



NORTH BERWICK GOLF CLUB

Provisional Assessment of Coastal Issues

Report date: 8 July 2014
Consultant: Bob Taylor

Executive Summary

The dynamic and complex nature of the coastal environment has implications for both coastal defences and conservation management. Predicting coastal processes is complex and extremely uncertain (almost impossible). Coastal defence however is recognised as important in providing and fulfilling eco-system needs, ranging from economic stability to environmental protection.

Sea level rises together with reduced sand deposition and reduced sand within the system are leading to a gradual lowering of the beaches within the local area beaches and going forward this will increase the likely impact on the immediate coastline. Since the 1960's altered wind dynamics to a more northern orientation have been driving storm surges into the north of the Firth of Forth which is in turn increasing the rate of erosion through certain sections. Protection of the coastline in places is provided by the off-shore reefs, i.e. the rock platforms and the islands including Bass Rock, Leckmoran Ness and the Leithies, but crucially a gradual lowering of sand within this system and increasing tidal surges is likely to lead to further erosion and coastal loss in certain sections, whilst other sections given the stronger off-shore protection can be expected to hold the line (at least through the medium term).

The rock platforms situated through the lower shoreline will help to break wave energy well before it hits the coastline and these platforms are generally well situated around the North Berwick coastline and these will help in slowing coastal erosion through this section of the coastline

The coastal edge supporting windblown sand ranges from stable to moderately eroding and this generally is accelerating as a result of human disturbance (access damage).

The golf club have installed measures on a ongoing basis to reduce coastal impacts, these include rock armouring timber revetments gabions and chestnut piling fencing. A more concerted and directed approach is required to provide ongoing protection through and into the short and medium term whilst recognising and giving cognisance to the other amenity and recreation uses along this stretch of the coastline.

Introduction

STRI have been commissioned by North Berwick Golf club to assess coastal damage and reparation opportunities and to advise on a way forward through the short to medium term with respect to improving the coastal protection offered along the length of the coastline bordering the golf club. The club are aware of the existing shoreline management plans and the need to maintain amenity and recreation interests but are also acutely aware of the status of the golf club, its importance within the local and regional economy and its international standing as one of the top golf clubs in the world having never been disturbed or altered since its original construction back in 1832. Relocation or managed realignment is not an option for this golf club given both its unique history and its contained position within the squeezed coastline of North Berwick and has such a more directed, practical solution based on ongoing discussion to ensure ongoing protection of the coastline is being sought.

Background to STRI

STRI are the world's largest organisation devoted to sport and amenity land uses. Employing over 70 staff STRI are a multi-disciplinary organisation with agronomists, design and construction engineers as well as the most recognised and respected ecology/environment department working within this field. Bob Taylor is Head of the department and has over 25 years' experience working with statutory consultees to resolve coastal erosion issues. Bob Taylor has worked extensively with The Royal and Ancient Golf Club of St Andrews in an advisory capacity on coastal erosion issues and appropriate protection works around the British Isles. Work in this field is on-going around sections of the UK and Irish coastline. . Bob Taylor is currently providing advice to Royal Troon (Scotland) by way of fixed point photography and GPS surveying and Lahinch (Ireland) and Royal Porthcawl (South Wales) on appropriate protection and clean-up operations.

History of the Golf Club

The Golf Club dates back to 1832 and is indeed one of the oldest and purest links, one of just two still playing on the original ground with no major sub-surface excavations having taken place. The golf course works to a 100 year lease (the last lease signed in 1996). The Club effectively manage the entire facility, but their responsibility ends at the top of the dunes.

North Berwick Golf Club is a major golf tourist attraction and has been recognised within the top 100 golf courses as 17th in the UK, 7th in Scotland and 51st worldwide. It is thus a flagship course, bringing in significant revenue to the region. A full history of the golf course can be sourced from the North Berwick Golf Club website.

Background

The North Berwick Golf Club is situated on a northerly orientated projection of land, situated on the south-side of the Firth of Forth running into the Forth Estuary. The position of the golf course running along the coastline is exposed from the north/north east and from the east and east/south east.

This section of coastline falls within the Forth Integrated Management Strategy and the East Lothian Shoreline Management Plan (2002) which forms the basis for describing the different sectorial zones along the coastline, provides a strategic framework for coastal defences through East Lothian as well as a reference for bringing together management of the competing coastal demands. This plan also aims to co-ordinate and facilitate coastal defence actions whilst improving the understanding of coastline processes operating within the individual zones. Importantly, the document recognises the need to consider the importance of alternative means of dealing with coastal erosion and together with the Forth Integrated Management Strategy forms a basis and reference for bringing together management of the competing coastal demands. These plans aim to promote a new approach to management that will bring users and regulators together to discuss and resolve issues at a local level, this being important if appropriate conservation is to be given to protecting this unique and diverse coastline.

The East Lothian Shoreline Management Plan splits the region into 13 coastal process limits with North Berwick falling into Section 7 – Longskelly Point to North Berwick - Rugged Knowes and Section 8 – North Berwick to St. Baldred-s Port. The coastline is split into Management Units with the main Management Unit fronting the golf club being identified as Management Unit 12. The management objective here is to selectively hold the line through maintenance of existing defences along with periodic monitoring. Adjacent Management Units involve no active intervention to limited intervention.

The East Lothian coastline runs to over 69 km in length and supports a varied and diverse landscape that is both nationally and internationally important for nature conservation, with most of the coast being designated as a Site of Special Scientific Interest (SSSI). The coastline also forms part of the Firth of Forth Special Protection Area and RAMSAR site and supports significant archaeological historic heritage interest with the golf club forming a significant contribution to local and regional tourism.

In writing this report it has been important to recognise the economic benefit that the golf club brings into the region (the Golf Club is an important contributor to the East Lothian region – economically important business). At the same time cognisance must be given to retaining access and enjoyment to the coastline (access and recreation management) and ongoing environmental sustainability. The greatest threats to the coastline are from sea level rises, climate extremes and unpredictable weather patterns, coupled on a local level with natural deterioration of existing structures (sleepered walls) through to displacement of rock armouring etc. and to local erosion through foot traffic leading to weakening of vegetation and slippage of the coastal edge. Ongoing conservation and maintenance of the coastline is required to protect the golf club and its historic character as well as the economic benefit provided, it is equally important to protect the Forth landscape character whilst maintaining a sustainable use for access and recreation.

Although figures differ, scientists acknowledge that climate change is occurring and is likely to result in an increase of global mean surface temperatures of up to 4° by 2100 and a rise in sea levels of between 5 to 50 cm. This coupled with increased storm events repeating on an unpredictable basis will lead to significant changes through sections of the Forth coastline. North Berwick Golf Club has seen significant deposition of sand on the golf course over recent years, although to date sea water inundation has been limited. The coastline fronting the golf club appears to be both accreting (through sections) and eroding – the latter a result of dune instability and increasing storm pressures.

The Golf Club forms part of a diverse economy offering major tourism and an important natural environment (high ecological/habitat resources).

Scotland as a whole is keen to develop a more strategic and co-ordinated approach to tourism and outside recreation, something that North Berwick provides in abundance. Indeed, the history of the golf club and its position as one of just two original golf courses (largely undeveloped since its original construction) adds immensely to the archaeological, social and economic benefits to the region.

Furthermore, given the grassland habitats that exist, the golf course provides very important wildlife interest with skylark in particular (red data listed – Bird of European Conservation Concern) commonly seen and heard through the summer months. The golf course also acts as an important buffer, giving separation between the coastal edge and the built environment inland, this being particularly important for wintering bird species (sea duck and geese) that require resting and feeding areas out of random and indirect disturbance.

Coastal Dynamics

It must be recognised from the outset that coastal systems can be extremely dynamic. Wave and wind dynamics coupled with the unpredictability of coastal storms and a gradual sea level rise and importantly the deterioration of existing defences over time will all have an impact on the coastal frontage. At North Berwick considerable protection is being provided by the offshore islands and the offshore reefs formed through the presence of the rock platforms but changes in wind dynamics and increased storm loading as resulted in selected areas of erosion which is of increasing concern to the golf club.

At North Berwick through my on-site observations it is clear that local area erosion is evident albeit at a low rate (this has been exemplified by recent storm surges); the shoreline is moderately active and management is required now to prevent further loss of the coastal edge. If work is considered now then soft engineered options may be adequate through most areas to hold the line.

The coastline at North Berwick is experiencing periods and cycles of erosion and/or accretion. Over the years and through sections of the North Berwick coastline coastal defence work has been carried out mostly in a reactive manner, involving vertical sleepers and/or rock armouring. Some soft engineering options including chestnut paling fencing have also been trialled.

The recommendations provided below seek to minimise impacts whilst preserving the natural characteristics of the coastal edge.

Coastal Processes affecting the North Berwick Golf Club Frontage

The East Lothian coastline is under threat in a number of locations including sections of coastal frontage adjacent to the North Berwick Golf Club. Coastal change has been noted since the 1960's primarily as a result of:

- Decreasing sand (beach sand)
- Increasing sea levels (anticipated to increase by a further 0.3 m by 2050)
- Higher wave energy
- Decreasing sediment supplies

In addition, wind direction and more importantly North Berwick changes in wind direction coming from the north are all playing a part. Local erosion also occurs through access and trampling damage.

Management Considerations

Coastal protection and on-going management is necessary to protect the internationally renowned golf course, this must be fully considered and appropriate giving consideration to the following:

- Is the management option the most appropriate option?
- What would be the impact on adjacent areas – up and down the coast?
- Are the costs and conservation impacts justified?
- Will the management satisfy the stated objectives?

In conjunction with the above, non-intervention is not an option. Managed retreat is not an option for this golf club. North Berwick is confined to a very tight parcel of land and owes its very existence to the site in which this course was originally laid out. Indeed North Berwick can boast that it is one of very few courses that are totally original with no sub soil cultivations having occurred since the placement of the existing golfing features back in 1832.

Methods Considered

Rock Filled Gabion Baskets and/or Gabion Mattress Type Structures - These must be built and maintained correctly as gabions can open using unsuitable locations or when placed and filled with insufficient attention to appropriate construction workings. Well sighted gabions would have minimum ecological and/or visual impact, particularly if nourished with dune/beach sand. The life expectancy can be 20 years (possibly more in certain circumstances) particularly when built and buried into the dune/ coastal edge. Gabions can become exposed during excessive storm events. The gabions would need to be thick galvanised wire filled with natural large angular coastal rocks sited on a protective geotextile membrane to prevent the underlying sands being washed out (not necessary if placed directly on the rock platforms).

Dune Fencing - Chestnut paling fencing should be utilised where recommended to assist in the growth and further stabilisation of the existing dunes. This can be unsightly and will need to be undertaken with care and on a localised basis only. The angle of each run would be entirely appropriate at North Berwick in optimising capture of windblown sand without overly impacting on the beach area.

Sand/Nourishment/Recycling – Involves the collection of windblown sand and its careful spread and deposition through the coastal fringe as specified. This technique can be particularly useful for replenishing sand through areas of Gabion installation and or to kick start or reduce impact through areas of dune fencing.

Timber revetment - This type of protection is less expensive than seawalls or rock revetments and would be less impacting, although still clearly visible if extending out from the coast line. It is generally reserved for high value sites suffering modest and/or periodic erosion. Timber re-vetting would be appropriate if positioned at a series of outward projecting triangles running from the gabions into the beach by 6 or so metres. The cost would be dependent upon construction methodologies and timber available, but they can be extremely successful and as indicated above minimally impacting if backfilled with sand and planted with marram. Such revetments can be used to buffer the gabion walls or they could buffer existing area of sleepered wall.

Rock Armouring - This is the most impacting and most expensive option and often the most difficult to consent given high impact, long term effect and the potential for gross coastal change up and down the shoreline. It is however something that has been used through the area of the 2nd hole and could be used further through this area to bolster the existing to offer further protection to the sleepered wall behind.

Areas of Concern & Recommendations for Coastal Protection

The following account follows a casual walk north-west along the coastline from the 1st through to the 13th holes. Different aspects of the coastal edge were discussed and where appropriate recommendations for ongoing protection provided.

1st Hole



View east north east and north north east from the 1st tee

A strong tract of coastal vegetation extends to 22-25 m out from the 1st tee (out from the coastal edge), this section of the coastline is at least in part being protected by the vertical pylons installed from the town through to the golf course and also as a result of the rock platforms and islands offshore. The vegetation here is very strong dominated by red fescue with sea lime and marram.

Midway along the fairway the vegetation reduces to a nominal 10 m, this continuing over 120 m to the next rock outcrop.

Vegetation interests noted through this section included ribwort plantain, bird's-foot trefoil, cat's-ear, rough hawkbit, upright bent, sand sedge and yarrow. As can be seen from the picture the dune height bordering the golf course extends to no more than 1-1.5 m leading to a possible risk of inundation during moderate to severe storm events.



Reducing vegetation and dune structure through fairway to green

Recommendation for management: To improve sand retention i.e. dune nourishment I strongly urge you to consider reinstating the series chestnut palings that are still evident at least in part through this section of the coastline. Introduce a series of 12 m long palings from the existing dune edge at 70° from the north with spurs connecting to the main run at 7 m running in a due north orientation. Space the main runs at 12 – 15 m and continue over the 120 m length to the rock outcrop to the right of the green. Do not connect any posts into the more established dunes. Use 3 m long posts and drive to 2 m into the base of the sand. Should this not be possible then it may be necessary to concrete the posts at a shallower depth to ensure stability.

The main runs will capture the sand being blown onto the course from a north east orientation; the spurs will capture any sand movement from the south east. Brash could be tied into the palings following any management of the sea-buckthorn or other scrub on the course. The brash will need to be tied in securely to reduce movement and/or flapping which would lead to further instability during storm events.

The presence of paling fencing will accelerate and improve short-term stabilisation.



Sand capture and expansion of sea lyme



Looking back from the 1st green i.e. from the rock platform

The palings will need to be positioned as indicated so as not to be overly intrusive to visitor access.

2nd Hole

A strong rock platform protects the 2nd tees; the vegetation here consisting of cocksfoot, sheep's fescue etc.

The 2nd carry is protected by a series of vertical sleepers which have held together well over the last 30 years since their introduction, one or two are however weakening. The rock armouring is also well represented the tees through to the carry but there placement is haphazard and fairly random in terms of their distribution. The protection here is neither sufficient in extent or formed with appropriate angle of repose to protect from stronger storm surges.



Eroding coastline – note changes in beach structure from sand to rock platform



Vertical sleepered face and weak rock armouring protecting the 2nd tees and carry area

We agreed that the rock armouring should ideally be bolstered to create a shallow 15° angle of repose to encourage breaking of wave energy well before hitting the sleepered face. This would involve raising the rocks to almost the height of the sleepers and extending out by a further 4 m than existing.



Eroding coastline from the fairway through to the green with local (short-term accretion)



Looking back to 2nd tees – note short-term sand build up through the spring of 2014 only

Through the remainder of the 2nd hole consider chestnut paling fencing running at an acute angle - see above, then extended out by no more than 8 m to within 1 – 2 m of the general high water mark. This will leave sufficient access through the upper section of the shoreline during high tides, it does appear however that the majority of people do prefer walking on the more elevated dune sections.

It was encouraging to see significant sand accretion at the foot of the dune, though any stabilisation without the above intervention is likely to be constrained by regular foot traffic that is acute through certain sections.

3rd Hole

A good indication of erosion extent can be seen to the right of the 3rd tees as the coastline erosion signage was introduced approximately 3 m from the coastline 12-15 years ago, the signs are now within less than 1 m of the coastal edge (2-3 m loss over 12-15 years).



Coastal erosion sign 1 m from coastal edge

Vegetation running right of the 3rd hole is quite strong, extending out to 6 m through the area of the carry, variable thereafter with the dominant species including sea lime, with false oat grass, cocksfoot and red fescue.

A small area of localised erosion was noted at the point of the open burn, erosion is likely to be largely attributable to unrestricted access and not through normal coastal erosion processes.

Recommendations for Management: We agreed that the access point at the burn should be closed, using two runs of paling fencing with brash at 2 m spacing's over a nominal 10-15 m length. Complete by introduction of beach sand over the brash to create a more visually tidy result prior to sprigging with marram or block turving using deep turves that have fallen from the coastal edge.

From the burn the coastline appeared to be relatively stable with the only evidence of obvious erosion occurring as a result of trampling damage. We agreed that the coastline warrants no immediate intervention other than to monitor annually, ideally through GPS surveying and fixed point photography. This would give a valuable quantitative record of the position of the coastal fringe and upper shoreline. Photographs would give an indication as to the stability or otherwise of the coastline. Such information would prove extremely valuable given any future discussions with East Lothian Council and/or Scottish Natural Heritage (SNH).



Significant accretion and good stability exists right of the 3rd green running through to the 14th point



Although good stability exists through to the 3rd green, the dunes are limited to 2 m in width before the green itself and work should be considered to increase this

The dune fringe fronting the 3rd green is no more than 2 m wide and over time could become unstable, eroding with eventual loss of the green surface. The beach extends over 25 m before giving way to the rock platforms at the lower water mark.

Recommendation for Management: Ongoing management of this section of the coastline will be essential, but this will need to be backed by additional paling fencing over a nominal 60 m tract or there about using 8-10 m lengths of chestnut paling fencing installed at 60° from the north at wide 10 m spacing's. Introduce short 2 m spurs at right angles to the main runs and use buckthorn brash to further collect sand to the back of the spurs i.e. back of the junction.

14th Hole



View of coastline from the left of approach

The dunes protecting the 14th are relatively tall to around 12-15 m in height, reducing to around 6-8 m through the mid-section of the fairway. The sward is becoming increasingly mesotrophic, similar to that noted right of the 3rd green, supporting perennial ryegrass, Yorkshire fog, false oat grass and cocksfoot, albeit with an increased component of marram and occasional sea lime.

A few localised access points were noted resulting in localised erosion, but these were not overly significant.

Recommendation for Management: No management other than annual monitoring through GPS surveying and fixed point photography is required. The near shore and off shore reefs i.e. the rock platforms and further out the islands are all offering good protection to this section of the bay.



Sea-buckthorn gives additional protection and interest through the dunes running down to the coastline to the left of the 14th tees

13th Hole

The coastal edge protecting the 13th hole was severely compromised some 10 – 12 years ago whereupon 8 m of the coastline was lost to storm damage. The resulting defences have been reduced to a nominal 12 m width of dune before the wall and the adjacent 13th hole.



Bay to the back and right of the 13th hole (running left of the 13th fairway). This bay is important as it does give protection to the 12th green.

Over the last five years, sea lime has built up to form quite a strong low level defence extending out to 4 m to the beach (18-20 m in width).

Two significant gaps between the offshore islands exist which given the more recent changes in wind speed direction is resulting in damage through this section of the bay. It would not be difficult to see here that any moderate to severe storms hitting the coastline from a northerly orientation would result in significant loss of the remaining dune system.

The dunes are highest towards the green (3 m) reducing to around 1 – 1.5 m at the lowest point i.e. adjacent to the wall.

Recommendations for Management: Introduce a series of chestnut paling fences at wide 12-15 m spacing's in an east to east south east orientation with spurs situated at right angles running in a north east to north north-east orientation.

It would be prudent to continue two or more of the paling fencings onto the dune i.e. at the lowest point and to the wall anchoring the posts well into the ground and away from the more vulnerable coastal margins. The area supporting the palings would need to be marked as GUR until a grass cover had been reinstated following sand deposition.

12th Hole



Section of coastline adjacent to the 12th hole

This section of the coastline has not changed significantly over the last 20 years which is confirmed by the presence of the red posts that earmark the out of bounds and are still in relatively the same position as they have always been with no significant loss on the coastal side.

Recommendation for Management: No recommendations for management other than ongoing annual monitoring required.



Eroding section of coastline at mouth of burn



Under cutting and destabilisation of the gabions through the mouth of the burn



Tall dune left of the 11th green prone to undercutting and loss of vegetation

The area due north of the open burn is prone to undercutting and coastal erosion, the dunes provide no more than 10 m of remaining protection, all of which could clearly be lost given any severe storm event. In addition, the burn remains quite dynamic and is at present undercutting the dune to the north side resulting in more significant erosion.

Recommendations for management: Given the potential for further erosion I strongly recommend that you look to create a more directed outflow to involve the following:

In the first instance it will be necessary to remove the failing gabions to the south side of the dune re-profiling and re-turfing the mound with deep turves collected from within this vicinity, whilst excavating and removing the gabions. Aim to form a 30-40 m slope staking each turf well into position. Individual turves will need to be heavily top dressed with beach sand with particular attention being given to filling in any joints to reduce drought stress and/or frost damage.

On the north side, rather than developing a solid structure it would be preferable to introduce a series of paling fences running in an east south east orientation with small 2 m spurs at right angles. The fences need only be 8-10 m in length and would need to be tied in well into the sand. Buckthorn brash would be used to bolster the palings and all wood and other debris would need to be removed. Once in place the water course can be re-orientated to run straight out to sea, the sand excavated should be stockpiled to the front and through the body of the palings to reduce visual impact and also to give an immediate start towards sand accretion and/or eventual stabilisation.

Further north, the 12th dunes are vulnerable and prone to undercutting and we agreed that soft engineered options, including the use of chestnut paling fencing would be suitable and indeed necessary, these to run over 15 m (spaced at 12 m) and positioned in a north east orientation so as to capture sand being blown from the south east and east. Continue through to where the sea-buckthorn becomes dominant and where full cover exists.

From here on, the dunes were noted as stable supporting both a strong marram, sea lime, red fescue sward with sea-buckthorn. The dunes are tall to around 12 – 15 m in height and parts of these important dunes were becoming locally dominated by coarse weed grass species including Yorkshire fog, cocksfoot and perennial ryegrass, these patches no doubt being an historic reflection of grass leaf deposition. This practice should not be allowed as it will only result in the loss of appropriate grass species leading to the potential for loss of stabilisation during storm events.

General Recommendations

The level of erosion at North Berwick is slight and localised but likely to increase as beach sand continues to be taken out of the system and as storm surges increase in terms of their intensity and velocity. Some protection is provided by the offshore islands and the rock platforms, these acting as inshore reefs and whilst through certain sections it may simply be worthwhile adopting an ongoing monitoring approach involving GPS surveying and fixed point photography, through other areas it will be necessary to bolster existing defences and/or introduce additional soft engineering options, particularly chestnut paling fencing. Sand is I understand not available to carry out any beach or dune nourishment.

A number of opportunities exist to introduce chestnut paling fencing and these have been identified above under holes 1, 2, 3, 12, 13. Through the 2nd hole the existing rock armouring should be reinstated to create a more structured defence, running back to the existing vertical sleepered wall. Rock armouring could be introduced through this section only, with a view to extending out by a further 4 m and to give a height of around 4 m giving a shallow angle of repose of around 15°. This will ensure that wave energy breaks and the waves topple well before overlapping and undercutting back of the sleepers.

Chestnut paling fencing must be introduced with care, posts should not be inserted into the margins of any more vulnerable dunes as this will lead to further erosion, it is normal to place the paling runs at between 10 – 15 m spacing's, spurs could normally run at right angles to the main runs. Sea-buckthorn brash could be tied in to the fencing with any large wood debris etc. removed as this will, through its movement result in further instability.

Prior to commencing with any work it will be necessary to discuss the Clubs proposals with East Lothian Council and to gain consent from Scottish Natural Heritage. I will be pleased to contribute to any meetings upon request to help move the ongoing project forward. In addition it is recommended that the club allow STRI to commence with an annual GPS/ fixed point Photography survey to enable a more quantitative assessment of coastline fluctuations and potential short term accretion or erosion that may be taking place; this will help considerably in any ongoing or future discussions with other interested consultees.

Signed

A handwritten signature in black ink, appearing to read 'RS Taylor' with a stylized flourish underneath.

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