This principle is aggravated when large sections of the shoreline are protected, as in the case of Ayrshire, resulting in the focussing on fewer stores to supply the wider need of the cell/sub cell. This problematic situation is hindered further by the extraction of sediment from river mouths. Given the size and location of the rivers in question these are unlikely to contribute significant volumes of beach material to the cell; however, the dredged material is likely to beach material moving alongshore. The removal of this 'beach sediment' from the foreshore to an offshore dump below the wave base can be a significant loss to the cell.

60,000 tonnes of sediment are extracted annually from Ayr Harbour. A significant proportion of this sediment is likely to be beach grade material. If this could be fed to the near shore, the erosional problems would decrease.

8.0 Summary of Results

A summary of results dealing with Archaeology and Built Heritage and Erosion Class is given below.

8.1 *Archaeology and Built Heritage*

8.1.1 *Number of Sites*

The desk based assessment and the field survey produced a total of 299 sites. Of these, 195 were previously recorded in the WoSAS Sites and Monuments Record and in the National Monuments Record held by the RCAHMS. The field survey produced another 104 sites that were previously unrecorded. Of these 299 sites, a total of 21were Listed Buildings, the majority of which lay inland from the coast edge but all within the survey zone of 50 – 100 m from the coast edge. A total of 11 Scheduled Ancient Monuments were located in the survey area. Four of these sites were both Listed and Scheduled. For the purpose of this project they were counted as Scheduled. A breakdown of the sites can be seen in Table 2. The number of these sites present in the different coastal sections can be seen in Table 3, the Scheduled Ancient Monuments in Table 4 and the Listed Buildings in Table 5.

Table 2: Number of Sites

Sites	*No of Sites Located During Survey*	*% of Total No of Sites*
Listed Building	21	7
Scheduled Ancient Monument	11	3.5
Designed Landscape	2	0.5
Designated Wreck	0	0
Undesignated Wreck	13	4.5
Other Known Site	243	81.5
Insufficient information	9	3
TOTAL	299	

Table 3: Sites per Coastal Section

Sites	*Ayrshire Coast*	*Cowal Peninsula*	*Great Cumbrae Island*	*Total*
Listed Building	13	7	1	21
Scheduled Monument	8	3	0	11
Designed Landscape	0	2	0	2
Designated Wreck	0	0	0	0
Undesignated Wreck	6	5	2	13
Other Archaeological Site	146	57	40	243
Insufficient Information	9	0	0	9
TOTAL	182	74	43	299

Table 4: Scheduled Ancient Monuments

Name	*Survey No*	*Coastal Section*	*NMRS No*
Bower Hill	A64	Ayrshire	NS21NE 3
Culzean Castle Battery	A142	Ayrshire	NS21SW 17
Culzean Coves Cave System	A74	Ayrshire	NS21SW 1
Culzean Coves Cave System	A85	Ayrshire	NS21SW 1
Dunure Castle (Listed)	A69	Ayrshire	NS21NE 8
Greenan Castle (Listed)	A58	Ayrshire	NS31NW 1
Katie Grays Rocks	A71	Ayrshire	NS21SW 14
Portencross Castle (Listed)	A11	Ayrshire	NS14NE 2
Dunoon Castle (Listed)	C18	Cowal	NS17NE 1
Dunoon Coastal Battery	C66	Cowal	NS17NE 26
Kilmun Collegiate Church	C38	Cowal	NS18SE 1

Table 5: Listed Buildings

Name	*Survey No*	*Coastal Section*	*NMRS No*
Academy Street, Ayr	A126	Ayrshire	NS32SW 144
Culzean Castle	A141	Ayrshire	NS21SW 1
Culzean Home Farm	A139	Ayrshire	NS21SW 7
Culzean, Ardlochan Lodge	A169	Ayrshire	NS20NW 20
Culzean, Camellia House	A176	Ayrshire	NS21SW 1
Culzean, Ice House	A179	Ayrshire	NS21NE 2
Dunure Castle, Doocot	A70	Ayrshire	NS21NE 31
Dunure Harbour	A63	Ayrshire	NS21NE 24
Irvine Harbour/Buildings	A34	Ayrshire	NS33NW 40
Kelburnfoot Lodge	A147	Ayrshire	NS25NW 22
Portencross Old Harbour	A10	Ayrshire	NS14NE 27
Portencross, North Harbour	A09	Ayrshire	NS14NE 33
Salt Pan Houses, Prestwick	A45	Ayrshire	NS32NW 4
Dunoon Pier	C20	Cowal	NS17NE 69
East Bay Quay	C21	Cowal	NS17NE 32
Hafton House	C53	Cowal	NS17NE 21
Kilmun Pier Post Office	C50	Cowal	NS18SE 44
Old Kilmun House	C71	Cowal	NS18SE 37
Toward Point Light house/Foghorn	C60	Cowal	NS16NW 12
St Columba's Church	C74	Cowal	NS18SE 35
Millport Harbour	GC04	Cumbrae	NS15SE 42

8.1.2 *Site Density*

The average density of the sites recorded during the survey can be seen in Table 6. Although this statistic is useful in terms of gaining a general idea of site density over the entire survey route, it bears no relation to actual site distributions. This is seen most clearly on the Ayrshire coast, where large stretches of coastline contain few or no recorded sites. This is primarily because of the influence of industrial activity on several stretches of coast that will have destroyed any sites that may once have been there – for example, the Ardeer Explosive Factory in Irvine Bay and the developments south of Irvine, a stretch of coastline 8 km long. Here, apart from the industrial sites themselves (which are a significant part of the built heritage), very few sites of any other period were recorded. In general, there were no significant distinctions in relation to site density between the three survey areas

Table 6: Site Density

Survey Area	*Total No of Sites*	*Length of Coast (km)*	*Average No of Sites per km*
Ayrshire Coast	182	77.5	2.35
Cowal Peninsula	74	28.2	2.62
Great Cumbrae Island	43	18.5	2.46
Entire Survey Area	299	124.2	2.40

8.1.3 *Site Dates*

It is clear from Table 7 that the vast majority of the sites have been designated, so far, as being of 'unknown' date. Many of these sites can, however, be tentatively placed into very broad categories, for example prehistoric, early Medieval, Medieval or Industrial. This would require further work on the database and further research into the various site types.

The sites that do have a date designation are predominantly post eighteenth century in date, including the numerous industrial sites on the Ayrshire section and the piers and quays on the Cowal Peninsula and Great Cumbrae. All the pre sixth century sites are find spots of Roman coins at Irvine (A119), Prestwick (A157) and Portencross (A90), as well as a bronze hoard at Maidens (A144) and a probable Mesolithic flint scatter at Rancleugh (A165). All of these prehistoric sites were known prior to this project. The three sites that fall into the sixth to fourteenth century date include the findspot of the Hunterston Brooch (A88), Culzean Castle (A141) and Dunure Castle (A69).

Table 7: Date Range of Sites

Date Category	*Ayrshire Coast*	*Cowal Peninsula*	*Great Cumbrae Island*	*Total*
20th century	15	10	7	32
18th-20th century	37	28	8	73
14th-18th century	10	3	0	13
6th-14th century	3	0	0	3
1st-6th century	3	0	0	3
4th mill BC-1st cent	1	0	0	1
Pre 4th Mill BC	1	0	0	1
Unknown	112	33	28	173

8.1.4 *Site Types*

Over the entire survey area certain categories of site became apparent. Some of the main groupings are mentioned briefly below and give a guide to some of the sites noted as 'other sites' in Section 8.1.1.

Flint Scatters

Five flint scatters have been previously noted on the top of the emerged beach deposits at Croy Bay (Map 13a). This is all agricultural land. At the time of field survey the majority of fields were grass covered, reducing the chance of locating any lithic scatters compared to in newly ploughed fields. This concentration of lithics in one area may suggest a focus of prehistoric activity here.

Fish Traps

Twenty-nine sites have been described as 'fish traps' along the northern Ayrshire coast and are of unknown date (Patterson 1989). Some of these were located during the field survey, but many could not be located or were considered to be natural features. This does not preclude their having acted as fish traps, but it was difficult to identify any anthropogenic contribution to their structure. Another possible fish trap was located to the north of Dunure (A61, Plate 9).

Medieval Castles & harbours

There were four main castles noted during the survey. These were at Portencross (A11), Greenan (A58, Plate 8), Dunure (A69) and Culzean (A141). All are situated on the coast edge or relatively near to it. The importance of the sea in terms of transportation is illustrated by the presence of Medieval harbours at some of the castle sites. These are most prominent at Portencross (A10) and Dunure (A63). Little of the Medieval castle survives at Culzean, but some of the original stonework was incorporated into the eighteenth century building. Less distinct Medieval harbours may be located at Saltcoats where the rocks would have formed a natural harbour that has subsequently been utilised by the most recent pier construction, and at Maidens where a similar situation exists. There are records of Ayr harbour being in use in the thirteenth century, when the Scots King had a number of vessels constructed there (Shaw 1953). It should be noted that Medieval shipping would have utilised natural and sandy bays and, therefore, left little evidence. Much of the evidence for early harbours would have been subsequently built over in later phases of the harbours' development.

A good example of a small bay being utilised as a port/harbour, although not necessarily Medieval in date, is that at Little Skate Bay (GC12, Plate 5) on the western side of Great Cumbrae.

Post-Medieval Harbours, Piers, Slipways & Jetties

There were numerous piers, slipways and jetties in all of the three sections of the survey area. Within this grouping there existed clear distinctions with regards to the function of the structures. On the Cowal Peninsula the main piers still in use were Dunoon Pier (C20) and Hunters Quay (C46). Piers that survived but were out of use included Strone Pier (C41, Plate 3), Kilmun Pier (C39) and Ardnadam Pier (C32) and piers where no or little physical structure remains included Kirn Pier (C25), Innellan Pier (C17) and Toward Pier (C04). All of these date to the nineteenth century and are a result of the heavy use of the Clyde steam boats used both for passenger and coal transportation. These piers and quays on the Cowal Peninsula provided easy access to land from the steamers for the masses that travelled to the area during the summer months of the nineteenth and early twentieth centuries. The Cowal peninsula provided the ideal holiday resort from the more industrialised Glasgow and Ayrshire Coast. These piers and quays form a unique type in relation to other structures in Britain. They are much shorter than other contemporary structures in England, where the shores are less steep and, therefore, the piers were longer (Lavery, 2001).

The Island of Great Cumbrae had a concentration of slipways and jetties around the southern and western, more sheltered coasts. Cumbrae was and is a holiday destination. Due to the small size of the island, one slipway is sufficient to cope with the numbers of passengers. This is located presently at Cumbrae Slip (GC17) with the remains of the larger, now disused, pier to the south at Dowancraig (GC30). The smaller jetties and slipways located around the western coast and in Millport harbour exist for smaller recreational vessels, for example GC02, Plate 4.

On the Ayrshire Coast a different situation exists. Here the larger piers and slipways are mostly associated with the harbour complexes that grew out of industrialisation. These include the harbour at Ardrossan (A21), Saltcoats (A22), Troon (A42) and Ayr (A54). These are partially used for recreational transport but their construction is primarily due to the industries that dominated the coast line on a large scale from the seventeenth century to the present day.

A clear distinction can be made in the post Medieval period in this general grouping of sites between the dominant recreational nature of the piers, jetties and slipways on the Cowal peninsula and Great Cumbrae Island and the industrial nature of many piers and harbours on the Ayrshire Coast, which is largely absent on the former two coastlines.

Industrial Sites

The Ayrshire Coast has long been a departure point for industrial materials, for example coal, and has given rise to large harbour complexes (see above). Evidence of the actual industrial processes also present themselves in the form of remains located on the coast edge. These include the loading bay at Kelburnfoot (A01), eroding mining waste at Stevenston (A25, Plate 7), the ruined pier and manmade promontory also at Stevenston (A32), Nobels Explosive Factory (A116 & A117) and the industrial waste eroding out of the dunes at Irvine Beach (A37). These present relatively recent additions to the archaeology of the coastline but are important in that they show the prominent place industry has played in the evolution of the Ayrshire coastline.

First and Second World War military sites

Evidence of First and Second World War sites are seen, for example, at the former submarine defence buildings at Eerie Port, Great Cumbrae (GC13), military installations at Seamill (A15, Plate 6 & A18) and the somewhat isolated outlook post south of Dunure (A66, Plate 10).

8.2 *Erosion Class*

Over the entire survey area a total of 24.2 km of the coastline was classified as definitely eroding over the short term, although in some cases the rate of erosion was low (Table 8). The majority of this (24 km) was located along the Ayrshire coastline, with a small section at the entrance to the Holy Loch on the Cowal Peninsula accounting for the other 0.2 km. It should be noted that this does not mean that all of the sites located within these areas are actively eroding at the coastal edge. Some are located in the 50 – 100 m area inland from the coast edge. It does mean, however, that they currently lie in an eroding area and can be classified as being under threat from erosional processes now or some time in the future.

A total of 54.5 km of the survey area was classified as currently stable. This made up by far the largest percentage of coastline. It should be noted that a significant proportion of those shores classified as currently stable are characterised by either rock platforms or artificial coastal protection structures. In the long term they are in fact erosional shores, albeit with a low rate of erosion. The long term status of the Clyde is thus erosional.

Table 8: Erosion Classes for the Survey Area

Erosion Class	*Distance in Survey Area (km)*	*% of Survey Area*
Eroding	24.2	19.5
Stable	54.5	44
Accreting	3.5	3
Eroding or Stable	24	19
Accreting or Stable	15	12
Eroding and Accreting	Term Not Used	0
No Access	3	2.5
TOTAL	124.2	100

As mentioned before, the Ayrshire coast is the worst affected by coastal erosion, with 31 % of it coming under threat from erosional processes (Table 9). The area between Troon and Portencross, where softer deposits of Carboniferous Sandstones and limestones have been gradually eroding to form the large Irvine Bay, are particular areas of concern.

Table 9: Erosion Class by Survey Section

Erosion Class	*Ayrshire Coast*		*Cowal Coast*		*Cumbrae Coast*		*Total Survey Area*	
	km	%	Km	%	km	%	km	%
Eroding	24	31	0.2	0.5	0	0	24.2	19.5
Stable	23	29.5	13	46	18.5	100	54.5	44
Accreting	2	2.5	1.5	5.5	0	0	3.5	3
Eroding or Stable	18.5	24	5.5	19.5	0	0	24	19
Accreting or Stable	7	9	8	28.5	0	0	15	12
Eroding/Accreting	0	0	0	0	0	0	0	0
No Access	3	4	0	0	0	0	3	2.5
TOTAL	77.5	100	28.2	100	18.5	100	124.2	100

In contrast, the Isle of Great Cumbrae proves to be the most stable of the three areas, with 100 % of its coastline classified as stable. The Cowal Peninsula is also relatively stable, with 46% of the coastline being stable and only 0.5% eroding. The Cowal Peninsula and the Ayrshire coast have similar percentages of their coastline classified as eroding or stable, where both erosion and stable characteristics were identified. This suggests that, although not under an immediate and direct threat from coastal erosion, the archaeological sites in these areas may experience erosion periodically or over a long period of time.

Only the Cowal Peninsula has experienced significant accretion of material. A total of 28.5% of this survey section was termed accreting or stable, all of which was located on the east facing coastline. The head of the Holy Loch is an area of accretion, where the River Eachaig deposits much of its sediments.

8.3 *Erosion and Archaeology/Built Heritage*

In Ayrshire there are 73 sites within eroding parts of the coast. These include the Listed Buildings at Portencross, the Castle (A11), the Old Harbour (A10) and the North Harbour (A09). Here the coast has been classified as eroding, but at a very slow rate. Kelburnfoot Lodge (A147), to the north of Portencross, is another Listed Building lying on the inland edge of the survey zone and, although in an eroding area of coast, it is under no direct immediate effect as the rates of erosion are suspected to be low.

The site where the Hunterston Brooch was found and the related early settlement is located is also situated in a stretch of coastline that has been classified as erosional. The site is, however, situated at the base of the Holocene cliff line some 80 – 100 m from the coast edge. The erosional rates at this area are not enough to pose any great threat to the site over the short term.

Outside Ayrshire, the only site in an area designated as eroding is the First World War Memorial Monument (C31) erected at Lazaretto Point at the entrance to the Holy Loch on the Cowal Peninsula. A stretch of approximately 200 m on the eastern side of the monument is visibly eroding and will eventually engulf the Memorial. The fish traps seen on the Ayrshire coast lie within the eroding section and are therefore under threat. However, their stone construction would reduce their vulnerability.

Industrial sites form a major part of the Ayrshire coast's history and development, and these sites also lie within eroding areas of the coast. A number of these occur near Stevenston. Here a vast bingof mining waste (A25) is rapidly eroding out of the coast edge. Just to the south, only faint remains of a pier lie at the end of an eroding manmade promontory (A32). The vast industrial waste deposits that create the coast edge bank of the Ardeer Explosives works is also actively eroding (A30). There is clearly a wide variety of sites located within eroding areas of the coastline, primarily in the Ayrshire section.

8.4 *Public Outreach and Training of Shorewatch Groups*

Shorewatch groups have been established with single individuals acting as the team leaders, providing a single contact for the group. This, it is hoped, will aid liaison with SCAPE and the Firth of Clyde Forum during subsequent phases, act as an organisational focus and provide the impetus for groups to continue Shorewatch once GUARD's involvement is over. Although not a prerequisite, the team leaders all hold ACFA qualifications and have prior experience in archaeological survey.

9.0 Recommendations and Discussion

9.1 *Recommendations*

Table 10 shows the total number of sites assigned to the three recommendation categories.

Table 10: Summary of Recommendations

Recommendation	*Ayrshire Coast*	*Cowal Peninsula*	*Great Cumbrae Island*	*Total Survey Area*
	No of sites	*No of sites*	*No of sites*	*No of sites*
Survey	16	3	1	20
Monitor	64	16	8	88
Nil	105	52	34	191
TOTAL	182	74	43	299

9.1.1 *Sites Recommended for Survey Table 11: Sites Recommended for Survey*

Site Name	*Site No*	*Protected Status*	*Report Map Number*
Dunure Castle	A69	Scheduled Monument	12b
Culzean Castle	A141	Listed Building	13b
Greenan Castle	A58	Scheduled Monument	11b
Portencross Castle	A11	Listed Building	7a
Culzean Coves, Caves	A74	Scheduled Monument	13b
Culzean Coves, Caves	A85	Scheduled Monument	13b
Portencross Old harbour	A10	Listed Building	7a
Portencross North harbour	A09	Listed Building	7a
Katie Gray's Rocks	A71	Scheduled Monument	13a
Bower Hill	A64	Scheduled Monument	12a
Prestwick Salt Pan Houses	A45	Listed Building	11a
Fisherton	A62	Nil	12b
Dead Knowe	A72	Nil	13a
Fisherton	A60	Nil	12b
Stevenston, East Shore	A25	Nil	8b
Stevenston, Ardeer	A32	Nil	8b
Toward Point	C05	Nil	4a
Hunters Quay	C30	Nil	2
Lazaretto Point	C31	Nil	2
Little Skate Bay	GC12	Nil	5a

In Ayrshire a total of 13 sites were recommended for survey. These include two possible fort/dun sites that lie on the southern Ayrshire coast. At Bower Hill (A64) and Dead Knowe (A72), both the sites lie directly on the cliff edge and are subject to very slow erosion rates. Further work may help to ascertain the authenticity of these potentially significant monuments on the coastline. The Culzean Cove cave sites would merit detailed monitoring and recording to allow any consolidation work to occur if they come under immediate erosional danger, specifically the substantial masonry work on the cliff face of A74, Plate 11.

There were also four castles and their associated features. The significance of these sites are all very high and are located at the extreme cliff edge. None are in immediate short term erosional danger but in the longer term are under definite threat. Survey of the castle sites may include standing building work or, in relation to Greenan and Portencross Castle, consolidation work where much of the structure is unsafe. Portencross Castle, Old Harbour and its environs have not been surveyed in detail. There are what may be wall foundations in the vicinity of the castle, which may relate to buildings known to have existed in the seventeenth century, but these could also be natural grass covered rock outcrops. The Castle has been weathered by the wind and the base of the walls by the sea, but it is in no danger of falling into the sea in the foreseeable future (Report Mss by ARP Lorimer for the Friends of Portencross Castle 2003). The harbours at Portencross are an important aspect of the village and castles' development and merit inclusion in the survey recommendations, as they are sites of high significance located in an area of erosion.

Also in Ayrshire, the building remains and related midden at Fisherton (A62), where buried structural remains exist close to the coast edge, and a related midden were noted. The midden material would suggest that it went out of use in the eighteenth to nineteenth centuries. The unknown age of the site and its vulnerability on a low lying coastal edge provoked a recommendation of further work to be carried out on the site.

The prominent part industrial sites have played in the development of the Ayrshire coast is often overlooked in the archaeological context. Sites at Stevenston, including the mining waste (A25, Plate 7) and the pier and manmade promontory (A32), should be surveyed as they are actively eroding at a relatively rapid rate. Their significance lies in the close relationship they have with the development of the Ardeer Explosives Factory and the now abandoned mining complex around which Stevenston grew. The Salt Pan Houses at Prestwick (A45) are listed buildings and as with the castle sites merit detailed monitoring of their position on the coast edge.

Great Cumbrae Isle only contained one site recommended for survey. This was the previously unrecorded site at Little Skate Bay (GC12, Plate 12). The site consists of a small, stone-block built jetty which has the potential of being considerably older than the other piers and jetties on the island. More detailed monitoring and recording work is recommended.

The Cowal Peninsula contained three sites with a survey recommendation. The lime kiln (C05, Plate 1) at Toward Point should be closely monitored and recorded due to its position on a rock promontory only a few metres from the sea. The vaulted structure (C30) lying beneath the road at Hunters quay is not actively eroding at a fast rate but it shows signs of degrading and collapse. Its unique structure in terms of sites found in the coastal zone survey suggests that consolidation/recording work may be appropriate. The monument at Lazaretto Point (C31) merits detailed monitoring due to high erosion processes that are occurring on the adjacent coast.

9.1.2 *Sites Recommended for Monitoring*

On the Ayrshire coast the majority of the sites that were recommended for monitoring were the fish traps located between Ardrossan and Hunterston, discussed above. Some of these proposed boulder features were located during the field survey but many were not. Doubts over the authenticity of these boulder features exists, as naturally occurring boulders were often strewn across the intertidal rock platform where the fish traps are suggested to be. Boulder features do exist here, but more monitoring field work is needed to look into this interesting aspect of the archaeological environment.

Many of the sites proposed for monitoring on the coast of the Cowal Peninsula include piers, jetties and slipways. Some are either Scheduled or Listed, for example, Dunoon Pier (C20), while others appear to be degrading relatively quickly. Boulder alignments of unknown purpose were located in the intertidal zone on Cowal, including C09 & C72 along with the possible boulder defined slipway C15, Plate 2. Monitoring of these sites and research into their use, possibly by the Shorewatch groups, is recommended.

The island of Great Cumbrae also contained sites that were allocated the monitoring category. These include the possible prehistoric cairns in the north-east of the island (GC20 & 21), which both lie near the coast edge. A possible chapel site (GC31) should be monitored for any evidence of the true location of the site. An industrial midden (GC07) that is eroding from the coast edge in storm tides/waves may also be monitored to check for material evidence that may give an insight into its origin.

10.0 Conclusion

It is clear from the coastal zone assessment that there exists a wide variety of sites within the survey area, ranging from prehistoric flint scatters in southern Ayrshire to cliff edge castle sites and remains of industrial processes. There was a clear distinction between the high level of industrial activity that occurred on the Ayrshire coastline compared to the low level in Cowal and Cumbrae. This also became apparent in the recorded sites; for example, the quays and piers recorded in Ayrshire were predominantly industry based, whereas the same features on Cowal were more recreational. It can be presumed that the survey areas in both Cowal and Ayrshire have had their archaeological and historical environment at the coast edge significantly altered over time by development relating to industry and housing.

Ayrshire clearly suffers from erosional problems in the northern and mid sections. This has been tackled to some extent by protection structures, including sea walls, gabion baskets and rip rap. This type of protection clearly has knock on effects on other areas of the coastline. In only one small section, that to the north of the Heads of Ayr, did coastal edge protection use materials that allowed active natural movement of sediments along the coast while still protecting the shoreline. The Cowal Peninsula, Great Cumbrae Island and the Ayrshire coast south of Greenan Castle are clearly more stable in the current climate. The Shorewatch groups and other interested local parties will, it is hoped, maintain a watch on the coastline, allowing proper assessment of this constantly changing environment.