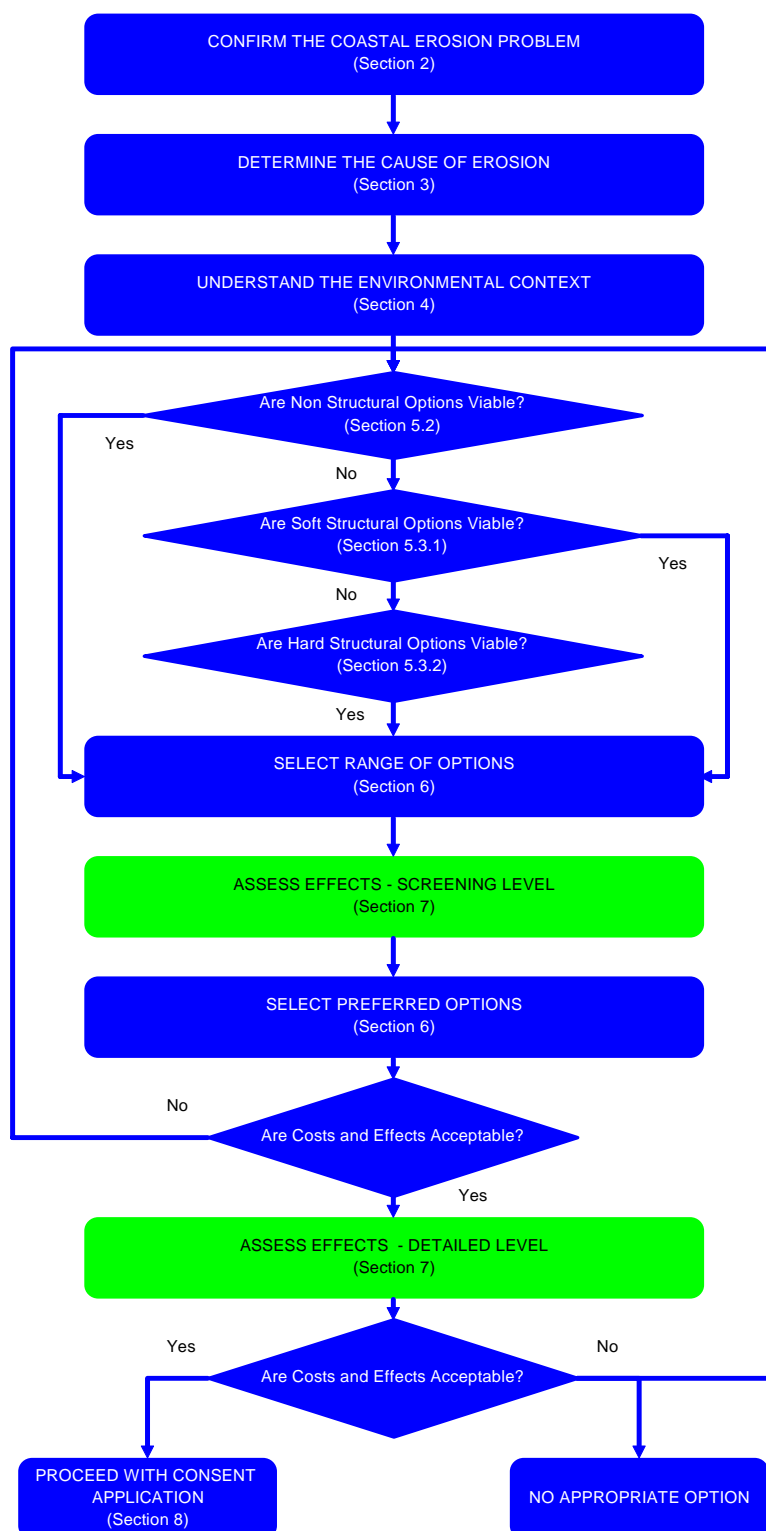


COASTAL EROSION MANAGEMENT MANUAL



SECTION 7 - ASSESSMENT OF ENVIRONMENTAL EFFECTS

EXPECTED OUTCOME OF THIS SECTION:

To assess the potential environmental effects of your selected coastal erosion management options.

COASTAL EROSION MANAGEMENT MANUAL

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7. ASSESSMENT OF ENVIRONMENTAL EFFECTS

7.1 INTRODUCTION

The Assessment of Environmental Effects (AEE) is the process by which the actual or potential effects that a proposal might have on the environment are identified and evaluated. This section discusses what effects should be considered during the preparation of an AEE for coastal erosion management purposes, and provides guidance on how to carry out an AEE.

7.1.1 THE CONTENT OF AN AEE

*Refer Section F,
Preparation of an
AEE*

The Fourth Schedule to the RMA sets out what should be included in an AEE. An AEE for a coastal erosion management activity will:

- describe and define the cause of the erosion problem;
- identify the scale of the erosion problem;
- describe the environment in which the erosion problem is occurring;
- describe the proposal and the reasons for selecting it;
- identify actual or potential effects the proposal could have on that environment;
- outline any consultation process;
- outline reasonable and practical ways to avoid, remedy or mitigate any of the adverse effects identified; and
- conclude with the best practical option for managing the coastal erosion problem.

7.1.2 THE LEVEL OF DETAIL REQUIRED

The extent and detail of information to be included in an AEE is dependant on the scale and significance of the actual or potential effects that the activity may have on the environment. The AEE should provide sufficient information for any person to be able to understand and assess the implications of the proposal.

Because of the broad scope of issues that need to be addressed when considering coastal erosion management specialist advice will often need to be sought to complete an AEE.

7.1.3 STATUTORY REQUIREMENT TO PREPARE AN AEE

Every resource consent application to undertake a coastal erosion management activity, must include "*an assessment of any actual or potential effects that the activity may have on the environment, and the ways in which any adverse effects may be mitigated*" (Section 88(4)(b) of the Resource Management Act 1991).

Whether a resource consent is required or not to undertake a coastal erosion management activity, it is good practice to consider the effects on the environment of the proposed activity.

The benefits of producing a well prepared AEE are:

- full and complete identification and evaluation of the actual or potential effects of that activity on the environment;
- identification of the most appropriate coastal erosion management option;
- identification of the likely costs of undertaking the project;
- sound basis for informed decision making; and, if a resource consent is required:
 - the consent authority will be able to process the resource consent application without delay;
 - the application may be able to be processed on a non-notified basis, or if notified it may attract fewer submissions;
 - reduced risk of an appeal to the Environment Court on your application;
 - high prospect of resource consent being granted to your project.

7.2 MATTERS TO BE ADDRESSED IN AN AEE

7.2.1 DESCRIPTION OF THE PROPOSAL

This will include:

- describing the activity to be undertaken (i.e. the proposal);
- describing the purpose of the proposal;
- describing the process for selecting the preferred option;
- identifying the location of the site, and the location of any proposed works in relation to the site; and
- identifying the proposed construction methodology, including access to and from the site.

7.2.2 DESCRIPTION OF THE SITE AND ITS ENVIRONMENT

This will include:

- describing physical features and values;
- identifying flora and fauna, particularly of any protected species and their habitats;
- identifying the existing uses made of the site and adjoining areas; and
- identifying any other erosion management initiatives at or adjacent to the site and their effectiveness.

7.2.3 ASSESSMENT OF EFFECTS

This will include identifying whether and how the proposal will:

- affect the existing uses made of the area;
- have a visual impact on the surrounding area and landscape;
- cause a loss of, or damage to habitats and/or plants and animal species;
- affect coastal processes;
- have an impact on natural heritage values; and
- affect amenity, cultural or spiritual values

It usually will be necessary to describe, and sometimes substantiate, how the effects on the environment were determined and why no other effects are considered relevant.

7.2.4 CONSULTATION

This will include:

- the identification of anyone who maybe interested in or affected by the proposal;
- a description of the consultation undertaken;
- a description of any response from those consulted; and
- a description of the applicant's response to the views of those consulted.

Often it is beneficial to undertake consultation early in a project 'life-cycle' primarily because it helps identify the issues that need to be covered in the AEE.

7.2.5 MITIGATION MEASURES

This will include:

- a description of the measures to be taken to avoid, mitigate or remedy identified adverse effects on the environment; and
- an assessment of the likely effectiveness of mitigation measures.

7.2.6 MONITORING

This will include:

- a description of how environmental effects will be monitored; and
- and may include how the integrity of a proposal may be monitored.

As a general rule, if only minor works are to be undertaken and the environment is not sensitive no monitoring will be required.

7.3 EFFECTS TO CONSIDER

It is common to consider whether a particular coastal erosion management activity will

have an affect on the following:

7.3.1 NATURAL CHARACTER

The RMA requires, in achieving the promotion of sustainable management and as a matter of national importance, the ARC to recognise and provide for:

"the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development (S.6(a))."

7.3.1.1 ASSESSMENT

In assessing the effects of an activity on natural character there are two main matters to address:

- the extent to which the location still has natural character, and the particular elements which comprise that character; and
- the extent to which natural character will be affected by the subdivision, use and development.

There are many elements and features which are commonly agreed to be important components of the natural character of the coastal environment. These include the dynamic functioning of physical coastal processes, the presence of indigenous vegetation along the coastline, unmodified coastal landforms, e.g. beaches and cliffs, clean water, and marine life. The NZCPS has described natural character as being *'those qualities and features in coastal environments which have been brought into being by nature ...'*. Thus natural character is distinct from that which is created by human activities.

In the Auckland Region the natural character of the coastal environment is complex and variable. Much of the original character of the Region's coast has been modified by human activity, even those parts of the coast which are considered to have a high degree of natural character have been subject to some modification. The natural character of a coast can be progressively modified through the adverse individual and cumulative effects of inappropriate subdivision, use and development, both within the CMA and on the adjacent land. The assessment of effects on the environment needs to be undertaken in this context.

7.3.1.2 EXAMPLES OF EFFECTS ON NATURAL CHARACTER:

Invariably non-structural options have only beneficial effects in terms of natural character by maintaining or re-establishing the 'natural environment'. Buffer mechanisms generally increase the perception of the depth of 'natural' coastal environment, provide for the dynamic functioning of physical coastal processes, and effectively protect outstanding features and landscapes. In addition buffer mechanisms usually maintain or enhance public access to and along the coast, and reduce the risk or hazard by avoiding development in the active coastal system.

Usually soft structural options have beneficial effects on natural character, by restoring or enhancing the perception of a 'natural' beach, enhancing amenity values, and

restoring the natural habitat of an area.

If designed and built with environmental outcomes in mind, e.g. of a form and appearance that 'fits' the environment, a hard structural option can have little adverse effect on the natural character of the area. For example a vertical seawall along the toe of an eroding cliff, generally following the natural contour, constructed of rocks of similar colour to the materials that naturally outcrop in the area, (such as may be found at Wai-o-Taiki Reserve, Tamaki Estuary); or a basalt rock seawall constructed to a similar form of existing seawalls, (such as at Devonport Beach, Waitemata Harbour).

Conversely a seawall may have an adverse effect on natural character of an area by contributing to the loss of beach sediment from the beach in front of the wall, due to the interaction of coastal processes with the seawall, or by introducing a built element to an otherwise relatively natural location.

7.3.2 PHYSICAL PROCESSES

A coastline acquires its character from its geological structure, its initial topography, and the subsequent modification of these by physical processes of wind, waves, tides, currents and rainfall. The response of coastal landforms to the effects of natural processes or human activity can vary considerably, from systems which are very sensitive to disturbing events, e.g. sand dunes, to slowly responding relatively insensitive systems, such as hard rock cliffs. The complexity of response reflects the nature and composition of individual landforms, and the degree or extent of the disturbing event.

Landforms are not static and can generally be viewed to be in a state of dynamic equilibrium. This equilibrium is regulated by sediment exchanges between the sediment entering the system, the sediment reserve at the site and the sediment leaving the system. In the longer term, material "lost" offshore or downdrift must be replaced from incoming sediment sources or else landforms will undergo net erosion or depletion.

Storms are often associated with coastal erosion. Although permanent changes can result, much of the "damage" to these systems as a result of extreme events is restored over the following months and years, as sediment is transported back onshore by wave and tidal energy. The area over which short-term fluctuations in beach volume take place is referred to as the 'dynamic envelope' or 'sweep zone'. Erosion of coastal cliffs, and estuarine embankments is progressive, involving retreat rather than recovery. Many cliffs undergo cycles of instability with erosion events, e.g. rock falls and landslides, followed by periods of relative stability.

As waves are the primary driving force behind almost every coastal process it is important to determine the wave climate for area where erosion is occurring (refer to ARC Wave Climate Strategy). This will assist in determining the quantity of mobilised sediment, and the direction and rate of sediment transport.

7.3.2.1 ASSESSMENT

An assessment of physical coastal processes needs to determine:

- the origin of the various landforms;

- the nature and pattern of historical change;
- the factors influencing the pattern of change, e.g. wave climate, storm frequency;
- the causes and mechanisms of change;
- the dependency of the landforms on continued erosion; and
- an evaluation of the effect of any proposed activities will have on these processes.

General assessments, as appropriate for minor works in less sensitive environments, will likely be limited to the collection and compilation of readily available information. Sources of information include published papers or texts, other resource consent applications, historical maps, charts and aerial photographs, and some form of field inspection. Where significant works are proposed, or in the case of a sensitive receiving environment, detailed assessments will involve all of the aforementioned plus field measurement, and in some cases numerical or physical modelling may be appropriate.

7.3.2.2 *EXAMPLES OF EFFECTS ON PHYSICAL PROCESSES*

Non-structural options recognise the dynamic functioning of the coastal system and have no effect on physical coastal processes.

Beach nourishment improves wave energy dissipation and generally has no adverse effect on physical processes.

The purpose of a groyne is to trap longshore drift in order to establish and maintain a beach updrift of the groyne, generally having a positive effect at that site. However as a consequence, sites downdrift of the groyne or groyne field shall be starved of sediment, at least until the embayment created by the groyne is filled and sand bypasses it. In such cases an adverse effect is created where the downdrift sites suffer erosion or accelerated erosion, until a new equilibrium is reached.

7.3.3 HERITAGE

Auckland's heritage involves those aspects of both the natural and cultural environment which have been inherited from the past, define the present and will be handed on to future generations. Heritage is a dynamic resource which changes spatially and over time as natural systems evolve and humans impact on the environment.

The natural heritage of Auckland includes: indigenous flora and fauna; terrestrial, marine and freshwater ecosystems and habitats; landforms, geologic features and soils. Auckland's cultural heritage includes: sites, places, place names, areas, waahi tapu, waahi tapu areas, taonga, buildings, objects, artefacts, natural features of cultural and historical significance, historical associations, people and institutions. Some of these resources have been highly modified yet they contain heritage that is of local, national and international significance.

Auckland imposes special pressures on its heritage resources because it is the largest and fastest growing urban area in New Zealand. A significant amount of Auckland's heritage has already been destroyed and much of that which remains is under threat. In

particular, much of the natural and cultural heritage of the coastal environment has been modified or destroyed through the gradual and cumulative effects of development, e.g. extensive modification of the region's coastal environments, including the loss of indigenous coastal margin vegetation.

7.3.3.1 ASSESSMENT

An assessment of the effect of a coastal erosion management activity on Auckland's heritage needs to determine:

a) Natural Heritage

- representativeness - how a site represents the original natural character of a district;
- diversity and pattern - the number and type of species and communities and their distribution;
- rarity and special features - whether a site contains threatened species or unusual features;
- naturalness - how similar this site would be to a site unaffected by humans or pests;
- long term sustainability - the likelihood that a site will continue to exist in the long term;
- whether the size and shape of an area is adequate to support the ecosystems within it;
- buffering - whether a site is protected from surrounding land uses;
- wildlife habitat values - e.g. a wetland for birds; and
- important natural landforms, e.g. a volcanic lava flow.

b) Cultural Heritage

- the extent to which the place reflects or, is representative of Auckland or New Zealand history and the frequency with other similar examples can be found;
- the importance of the place to tangata whenua;
- the community association with the place;
- the commemorative value of the place;
- the symbolic value of the place;
- the potential of the place for public education;
- the potential of the place to provide knowledge of Auckland or New Zealand history; and
- the technical accomplishment or value of the place.

7.3.3.2 EXAMPLES OF EFFECTS ON HERITAGE VALUES:

Natural areas are constantly changing, partly because of natural changes, but also because of the impacts of human activities. Non-structural options generally protect

ecosystems and the species that live in them by retaining the transition between the coastal ecosystem to the terrestrial ecosystem, and provide opportunities for restoration, e.g. by replanting native species, enhancing the heritage value of an area.

Rebuilding or restoring beaches by beach nourishment may beautify the landscape and enhance the perception of naturalness. Importing sand from one locality to another for beach nourishment may be of particular concern to tangata whenua. This matter is best addressed through consultation.

Often it is the construction of hard structural options that has the potential to have an adverse effect on heritage values, e.g. potential to disturb a waahi tapu site. This may be avoided by identifying such areas through consultation with tangata whenua and, if need be, altering a project to provide for the relationship of Maori with the site.

7.3.4 VISUAL AND LANDSCAPE EFFECTS

The Auckland Region's coastal environment has many diverse landscapes, ranging from highly modified urban areas to wild and scenic landscapes. These landscapes are important not only for their scenic qualities but also as representative examples of the landscape heritage of the Region. The visual and scenic qualities of coastal landscapes and seascapes also contribute to amenity, recreational, and tourism values, and thereby enhance the social and economic well-being of the community.

Visual impacts result from natural or induced changes in the components, character or quality of landscape. Usually these are the result of vegetation or landform modification or the introduction of inappropriately located or designed coastal erosion management structures.

Visual "effects" are somewhat different from many other environmental factors because their assessment requires information on perceptions as well as on resources. Because visual experience is a combination of physical stimulus and psychological response, some aspects of visual impacts are subjective. The visual effects generated by any particular proposal may be perceived as:

- positive (beneficial), contributing to the visual character and quality of the environment; or
- negative (adverse), detracting from existing character and quality of the environment; or
- neutral (benign) with essentially no effect on existing character or quality of the environment.

The identification and protection of the Region's coastal landscapes and seascapes is closely linked to the protection of other values. For instance, protecting areas of ecological importance and significant landforms along with the associated physical processes, or protecting areas and features of historic and cultural significance, means that landscapes are maintained or enhanced.

A number of landscape assessment reports have been prepared for areas of the coastline of the Auckland Region.

*Refer Section F,
Preparation of an
ΔFF*

AEE

7.3.4.1 ASSESSMENT

Typically an assessment of visual effects would include the following description and analysis:

- description of the nature of the works, including visual characteristics;
- description of the broad setting of the site of the works;
- description of the immediate setting of the proposed site;
- define and quantify affected viewing audiences; and
- description of the effects of the proposal on the setting of the site and the affected audiences.

7.3.4.2 EXAMPLES OF EFFECTS ON VISUAL AND LANDSCAPE VALUES:

Establishing setbacks or reserves, particularly in conjunction with revegetation, will usually have a beneficial effect by increasing the depth of the 'natural' coastal environment and providing 'open spaces' which may be suitable for a variety of uses (e.g. recreational).

Revegetation, removing/destroying animal and plant pests, retiring unproductive or eroding land by planting native vegetation is likely to enhance the landscape value of a site.

A widespread example of the issue of compatibility of materials used in hard structural options and form is found on the eastern coastline of the Region. Here the stratified Waitemata series sandstones that characterise the cliffs are of pale, creamy brown hues, yet the material that has been traditionally used as rip-rap armouring at the toe of the cliffs is a dark basaltic rock which dramatically conflicts in colour, form and texture.

7.3.5 LAND USE EFFECTS

The coastal environment has strongly influenced the Region's settlement patterns, and people's lifestyles. Large numbers of people and the community make intensive use of the coastal environment for a diverse range of reasons including recreational, economic, conservation, residential, and for heritage purposes. As more and more use is made of the coastal environment pressures and conflicts arise. Practices and land use patterns which in the past occurred with little or no adverse effects have begun to become increasingly significant, affecting the quality of the environment and people's enjoyment of the coast.

The appropriateness of particular coastal erosion management options is critically affected by the level and type of surrounding land use, and the relative impact that the management option will have on the scale and character of land use or activities in that area.

7.3.5.1 ASSESSMENT

A typical assessment of land use effects would include the following:

- a description of the existing and potential land use activities; and
- a description of the proposed activity and the potential land use activities that will result.

7.3.5.2 *EXAMPLES OF EFFECTS ON LAND USES:*

Establishing setbacks or reserves will have a beneficial effect by increasing the depth of the 'natural' coastal environment, and provide 'open spaces' which may be suitable for a variety of uses, e.g. recreation. Conversely they may take land for which the land use is no longer suitable in a setback or reserve area e.g. residential.

Revegetation will, like hard structural options, provide protection to land use activities landward of the stabilised coastal margin. Soft structural options are likely to offer greater environmental benefits though, e.g. the enhancement of natural areas. However vegetated areas are likely to be more sensitive to damage (i.e. have higher risk of damage) than hard structural options.

It is likely that the potential effects on land use of a well designed and constructed seawall built in an area which has predominantly been stabilised by other seawalls will be minimal. Conversely the introduction of seawalls to an 'undeveloped' region of the coastline is likely to be accompanied by development of the area landward of the seawall, which is likely to give rise to a number of adverse effects, e.g. modification of valued natural heritage through land clearance and earthworks.

7.3.6 SOCIAL AND ECONOMIC EFFECTS

The purpose of the RMA is to promote sustainable management. This in part means managing the use, development and protection of the coastal environment in a way which enables people and communities to provide for their social, economic, and cultural well-being, and for their health and safety. The coastal environment is therefore valued not only for its natural qualities, but also as an environment for the use and development of facilities and infrastructure associated with activities.

7.3.6.1 *ASSESSMENT*

A typical assessment of the social and economic effects is likely to include:

- a description of the local community;
- a description of the local community social and economic values of the site; and
- an evaluation of the broader environmental social and economic values of the site.

7.3.6.2 *EXAMPLES OF EFFECTS ON SOCIAL AND ECONOMIC VALUES:*

Buffer mechanisms, such as reserves, may have beneficial effects, e.g. more recreational opportunities, and greater public access to the coast. Conversely, the value of the reserve may be perceived as less than for an existing land use such as residential.

Beach nourishment projects are only likely to create beneficial effects, e.g. the enhancement of the amenity value of an area, with a consequent rise in adjacent

property values.

The construction of a groyne may assist in stabilising a coastline and thereby creating a positive economic social and economic effect in terms of property security for the area landward of the groyne field. A negative (adverse) effect maybe the restriction or constriction of public access along the coastal margin, or downdrift erosion

7.3.7 CONSTRUCTION EFFECTS

The actual and potential effects on the environment of the implementation of a coastal erosion management activity should be considered separately from the effects arising whilst it is operational. The potential to create adverse environmental effects generally is greatest during the construction/implementation phase, including the transport of material and machinery to the site.

7.3.7.1 *ASSESSMENT*

A typical assessment of the effects of construction activities is likely to include:

- determining the schedule of the duration and timing of the works;
- identify access requirements to the site during construction;
- identify the extent of required earthworks;
- identify the potential effects on health and safety;
- identify the likely construction methodology and management practices; and
- identify the time required for the site to recover from construction effects.

7.3.7.2 *EXAMPLE OF EFFECTS FROM CONSTRUCTION ACTIVITIES*

Generally the implementation on non-structural options, such as establishing reserves, do not involve construction activities.

Beach nourishment projects by nature involve the deposition of a large quantity of beach material in a short period of time. As a consequence any fauna inhabiting the beach is likely to be smothered. The timing of the works to avoid breeding times may be an appropriate consideration. In general there is higher use of beaches by people during summer periods, so less disturbance is caused if such projects are undertaken before the summer season.

Construction of seawalls often involves the use of machinery and the disturbance of foreshore sediments, which may, for a short term detract from the amenity value of a location, or release sediment into the coastal marine area which may smother benthic flora and fauna or which may be lost from the system.

7.4 MITIGATION

Mitigation measures are an integral component of the planning and design of a coastal erosion management option. Developing a solution without considering how adverse effects may be avoided, or endeavouring to mitigate generated effects, is unlikely to be as successful. Avoidance and mitigation is a priority within the design process.

Mitigation can include a range and combination of strategies. Efforts to reduce any negative effects that a project may create can, and should, be equally applied to the smallest detail of construction and the largest component of any work. In some circumstances the need to bring lateral thinking, and perhaps innovation, to create mitigation measures will be necessary, e.g. the use of new materials, design techniques and implementation measures to better conserve the character of the coast.

7.4.1 EXAMPLES OF MITIGATION MEASURES

- Structural forms which emulate the profile and alignment of the coast.
- Materials chosen to best capture the natural materials of the coast.
- Coloured oxides incorporated and a range of textures applied to concrete elements.
- If public access is restricted, incorporate walkways or steps.
- Schedule construction to avoid breeding times for fauna, or important recreation times for people.

7.5 MONITORING

If only minor works are proposed and the environment is not sensitive, no monitoring will be required. In other instances, where the works are on a large scale or the environment is sensitive, a monitoring programme will be required as part of the AEE. The AEE should highlight areas where monitoring will need to focus (e.g. nearby Coastal Protection Areas, beach profiling to confirm the long term beach profile).

Monitoring can be viewed as a process which validates the AEE. If monitored results differ from the assessed effects then, depending on the sensitivity of the environment to those effects, a different strategy or long term option may need to be pursued. Therefore as part of the monitoring programme, trigger levels need to be established and a course of action developed if the trigger levels are exceeded.