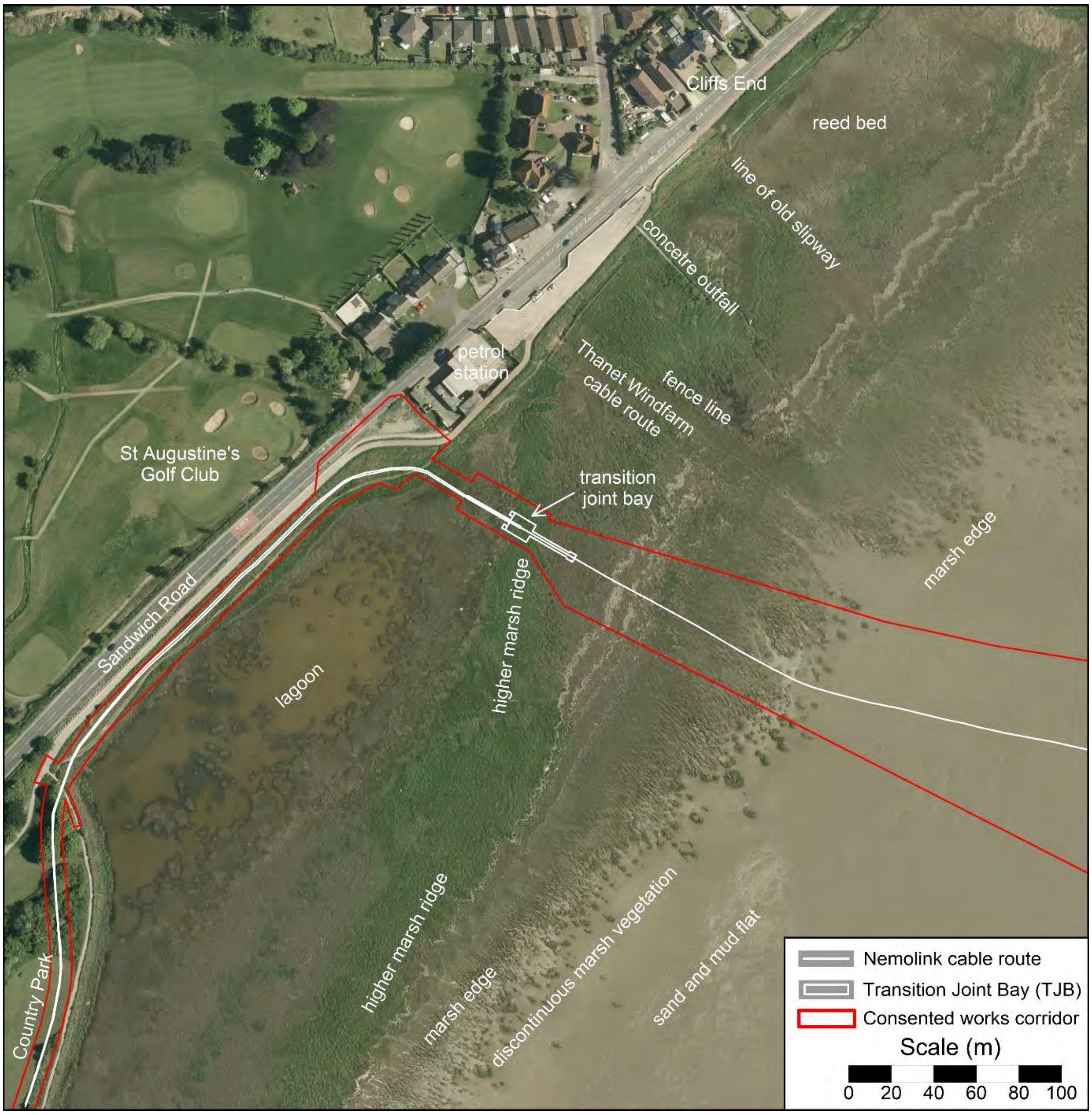


Figure A1.37 Aerial photograph flown 27/05/2013. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

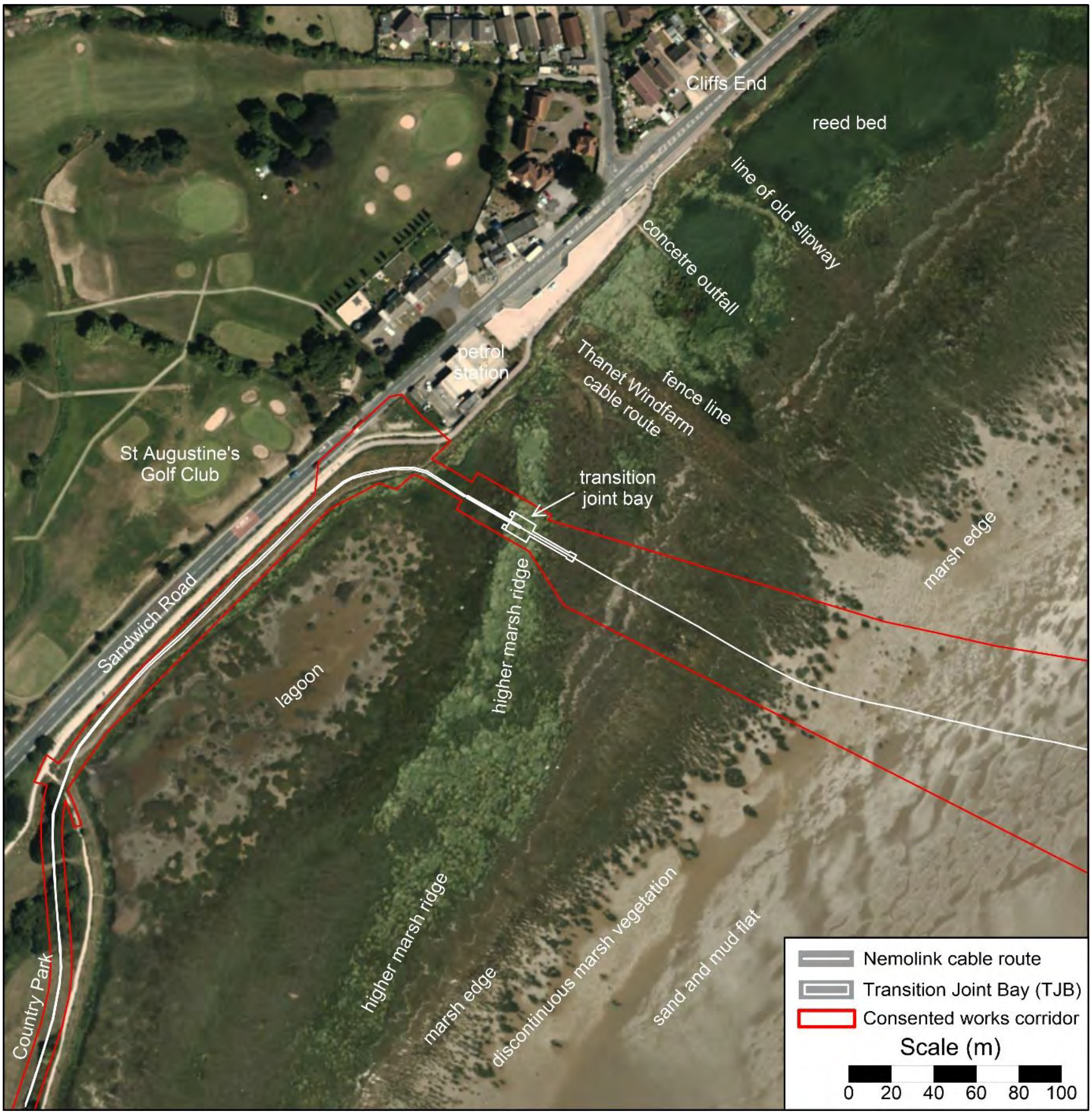


Figure A1.38 Aerial photograph (RGBN) flown 15/07/2013. Source: Open Government DEFRA Data Services Platform

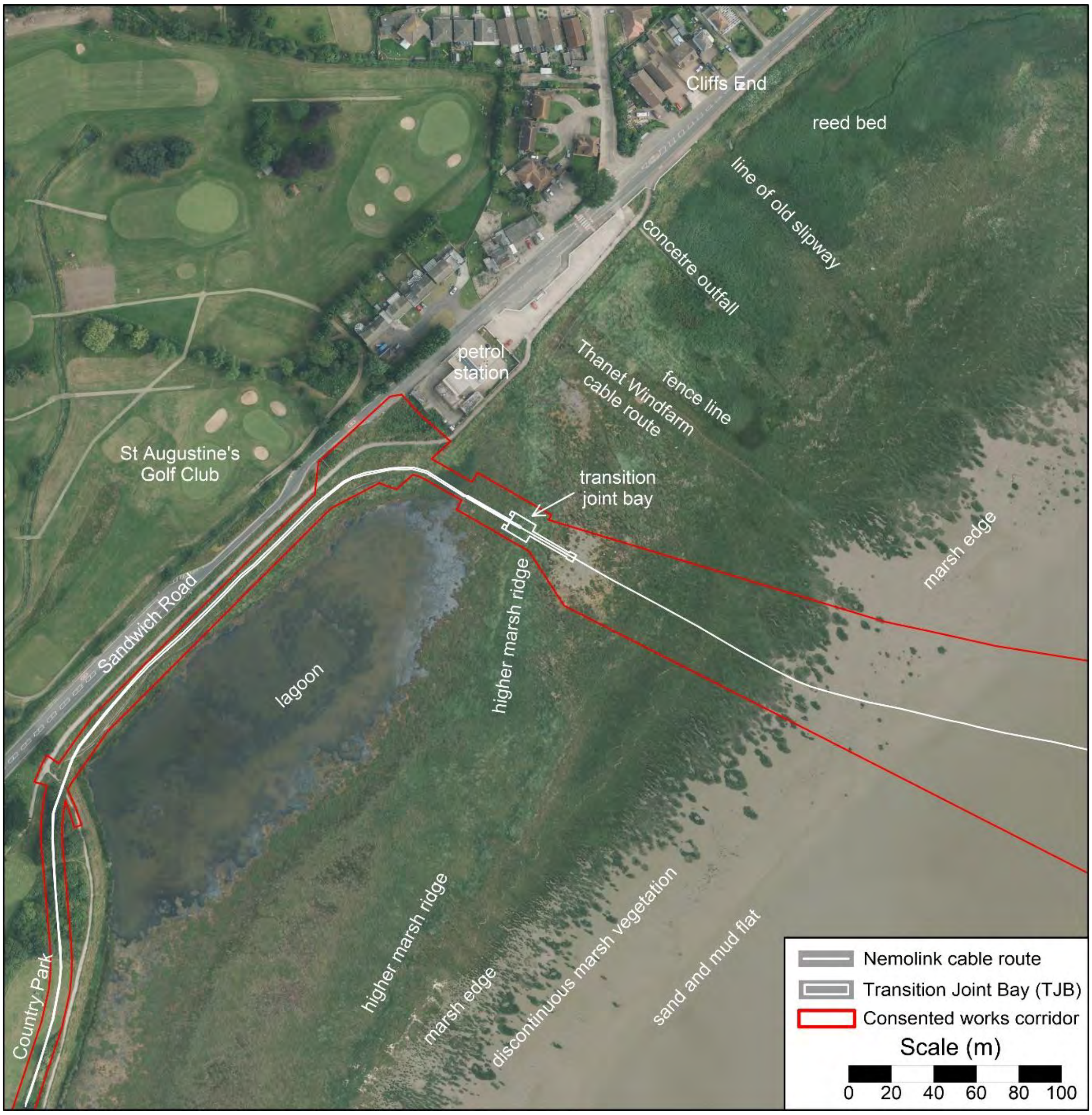


Figure A1.39 Aerial photograph flown 07/07/2016. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

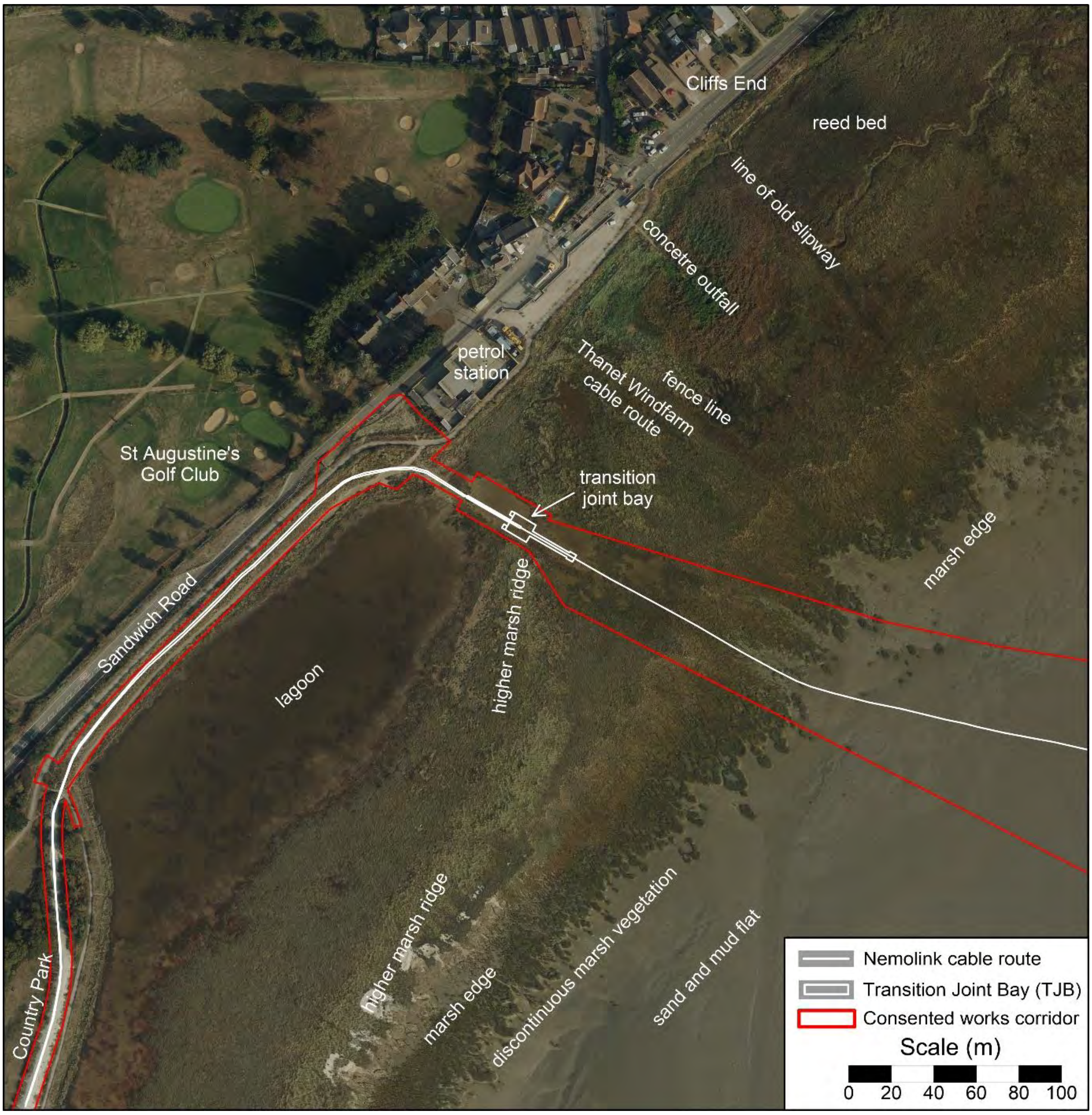


Figure A1.40 Aerial photograph flown 19/09/2020. Source: Channel Coastal Observatory / National Network of Regional Coastal Monitoring Programmes

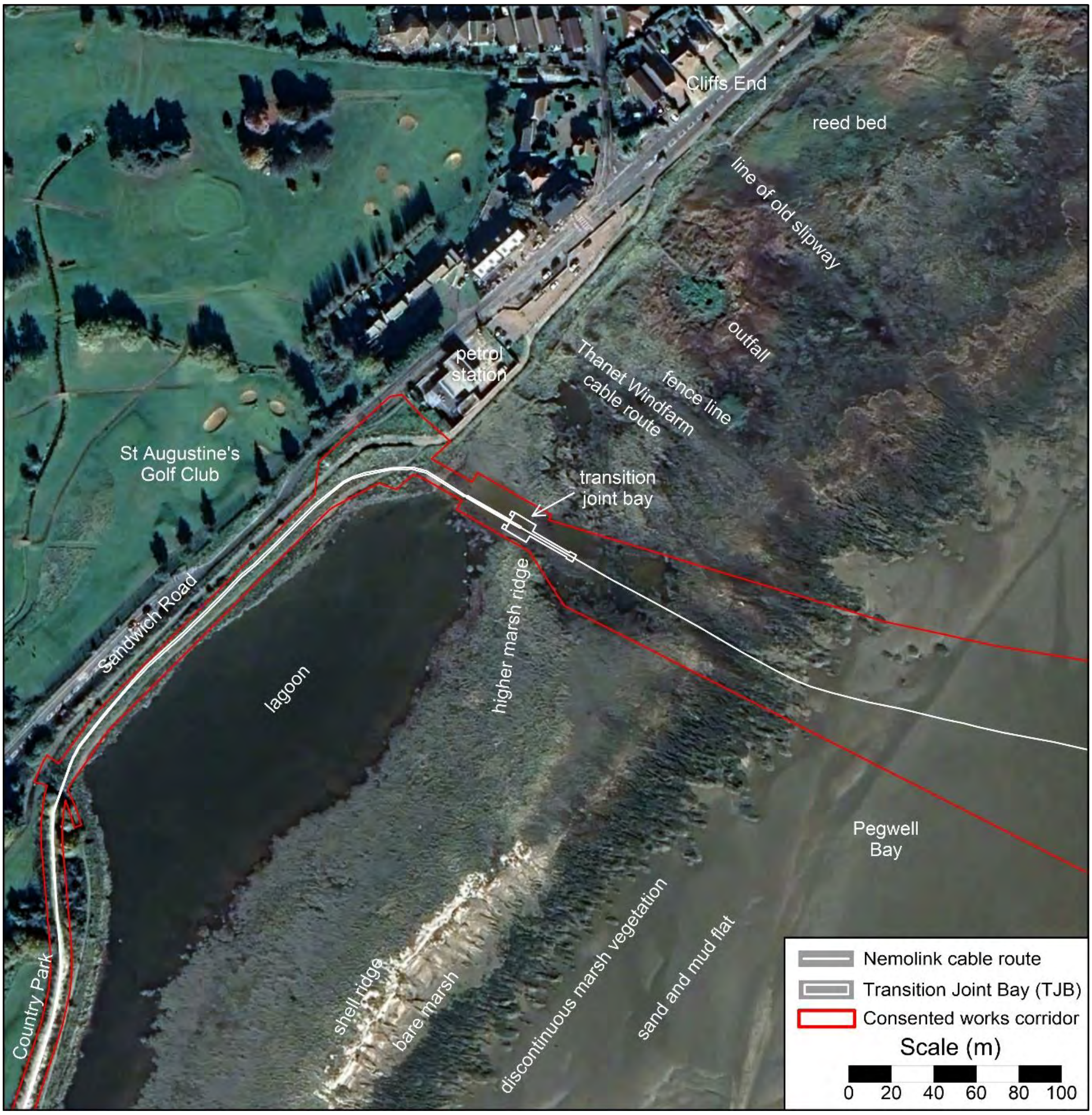


Figure A1.41 Satellite image captured 15/10/2022. Source: Airbus / Google Earth

Appendix 2

Photographs of topographical and hydrological features - June 2022

Photograph A2.1 View along the cable corridor from the petrol station end, 08 June 2022

Photograph A2.2 View along the cable corridor from the petrol station end

Photograph A2.3 View along the cable corridor from the petrol station end

Photograph A2.4 View from Pool A towards the Lagoon; note desiccation cracks

Photograph A2.5 View across the connection between the cable corridor and Lagoon

Photograph A2.6 View along the landward side of the Lagoon

Photograph A2.7 View east along the shore behind the petrol station, showing ‘connecting’ channel

Photograph A2.8 The low ridge between Pool A and Pool B

Photograph A2.9 Clumps of perennial glasswort on the slightly higher western margin of Pool B

Photograph A2.10 View along Pool B towards the petrol station

Photograph A2.11 View east across Pool B

Photograph A2.12 View seawards across Pool B

Photograph A2.13 The low ridge separating Pool B from Pool C

Photograph A2.14 View seawards across Pool C

Photograph A2.15 View landwards across Pool C

Photograph A2.16 View landwards from the new ridge formatting seaward of Pool C

Photograph A2.17 Accumulation of wave deposited shells on the new seaward ridge

Photograph A2.18 The seaward margin of the cable corridor

Photograph A2.19 The seaward end of the intertidal access route – view seaward at high water of a neap tide

Photograph A2.20 View landward along the intertidal access corridor at low neap tide

Photograph A2.21 A small natural pool between the intertidal access route and the cable corridor

Photograph A2.22 View northeast along the marsh front from the seaward end of the cable corridor

Photograph A2.23 View southwest from the seaward end of the cable corridor

Photograph A2.24 The marsh edge to the southwest of the cable route

Photograph A2.25 *Spartina* colonization of erosional mud mounds

Photograph A2.26 Shell chenier ridges migrating landwards southwest of the cable route

Photograph A2.27 Closer view of transgressive chenier ridge, view southwest

Photograph A2.28 Closer view of chenier ridge, view northwest towards cable route

Photograph A2.29 Erosional mud mounds and transgressive chenier ridge, view towards lagoon

Photograph A2.30 Small transgressive lobe of shells, looking towards cable route

Photograph A2.31 The high marsh ridge southwest of the cable route

Photograph A2.32 Transition between mid-marsh and high marsh ridge, southwest of the cable route

Photograph A2.33 Eastern margin of the lagoon behind the high marsh ridge, with relatively low water level

Photograph A2.34 View southwest across the lagoon from the petrol station end

Photograph A2.35 View northeast across the western end of the lagoon from the County Park

Photograph A2.36 View southwest along the seaward edge of the Country Park and cable route

Photograph A2.37 View northeast across the lagoon from the seaward end of the Country Park

Photograph A2.38 View east across the lagoon from the northeastern end of the Country Park

Photograph A2.39 Shallow pool lying between the Nemo Link cable route and the Thanet OWF cable route

Photograph A2.40 Creek connecting the lagoon and the pool to the north of the Nemo Link cable route

Photograph A2.41 View southwest showing the shallow connecting channel behind the petrol station

Photograph A2.42 View southwest across the landward end of the cable route, lagoon to top right

Appendix 3

Photographs of topographical and hydrological features - June 2022

Photograph A3.1 View along the cable corridor from the petrol station end

Photograph A3.2 View from the higher ground to west of the petrol station showing high water levels

Photograph A3.3 View southwest along the landward margin of the lagoon

Photograph A3.4 View northeast along the small channel behind the petrol station

Photograph A3.5 View along the cable corridor from the petrol station end, Pool A in middle distance

Photograph A3.6 The slightly higher ridge, now revegetated, between Pool A and Pool B

Photograph A3.7 View across the cable corridor showing revegetation in the area of the TJB

Photograph A3.8 View across Pool A and the cable corridor towards the petrol station end

Photograph A3.9 View along the cable corridor showing Pool B and Pool C in the distance

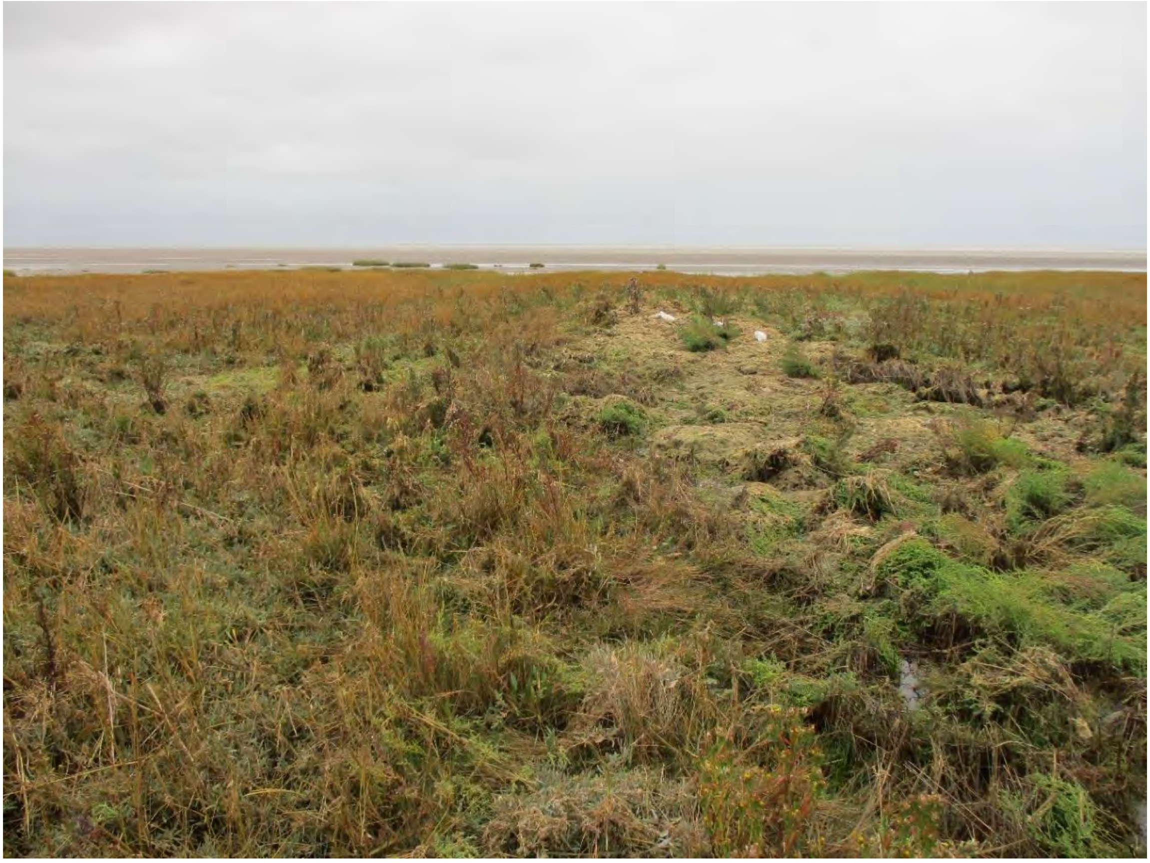
Photograph A3.10 Recent growth of annual and perennial Glasswort on the margins of Pool B

Photograph A3.11 Closer view of colonizing vegetation on the margins of Pool B **(Quadrat X)**

Photograph A3.12 New vegetation growth on the ridge between Pool B and Pool C

Photograph A3.13 View across Pool C towards the new ridge forming near the marsh edge

Photograph A3.14 View landward across Pool C



Photograph A3.15 View along the new low ridge forming near the marsh edge

Photograph A3.16 Deposition of shells in zone of former mud mounds and new marsh edge ridge growth

Photograph A3.17 View along the intertidal access corridor, showing colonization by *Spartina*

Photograph A3.18 View landward from the seaward end of the intertidal access corridor

Photograph A3.19 View southwest along the marsh front near the seaward end of the cable route

Photograph A3.20 View landward from the seaward end of cable corridor

Photograph A3.21 View southwest across the intertidal flats to seaward of the marsh edge

Photograph A3.22 View northeast across the intertidal flats to seaward of the marsh edge

Photograph A3.23 The transgressive chenier ridge to the southwest of the cable route (view southwest)

Photograph A3.24 The high marsh ridge and mid to low marsh transition west of the cable route (view NE)

Photograph A3.25 Development of new Spartina low marsh to seaward of the eroding mid marsh

Photograph A3.26 View along the transgressive chenier ridge (view southwest)

Photograph A3.27 View landward towards the lagoon from the transgressive chenier ridge

Photograph A3.28 The seaward side of the lagoon (southwestern end)

Photograph A3.29 The SW end of the lagoon, showing high water level and healthy marginal vegetation

Photograph A3.30 View north along the seaward side of the lagoon, with high marsh ridge to the right

Photograph A3.31 The high marsh ridge immediately southwest of the cable corridor

Photograph A3.32 The landward side of the lagoon, showing high water level

Photograph A3.33 View across the lagoon from the County Park

Appendix 4

Quadrat data from 2022 NVC surveys

Table A4.1 Qualitative descriptions of Zone 1 and Zone 8 Quadrats – Quadrats assessed using qualitative DAFOR scale: D- Dominant, A – Abundant, F- Frequent, O- Occasional and R- Rare
Note – Quadrats in Zones 1 and 8 located along the landward edge of the lagoon were not surveyed in detail – descriptions of the vegetation present are provided in Table A1.1 below and in the main report above and photos provided in Appendices 2 and 3.

Quadrat Number	June 2022	October 2022
1.1	Quadrat located on earth bank forming landward edge of the marsh, adjacent to footpath, with fuel station beyond. Vegetation comprising a heatlhy grassland assemblage dominated by Sea couch *Elytrigia atherica* with frequent False oat-grass *Arrhenatherum elatius*, and frequent – occasional herbaceous perennials including: Common nettle *Urtica dioica*, Alexanders *Smyrnium olusatrum*, Hogweed *Heracleum sphondylium*, bramble *Rubus fruticosus* agg., Sea beet *Beta vulgaris ssp. maritima*, and Hedge bedstraw *Galium mollugo*.	Similar in species composition to June survey, with transitional vegetation on ecotone between saline influence marsh and terrestrial verge species. Bank vegetation has greatest affinity with SM24 *Elytrigia atherica* salt marsh with MG1 *Arrhenatherum elatius* grassland at top of bank adjacent to footpath. Species assemblage as described in June 2022 with additional Fennel *Foeniculum vulgare* , red fescue *Festuca rubra*, Cock's-foot, *Dactylis glomerata*, Common mugwort *Artemisia vulgaris*, Perennial wall-rocket *Diplotaxis tenuifolia* and Common mallow *Malva sylvestris*.
1.2	Quadrat located on level area between footpath and road, in location revegetating following use as storage and lay down area for construction works in 2020 (when not accessible) Grassland re-establishing and returning to healthy sward with occasional herbaceous species.. Sward relatively species-poor and dominated by Perennial rye-grass, *Lolium perenne*, common couch *Elytrigia repens*, red fescue with frequent ribwort plantain *Plantago lanceolata*, and occasional Sea beet, teasel *Dipsacus fullonum*, Cock's-foot and Broad-leaved dock *Rumex obtusifolius*.	Relatively species-poor grass-dominated sward similar to that present in June 2022, dominated by Common couch, Perennial rye-grass, and red fescue, with occasional dandelion *Taraxacum officinalis* agg., Creeping bent *Agrostis stolonifera*, and Prickly ox-tongue *Helminthotheca echioides*.
1.3	Quadrat located in strip of grassland dominated vegetation between cyclepath adjacent to road and footpath. Rank, unmanaged grassland, with tall herbaceous perennials. Sward dominated by False oat-grass and Sea couch, with abundant Fennel, frequent Oxeye daisy *Leucanthemum vulgare*, and occasional Sea beet, Alexanders and Common mugwort	Grassland with more apparent dominance by Elytrigia atherica with dead seedheads of perennial species and basal regrowth, with species as in June with occasional Blackthorn *Prunus spinosa* and Perennial wall-rocket.
1.4	Roadside verge, between road and cyclepath. Narrow strip of vegetation with low bund adjacent to cyclepath Dominated by Sea couch, False oat-grass, with abundant Fennel, Oxeye daisy, frequent Alexanders, and occasional Hogweed, Common mallow, Greater knapweed *Centaurea scabiosa* and common mugwort.	Roadside verge dominated by rank grassland species and tall herbs – similar to survey in June 2022. Dominated by Sea couch, with frequent Fennel and Alexanders, and occasional False oat-grass, red fescue, Cock's-foot, and Perennial wall-rocket.
1.5	Dense, unmanaged grassland vegetation adjacent to footpath. Dominated by Sea couch, Fennel and Alexanders, with occasional bramble, False oat-grass, Oxeye daisy, Sea beet and Betony *Stachys officinalis*.	Similar vegetation to that present in June Grassland dominated by Sea couch and False oat-grass, with abundant Fennel, Alexanders, occasional Perennial wall-rocket, Salsify *Medicago sativa*, hedgerow cranesbill *Geranium pyrenaicum* and goat's rue *Galega officinalis*.
8.1	Southern most quadrat located on shore of lagoon with armoured seawall to landward. Fringe of linear marsh vegetation dominated by sea clubrush	Very similar marsh vegetation to June 2022 survey

	Bolboschoenus maritimus and sea couch, with sea clubrush forming locally dominant stands along lagoon shore, with narrow strip of Common cord-grass *Spartina anglica* along the waters edge.	5m wide strip of upper marsh dominated by sea clubrush and sea couch in approx. 50:50 proportions with narrow fringe of low marsh vegetation with *Spartina anglica* in good condition and abundant *Salicornia ramosissima* and Spear-leaved orache *Atriplex prostrata*.
8.2	Quadrat located on rock-armoured seawall, with concrete on sloping edge. Grassland with perennial and annual vegetation, generally consistent with previous surveys. Grass dominated by red fescue, Sea couch and Fennel with occasional Cock's-foot, Compact brome *Anisantha madritensis*, Soft brome *Bromus hordeaceous*, Rat-tail fescue *Vulpia myuros*.	Similar vegetation on armoured sea wall with edge of Sea couch dominated marsh fringe along toe of sea wall. Much vegetation died back with abundant Fennel and occasional Alexanders, Perennial wall-rocket, Cock's-foot, red fescue, and Rat-tail fescue
8.3	Saltmarsh on lagoon shore, in corner of lagoon adjacent to footpath. Transitional marsh dominated by Sea couch, with occasional Sea purslane, Sea aster, and *Suaeda maritima* along the waters edge. Vegetation appeared to have been eroded by high water levels with a reduced level of Common cord-grass present and a very slight erosional mud cliff of 2-3cm.	Transitional marsh similar in character to the June 2022 survey Sea couch dominant with frequent Sea aster, Sea purslane and *Suaeda* along shoreline
8.4	Quadrat located in frequently disturbed area of grassland adjacent to heavily used footpath. Grassland sward dominated by red fescue and Sea couch with occasional Ribbed melilot *Melilotus officinalis*, Stag's-horn plantain *Plantago coronopus*, Sea fern-grass *Catapodium marinum*, Fern-grass, *Catapodium rigidum*, and rare oxeye daisy and Fennel. The sward was more or less closed with approx. 5% bare ground and 10% of ground cover moss species.	Similar vegetation present to that recorded in June 2022. Occasional White clover *Trifolium repens*, Salsify, Perennial wall-rocket and Sea beet present but generally dominated by Sea couch and red fescue.
8.5	Quadrat located within grass-dominated verge adjacent to foot path and to landward side of path. Dominated by Sea couch, Cock's-foot, red fescue, and Common couch, with occasional Sea beet, Common bird's-foot-trefoil *Lotus corniculatus*, stag's-horn plantain, and Salsify.	Similar vegetation to that surveyed in June 2022, but generally senescent. Grass dominated sward with Sea couch dominant with White clover, Sea beent, stag's-horn plantain and Fennel.
8.6	5m wide strip of salt marsh vegetation along shore of lagoon. Dominated by Sea purslane *Atriplex portulacoides* and Sea couch with abundant Sea clubrush, *Spartina anglica*, Sea aster and Common glasswort *Saliconia europaea*	Marsh along lagoon edge. Water level high. Fringe with annual species abundant including *Salicornia ramosissima*, *Suaeda maritima*, with abundant Sea aster and Common cord-grass.

tbc

Appendix 4 – Data from NVC Quadrats: 2018-2022

NOTE: Zone 2 Quadrats located on the landward shore of the lagoon (2.1) and within the immersed area of the lagoon (2.2 – 2.5) were inaccessible at the time of the June and October 2021 surveys; Quadrats 2.6 to 2.9 associated with the corridor were sampled as shown below. 'A' = Associate - species present in adjacent area, with 'm' indicating distance away; 'X' represents dead vegetation. % Cover refers to the percentage area within the quadrat where a species is present, and hence totals may exceed 100%. Quadrats located within the works corridor are denoted in red

Table A4.2a Zone 2 Quadrat Data - % Cover data from Quadrats 2.6 to 2.7 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**
Quadrat numbers:	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**
Vegetation height (cm)	5	25	5	15	5	20	10	30	20	30	5	15	5	10	10	10	15	20	20	20
Open water	0	10	0	20	0	25	90	60	75	60	0	15	0	90	0	2	75	0	50	90
Water depth (cm)	0	2	0	3	0	5	3	3	5	3	0	1	0	3	0	<1	2	0	2	5
Bare ground	99	70	80	40	70	40	5	20	15	5	99	70	80	25	60	50	20	75	30	
Debris	0	0	1	1	2	0	0	0	2		0	0	0	1	0	0	0	0		2
Aster tripolium var discoideus				1	2	2		1	A	2	1	1			1	15		3	2	A
Atriplex portulacoides																			a	A
Elytrigia atherica																			a	A
Puccinellia maritima	1	A	2	3	20	30	3	5	3	8	1	1	1	1	3	20	5	5	5	3
Ruppia maritima																				
Salicornia sp	3		25		20		3	2	3		3		10		15		4	3	3	
Salicornia fragilis		15		25		10		20		20		13		20		5		10		10
Salicornia ramosissima		10		15		15		4		25		7		20		20		5		5
Sarcocornia perennis									A	5										5
Spartina anglica	1	1	3	5	10	25	12	25	25	15	1	1	2	4	10	5	15	20	30	15
Spergularia media					2															
Suaeda maritima		1		2		3						1								2
Triglochlin maritima																				
Bryozoan			1								1				I					
Enteromorpha spp.				1										1						
Filamentous algae	2	1		1							2			2	2					
Ulva lactuca	1										2	1		1						
Wrack brown alga				3					-	-				5			1			

Appendix 4 – Data from NVC Quadrats: 2018-2022

Table A4.2b Zone 2 Quadrat Data - % Cover data from Quadrats 2.8 to 2.9 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**
Quadrat numbers:	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**
Vegetation height (cm)	12	25	20	25	30	30	25	50	40	60	30	30	30	30	30	35	30	70	60	60
Open water	0	15	0	70	0	30	2	0	2	2	0	20	0	25	0	10	15	10	20	4
Water depth (cm)	0	2	0	5	0	5	2	0	2	3	0	4	0	5	0	5	3	3	5	3
Bare ground	80	15	30	50	2	20	0	0	0	0	15	1	10	2	4	0	0	0	0	0
Debris	0	2	3	0	3	1	1	0	2	2	0	0	5	1	2	1	2	0	1	
Aster tripolium var discoideus	6	4	5	A	3	2	20	20	8	25	20	30	25	30	5	10	20	20	10	20
Atriplex portulacoides	6		2	A	3	2	3	2	5	3	25	25	25	30	60	50	35	25	35	50
Elytrigia atherica									2	0	20	3	5	2	5	5			5	8
Puccinellia maritima	4	4	10	5	90	30	90	90	70	70	2	10	25	50	20	20	50	40	40	40
Ruppia maritima																				
Salicornia sp	8		20		5				0		1		2		2					
Salicornia fragilis		55		25		15						3		2		2				
Salicornia ramosissima		4		4		10						1		1		1				
Sarcocornia perennis																				
Spartina anglica	2	2	3	15	15	30	20	80	80	80	1	1	2	10	25	60	30	75	70	80
Spergularia media	1		2		2		4	3	3		1		1	1	4	2	3	2	2	
Suaeda maritima	1	1	1	2		2				2	1	1	1	5		5	5	2	3	3
Triglochlin maritima			1		A		2	3	2	3	1	1	1		4	2	5	2	8	15
Bryozoan													1	1		1				
Enteromorpha spp.																				
Filamentous algae	5	2		5								1								
Ulva lactuca	3	2									2									
Wrack brown alga				3											1					

Appendix 4 – Data from NVC Quadrats: 2018-2022

Table A4.3a Zone 3 Quadrat Data - % Cover data from Quadrats 3.1 to 3.3 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Vegetation height (cm)	8	15	10	15	0	20	0	15	0	20	20	30	25	30	20	25	15	15	20	20	15	15	10	25	30	20	0	20	5	25
Open water	95	50	0	100	0	100	0	0		100	0	4	0	10	0	20	0	0		2	50	50	0	25	0	95	75	0		100
Water depth (cm)	8	5	0	8	0	8	0	0		12	0	1	0	2	0	3	0	0		2	8	8	0	8	0	10	3	0		8
Bare ground	2	0	100	10	90	25	0	100	100		0	0	5	0	4	2	2	0	1		15	0	70	5	30	50	25	75	98	
Debris	0	0	0	0	0	0	0	2	2		0	0	0	1	0	0	0	0			0	5	50	0	70	0	0	3	2	1
Aster tripolium var discoideus		1		2							1	1	2	3	2	2	2	5	3	3		1	1	2				A		
Atriplex littoralis																														
Atriplex portulacoides		2	A	2	A	A		A		A	95	95x	90	90	95	95	100	100	100	100	10	20x	2	x				A	A	A
Inula crithmoides	A	A																												
Puccinellia maritima		A														2	5	3	2	2		1								
Ruppia maritima	10		0	0																	4									
Salicornia sp			2		x						1		5		3		2		2				5				2		2	
Salicornia europaea					x																							1		
Salicornia fragilis								A						2		3		2								15		3		2
Salicornia ramosissima				60		65		2		40		2		40				3		4				80		15		25		20
Spartina anglica	4	80x	x		x			1			4	4	2	3	4	5	8	20	10	15	2x	30x		2			2	A	2	2
Spergularia media																														
Suaeda maritima	A	A	1	20	x	15		A				4	2	15		10		12		3			1	35		10		3		
Filamentous green algae																														
Ulva sp.																														

Table A4.3b Zone 3 Quadrat Data - % Cover data from Quadrats 3.4 to 3.6 from 2022 Survey (with 2018-2021 Survey data for same quadrat). N.B. Q3.6 surveyed from 2019 onwards only.

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**3.4**	**3.4**	**3.4**	**3.4**	**3.4**	**3.4**	**3.4**	**3.4**	**3.4**	**3.4**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**
Vegetation height (cm)	15	15	15	40	25	20	15	20	20	25	8	30	8	20	10	20	20	50	20	30	0	0	0	0	0	0	0	0
Open water	0	2	0	5	0	5	0	0		2	0	0	0	0	0	0	0	0		0	0	100	98	100	100	100	100	100
Water depth (cm)	0	1	0	5	0	0	0	0			0	0	0	0	0	0	0	0			0	10	2	10	5	5	3	10
Bare ground	20	0	5	0	3	0	25	10	25	3	80	40	50	40	20	10	10	5	5	5	100	100	2	0	0	0	0	0
Debris	2	0	1	0	0	0	3	2	3		0	5	0	10	0	0	0	0	1	2	2	0	0	1	0	0	1	0
Aster tripolium var discoideus	2	5	5	20	A	A	2	4	2	1	1		1	5	4	5	10	50	15	15								
Atriplex littoralis																												
Atriplex portulacoides	75	75	80	50	95	95	70	60	70	80					3	2	5	5	15	5								
Inula crithmoides																												
Puccinellia maritima	1	1	1		3	1	2	2	3	2	3		2	15	60	30	35	30	30	20								
Ruppia maritima																												
Salicornia sp			2				2		5		20		40		20		5		5									
Salicornia europaea												1				5		3		2								
Salicornia fragilis						2		1		2		15		2		2				3								
Salicornia ramosissima		1		20		5		20		40		40		25		35		15		60								
Spartina anglica	3	2	3	3	5	10	15	20	20	15	1	1	3	5	3	2	35	50	40	35								
Spergularia media								2		1					2		5	10	3	5								
Suaeda maritima		2	1	10		10	3	15	3	10			1	10		5	3	5	5	8								
Filamentous green algae	5																					3						
Ulva sp.																											1	

Table A4.3c Zone 3 Quadrat Data - % Cover data from Quadrat 3.7 from 2022 Survey (with 2018-2021 Survey data for same quadrat) N.B. Q3.7 surveyed from 2019 onwards only.

Visit	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**3.7**	**3.7**	**3.7**	**3.7**	**3.7**	**3.7**	**3.7**	**3.7**
Vegetation height (cm)	0	20	0	0	0	0	0	0
Open water	0	100	30	100	100	100	95	100
Water depth (cm)	0	8	2	10	5	5	1	8
Bare ground	100	95	70	0	0	0	5	0
Debris	1	0	1	0	0	0	0	
Aster tripolium var discoideus								
Atriplex littoralis								
Atriplex portulacoides								
Inula crithmoides								
Puccinellia maritima								
Ruppia maritima								
Salicornia sp	1							
Salicornia cf europaea								
Salicornia cf fragilis		2						
Salicornia cf ramosissima		2						
Spartina anglica	A	A						
Spergularia media								
Suaeda maritima		1						
Filamentous green algae		1						
Ulva sp.								

Table A4.4a Zone 4 Quadrat Data - % Cover data from Quadrats 4.1 to 4.3 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jan-21**	**Oct-21**	**Jun-22**	**Oct-22**	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**
Quadrat numbers:	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.3**	**4.3**	**4.3**	**4.3**	**4.3**	**4.3**	**4.3**	**4.3**	**4.3**	**4.3**
Vegetation height (cm)	80	50	80	50	90	60	80	30	60	40	70	35	60	40	70	70	80	40	60	30	80	30	80	20	80	70	90	40	70	50
Open water	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0		
Water depth (cm)	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0		
Bare ground	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0		
Aster tripolium var discoideus																					1	1								
Atriplex portulacoides										A	30	40	20	40	45	60	40	40	70	90	1	1	2	2	0				A	A
Elytrigia atherica	100	100	90	100	100	100	100	100	80	90	85	60	90	90	80	90	100	100	80	40	100	100	100	100	80	100	90	100	80	95
Puccinellia maritima																														
Salicornia sp																														
Salicornia cf europaea																														
Salicornia cf fragilis																														
Salicornia ramosissima																														
Spartina anglica																														
Spergularia maritima																														
Suaeda maritima										3																				
Filamentous green algae																														
Ulva lactuca																														
Debris	0	0	10	0	2	0	0	0	40	25	0	0	5	0	5	0	0	0	20	10	0	0	0	25	25	0	20	0	25	10

Table A4.4b Zone 4 Quadrat Data - % Cover data from Quadrats 4.4 to 4.6 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**
Vegetation height (cm)	80	60	80	30	70	70	80	30	60	40	70	20	70	30	60	40	80	30	60	30	8	25	15	20	20	30	20	40	20	30
Open water	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	30	0	50	0	30	95	25	60	60
Water depth (cm)	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	2	0	3	0	5	3	2	3	5
Bare ground	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			80	10	80	30	40	10	0	10	3	
Aster tripolium var discoideus	1																							1	2	5	1	5	3	5
Atriplex portulacoides										2										a										
Elytrigia atherica	100	100	100	100	100	100	100	100	90	95	100	100	100	100	100	100	100	100	90	100										
Puccinellia maritima																					3	1	3	4	12	25	20	30	35	65
Salicornia sp																					15		15		10		8		5	
Salicornia cf europaea																						10		15		3		2		5
Salicornia cf fragilis																						40		30		50		4		8
Salicornia ramosissima																						10		10		15		2		3
Sarcocornia perennis																														5
Spartina anglica																					2	2	8	15	35	60	40	60	50	15
Spergularia maritima																													3	
Suaeda maritima																												2		10
Filamentous green algae																					3	1		1				1		
Ulva lactuca																					2	1								
Debris															5								1		2	1				
Wrack	0	0	0	0	25	0	5	0	50	10									20	20				1	1	1				

Table A4.4c Zone 4 Quadrat Data - % Cover data from Quadrats 4.7 to 4.8 from 2022 Survey (with 2018-2021 Survey data for same quadrat) N.B. Q4.7 and Q4.8 added in 2019 and surveyed from 2019 onwards

Visit	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**4.7**	**4.7**	**4.7**	**4.7**	**4.7**	**4.7**	**4.7**	**4.7**	**4.8**	**4.8**	**4.8**	**4.8**	**4.8**	**4.8**	**4.8**	**4.8**
Vegetation height (cm)	5	10	5	10	20	15	10	15	5	10	10	10	10	50	20	10
Open water	0	0	0	0	0	0	0		0	100	4	100	75	40	50	100
Water depth (cm)	0	0	0	0	0	0			0	5	2	8	2	2	2	8
Bare ground	95	75	75	50	25	25	40	10	100	95	98	98	25	60	50	0
Aster tripolium var discoideus		4	3	10	12	15	15	15								
Atriplex portulacoides	1	2	3	5	4	10	12	40						A		
Elytrigia atherica		1		5	0	0		1								
Puccinellia maritima	2	5	20	15	15	25	25	20								
Salicornia sp	8		2		30	0	2		1				2		0	
Salicornia cf europaea					2	3								2		
Salicornia cf fragilis					0	5				1				1		a
Salicornia ramosissima		25		5	0	0		5		2				2		a
Sarcocornia perennis								3								a
Spartina anglica	1	1	1		3	5	2	2	1	5	3	3	8	10	5	2
Spergularia maritima					3	4	4									
Suaeda maritima		5	2	3	0	3		2								
Filamentous green algae										2				A		
Ulva lactuca										1						
Debris		1		2												
Wrack																

Table A4.5a. Zone 5 Quadrat Data - % Cover data from Quadrats 5.1 to 535 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**5.1**	**5.1**	**5.1**	**5.1**	**5.1**	**5.1**	**5.1**	**5.1**	**5.1**	**5.1**	**5.2**	**5.2**	**5.2**	**5.2**	**5.2**	**5.2**	**5.2**	**5.2**	**5.2**	**5.2**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**
Vegetation height (cm)	90	20	60	40	60	50	70	50	60	50	55	30	60	35	60	50	90	40	60	60	30	40	30	40	40	40	30	40	40	40
Bare ground	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0		
Open water	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0		
Water depth (cm)	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0		
Debris	0	0	3	0	5	0	0	0			0	0	0	0	15	0	0	0	10	5	0	0	0	0	4	0	1	0		
Aster tripolium var discoideus																						3	2	2		A				
Atriplex portulacoides	30	50	60	80	70	90	80	90	90	100	10	25	30	50	35	50	60	60	75	90	99	95	100	100	100	100	100	100	100	100
Elytrigia atherica	70	50	60	30	50	60	60	80	80	60	90	75	80	50	80	75	100	100	90	80	3	5	5	5	10	10	25	40	35	25
Inula crithmoides							3														A	A	A	A	A	A	A	A	A	A
Puccinellia maritima																														
Salicornia sp																														
Salicornia ramosissima																														
Spartina anglica																														
Spergularia maritima																														
Suaeda maritima																														

Table A4.5ba. Zone 5 Quadrat Data - % Cover data from Quadrats 5.4 to 5.5 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**	**Jun-18**	**Oct-18**	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**
Quadrat numbers:	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.5**	**5.5**	**5.5**	**5.5**	**5.5**	**5.5**	**5.5**	**5.5**	**5.5**	**5.5**
Vegetation height (cm)	30	30	20	30	20	20	20	20	25	25	50	35	40	30	40	30	30	30	40	30
Bare ground	0	0	40	3	50	25	0	20	30		0	0	0	0	0	0	0	0		
Open water	0	25	0	70	0	60	80	0		25	0	0	0	0	0	0	0	0		
Water depth (cm)	0	3	0	3	0	5	5	0		5	0	0	0	0	0	0	0	0		
Debris	30	50	3	0	0	0	0	0			0	0	0	0	0	0	0	0		
Aster tripolium var discoideus	3	1	2	3	A	A	1	2	1	1	1	2	2	3	A		1	A		A
Atriplex portulacoides	70	25	40	40	50	50	60	80	70	80	50	70	80	90	90	90	95	90	90	100
Elytrigia atherica	1	A					A	A	A	A	50	30	50	30	30	25	25	30	60	40
Inula crithmoides	A	A	A		A		0	A			A	A	A	A	A	A	A	A	A	A
Puccinellia maritima								2										2	3	2
Salicornia sp	1		4						3											
Salicornia ramosissima		15		50		25		25		20										
Spartina anglica								A												
Spergularia maritima								1												
Suaeda maritima		20	3	15		20		1		1										A

Table A4.6a Zone 6 Quadrat Data - % Cover data from Quadrats 6.1 to 6.3 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.2**	**6.2**	**6.2**	**6.2**	**6.2**	**6.2**	**6.2**	**6.2**	**6.2**	**6.2**	**6.3**	**6.3**	**6.3**	**6.3**	**6.3**	**6.3**	**6.3**	**6.3**	**6.3**	**6.3**
Vegetation height (cm)	25	20	25	20	25	25	25	50	30	40	8	25	15	20	25	35	25	40	25	30	25	25	25	25	25	20	30	30	25	30
Open water	0	0	0	10	0	0	5	0	2	1	0	15	0	2	0	15	10	2	15	30	0	0	0	0	0	0	0	0	0	0
Water depth (cm)	0	0	0	3	0	0	2	0	2	2	0	5	0	2	0	5	3	2	3	3	0	0	0	0	0	0	0	0	0	0
Bare ground	10	2	2	0	0	0	0	0	0	0	95	45	25	10	15	5	0	3	10	0	0	0	0	0	0	0	0	0	0	0
Aster tripolium var discoideus	2	3	3	4	3	5	6	30	25	30			1	A	A	2	2	3	2	5	3	4	3	5	3	3	4	15	10	20
Atriplex portulacoides	15	20	30	25	50	70	50	50	50	70							1		2	2	45	70	75	80	80	100	90	80	70	80
Elytrigia atherica									0	0									0	0									0	0
Inula crithmoides									A	0									0	0				A	1	A			0	0
Limonium vulgare									0	0									0	0								2	0	0
Puccinellia maritima	45	40	60	40	60	30	75	80	75	35	2	1	4	25	20	40	50	75	60	40	70	25	30	25	45	20	75	70	60	50
Salicornia sp	1		2		2		2		0	0	15		50		30		8		5	0	2		1						0	0
Salicornia dolichostachya									0	0									0	0									0	0
Salicornia europaea		2		2		2		2	0	0		50		60		10		2	0	10		4		1					0	0
Salicornia fragilis						2			0	0						30		30	0	35								2	0	5
Salicornia ramosissima									0	0		3		20					0	0		2							0	0
Sarcocornia perennis																														
Spartina anglica	2	3	2	4	3	5	5	10	8	35	2	3	25	30	40	70	65	80	60	30					2	5	3	10	8	10
Spergularia media	1	1	1	1	2		2		3	0								3	0	0		1							0	0
Suaeda maritima	3	15	5	20		25		5	2	10								5	2	30	2	3		4		5	3	25	0	20
Triglochin maritima		1	3	2			2	2	5	0									0	0									0	0
Bryozoan					1				0	1			0				1		0	0			0						0	0
Enteromorpha spp.									0	0			0						0	0			0						0	0
Filamentous green algae									0	0		2	0				1		0	3			0						0	0
Ulva lactuca									0	0	1		0	0					0	0			0						0	0
Wrack							1		0	0									1	0										

Table A4.6a Zone 6 Quadrat Data - % Cover data from Quadrats 6.4 to 6.6 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**6.4**	**6.4**	**6.4**	**6.4**	**6.4**	**6.4**	**6.4**	**6.4**	**6.4**	**6.4**	**6.5**	**6.5**	**6.5**	**6.5**	**6.5**	**6.5**	**6.5**	**6.5**	**6.5**	**6.5**	**6.6**	**6.6**	**6.6**	**6.6**	**6.6**	**6.6**	**6.6**	**6.6**	**6.6**	**6.6**
Vegetation height (cm)	20	25	20	20	25	15	25	15	20	20		20	20	30	30	30	20	30	20	30	5	10	10	20	20	25	25	50	25	20
Open water	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	2	0	0	0	0	99	0	100	0	100	100	80	100	100
Water depth (cm)	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	2	0	0	0	0	8	0	5	0	5	5	5	5	8
Bare ground	1	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	99	1	95	0	75	75	0	0	0	0
Aster tripolium var discoideus	1	1	1	2	A	2	2	2	3	2			3	3	4	4	4	10	4	5								A	0	0
Atriplex portulacoides	70	70	80	90	90	95	90	90	75	95		40	60	80	70	90	80	90	90	70									0	0
Elytrigia atherica									0	0		2	2	2	2	3	3	3	5	2									0	0
Inula crithmoides									0	0		A	A	A	A	A		A	A	A									0	0
Limonium vulgare									0	0					A				0	0									0	0
Puccinellia maritima	45	35	30	20	30	20	40	60	80	50		50	40	20	50	30	70	50	50	20	1	1	1	1			0	2	3	2
Salicornia sp									0	0									0	0	2		1		5		2		0	0
Salicornia dolichostachya									0	0		A							0	0						2			0	0
Salicornia europaea									0	0									0	0		2		1				A	0	1
Salicornia fragilis		1							0	0									0	0		1		1		3		A	0	0
Salicornia ramosissima		1		A					0	0		1						2	0	0				1				A	0	0
Sarcocornia perennis																														
Spartina anglica		A		A	A	1	A	1	1	2		10	15	25	20	35	15	35	10	20	2	3	6	20	30	35	35	65	60	20
Spergularia media									0	0		2	2		3	2	3	2	5	0									0	0
Suaeda maritima		A		1				5	1	4		1	1				1	2	0	0									0	0
Triglochlin maritima									0	0									0	0									0	0
Bryozoan									0	0									0	0									0	0
Enteromorpha spp.									0	0									0	1									0	0
Filamentous green algae									0	0									0	0	1	30							0	0
Ulva lactuca									0	0									0	0	2	1		1					0	0
Wrack																								1						

Table A4.6c Zone 6 Quadrat Data - % Cover data from Quadrats 6.7 to 6.8 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.8**	**6.8**	**6.8**	**6.8**	**6.8**	**6.8**	**6.8**	**6.8**
Vegetation height (cm)	7	15	10	25	20	30	15	25	20	20	20	30	20	30	20	50	25	30
Open water	0	98	0	99	0	100	90	90	100	100	0	60	0	40	90	10	80	80
Water depth (cm)	0	6	0	3	0	5	3	3	5	5	0	3	0	8	5	2	5	8
Bare ground	99	0	90	25	75	35	0	0	0	0	50	10	20	10	0	0	0	0
Aster tripolium var discoideus							0	A	A	A					2	2	1	3
Atriplex portulacoides									0	0							0	0
Elytrigia atherica									0	0							0	0
Inula crithmoides									0	0							0	0
Limonium vulgare									0	0							0	0
Puccinellia maritima	1	1	1	1	1	5	2	3	2	5	0		15	5	8	15	25	40
Salicornia sp	2		2		3		2		2	0	5		3		3		3	0
Salicornia dolichostachya									0	5							0	2
Salicornia europaea		5		2		2		2	0	10		10		15		2	0	2
Salicornia fragilis		10		3		10		A	0	0		3		30			0	0
Salicornia ramosissima		2		2		2		1	0	2							0	0
Sarcocornia perennis										1								5
Spartina anglica	2	5	10	25	20	50	12	25	15	8	50	70	75	90	90	95	95	30
Spergularia media									0	0							2	0
Suaeda maritima									0	2							0	12
Triglochlin maritima									0	0							0	0
Bryozoan			0						0	0							0	0
Enteromorpha spp.	1		0						0	0							0	0
Filamentous green algae	2		0				2		0	0		1			2		0	0
Ulva lactuca	1		0						0	0							0	0
Wrack				2	2							1	2					

Table A4.7a. Zone 7 Quadrat Data - % Cover data from Quadrats 7.1 to 7.3 from 2022 Survey (with 2018-2021 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**7.1**	**7.1**	**7.1**	**7.1**	**7.1**	**7.1**	**7.1**	**7.1**	**7.1**	**7.1**	**7.2**	**7.2**	**7.2**	**7.2**	**7.2**	**7.2**	**7.2**	**7.2**	**7.2**	**7.2**	**7.3**	**7.3**	**7.3**	**7.3**	**7.3**	**7.3**	**7.3**	**7.3**	**7.3**	7.3
Vegetation height (cm)	15	20	20	20	20	25	20	40	10	20	15	35	20	40	15	20	15	30	20	20	20	30	20	30	20	40	20	30	20	30
Open water	0	0	2	0	0	0	5	0	5	0	3	2	5	2	0	10	40	25	5	2	0	5	10	5	10	2	5	20	20	10
Water depth (cm)	0	0	5	0	0	0	3	0	2		2	2	5	5	0	5	10	10	3	2	0	2	10	5	5	2	3	5	3	3
Bare ground	20	5	15	2	3	2	5	0		2	50	5	15	5	25	10	5	5	5	10	35	5	20	2	15	30	20	20	15	5
Debris	0	0	0	0	1	1	2	0	1		0	0	0	0	0	1	1	1	1		0	0	0	0	0	0	1	1	2	
Aster tripolium var discoideus	2	3	2	3	4	4	3	5	4	5								A	A	A										
Atriplex portulacoides			A	A	A	A	A	A		A																				
Inula crithmoides																														
Puccinellia maritima	3	3	2	5	3	5	8	10	4	15	1			2			2	5	A	A										
Salicornia sp	20		15		5		5		5		20		15		8		5		3		10		3		2		1		0	
Salicornia dolichostachya																														
Salicornia europaea				40		35		20		5				40		25		15		2						2		2		
Salicornia fragilis		60								2		50		10								5		4						
Salicornia ramosissima																														
Sarcocornia perennis		15	20	25	25	25	40	45	50	70		10	5	15	25	40	30	40	40	50		8	8	10	10		20	10	10	10
Spartina anglica	50	15	60	60	60	75	70	75	80	80	50	30	80	70	70	50	80	60	80	70	60	70	75	80	80	95	70	80	70	80
Spergularia media	2	3	3	2	3	1	3	2	2	3	A							2												
Suaeda maritima							0		0	2																				
Enteromorpha spp.														2			2	2	5					2	3		4	4	5	
Filamentous green algae	20	0	15		3		5				15	2	10	3	4		4	3	20	2	30	1	5	5			3	4	3	3
Ceramium rubrum agg. (red seaweed)																					A		2				2			
Ulva lactuca	2										2										3									
Bryozoan			1	1											I				1								2			
Cockles				15	2		5		25	5				10	5		10	2	50	40				2	20	25	10	5	40	10
Wrack							2										3	2									3			

Table A4.7b. Zone 7 Quadrat Data - % Cover data from Quadrats 7.5 to 7.8 from 2021 Survey (with 2018-2020 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Vegetation height (cm)		8	10	10	10	10	5	0	0	0		20	15	25	25	35	20	40	15	40	1	2	3	15	15	40	20	50	25	60
Open water		0	0	0	0	0	0	0	0	5		5	0	5	0	0	5	5	5	10	15	15	20	15	5	2	10	10	4	10
Water depth (cm)		0	0	0	0	0	0	0		2		4	0	3	0	0	2	2	3	5	2	4	2	10	2	2	5	2	2	5
Bare ground		10	40	90	90	90	100	100	100	100		75	90	70	75	60	30	10	25	10	50	40	95	80	75	50	1	25	15	10
Debris		0	0	0	0	0	2		1	0		0	0	0	0	0	0	0	1		0	0	0	0	0	0	0	1		
Aster tripolium var discoideus		3	1		A	A																								
Atriplex portulacoides		40	30	20	15	10	2																							
Inula crithmoides		A	A	A	A	A																								
Puccinellia maritima		15	5	5	3	3	1																					2		
Salicornia sp			5		3		-										0		0		1		2		3		2		1	
Salicornia dolichostachya												A																		
Salicornia europaea																2		5				1		5		2		3		2
Salicornia fragilis																														
Salicornia ramosissima																														
Sarcocornia perennis		7	5		4	2	2					8	5	3	15	5	30	15	20	15							3	5	4	8
Spartina anglica		3	10	2	4	2	0					7	5	30	20	60	50	80	80	90	A	2	4	10	45	60	50	80	75	85
Spergularia media		2	1																											
Suaeda maritima																														
Enteromorpha spp.					5	5	4		15	2							3	5	5	3	1		3	4			4	2		
Filamentous green algae		4	8				3		5	2		3	5	5	2		3	2	10	3	40	10					2			3
Ceramium rubrum agg. (red seaweed)							2					1		2					1											
Ulva lactuca										2		1	1								2	2								
Bryozoan									1															20						
Cockles				40	10	20	75	90	50	50				1	2	1	3	2	5	2					10		8	2	35	3
Wrack							3										2										1			

Table A4.7c. Zone 7 Quadrat Data - % Cover data from Quadrats 7.9 to 7.10A from 2021 Survey (with 2018-2020 Survey data for same quadrat)

Visit	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-18	Oct-18	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22	Jun-19	Oct-19	Jun-20	Oct-20	Jun-21	Oct-21	Jun-22	Oct-22
Quadrat numbers:	**7.7**	**7.7**	**7.7**	**7.7**	**7.7**	**7.7**	**7.7**	**7.7**	**7.7**	**7.7**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.9**	**7.9**	**7.9**	**7.9**	**7.9**	**7.9**	**7.9**	**7.9**
Vegetation height (cm)	10	20	15	25	20	40	20	40	20	30	<1	1	1	10	15	40	20	50	20	60	5	20	5	10	10	20	10	20
Open water	0	0	2	1	0	2	2	1	0	2	15	20	15	2	25	50	50	10	5	2	2	1	0	1	20	0	0	5
Water depth (cm)	0	0	2	2	0	2	2	1		2	1	1	1	2	2	3	5	2	2	2	2	2	0	1	3	0		1
Bare ground	60	50	40	10	20	10	15	5	15	5	60	80	95	95	92	80	10	60	40	30	95	75	85	80	70	80	80	50
Debris	0	0	0	0	0	0	1	0			0	0	0	0	0	0	1	1			0	0	0	0	20	0		
Aster tripolium var discoideus					1	2	1	1	1	3																		
Atriplex portulacoides																												
Inula crithmoides																												
Puccinellia maritima	1	1	1	5			3	5	5	3															1	1		
Salicornia sp	15		10		5		3		10												3		4		3		3	
Salicornia dolichostachya										10																		3
Salicornia europaea		30		40		65		50		5												30		20		5		
Salicornia fragilis																												3
Salicornia ramosissima		2																										
Sarcocornia perennis			2	2	2	3	15	15	20	20											2	3	3	3	7	8	15	10
Spartina anglica	2	3	60	70	80	80	90	80	90	80	5	2	8	5	8	15	50	60	70	80	2	4	5	8	8	10	10	25
Spergularia media					1				2																			
Suaeda maritima									3	5																		
Enteromorpha spp.					3	2	0		5		2		1	0			5											
Filamentous green algae	30	3	5	1			4		10	2	25	A	1	0			3	1			10	1			3			10
Ceramium rubrum agg. (red seaweed)		1										A	1															
Ulva lactuca	2	1									15	1					2											
Bryozoan			15	10	I		1							2	I							5						
Cockles					4	1	5		2	2					3	2	10	15	40	15			10	3	15	3	20	5
Wrack							1										1								1		1	

Table A4.7d. Zone 7 Quadrat Data - % Cover data from Quadrats 7.9 to 7.10A from 2021 Survey (with 2018-2020 Survey data for same quadrat)

Visit	**Jun-19**	**Oct-19**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**	**Jun-20**	**Oct-20**	**Jun-21**	**Oct-21**	**Jun-22**	**Oct-22**
Quadrat numbers:	**7.10**	**7.10**	**7.10**	**7.10**	**7.10**	**7.10**	**7.10**	**7.10**	**7.10 A**	**7.10 A**	**7.10 A**	**7.10 A**	**7.10 A**	**7.10 A**
Vegetation height (cm)	15	30	20	20	10	15	10	20	10	30	15	25	15	20
Open water	3	10	2	0	2	0	0		3	3	5	5	5	5
Water depth (cm)	5	5	5	0	2	0			10	15	10	10	20	10
Bare ground	3	5	10	20	25	30	40	25	20	15	15	0	10	5
Debris	0	0	0	0	1	1			2	0	1	0		
Aster tripolium var discoideus				1	2	4	5	8						
Atriplex portulacoides														
Inula crithmoides														
Puccinellia maritima			2	5	8	20	8	10				2		
Salicornia sp	2		25		20		3		2		1		0	
Salicornia dolichostachya								10						
Salicornia europaea		5		15		30		10		3		2		
Salicornia fragilis														
Salicornia ramosissima														
Sarcocornia perennis	10	5	8	10	20	30	25	40	4	5	3	4	5	7
Spartina anglica	90	90	75	50	65	40	40	25	90	90	85	90	90	80
Spergularia media					2		3	2						
Suaeda maritima						4		2						
Enteromorpha spp.		5					2				5	5	5	
Filamentous green algae	10	5		3	4	3	15	15	10	10	20			3
Ceramium rubrum agg. (red seaweed)	1													
Ulva lactuca														
Bryozoan		10							I					
Cockles			2	3	3	2	5	2	25	20	20	30	40	40
Wrack					2									

Appendix 5

Photographs of quadrat locations - June 2022

Quadrat 1.1 Bank at upper edge of salt marsh beside footpath.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.2 Terrestrial habitat in area of disturbed ground subject to colonisation by opportunistic ruderals. Not surveyed in june 2020 due to being located in construction zone of water main works and subject to disturbance and habitat loss No apparent re-seeding after disturbance, and re-establishment of grassland via natural colonisation		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.3 2018: Upper marsh community, terrestrial in character supporting a mix of coastal species indicative of bare ground / disturbance. A high frequency of *Atriplex littoralis* suggests a relatively high salinity. 2020; Grassland dominated community following colonisation in previously disturbed area		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.4 Road verge with *Arrhenatherum elatius* (MG1) as well as ruderals such as fennel (*Foeniculum vulgare*). No surveyed in 2020 – roadside disturbed by water mains works 2019 photos shown for context		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.5 2018: Upper marsh community, terrestrial in character supporting a mix of species indicative of bare ground/disturbance. 2020: Grassland community following colonisation of bare ground / disturbed corridor		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

<table>
<tr>
<td>Quadrat 2.1

Transitional zone at the margins of the saline lagoon</td>
<td></td>
<td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td>
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<table>
<tr><td>Quadrat 2.6 June

Construction corridor with undulating areas of bare ground with saltpans. Colonisation of the habitat by annual species, particularly species of glasswort (Salicornia spp) is evident.</td><td></td><td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td></tr>
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</table>

Quadrat 2.7 Construction corridor with undulating areas of bare ground and saltpans. Colonisation by annual saltmarsh species is evident.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 2.8 Edge of construction zone beside saltpan, influenced by proximity of established saltmarsh		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 2.9 Mosaic of saltmarsh communities interspersed by small dried-up saltpans at the edge of the construction corridor		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.1 June Unmodified mid-marsh habitat at fringes of lagoon inundation zone 2021 - High water level and no vegetation present		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

<table>
<tr><td>Quadrat 3.2 June
Unmodified mid-marsh habitat at fringes of lagoon inundation zone
.</td><td></td><td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td></tr>
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Quadrat 3.3 Unmodified mid-marsh habitat at fringes of lagoon inundation zone		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.4 Unmodified mid-marsh habitat with *Atriplex portulacoides* at fringes of lagoon inundation zone		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

<table>
<tr><td>Quadrat 3.5
Bare ground at the edge of the construction zone with a scattering of Salicornia plants</td><td></td><td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td></tr>
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Quadrat 3.6 New Quadrat in 2019 .		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.7 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

<table>
<tr>
<td>Quadrat 4.1
Rank and unmodified upper saltmarsh habitat dominated by Elytrigia atherica
(SM24)</td>
<td></td>
<td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td>
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Quadrat 4.2
Rank and unmodified upper saltmarsh habitat dominated by a mix of *Elytrigia atherica* and *Atriplex portulacoides*

Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)

Quadrat 4.3 Rank and unmodified upper saltmarsh habitat dominated by *Elytrigia atherica* (SM24)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.4 Rank and unmodified upper saltmarsh habitat dominated by *Elytrigia atherica* (SM24)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

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<tr>
<td>Quadrat 4.5
Rank and unmodified upper saltmarsh habitat dominated by Elytrigia atherica
(SM24)</td>
<td></td>
<td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td>
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Quadrat 4.6 Edge of dried-up saltpan within construction zone supporting annual saltmarsh plants including glassworts.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.7 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.8 June New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 5.1 Rank and unmodified upper-marsh habitat dominated by *Elytrigia atherica* and *Atriplex portulacoides*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

<table>
<tr><td>Quadrat 5.2
Rank and unmodified upper-marsh habitat dominated by Elytrigia atherica and patches of Atriplex portulacoides</td><td></td><td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td></tr>
<tr><td></td><td></td><td></td></tr>
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<tr><td>Quadrat 5.3
Unmodified mid-marsh habitat
dominated by Atriplex portulacoides with
a scattering of Elytrigia atherica</td><td></td><td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td></tr>
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Quadrat 5.4 Unmodified mid-marsh habitat with *Atriplex portulacoides* and areas of bare ground (litter) at fringes of lagoon inundation zone.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 5.5 Unmodified upper-marsh habitat dominated by *Atriplex portulacoides* and *Elytrigia atherica*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.1 Rank and stable mid-marsh sward with frequent deposits of tidal debris. Channels obscured and overgrown		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.2 Bare ground within construction zone with shallow (<10cm) runnels and depressions as well as a scattering of cockle shells. The habitat has been colonised by species of glasswort		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

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<tr>
<td>Quadrat 6.3
Rank and unmodified mid-marsh community dominated by Atriplex portulacoides</td>
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Quadrat 6.4 Rank and unmodified mid-marsh community with *Atriplex portulacoides* and scattered accumulations of tidal debris		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

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<tr>
<td>Quadrat 6.5
Unmodified mid-marsh community dominated by Atriplex portulacoides with some Spartina anglica. A band of tidal debris is present at the seaward edge of the quadrat</td>
<td></td>
<td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td>
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Quadrat 6.6 A hyper-saline pan within construction zone with limited colonisation by saltmarsh plants		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.7 Bare ground within construction zone with shallow (<10cm) runnels and depressions as well as a scattering of cockle shells. A shallow water-filled pan evident on bare ground to the south		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.8
New quadrat in 2019

Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)

<table>
<tr>
<td>Quadrat 7.1
Unmodified marsh within 5m of construction corridor. Weak channels approximately 20cm deep are present together with a light scattering of cockle shells. Perennial glasswort (Sarcocornia perennis) present (SM7)</td>
<td></td>
<td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td>
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Quadrat 7.2
Quadrat approximately 20m from nearest (seaward) edge of saltmarsh. Lower marsh habitat (SM6) with 40-45cm deep runnels perpendicular to coast at regular 1-2m intervals. Some cockle shells in base of runnels. Perennial glasswort (*Sarcocornia perennis*) present on ridges (SM7)

Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)

Quadrat 7.3 Quadrat approximately 10m from nearest (seaward) edge of saltmarsh. Lower marsh habitat (SM6) with deep (40-45cm) runnels perpendicular to coast at regular 1-2m intervals. Cockle shell accumulations in base of runnels. Perennial glasswort (*Sarcocornia perennis*) present on ridges (SM7)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

<table>
<tr>
<td>Quadrat 7.4
Transitional zone at the lower end of the marsh where a low erosion cliff is present. Water-washed channels are partly armoured by layers of cockle shells within the mud. Ridges are dominated by a mix of Sarcocornia perennis, Puccinellia maritima and Atriplex portulacoides.</td>
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<td>Photo Orientation:

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North – Quadrat – South
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Quadrat 7.5 Low marsh community supporting ridges dominated by *Sarcocornia perennis* and some *Spartina anglica*	v 	Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.6 Consolidated mud appears to be relatively stable. Roots of *Spartina anglica* hold ridges together. Cockle shell accumulations locally abundant. Runnels hold water		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.7 Consolidated substrate supporting annual Salicornia species		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.8 Quadrat approximately 10m from seaward edge of saltmarsh within construction zone. Consolidated mud appears to be relatively stable. Roots of *Spartina anglica* holding ridges together. Cockle shell accumulations locally abundant. Runnels holding water including a 50cm deep pool		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.9 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.10 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.10A New quadrat in 2020		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.1 Marginal zone of saline lagoon supporting a fringe of *Bolboscoenus maritima* and *Elytrigia atherica*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.2 Rock and cement armoured sea wall supporting largely terrestrial species		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

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<td>Quadrat 8.3
Marginal zone of saline lagoon supporting a fringe of Bolboscoenus maritima, Elytrigia atherica and Juncus gerardii beside a well-trodden gravelly path</td>
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<td>Photo Orientation:

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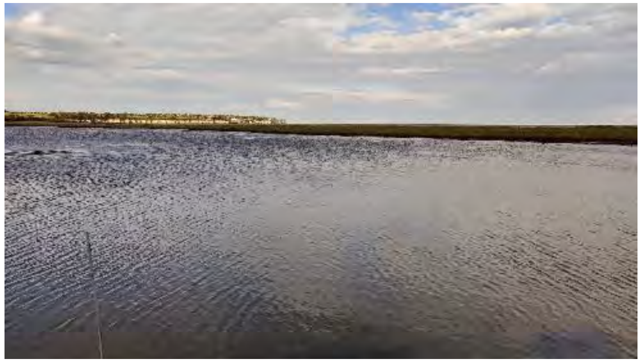
Quadrat 8.4 Terrestrial zone supporting a disturbed ground community beside well used footpath		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.5 Terrestrial zone supporting a disturbed ground community beside well used footpath		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.6 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Appendix 6

Photographs of quadrat locations – October 2022

Quadrat 1.1 Bank at upper edge of salt marsh beside footpath.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.2 Terrestrial habitat in area of disturbed ground subject to colonisation by opportunistic ruderals. Recovering from recent disturbance and ground works		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.3 Upper marsh community, terrestrial in character supporting a mix of coastal species indicative of bare ground / disturbance. A high frequency of *Atriplex littoralis* suggests a relatively high salinity		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.4 Road verge with *Arrhenatherum elatius* (MG1) as well as ruderals such as fennel (*Foeniculum vulgare*)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 1.5 Upper marsh community, terrestrial in character supporting a mix of species indicative of bare ground/disturbance.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 2.1 Transitional zone at the margins of the saline lagoon Quadrat 2.2 – 2.6: no photos - Saline lagoon		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

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<tr>
<td>Quadrat 2.6

Construction corridor with undulating areas of bare ground with saltpans. Colonisation of the habitat by annual species, particularly species of glasswort (Salicornia spp) is evident.</td>
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<td>Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)</td>
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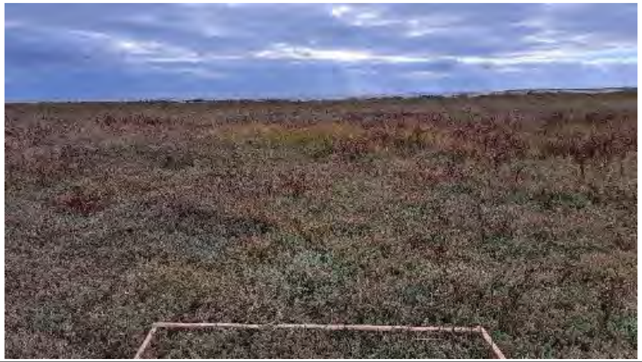
Quadrat 2.7 Construction corridor with undulating areas of bare ground and saltpans. Colonisation by annual saltmarsh species is evident		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 2.8 Edge of construction zone beside saltpan, influenced by proximity of established saltmarsh		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 2.9 Mosaic of saltmarsh communities interspersed by small dried-up saltpans at the edge of the construction corridor		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.1 October Unmodified mid-marsh habitat at fringes of lagoon inundation zone. Vegetation including yellowing plants of *Spartina anglica* show signs of stress		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.2 June Unmodified mid-marsh habitat at fringes of lagoon inundation zone with dying *Atriplex portulacoides*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

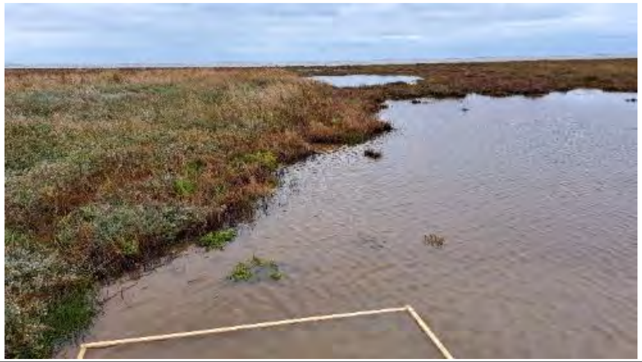
Quadrat 3.3 Unmodified mid-marsh habitat at fringes of lagoon inundation zone with dead *Atriplex portulacoides* and stressed *Spartina anglica*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.4 Unmodified mid-marsh habitat with *Atriplex portulacoides* at fringes of lagoon inundation zone		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.5 Bare ground at the edge of the construction zone with a scattering of *Salicornia* plants		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 3.6 New Quadrat in 2019 .		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

<table>
<tr><td>Quadrat 3.7

New quadrat in 2019</td><td></td><td>Photo Orientation:

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Quadrat 4.1 Rank and unmodified upper saltmarsh habitat dominated by *Elytrigia atherica* (SM24)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.2 Rank and unmodified upper saltmarsh habitat dominated by a mix of *Elytrigia atherica* and *Atriplex portulacoides*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.3 Rank and unmodified upper saltmarsh habitat dominated by *Elytrigia atherica* (SM24)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.4 Rank and unmodified upper saltmarsh habitat dominated by *Elytrigia atherica* (SM24)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

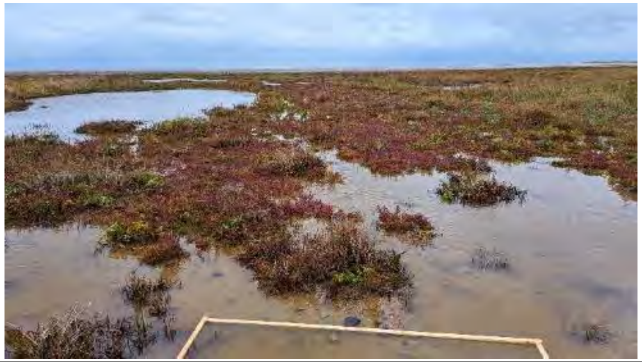
Quadrat 4.5
Rank and unmodified upper saltmarsh habitat dominated by *Elytrigia atherica*
(SM24)

Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)

Quadrat 4.6 Edge of dried-up saltpan within construction zone supporting annual saltmarsh plants including glassworts.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.7 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 4.8 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 5.1 Rank and unmodified upper-marsh habitat dominated by *Elytrigia atherica* and *Atriplex portulacoides*.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 5.2 Rank and unmodified upper-marsh habitat dominated by *Elytrigia atherica* and patches of *Atriplex portulacoides*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 5.3 Unmodified mid-marsh habitat dominated by *Atriplex portulacoides* with a scattering of *Elytrigia atherica*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 5.4 Unmodified mid-marsh habitat with *Atriplex portulacoides* and areas of bare ground (litter) at fringes of lagoon inundation zone		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 5.5 Unmodified upper-marsh habitat dominated by *Atriplex portulacoides* and *Elytrigia atherica*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.1 Rank and stable mid-marsh sward with frequent deposits of tidal debris. Channels obscured and overgrown		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.2 Bare ground within construction zone with shallow (<10cm) runnels and depressions as well as a scattering of cockle shells. The habitat has been colonised by species of glasswort		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

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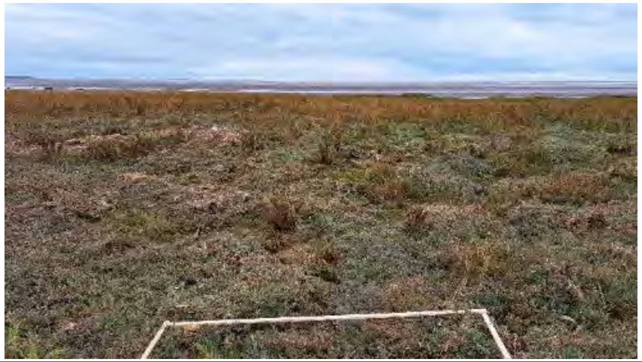
Quadrat 6.4 Rank and unmodified mid-marsh community with *Atriplex portulacoides* and scattered accumulations of tidal debris.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.5 Unmodified mid-marsh community dominated by *Atriplex portulacoides* with some *Spartina anglica*. A band of tidal debris is present at the seaward edge of the quadrat		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.6 A hyper-saline pan within construction zone with limited colonisation by saltmarsh plants		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.7 Bare ground within construction zone with shallow (<10cm) runnels and depressions as well as a scattering of cockle shells. A shallow water-filled pan evident on bare ground to the south		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 6.8 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.1 Unmodified marsh within 5m of construction corridor. Weak channels approximately 20cm deep are present together with a light scattering of cockle shells. Perennial glasswort (*Sarcocornia perennis*) present (SM7)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.2 Quadrat approximately 20m from nearest (seaward) edge of saltmarsh. Lower marsh habitat (SM6) with 40-45cm deep runnels perpendicular to coast at regular 1-2m intervals. Some cockle shells in base of runnels. Perennial glasswort (*Sarcocornia perennis*) present on ridges (SM7)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.3 Quadrat approximately 10m from nearest (seaward) edge of saltmarsh. Lower marsh habitat (SM6) with deep (40-45cm) runnels perpendicular to coast at regular 1-2m intervals. Cockle shell accumulations in base of runnels. Perennial glasswort (*Sarcocornia perennis*) present on ridges (SM7)		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.4 Transitional zone at the lower end of the marsh where a low erosion cliff is present. Water-washed channels are partly armoured by layers of cockle shells within the mud. Ridges are dominated by a mix of *Sarcocornia perennis*, *Puccinellia maritima* and *Atriplex portulacoides*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.5 Low marsh community supporting ridges dominated by *Sarcocornia perennis* and some *Spartina anglica*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.6 Consolidated mud appears to be relatively stable. Roots of *Spartina anglica* hold ridges together. Cockle shell accumulations locally abundant. Runnels hold water		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.7 Consolidated substrate supporting annual *Salicornia* species		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.8
Quadrat approximately 10m from seaward edge of saltmarsh within construction zone. Consolidated mud appears to be relatively stable. Roots of *Spartina anglica* holding ridges together. Cockle shell accumulations locally abundant. Runnels holding water including a 50cm deep pool

Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)

Quadrat 7.9 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.10 New quadrat in 2019		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 7.10a New quadrat in 2021		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.1 Marginal zone of saline lagoon supporting a fringe of *Bolboscoenus maritima* and *Elytrigia atherica*		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.2
Rock and cement armoured sea wall
supporting largely terrestrial species

Photo Orientation:

Seaward (East)
North – Quadrat – South
Landward (West)

Quadrat 8.3 Marginal zone of saline lagoon supporting a fringe of *Bolboscoenus maritima*, *Elytrigia atherica* and *Juncus gerardii* beside a well-trodden gravelly path.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.4 Terrestrial zone supporting a disturbed ground community beside well used footpat.		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

Quadrat 8.5 Terrestrial zone supporting a disturbed ground community beside well used footpath		Photo Orientation: Seaward (East) North – Quadrat – South Landward (West)
		
		

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<tr><td>Quadrat 8.6

New quadrat in 2019</td><td></td><td>Photo Orientation:

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