

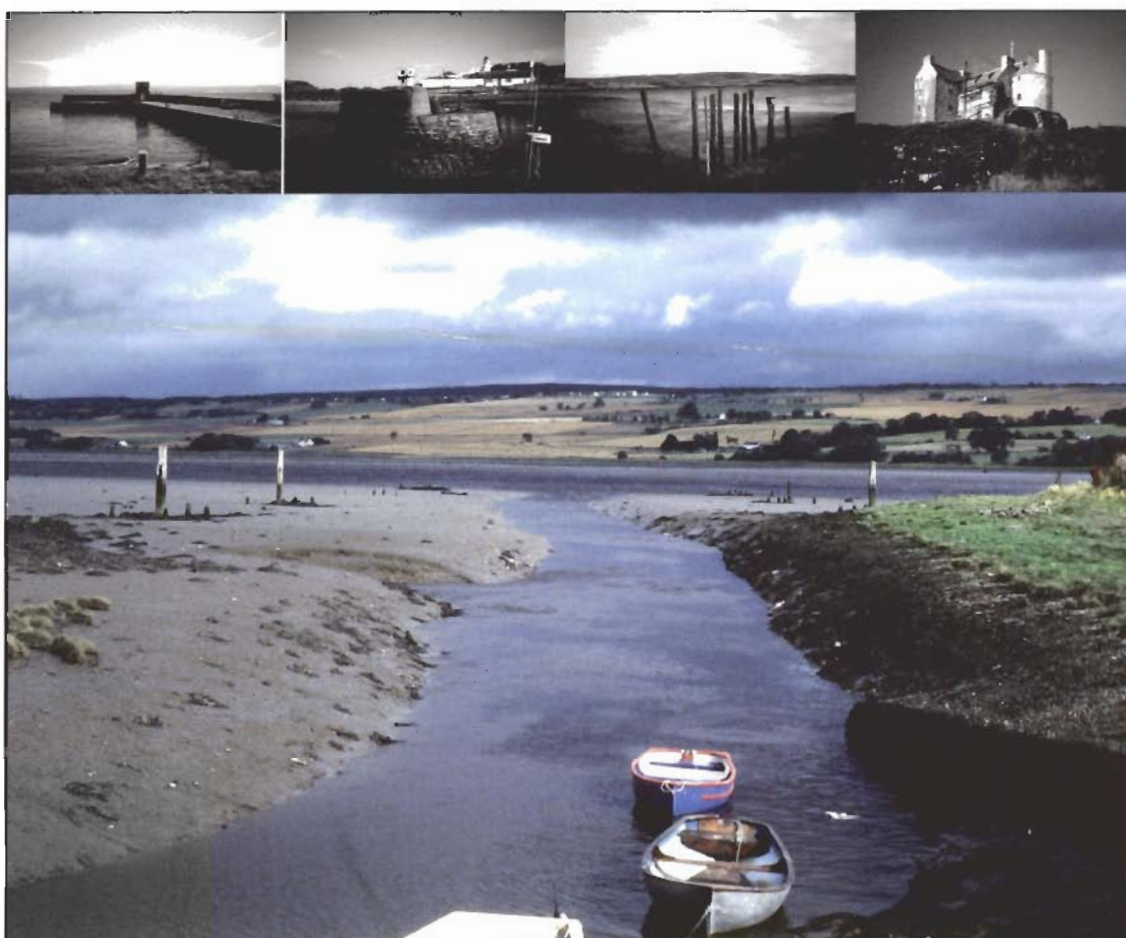
Coastal Assessment Survey Inner Moray Firth

Inverness to Dingwall

September 1998

VOLUME 1

Map sets 1-18



a report for
HISTORIC SCOTLAND



by the
CENTRE *for* FIELD ARCHAEOLOGY



CENTRE *for* FIELD ARCHAEOLOGY

University of Edinburgh

November 1998

Commissioned by Historic Scotland

**MORAY, BEAULY AND CROMARTY FIRTH
COASTAL ASSESSMENT 1998**

Report No. 446

This document has been prepared in accordance with CFA standard operating procedures.

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Volume 1- The central cover photograph is Dingwall Harbour

Volume 2 - The central cover photograph is the Tarbat Ness Light House

1 INTRODUCTION

Background

In August 1998 Historic Scotland invited tenders to conduct a coastal survey project to cover the coastal edge from Inverness to Tarbat Ness (National Grid Reference NH 650465 and NH 950 878 respectively). Following submission of its Project Design, the Centre for Field Archaeology was awarded the contract.

This project is part of a larger Historic Scotland review of archaeology and the coastal zone and is the thirteenth such survey to be completed. Surveys have already examined the Solway coast (Cressey and Toolis 1996), the north coast of the Forth estuary (Robertson 1996); the south coast of the Forth estuary (James 1996); a stretch of coast from Ullapool to Lochinver (Long 1996) and the coastline within the Firth of Forth and Tay Estuary Robertson *et.al.* (1997). Surveys have also been undertaken in Lewis (Burgess & Gilmour 1997), Orkney (Moore & Wilson 1997) and Shetland (Moore & Wilson 1997). In addition there have been excavations, site recording and focal studies such as the Solway Phase 2 study that examined the biostratigraphy of coastal sediments (Cressey *et. al.* 1998)

This programme of work has come out of the recognition of the importance of the coastal zone to Scottish archaeology and the need for information that will allow Historic Scotland to determine the nature of specific threats to archaeology and formulate solutions for specific sites (Ashmore 1994). Of particular relevance here was the recognition of the need to obtain standardised information and colour-coded mapped data for coastal areas. As a consequence, all the coastal surveys follow similar methodologies, based on Historic Scotland's *Archaeology Procedure Paper 4, Coastal Zone Survey* (1996), although there has been some evolution of the format.

In addition to the archaeological dimension, this survey has been conducted against a wider regional interest in the management of the Moray Firth. The Moray Firth Partnership (hereafter MFP) has generated a large corpus of information designed to promote management objectives for the area centred on a cultural and historical perspective. The MFP document *Living and Working* considers, amongst other topics, the landscape and cultural heritage, geology and geomorphology, marine and coastal environments, ecology, social and economic resources, recreation and tourism, harbours and shipping as well as coastal protection, planning and management. Archaeology, and the preservation of archaeological sites, clearly cross-cuts a number of these subjects. The present report contributes towards understanding the current status of the coastal archaeology and built heritage, which can be placed alongside the wider issues central to coastal zone management for the Moray Firth.

During this project, desk based work and report production were conducted by Andy Dunwell, Alex Hale and Dr Mike Cressey. Alex Hale supervised the fieldwork, with assistance from Alastair Rees, Bruce Glendinning, Ian Sudderby and George Mudy. Geomorphologic and erosion mapping was conducted by Mike Cressey. Dr Malcolm Murray assisted with aspects of the coastal geomorphology and computer-based map production. Dr Bill Finlayson managed the project for CFA and Patrick Ashmore for Historic Scotland.

Project Aims

The objectives for the Moray Firth Survey were set out in the Historic Scotland Project Outline as:

To gain factual information on, and an inventory of part of the coastal heritage to provide a basis for more work including:

- *detailed survey of important areas prior to protection, excavation or abandonment;*
- *Monitoring of sites and stretches of coastline by local organisations and people.*

In addition to agreeing to follow the Historic Scotland *Procedure Paper* to fulfil these objectives, CFA has undertaken to carry out certain additional elements of work to further the long-term objectives of the project.

Report Format

In this report we use the term *shoreline* to refer to the distinct boundary between land and sea that changes with the tides. A *coastal unit* defines the areas between individually numbered cut-off points that demarcate individual sections of coastline which may be classified according to its *eroding*, *stable* or *accreting* status. The *unit* is distinct from littoral “cells” or segments of coastline that normally include an entire cycle of sediment delivery to the coast by either rivers or coastal erosion.

This report contains the results of the rapid coastal assessment. These are presented sequentially for each coastal unit and follow a standard format. Elements include an introductory section, a section containing the coastal geology/morphology, coastal erosion and archaeological gazetteer and maps. Pertinent issues are highlighted through three case studies, which are followed by a section incorporating results and observations. This is followed by a list of references, contacts made whilst the project was in progress and persons to whose help we acknowledge. Appendix 1 includes histograms of the statistics in support of the results.

The Study Area

The study area as defined for this project comprises a wide variety of coastal land - forms, including the steep precipitous cliffs characterised by the North and South Sutors. Estuarine environments are predominant within the Beulay and Cromarty Firths where intertidal mud flats, macro-tidal river channels and saltmarsh are extensive. Relict shoreline features reflecting relative sea-level changes are also present within the study area. The coastline is dynamic and its configuration is changing albeit at different rates.

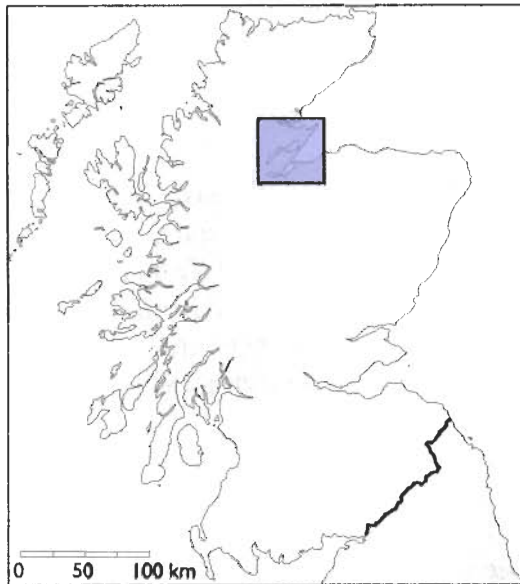
Geological Background

The geological structure of the Moray Firth has been comprehensively mapped and described by British Geological Survey in *The Northern Highlands of Scotland* 1989 publication. The distribution of basement and drift lithologies are shown in Figure 1. The dominant basement lithology consists of metamorphosed Moine sediment that is unconformably overlain by Old Red Sandstone of Devonian Age. The Old Red Sandstone is locally exposed along much of the coastal sections and is overlain by younger rocks of Permo-Triassic and Jurassic Age. These rock types are derived from mainly non-marine sources such as aeolian dune sand and freshwater/brackish marine alluvial sediment. Within the Moray Firth region, the Old Red Sandstone is subdivided into Middle and Upper Old Red Sandstone. The latter series is predominant along the Black Isle shoreline and further south towards Inverness.

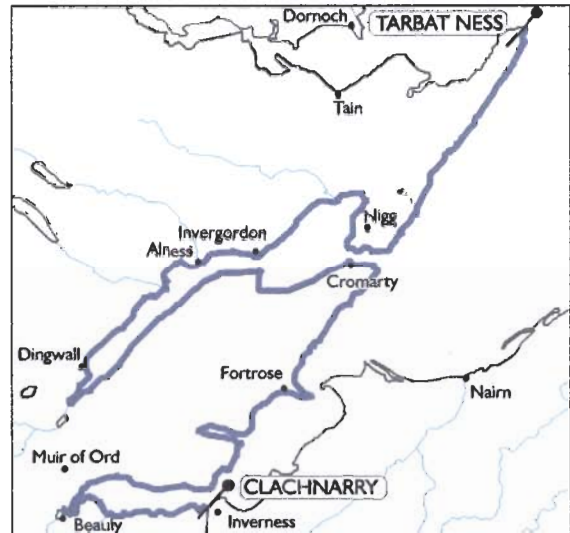
Quaternary/Holocene geomorphology and relative sea-level changes

The climatic oscillations occurring within the Quaternary era (<1.6 million years BP) have given rise to a series of erosion and depositional events that have shaped the character of the present coastline. The Moray Firth experienced four major periods of glaciation during the Pleistocene epoch. The glacial maximum occurred ca 18000 years BP, during which time the ice sheet limit extended across the survey area beyond the present coastline and out into the dry bed of the North Sea (Jardine 1979). Deglaciation from ca. 13500 years BP onwards was marked by rapidly rising temperatures and rapid ice wastage, probably associated with high melt-rates, while unvegetated till-mantled slopes became exposed (Maizels and Aitken 1991). The wastage of the late Devensian Ice-Sheet (c.13000 BP) was instrumental in releasing large volumes of out-wash that was carried along much of the Inner Moray Firth at this period. The wastage of the Loch Lomond Advance (c.11,500-10500 years BP) is also attributed to the extensive re-distribution of glacial sands and gravel that mantle the basement facies already described.

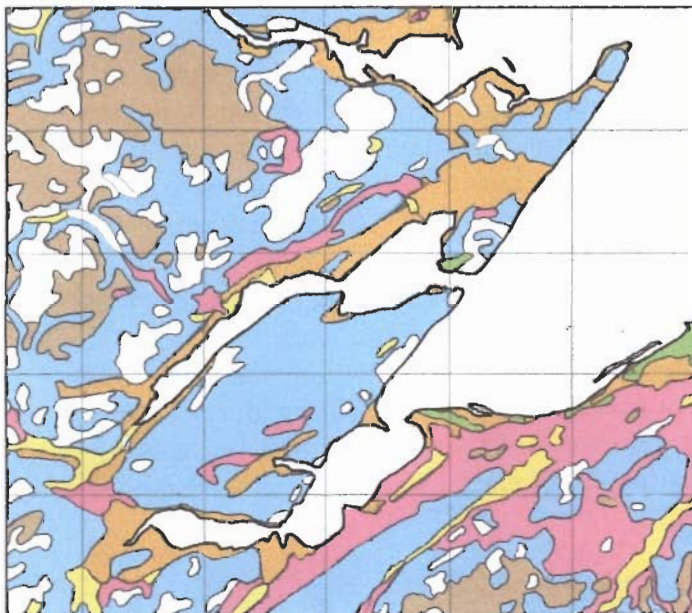
During the Pleistocene, sea level rose and fell episodically as climate warmed and cooled and continental glaciers advanced and retreated. After the ice was removed, the continents rebounded. The rate of rebound was not a simple linear trend but rather a function of the isostatic/eustatic budget. Within our study area, the rebound has been on the order of several metres, and abandoned beaches and wave cut terraces lie several metres above current sea level.



LOCATION OF THE MORAY FIRTH SURVEY



LIMITS OF THE MORAY FIRTH SURVEY Clachnarry to Tarbat Ness



DRIFT GEOLOGY

1: 625 000

Key:

- Blown sand
- Peat
- Alluvium (incl. River Terrace Deposits)
- Raised Beach and Marine Deposits
- Glacial Sand and Gravel
- Boulder Clay and Morainic Drift

Based on the 1977 *Quaternary Map of the United Kingdom* (First Edition), North Sheet.

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FIGURE 1: LOCATION AND GEOLOGY MAPS

Based on the results of detailed stratigraphic investigations at the head of the Beauly Firth, Sissons (1981) proposed that extensive marine erosion occurred in the area during the Loch Lomond Stadial (Younger Dryas). He argued that the erosion produced distinctive abandoned clifflines that border much of the inner Moray Firth. Sissons (1981) suggested that the shoreline associated with this event stands at about 2 m above OD and it is equivalent to the Main Lateglacial Shoreline of the Forth Valley (Sissons 1969, 1974, 1976). Biostratigraphic analyses of the sediments deposited at the head of the Beauly Firth by Haggart (1986, 1987 and 1988) and Firth and Haggart (1989) have led to a greater understanding of sea-level movements and shoreline displacement. Haggart (1986) postulated that at 9600 BP, the estuarine flats (the so-called Barnyard Beds) lying at an altitude of 6m above OD, at the head of the Beauly Firth, were abandoned as relative sea-level fell. The limit of the regression is not known, but a rise in relative sea-level is recorded to 9m above OD at Béaully, and radiocarbon dated to between 7100 and 5775 years BP. This marine transgression is correlated with the Main Postglacial Shoreline of eastern Scotland (Sissons, 1989). The late Holocene has been characterised by falling relative sea-levels (Firth 1990). Minor transgressive events or stillstands are responsible for up to five late-Holocene shorelines (Firth and Haggart 1989).

The Tidal Environment of the Moray Firth

According to the MFP *Geomorphology and Coastal Defence Topic Paper* (p.17) there is a general lack of detailed scientific information on the movement of beach sediment or on the history of onshore wave height and direction. This is compounded by the fact that there are similar gaps in information on offshore wave height/period and direction. The MFP sees this as a serious obstacle in assessing the local effects of any global climate change. This report does however note (p.27) that at present the major tidal currents bypass the mouth of the Moray Firth and pass down the North Sea where the surge in water level can build up to 3m above the predicted level. This has allowed the Moray Firth coast to escape the worst effects of recent storm surges. The Shoreline Management Plan (SMP) 1996 Wallingford publication provides more information based on metrology and hydrographic information obtained from Admiralty records, the Met Office and offshore oil industry. The wave climate is suggested to be dominated by locally generated wind waves and episodic storm activity (see Lamb 1991). Short-fetch lengths are seen as a contributing factor in suppressing wave height (*ibid* p.7). Wind direction is critical in controlling the tidal regimes at any given location. The Spring tidal range is quoted (*ibid* p.8) as increasing south-westward within the region; from 2.8/3.1m at Wick/Fraserburgh through 3.5m at Lossiemouth, Burghead and Cromarty, and through 3.6/3.7m at Nairn/Invergordon and 4.1m at Inverness. Overtopping events (breaches in sea defences) and the damage to coastal defence is usually associated with times of both large waves and high water levels. Within the survey area, the largest waves occur during storms from the north-westerly or north-easterly quadrants. There appears to be no known information on wave conditions within the Inverness Firth. Wave energy generated offshore of the Moray Firth will have limited effect on the coastline within the Beauly Firth due to the shelter provided by the forelands of Fort George and Channory.

Sites of Special Scientific Interest

Within the study area there are six sites designated as Sites of Special Scientific Interest and are important for specific habitats of plants and wildfowl. The Rosemarkie to Shandwick coastline is important for its geology. All sites are associated with maritime and peri-marine environments. Table 1 below lists the sites by name and the reason for their designation.

No	Site Name	Conservation status and habitat	Principal Conservation Interest
1	Beaully Firth	SSSI; intertidal sand and mudflats; saltmarsh	Nationally important site for overwintering waders and wildfowl; internationally important populations of seaduck.
2	Munlochy Bay	SSSI; intertidal sand and mudflats; saltmarsh	Important area for overwintering wildfowl
3	Conon Islands	SSSI; saltmarsh; fen woodland	Woodland; brackish fen vegetation; woodland and heathland birds; overwintering waders and wildfowl
4	Cromarty Firth	SSSI; intertidal sand and mudflats; saltmarsh; sand and shingle; Nigg & Udale Bays	Internationally and nationally important site for waders and wildfowl.
5	Rosemarkie to Shandwick Coastline	SSSI; slumped cliffs; rocky platform	Coastal cliff vegetation; seabirds; Cromarty and Rosemarkie inliers provide insight into the basement of the East Scotland Caledonides.
6	Tarbat Ness	SSSI; rocky platforms and low cliffs.	Maritime heath and salt spray communities

Table 1 Sites of Special Scientific Interest within the study area. The sites are shown in Figure 2 (Source: Moray Firth Review).

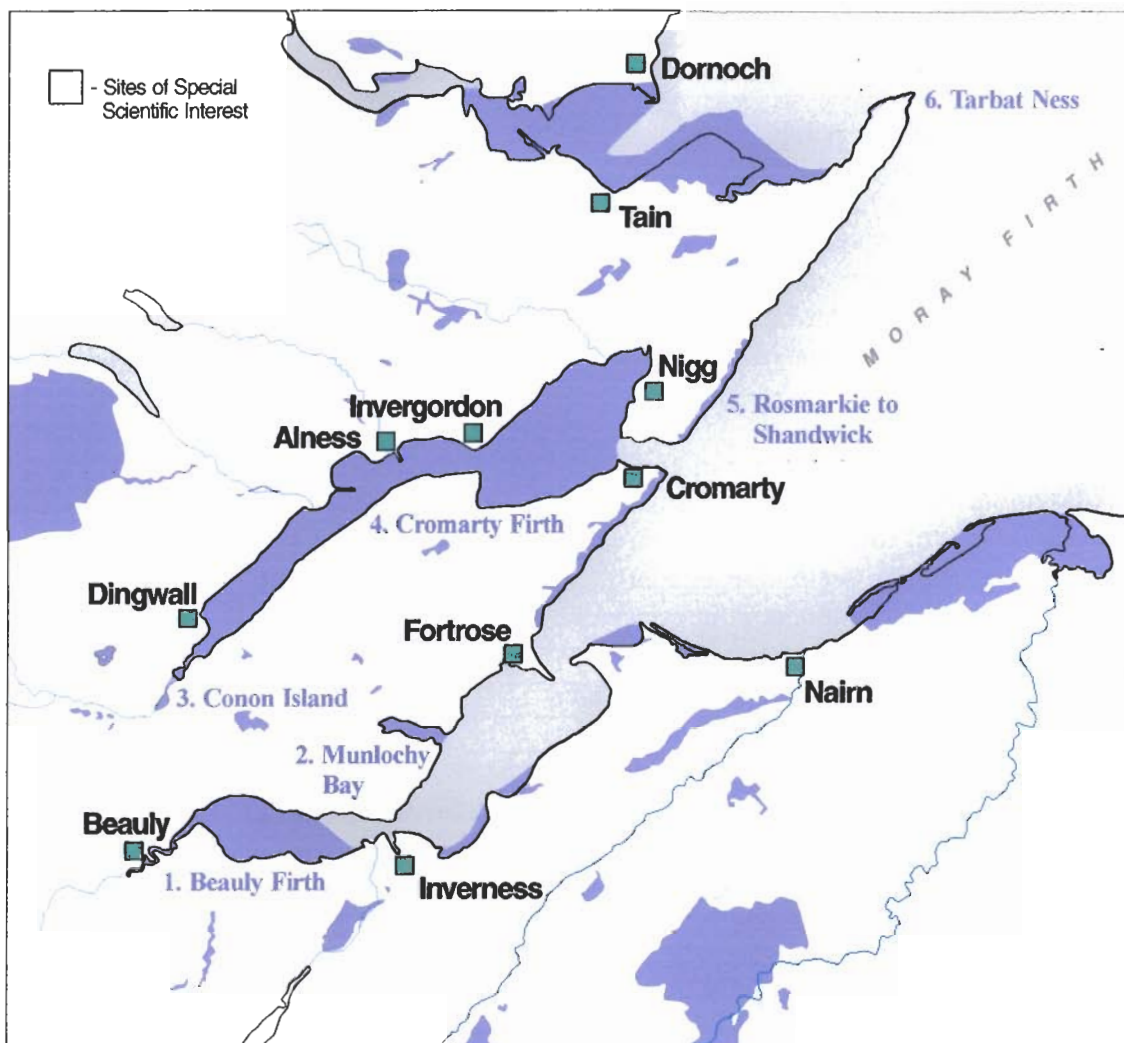


Figure 2. Distribution of Sites of Special Scientific Interest in the survey area.

2 METHODOLOGY

Methodology

The Project Outline requests information regarding the extent of our proposed survey within the total 200km coastal strip. To this end our Project Design proposed a four-phase strategy that would involve: desk-based survey, field survey, specific aerial photographic survey and reporting.

Phase 1 (preliminary work)

CFA conducted a rapid-scan desk-based survey for both archaeological and geomorphological aspects for the full length of the specified coastline from Inverness starting at Clachnaharry and finishing at Tarbat Ness, a distance of 166.8'km based on linear extrapolation. During the course of the rapid scan, CFA made initial contact with the relevant bodies listed in the Historic Scotland Procedure and Project Outline.

Phase 2 (desk based study)

CFA then carried out a full desk-based study, in accordance with Historic Scotland procedures. From this research we identified a series of zones of accretion, stability, or recession, which were subsequently ground truthed to verify the preliminary conclusions on their characteristics derived from the desk-based study. An important aspect of this work was an assessment of the reliability of geological and geomorphological mapping in the survey area.

CFA concurred with the Project Outline in considering that aerial photographic imagery would be of particular importance to the survey, especially in the study of intertidal mud and silt flats. This view was partially an outcome of safety considerations. Examination of accessible aerial photography was also important to ensure good spatial coverage within the constraints of available resources. In addition, however, we consider that the aerial photographic imagery is probably the best source of information for intertidal areas. Previous surveys of intertidal zones have shown that aerial photographic imagery is often the only source which reveals the patterns of large scale features.

There are several series of photographs relevant to the study, including runs from the immediately post war period, and surveys undertaken in the 1960s and '70s taken for land use capability studies. More recent aerial surveys have been commissioned by SNH and these were scrutinised for additional information. These provide a series of images that can be used for comparative purposes over a considerable period, and when combined with ground inspection, provide evidence for almost 50 years of change. Although the Historic Scotland procedure notes that the examination of several series of photographs and map sources can be expensive, we consider that, especially given the importance we attach to aerial photographic analysis for the intertidal zone, the time employed on aerial photographic analysis and other documentary sources repaid the investment. In addition, it can be difficult in the field to determine whether a given stretch of foreshore is accreting, stable, or eroding, and the accumulated aerial photographic evidence makes this possible.

There have been a number of geomorphological studies made along the Inner Moray Coast, including work by Haggart (1987) and Peacock, Graham & Gregory (1980). Recent work conducted by Dr Andrew Haggart of London Guildhall University assessed the previous models of coastal change over the last ten thousand years and using multi-approach methods has proposed a remodelled sea-level change curve for the area (Haggart 1989). More recently collaboration between geomorphologists and archaeologists has led to the combination of using intertidal archaeological remains as specific sea-level indicators in the Beaulieu Firth (Haggart, Hale & Firth forthcoming). In many respects the palaeoenvironmental data required for the purposes of the project has already been collected, and one of the chief aspects of the work required here is that of collation. Unfortunately, as much of this work has not been conducted with a specific archaeological/heritage interest and has occurred over the last 30 years, there are problems of compatibility of information and standards of research. However, recent commercial development, especially by the Cromarty Firth Partnership, has led to the production of a number of useful geological and geomorphological studies. The focus of most of the palaeoenvironmental research has been on Holocene deposits and the encouraging results indicate the potential for future palaeo-archaeological, multi-discipline research projects to develop in the North-East Firths region.

Phase 3 (fieldwork)

The archaeological survey undertaken required (as specified in the Historic Scotland procedure) to be systematic and to be conducted in all relevant land parcels (with the exception of unsafe intertidal areas). The northern shoreline of the Cromarty Firth has become heavily industrialised since the North Sea oil companies began to use the Firth as a deep water storage and repair base for off-shore oil rigs and the adjacent shorelines as supply depots and fabrication yards. This was considered likely to have had an impact on both the presence of archaeological remains and their visibility. No survey work was undertaken within the extensive petrochemical installations at Invergordon and further south at the Nigg Offshore Fabrication yards (see Map Sheet 25 below). However the desk-based assessment did take into account all the sites and monuments previously destroyed as a result of their construction. It was clear on the ground that industrial development had in fact been so intense to make inspection worthless in the immediate hinterland behind the artificial coasts created to protect them. Where access was available on the seaward side of the works, then the foreshore was examined according to normal procedures.

Based on the information obtained at the desk-based stage (both archaeological and geomorphological), we ensured that the field survey covered a representative sample of the various combinations of environmental settings and on the cultural side, periods/site types. There were no restrictions to access in regard sensitive wildlife areas including sites designated as SSSIs.

The desk study was completed before fieldwork commenced, allowing the field teams to be supplied with data assembled from a range of sources for checking. In essence, the fieldwork comprised standard archaeological fieldwalking survey, combined with the recording of the erosional status of sites, the assessment of vulnerable parts of the landscape, and ground truthing of geomorphological data. We used GPS to assist in the determination of the location of sites for mapping as required in the Historic

Scotland Procedure, where local mapped features did not provide an accurate fix. The survey was not done in a single sweep but was carried out at selected points along the coast in order to take into account the vagaries of local tidal variation. Separate field visits along key locations by the geomorphology team (Drs Cressey, Murray and Alex Hale) ensured that the observations made during the initial survey were as accurate as possible. Additional information was added to CFA's Rapid Coastal Assessment Sheets as required.

The initial survey was undertaken during September 1998, during which the full advantage of the equinoctial tides were taken and no time was lost to inclement weather. The only restriction imposed on the field team was access to beaches at the base of precipitous cliffs. These were encountered at the North and South Sutors, parts of which were not surveyed on the grounds of health and safety.

Phase 4 (report compilation)

We allowed a considerable time element for reporting, as we appreciated that a considerable volume of data is likely to be produced during the survey. The present Report has been constructed using digitised map-based data based on desk-based results and field data. The survey map sheets are shown from south to north forming a logical progression around this sinuous part of the Scottish coastline.

MAP 1: CLACHNAHARRY TO PHOPACHY

Hinterland Geology and Coastal Geomorphology: This section of coastline forms part of the southern shore of the Beaulay Firth. The basement geology consists of sedimentary Middle Old Red Sandstone of the Moine Series. Boulder clay dominates the main lithology away from the coast. Clachnaharry sits on a low-level delta that flanks the river Ness. A degraded Holocene raised shoreline runs west parallel with the present shore. This feature is discontinuous and hard to recognise owing to presence of a road and railway line but it becomes more prominent in the region of Bunchrew. From here and towards the head of the Beaulay Firth, Holocene marine deposits become the dominant coastal lithology. The foreshore is linear until Bunchrew Mains where a foreland at c.5-10m OD juts out into the firth. West of Bunchrew the shoreline is dominated by saltmarshes, mud and shingle that overlook extensive intertidal mudflats.

Erosion Class: The Beaulay Firth is sheltered from larger swell and storm waves from the east in the Moray Firth by the promontories at Chanonry and Fort George. As a result of this, the predominant character of this the coastline between Clachnaharry and Bunchrew Mains is classified as eroding or stable with accretion predominant in parts. Erosion is mainly confined to scour zones at the base of sea walls and at Bunchrew caravan site where concrete rubble and old tree stumps have been placed in an attempt to stabilise erosion at the HWM. Degraded saltmarsh also points to local erosion induced by wave attack. This is less noticeable to the north of Englishton where a sheltered bay is accreting and saltmarsh is well developed. Offshore where bladder-wrack seaweed covers rocks and shingle conditions are considered to be stable.

Built Heritage & Archaeology: The first archaeological remains recorded in this coastal survey consist of the major 19th century engineering works of the Caledonian Canal, designed and built by Telford in 1810 (Butt 1967). The excellent state of preservation of not only the canal, sea locks and basin are complimented by the associated workman's cottages, workshops and hand crane. This example of Industrial heritage is contrasted by the Mesolithic ? shell midden situated on the raised sea beach behind the canal. Further built heritage include Buchrew House and designed landscape gardens, built 1615. To the west of Buchrew house, the remains of an 18th/19th century landing place and associated storehouse were located, although they were both in a very poor state. To conclude, this area shows a varied group of sites in age, location and fabric.

Map 1: Hinterland Geology and Coastal Geomorphology

1. CLACHNARHARRY: CALEDONIAN CANAL PIER to CNOCH COTTAGE.

NH 635 460

2.2km

Mainly mud and sand

Low edge (<10m)

Raised beach and marine deposits

This unit has a low cliff backed by marine sands and gravel overlain by boulder clay. The foreshore is mainly mud with shingle.

Breakwaters protect the canal entrance.

2. North of CNOCH COTTAGE to east of PHOPACHY FARM

NH 617 460

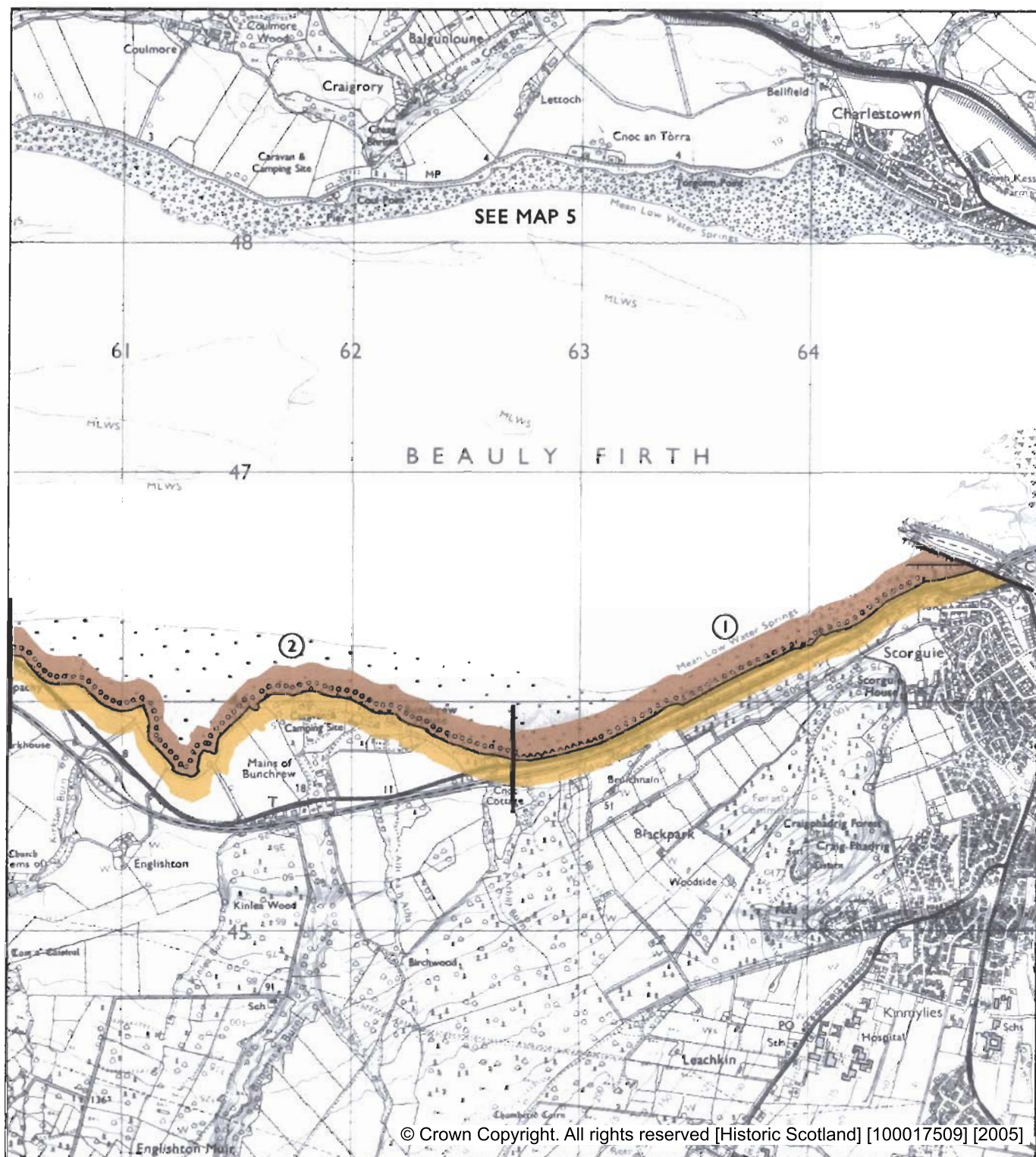
3km

Mainly mud and shingle

Low edge (<10m)

Raised beach and marine deposits

Curvilinear low cliff-edge backed by marine derived sands and gravel consolidated by boulder clay. Estuarine tidal flats of mud and shingle.



MAP 1: CLACHNARRY TO PHOPACHY

MORAY FIRTH SURVEY Grid ref: NH 61-65/44-49

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 177

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 08 September 1998

Hinterland:

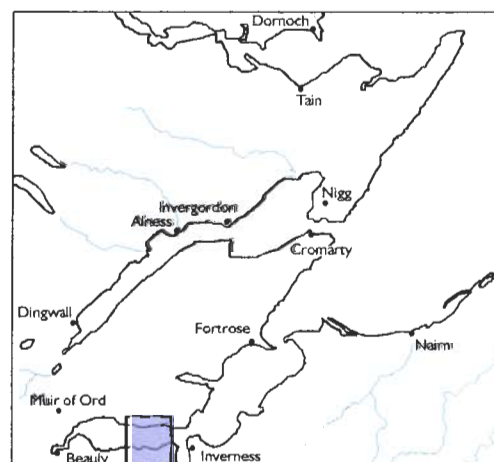
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



Map 1: EROSION

1. CLACHNARRY to SCOURUIE

NH 644 464

0.8km

Eroding or stable

Concrete sea defences are being eroded by scour at their base. Mudflats contain patches of boulders and shingle that has evidence for accretion.

2. WEST SCOURUIE

NH 640 463

0.5m

Eroding or stable

This unit of coastline is defended by concrete rubble that is eroding at the base. Mudflats are accreting

3. WEST OF SCOURUIE to north of BRUICHCHAIN

NH 635 462

7.2km

Eroding or stable

A concrete sea wall defends this unit of coastline that is being effected by scour at the base. Mudflats are accreting with shingle banked against the MHW.

4. North of BRUICHCHAIN to North of CNOC COTTAGE

NH 630 458

0.7km

Eroding or stable

A concrete sea wall defends this unit. Erosion is occurring at the MHW. Dumped rubble also shows signs of erosion. The intertidal zone appears to be stable with the accretion of mud and shingle

5. North of CNOC COTTAGE to BUNCHREW HOUSE

NH 625 458

0.2km

Eroding or Stable

Sea defences being effected by erosion. Foreshore scoured seaweed and rocks.

6. BUNCHREW HOUSE

NH 623 459

0.3km

Definitely Eroding

The land immediately in front of Bunchrew House is defended by a sea wall that shows signs of scouring at its base. There appears to be a noticeable lack of shingle against the MHW which suggest that sediment supply is reduced here for reasons that are not clear

7. East of BUNCHREW HOUSE to BUNCHREW CARAVAN HOUSE

NH 620 460

0.3km

Stable

This unit is stable with a wide range of different particle sizes on a low angled beach. Vegetation at the MHWMS lends additional stability to the backshore. Accreting mud and shingle form the wide intertidal area.

8. BUNCHREW CARAVAN SITE

NH 618 461

2.8km

Definitely Eroding

Demolition rubble and large tree stumps have been dumped at the HWM in an attempt to defend this section of shoreline. In parts the sea has scoured out some of this material from the base of the rubble. The foreshore is well exposed with boulders and shingle

9. MAINS of BUNCHREW

NH 615 459

0.2km

Both Accreting and Eroding

This unit has a noticeable lack of saltmarsh and the fronting cobble beach appears to be eroding. Mud and shingle is accreting on the wide foreshore.

10. North of ENGLISTON

NH 613 457

0.4km

Both Accreting and Eroding

Saltmarsh development is leading to accretion in parts of this sheltered bay. Out towards the intertidal flats a series of piles are exposed and it is not clear if these are old sea defences. Owing to the sheltered position mud is accreting on the foreshore.

11. North of PARKHOUSE

NH 610 460

0.4km

Eroding or stable

The hinterland is well vegetated but saltmarsh is slowly eroding from the HWM. The beach consists of shingle and mud which appears to be accreting on foreshore.

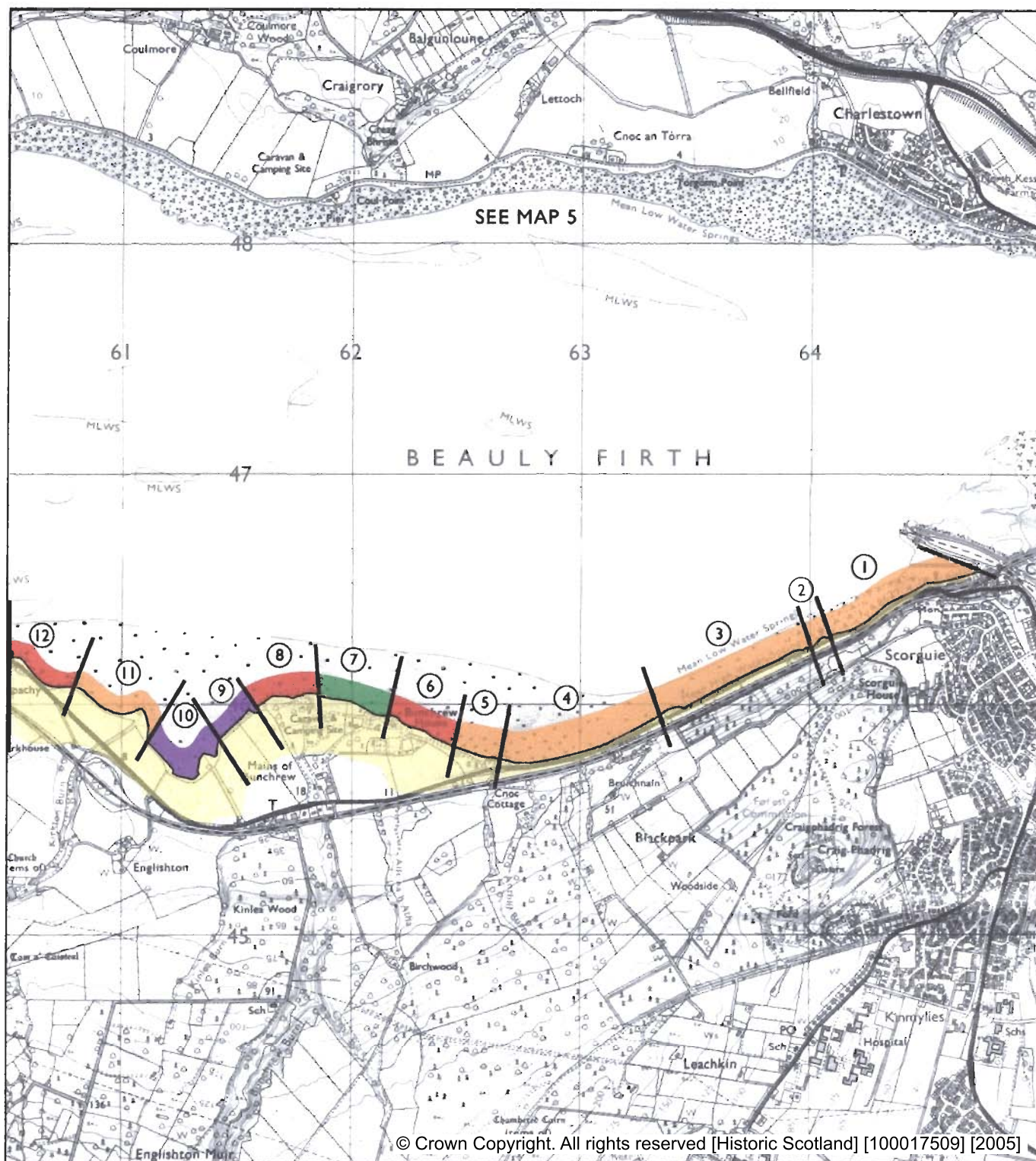
12. PHOPACHY

NH 607 461

3.2km

Definitely Eroding

Backshore well vegetated with an eroding saltmarsh at the HWM caused by scouring in storm conditions. Mud and shingle are exposed on the tidal flats.



MAP 1: CLACHNARRY TO PHOPACHY

MORAY FIRTH SURVEY Grid ref: NH 61-65/44-49

1:25 000

Basemap: O.S. *Pathfinder* Series
Sheet 177

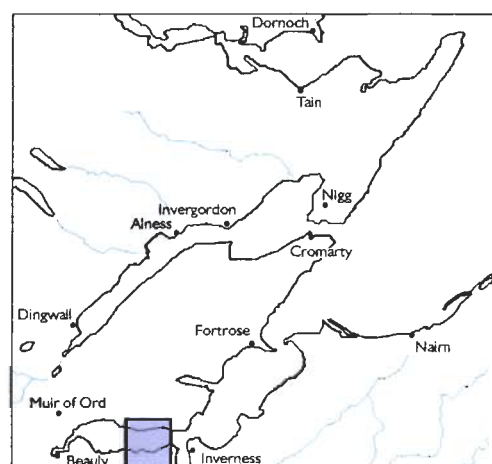
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EROSION CLASS

Assessment date: 08 September 1998

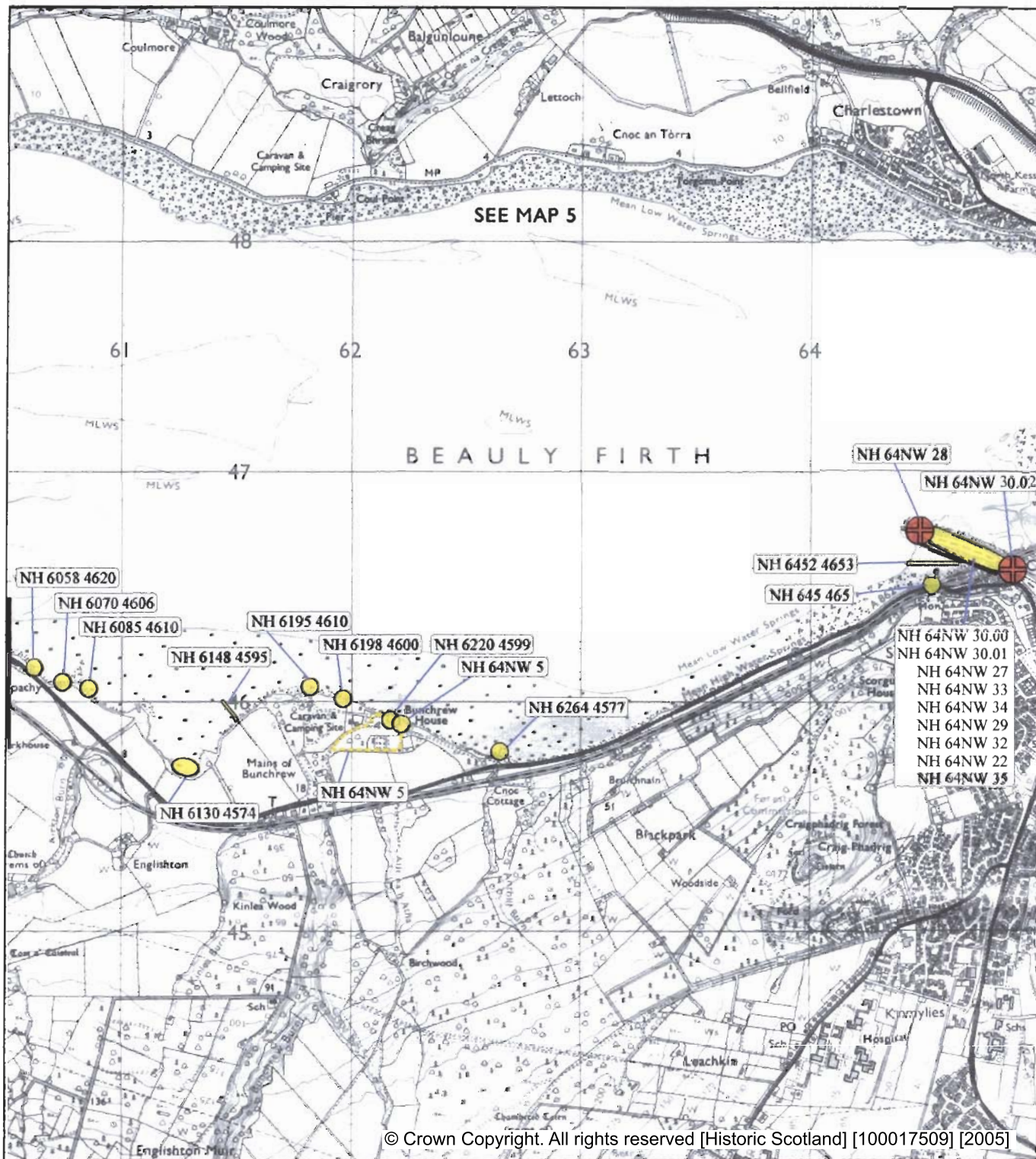
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 1: BUILT HERITAGE AND ARCHAEOLOGY

Coastal Edge & Foreshore	Sites in the Hinterland	Coastal edge & Foreshore	Sites in the Hinterland	Sites in the Hinterland
NH 6452 4653 CLACHNAHARRY Disused pier 19 th century AD Poor Nil	NH64NW 30.00 NH 6442 4676 - 6500 4645 CLACHNAHARRY Caledonian Canal 19 th century AD Good Nil	NH 6148 4595 BUNCHREW Wooden piles forming fence line Uncertain Good Nil	NH64NW 29 NH 6473 4657 CLACHNAHARRY, 2 Low St Cottages 19 th century AD Good Nil	NH64NW 28 - Scheduled & Listed C NH 6447 4673 CLACHNAHARRY Caledonian Canal; sea lock & lock keeper's cottage 19 th century AD Good Nil
NH64NW 2 NH 645 465 CLACHNAHARRY Shell midden (not located) Uncertain Unknown Nil	NH64NW 30.01 NH 6479 4649 CLACHNAHARRY Caledonian Canal, hand crane 19 th century AD Good Nil	NH 6130 4574 BUNCHREW Wooden posts across inlet, possible fish trap Uncertain Poor Survey	NH64NW 32 NH 6471 4667 CLACHNAHARRY Canal cottages 19 th century AD Good Nil	NH64NW 5 NH 6217 4591 BUNCHREW Residential house; designed landscape 17 th century AD; built 1615 Good Nil
NH 6264 4577 ANTHILL Groyne Unknown Fair Nil	NH64NW 30.02 - Scheduled NH 6488 4656 CLACHNAHARRY Caledonian Canal, lock 19 th century AD Good Nil	NH64NW 37 NH 6085 4610 PHOPACHY Stone rubble remains of landing place and storehouse 18 th /19 th century AD Poor Survey	NH64NW 5 NH 6217 4591 BUNCHREW Residential house; designed landscape 17 th century AD; built 1615 Good Nil	
NH 6222 4591 BUNCHREW Wooden posts and concrete pipe Unknown Fair Nil	NH64NW 27 - Listed C NH 6487 4653 CLACHNAHARRY Caledonian Canal; lock, workshops 19 th century AD Good Nil	NH6070 4606 PHOPACHY Land drain outfalls 20 th century AD Good Nil	NH64NW 72 NH 6044 4612 PHOPACHY Residential country house 18 th /19 th century AD Good	
NH 6220 4599 BUNCHREW Concrete slipway 20 th century AD Poor Nil	NH64NW 33 NH 6483 4659 CLACHNAHARRY Caledonian Canal, railway swing bridge 20 th century AD; built 1909 Good Nil	NH 6058 4620 PHOPACHY Wooden piles Uncertain Poor Nil	NH 6466 4654 CLACHNAHARRY, 10 Low St Cottages 19 th century AD Good Nil	
NH 6198 4600 BUNCHREW Wooden piles Uncertain Good Nil				
NH 6195 4610 BUNCHREW Metal pipe, land drain 20 th century AD Good Nil	NH64NW 34 NH 6481 4657 CLACHNAHARRY, Station Railway signal box 20 th century AD Good Nil		NH64NW 35 Listed B NH 647 466 CLACHNAHARRY Caledonian Canal, sea lock basin 19 th century AD Good Nil	



MAP 1: CLACHNARRY TO PHOPACHY

MORAY FIRTH SURVEY Grid ref: NH 61-65/44-49

1:25 000

Basemap: O.S. Pathfinder Series
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
 or area of designated wreck

Listed Historic Building

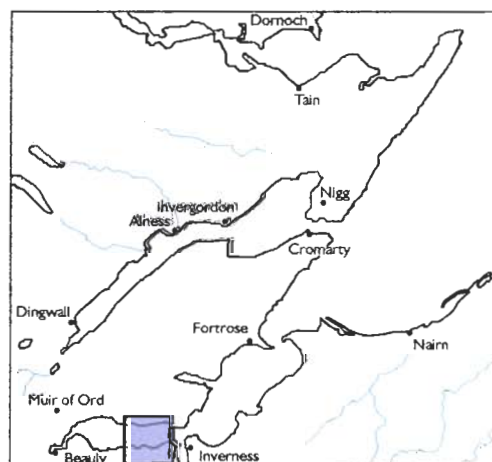
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
 or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



MAP 2: PHOPACHY TO EASTER LOVAT

Hinterland Geology and Coastal Geomorphology: Middle Old Red Sandstone continues to form the dominant basal geology with quartz and feldspars attributed to the Moine Series occurring in the vicinity of Kirkhill. Within the area Quaternary age drift deposits derived exclusively from boulder clay have been sculptured by a series of raised shoreline terraces. Towards Easter Lovat marine carse clay development becomes extensive at the head of the firth. This low lying flood plain was reclaimed in the historic period to create field systems which are now defended by flood banks. Saltmarsh development is extensive alongside the outer tidal reach of the River Beaulay.

Erosion class: Erosion is minimal with accretion the dominant class in this area. This unit of coastline benefits from shelter afforded by the narrow isthmus at Kessock which absorbs the effect of storm waves and swell. This has a tendency to promote increased sedimentation and accretion on the shallow foreshore. Fine suspended silts carried down the River Beaulay are circulated at the head of the Firth and deposited along the main river channel. Channel migration leads to sediment movement and accretion where the currents are slacker. In front of flood banks saltmarsh vegetation is well established, some of which is eroding at Inchberry Croit. Intertidal mudflats are extensive and exposed to at least over 1km between the HWM and LWM.

Built Heritage and Archaeology: Two distinct intertidal archaeological monuments found in this area are the remnants of fish traps or 'yairs'. These complex wooden and stone structures were designed to trap fish on both the ebb and flow tides. Their exact period of inception is unknown but they were recorded in use as late as the 1830s. Extensive 19th century land reclamation included the building of embankments to increase fertile farming land on the Lovat estate. The reclamations also included the construction of a major network of drainage channels and canals, one of which is within the survey area at Balintore. At the eastern margin of this area the Phopachy intertidal crannog is located. Sub-surface timber remains from structural features have been dated to the 1st century BC. The condition of the site appears to be relatively poor.

Map 2: Hinterland Geology and Coastal Geomorphology

1 East of PHOPACHY FARM to LENTRAN POINT

NH 595 460

km 1.7km

Mainly estuarine mud

Low edge (<10m)

Marine deposits overlain by carse clays

This unit comprises the commencement of carse deposition over marine derived sand and gravel.

The low edge is fairly regular. Intertidal mud flats and shingle present at MHWMS.

2 LENTRAN POINT to north of BALCARSE

NH 575 475

1.8km

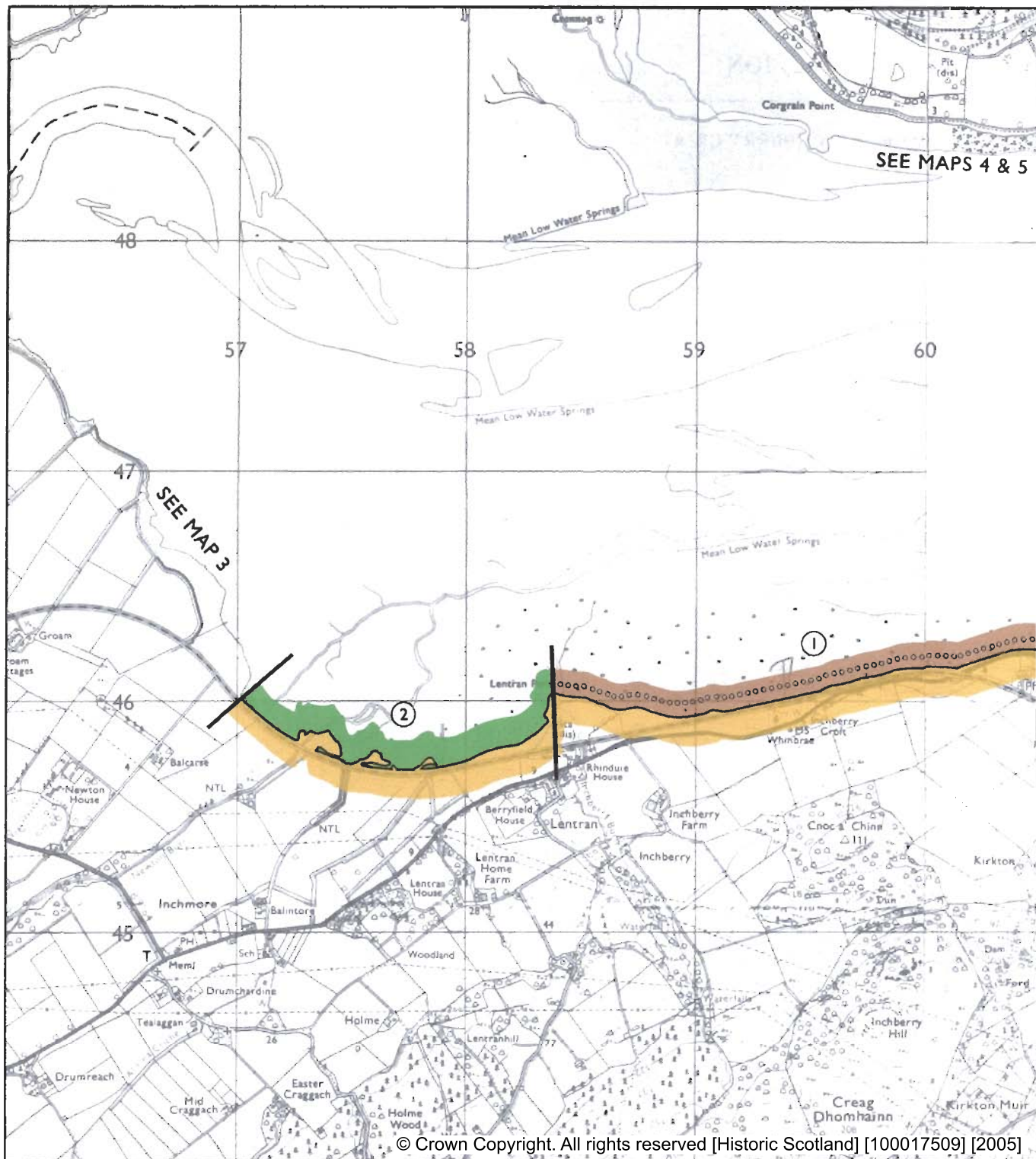
Low edge (<10m)

Mainly mud

Carse clay over marine derived sand and gravel

This unit consists of a large alluvial fan developed over carse clays, which in turn mantle marine sand and gravel. The intertidal area is estuarine mud and shingle incised by drainage channels.

Saltmarsh has developed along at the shoreline.



MAP 2: PHOPACHY TO BALCARSE

MORAY FIRTH SURVEY Grid ref: NH 56-60/44-49

1:25 000

Basemap: O.S. Pathfinder Series
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 08 September 1998

Hinterland:

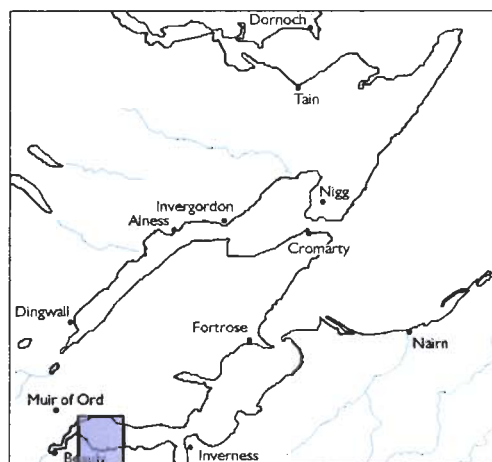
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 2: EROSION

1. East of INCHBERRY CROIT

NH 599 462

0.2km

Definitely Eroding

Low-lying coastal edge with eroding saltmarsh defended by rubble sea defence.

2. INCHBERRY CROIT

NH 585 459

1.6km

Both Accreting and Eroding

Exposed section of coastline with eroding saltmarsh. The foreshore sediments consist of mud and shingle which shows evidence of accretion.

3. North of INCHBERRY FARM WEST to east of BALCARSE

NH 585 459

1.6km

Both Accreting and Eroding

This section of coastline is undergoing erosion due to the loss of the saltmarsh buffer at the MHWM. The foreshore consists of mud and shingle, which is accreting in parts

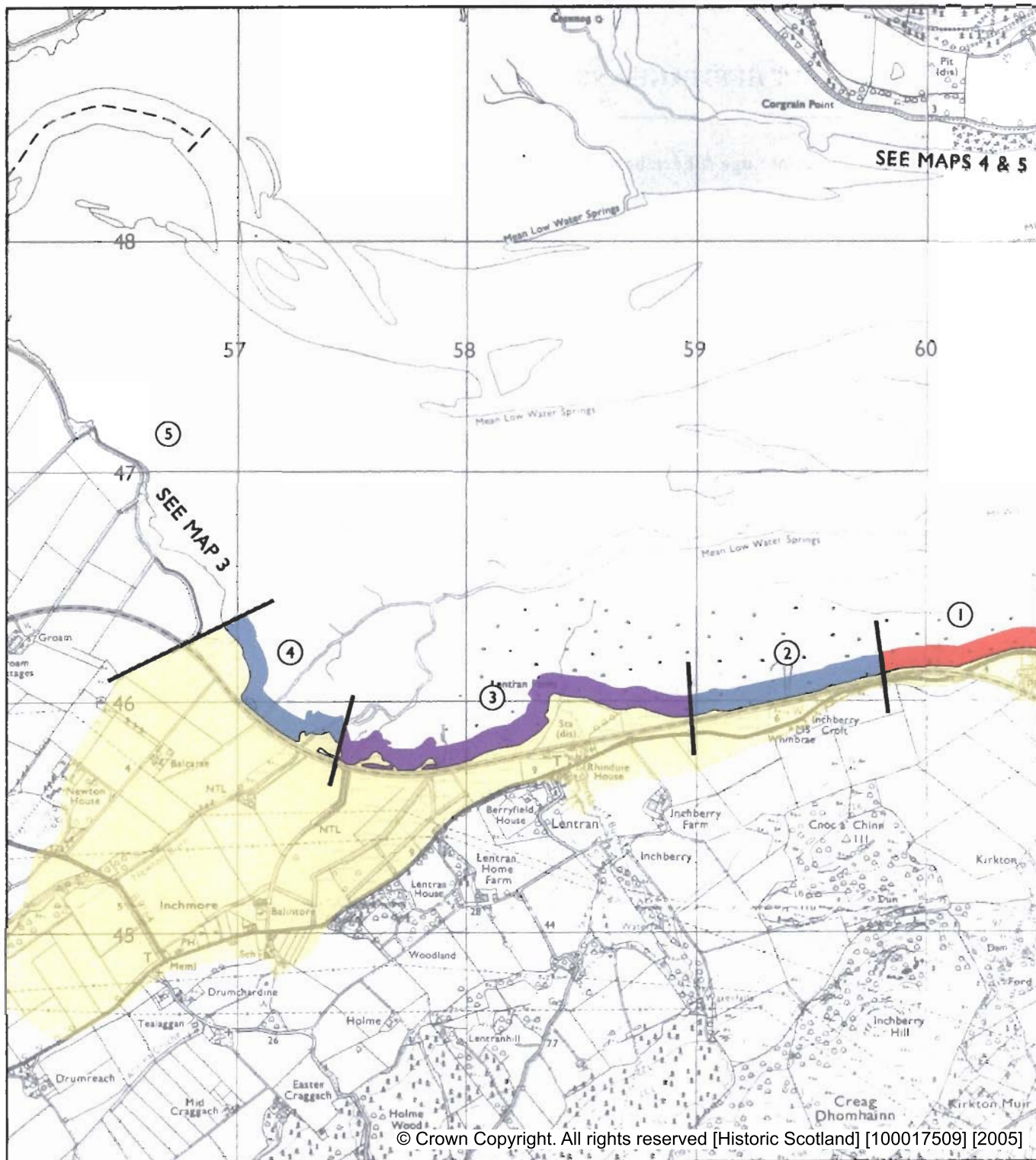
4. East of BALCARSE to north of BALCARSE FARM

NH 572 460

0.9km

Accreting

Sediment is accreting on the backshore owing to the presence of reed beds. Mud and shingle is also accreting on the wide foreshore



MAP 2: PHOPACHY TO BALCARSE

MORAY FIRTH SURVEY Grid ref: NH 56-60/44-49

EROSION CLASS

Assessment date: 08 September 1998

Key:

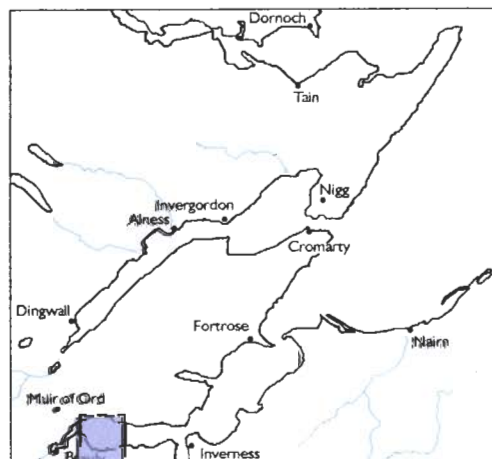
- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m

N.B. The O.S. base map uses an imperial contour interval. Therefore on this sheet, the position of the land below 10m is an estimate.

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 176

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MAP 2: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH64NW 40
NH 6025 4670
PHOPACHY
Marine crannog
1st century BC
Poor
Nil

NH54NE 30
NH 5939 4620
WHINBRAE
Double tidal fish trap
Uncertain
Poor
Survey

NH54NE 29
NH 5841 4622
LENTAN POINT
Tidal fish trap
Uncertain
Poor
Survey

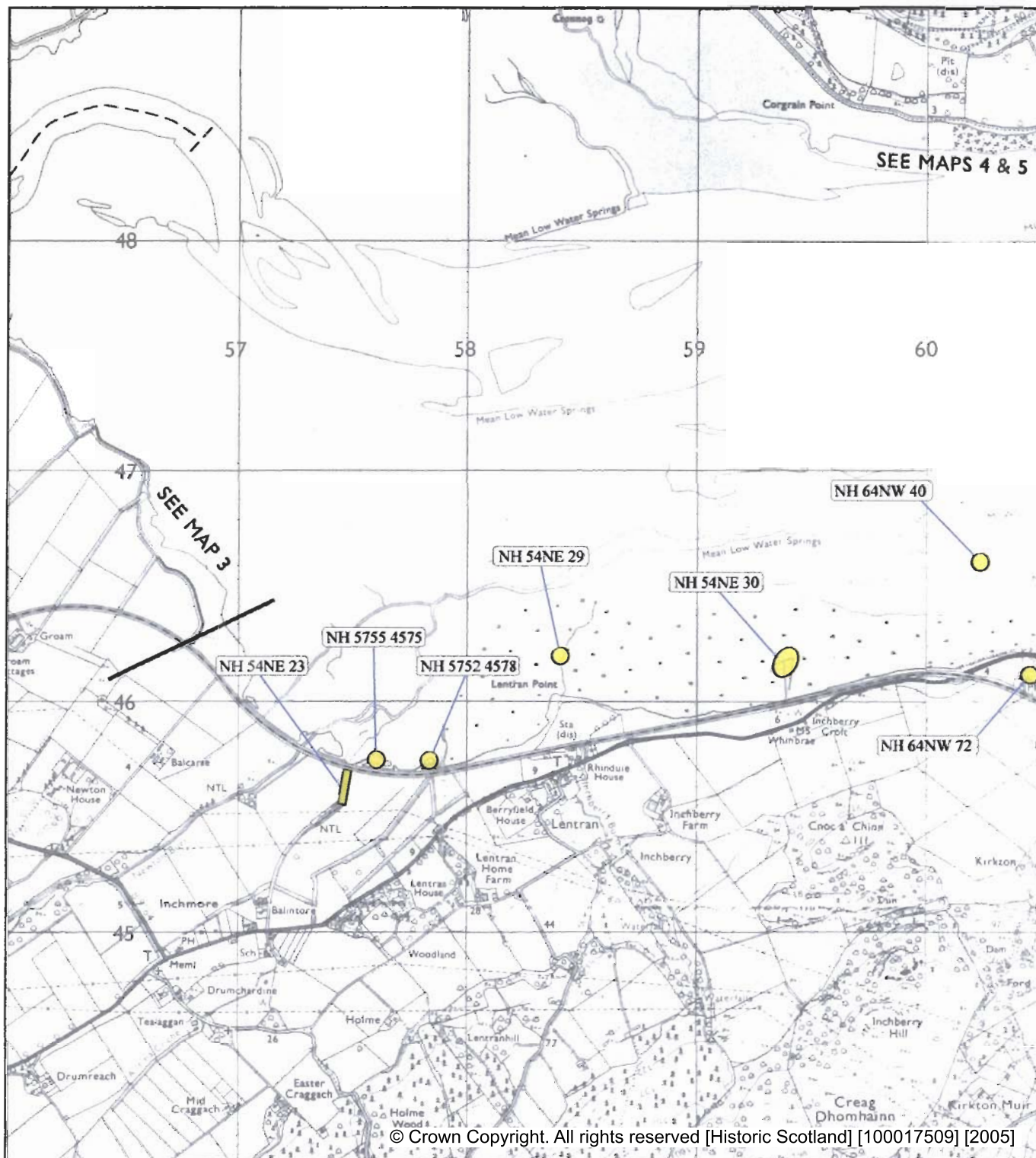
NH 5752 4578
LENTAN POINT
Embankment
Unknown
Poor
Nil

NH 5755 4575
LENTAN POINT
Railway embankment
19th/20th century AD
Good
Nil

NH54NE 23
NH 5744 4564
BALINTORE. Allt na Criche
Canal; sea wall
19th century AD
Fair
Nil

Sites in the Hinterland

NH64NW 72
NH 6044 4612
PHOPACHY
Residential country house
18th/19th century AD
Good



MAP 2: PHOPACHY TO BALCARSE

MORAY FIRTH SURVEY Grid ref: NH 56-60/44-49

1:25 000

Basemap: O.S. Pathfinder Series Sheet 176

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument, or area of designated wreck

Listed Historic Building

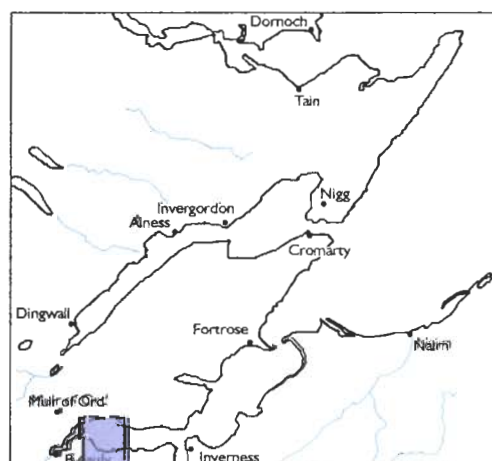
Monument formally proposed by Historic Scotland for scheduling, or wreck for designation

Other known Ancient Monuments, or Undesignated wreck

Designated Landscape

Insufficient information; more work needed

Probably archaeologically sterile



Map 3: EASTER LOVAT TO TARRADALE HOUSE

Hinterland Geology and Coastal Geomorphology: This coastal unit forms the head of the Beulay Firth. Lower Old Red Sandstone underlie the low lying coastline. Fine-grained sedimentary units (carse) and buried peats are laterally extensive forming a flood plain. This is bounded by a Holocene raised shoreline that skirt the lowlands alongside the River Beulay. At Barnyards, sedimentary sequences have been investigated in detail by Firth and Haggart (1989) and provide a detailed record of relative sea-level changes in the Moray and Beulay Firths. Between Easter Lovat and Tarradale House the land is reclaimed and lies below 10m OD. Earthwork flood defences protect the hinterland.

Erosion class: Stability and accretion are the predominant class within this section of coastline. Here at the head of the Firth, the effect of storm conditions are reduced but currents are likely to be strong with high sediment loading brought down the River Beulay. This is leading to the accretion of mud against river channel sides and up against on the saltmarsh that fronts the flood-banks.

Built Heritage and Archaeology: The archaeological remains in this area are very sparse and consists of two relatively modern features. The first, a series of timber piles, were part of a 18th/19th century pier at Wester Lovat farm and built to service the Lovat estate. The second site consists of the extensive embankment system on the northern shore of the Firth, between Barnyards and Tarradale House. They consist of initial low banks at the high water mark (HWM), which appeared to have trapped sediment and initiated extensive reed bed growth, which are in turn backed by the main reclamation embankment. Behind the main bank are small drainage channels which interconnect and outflow into the Firth at particular points. The distinct absence of archaeological remains in this area may be due to the major reclamation works that took place in the 18th century, which has obscured much of the previous land surfaces and altered the estuarine and riverine interface.

Map 3: Hinterland Geology and Coastal Geomorphology

1 North of BALCARSE to north east of EASTER
LOVAT.

NH 560 476

2.3km

Mainly mud

Low edge (<10m)

Carse clays overlying marine deposits

Delta formed on an alluvial fan. Carse clays overlay marine deposits of sand and gravel. The shoreline is irregular and defended by flood banks. Saltmarsh gives way to intertidal flats of estuarine mud.

2 North east of EASTER LOVAT to WESTER
LOVAT

NH 543 470

1.9km

Mainly mud

Low edge (<10m)

Carse clays overlying marine deposits

Upper tidal reach of the River Beulay with carse clays overlying marine derived deposits of sand and gravel. Riverbanks defended by flood banks. Saltmarsh colonisation formed on alluvial mud.

3. South of BARNYARDS FARM to south of
TARRDALE HOUSE

NH 547 475

2.6km

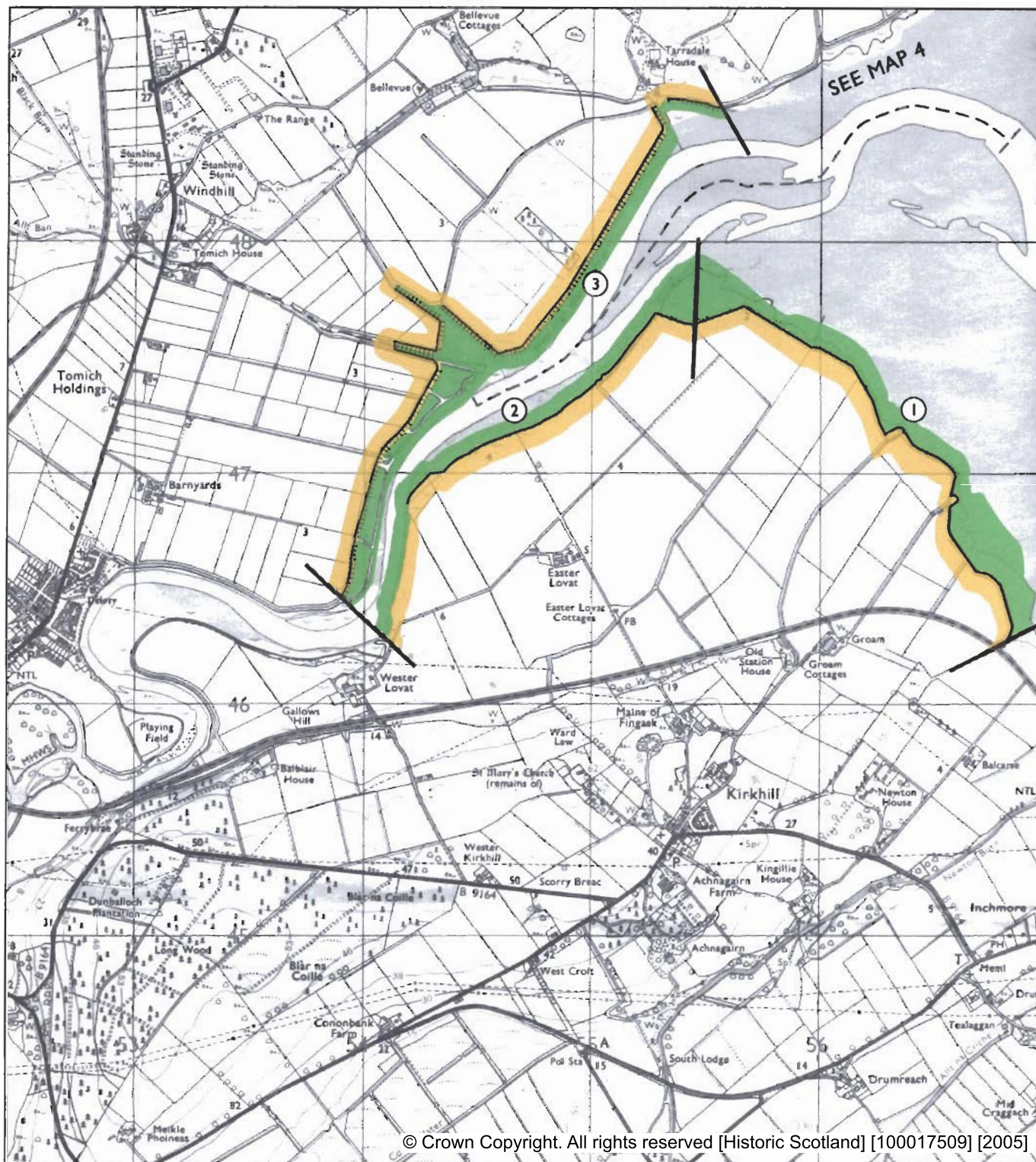
Mainly mud

Low edge (<10m)

Carse clays overlying marine sand and gravel

This unit comprises the lower tidal reach of the River Beulay. Carse clays cover sequences of marine derived deposits in the hinterland.

Floodbanks protect the riverside, which is colonised by saltmarsh vegetation. Meandering river channels are exposed at low tide.



MAP 3: BALCARSE TO TARRADALE HOUSE

MORAY FIRTH SURVEY Grid ref: NH 53-57/44-49

1:25 000

Basemap: O.S. Pathfinder Series
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 08 September 1998

Hinterland:

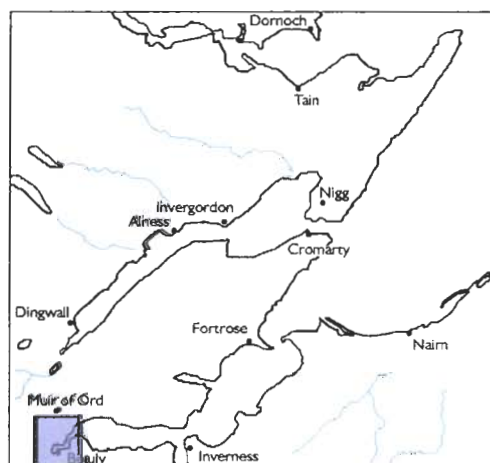
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 3: EROSION

1. North east of BALCARSE to north of
EASTER LOVAT

NH 566 470

2.2km

Both Accreting and Eroding

This unit is defended by floodbanks that are eroding in parts. This unit is close to the head of the firth and its sheltered aspect implies fairly stable condition with accretion further enhanced by alluvial sediment supplied by the River Beulay

2. North east of BALCARSE to WESTER
LOVAT

NH 543 470

2km

Both Accreting and Eroding

Southern shore of the outer tidal reach of the River Beulay. This stretch will be susceptible to erosion at the channel edge. Sediment focusing in parts is due to alluvial transport down the river.

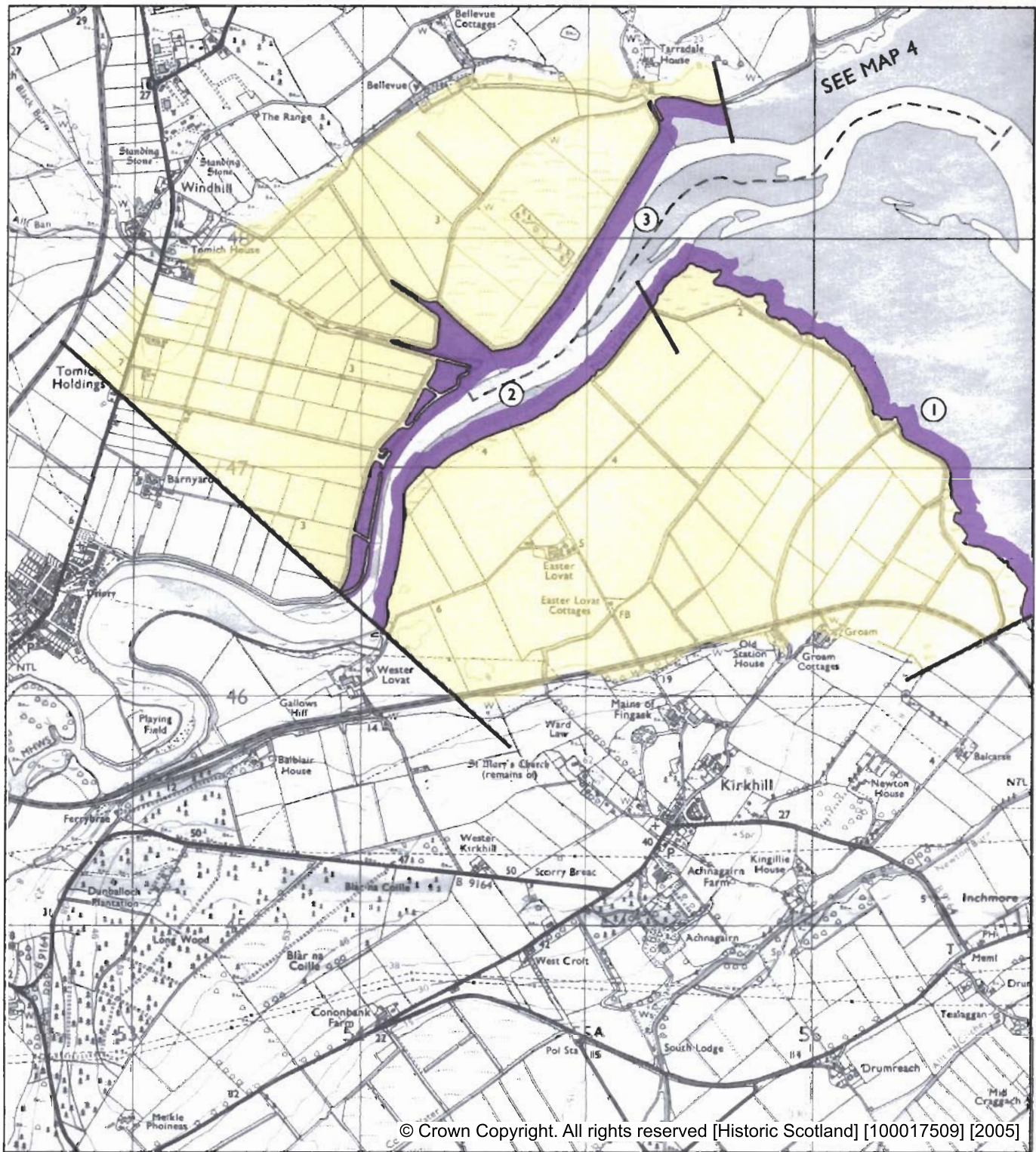
3. North of GALLOWS HILL to TARRADALE
HOUSE

NH 547 475

1.4km

Both Accreting and Eroding

Northern shore of outer tidal reaches of the River Beulay. Undergoing erosion in parts of the river channel and is leading to accretion of mud on the exposed banks. Suspended sediment from further upstream is liable to accrete at the mouth of the river.



MAP 3: BALCARSE TO TARRADALE HOUSE

1:25 000

MORAY FIRTH SURVEY Grid ref: NH 53-57/44-49

Basemap: O.S. Pathfinder Series

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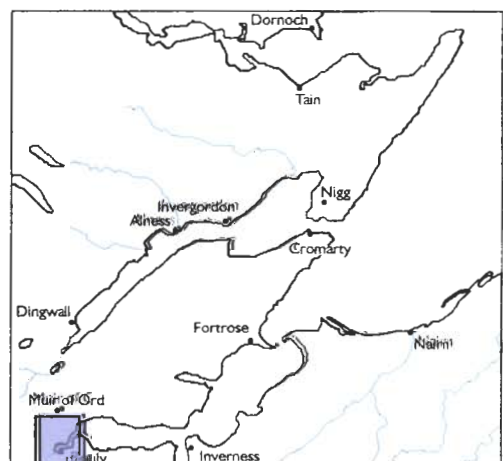
EROSION CLASS

Assessment date: 08 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m

N.B. The O.S. base map uses an imperial contour interval. Therefore on this sheet, the position of the land below 10m is an estimate.



MAP 3: BUILT HERITAGE AND ARCHAEOLOGY

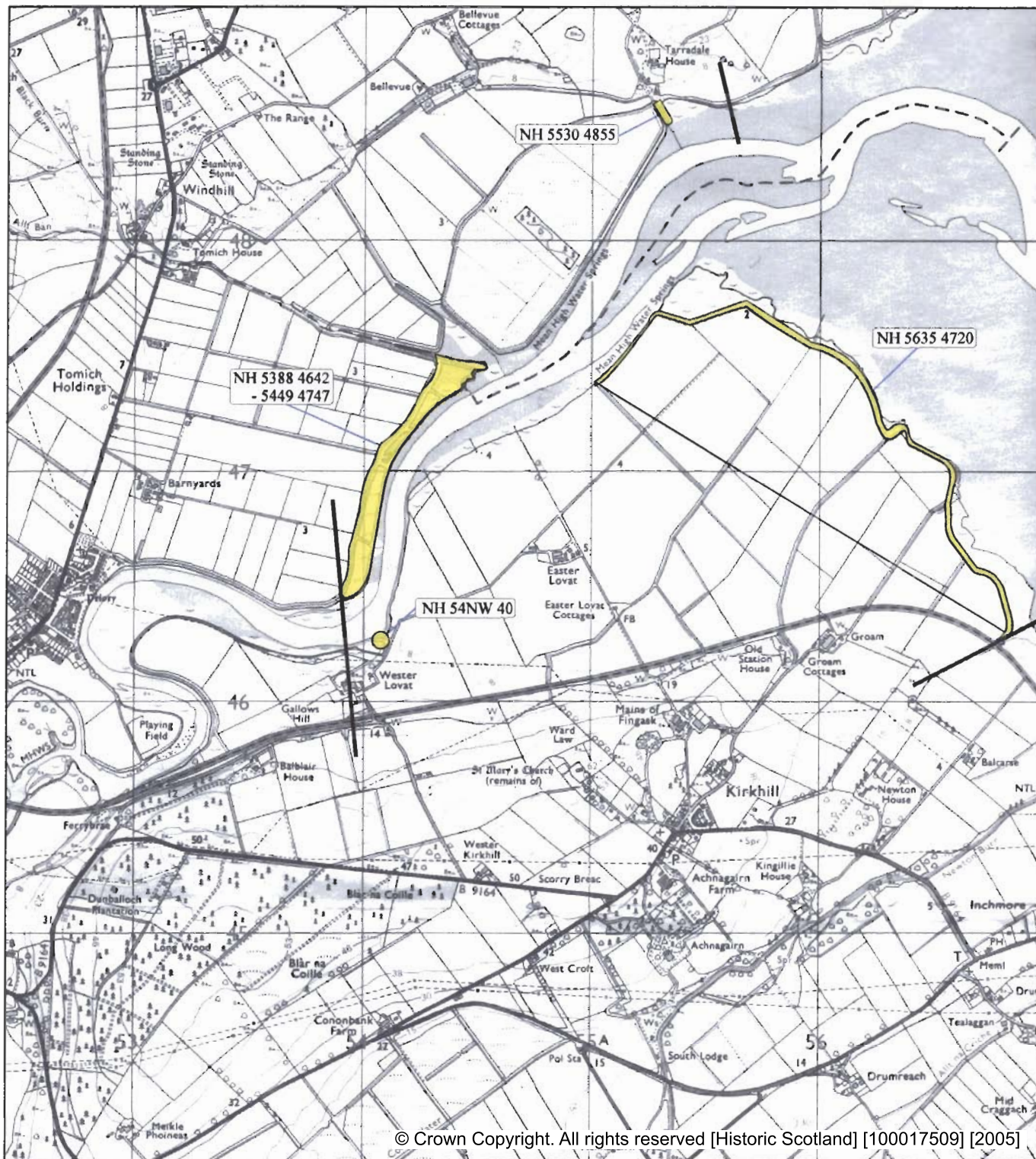
Sites on the Coastal Edge & Foreshore

NH 5635 4720
EASTER LOVAT
Embankment
19th century AD
Good
Nil

NH54NW 40
NH 5412 4637
WESTER LOVAT
Timber piles of pier
18th/19th century AD
Poor
Survey

NH 5388 4642 to 5449 4747
BARNYARDS
Embankment system
18th century AD
Good
Nil

NH 5530 4855
TARRADALE HOUSE
Pier
18th/19th century AD
Fair
Nil



MAP 3: BALCARSE TO TARRADALE HOUSE

MORAY FIRTH SURVEY Grid ref: NH 53-57/44-49

1:25 000

Basemap: O.S. Pathfinder Series
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

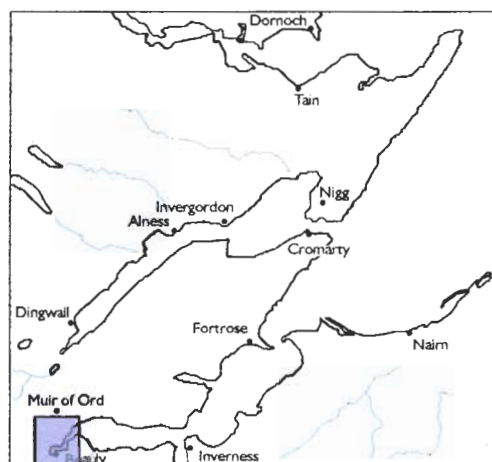
 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile



Map 4: TARRADALE HOUSE TO CORGRAIN POINT

Hinterland Geology and Coastal Geomorphology: Old Red sandstone underlies this unit of coastline which forms the head of the Beaulay Firth. In the vicinity of Tarradale House carse clay continue landward and were formed by a marine incursion. Earlier marine incursions are also represented by two eroded raised beach terraces immediately north of Tarradale house. Eastwards towards Redcastle, the coastal edge is narrow forming a coastal plateau which is bounded by land that rises steeply cut by a higher Post-glacial raised sea beach. Floodbanks and saltmarsh protect the head of the firth and the hinterland is low lying at below 10m Ordnance Datum. The foreshore consists of extensive intertidal mudflats.

Erosion class: Owing to the sheltered position of this section of estuarine coastline the condition of the low shore is stable and accreting. Estuarine mud is the dominant feature of the foreshore with isolated patches of shingle in parts. Some slight degradation of the carse clay platform is ongoing but recession of this low cliff is at the present only slight. Undercutting is leading to collapse but the fallen material is not being transported and appears to form a lower step of vegetation. It is the vegetation that is rendering stability in what is considered to be a fairly low wave energy environment.

Built Heritage and Archaeology: The western part of this area consists of two separate archaeological site types on the foreshore; an embankment system, built in the 18th century AD, to prevent flooding of the adjacent land and two fish yairs. In the western part the hinterland archaeology consists of three 18th/19th century ruined buildings at Spital Shore. The Milton Pier was built to transport quarry stone from the shoreline quarry along a light railway, during the building of the Caledonian Canal. It was constructed to service the low water channel which has subsequently migrated south, leaving the pier approximately 500 m above low water mark (LWM). It was later used as a rifle range and remains in a poor state of repair. Milton village in the eastern part of the area is a small village with 19th century cottages, still inhabited and a smithy building in poor condition.

In the hinterland archaeology the Redcastle, a 17th/18th century tower house and designed landscape, is reputed to stand on the site of Ederdour erected by William the Lion in the 12th century AD. Today the castle is part of a large working estate and is in a poor state of repair. Off shore from the castle is the Redcastle intertidal crannog. The site is a complex Iron Age structure with at least two phases of construction and appears to have been constructed during a period of lower water level. A series of piles at low water mark near Corgrain Point are the remnants of a wooden fish trap, which requires survey and monitoring.

Map 4: Hinterland Geology and Coastal Geomorphology

1. South of TARRADALE HOUSE to MILTON PIER

NH 560 488

2.8km

Mud with shingle

Low edge (<10m)

Carse clays overlying marine sand and gravel

Flood defended head of the Beulay Firth.

Intertidal mud flats backed by saltmarsh. The hinterland is predominantly carse clay overlying marine sand and gravel.

2. MILTON PIER to south west of COULMORE

NH 590 492

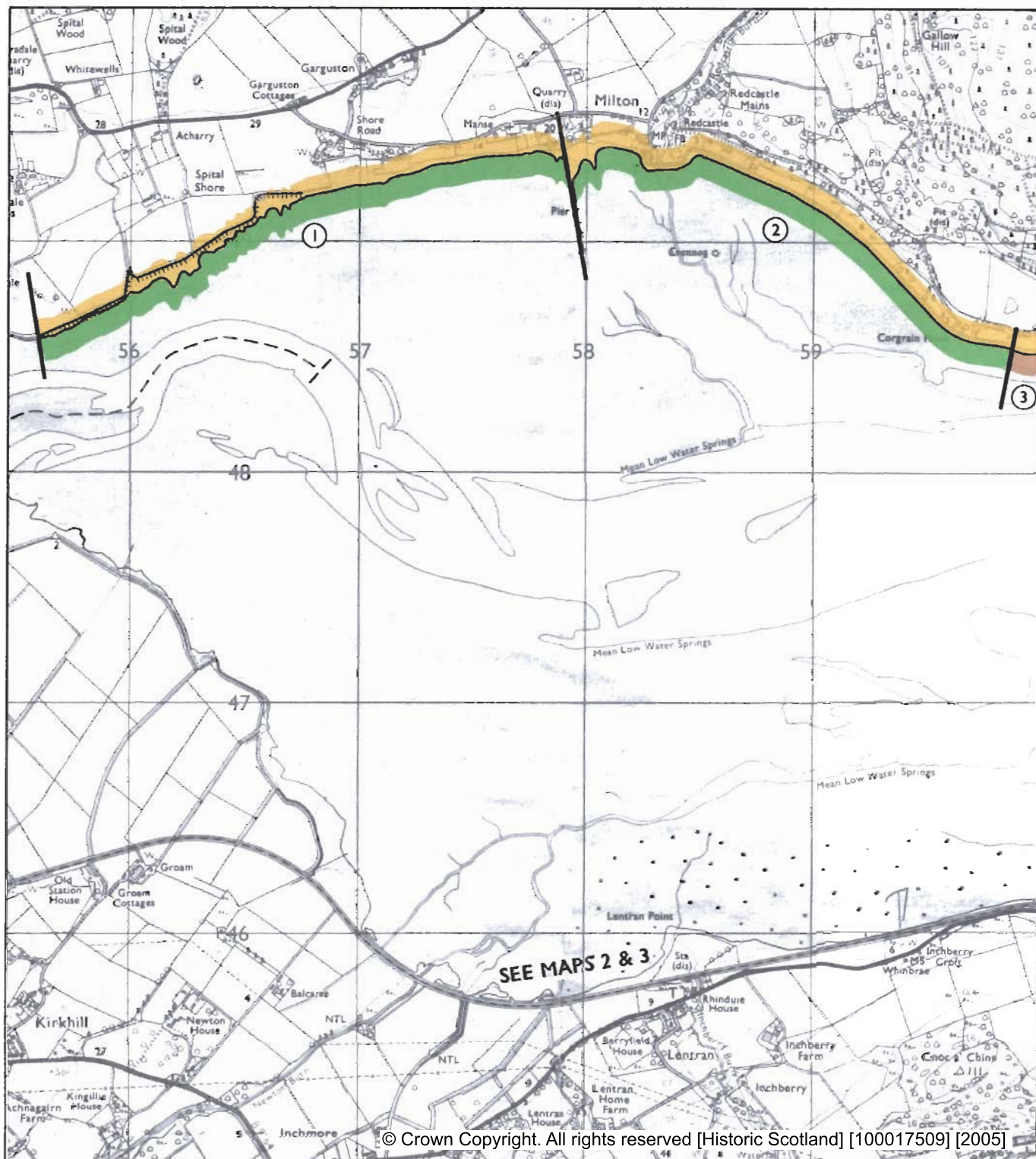
2.4km

Mud flats

Low edge (10m)

Carse clays overlying marine sand and gravel

Extensive tidal mud flats meet saltmarsh at the coastal edge. Hinterland wooded. This unit incorporates the site of the crannog at Redcastle.



MAP 4: TARRADALE HOUSE TO CORGRAIN POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 56-60/45-50

Basemap: O.S. Pathfinder Series
Sheet 176

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 08 September 1998

Hinterland:

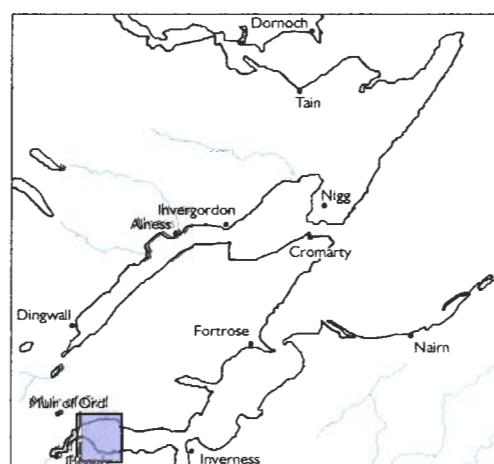
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

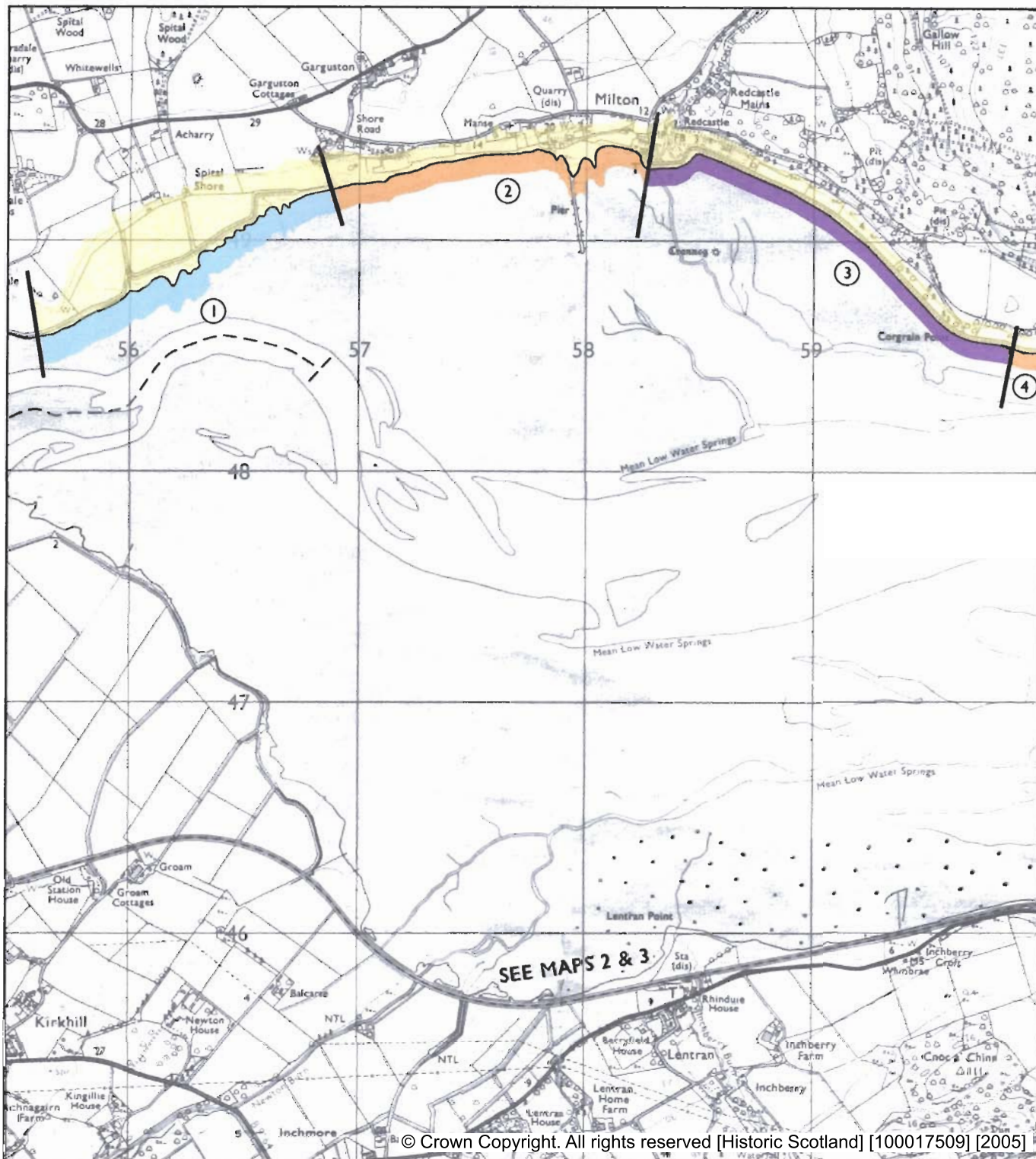
Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 4: EROSION

1. East of TARRADALE HOUSE to south of
SHORE ROAD
NH 565 490
1.4km
Accreting or Stable
High earthwork floodbanks defend the hinterland
and saltmarsh is well established on the
backshore. Conditions are stable with mud
accreting on foreshore.
 2. South of SHORE ROAD to REDCASTLE
NH 576 494
1.4km
Stable or Eroding
Head of the Beaully Firth with accreting mudflats
owing to its sheltered aspect and constant
sediment supply. At the HWM some local erosion
of the saltmarsh vegetation and underlying clay is
occurring. At Redcastle the clay is eroding
forming a step as the material that has fallen from
the low edge continues to grow.
 3. REDCASTLE east to CORGRAIN POINT
NH 592 490
1.9km
Both Accreting and Eroding
A fairly stable stretch of coastline with some local
erosion at HWM. The foreshore is wide with
accreting mud and shingle
-



MAP 4: TARRADALE HOUSE TO CORGRAIN POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 56-60/45-50

Basemap: O.S. Pathfinder Series

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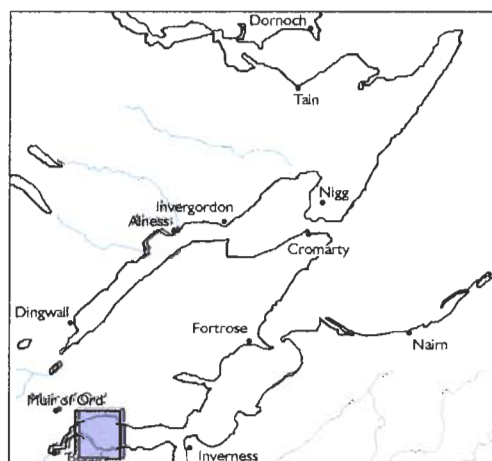
EROSION CLASS

Assessment date: 08 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m

N.B. The O.S. base map uses an imperial contour interval. Therefore on this sheet, the position of the land below 10m is an estimate.



MAP 4: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 5542 4861 to 5673 4920
TARRADALE TO SPITAL
SHORE
Embankment
18th century AD
Good
Nil

NH54NE 34
NH 5604 4855
SPITAL SHORE
Tidal fish trap
Uncertain
Poor
Survey

NH54NE 33
NH 5693 4903
SPITAL SHORE
Uncertain
Possible fish trap
Poor
Survey

NH 5797 4906
MILTON
Pier
18th/19th century AD
Poor
Monitor

NH 5841 4932
MILTON
Wooden piles
Uncertain
Poor
Nil

NH54NE 2
NH 5858 4895
REDCASTLE
Intertidal crannog
3rd century BC
Poor
Monitor

Sites on the Coastal Edge & Foreshore

NH54NE 31
NH 5965 4860
CORGRAIN POINT
Tidal fish trap
Uncertain
Poor
Survey

NH 6012 4848
CORGRAIN POINT
Wooden piles of linear pier
Uncertain
Poor
Monitor

Sites in the Hinterland

NH 5698 4928
SPITAL SHORE
Ruined building
18th/19th century AD
Poor
Nil

NH 5723 4933
SPITAL SHORE
Ruined building
18th/19th century AD
Poor
Nil

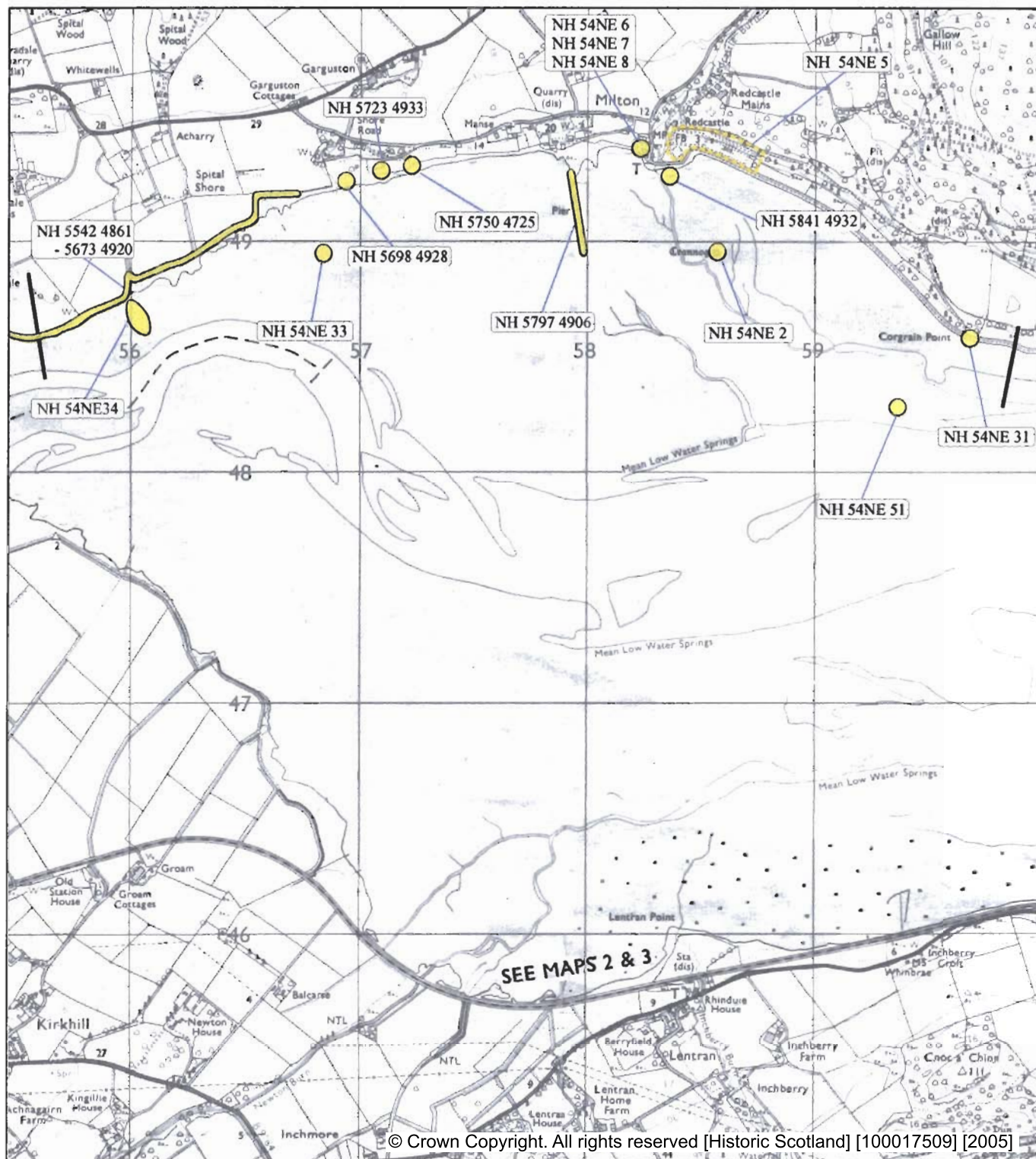
NH 5705 4725
SPITAL SHORE
Ruined building
18th/19th century AD
Poor
Nil

NH54NE 6
NH 5824 4943 & 5826 4942
MILTON
Cottages
18th/19th century AD
Good
Nil

NH54NE 7
NE 5825 4940
MILTON
Cottages
19th century AD
Good
Nil

NH54NE 8
NH 5826 4937
MILTON
Smithy
19th century AD
Poor
Monitor

NH 54 NE 5
NH 5838 4951
REDCASTLE
Castle and designed landscape
17th century AD
Poor
Monitor



MAP 4: TARRADALE HOUSE TO CORGRAIN POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 56-60/45-50

Basemap: O.S. Pathfinder Series
Sheet 176

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

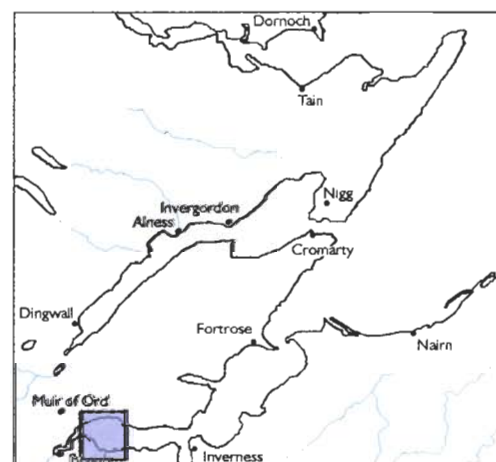
 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile



Map 5: CORGRAIN POINT TO CHARLESTOWN

Hinterland Geology and Coastal Geomorphology: The basement geology is Upper Old Red Sandstone. This is overlain by Quaternary age marine deposits and boulder clay. Representing the limits of marine incursions, two terraces attributed to the Main Late-glacial and main Post-glacial shorelines run parallel with the present shoreline. The hinterland rises steeply behind Charlestown and North Kessock. The shoreline is defended by sea walls along the Kessock shore where mud and cobbles are exposed at the LWM. Towards Craigton Point, where the isthmus is crossed by Kessock Bridge, the coastal plateau and the foreshore narrow considerably.

Erosion class: This unit of coastline is sheltered from the effects of easterly gales. This creates a fairly low energy wave environment which is leading to accretion of mud and shingle on the foreshore. Where pockets of erosion do occur, then these are confined to saltmarsh resting on the top of the carse terrace that lies at the foreshore. Towards North Kessock the foreshore is armoured and defended by sea walls, here conditions are considered to be stable with mud and shingle.

Built Heritage and Archaeology: The archaeology in this area is dominated by foreshore and intertidal remains, including a series of stone fish traps and two intertidal crannogs, one of which, Carn Dubh, has been radiocarbon dated to the late Iron Age. Towards the eastern part of this area are piers and boat slipways two of which are associated with boat houses. The boat at Lettoch, a 20th century clinker built cruiser was recorded due to its poor current state of preservation. The four fish traps at Torgorm Point consist of various stake net mounds and lines of stones.

Map 5: Hinterland Geology and Coastal Geomorphology

1. South west of COULMORE to COUL POINT

NH 610 485

2km

Mud flats

Low edge (<10m)

Mainly marine deposits

Foreshore derived of mud and shingle and extensive tidal mud flats. The hinterland comprises fields below 10m OD.

2. COULPOINT to CHARLESTOWN

NH 630 483

2.6km

Mainly mud and shingle

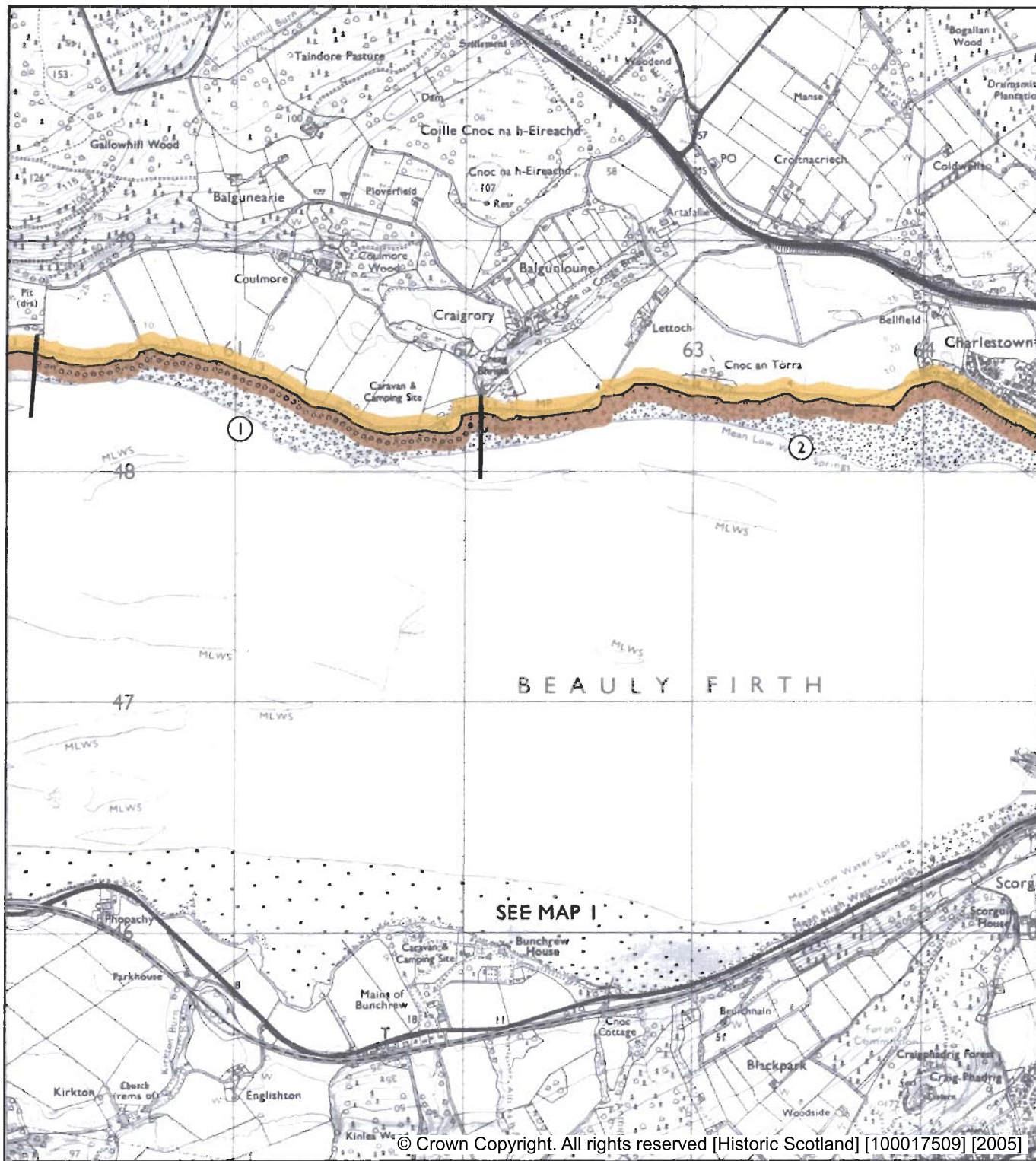
Low edge (<10m)

Marine deposits of sand and gravel

The hinterland is in part colonised by saltmarsh.

Sea defences are present towards Charlestown.

The hinterland consists of farmed land. Urban development occurs at Charlestown.



MAP 5: CORGRAIN POINT TO CHARLESTOWN 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 60-64/45-50

Basemap: O.S. Pathfinder Series
Sheet 177

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 08 September 1998

Hinterland:

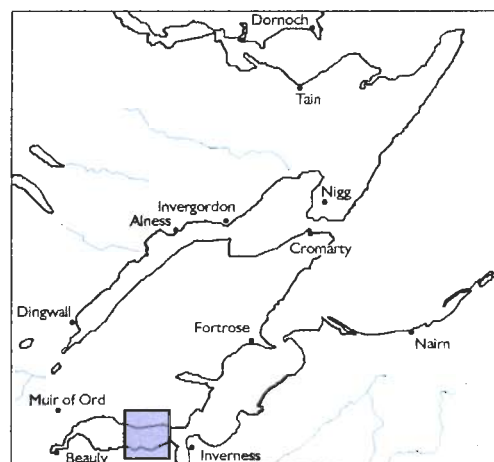
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 5: EROSION

1. East of CORGRAIN POINT to COUL POINT

NH 616 482

2.2km

Stable or Eroding

Mud and boulder foreshore eroding in parts but generally stable due its sheltered aspect.

2. COUL POINT to TOPRGORM POINT

NH 625 483

1.3km

Stable or Eroding

Stable with local patches of erosion on the saltmarsh at HWM. Sheltered aspect prevents any serious erosion.

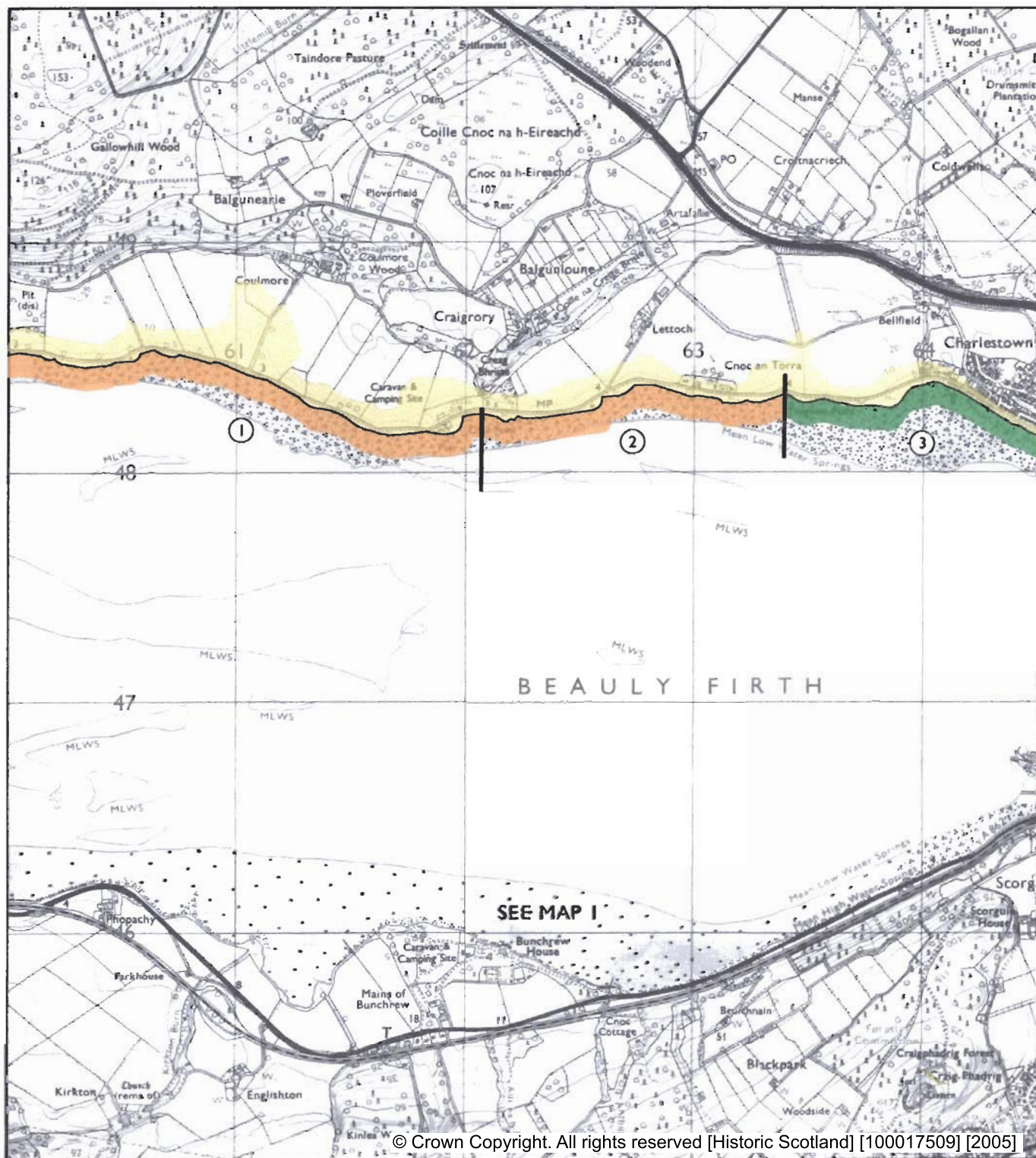
3. TORGORM POINT to CRAIGTON POINT

NH 650 480

2.7km

Stable

The intertidal zone is noticeable narrower than further down the coast with no evidence of instability. At North Kessock stability is being maintained owing concrete sea walls.



MAP 5: CORGRAIN POINT TO CHARLESTOWN 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 60-64/45-50

Basemap: O.S. Pathfinder Series
Sheet 177

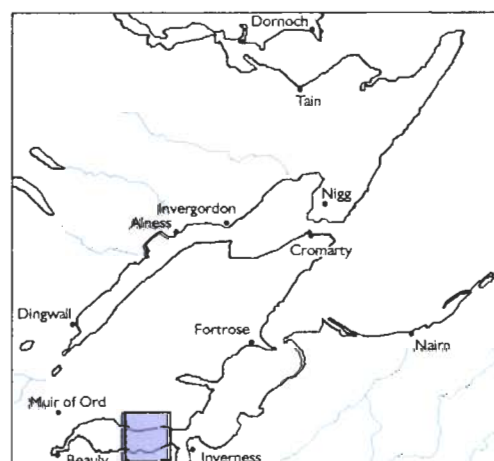
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EROSION CLASS

Assessment date: 08 September 1998

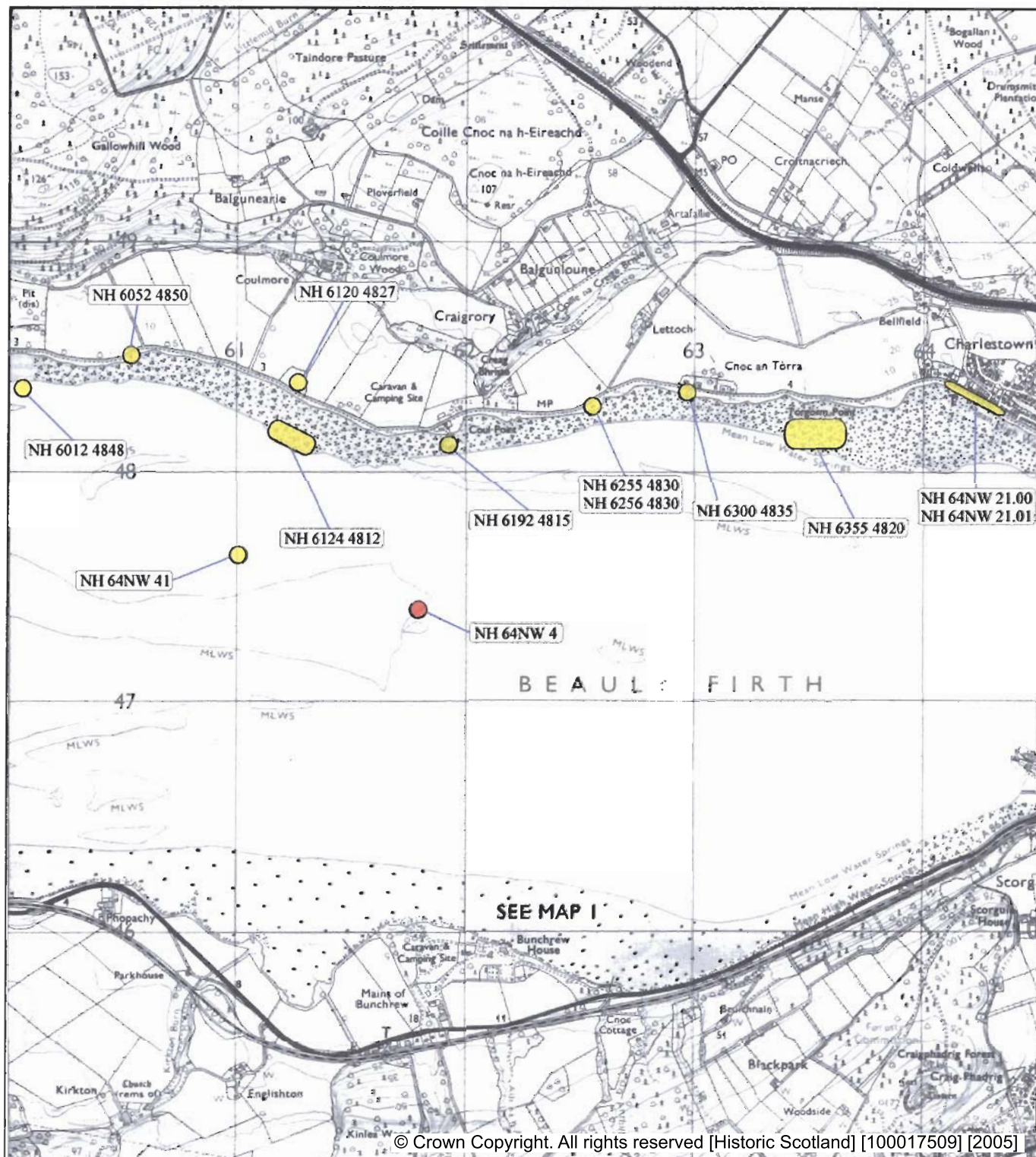
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 5: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites on the Coastal Edge & Foreshore	Sites in the Hinterland
NH 6052 4850 COULMORE Boathouse & slipway 19 th /20 th century AD Good & poor (respectively) Nil	NH 6192 4815 COUL POINT Pier 19 th /20 th century Fair Nil	NH 6120 4827 COULMORE Gravel pit (disused) 19 th /20 th century AD Poor Nil
NH64NW 41 NH 6102 4764 COULMORE Intertidal crannog Uncertain Poor Monitor	NH 6255 4830 LETTUCH Boathouse and pier 20 th century AD Poor Nil	NH64NW 21.00 NH 6425 4833 CHARLESTOWN, Main St Cottages 19 th century AD Good Nil
NH 6124 4812 COULMORE Stone fish trap Uncertain Fair Survey	NH 6256 4830 LETTUCH Hulk 20 th century AD Fair Nil	NH64NW 21.01 NH 6425 4832 CHARLESTOWN, Main St House; Charlestown Villa 19 th century AD Good Nil
NH64NW 4 - Scheduled NH 6175 4730 CARN DUBH Intertidal crannog 3rd century BC Poor Monitor	NH 6300 4835 CNOC AN TORRA Slipway and boathouse 20 th century AD Good Nil	
	NH 6355 4820 TORGORM POINT Four fish traps Uncertain Poor Survey	



MAP 5: CORGRAIN POINT TO CHARLESTOWN 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 60-64/45-50

Basemap: O.S. Pathfinder Series
Sheet 177

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
 or area of designated wreck

Listed Historic Building

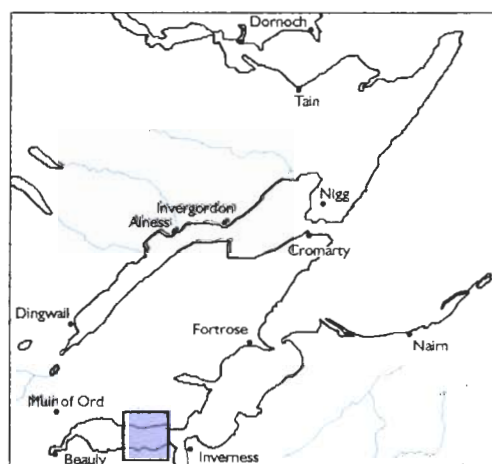
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 6: CHARLESTOWN TO KILMUIR

Hinterland Geology and Coastal Geomorphology: Brecciated conglomerates assigned to the Middle Old Red Sandstone Formation dominate the basal geology along this unit of coastline. Nearshore lithologies are exclusively marine in origin with raised beach terraces resting unconformably towards the base of the steeply rising hinterland. Late-glacial and Main Postglacial shorelines are represented. The latter masks the former at NH 664 487. Boulder clay outcrops between the brecciated deposits which continue further eastwards. The coastal edge is a fairly low plateau covered by a thin cover of marine deposits and alluvium. The foreshore is narrow owing to the position of the main river channel that runs close to the shore.

Erosion class: The coastal edge between Craigton Point and Kilmuir village was seen on the whole to be stable with only local isolated patches of scour on the foreshore. The narrow coastal plateau on which the village rests is exposed to locally generated waves travelling across the Murray Firth from the south west (the predominant wave direction). Rock armouring is effective at Kilmuir where the beach gradient is shallow and offers a good level of protection to the grass edge.

Built Heritage and Archaeology: The built heritage in this area is all 18th to 20th century and no earlier archaeological remains were located during the survey. Part of the built heritage of the North Kessock village was a direct result of the ferry which used to cross the mouth of the Beauly Firth, until the Kessock Bridge was completed in 1981. At Craigton and Croft Downie the built heritage includes two private slipways and a boat house.

Map 6: Hinterland Geology and Coastal Geomorphology

1. CHARLESTOWN to CRAGTON POINT at KESSOCK BRIDGE

NH 630 483

1.7km

Mainly mud and shingle/sea defences

Low edge (>10m)

Marine sands and gravel

Developed coastal edge with predominantly marine derived deposition in the immediate hinterland. Tidal mud flats are not as well exposed as in previous unit owing to deeper channel development towards the mouth of the inner estuary. Flood defences are present along the length of this unit.

2. CRAIGTON POINT to east of KILMUIRE

NH 668 490

1.9km

Mainly mud/boulders and shingle

Low edge (10m)

Raised beach and marine deposits

An exposed section of the Moray Firth with mud, boulders and shingle. The hinterland is wooded and fairly steep sided. Towards Ord Hill boulder clay is present.

3. East of KILMUIR to North of St Marys Church

NH 684 510

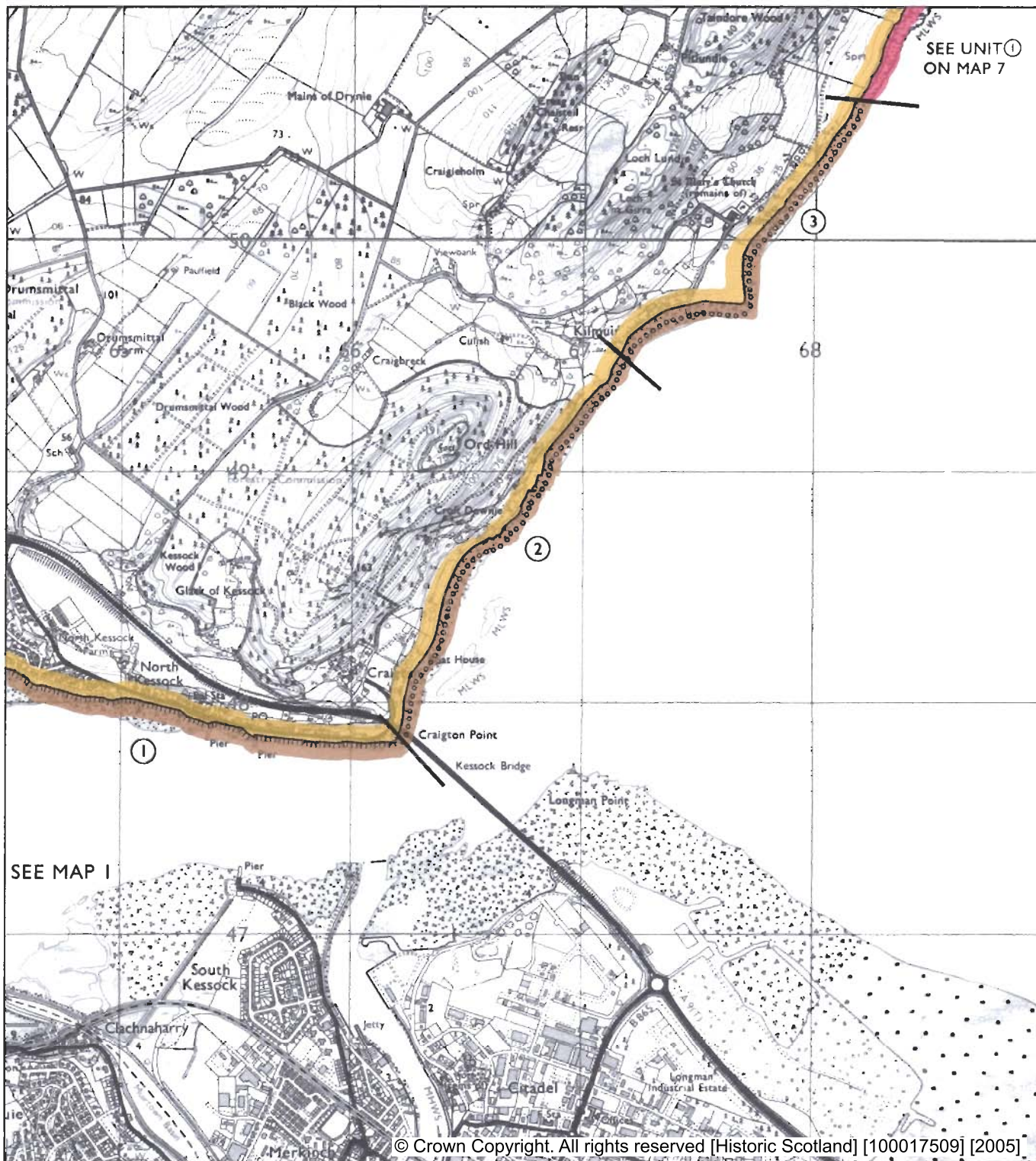
2.7km

Mud, boulders and shingle with exposed rock platform

Cliff (>10m)

Raised beach deposits

A small cusped headland has been formed north east of Kilmuir consisting of marine sands over beach gravel. The foreshore is predominantly mud and shingle as far as east of Taindore Wood. From here northwards, exposed rock platform occurs terminating at the mouth of Munlochy Bay. Raised beach deposits extend throughout the length of this unit.



MAP 6: CHARLESTOWN TO KILMUIR

MORAY FIRTH SURVEY Grid ref: NH 65-69/46-51

1:25 000

Basemap: O.S. Pathfinder Series
Sheets 160 & 177
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 08 September 1998

Hinterland:

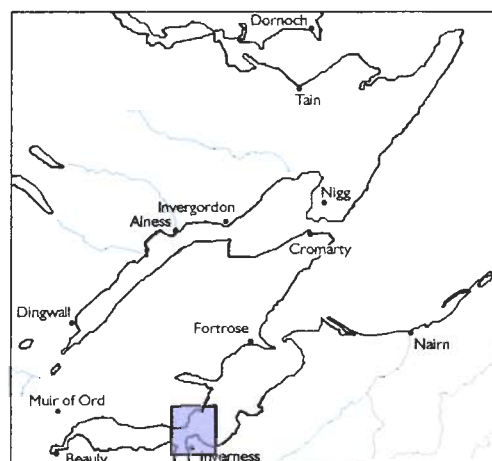
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 6: EROSION

1. TORGORM POINT to CRAIGTON POINT

NH 650 480

2.7km

Stable

The intertidal zone is noticeable narrower than further down the coast with no evidence of instability. At North Kessock stability is being maintained owing concrete sea walls.

2. CRAIGTON POINT to north east of KILMUIRE

NH 668 490

2.5km

Stable or Eroding

This unit of coastline appears to be stable with only slight evidence of scouring on the foreshore. At Kilmuir the shoreline is well defended.

3. North east of KILMUIR

NH 678 498

0.4km

Accreting and eroding

Immediately north east of Kilmuir a triangular headland projects out into the firth. This feature has shingle banks down to the LWM. The cliff behind the foreshore is undergoing rabbit erosion. This is leading to slope failure in parts.

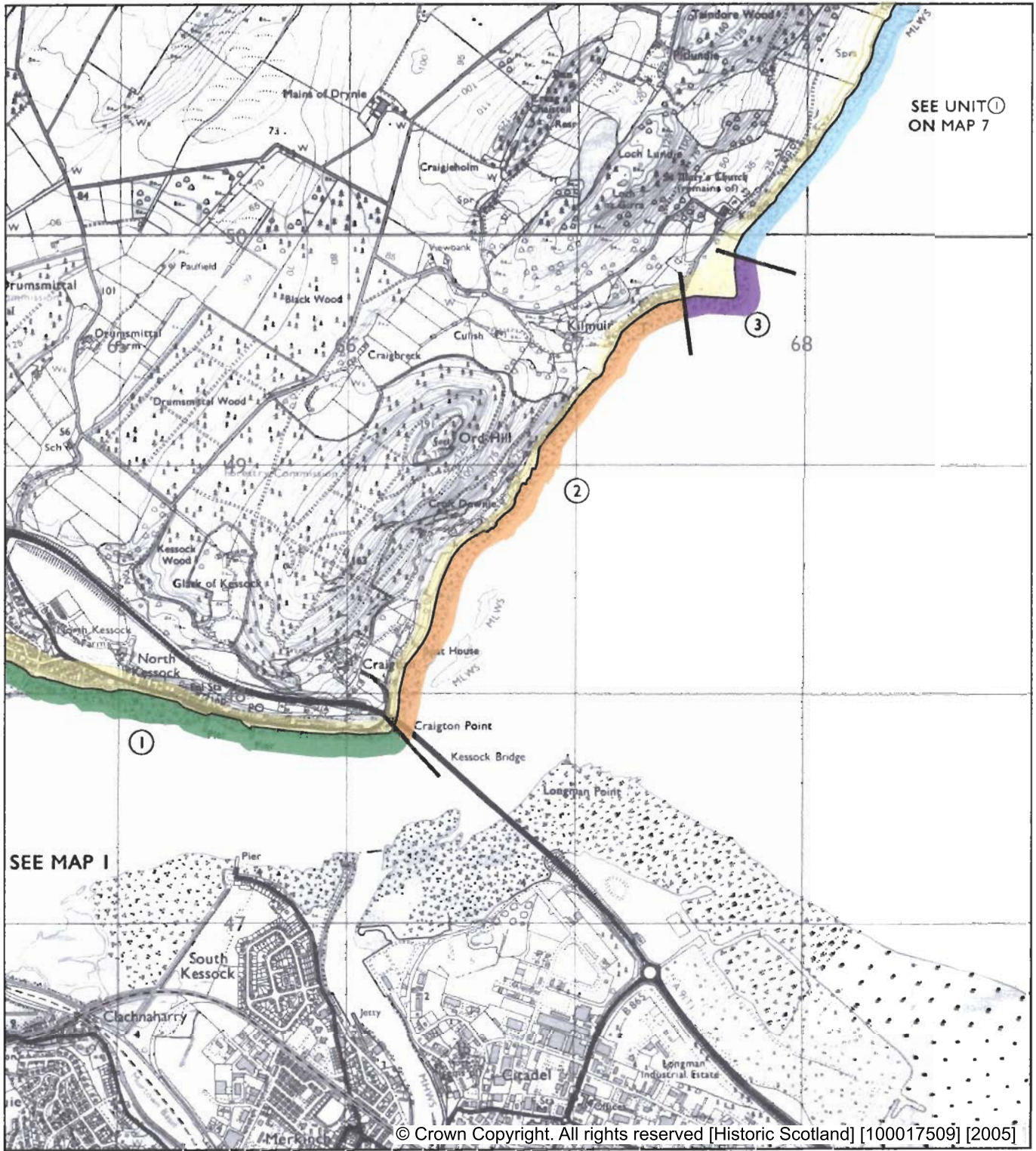
4. North east of KILMUIR to CRAIGIEHOWE

NH 685 510

2.5km

Stable or accreting

This section of coastline appears to be stable owing to the resilient nature of the underlying sandstone geology. Towards the base of the cliffs rock fall is vegetated providing stability to this region.



MAP 6: CHARLESTOWN TO KILMUIR

MORAY FIRTH SURVEY Grid ref: NH 65-69/46-51

1:25 000

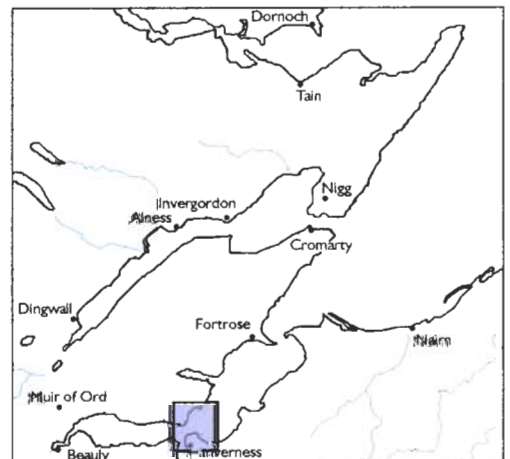
Basemap: O.S. *Pathfinder* Series
Sheets 160 & 177
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EROSION CLASS

Assessment date: 08 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 6: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH64NE 121 - Listed C (S)

NH 6538 4785
NORTH KESSOCK
Pier; Kessock Ferry
18th/19th century AD
Good
Nil

NH64NE 151

NH 6558 4782
NORTH KESSOCK
East Pier
19th century AD
Good
Nil

NH64NE 153

NH 662 478 - 669 472
KESSOCK BRIDGE
Bridge
20th century AD; built 1976-82
Good
Nil

NH 6632 4820

CRAIGTON
Boat house and slipway
19th century AD
Poor
Monitor

NH 6676 4896

CROFT DOWNIE
Boat house
19th/20th century AD
Poor
Monitor

NH 6722 4953

KILMUIR
2 boat slipways
19th/20th century AD
Poor
Monitor

Sites in the Hinterland

NH64NE 122 - Listed B

NH 6540 4794
NORTH KESSOCK
Kessock Hotel
18th/19th century AD
Good
Nil

NH64NE 41

NH 655 478
NORTH KESSOCK
Cottages
19th century
Good
Nil

NH64NE 43

NH 6563 4787
NORTH KESSOCK
Hotel stables
18th/19th century AD
Good
Nil

NH64NE 44 - Listed, B

NH 6669 4882
CROFT DOWNIE
Cottage: 'Craigton Cottage'
19th century AD
Good
Nil

NH64NE 468 - Listed C(S)

NH 6730 4968
KILMUIR
Chisholm Cottage
19th century AD
Good
Nil

NH64NE 469 - Listed C(S)

NH 6730 4970
KILMUIR
Neuk Cottage
19th century AD
Good
Nil

Map 7: KILMUIR TO AVOCH BAY

Hinterland Geology and Coastal Geomorphology: Brecciated conglomerates form the principal basement geology and these outcrop along the foreshore and into the hinterland. North east of Kilmuir, a cusped foreland formed from marine deposits extends out into the Firth. The hinterland rises sharply behind the foreland and is well wooded. Further north, brecciated convex cliffs overlooks the mouth of Munlochy Bay. Munlochy Bay is a small isolated estuary surrounded by a shingle beach and mudflats. This bay is a key site for studies on Late-glacial and Flandrian relative sea level changes in the Moray Firth. It provides unique morphological evidence for three Late-glacial and five Flandrian beaches and also stratigraphic evidence for the Main Late-glacial shoreline and a possible Flandrian storm (tsunami) surge layer and established radiocarbon dated chronologies for the culmination of the Main Post-glacial transgression. The southern side of the bay has recently been afforested whilst the northern shore contains dense mature forest and fields.

Erosion class: Between Kilmuir and Munlochy Bay the coastline comprises a mixture of stable shingle beaches until east of Taindore Wood. From here, rock abrasion platforms outcrop. These are considered to be eroding but stable owing to their resilient nature. Towards the base of the cliff, rock falls are vegetated providing reasonable stability. Munlochy Bay is extremely sheltered and its entire shoreline is stable. Rabbit erosion was noted in the cliff at NH 6853 5292. Between Wood Hill to Ormond Hill, exposed sandstone rock platform are eroding at such a slow and immeasurable rate that they are for the present considered to be stable in the short term.

Built Heritage and Archaeology: The built heritage in this section varies from the listed cottages in Kilmuir village, both of which are inhabited and in very good condition, to the ruined building remains on the north shore of Munlochy Bay and Craiguch Well, also on the northern shore of Munlochy Bay. The archaeology of the foreshore dominates the total number of sites recorded, possibly as a result of the variety of geology and erosion classes. The archaeology includes the remains of jetties, walkways, and the extensive reclamation embankment system at the head of Munlochy Bay. The possible shell midden at the mouth of Munlochy Bay, on top of a low raised sea beach may be linked to the nearby cave system at Cragiehowe. On the northern shore of Munlochy Bay the remains of a hulk have been used torevet a narrow channel cut in order that the Bay quarry may be accessed. This small inlet is currently used for recreational purposes.

Map 7: Hinterland Geology and Coastal Geomorphology

1. North of ST MARYS CHURCH to CRAIGHOWE

NH 685515

2 km

Mainly rock platform

Low edge (<10m)

Boulder clay and marine deposits

Boulder clay mantles raised beach deposits which rest above Old Red Sandstone. The coastal edge is irregular overlooking rocky platform which has been eroded into a series of gullies.

2. CRAIGIEHOWE to east of BAYFIELD

Irregular spur formed consisting of marine sand and gravel. Boulder clay mantles breccia deposits and marine terraces in parts. The foreshore is variable with shingle, mud and sand. Exposed rocky platforms are present at entrance to Munlochy Bay.

3. East of BAYFIELD to BAYHEAD

NH 670 525

2.3km

Mainly mud and sand

Low edge (<10m)

marine sand and gravel

Middle section of the south shore of Munlochy Bay. Foreshore of mud and sand colonised at HWM by saltmarsh. Hinterland defended by flood banks with marine deposits below 10m OD. Saltmarsh extends eastwards towards the head of the bay.

4. BAYHEAD to west of ORD HILL PLANTATION

NH 656 531

2km

Intertidal mud and sand

Low edge (<10m)

Marine deposits

Flood banks protect the head of Munlochy Bay. The foreshore consists of saltmarsh and tidal flats with mud and sand. The coastal edge is irregular and low-lying. Marine deposits continue into the hinterland.

5. West of ORD HILL PLANTATION to WOOD HILL PLANTATION

NH 675 532

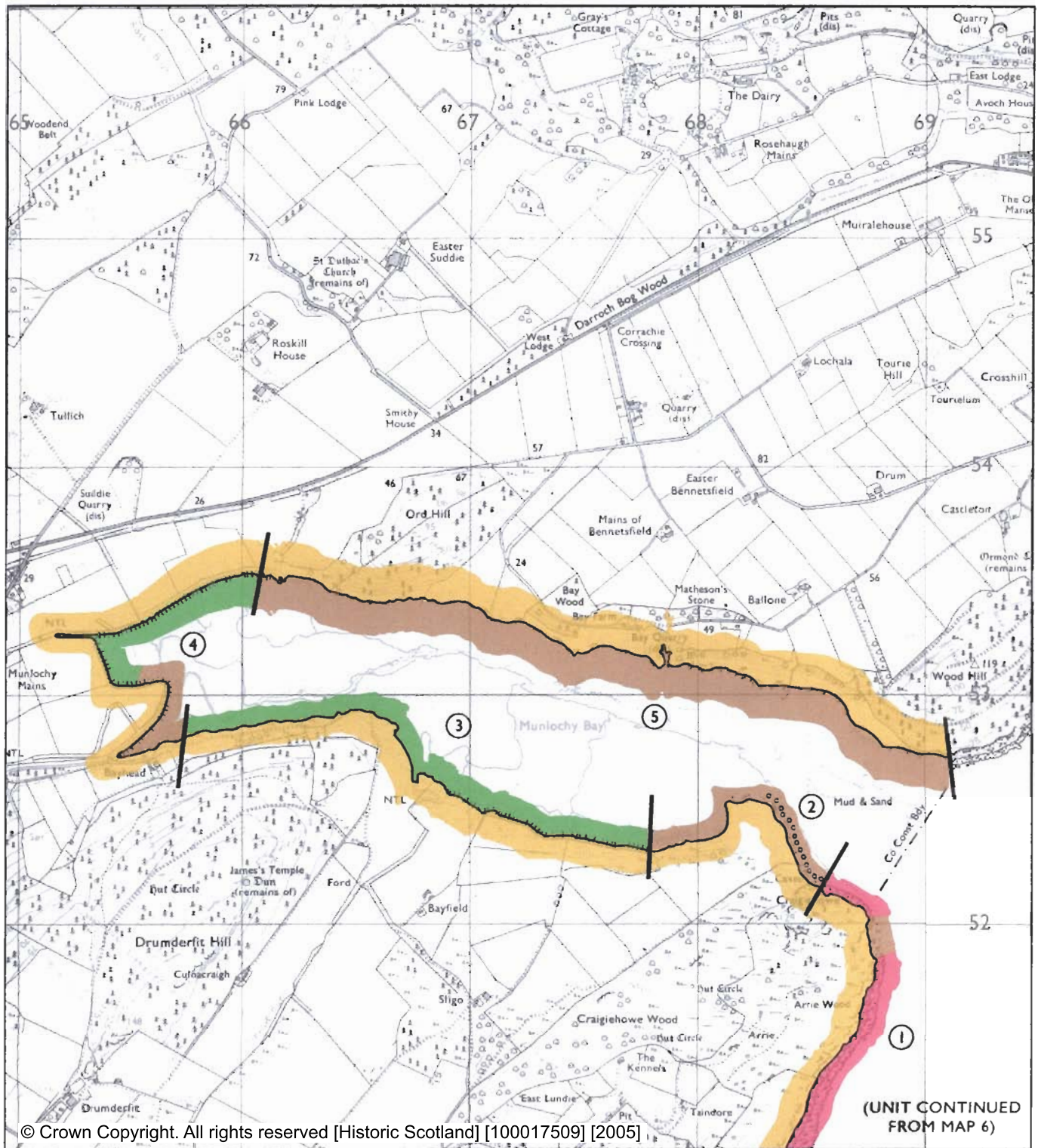
3.2km

Mainly mud and sand

Low edge (<10m)

Raised beach and marine deposits

Forming the northern shore of Munlochy Bay this section of coast is linear and unbroken with uniformity to the mouth of the bay. The foreshore comprises mainly mud and sand. The hinterland is below 10m OD and consists of marine deposits.



MAP 7: KILMUIR TO WOOD HILL

MORAY FIRTH SURVEY Grid ref: NH 65-69/51-56

1:25 000

Basemap: O.S. Pathfinder Series

Sheet 160

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 10 September 1998

Hinterland:

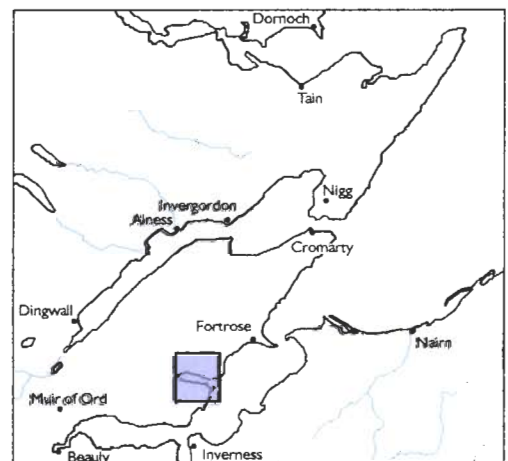
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 7: EROSION

1. North east of KILMUIR to CRAIGIEHOWE

NH 685 510

2.5km

Stable or accreting

This section of coastline appears to be stable owing to the resilient nature of the underlying sandstone geology. Towards the base of the cliffs rock fall is vegetated providing stability to this region.

2. CRAIGIEHOWE to BAYFIELD

NH 670 526

3.4km

Definitely Accreting

Southern shore of Munlochy Bay. The bay is very sheltered and this is leading to accretion of mud and shingle on the wide foreshore. At the HWM shingle is banked up and stabilised by vegetation.

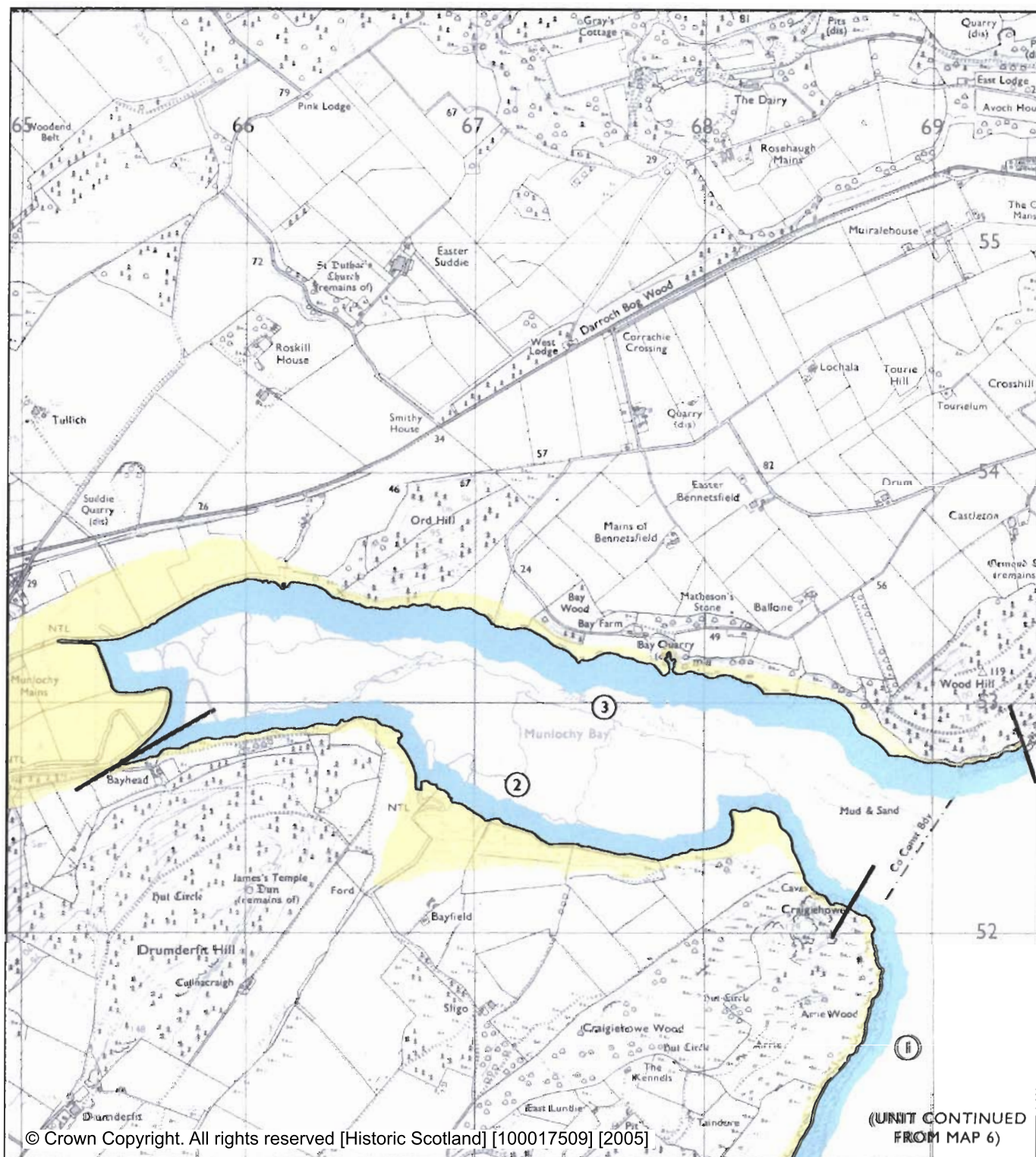
3. BAYHEAD to south of WOOD HILL

NH 670 533

4.2km

Definitely accreting

The north shore of Munlochy Bay is sheltered leading to accretion of the exposed tidal flats caused by sediment entrapment within the bay. Rabbit erosion on a low cliff face is occurring at NH 6853 5292.



MAP 7: KILMUIR TO WOOD HILL

MORAY FIRTH SURVEY Grid ref: NH 65-69/51-56

1:25 000

Basemap: O.S. *Pathfinder* Series
Sheet 160

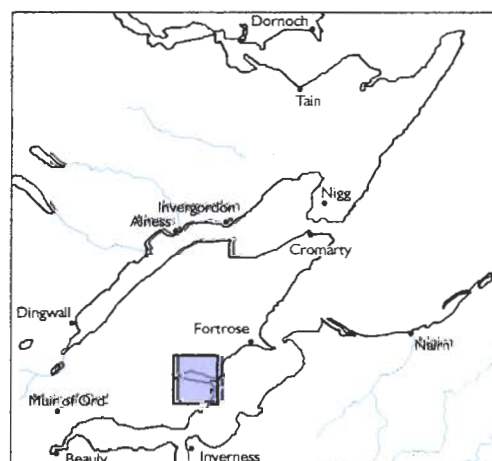
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EROSION CLASS

Assessment date: 10 September 1998

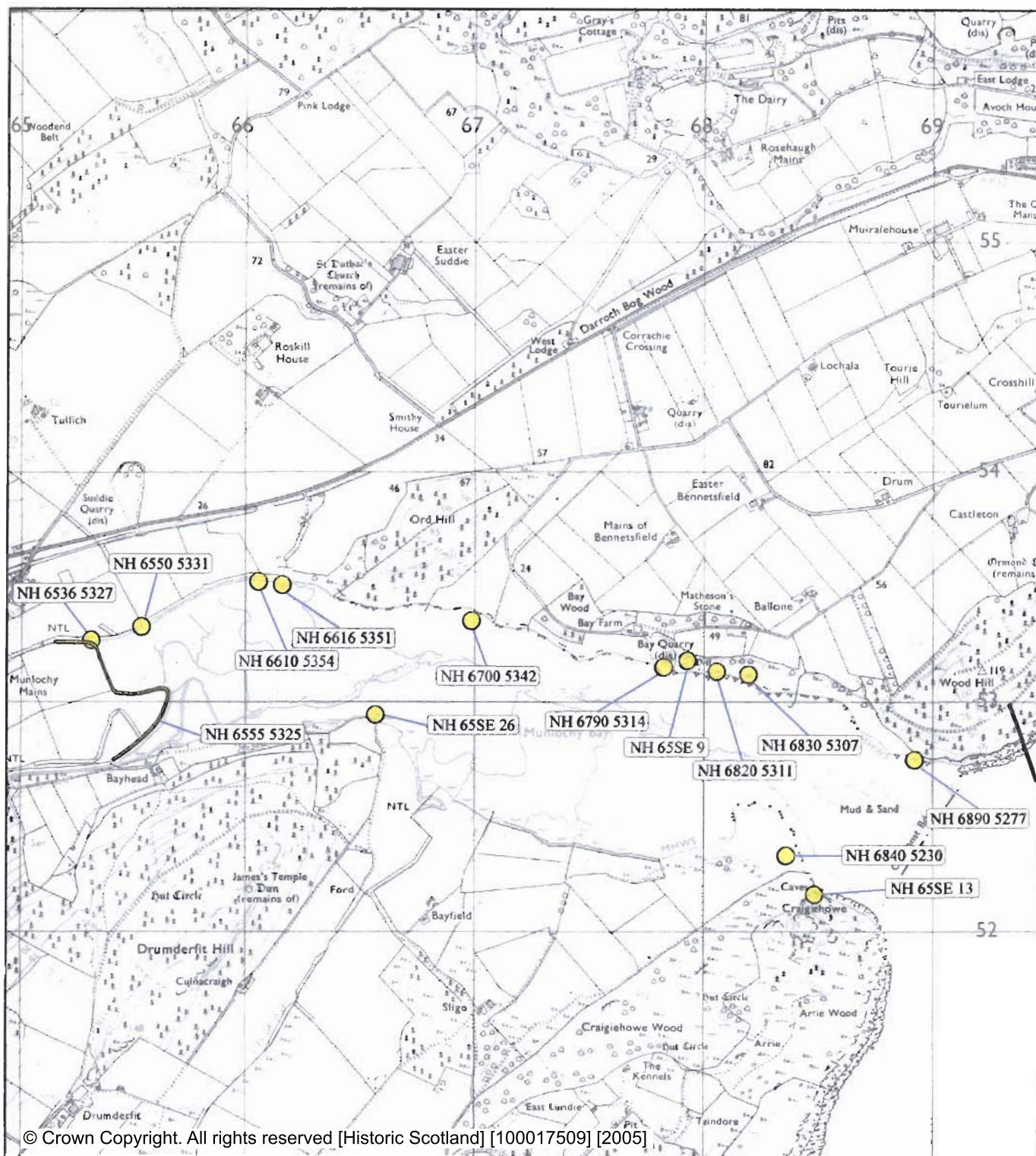
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 7: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites on the Coastal Edge & Foreshore	Sites in the Hinterland
NH65SE 13	NH 6610 5354	NH65SE 9
NH 6851 5216	ORD HILL	NH 6793 5318
CRAIGIEHOWE	Wooden walkway	BAY FARM
Cave with Fingalian association	20th century AD	Craiguch Well; rag well
Uncertain	Poor	Uncertain
Good	Nil	Good
Survey and monitor		Nil
	NH 6616 5351	
NH 6840 5230	ORD HILL	NH 6820 5311*
CRAIGIEHOWE	Pier and harbour	BAY FARM
Possible shell midden	Uncertain	Remains of building
Uncertain	Fair	18 th /19 th century AD
Poor	Monitor	Poor
Survey		Nil
	NH 6700 5342	
NH65SE 26	BAY WOOD	
NH 6658 5293	Hulk	
MUNLOCHY BAY	Uncertain	
Remains of jetty	Poor	
19 th century AD		
Fair	NH 6790 5314	
Nil	BAY QUARRY	
	Harbour wall revetted with hulk remains	
NH 6555 5325	19 th century AD	
MUNLOCHY MAINS	Fair	
Embankment	Nil	
19 th century AD		
Good	NH 6830 5307	
Nil	BAY FARM	
	Boat house	
NH 6536 5327	20 th century AD	
MUNLOCHY MAINS	Poor	
Wooden bridge	Nil	
Uncertain		
Poor	NH 6890 5277	
Nil	WOOD HILL	
	Mining cart	
NH 6550 5331	19 th century AD	
MUNLOCHY MAINS	Poor	
Wooden walkway	Nil	
20 th century AD		
Poor		
Nil		



MAP 7: KILMUIR TO WOOD HILL

MORAY FIRTH SURVEY Grid ref: NH 65-69/51-56

BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile

1:25 000

Basemap: O.S. Pathfinder Series

Sheet 160

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Map 8: AVOCH BAY TO FORTROSE

Hinterland Geology and Coastal Geomorphology: Upper Old Red Sandstone continues as the basement geology. At Rosemarkie, boulder and undifferentiated drift deposits dominate the cover lithologies in the hinterland. The dominant geomorphic feature within this unit is the cusped foreland of Chanory Ness and Point. This feature is postulated to have formed by the movement of material in a south westerly direction along the coastline of the Inner Moray Firth and in a westerly direction of the Beaulay Firth coastline (SMP 1996). From Avoch to Fortrose the shore frontage is developed with a coastal edge consisting of a low plateau of erodable marine deposits and alluvium. Chanory Ness has dune cover and stepped shingle beaches. From the Ness to Rosemarkie Bay the predominant beach cover is sand.

Erosion class: South of Avoch fishing village a vertical concrete sea wall protects the shore road. Immediately south of the harbour and at the mouth of a small stream gabion basket protection has been utilised. Seawalls defend the road between Avoch and Fortrose. Rock armour protects the coast further towards Fortrose. The degraded condition of short stretches of seawall and timber groyne systems indicate minor backshore erosion taking place in the area. Chanory Ness is subjected to a relatively low fetch to the south west and has been undergoing wave induced erosion over a number of years (SMP 1996). In the short term, a greater part of the ness is stable or accreting with high banks of vegetated shingle. Chanory Point is accreting outwards but is at the same time eroding according to the nature of seasonal tide conditions.

Built Heritage and Archaeology: The built heritage in the western part of this area is the village of Avoch, which contains a number of maritime related buildings such as the ship chandler's and warehouse. The foreshore remains include the Telford designed Avoch harbour, built between 1803-21 and a modern slipway to the south west of the village, built to access the current fish farms in Avoch Bay. The eastern part of the area consists of the Fortrose village including a Telford designed harbour complex (1803-21).

Map 8: Hinterland Geology and Coastal Geomorphology

1. South of WOOD HILL

NH 697 533

0.5km

Exposed rock platform and sand

Low cliff (>10m)

Raised beach and marine deposits

This coastal unit is fairly irregular with exposed rock platforms at the mouth of Munlochy Bay. Raised beach deposits cover the wooded hinterland.

2. WOOD HILL to AVOCH HARBOUR

NH 701 547

2.7km

Mainly mud and sand

Cliff (10m)

Raised beach and marine deposits/freshwater alluvium

Towards Avoch Bay mud and shingle are exposed at the LWM. Flood defence works defends the coastal edge. Marine deposits dominate the hinterland and alluvium derived from Avoch Burn.

3. AVOCH HARBOUR

NH 713 557

0.5km

Mainly shingle and mud

Cliff (<10m)

Raised beach and marine deposits

This unit consists of a shingle and mud foreshore with a near shore MLWS mark. Groynes form part of flood defence works along this stretch of coast. Freshwater alluvium is present.

4. AVOCH HARBOUR to FORTROSE

NH 712556

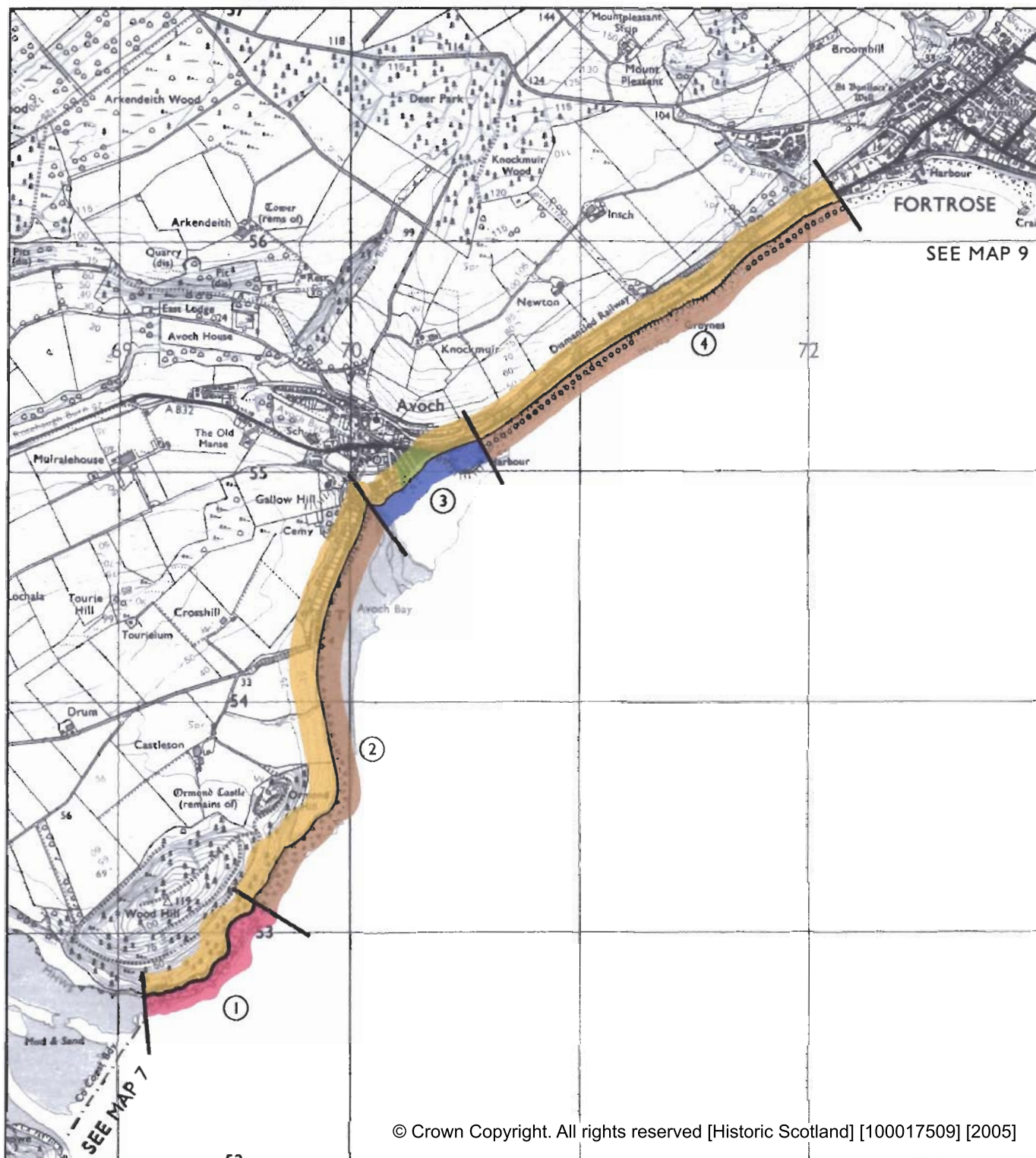
1.8km

Mainly single and mud

Cliff (<10m)

Raised beach and marine deposits

The hinterland is dominated by marine deposits, which support woodland. The foreshore is a mixture of mud and shingle with shore protection. This section of coastline is exposed.



MAP 8: WOOD HILL TO FORTROSE

MORAY FIRTH SURVEY Grid ref: NH 69-73/52-57

HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 10 September 1998

Hinterland:

- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

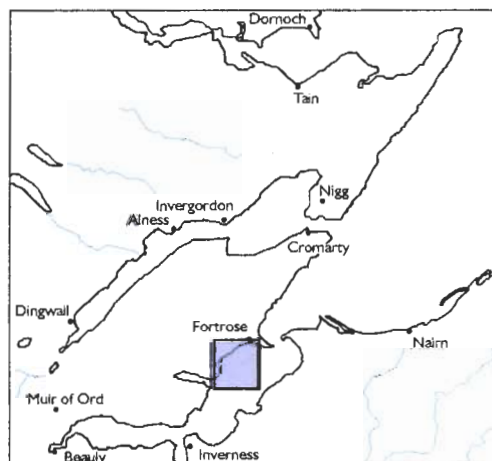
- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 160
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MAP 8: EROSION

1. South of WOOD HILL to ORMOND HILL
NH 695 530

1.4km

Eroding or stable

Exposed rock platform of Upper Old Red
Sandstone is eroding albeit slowly.

2. ORMOND HILL to start of AVOCH BAY
NH 699540

0.5km

Stable

Sandy beach with stable conditions.

3. AVOCH BAY

NH 699 540

0.5km

Stable

Small sheltered bay defended by sea walls. The shore is stable owing to sediment supply via longshore drift leading to build up of sand and shingle. In parts this material is stabilised by vegetation. Sand is exposed at the LWM.

4. AVOCH HARBOUR

NH 702549

0.2km

Stable

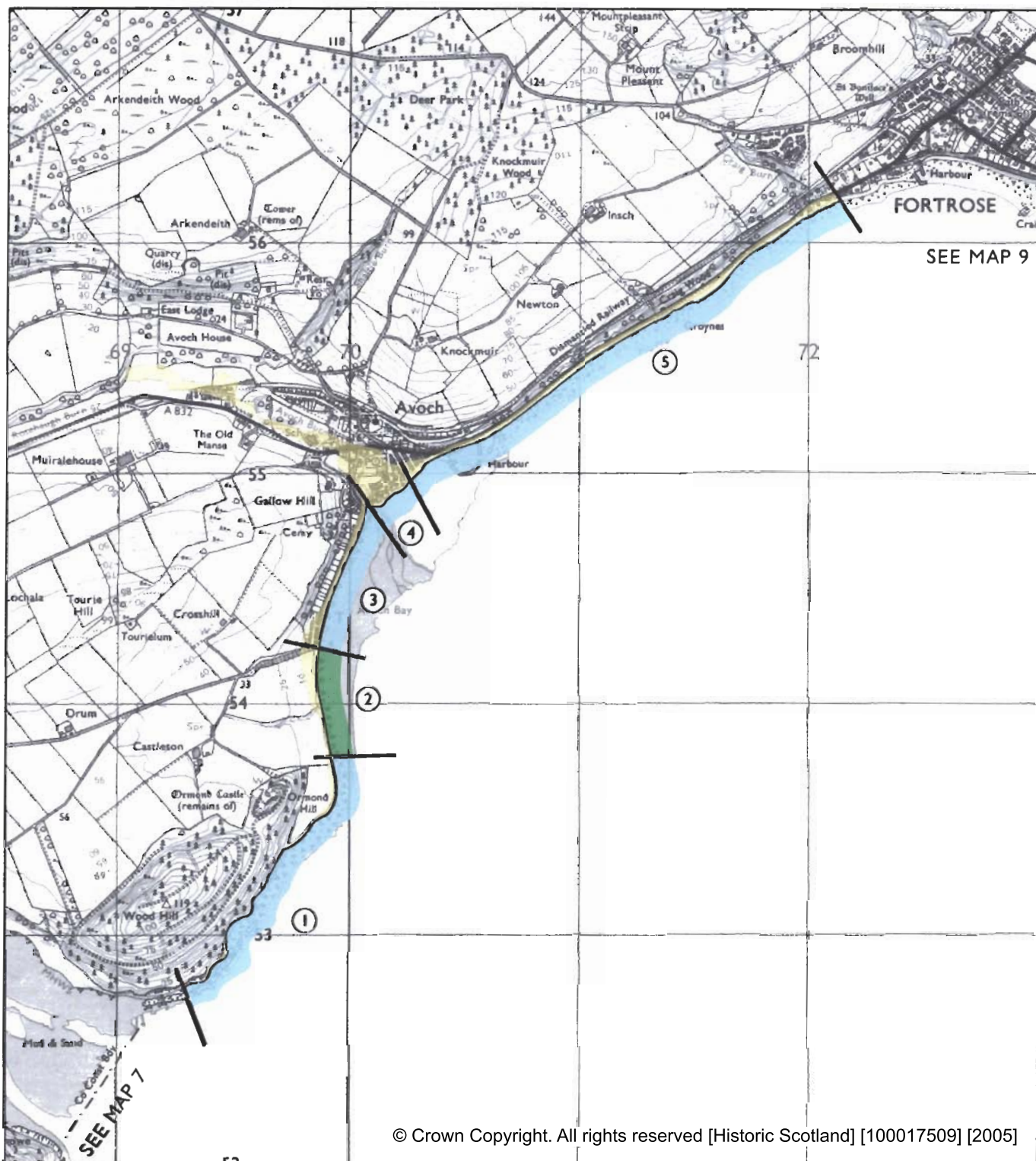
The sandy beach is protected by sea walls and is stable.

5. AVOCH to south west of FORTROSE
NH 715 557

2.4km

Stable

Rubble sea-defences and groynes on the shore. Shingle banks are stabilised by vegetation. Stable conditions prevail. A c.50m section of erosion has occurred on the neck of the pier at Avoch and is now defended by rubble. Turf behind has been scoured by wave action. On the whole conditions are stable.



MAP 8: WOOD HILL TO FORTROSE

MORAY FIRTH SURVEY Grid ref: NH 69-73/52-57

1:25 000

Basemap: O.S. Pathfinder Series

Sheet 160

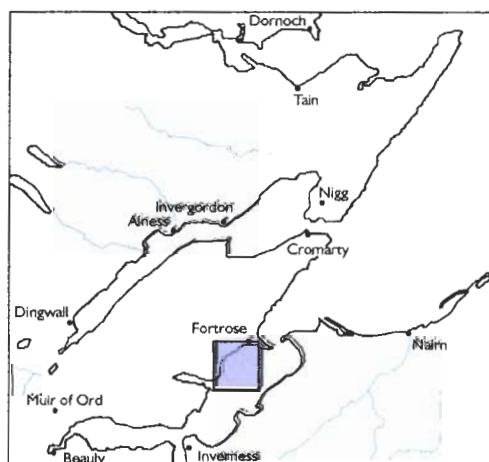
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EROSION CLASS

Assessment date: 10 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 8: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 6989 5427
AVOCH
Slipway
20th century AD
Poor
Nil

NH 7030 5495
AVOCH
Metal piles
20th century AD
Good
Nil

NH75NW 72 - Listed B

NH 7050 5501
AVOCH
Harbour
19th century AD; 1803-21
Good
Nil

NH7156 5574

CRAIG WOOD
Groynes
20th century AD
Fair
Nil

Sites in the Hinterland

NH 6995 5363
ORMOND HILL
Boat house
20th century AD
Fair
Nil

NH75SW 4-22, 4 & 7-19 Listed B

NH 700 547 - 702 549
AVOCH
Houses; bridge; conservation area
20th century AD
Good
Nil

NH75NW 41, 45-49, 77-78. 41, 45, 49, & 78 Listed B

NH 702 550 - 704 551
AVOCH
Various residential houses
20th century AD
Good
Nil

NH75NW 71 - Listed C

NH 7040 5510
AVOCH
Commerical warehouse; shipchandler's
20th century AD
Good
Nil

NH65SE 40

NH 6990 5444
AVOCH, Ormond Terrace
Buildings
19th century AD
Good
Nil

Map 9: FORTROSE TO SCART CRAIG

Hinterland Geology and Coastal Geomorphology: With the exception of the Chanory Peninsula, the section of coastline at Scart Craig is rugged and inaccessible with near vertical cliffs fronted by a narrow strip of foreshore. The high steep cliffs of Old Red Sandstone are overlain by glacial deposits which somewhat soften the appearance of the coastline. At the southern end of the frontage, between Scart Craig and Rosemarkie there are raised beach deposits at the base of the cliffs. Rosemarkie village rests on undifferentiated schist and gneiss of the Moine Series. The beach unit from Chanory Ness to Scart Craig is just over 5km long with an average width at the LWM of 40m (Smith and Mather 1973).

Erosion class: This unit of coastline is classified as stable or accreting at Rosemarkie village and stable towards Scart Craig. Stability is maintained at Rosemarkie by a low concrete seawall. Glacial debris accumulates at the base of the cliff as a result of weathering and is then transported by wave action to the south and east in a direction of net littoral drift (SMP 1996). Sand is accreting on the upper foreshore south of Scart Craig where it is blown onshore resulting in minor dune development. Sand accretion also occurs in Rosemarkie Bay helped by longshore drift and the shelter provided by the sandstone ledges outcropping on the foreshore in the lee of Scart Craig.

Built Heritage and Archaeology: The built heritage on Chanory Point consists mainly of 18th/19th century buildings associated with the lighthouse and the ferry that used to run between here and Fort George. The foreshore remains tend to be modern in date, including three sites of concrete and metal piles. Their purpose is unclear but they may be associated with mooring craft.

Map 9: Hinterland Geology and Coastal Geomorphology

1. FORTROSE to CHANORY POINT

NH 735 563

3.1km

Fringing sand and shingle beach

Low edge(<10m)

Raised beach and marine deposits

South-eastern flank of a cusped triangular foreland with fringing sand and shingle beach. Sea defences present at Fortrose. Marine sands and gravel dominate the hinterland.

2. CHANNERY POINT to KINGKURDY HOUSE

NH 741 566

2.8km

Fringing sand, gravel and shingle beach

Mostly Low edge (<10m)

Raised beach and marine deposits/beach gravel overlain by turf

The hinterland geology consists of raised beach deposits, with banks of shingle overlain by turf. Sand and shingle dominate the foreshore. A 2.5m high sea wall is present at Rosemarkie.

3. KINCURDIE HOUSE to THORN ROAN

NH 744 590

2 km

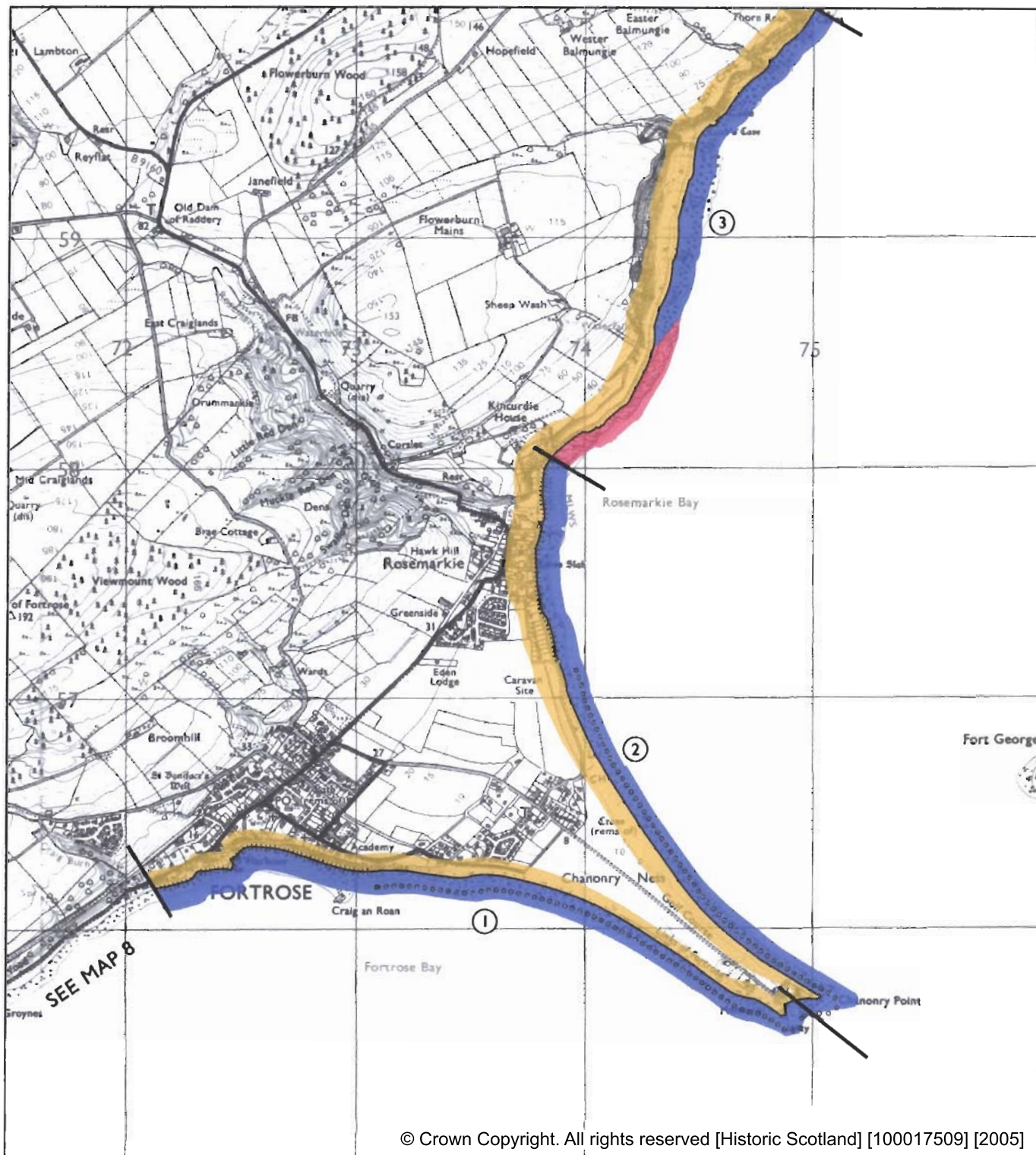
Exposed rock platform/sand and shingle with dune formation at Scart Craig

Cliff (>10m)

Raised beach and marine deposits/dune sands and machair vegetation.

The foreshore within this unit consists of exposed rock platform with sand and shingle exposed towards Scart Craig. Sea caves are present at this location. Marine deposits and relict shorelines of Postglacial age dominate the hinterland.

Escarpments rise over c.20m above OD. A dune has been formed by accreting sand blown up onto the low postglacial platform, which lies at the base of the degraded cliff.



MAP 9: FORTROSE TO SCART CRAIG

MORAY FIRTH SURVEY Grid ref: NH 72-76/55-60

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 160

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 10 September 1998

Hinterland:

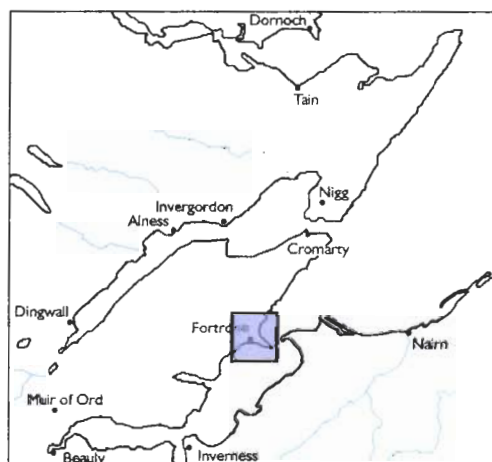
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 9: EROSION

1. FORTROSE BAY

NH 730 563

2.6km

Stable

Fortrose bay is sheltered in the lee of Channery Point. Two Gabion basket groins are now split but still control longshore drift. Sand is present between the groynes and appears to be shifting eastwards. No evidence to suggest that conditions at this point in time are unstable.

2. CHANNERY POINT

NH 750 557

1km

Stable or Eroding

The headland appears to be stable owing to focusing of sand and shingle from both sides of this cusped foreland. The backshore is stable owing to vegetation cover.

3. CHANNERY NESS

NH 745 563

0.9km

Definitely Accreting

Longshore drift is leading to the formation of shingle banks. The finer sediment is banked into a series of cusps. This zonation is noticeable towards the backshore where vegetation is leading to stability.

4. CHANNERY NESS to ROSEMARKIE NORTH

NH 740 570

1.4km

Accreting or Stable

A linear stretch of coastline with boulders and shingle banked at the backshore area. Exposed aspect leading to build up or sediment re-supply. Gabion basket defend the coastal edge at the caravan park (NH 7391 5710).

5. ROSEMARKIE NORTH to east of SHEEP WASH

NH 742 582

0.7km

Eroding or Stable

A low sea wall defends the play area south of Kincurdie House. Northwards the coastline contains a fossil dune system overlooking exposed rocky cliffs and exposed rock platform. Sand is accreting in the gullies, which suggest that conditions here are generally stable.

6. East of SHEEPWASH to SCART CRAIG

NH 749 598

0.8km

Accreting or Stable

Boulder strewn stretch of coastline which at the time of the survey appears to be stable.

7. SCART CRAIG

NH 749 598

0.8km

Stable

Outcropping Old Red Sandstone platform is fairly resilient to attrition by wave action. Shingle is banked up on a wide backshore. Conditions at the time of the survey remain stable.



MAP 9: FORTROSE TO SCART CRAIG

MORAY FIRTH SURVEY Grid ref: NH 72-76/55-60

1:25 000

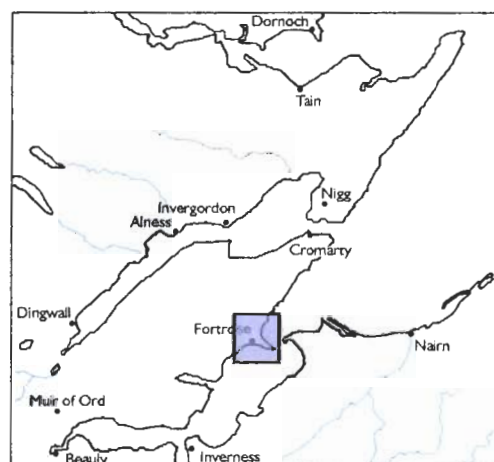
Basemap: O.S. Pathfinder Series
Sheet 160
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EROSION CLASS

Assessment date: 10 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 9: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 7299 5630
FORTROSE
Wooden piles; sea defence
Uncertain
Poor
Nil

NH 7348 5620
CHANNORY NESS
Storm drain
20th century AD
Poor
Nil

NH 7469 5564
CHANNORY NESS
Railway sleepers used as sea defence
20th century AD
Fair
Nil

NH75NW 52 - Listed C(S)
NH 7487 5562
CHANONRY POINT
Jetty and slipway
19th century AD; 1803-21
Good
Nil

NH 7475 5570
CHANONRY NESS
Concrete and metal piles
20th century AD
Poor
Nil

NH 7245 5630
FORTROSE
Slipway
20th century AD
Fair
Nil

NH75NW65.00 - Listed C
NH 7248 5629
FORTROSE
Harbour
19th century AD; 1803-21
Good
Nil

Sites on the Coastal Edge & Foreshore

NH75NW 5
NH 7447 5947
CAIRD'S CAVE
Excavated rock shelter
Uncertain
Good
Nil

Sites in the Hinterland

SMR: NH75NW 436 - Listed C
NH 7461 5585
CHANONRY POINT
Cottage
Good
Nil

NH75NW 55 - Listed C(S)
NH 7471 5574
CHANONRY POINT
Ice House
19th century AD or earlier
Good
Nil

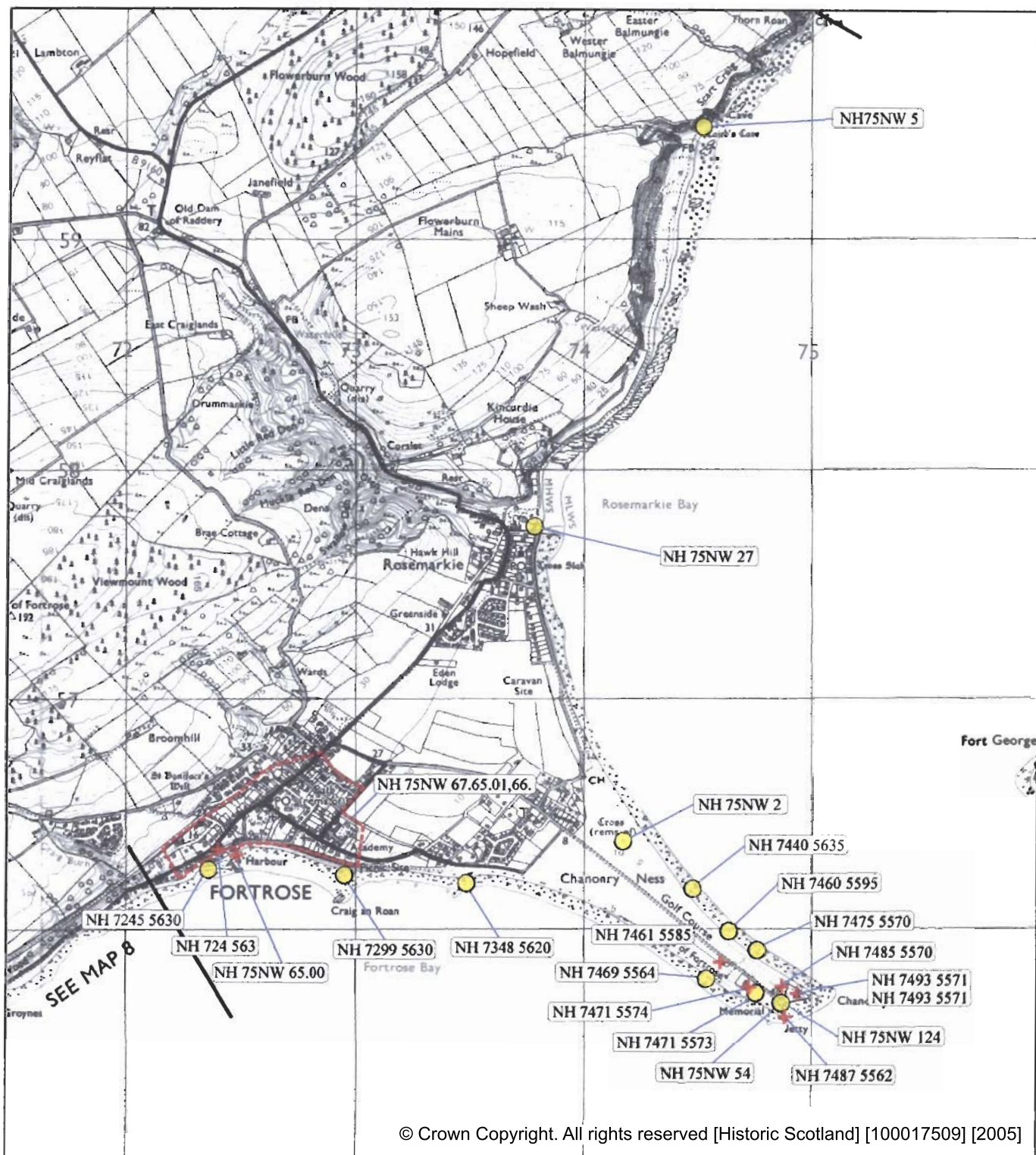
NH 7471 5573
CHANNORY POINT
Ruined building, incorporated into golf course
Uncertain
Poor
Monitor

NH75NW 54
NH 7482 5572
CHANONRY POINT
Cottage
18th/19th century AD
Good
Nil

NH75NW 124
NH 7481 5563
CHANONRY POINT
Monuments; Brahan Seer's Stone
20th century AD
Good
Nil

NH75NW 53 - Listed C(S)
NH 7485 5570
CHANONRY POINT
Ferry House
19th century AD or earlier
Good
Nil

NH75NW 67, 65.00, 65.01, 66; some Listed C
NH 724 563 area
FORTROSE
Variety of buildings; conservation area
18/19th/20th century AD
Good



MAP 9: FORTROSE TO SCART CRAIG

MORAY FIRTH SURVEY Grid ref: NH 72-76/55-60

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 160

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

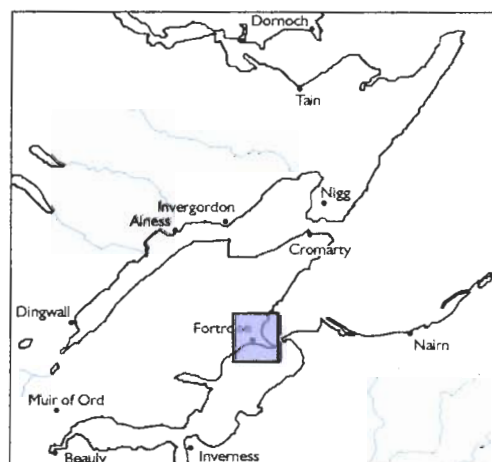
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 10: SCART CRAIG TO ETHIE FISHING STATION

Hinterland Geology and Coastal Geomorphology: Psammatic granulate and subordinate pelitic schist with hornblende with granite inclusions represent the basement rocks in this coastal unit. Some of these rock types are exposed at the surface but in general are mantled by a thin cover of boulder clay. The coastline is narrow with a discontinuous platform of Post-glacial raised beach. The cliffs are extremely precipitous with an indented cliff edge that overlook abrasion platform, sea caves and stacks. Towards Ethie Fishing Station multiple escarpments have been formed by boulder clay and marine land slips.

Erosion class: This unit of coastline is exposed to the impact of storms from the north easterly quadrant. Boulder clay is eroding from the crest of the cliff then wave impacted at the base. This imparts material which is then picked up and thrown back on the cliff base leading to abrasion. This loss from the cliff contributes to offshore sediment supply. In general the cliffs are eroding yet at an indeterminable slow rate and are therefore assigned to the classification of stable and eroding.

Built Heritage and Archaeology: The limited sites recorded in this area were Caird's cave, a rock shelter inhabited until the early 20th century which was excavated by Dr. Maclean in 1912 (Stevenson 1955). The other site is another cave near Learnie, where a low wall survived in front of the entrance. The limited archaeology recorded may in part be due to the inaccessibility of this shoreline and sites may be obscured due to heavy gorse growth on the cliff sections.

Map 10: Hinterland Geology and Coastal Geomorphology

1. THORN ROAN to east of BERRYHILL

NH 760 613

2.3km

Rock platform/boulders/shingle and sand

High cliff (25m)

Terraced raised beach and marine deposits

This unit consists of an exposed narrow discontinuous platform of postglacial raised beach. A series of terraces rise to over 25m above OD. The foreshore is mainly outcropping rock platform with boulder and shingle as a result of erosion processes.

2. East of BERRYHILL to north of ETHIE FISHING STATION

NH775 630

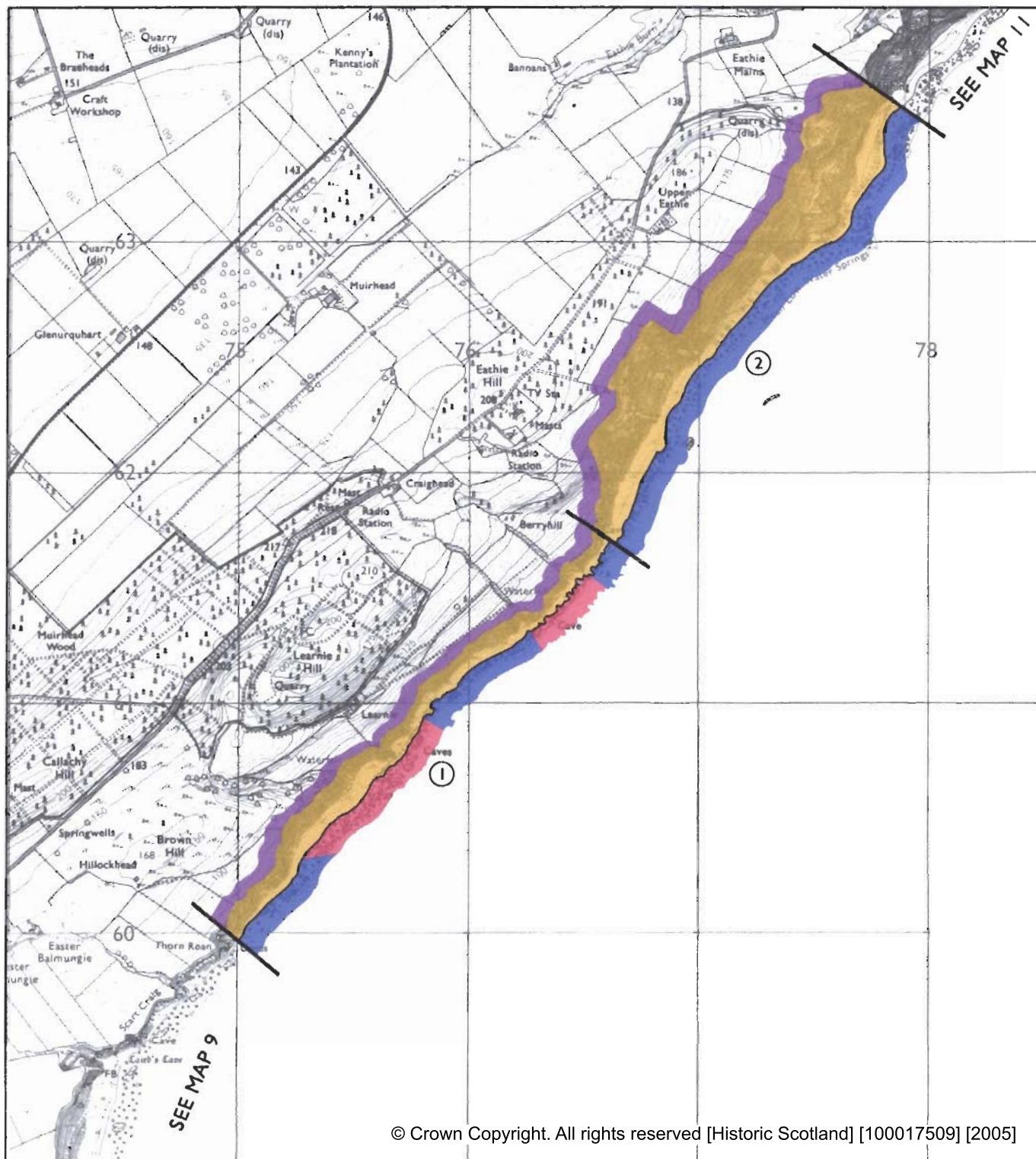
2.8km

Some exposed rock platform with mainly boulders, sand and shingle

High cliff (c.70-90m)

Terraced raised beach and marine deposits/glacial drift

Exposed rock platforms with boulders and shingle. The coastal edge is very irregular rising in parts to in excess of c.90m OD. The high cliff is terraced down to the MHWS line.



MAP 10: SCART CRAIG TO EATHIE FISHING STATION 1:25 000
 MORAY FIRTH SURVEY Grid ref: NH 74-78/59-64

Basemap: O.S. *Pathfinder* Series
 Sheets 144 & 160
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 10 September 1998

Hinterland:

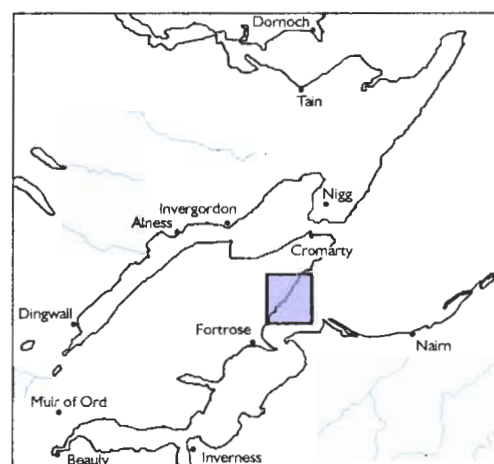
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 10: EROSION

1. THORN ROAN to south of BERRYHILL

NH 758 610

2km

Eroding or Stable

Indented cliff edge with steep slopes. This unit is exposed to north-easterly gales. Beach boulders scour the rock platform. Attrition of the foreshore is likely to be slow owing to the resilient nature of the local sandstone.

2. South of BERRYHILL to EARHIE FISHING STATION

NH 773 630

2.3km

Eroding or stable

The coastline is irregular and incised at the base by scouring of boulders at the base of the cliff. Exposed to easterly gales erosion is constant on the foreshore albeit slow.

MAP 10: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 7575 6082

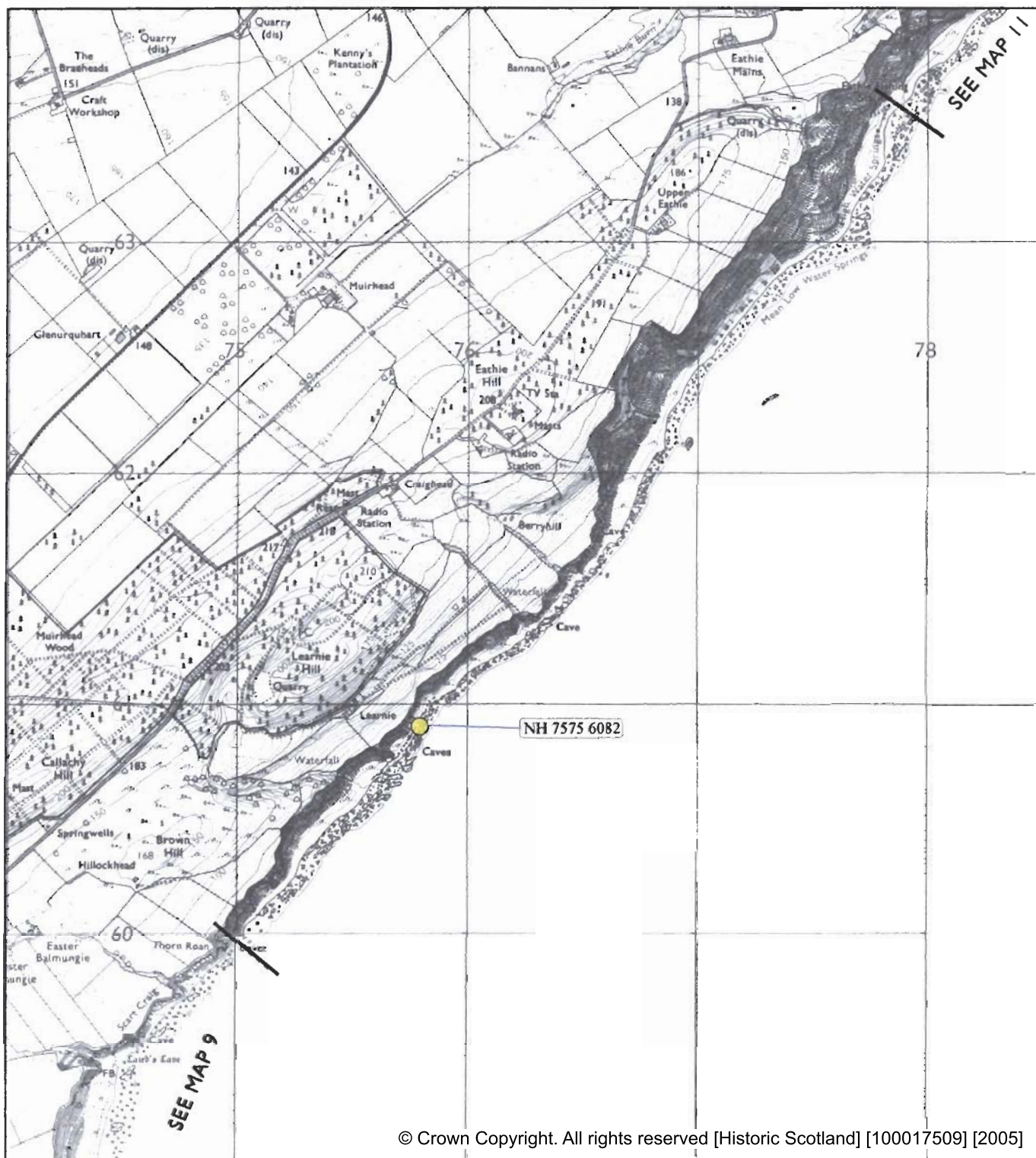
LEARNIE

Cave and walled entrance

Uncertain

Good

Nil



MAP 10: SCART CRAIG TO EATHIE FISHING STATION 1:25 000
MORAY FIRTH SURVEY Grid ref: NH 74-78/59-64

Basemap: O.S. Pathfinder Series
Sheets 144 & 160
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
 or area of designated wreck

Listed Historic Building

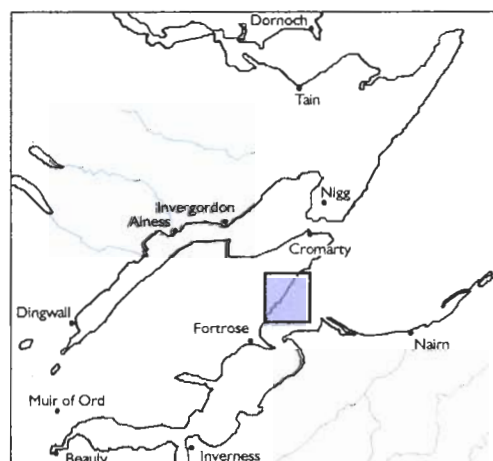
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 11: EATHIE FISHING STATION TO CROMARTY

Hinterland Geology and Coastal Geomorphology: This unit of coastlines forms the southern peninsula called the South Sutor. Precipitous cliffs, abrasion platform, cave and stacks typify the ruggedness of this section of coastline that is exposed to the full fetch of storm waves from the north east quadrant. The basement geology is Middle Old Red Sandstone. North of Eathie Fishing Station a series of folds and intrusive epidiorite dykes outcrop against the cliff. The eastern side of the South Sutor is overlain by schist deposits and various igneous intrusions. Drift lithologies include boulder clay and morainic drift. A narrow discontinuous platform of raised Post-glacial raised beach forms a lower cliff terrace. The former fishing village of Cromarty lies on the western flank of a cusate foreland built out during the late and post-glacial period. The lowest raised beach is backed by a major degraded cliff line which extends to Jemmimaville as far as the cliff coast east of Cromarty. The beach consists of fine gravel.

Erosion class: At McFarquar's Cave to Rednose (NH 804 657) the cliff line is very precipitous and overlooks numerous abrasion platforms and gullies. Dowgate Cave area could not be surveyed due to lack of access to the cliff base. It remains a matter of conjecture at what rate these cliffs are eroding. Away from the South Sutor towards the inner entrance of the Cromarty Firth lends shelter to the Cromarty shoreline. Here conditions are considered to be stable and accreting.

Built Heritage and Archaeology: The hintertland archaeology consists of the Castledownie promontory fort which is currently under plough and the ramparts on the upper cliff edge appear to be under threat from erosion. The military complex on the South Sutor consists of an extensive camp on the top of the cliff and also a series of look out posts on the shoreline below the cliffs. The Cromarty Firth was an important naval base during both World Wars and the military presence is visible around various parts of the coastal zone. The built heritage on the east shore of Cromarty village includes numerous fishermen's cottages, arranged in streets locally known as 'vennels' and attesting to the importance of Cromarty as a fishing port.

Map 11: Hinterland Geology and Coastal Geomorphology

1. North of ETHIE FISHING STATION to Mc FARQUHARS BED
NH720 647

1.7km

Exposed rock platform/sand and shingle

High cliff (50m)

Raised beach and marine deposits/glacial drift

Exposed coastline with rock platform and locally occurring boulder and shingle. The exposed cliff is steep with terrace formation. Glacial drift overlies relict raised beach deposits.

2. Mc FARQHAR'S BED to DOWGATE CAVE
NH 860 660

2.4 km

Sea stacks/sea caves/shelving rock platform

Cliff (50m)

Raised beach and marine deposits

Irregular coastal edge incised by exposure to easterly gales. Rock stacks arches and caves are present. Raised beach deposits extant at start of the unit giving way to high cliff composed of glacial deposits.

3. DOWGATE CAVE to east of LITTLE ROCK
NH 860 674

1.4km

Rock platform/boulder beds/shingle

High cliff (>75m)

Relict raised beach and marine deposits/glacial drift

Southern Sutors headland with deeply incised and irregular shoreline comprised of exposed rock platform and boulders. The cliff is steep and precipitous in parts comprised of glacial deposits.

4. East of LITTLE ROCK to CROMARTY HARBOUR.

NH 794 673

1.4km

Sand and shingle

Low edge (10m)

Raised beach and marine deposits

The Cromarty beach is ridged sand and shingle and no dunes are present. Sea defences protect Cromarty, which lies on a cusped foreland overlooking the entrance to Cromarty Firth. Raised beach deposits falling below 10m OD dominate hinterland geomorphology.

MAP 11: EROSION

1. EATHIE FISHING STATION to ST BENNET'S WELL

NH 787 644

2.6km

Eroding or stable

Highly irregular and incised cliff edge with gullies and exposed rock platforms. Attrition of the foreshore is likely to be slow owing to the resilient nature of the local sandstone.

2. ST BENNETS WELL to McFARQUAR'S CAVE

NH 796 652

0.5km

NOT SURVEYED

Owing to the precipitous nature of this cliff and restricted access to the beach this unit could not be investigated on the grounds of health and safety.

3. McFARQUAR'S CAVE to RED NOSE

NH 804 657

1km

Stable or Eroding

Highly exposed precipitous cliff incised with gullies and rocky platforms. The base of cliff and outcropping platforms are prone to scouring by wave action and are undergoing erosion albeit at a slow rate.

4. RED NOSE to DOWGATE CAVE

NH 807 665

1km

NOT SURVEYED

Owing to the precipitous nature of this cliff and restricted access to the beach this unit could not be investigated on the grounds of health and safety.

5. DOWGATE CAVE to east of LITTLE ROCK

NH 808 674

1.5km

Definitely Eroding

Exposed headland of the South Sutor. Erosion is active with constant attrition of the cliff base by wave action that has led to the formation of sea caves and isolated sea stacks.

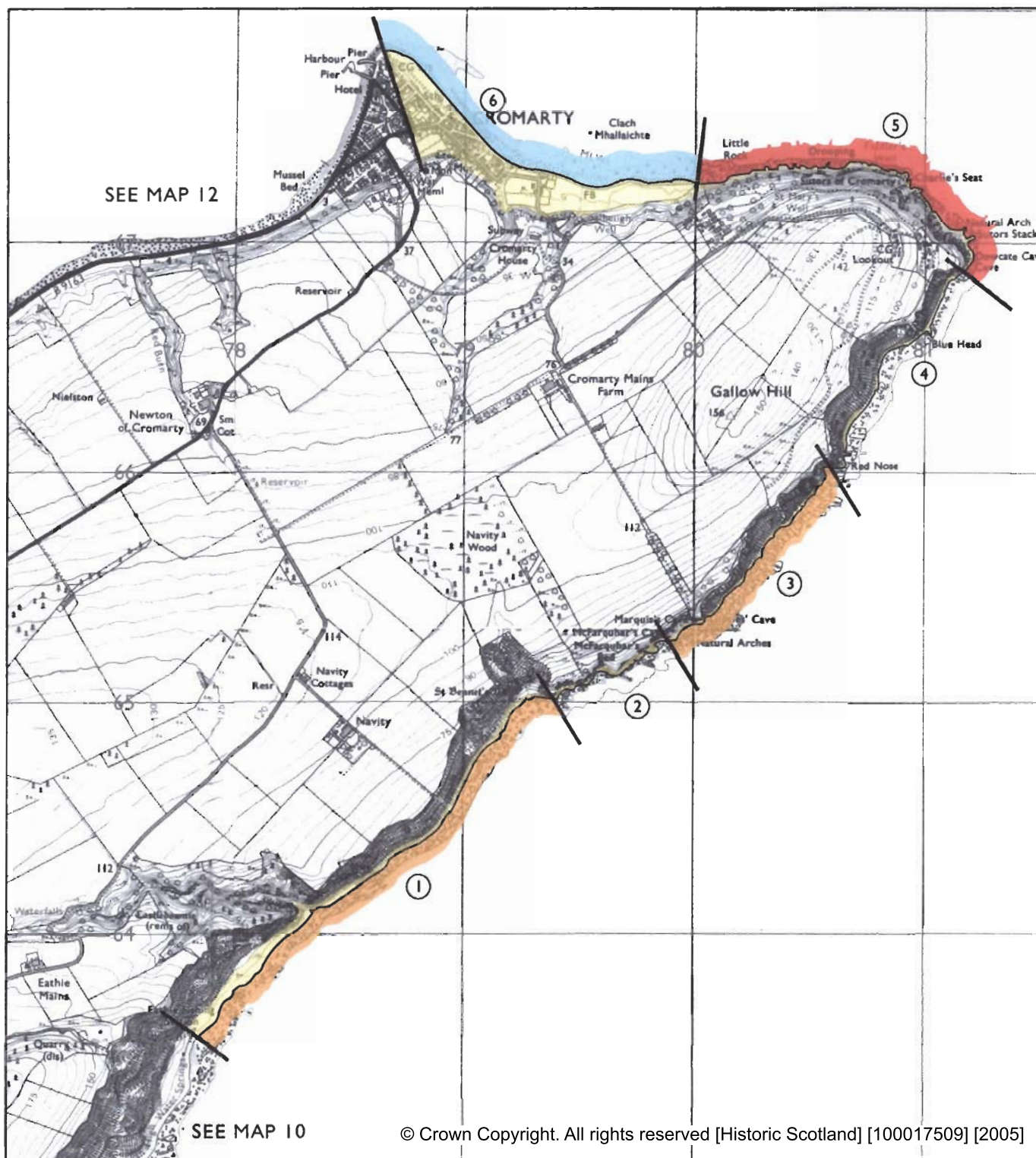
6. East of LITTLE ROCK to CROMARTY HARBOUR

NH 795 675

1.6km

Stable or eroding

Defended by concrete sea defences this unit appears to be fairly stable with sand and shingle banked up at the MHW. Sediment supply appears to be ongoing caused by longshore drift from within the Cromarty Firth.



MAP 11: EATHIE FISHING STATION TO CROMARTY 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 77-81/63-68

Basemap: O.S. Pathfinder Series
Sheets 134 & 144
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EROSION CLASS

Assessment date: 10 September 1998

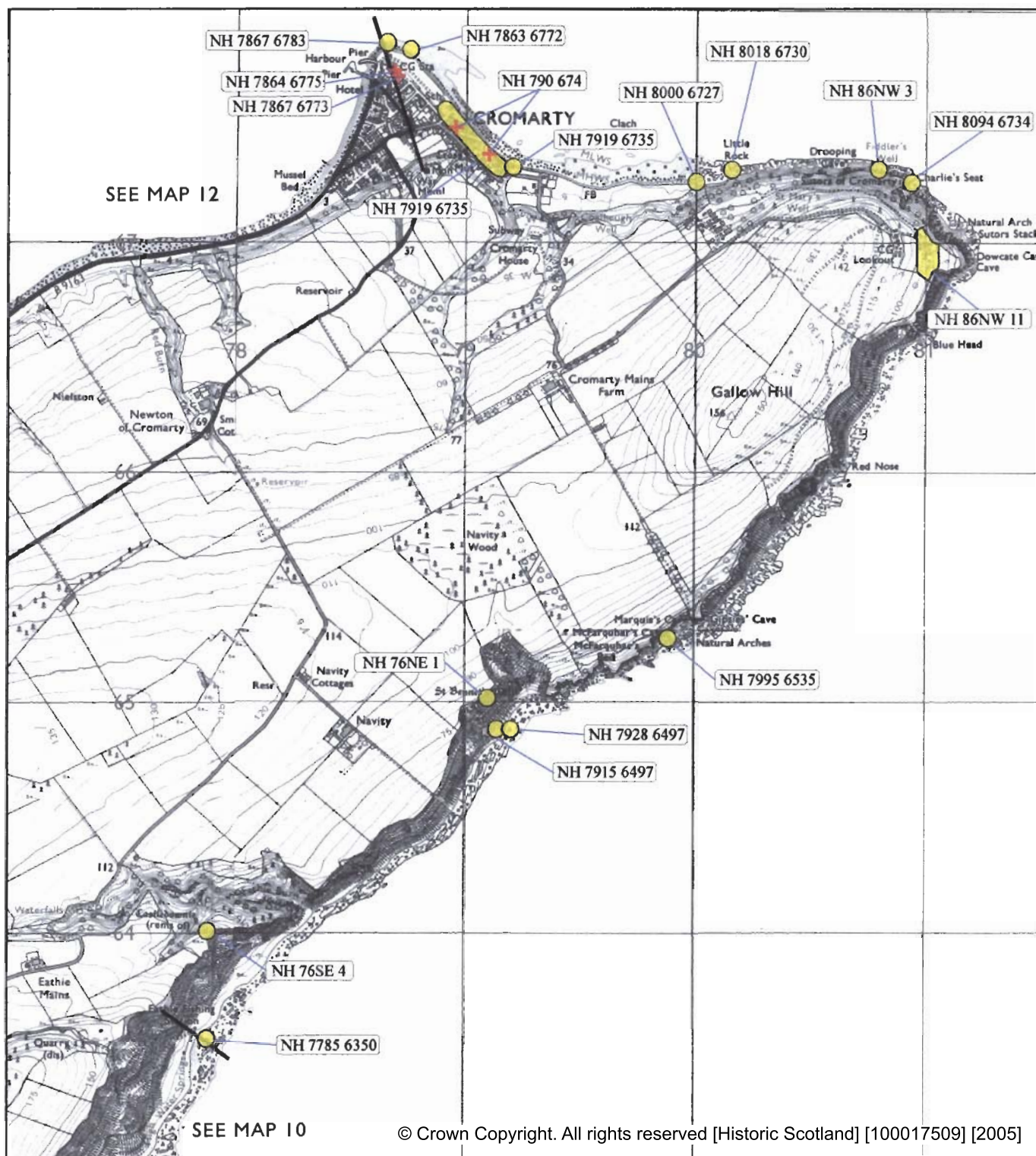
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 11: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites in the Hinterland	Sites in the Hinterland
NH 7785 6350 EATHIE Sand slipways Uncertain Good Nil	NH76NE 43 NH 7864 6775 CROMARTY Girnal 17 th /18 th century AD Poor Nil	NH86NW 3 NH 8075 6733 SUTORS OF CROMARTY Fiddler's Well; healing well Uncertain Good Nil
NH 7915 6497 NAVITY Trackway Uncertain Fair Nil	NH76NE 38.00 - Listed A NH 7867 6773 CROMARTY Lighthouse 19 th -20 th century AD Good Nil	NH 8018 6730 LITTLE ROCK Target butt and target frame 20 th century AD; WW I & II Fair Monitor
NH 7928 6497 NAVITY Boat house and slipway 19 th /20 th century AD Poor/ fair (respectively) Nil	NH76SE 4 NH 7788 6400 CASTLEDOWNIE Promontory fort Uncertain Poor Monitor	NH 8000 6727 LITTLE ROCK Footbridge made of metal target 20 th century AD; WW I & II Fair Nil
NH 8094 6734 SOUTH SUTOR Military pillboxes 20 th century AD; WWI&II Fair Survey and monitor	NH76NE 1 NH 7913 6508 & 7923 6502 NAVITY St Bennet's Chapel (site of) and well 16 th /17 th century AD Fair Nil	NH 7919 6735 CROMARTY Canalised stream 19 th century AD Good Nil
NH 7863 6772 CROMARTY Rails for boat launch slipway 20 th century AD Fair Nil	NH 7995 6535 McFARQUHAR'S BED Boathouse Uncertain Fair Nil	NH76NE 20-4, 31-3, 35-6, 39, 48, 58 - Various Listed B NH 790 674 area CROMARTY (East shore) Residential & industrial properties 17 th /18 th /19 th century AD Good Nil
NH 7867 6783 CROMARTY Concrete slipway 20 th century AD Good Nil	NH86NW 11 NH 8103 6695 SOUTH SUTOR Military coastal battery; bunkers 20 th century AD; WWI&II Fair Survey and monitor	



MAP 11: EATHIE FISHING STATION TO CROMARTY 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 77-81/63-68

Basemap: O.S. Pathfinder Series

Sheets 134 & 144

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument, or area of designated wreck

Listed Historic Building

Monument formally proposed by Historic Scotland for scheduling, or wreck for designation

Other known Ancient Monuments, or Undesignated wreck

Designated Landscape

Insufficient information; more work needed

Probably archaeologically sterile



Map 12: CROMARTY TO SHORE MILL

Hinterland Geology and Coastal Geomorphology: The underlying basement geology in this sector of coastline is undifferentiated thin bedded Lower Red Sandstone. The drift deposits consist of boulder clay which has been sculpted at the coast by post-glacial marine terraces. The raised beaches continue west along the shore of the Cromarty Firth. The wide foreshore is dominated by shingle and mud which are exposed as mudflats down to the LWM.

Erosion class: This section is sheltered by the promontories of the Sutors. The low coastal edge has easily eroded sands and gravel which are prone to erosion by wave action. At Cromarty a promenade defends the town. Parts of the coastline beyond Cromarty shows evidence of accretion and stability. Local erosion has been observed as effecting saltmarsh at the backshore. The mud flats toward the LWM are accreting.

Built Heritage and Archaeology: The foreshore archaeology in the eastern part of this area consists of the recent sites around Cromarty such as slipways and the extensive harbour. In the middle and western sections the forshore archaeology is dominated by fish trap remains; both wooden and stone examples. The hinterland sites consist of the built heritage in Cromarty village of the lighthouse, a giral, and the large hemp works. Finally, at the western extreme of this area are the remains of a large quarry, used to supply the stone for Cromarty harbour.

Map 12: Hinterland Geology and Coastal Geomorphology

1. CROMARTY HARBOUR to north of NIELSTON

NH 780 670

1.6km

Shingle

Low edge (10m)

Raised beach and marine deposits

Western side of the triangular foreland with a foreshore consisting of banked shingle. The backshore geomorphology consists of raised beach deposits.

2. North of NIELSTON to north of ROSEFARM

NH 766 664

1.3 km

Sand and shingle

Cliff (c.25m)

Raised beach and marine deposits

The foreshore consists of sand and gravel. The hinterland consists of glacial drift over exposed rock.

3. North of ROSEFARM to east of WOODSIDE

NH 750 657

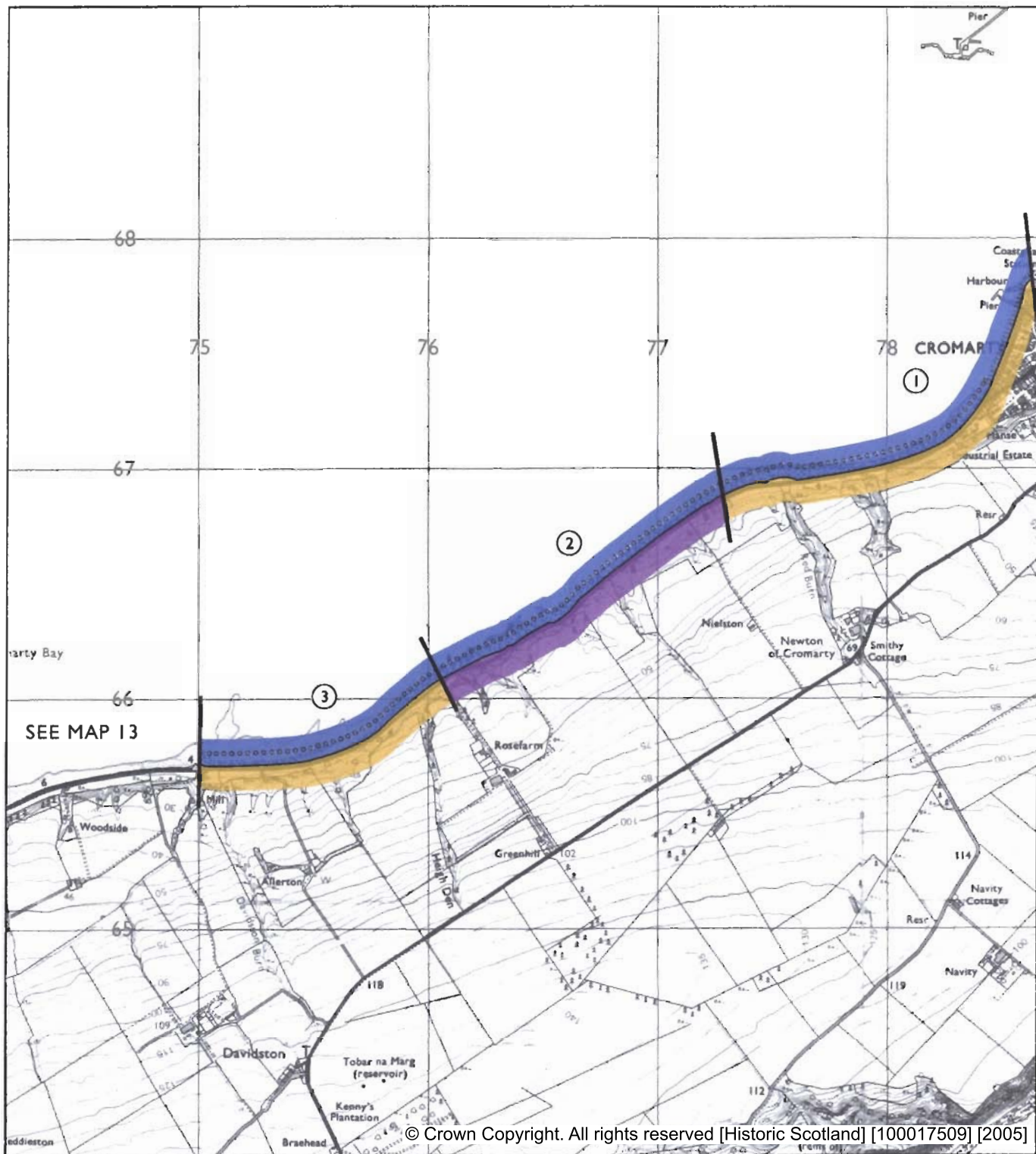
2.4km

Shingle and sand

Low edge in parts (<10m)

Raised beach and marine deposits

Relict Postglacial shoreline on south side of Cromarty Bay. Foreshore dominated by shingle. Hinterland consists of marine sand and gravel.



MAP 12: CROMARTY TO SHORE MILL

MORAY FIRTH SURVEY Grid ref: NH 75-78/64-69

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 144

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 10 September 1998

Hinterland:

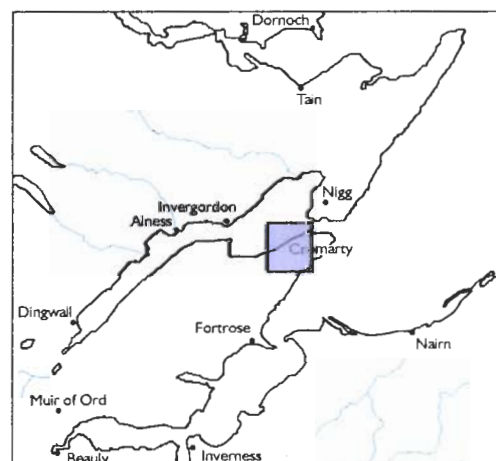
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 12: EROSION

1. CROMARTY HARBOUR to ROSEFARM

NH 770 667

3.7km

Eroding or stable

This unit of coastline is uniform in character with sea defences overlooking a sand and pebble foreshore. Attempts to stabilise coastal erosion using rubble occurs at NH 773 669. In general there is no evidence to suggest that conditions are not stable.

2. ROSEFARM to east of SHORE MILL

NH 756 658

0.4km

Accreting or stable

Backed by raised beach deposits this unit appears to be stable as sand and shingle is banked up at the MHW. The foreshore consists of sand and gravel and also appears to be accreting in parts.

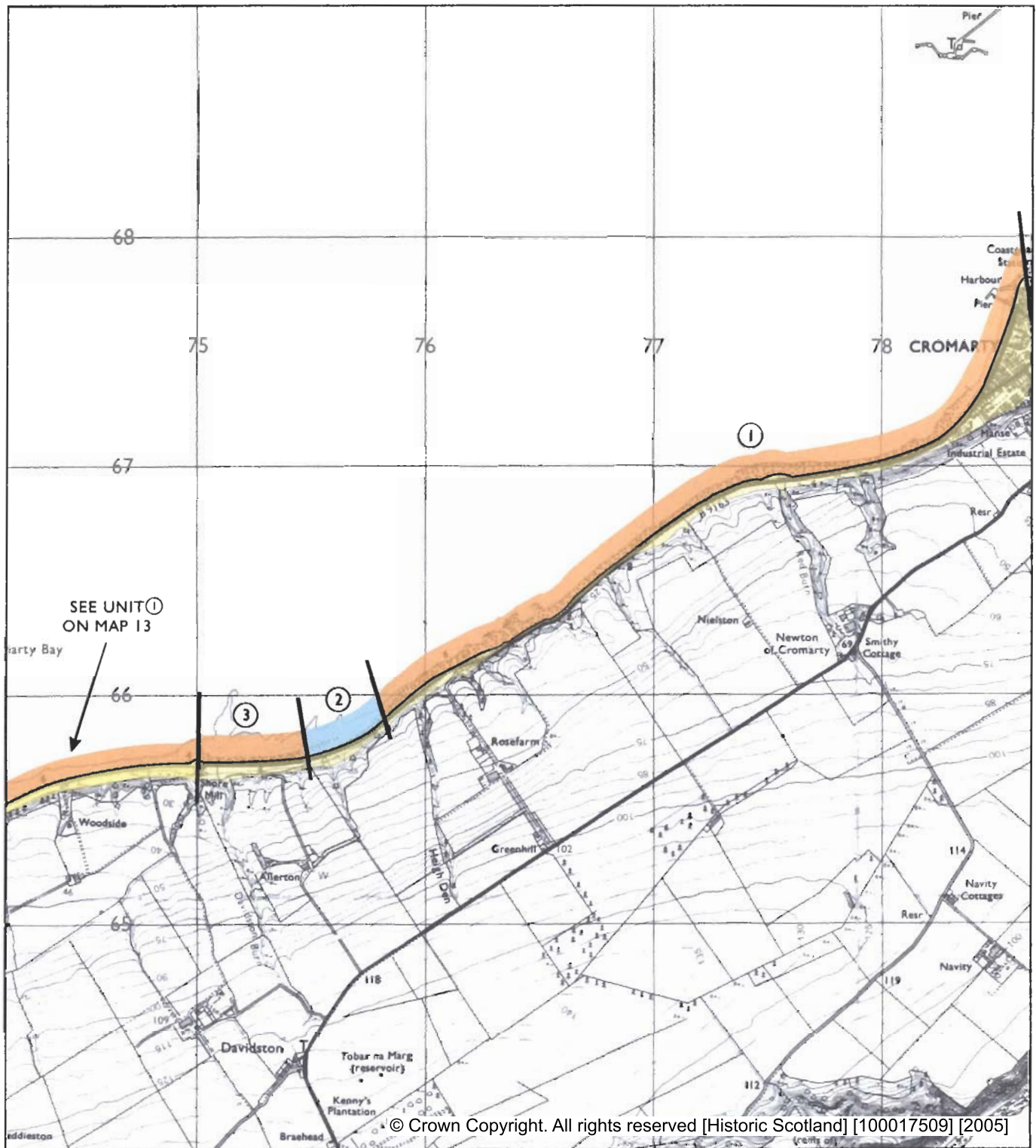
3. East of SHORE MILL to west of WOODSIDE

NH 745 657

1.9km

Eroding or stable

A sea wall defends the length of this unit of coastline. The backshore rests on marine sand and gravel. The foreshore consists of mud and gravel which appears to be accreting and eroding according to the distribution of the sediment.



MAP 12: CROMARTY TO SHORE MILL

MORAY FIRTH SURVEY Grid ref: NH 75-78/64-69

1:25 000

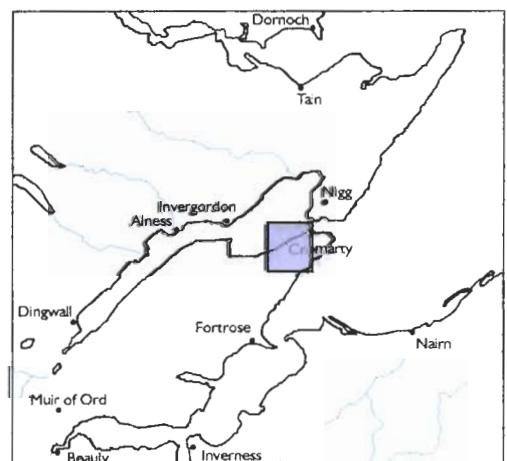
Basemap: O.S. Pathfinder Series
Sheet 144
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EROSION CLASS

Assessment date: 10 September 1998

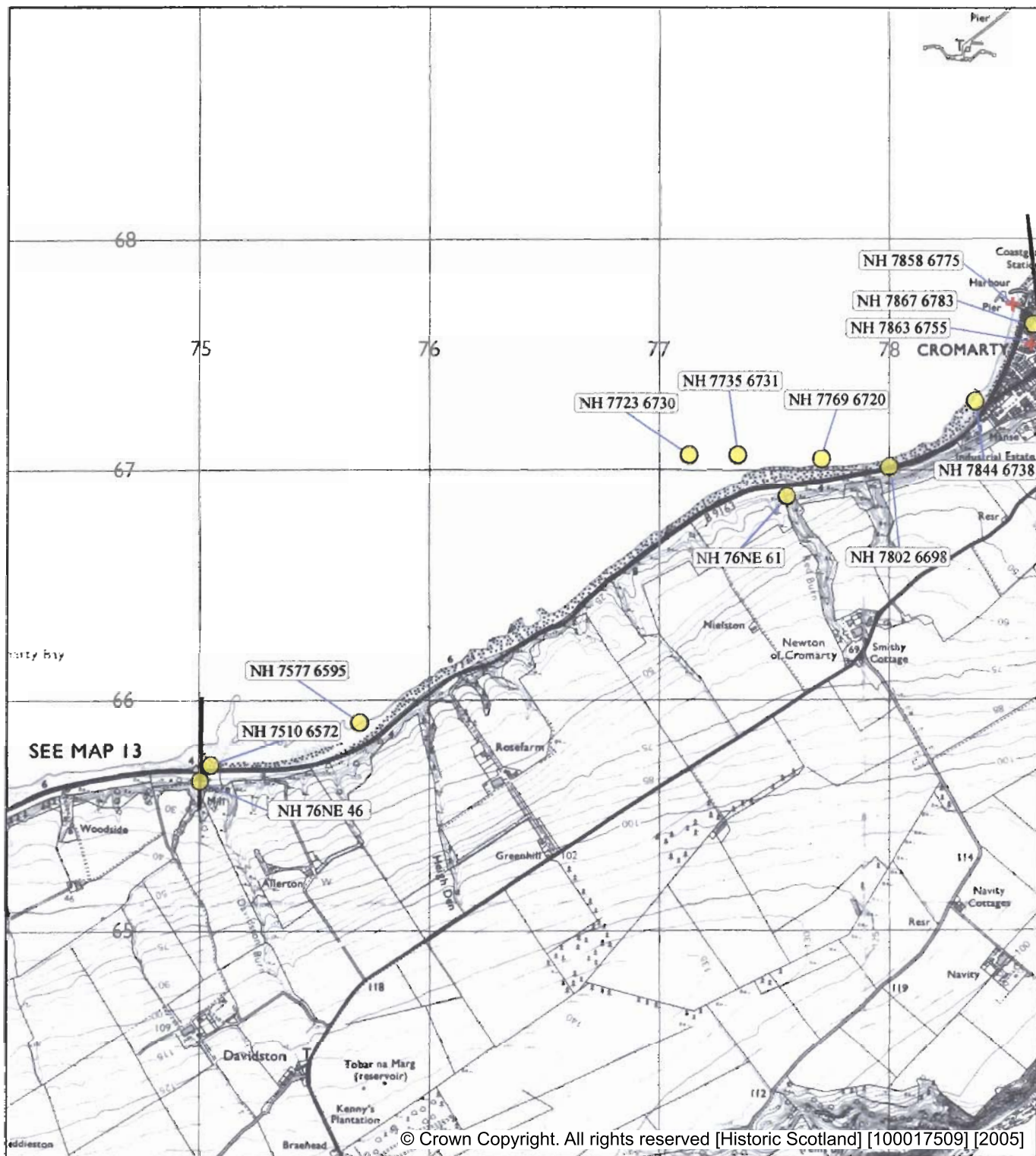
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 12: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites on the Coastal Edge & Foreshore	Sites in the Hinterland
NH76NE 49 - Listed B NH 7858 6775 CROMARTY Harbour 19 th /20 th century AD Good Nil	NH 7723 6730 CROMARTY Fish trap Uncertain Poor Survey NH 7577 6595 ROSEFARM Fish trap Uncertain Poor Survey NH 7510 6572 SHORE MILL Hulk 20 th century AD Poor Nil	NH76NE 51 - Listed B NH 7863 6755 CROMARTY Hemp works 19 th century AD Good Nil NH 7802 6698 CROMARTY Coronation well (1911) 20 th century AD Good Nil NH76NE 61 NH 7750 6694 CROMARTY Admiralty quarry 19 th century AD Good Nil
NH 7844 6738 CROMARTY Mooring ring 20 th century AD Fair Nil	NH 7769 6720 CROMARTY Fish trap Uncertain Poor Survey	
NH 7735 6731 CROMARTY Fish trap Uncertain Poor Survey	NH76NE 46 NH 7502 6565 SHORE MILL Watermill 18 th /19 th century AD Good Nil	



MAP 12: CROMARTY TO SHORE MILL

MORAY FIRTH SURVEY Grid ref: NH 75-78/64-69

1:25 000

Basemap: O.S. Pathfinder Series
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

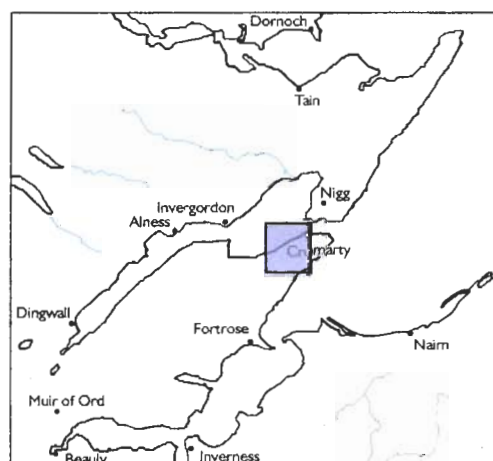
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 13: SHOREMILL TO UDALE BAY

Hinterland Geology and Coastal Geomorphology: Undifferentiated thin bedded sandstone continue to dominate the basement geology. Boulder clay is the main cover lithology. The coastline is mantled by raised beach sand and gravel of post-glacial age. At Udale bay raised beach cliffs of post-glacial age are well represented. Further inland from the bay the *Alt Dubhact* floodplain provides freshwater alluvium. The hinterland is low lying at below 10m OD.

Erosion class: This section of estuarine coastline is sheltered with an accreting foreshore. Within Udale Bay sediment development is stabilising the saltmarsh on the backshore. At Jemimaville (NH 719 653) sea defences are eroding at their base as a result of wave hammer.

Built Heritage and Archaeology: The built heritage in this area include an 18th century water mill at Shore Mill, with the water wheel still present. The other site is the village of Jemimaville; an 18th century village with various residential, commercial and religious buildings. The foreshore archaeology includes two fish trap sites and the Resolis free church in Jemimaville which is currently being undercut by coastal erosion. At the northern part of this area at Newhall Point are the remains of a Pre-Reformation chapel and burial ground and on the foreshore a stake net mound, the remnants of a large fish trap.

Map 13: Hinterland Geology and Coastal Geomorphology

1. West of WOODSIDE to JEMIMAVILLE

NH 730 652

1.8km

Shingle/mud and sand

Low edge (<10m)

Raised beach and marine deposits

Low linear coastal edge with a foreshore consisting of shingle. The hinterland consists of a relict shoreline containing a backshore of marine sand and gravel.

2. JEMIMAVILLE to St MICHAEL'S CHURCH

NH 710 668

1.3 km

Saltmarsh tidal flats with mud and shingle beds

Low edge (<10m)

Raised beach and marine deposits

This unit lies at the head of Udale Bay formed behind the headland at Newhall point. The foreshore is flanked by saltmarsh incised by a river channel. The backshore consists of relict raised beach behind which the land is low lying at below 10m OD.

3. St MICHAEL'S CHURCH to NEWHALL POINT

NH 710 668

1.3km

Mud/sand/shingle

Low Cliff (<10m)

Raised beach and marine deposits

Eastern side of Newhall Point. The foreshore is dominated by sand and shingle overlooking tidal flats. The hinterland consists of marine deposits and relict raised shoreline.



MAP 13: SHORE MILL TO UDAL BAY

MORAY FIRTH SURVEY Grid ref: NH 71-75/64-69

1:25 000

Basemap: O.S. Pathfinder Series
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 10 September 1998

Hinterland:

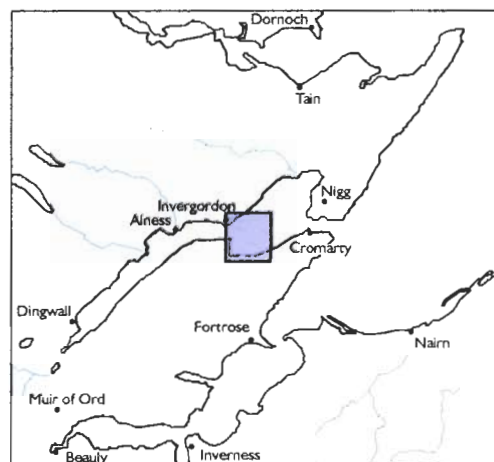
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 13: EROSION

1. East of SHORE MILL to west of WOODSIDE
NH 745 657

1.9km

Eroding or stable

A sea wall defends the length of this unit of coastline. The backshore rests on marine sand and gravel. The foreshore consists of mud and gravel which appears to be accreting and eroding according to the distribution of the sediment.

2. North east of FARNES

NH 735 653

1km

Accreting or stable

A cobble beach overlooks accreting mud flats. Raised beach deposits at the backshore are stabilised by saltmarsh. At the present there are no indicators to suggest that conditions are not stable.

3. North of UDALE FARM

NH 728 653

12-15m approx.

Definitely eroding

Erosion of marine sand and gravel is occurring at the MHWL due to the loss of saltmarsh. Offshore mud and shingle is present and appears stable.

4. East of JEMIMAVILLE

NH 725 653

0.5km

Stable

A sea wall lends stability to this unit of coastline. Offshore mud flats show evidence of accretion.

5. JEMIMAVILLE

NH 719 653

0.6km

Stable or eroding

Sea defences are being eroded at the base by shingle scour. Offshore mud flats are accreting.

6. UDALE BAY

NH 710 653

1.2km

Accreting or stable

Udale bay is sheltered with an irregular coastal edge due to saltmarsh development. This is consolidating the MHWL. Offshore the wide tidal flats are accreting with mud and shingle.

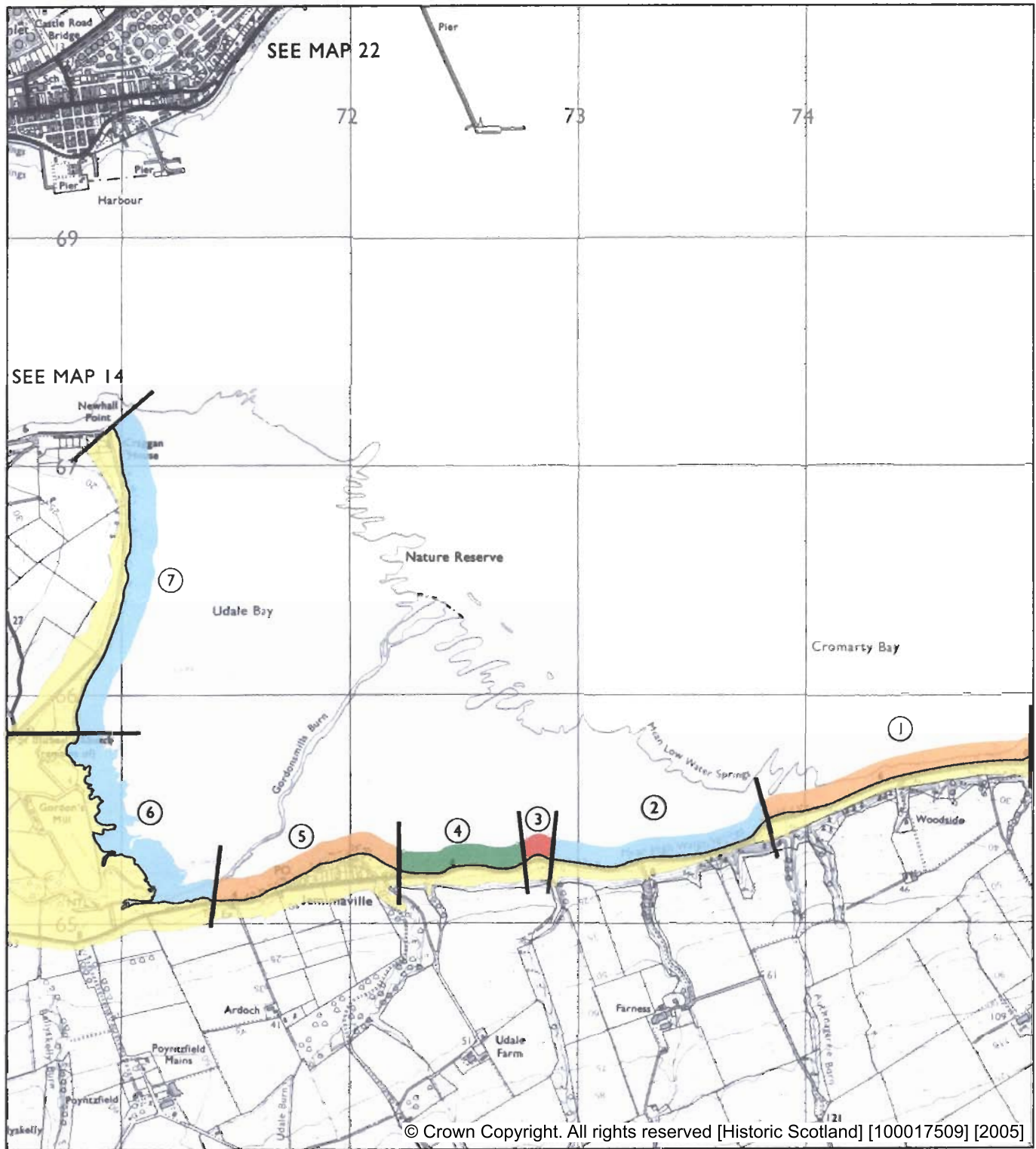
7. St MICHAELS CHURCH to NEWHALL POINT

NH 710 666

1.4km

Accreting or stable

Sea defences guard Newhall Point. Cobble and sand is banked up at the HWM. The foreshore is accreting with mud flats extending to about 1.5km.



MAP 13: SHORE MILL TO UDAL BAY

MORAY FIRTH SURVEY Grid ref: NH 71-75/64-69

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 144

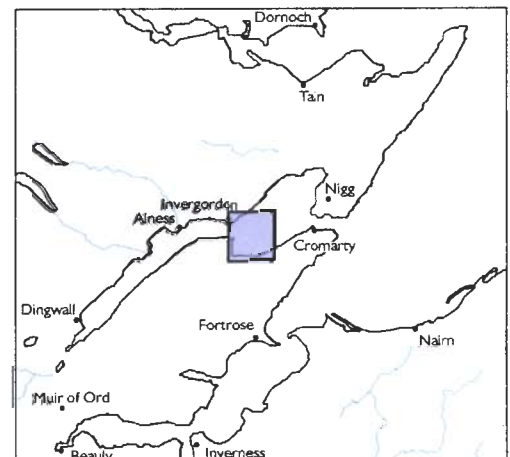
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EROSION CLASS

Assessment date: 10 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 13: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 7418 6590

WOODSIDE

Fish trap

Uncertain

Poor

Survey

NH 7186 6523

JEMIMAVILLE

Resolis Free church

19th century AD

Poor

Monitor

NH 7204 6530

JEMIMAVILLE

Partially upstanding building

Uncertain

Poor

Nil

NH 7218 6576

JEMIMAVILLE

Complex fish trap

Uncertain

Poor

Survey

NH 7157 6512

UDALE BAY

Slipway

20th century AD

Poor

Nil

NH 7185 6640

UDALE BAY

Fish trap

Uncertain

Poor

Survey

Sites on the Coastal Edge & Foreshore

NH 7084 6603

KIRKTON

Metal boat boiler

20th century AD

Fair

Nil

NH 7088 6621

KIRKTON

Hulk

Uncertain

Poor

Monitor

NH 7110 6723

NEWHALL POINT

Fish trap stake net mound

Uncertain

Poor

Survey

Sites in the Hinterland

NH76NW 4, 6, 72-95 - Various Listed C

NH 718 651 area

JEMIMAVILLE

Residential, religious &

commercial buildings; lamp post

18th/19th century AD

Good

Nil

NH76NW 2 - Scheduled

NH 7088 6707

NEWHALL POINT,

BALBLAIR

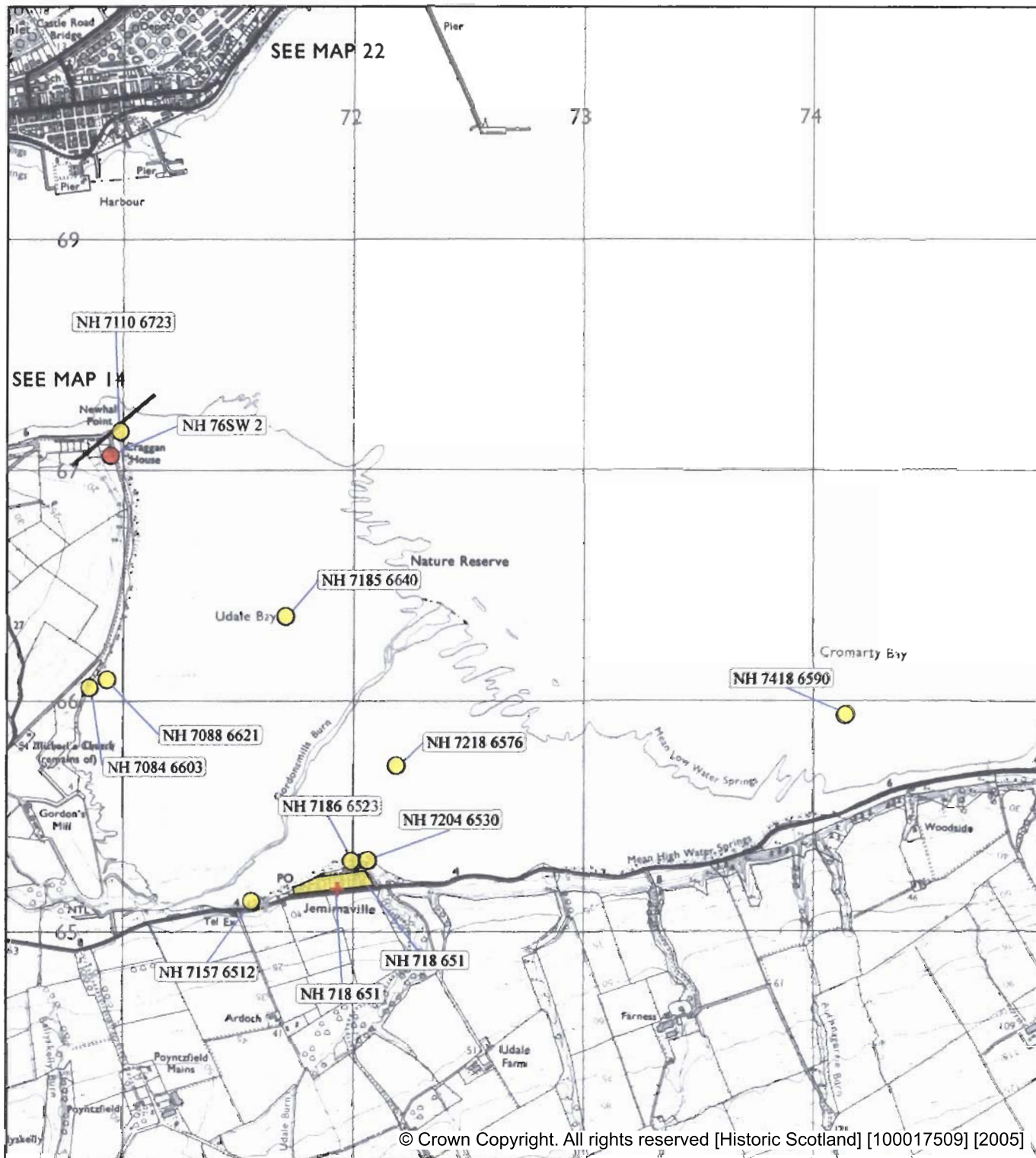
Pre-Reformation chapel and

burial ground

10th-11th century AD

Poor

Monitor



MAP 13: SHORE MILL TO UDAL BAY

MORAY FIRTH SURVEY Grid ref: NH 71-75/64-69

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 144

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 14: NEWHALL POINT TO ALNESS FERRY

Hinterland Geology and Coastal Geomorphology: Middle and Old Red Sandstone continues to form the basement geology. This is overlain by boulder clay and morainic drift deposits. Well defined Post-glacial raised beach platform extends westwards along the coast. The foreshore is a mixture of shingle, boulders and sand. Extensive mudflats are exposed down to the LWM.

Erosion class: Sea defences protect Newhall Point where cobble and sand is banked up at the HWM. Here conditions were seen to be stable. North west of Inch, rubble armouring down to the foreshore margin is eroding. Unvegetated soft marine deposits are prone to erosion by deflation and overtopping at the backshore. Rabbit erosion within the cliff is occurring at NH 728 653.

Built Heritage and Archaeology: At Balblair the built heritage consists of a boatyard and Inverbreakie pier, both in current use. The second group of foreshore and hinterland sites is concentrated around Ferryton Point and includes a modern wooden jetty and the stone remains of a fish trap. The giral at Ferryton point and associated trackway suggest that this was once an active fishing station and the giral is currently a well maintained house.

Map 14: Hinterland Geology and Coastal Geomorphology

1. NEWHALL POINT to north of

AUCHMARTIN

NH 705 671

1.4km

Sand and shingle

Low edge (<5m)

Raised beach and marine deposits

Linear stretch of coastline forming the southern shore of the inner channel of the Cromarty Firth.

The shoreline comprises sand and shingle backed by raised beach deposits.

2. North of AUCHMARTIN to FERRYTON

POINT

NH 685 669

1.5km

Sand and shingle

Low edge (<5m)

Raised beach and marine deposits

Raised beach backs onto a sand and shingle foreshore. Wave cut platform is present at the backshore.

3. FERRYTON POINT to WESTER

ALNESSFERRY

NH 670 667

2.6km

Sand and shingle

Low edge(<5m)

Raised beach and marine deposits

Linear stretch of coastline with raised beach deposits overlooking sand and shingle foreshore.

MAP 14: EROSION

1. North of BALBLAIR

NH 270 671

1.5km

Eroding or stable

Raised sea beach deposits outcrop onto the shore but are generally well vegetated. Where vegetation cover is poor then these areas appear to be susceptible to local erosion.

6. North of EASTER ALNESFERRY

NH 667 666

0.8km

Eroding or stable

Locally eroding raised beach deposits backing onto a boulder and cobble beach that shows no evidence of erosion down to the LWM.

2. EASTER SHEEPARK

NH 695 671

c. 12m

Definitely eroding

Unconsolidated raised beach deposits affected by rabbit erosion. The mud flats appear to be stable.

3. North of WESTER SHEEPARK

NH 685 669

1.4km

Eroding or stable

The boulder and pebble beach appears to be stable. Isolated patches of erosion at the cliff base as a result of the lack of vegetation.

4. FERRYTON POINT to INCH

NH 676 669

0.8km

Eroding or stable

Cobble and pebble beach backed by raised beach deposits. Stability is maintained here by vegetation.

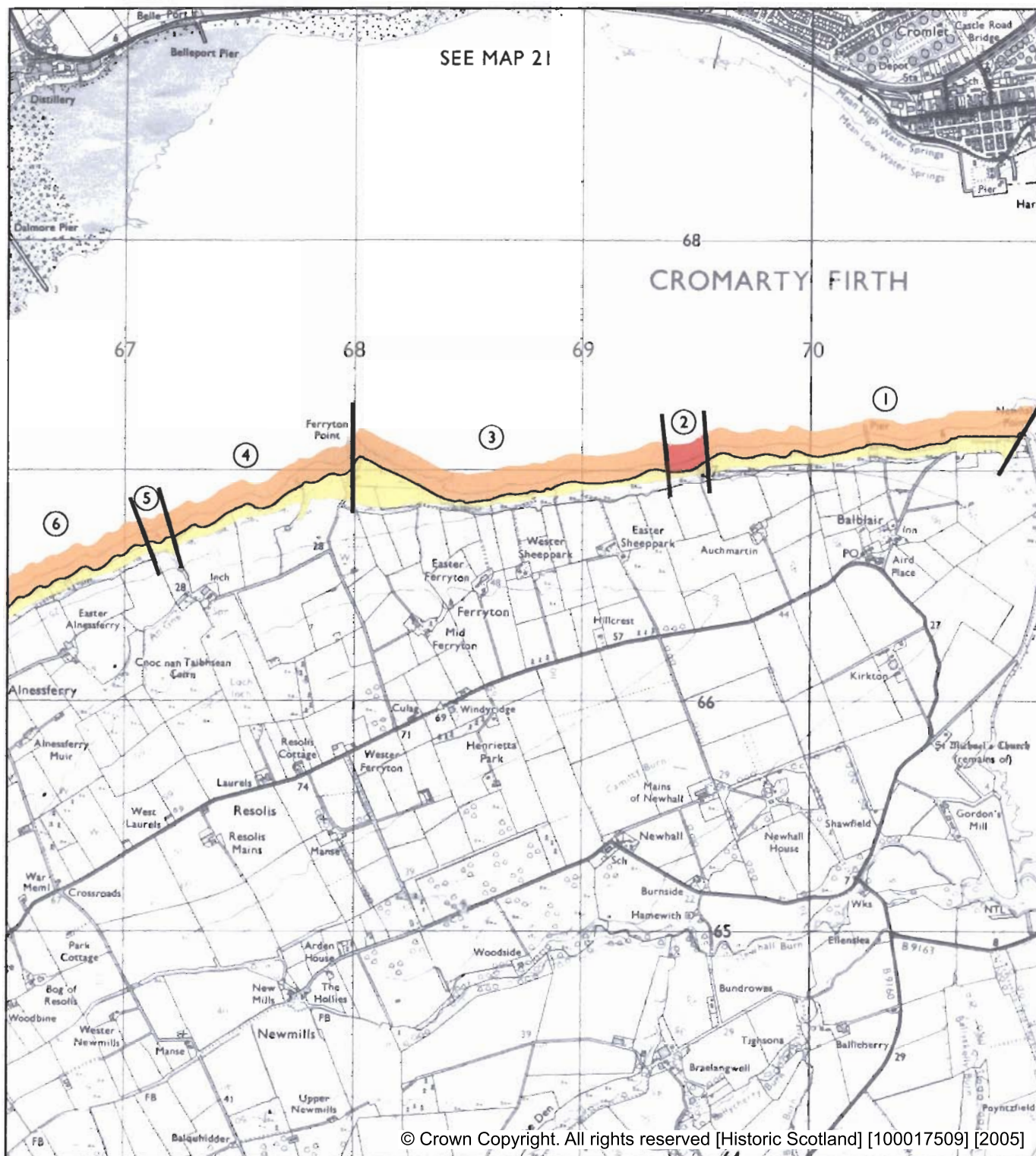
5. North west of INCH

NH 672 667

c. 10m

Eroding or stable

This unit is effected at the foreshore by rubble dumping. The shingle and mud foreshore appears to be stable



MAP 14: NEWHALL POINT TO ALNESS FERRY 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 67-71/64-69

Basemap: O.S. *Pathfinder* Series

Sheet 144

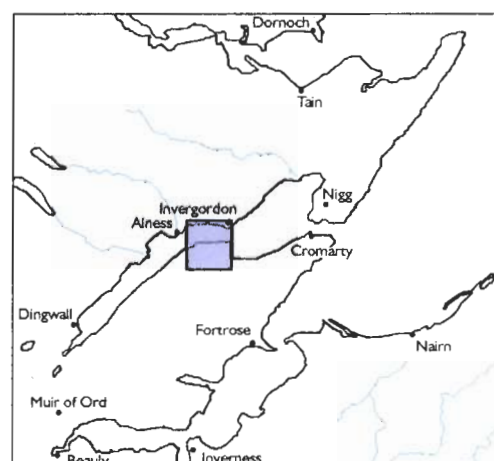
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EROSION CLASS

Assessment date: 11 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 14: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH76NW 19
NH 7026 6709
BALBLAIR
Inverbreakie Pier
19th century AD; built 1817
Good
Nil

NH76NW 18
NH 7024 6715
BALBLAIR,
Boatyard and associated buildings
19th/20th century AD
Good
Nil

NH 6875 6689
WESTER SHEEPPARK
Metal boat trailer
20th century AD
Poor
Nil

NH 6799 6702
FERRYTON POINT
Wooden Jetty
20th century AD
Poor
Nil

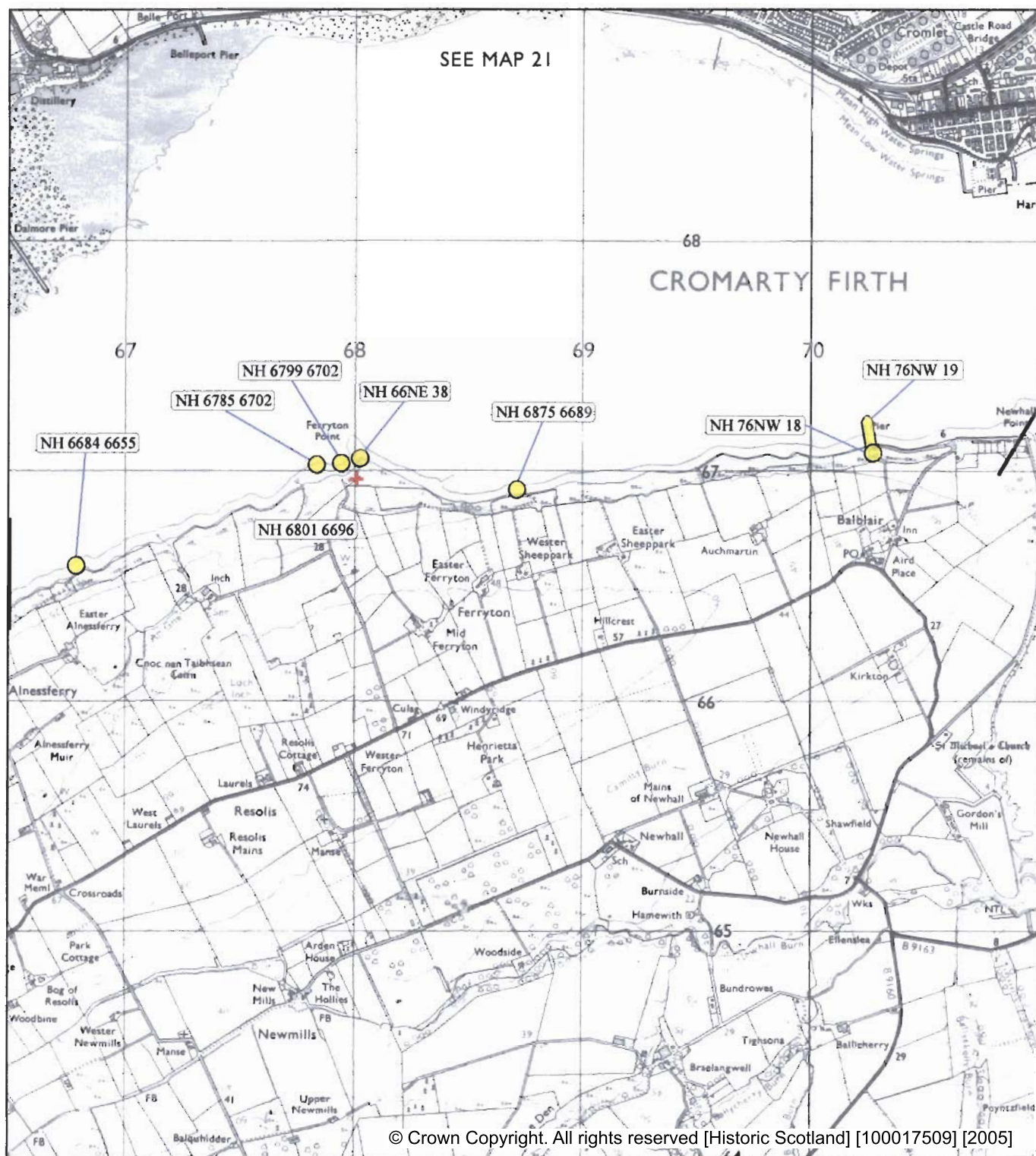
NH 6785 6702
FERRYTON POINT
Fish trap
Uncertain
Poor
Survey

NH 6684 6655
WESTER ALNESSFERRY
Stone pier and slipway
Uncertain
Poor
Monitor

Sites in the Hinterland

NH66NE 39 - Listed C
NH 6801 6696
FERRYTON POINT
Girnal
17th/18th century AD
Good
Nil

NH66NE 38
NH 6803 6706
FERRYTON POINT
Trackway
Uncertain
Fair
Nil



MAP 14: NEWHALL POINT TO ALNESS FERRY 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 67-71/64-69

Basemap: O.S. Pathfinder Series

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

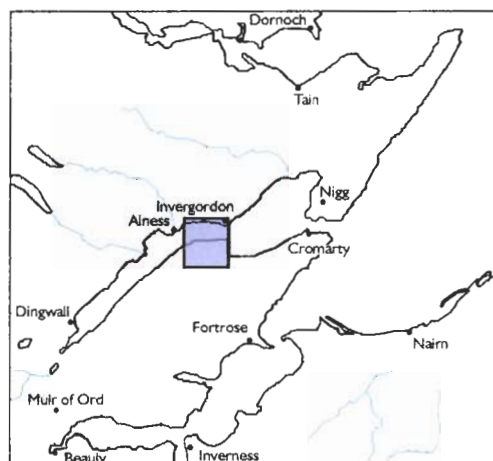
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 15: ALNESS FERRY TO EASTER TOBERCHURN

Hinterland Geology and Coastal Geomorphology: The basement geology within this unit of coastline is Middle Old Red Sandstone overlain by boulder clay and morainic drift. At the shoreline a narrow coastal plateau is backed by a raised sea platform. This is fronted by another wave cut platform closed to the shore and is attributed to the Post-glacial shoreline. These features overlook a linear coastal edge with intertidal mud flats.

Erosion class: This unit of coastline is predominantly stable owing to its sheltered position. The intertidal area is accreting mud flats with accreting cobbles and shingle on the foreshore. Fine bedded sandstone is exposed in the region of Craig Castle at the base of a steep cliff which is densely vegetated and stable.

Built Heritage and Archaeology: The foreshore archaeology along this area consists of seven stone piers or quays associated with shoreline quarries, between Wester Alnessferry and Wester Cullicudden. Castlecraig is a scheduled and listed late 16th century tower house affected by severe erosion, some of which is marine. The cliffs on which it is built are stable but evidence of erosion was noted when a gun loop was found on the foreshore 100 m to the west of the tower house. The gun-loop masonry has fallen from the eroding tower wall.

Map 15: Hinterland Geology and Coastal Geomorphology

1. WESTER ALNESSFORD to WESTER CULLICUDDEN

NH 654 657

2.6km

Sand and shingle

Low edge (<15m)

Raised beach and marine deposits

Linear stretch of coastline backed by raised beach deposits becoming with the low cliff becoming steeper towards Wester Cullicudden. The foreshore is comprised of sand and shingle.

2. WESTER CULLICUDDEN to EASTER TOBERCHURN

NH 632 638

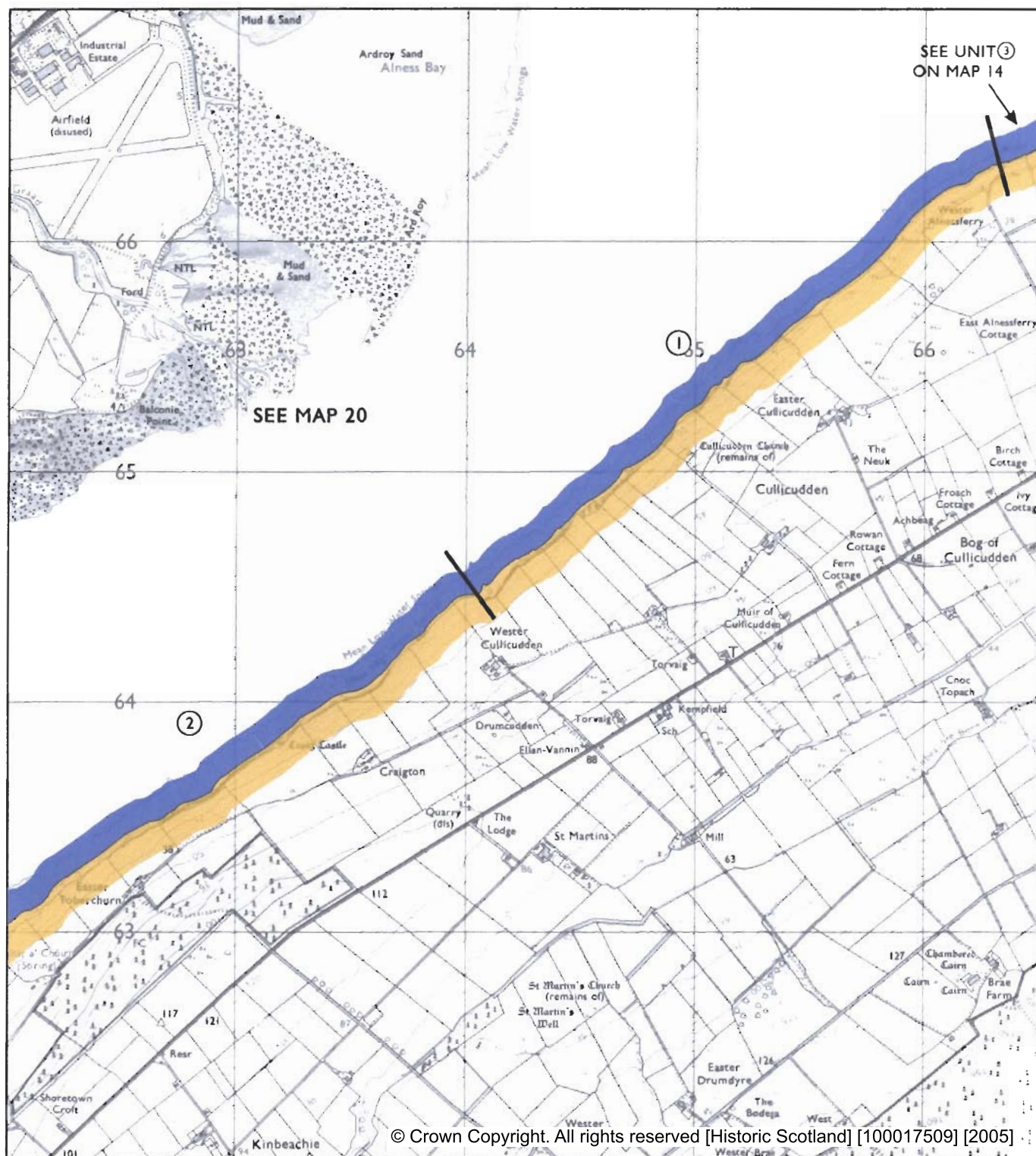
2.4km

Sand and shingle

Low cliff (<15m)

Raised beach and marine deposits

Linear stretch of coastline with cliff becoming steeper towards Wester Cullicudden. Raised beach deposits continue backing onto a foreshore dominated by sand and shingle.



MAP 15: ALNESS FERRY TO EASTER TOBERCHURN 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 62-66/62-67

Basemap: O.S. Pathfinder Series

Sheet 144

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 14 September 1998

Hinterland:

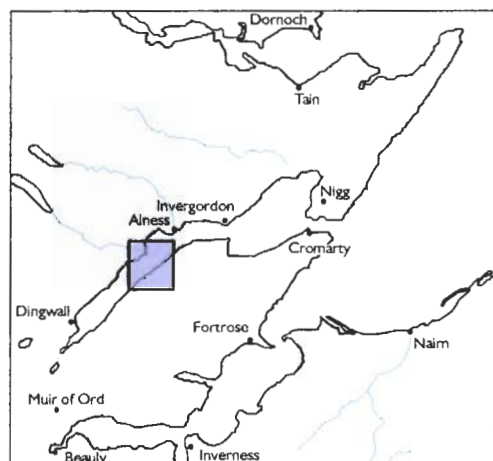
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 15: EROSION

1. East of ALNESFERRY

NH 664 664

0.2km

Eroding or Stable

Sea defences are being eroded by wave action.

Cobbles and shingle is banked at the HWM and appears to be stable.

2. North of ALNESFERRY to EASTER

CULICUDEN CHURCH

NH 655 657

2km

Stable

The build up of shingle and cobbles at the MHWMS suggest that conditions are stable with a sandy beach towards the LWM. There are no indicators to suggest conditions are not stable.

3. East of CULICUDEN CHURCH

NH 647 651

0.1km

Definitely Eroding

A short stretch of exposed cliff is eroding where softer raised beach deposits outcrop over the hard laminated sandstone.

4. East of CULLICUDEN CHURCH to CRAIG CASTLE

NH 640 646

2km

Stable or Eroding

Large boulders and shingle are accreting on the foreshore. The cliff margins are dense with trees. Quarrying has been carried out in the past along this section leading to exposed cliff sections. The vestigial remains of piers connected with this industry can just be made out among the rocky shore. At Craig Castle erosion of the cliff has led to the wide distribution of building fabric along the foreshore.

5. CRAIG CASTLE to WEST OF BROOMTOWN WOOD

NH 625 634

3.7 km

Stable or Eroding

This unit of coastline consists of cobbles and shingle banked at the HWM. Slight erosion is occurring along the MHWMS where marine gravel outcrops or where vegetation is poor. The beach becomes sandier offshore but there is no evidence for active erosion.



MAP 15: ALNESS FERRY TO EASTER TOBERCHURN 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 62-66/62-67

Basemap: O.S. Pathfinder Series Sheet 144

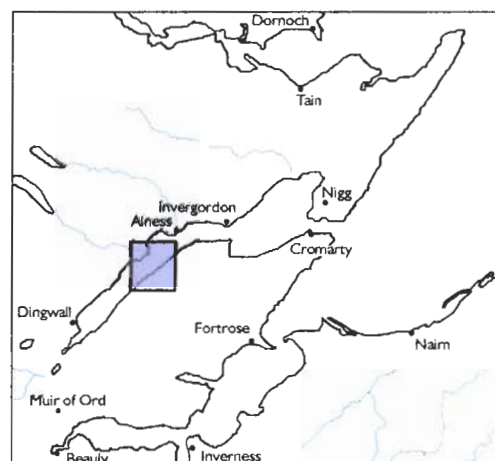
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EROSION CLASS

Assessment date: 14 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 15: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 6516 6539
WESTER CULLICUDDEN
Stone pier
Uncertain
Poor
Monitor

NH 6500 6532
WESTER CULLICUDDEN
Stone pier
Uncertain
Poor
Monitor

NH 6480 6509
WESTER CULLICUDDEN
Stone pier associated with shoreline quarry
Uncertain
Poor
Monitor

NH 6470 6501
WESTER CULLICUDDEN
Stone pier
Uncertain
Poor
Monitor

NH 641 645
WESTER CULLICUDDEN
Quay and associated quarry
19th/20th century AD
Fair
Monitor

Sites on the Coastal Edge & Foreshore

NH 6367 6422
WESTER CULLICUDDEN
Quay and associated quarry
19th/20th century AD
Poor
Monitor

NH 6319 6382
CASTLE CRAIG
Carved stone gun loop
Late 16th century
Fair
Monitor

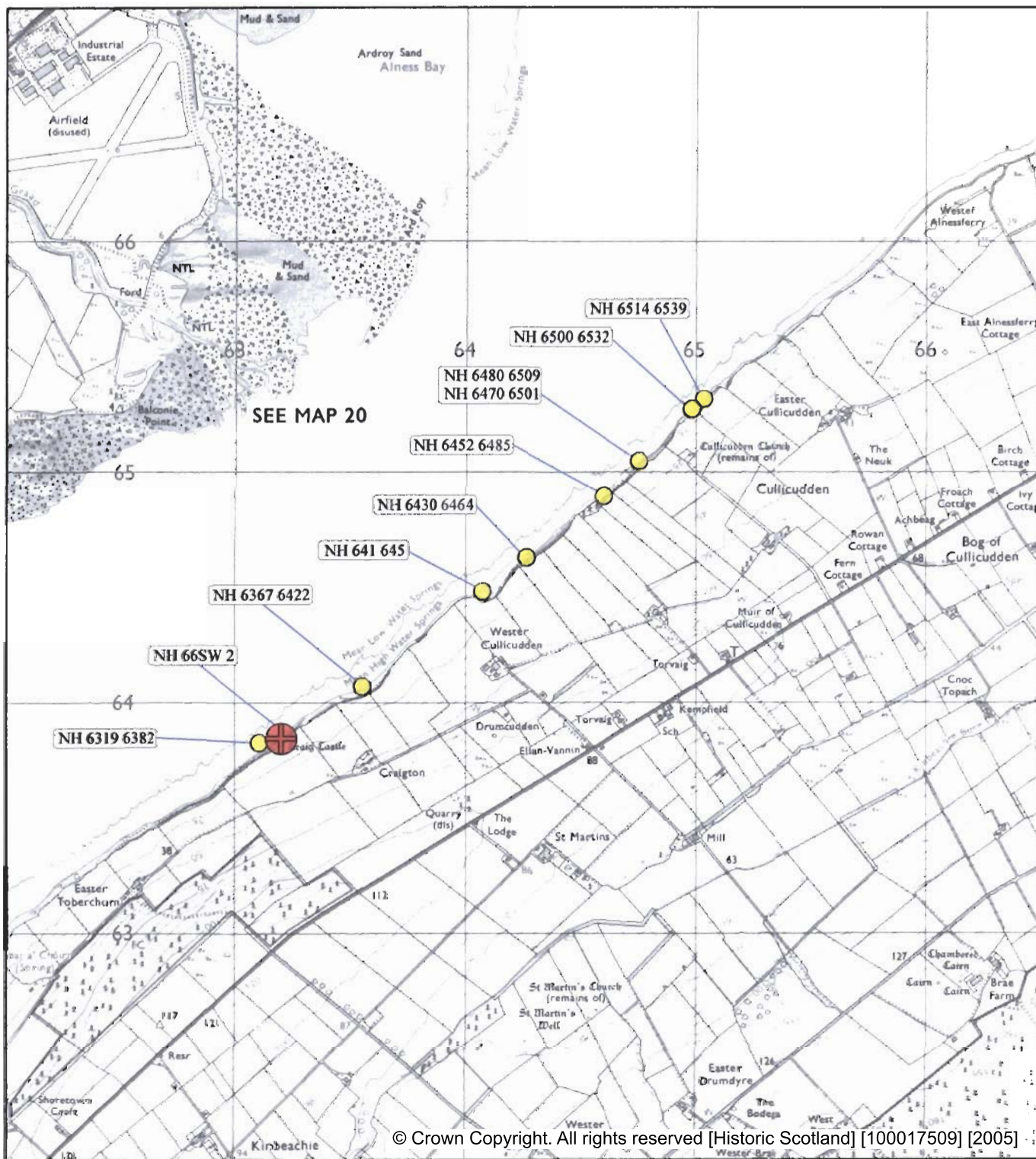
Sites in the Hinterland

NH 6514 6539
EASTER CULLICUDDEN
Quarry
Uncertain
Good
Nil

NH 6452 6485
WESTER CULLICUDDEN
Stone building
Uncertain
Poor
Monitor

NH 6430 6464
WESTER CULLICUDDEN
Stone building
Uncertain
Poor
Monitor

NH66SW 2 - Scheduled & Listed B
NH 6319 6381
CASTLECRAIG
Tower-house
Late 16th century AD
Poor
Monitor



MAP 15: ALNESS FERRY TO EASTER TOBERCHURN 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 62-66/62-67

Basemap: O.S. Pathfinder Series

Sheet 144

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument, or area of designated wreck

Listed Historic Building

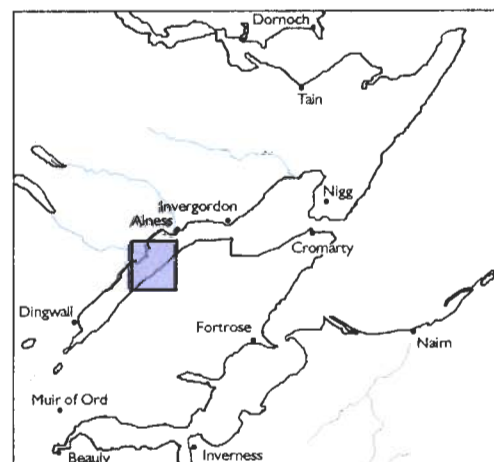
Monument formally proposed by Historic Scotland for scheduling, or wreck for designation

Other known Ancient Monuments, or Undesignated wreck

Designated Landscape

Insufficient information; more work needed

Probably archaeologically sterile



Map 16: EASTER TOBERCHURN TO ALCAIG

Hinterland Geology and Coastal Geomorphology: Middle Old Red Sandstone continues through this section of coastline. Boulder clay and morainic drift deposits form the main cover soils. At Toberchurn two raised beach terraces run parallel with the present shoreline. At Milton three raised beach platforms represent the Main Perth Shoreline, The Main Late-glacial and the Post-glacial marine incursion. These features continue along the Conon river valley. Extensive tidal flats dominate this coastline.

Erosion class: This unit of coastline comprises sections that show evidence of stability with only isolated patches of erosion. This is mainly coincident with exposures of raised beach deposits which have become unstable due to poor vegetation cover. The shoreline is boulder strewn with mud that is accreting on the foreshore as a result of shelter in this low energy wave environment.

Built Heritage and Archaeology: The hinterland archaeology consists of three relatively modern sites; one a ruined building associated with the second 19th century stone quarry. The third site is a possible cairn which was overgrown and difficult to distinguish when recorded. The foreshore archaeology includes the pier for the 19th century Wester Toberchurn to Foulis Ferry, which is in a poor condition, a number of other pier remains and twelve fish traps. These include a complex of four sites near Findon.

Map 16: Hinterland Geology and Coastal Geomorphology

1. EASTER TOBERCHURN to north of
BROOMTOWN WOOD

NH 610 622

km 2.5km

Mud and shingle

Low edge (<10m)

Raised beach and marine deposits

Raised beach deposits continue. Mud and shingle dominate the shoreline.

2. North of BROOMTOWN WOOD to north of
FINDON MAINS

NH 604 613

0.9km

Low edge (m)

Raised beach and marine deposits

Lower reach of the Cromarty Firth with a shoreline dominated by mud and sand. Hinterland geomorphology consists of raised beach deposits.

3. FINDON MAINS to BALCLADAICH WOOD

NH 596 664

Mud/boulders/gravel/tidal flats

2 km

Low edge (<10m)

Raised beach and marine deposits

Lower tidal reach of the Cromarty Firth with a foreshore dominated by mud, boulders and shingle. The hinterland comprises of raised beach deposits. The Cromarty Bridge traverses this coastal unit.

4. BALCLADAICH WOOD to URQUHART

NH 573 582

1 km

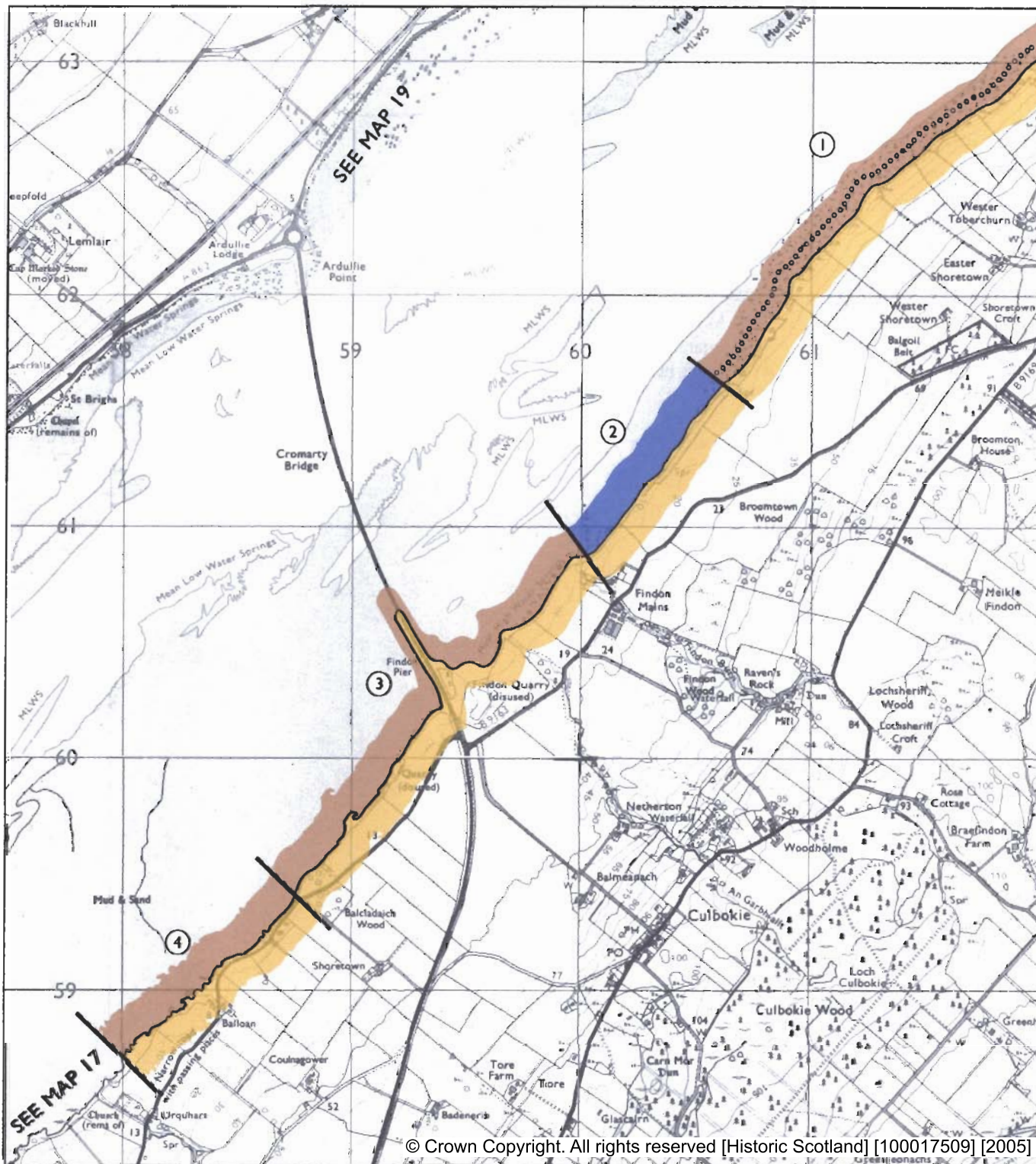
Mud/sand/shingle/tidal flats

Low edge (<10m)

Raised beach and marine deposits

This section forms the lower reach of the Cromarty Firth with an irregular shoreline.

Estuarine mud and shingle dominate the foreshore.



MAP 16: EASTER TOBERCHURN TO ALCAIG 1:25 000
MORAY FIRTH SURVEY Grid ref: NH 58-62/59-63

Basemap: O.S. Pathfinder Series
Sheets 143, 144, 159, 160
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 14 September 1998

Hinterland:

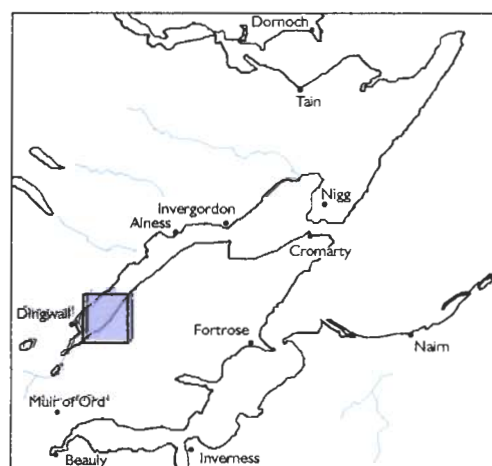
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 16: EROSION

1. CRAIG CASTLE to WEST OF BROOMTOWN WOOD

NH 610 622

3.7 km

Stable or Eroding

This unit of coastline consists of cobbles and shingle banked at the HWM. Slight erosion is occurring along the MHWMS where marine gravel outcrops or where vegetation is poor. The beach becomes sandier offshore but there is no evidence for active erosion.

2. East of BROOMTOWN WOOD to FINDON QUARRY

NH 595604

1.7

Stable or Eroding

A stable foreshore of mud and cobbles. Slight erosion is occurring at the HWM. Rock armouring protects the base of the Cromarty Bridge.

3. South of FINDON PIER to east of SHORETOWN

NH 588 579

0.9km

Definitely Accreting

Localised erosion of raised beach deposits is occurring towards the backshore. Accreting mud flats dominate the foreshore.

4. East of SHORETOWN to BALLOAN

NH 585 595

0.3km

Definitely Eroding

Rubble deposition at the coastal edge attempts to limit the damage from erosion behind the cobble MHW. Mud flats are extensive and show signs of accretion mid way from the shore.

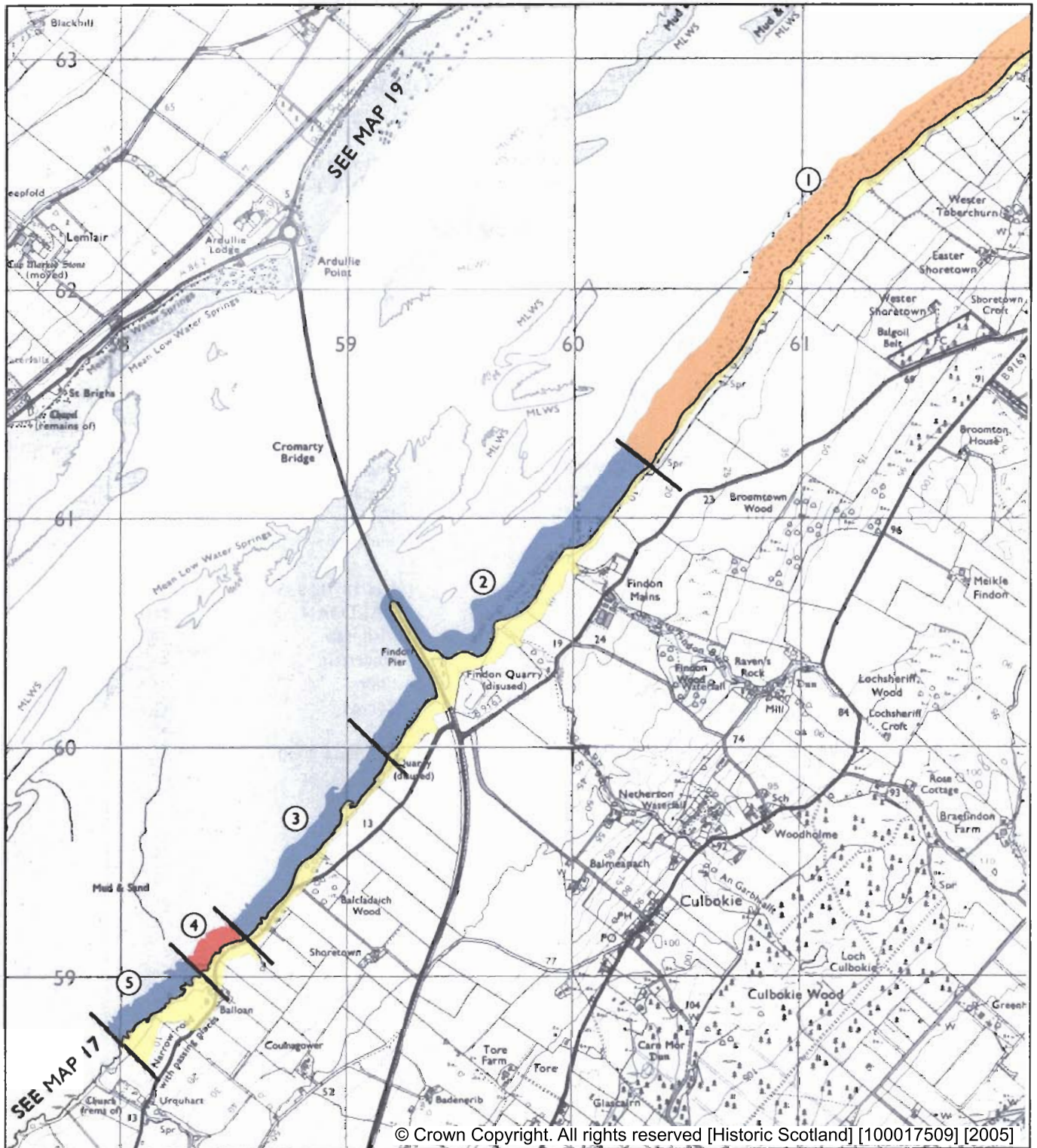
5. BALLOAN to north of URQUART

NH 582 589

0.4

Definitely Accreting

Accreting mud and sand on the foreshore with channels exposed at the LWM. Shingle build up suggests stable conditions.



MAP 16: EASTER TOBERCHURN TO ALCAIG 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 58-62/59-63

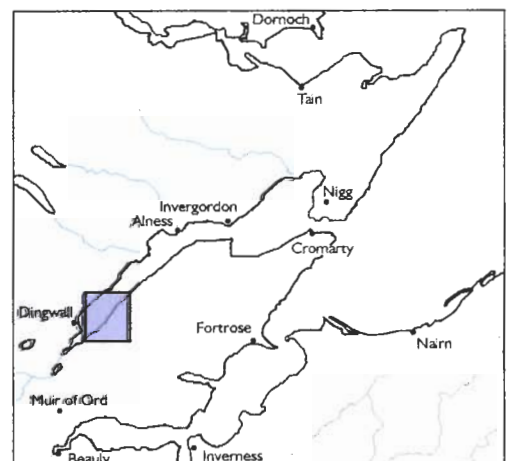
Basemap: O.S. Pathfinder Series
Sheets 143, 144, 159, 160
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EROSION CLASS

Assessment date: 14 September 1998

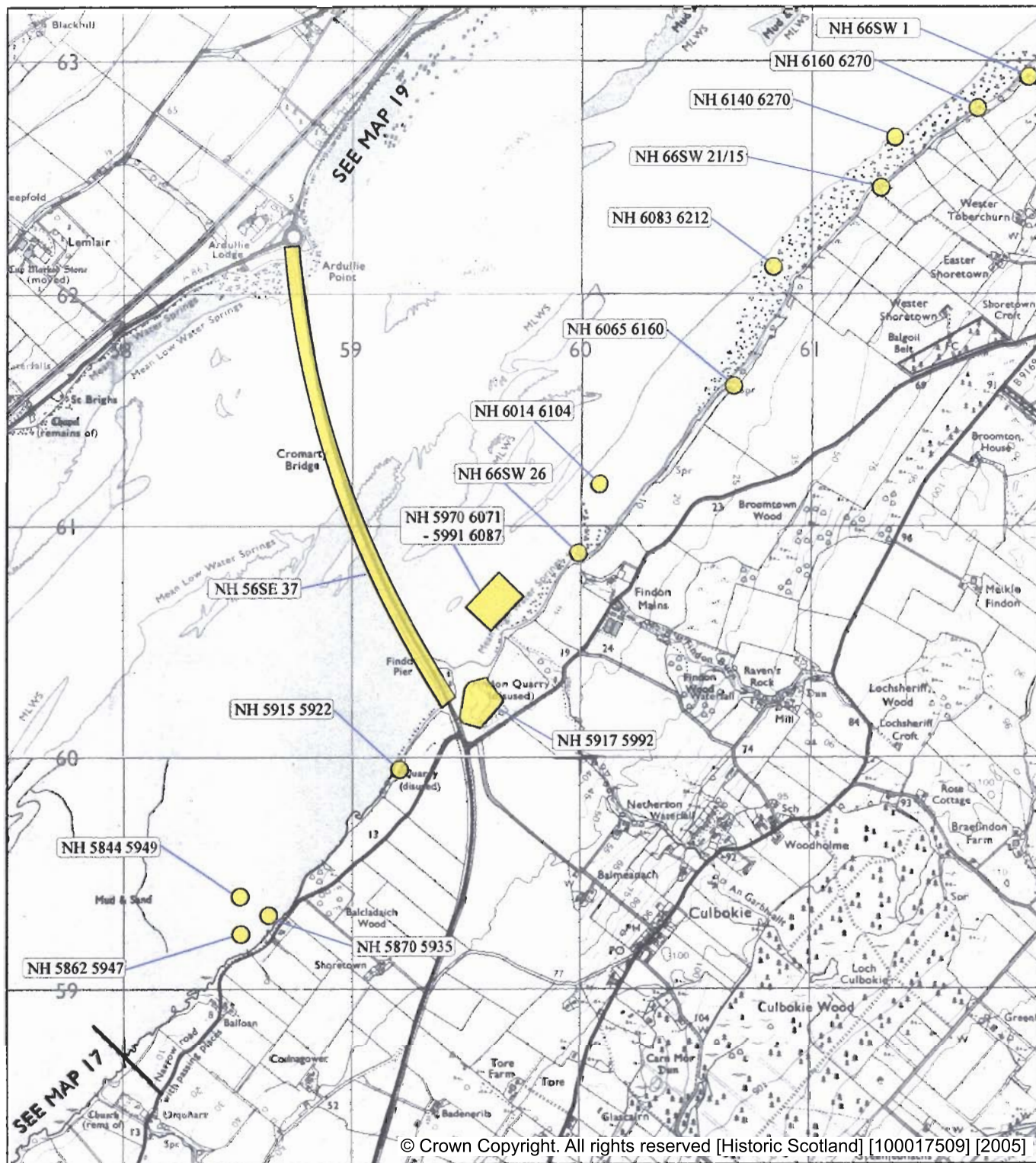
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 16: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites on the Coastal Edge & Foreshore	Sites on the Coastal Edge & Foreshore	Sites in the Hinterland
NH 6160 6270 WESTER TOBERCHURN Stone pier Uncertain Poor Monitor	NH 5970 6071 to 5991 6087 FINDON 4 fish traps Uncertain Poor Survey	NH56SE 37 NH 5921 6063 CROMARTY BRIDGE Road bridge 20 th century Good Nil	NH66SW 1 NH 6195 6292 TOBERCHURN Cairn (possible) Uncertain Poor Monitor
NH 6140 6270 WESTER TOBERCHURN Fish trap Uncertain Poor Survey	NH56SE 37 NH 5921 6063 CROMARTY BRIDGE Road bridge 20 th century Good Nil	NH 5915 5922 BALCLADAICH Possible fish trap Uncertain Fair Survey	NH6065 6160 BROOMTOWN WOOD Ruined building associated with a quarry Uncertain Poor Monitor
NH64NW 28 - Scheduled & Listed C NH 6447 4673 CLACHNAHARRY Caledonian Canal; sea lock & lock keeper's cottage 19 th century AD Good Nil	NH 5915 5922 BALCLADAICH Possible fish trap Uncertain Fair Survey	NH 5870 5935 BALLOAN Fish trap Uncertain Poor Survey	NH 5917 5992 FINDON Quarry 19 th century AD Good Nil
NH 6131 6247 WESTER TOBERCHURN Pier of Foulis Ferry 19 th century AD or earlier Poor Monitor	NH 5870 5935 BALLOAN Fish trap Uncertain Poor Survey	NH 5844 5949 BALLOAN Fish trap Uncertain Poor Survey	
NH 6083 6212 WESTER SHORETOWN Fish trap Uncertain Poor Survey	NH 5862 5947 BALLOAN Fish trap Uncertain Poor Survey	NH 5862 5947 BALLOAN Fish trap Uncertain Poor Survey	
NH 6014 6104 FINDON MAINS Pier Uncertain Poor Monitor	NH 5844 5949 BALLOAN Fish trap Uncertain Poor Survey		
NH66SW 26 NH 6000 6083 FINDON MAINS Boathouse foundations Uncertain Poor Monitor	NH 5722 5859 OLD FERINTOSH Fish trap Uncertain Poor Survey		



MAP 16: EASTER TOBERCHURN TO ALCAIG 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 58-62/59-63

Basemap: O.S. Pathfinder Series
Sheets 143, 144, 159, 160
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile



Map 17: ALCAIG TO DINGWALL

Hinterland Geology and Coastal Geomorphology: This section forms the macro-tidal head of the Cromarty Firth. The basement geology to Conon Bridge is Middle Old Red Sandstone. Drift lithologies are predominantly boulder clay and morainic drift. Towards Conon Bridge the three aforementioned marine incursions are represented and marine terraces are present at Dingwall. The Conon floodplain is comprised of alluvium and colonised with alder carr. Towards the outer basin of the river sinuous bends and mid channel shoals traverse extensive mud flats that dominate the intertidal area.

Erosion class: This section of the estuary is very sheltered. The upper reach of the River Conon is managed by a hydro-electrical company and the sediment load is likely to vary according to the requirements of the industry. At the time of the survey, flotsam was extensive on the outer shoals of the mudflats. Alteration to the configuration of the sinuous channels are impacting on the intertidal archaeology (see SMR NH 55 NE013 at NH 5619 5818 map sheet 17). Extensive accretion is evident up to the MHWL where mud meets the stable foreshore.

Built Heritage and Archaeology: The foreshore sites in this area include evidence of the 19th century Alcaig to Dingwall ferry, such as the ferry pier, causeway and wooden jetty posts. The multitude of sites indicate a dynamic environment in which sites are both damaged by coastal erosion and rendered unusable due to silting and accretion. On the northern shoreline four salmon bothies were recorded all in poor states of repair. This area of the firth was used as a ferry route prior to the construction of the railway to Dingwall in the late 19th century, consequently the area contains a number of sites pertinent to the ferry. The mid-channel features require future monitoring using a boat for access.

Map 17: Hinterland Geology and Coastal Geomorphology

1. URQUHART to TIGHNAHINCH

NH 570580

1.7km

Estuarine mud/tidal flats

Low edge (<10m)

Raised beach and marine deposits

Outer tidal reach of the River Conon. The foreshore consist of mud flats. The hinterland has a low irregular edge consisting of marine sand and gravel. A low raised sea cliff is present.

2. TIGHNAHINCH to south west of ALCAIG

NH 564 576

2.8km

Estuarine mud/tidal flats

Low edge (<10m)

Raised beach and marine deposits

Irregular coastline towards the head of the Cromarty Firth. Raised beach deposits dominate the hinterland.

3. West of ALCAIG to CONON BRIDGE

NH 553 565

1.3km

Saltmarsh/tidal creeks

Low edge (<10m)

Raised beach and marine deposits

Head of the Cromarty Firth with a foreshore dominated by saltmarsh and tidal creeks. Raised beach deposits are present within the hinterland. The land behind is low lying.

4. CONON BRIDGE to south of PITGLASSIE

NH 550 570

1.2km

Estuarine mud/saltmarsh/tidal creeks

Low edge (<10m)

Carse clays over marine deposits

The foreshore is colonised by salt marsh and estuarine mud. Tidal creeks present. Flood banks protect the hinterland.

5. South of PITGLASSIE to DINGWALL HARBOUR (disused)

NH 558 580

1.3

Estuarine tidal mud flats/tidal creeks

Low edge (<0m)

Estuarine clay over marine sand and gravel

North shore of head of Cromarty Firth forming the arm of a cusped triangular headland. Defended by flood banks the hinterland is low lying carse clay overlying marine sand and gravel. The foreshore consists of mud and shingle.

6. DINGWALL HARBOUR to north of

DINGWALL

NH 555 597

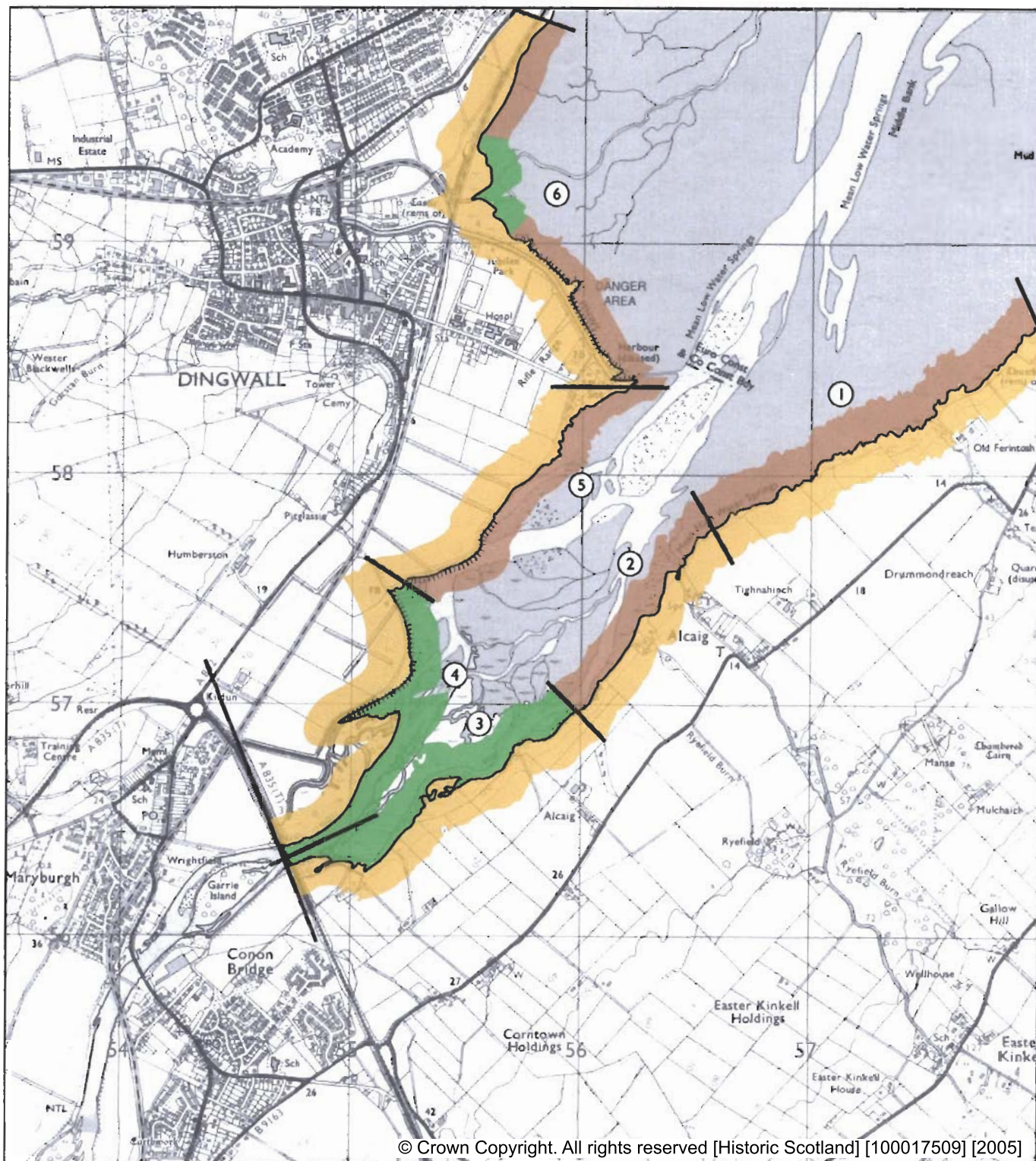
1.8km

Tidal mud flats

Low edge (<10m)

Marine deposits

Marine sands and gravel underlie carse clays within the hinterland that is low lying and developed. This unit incorporates the canalised channel for the disused harbour with saltmarsh formation towards the town of Dingwall. Estuarine mud flats continue.



MAP 17: ALCAIG TO DINGWALL

MORAY FIRTH SURVEY Grid ref: NH 54-58/55-60

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 159

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 14 September 1998

Hinterland:

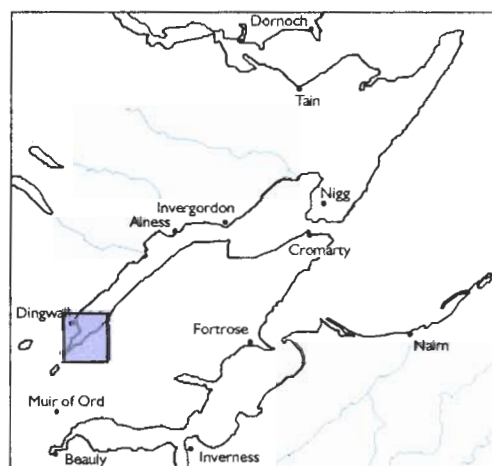
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 17: EROSION

1. North east of URQUART

NH 579 587

0.2km

Both Accreting and Eroding

This unit has exposed bedrock with accreting mud forming extensive mud flats. Sandstone is locally exposed and is being eroded by wave action albeit at a slow rate.

2. URQUART to north of TIGHNAHINCH

NH 576 584

1km

Definitely Accreting

Irregular unit of coastline with accreting mud flats. Shingle is banking up at the MHWL suggesting that conditions are relatively stable.

3. North of TIGHNAHINCH to North of

ALCAIG

NH 564 578

1.6km

Definitely Accreting

This unit shares the same characteristics as its neighbouring units with mud accretion on the expansive tidal flats. Conditions appear to be stable owing to the amount of shingle that is accumulating at the MHWL.

4. ALCAIG

NH 557 569

0.8km

Definitely Accreting

Mud and shingle is accreting with a trend towards increased alluvial deposition released from the River Conon where alluvial deposits. The large quantity of driftwood suggests that sediment loading is active along the tributaries leading from the main river channel. Saltmarsh vegetation lends increased stability at the HWM.

5. South west of ALCAIG

NH 554 566

0.1km

Definitely Eroding

Flood terrace formation effected by slope failure where coarse deposits is effected by wave action. Defoliation of saltmarsh vegetation appears to be a crucial factor in controlling in the speed of active erosion.

6. South west of ALKAIG to south east of

PITGLASSIE

NH 551 570

1.3km

Definitely Accreting

This unit consists of the mouth of the Conon River. The riverbanks are stabilised by saltmarsh vegetation and wooded with alder carr behind which lie earthwork flood banks. Channels are accreting with alluvium derived from further upstream.

7. South east of PITGLASSIE to DINGWALL

HARBOUR

NH 561 580

1.5km

Definitely accreting

As with unit 7 above mud deposition is at present accreting on the foreshore. The main river channel is at present c. 50m offshore and migrating northwards. This is leading to the loss of sediment by undercutting and effecting the remains of a fishtrap (See record ****). The shoreline is armoured for much of this unit, particularly towards the recreation area adjacent to the disused harbour.

8. DINGWALL HARBOUR towards north east

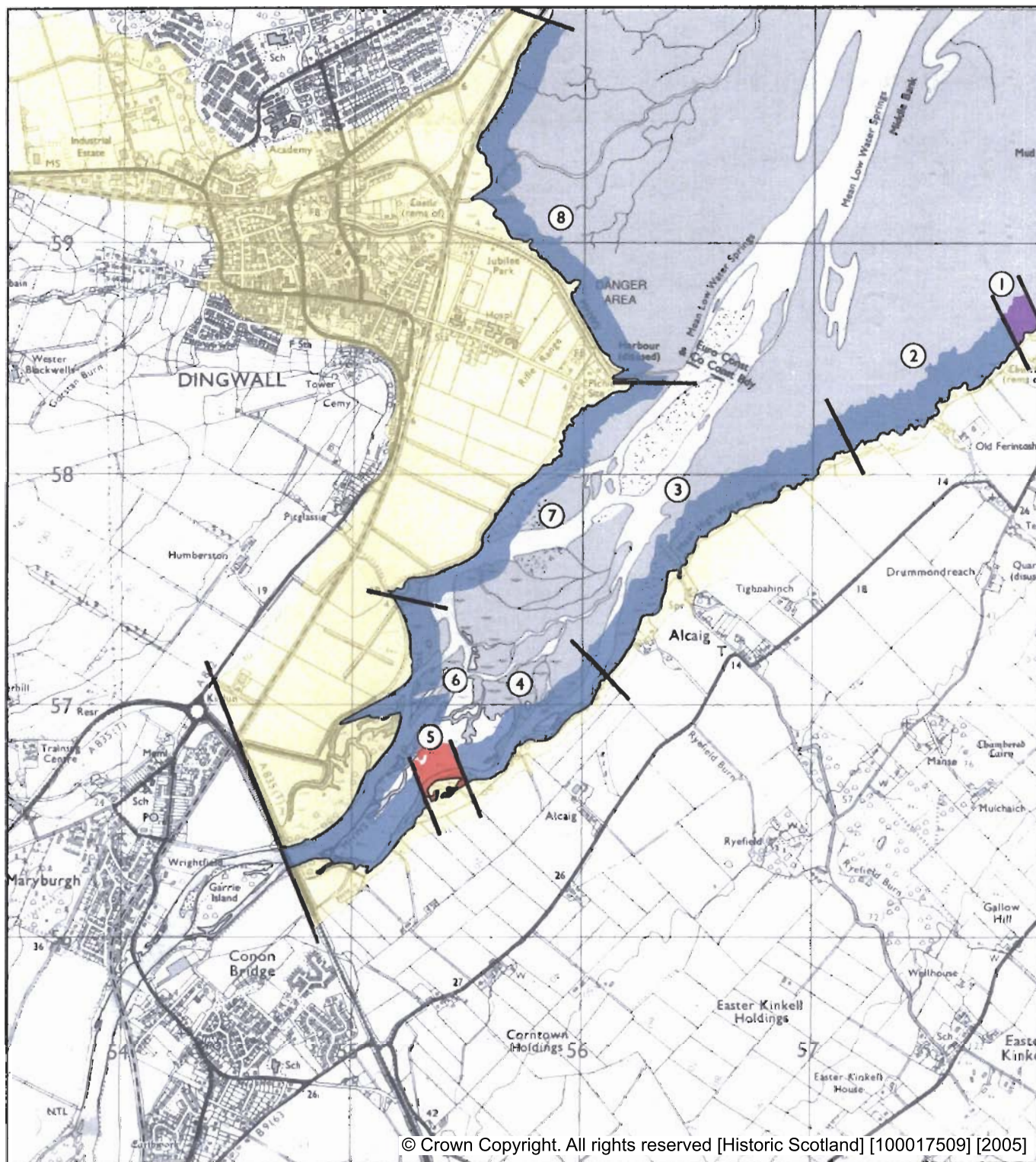
DINGWALL

NH 559 590

2km

Definitely accreting

Saltmarsh and flood defences traverse this unit of coastline. Mud is accreting on the foreshore.



MAP 17: ALCAIG TO DINGWALL
MORAY FIRTH SURVEY Grid ref: NH 54-58/55-60

1:25 000

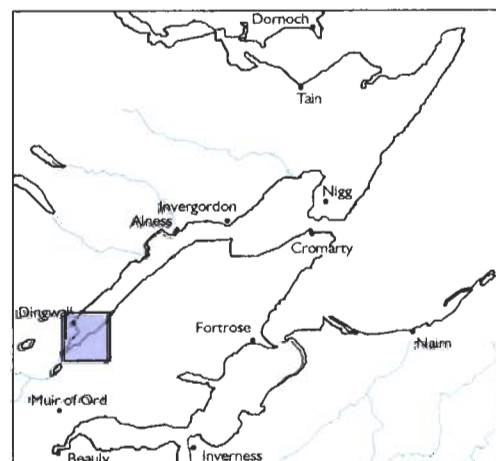
Basemap: O.S. *Pathfinder* Series
Sheet 159
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EROSION CLASS

Assessment date: 14 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 17: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH55NE 27
 NH 5638 5762
 ALCAIG
 Pier for Alcaig-Dingwall ferry
 19th century AD
 Fair
 Monitor

NH 5638 5745
 ALCAIG
 Stone causeway
 Uncertain
 Poor
 Monitor

NH 5555 5768
 PITGLASSIE
 Wooden jetty posts
 Uncertain
 Poor
 Monitor

NH 5574 5785
 PITGLASSIE
 Timber mooring posts
 Uncertain
 Poor
 Monitor

NH 5722 5859
 OLD FERINTOSH
 Fish trap
 Uncertain
 Poor
 Survey

NH 5582 5803
 DINGWALL
 Wooden pier
 Uncertain
 Poor
 Monitor

NH 5580 5800
 DINGWALL
 Stone and timber jetty
 Uncertain
 Poor
 Monitor

Sites on the Coastal Edge & Foreshore

NH 5620 5765
 DINGWALL
 Stone mound, possible beacon stance
 Uncertain
 Poor
 Monitor

NH 5587 5814
 DINGWALL
 Landing-place for Alcaig-Dingwall ferry
 18th/19th century AD
 Poor
 Monitor

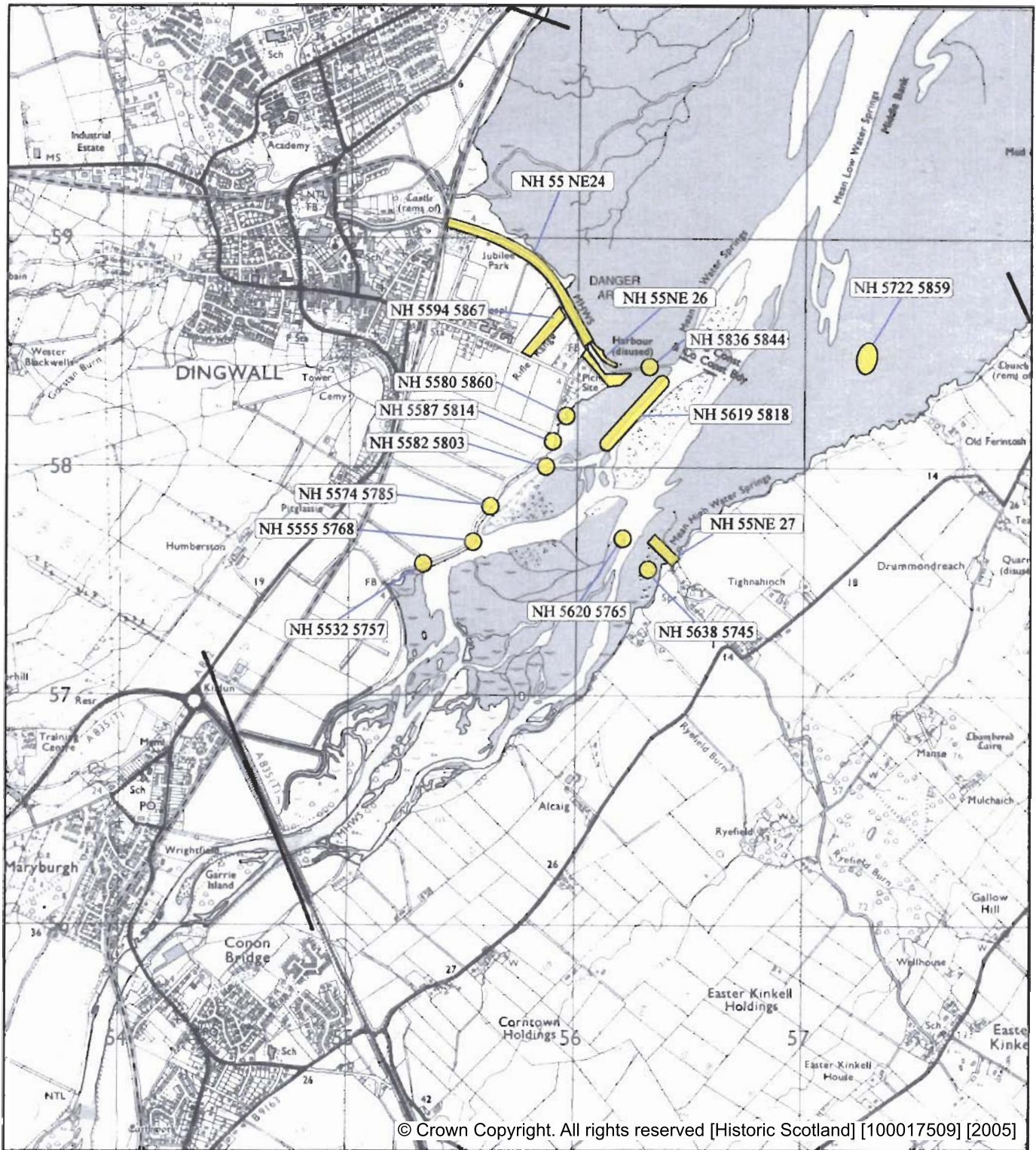
NH 5600 5827
 DINGWALL
 Timber jetty posts
 Uncertain
 Poor
 Monitor

NH 5619 5818
 DINGWALL
 Fish trap
 Uncertain
 Fair
 Survey and Monitor

NH 5636 5844
 DINGWALL
 Beacon stances
 19th century AD
 Poor
 Monitor

Sites in the Hinterland

NH 5532 5757
 PITGLASSIE
 Four salmon bothies
 20th century AD
 Poor
 Monitor



MAP 17: ALCAIG TO DINGWALL

MORAY FIRTH SURVEY Grid ref: NH 54-58/55-60

BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

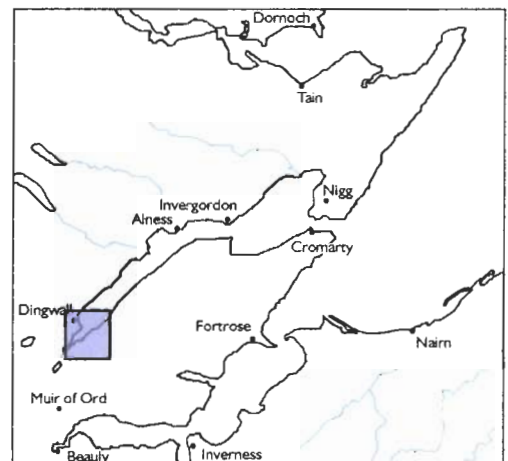
 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 159
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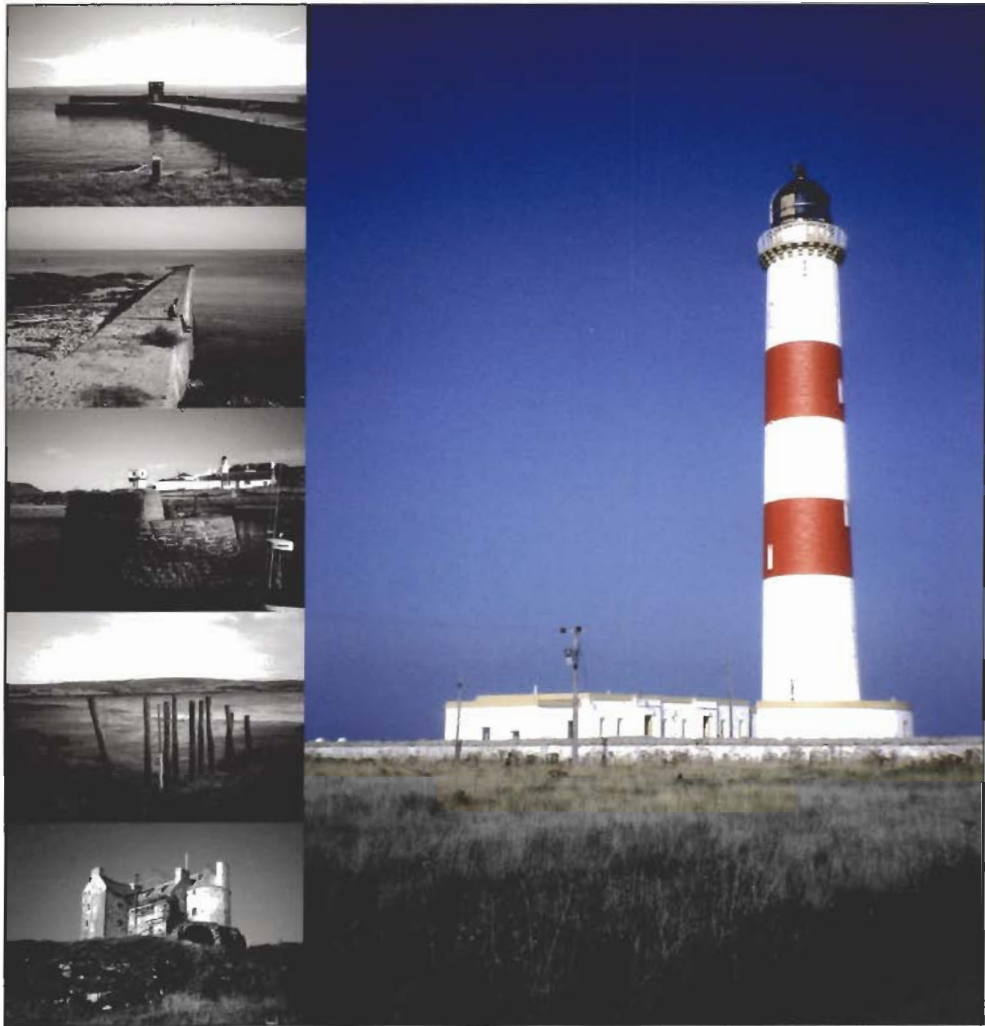
Coastal Assessment Survey Inner Moray Firth

Dingwall to Tarbat Ness

September 1998

VOLUME 2

Map sets 18-31



a report for
HISTORIC SCOTLAND



by the
CENTRE *for* FIELD ARCHAEOLOGY



Map 18: DINGWALL TO ARDULIE POINT

Hinterland Geology and Coastal Geomorphology: Middle Old Red Sandstone forms the basement geology in this unit of coastline. This is overlain by boulder clay and undifferentiated glacial drift deposits. Marine deposits are represented by two raised beaches at Arduilie Point. Here a small foreland forms the northern limit of the Cromarty Bridge crossing. The intertidal environment is dominated by tidal mudflats. Shingle and boulders continue the length of this unit and the foreshore narrows here in contrast to the proceeding coastal unit. The hinterland rises sharply away from the Cromarty estuary.

Erosion class: The sheltered position of this unit promotes stability with accretion of mud and shingle on the foreshore. At Arduilie point the bridge abutments and the flanking shoreline are defended by rock armour. The most notable section suffering erosion is the cliff at the ruin of St Brigh's Chapel (NH 577 615). An exposed section of cliff is seriously eroding exposing the buildings fabric. Exposed within the cliff is laminated marine sand and shingle. Attempts to stabilise the cliff edge have been made using seeded netting.

Built Heritage and Archaeology: The western foreshore sites in this area are the north shore complement to those on the preceding map. They consist of timber and stone remains associated with the Dingwall to Alcaig ferry which are possible beacon stances to aid navigation. They also include some fish trap sites, including one at LWM which consists of numerous wooden posts interwoven with wattling. This degree of preservation demonstrates the preservative nature of the intertidal sediments, however, where the post and wattle work are exposed they are prone to erosion by both water and the sediment load. The hinterland archaeology is varied and includes the Dingwall harbour and canal, designed by Telford, linking the former with the navigable channel in the Firth. At the mouth of the canal are the remains of the navigation beacon stances. North east of Dingwall is the Mountrich shell midden complex, situated on the top of a raised sea beach feature and prone to terrestrial weathering. At Lemlair the 12th century St. Brighs chapel and associated burial ground was recorded as being under active coastal erosion and during the survey a number of possible human bones was found on the foreshore below the site.

Map 18: Hinterland Geology and Coastal Geomorphology

1. East of DINGWALL TOWN to ST BRIGHS

NH 573 614

3.3km

Tidal mud flats

Low cliff (10-15m)

Raised beach and marine deposits

This unit comprises a linear stretch of estuarine coast with predominantly raised beach deposits on the hinterland. The foreshore consists of estuarine tidal flats with boulders at the MHWS mark.

2. ST BRIGH'S to ARDULLIE POINT

NH 589 626

2.6km

Mud flats/shingle

Low cliff (10m)

Raised beach and marine deposits

This coastal cell incorporates Arduvie Point a small headland forming the north side of the Cromarty Bridge. The foreshore consists of mud flats. The hinterland behind rises steeply and comprises raised beach deposits.

MAP 18: EROSION

1. CRAIG WOOD to MOUNTRICH

NH 562 604

0.7km

Accreting or stable

Defended coastal edge with saltmarsh communities stabilising the backshore area.

Shingle and mud are accreting on the foreshore.

2. MOUNTRICH

NH 565 606

c. 12-15m

Definitely eroding

Eroding saltmarsh at HWM with cobbles and mud exposed to the low watermark where conditions are accreting.

3. MAINS of MOUNTGERALD

NH 570 610

1.3km

Accreting or stable

Stable cobble and mud beach with extensive mudflats. Boulder dump sea defence protects the coastal edge and the A862 trunk road.

4. St BRIGH'S CHAPEL (RUIN)

NH 577 615

c. 75m

Definitely eroding

The c.3m high gravel and sand cliff is seriously eroding exposing the building fabric of the chapel.

Recently attempts have been undertaken to stabilise the top of the cliff using matting and grass seeding. Erosion is extensive along this section of shoreline owing to the lack of hard defences.

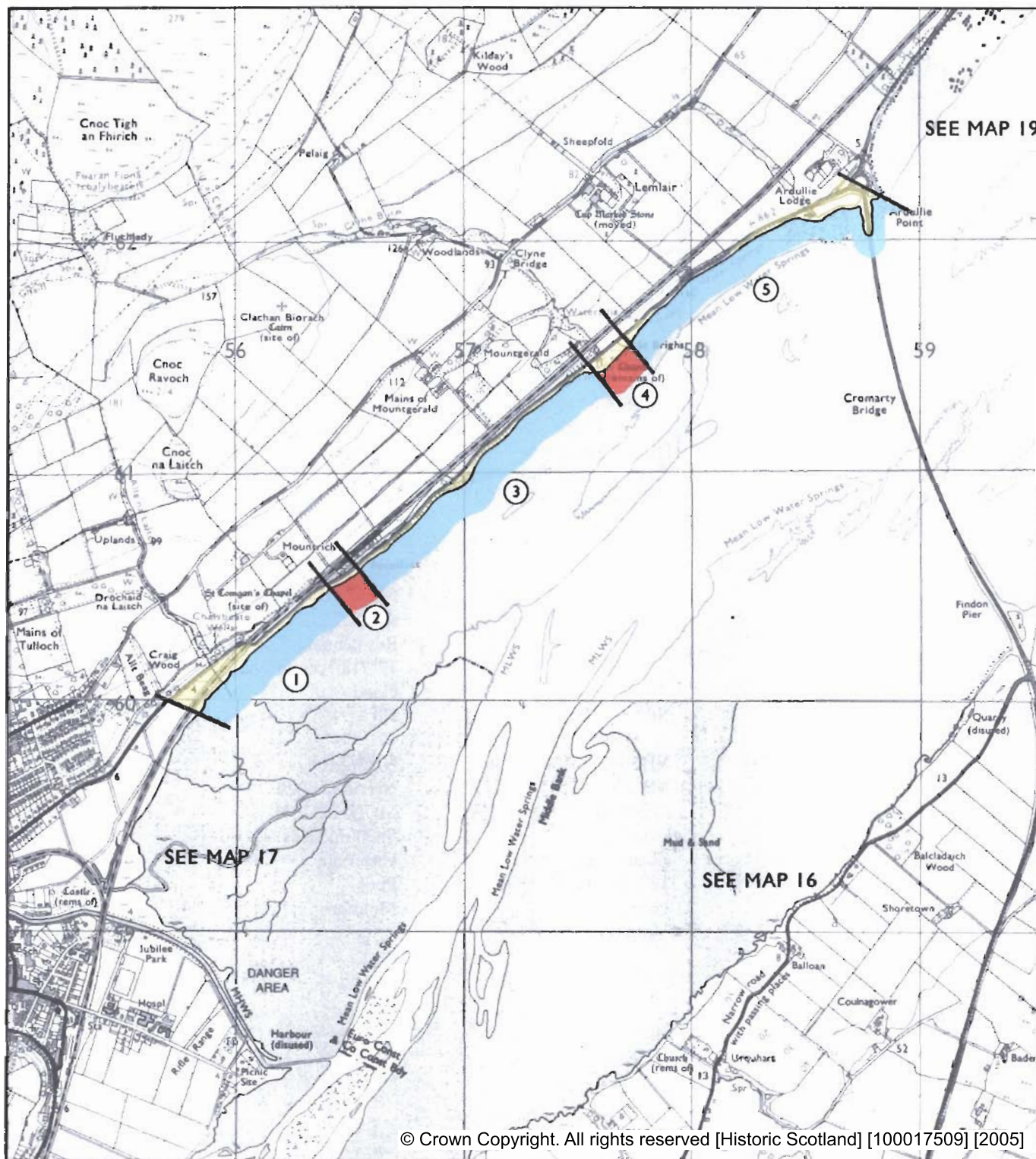
5. St BRIGH'S CHAPEL to ARDULIE POINT

NH 585 621

1.2km

Accreting or stable

This unit is defended by quarried stone to protect the A862 road and the headland of Ardulie Point that holds the northern piers of the Cromarty Bridge. The foreshore is accreting mud, cobbles and mud that are extensively exposed at the LWM.



MAP 18: DINGWALL TO ARDULIE POINT

MORAY FIRTH SURVEY Grid ref: NH 55-59/58-63

1:25 000

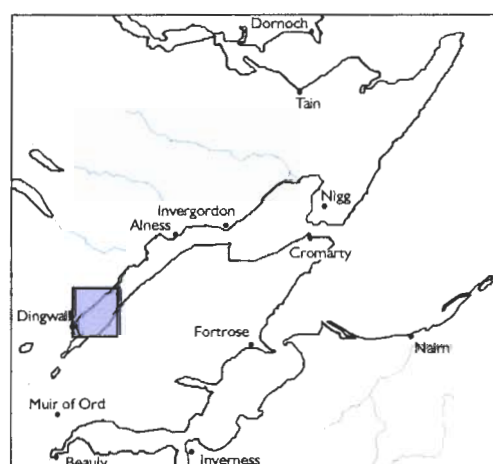
Basemap: O.S. Pathfinder Series
Sheets 143 & 159
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EROSION CLASS

Assessment date: 15 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 18: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 5720 6060
MOUNTGERALD
Complex fish trap
Uncertain
Poor
Survey

NH 5755 6140
MOUNTGERALD
Double fish trap
Uncertain
Good
Survey and monitor

NH 5880 6215
ARDULLIE LODGE
Wooden breakwater
20th century AD
Poor
Nil

Sites in the Hinterland

NH55NE 26
NH 5612 5848
DINGWALL
Harbour (disused)
18th/19th century AD
Poor
Monitor

NH55NE 24
NH 5494 5908 - 5615 5842
DINGWALL, River Peffrey
Canal designed by Telford
19th century AD; 1803-21
Fair
Nil

NH 5594 5867
DINGWALL
Firing range
20th century AD
Good
Nil

NH56SE 3 - Scheduled
NH 5765 6150
LEMLAIR, ST. BRIGHS
CHAPEL
Chapel; burial ground
12th century AD or earlier
Poor
Monitor

Sites in the Hinterland

NH56SE 20
NH 5772 6155
CILLE BHREA, St Brighs
Residential house
18th/19th century AD
Good
Nil

NH 5786 6170
LEMLAIR
Rectilinear structures
Uncertain
Good
Survey

NH56SE 21
NH 5861 6232
ARDULLIE LODGE
Residential house; designed
17th/18th century AD
Good
Nil

NH56SE 6
NH 5602 6029
MOUNTRICH
Shell middens
Uncertain
Poor
Monitor

Map 19: ARDULIE POINT TO BALCONIE POINT

Hinterland Geology and Coastal Geomorphology: Old Red Sandstone continues to underlie the drift deposits of mainly marine derived sand and gravel. Raised beach features continue eastwards along this unit of coastline. The narrower coastal plateau gives way to a broader expanse of marine modified landscape. Towards Balconie Point, freshwater alluvium has formed an outwash fan that is incised by river channels. The hinterland is low lying below 10m OD. Intertidal flats become much more extensive towards Alness Bay.

Erosion class: From Arduilie Point to Foulis Point conditions at the foreshore appear to be stable. The unit between Foulis Point to the west of Kiltearn Cottage is defended by rock armour and is stable. New gabion baskets have been placed at the cliff near Kiltearn Cottage and lend stability to the soft coastal edge. At NH 6232 6528 extensive rubble armouring has been dumped over derelict wooden sea defences but this material is being eroded by overtopping. Rabbits infest this soft shoreline and are exacerbating the problem. At Balconie Point the sea cliff is eroding and the softer merse deposits at the backshore are eroding due to wave hammer and overtopping on MHWS tides. Offshore conditions are stable with mud accreting on the tidal flats.

Built Heritage and Archaeology: The first site recorded on this area of the survey was the Cromarty road bridge. On the north east side of the bridge were two herring boat hulks that had been abandoned in the intertidal zone. Foulis Point was an important 18th and 19th century landing place and this was confirmed by the hulks on the north east shore of the point and the siting of a grain ginal, which has recently opened as a public heritage centre. The hinterland sites at Kiltearn indicate that the area was an important 18th and 19th century religious centre. Beneath a modern levee a wooden drainage trough was found associated with a small pond beneath the parish church. The fishing station on Balconie Point was built to represent a chapel.

Map 19: Hinterland Geology and Coastal Geomorphology

1. ARDULLIE POINT to FOULIS POINT

NH 592630

Mud, sand and shingle

1.9km

Low cliff (10m)

Raised beach deposits

Mud and shingle dominate the foreshore. Raised beach deposits cover the hinterland.

2. FOULIS POINT to KILTEARN COTTAGE

NH 605 645

Mud, sand and shingle

2.9km

Low cliff (10m)

Raised beach deposits

Irregular coastal edge with a foreshore of mud and shingle. The hinterland consists of raised beach deposits, which support pasture.

3. KILTEARN COTTAGE to BALCONIE POINT

NH 619 652

Mud and sand

1.5km

Low edge (10m)

Alluvium

Promontory at the head of two rivers. The hinterland consists of freshwater alluvium below 10m OD. The foreshore is mud and sand with boulders and shingle. River channels are visible at low water.



MAP 19: ARDULIE POINT TO BALCONIE POINT 1:25 000
MORAY FIRTH SURVEY Grid ref: NH 59-63/62-67

Basemap: O.S. Pathfinder Series
Sheets 143 & 144
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 15 September 1998

Hinterland:

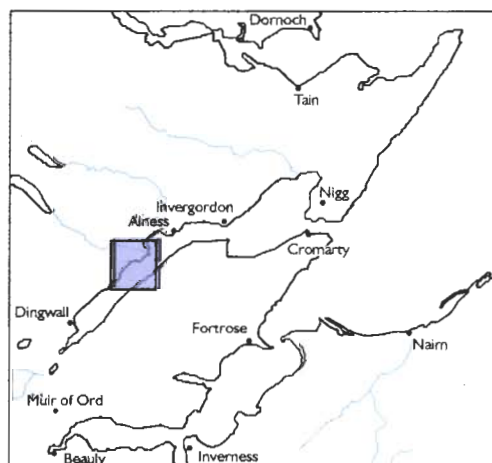
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 19: EROSION

1. ARDULIE POINT to FOULIS POINT

NH 592 630

1.6km

Accreting or stable

From Cromarty Bridge to Foulis Point the coastal protection continues as in the previous unit. The foreshore appears to be stable with occasional large boulders, cobbles and mud.

2. FOULIS POINT to south of KILTEARN COTTAGE

NH 655 644

1km

Stable or Eroding

This unit of coastline appears to be fairly stable with very localised patches of erosion on the foreshore where shingle is exposed and prone to displacement. Sea defences is lending stability to the backshore region.

3. South of KILTEARN COTTAGE to BALCARSE POINT

NH 620 650

1.9km

Definitely Accreting

New Gabion baskets have been placed along the shore west of Kiltearn church. Sediment loading is leading to accretion within the region of the river Sgitheach. Rubble dumping is extensive at NH 6232 6528 where the soft marine sand and gravel deposits are eroding by both overtopping and rabbit warrens. On the beach, conditions appear to be stable with mud and shingle accretion.

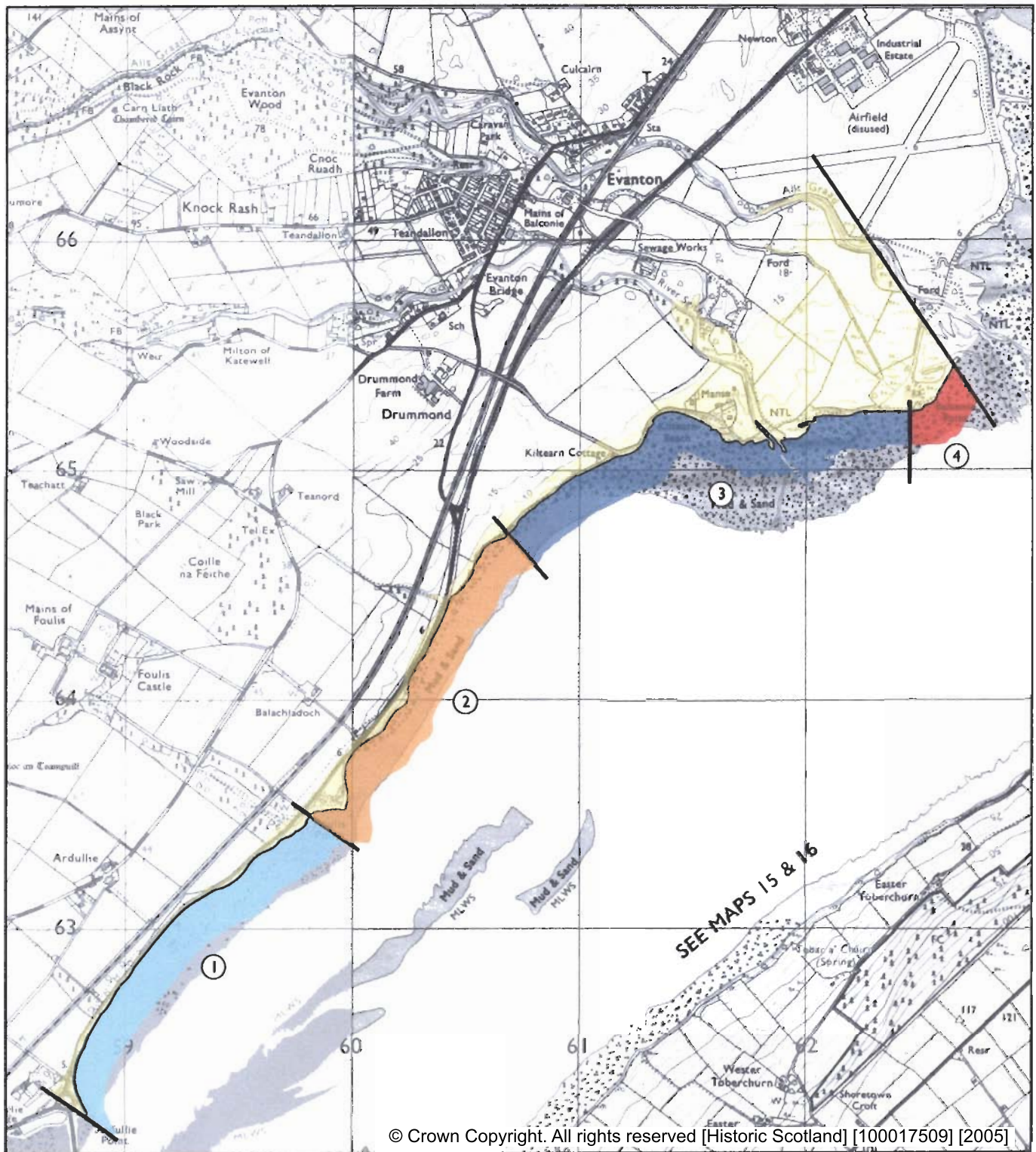
4. BALLONIE POINT

NH 626 653

0.2km

Definitely Eroding

The cliff is eroding in places and the softer merge deposits failing as a result of scouring at the low water mark. Rubble sea defence continues through this unit but their effectiveness appears to be poor.



MAP 19: ARDULIE POINT TO BALCONIE POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 59-63/62-67

Basemap: O.S. Pathfinder Series

Sheets 143 & 144

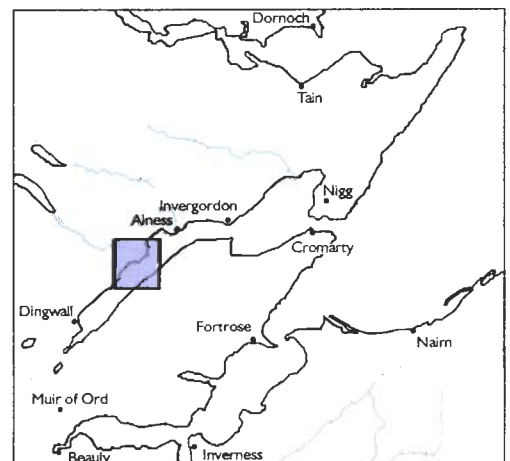
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EROSION CLASS

Assessment date: 15 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 19: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH56SE 8550
NH 5895 6235
ARDULLIE POINT
Two abandoned herring boats
20th century AD
Poor
Survey and monitor

NH 5992 6335
FOULIS POINT
Fish trap
Uncertain
Poor
Survey

NH 5971 6340
FOULIS POINT
Stone pier
Uncertain
Poor
Monitor

NH56SE 25
NH 5998 6359
FOULIS POINT
Ferry; landing-place
18th/19th century AD
Good
Nil

NH 5998 6371
FOULIS POINT
Two hulks
Uncertain
Poor
Survey and monitor

NH 6025 6390
DRUMMOND
Stone alignments
Uncertain
Fair
Nil

Sites on the Coastal Edge & Foreshore

NH 6060 6470
DRUMMOND
Stone walling
Uncertain
Poor
Monitor

NH 612 650 - 616 650
KILTEARN BEACH
Fish trap
Uncertain
Poor
Survey

NH 6167 6518
KILTEARN
Wooden trough and associated pond
Uncertain
Poor
Survey and Monitor

NH 6232 6527
BALCONIE POINT
Fishing station (designed to look like a chapel)
Uncertain
Poor
Monitor

NH 6261 6529
KILTEARN BEACH
Fish trap
Uncertain
Poor
Survey

NH 6250 6552
BALCONIE POINT
Wall / levee
19th century AD
Fair
Nil

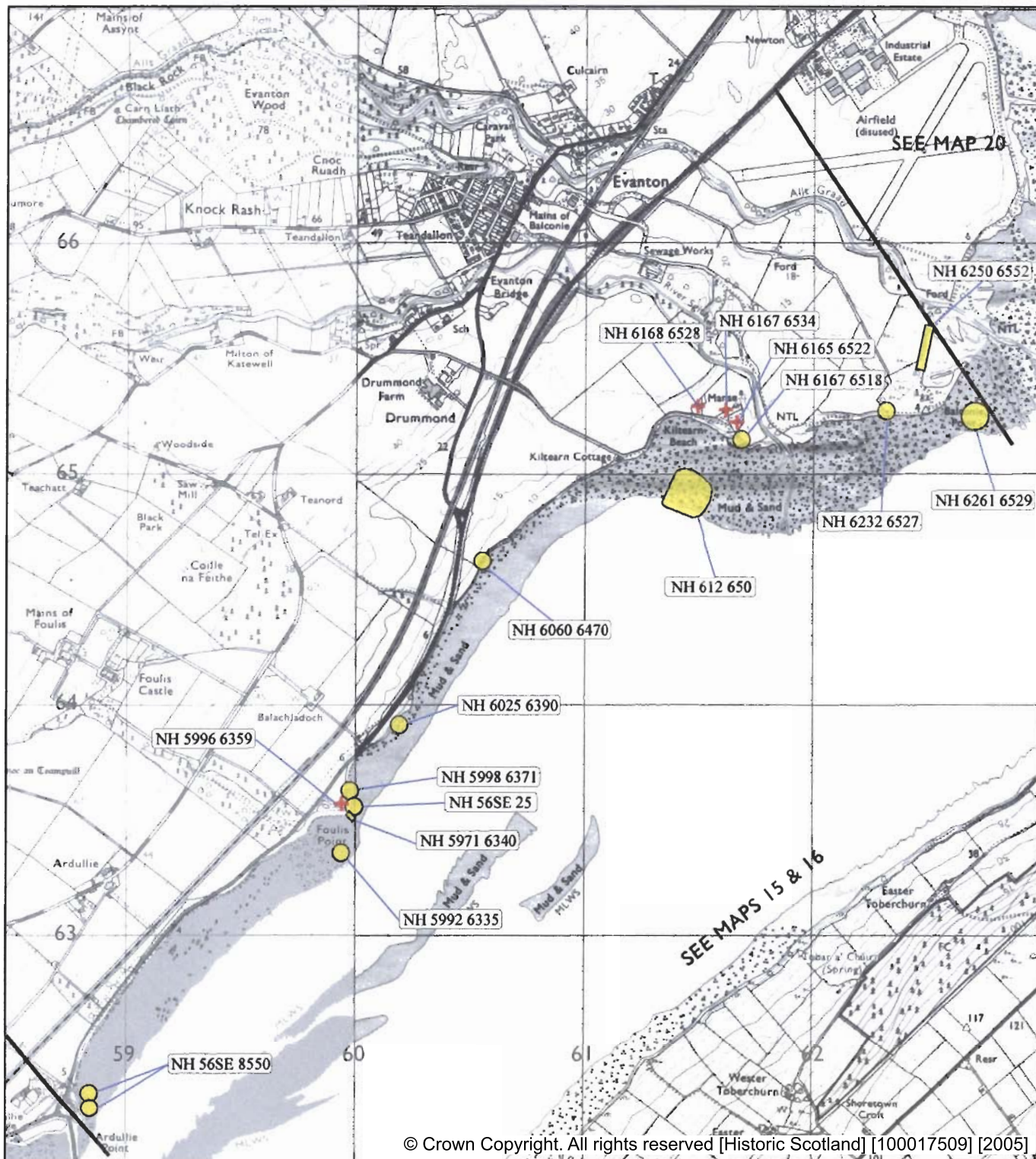
Sites in the Hinterland

NH56SE 19 - Listed C
NH 5996 6359
FOULIS POINT
Girnal
18th century AD
Good
Nil

NH66NW 1 - Listed B
NH 6165 6522
KILTEARN
Parish church
Built 1791
Poor
Monitor

NH66NW 48 - Listed B
NH 6168 6528
KILTEARN, Parish Manse
Steading
18th/19th century
Good
Nil

NH66NW 25 - Listed C (S)
NH 6167 6534
KILTEARN, Parish Manse
Barn
18th/19th century
Good
Nil



MAP 19: ARDULLIE POINT TO BALCONIE POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 59-63/62-67

Basemap: O.S. Pathfinder Series
Sheets 143 & 144
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

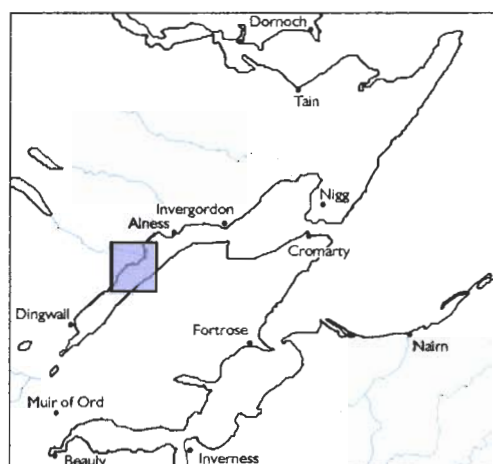
 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile



Map 20: BALCONIE POINT TO ALNESS POINT

Hinterland Geology and Coastal Geomorphology: This stretch of coastline includes the Alness embayment which is sheltered behind a hinterland which is low-lying at below 10m OD. The basement geology is Old Red Sandstone overlain by raised beach sand and gravel.

Erosion class: The low-energy wave environment within the bay along with high sediment yields down the River Alness allows mud to accrete within the bay. Conditions along this unit of coastline are seen to be accreting with slight erosion noted in parts. Isolated patches of shingle showed evidence for scour on the foreshore.

Built Heritage and Archaeology: One fish trap and a series of fish trap mounds were recorded in this area of the survey. There were also stone piers and the modern pier at Evanton airfield, which is used for coiling steel cable for the oil industry. On the hinterland of the area the archaeological remains included the military complex of the Evanton airfield and associated buildings, such as the pillboxes and aircraft hangers.

Map 20: Hinterland Geology and Coastal Geomorphology

1. BALCONIE POINT to WESTER TEANININCH

NH 627

1.8km

Mud and sand/tidal flats

Low edge (5m)

Alluvium

Irregular coastal edge consisting of incised saltmarsh. This overlooks a foreshore dominated by mud and shingle.

2. WESTER TEANININCH to south of BALLACHRAGGAN

NH 634 679

1km

Mud and sand/tidal flats

Low edge (10m)

Marine deposits

Head of Alness Bay, linear stretch of estuarine coast backed by marine sands and gravel. The foreshore is consists of mud and sand.

3. South of BALLACHRAGGAN to ALNESS POINT

NH646 680

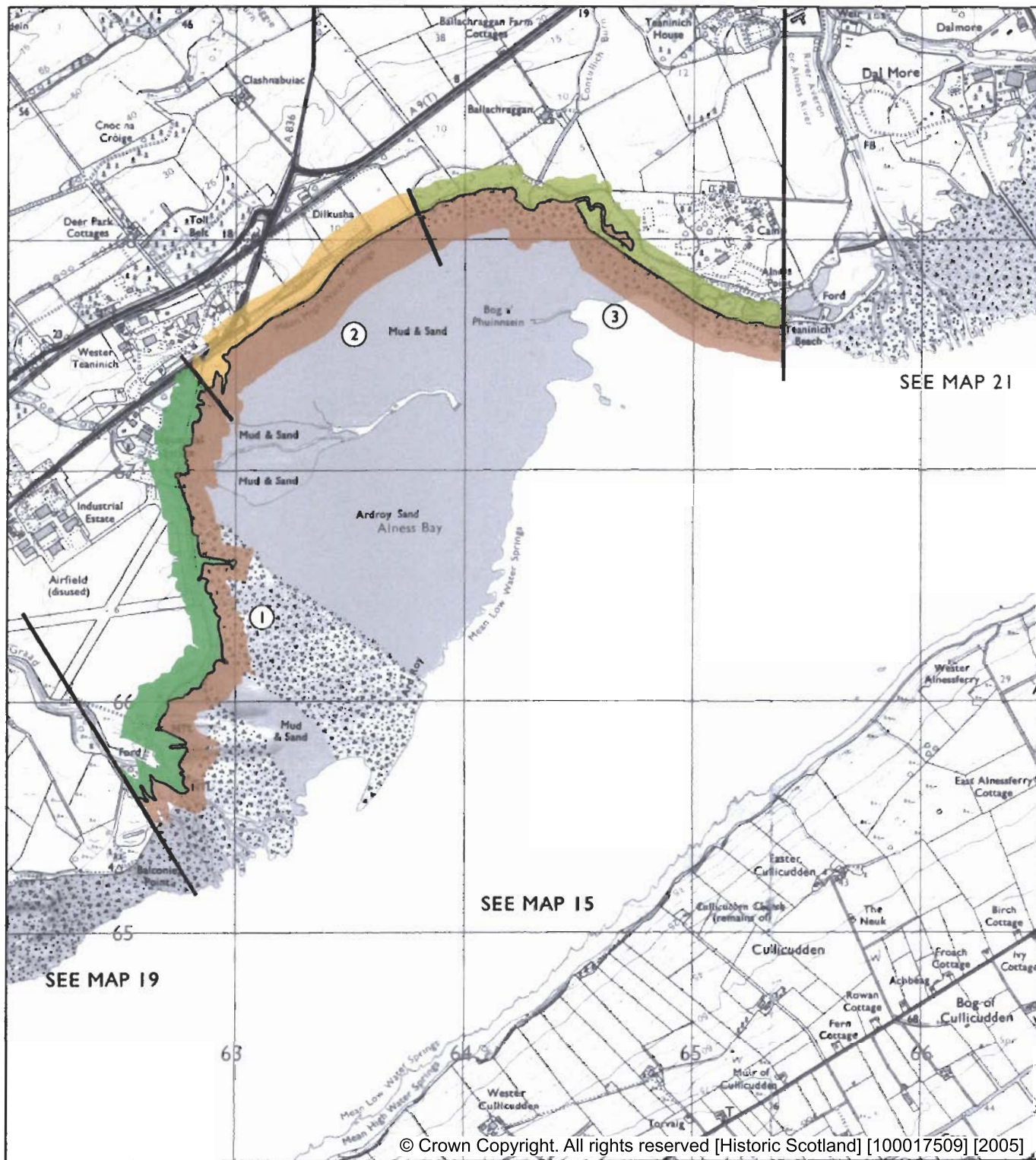
1.9km

Mud/shingle

Low edge (<10m)

Raised beach and marine deposits

Small embayment with developing saltmarsh intersected by numerous drainage channels. The hinterland is low lying. The foreshore consists of mud and sand exposed over a wide area at low tide.



MAP 20: BALCONIE POINT TO ALNESS POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 62-66/64-69

Basemap: O.S. Pathfinder Series
Sheet 144

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 16 September 1998

Hinterland:

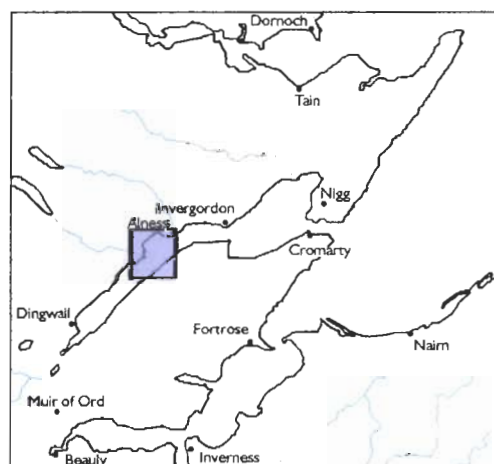
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 20: EROSION

1. BALCONIE POINT to WESTER TEANINCH

NH 630 660

1.8km

Accreting and eroding

Mud and sand has accreted at the MHWMS with salt marsh prone to erosion at the backshore.

Mud and shingle are exposed at low water; here shifting river channels are leading to both accretion and some erosion.

2. WESTER TEANINCH to west of TEANINCH BEACH

NH 635 680

1.8km

Eroding or stable

Scouring and sediment displacement is ongoing within Alness bay. The sheltered aspect of the bay favours sediment accumulation. Eroding parts may be delimited where channels are slowly migrating.

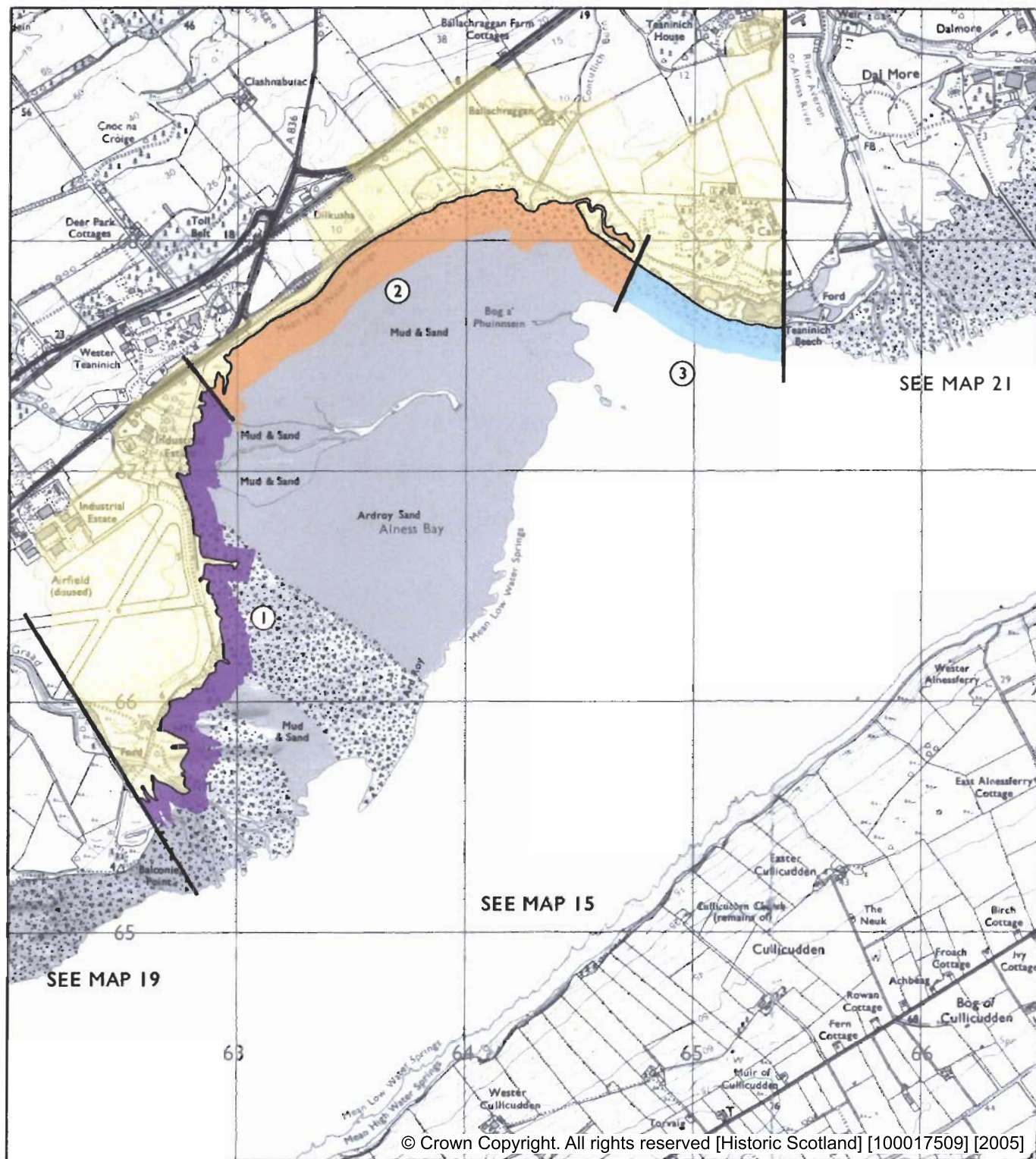
3. South of BALLACHRACHRAGGAN to TEANINICH BEACH

NH 650 677

0.7

Accreting or stable

Estuarine sediment is accreting at MHWS mark with shingle and merse colonised by saltmarsh. There is no indication to suggest that conditions here are not stable.



MAP 20: BALCONIE POINT TO ALNESS POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 62-66/64-69

Basemap: O.S. *Pathfinder* Series
Sheet 144

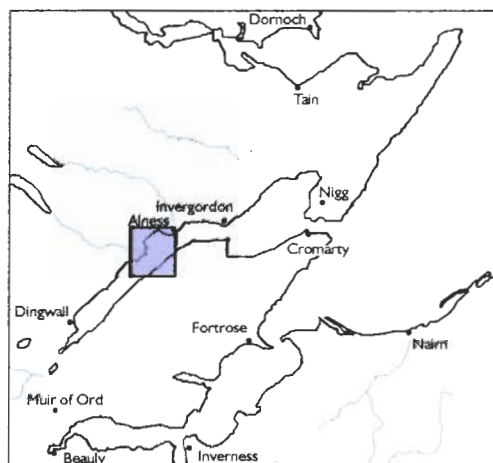
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EROSION CLASS

Assessment date: 16 September 1998

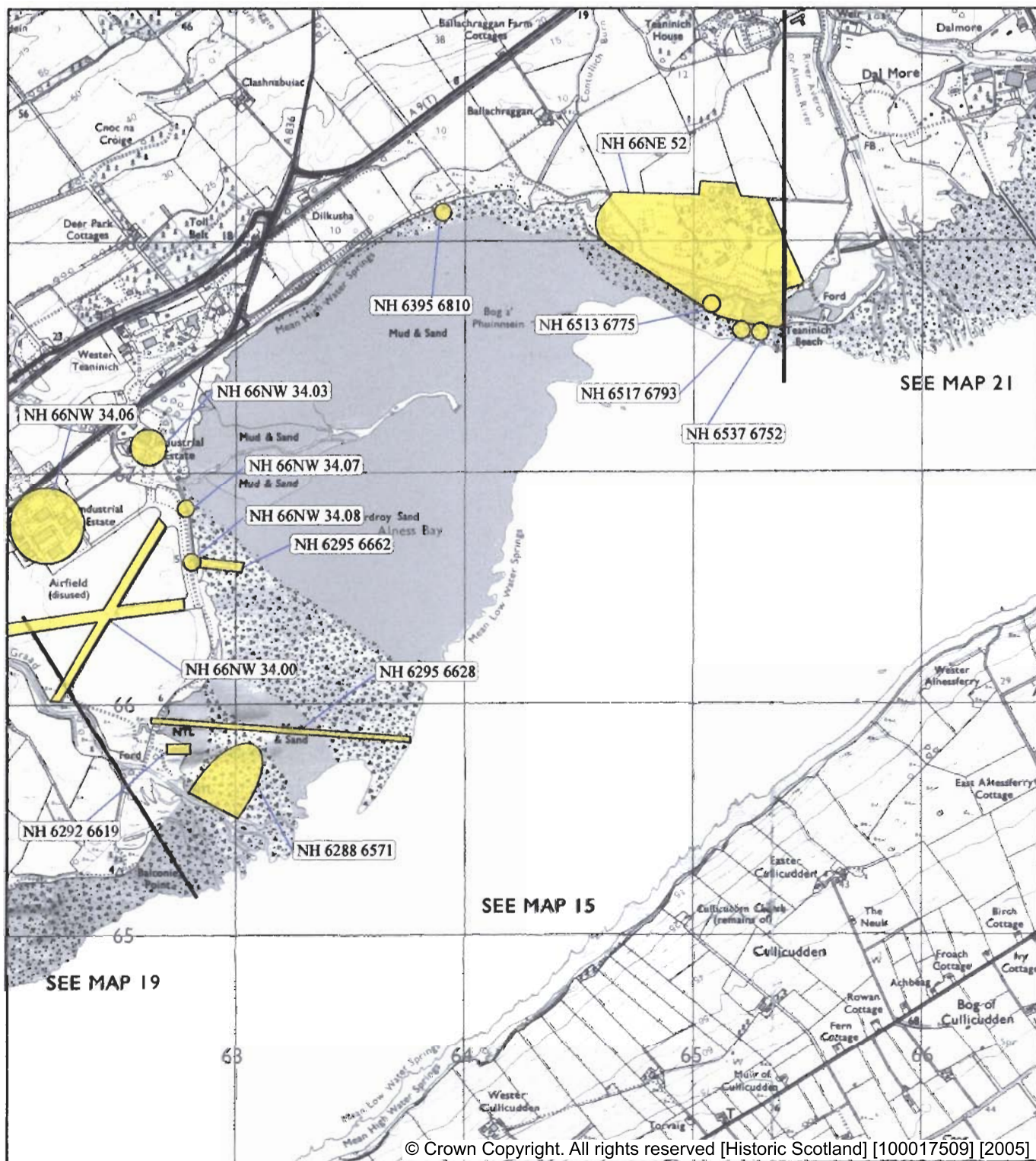
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 20: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites in the Hinterland	Sites in the Hinterland
NH 6288 6571 EVANTON AIRFIELD Fish trap stone mounds Uncertain Poor Survey	NH66NW 34.00 NH 625 665 centre EVANTON AIRFIELD Airfield; Novar camp 20 th century AD; WWII Fair Nil	NH 6568 6815 ALNESS POINT Icehouse 19 th /20 th century AD Good Nil
NH 6292 6619 EVANTON AIRFIELD Two linear stone quays 20 th century AD Fair Nil	NH66NW 34.07 NH 6279 6683 EVANTON AIRFIELD Pillbox 20 th century AD; WWII Fair Nil	NH 6624 6823 ALNESS POINT Military camp, WWII 20 th century AD Fair Nil
NH 6295 6628 EVANTON AIRFIELD Industrial pier 20 th century AD Good Nil	NH66NW 34.08 NH 6283 6655 EVANTON AIRFIELD Pillbox 20 th century AD; WWII Fair Nil	
NH 6295 6662 EVANTON AIRFIELD Stone pier Uncertain Fair Nil	NH66NW 34.06 NH 6261 6708 centre EVANTON AIRFIELD Aircraft hangars; buildings; huts 20 th century AD; WWII Good Nil	
NH 6395 6810 BALLACHRAGGAN Possible fish trap Uncertain Poor Survey	NH66NW 34.03 NH 6263 6755 centre EVANTON AIRFIELD Aircraft hangars; buildings; huts 20 th century AD; WWII Good Nil	
NH 6517 6763 ALNESS POINT Ruined building Uncertain Poor Monitor		
NH 6537 6752 TEANINICH BEACH Pier Uncertain Fair Monitor		



MAP 20: BALCONIE POINT TO ALNESS POINT 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 62-66/64-69

Basemap: O.S. Pathfinder Series
Sheet 144

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

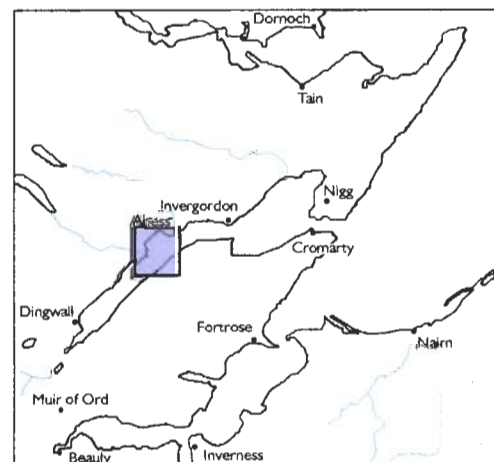
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 21: ALNESS POINT TO INVERGORDON

Hinterland Geology and Coastal Geomorphology: Old Red Sandstone forms the basement geology. Drift lithologies along this unit of coastline are mainly derived from marine deposits and freshwater alluvium. Freshwater alluvium derived from the River Alness has formed an extensive alluvial tail that extends out into the Cromarty Firth. Eighteenth and nineteenth century reclamation is also a factor in its development. Three marine incursions are represented by the positions of raised beach terraces that converge within the hinterland. Further inland morainic drift dominates the cover soil. The land behind Alness Point and along to Invergordon is low-lying at below 10m OD (NH 684 695). Invergordon is heavily developed and the foreshore is armoured and greatly modified.

Erosion class: Saltmarsh lends stability to the low coastal edge south of Dalmore (NH 660 680). Conditions on the foreshore along this unit of coast are stable or accreting. At Belle Port the shore is heavily armoured to defend the B817 trunk road. Mud is accreting against the concrete seawalls that protect the industrial installations of Invergordon.

Built Heritage and Archaeology: The sites in this area are very diverse in both age and condition. The built heritage on the coastal hinterland ranges from the well preserved 17th century ginnal and later icehouse at Alness Point to the limited remains of the RAF seaplane base to the west. Around Dalmore the foreshore remains include timber pier posts, fish trap mounds and fish trap stone alignments. The Pictish Class 1 symbol stone at Rosskeen appears to be affected by coastal weather systems, especially westerlies which have eroded the side of the stone facing the shoreline. The railway bridges at Rosskeen are good examples of different bridge designs.

Map 21: Hinterland Geology and Coastal Geomorphology

1. ALNESS POINT to near BELLPORT PIER

NH 660 680

1.9km

Saltmarsh/mud and shingle

Low edge (<10m)

Alluvium (freshwater)

Deeply incised stretch of saltmarsh fronted by a foreshore dominated by mud and shingle. The hinterland consists of alluvial deposits in the form of an alluvial fan formed at the head of the Alness River.

2. BELLPORT PIER to ROSKEEN BRIDGE

NH 680 690

1.9km

Estuarine mud and shingle

Low edge (<10m)

Raised beach and marine deposits

The hinterland consists of raised beach and marine deposits and is low lying. The foreshore is narrower at this point and consists of mud and shingle.

3. ROSKEEN BRIDGE to INVERGORDON PIER

NH 680 690

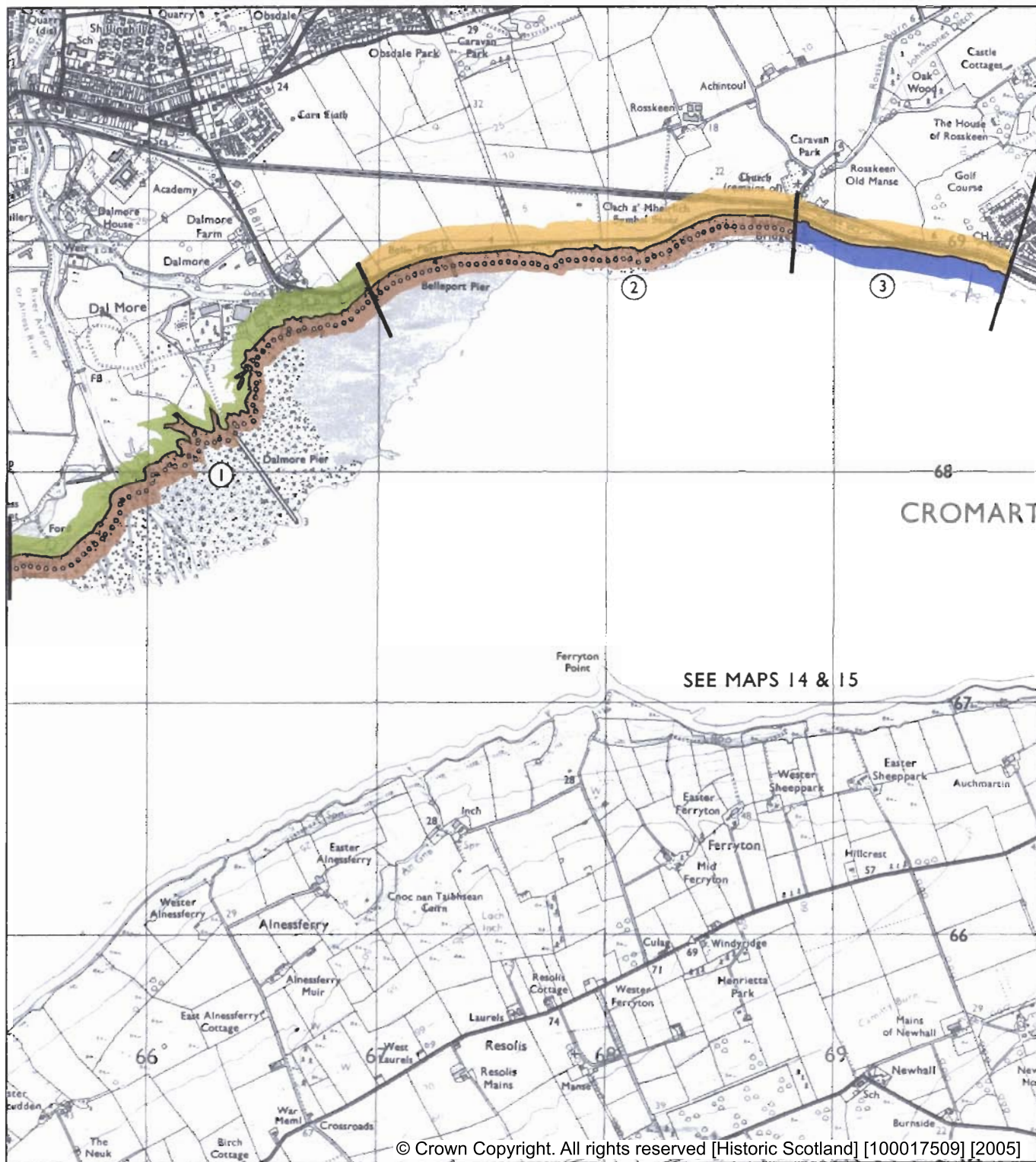
1.9km

Estuarine mud, sand and shingle

Low edge (10m)

Raised beach and marine deposits

The hinterland consists of raised beach and marine deposits and has been heavily modified by industrial development. The foreshore is narrow and consists of mud and shingle



MAP 21: ALNESS POINT TO INVERGORDON

1:25 000

MORAY FIRTH SURVEY Grid ref: NH 66-69/65-70

Basemap: O.S. Pathfinder Series
Sheet 144

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 16 September 1998

Hinterland:

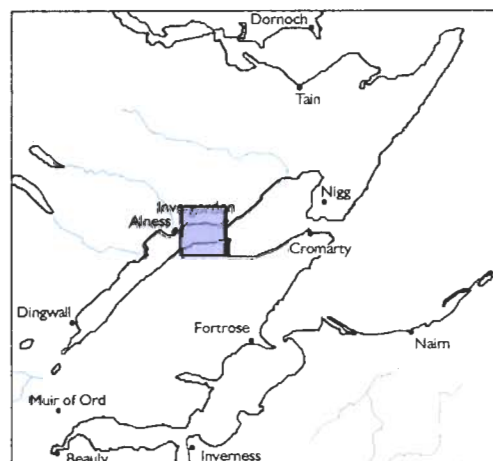
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 21: EROSION

1. TEANINICH BEACH to DALMORE PIER

NH 660 679

1km

Accreting or stable

Sediment loading and re-deposition is occurring at the mouth of the River Alness. Accreting mud forms low banks at around the MHWL down to LWMS. Conditions appear to be stable.

2. DALMORE PIER

NH 664 680

0.2km

Definitely Eroding

Rubble from attempts to stabilise erosion of the pier is being scoured by wave action. Some accretion is occurring against other parts of the pier base.

3. DALMORE PIER to east of BELLE PORT PIER

NH 665 686

0.7km

Accreting or eroding

Accreting estuary mud and shingle is ongoing in front of the distillery sea wall. Erosion confined to scouring around pier base. Mud and shingle is accreting down to the LWM.

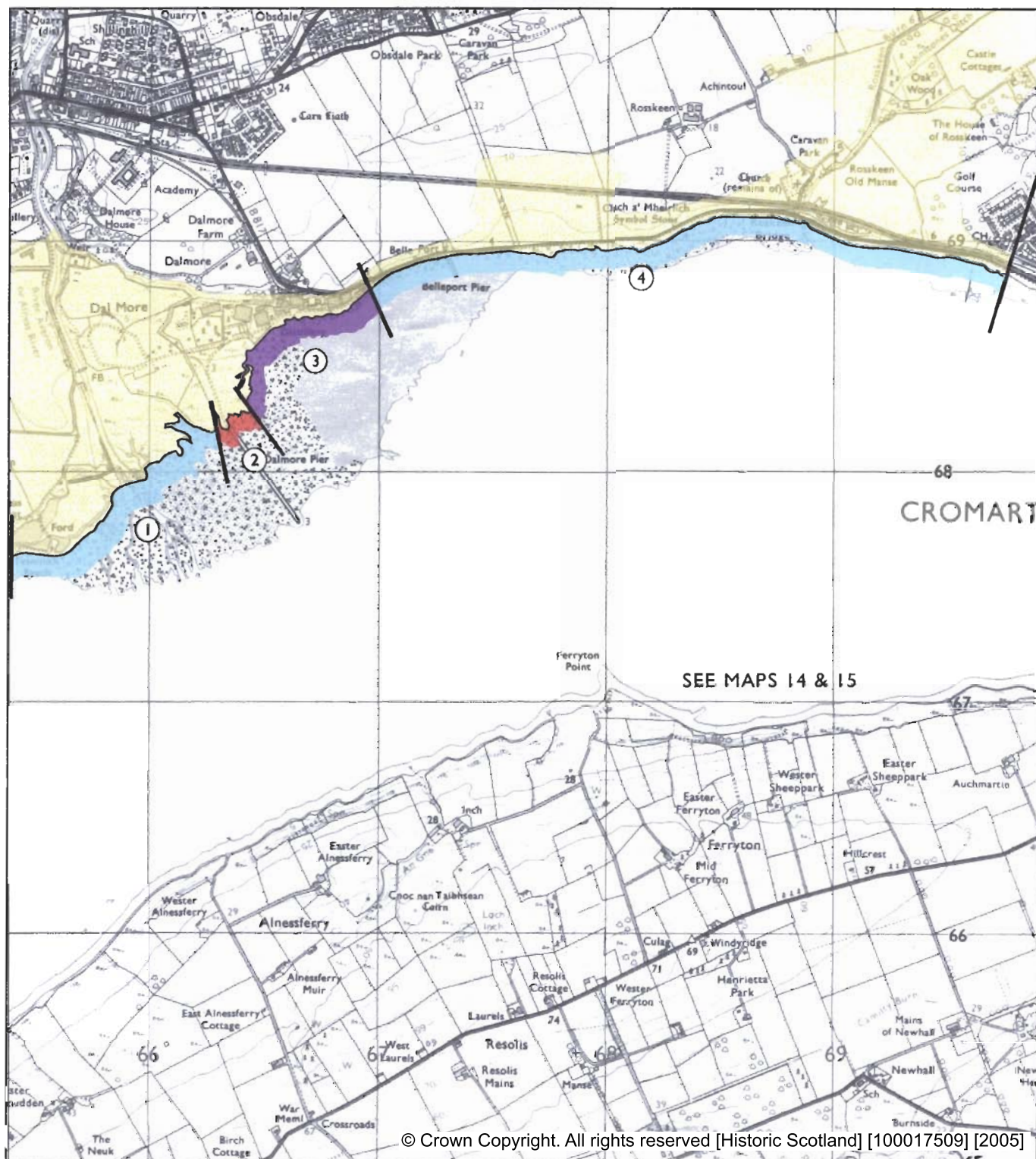
4. East of BELLE PORT to INVERGORDON

NH 676 689

2.8km

Accreting or stable

The foreshore appears to be stable with accreting mud. At Belle Port pier the shore is heavily armoured to defend the B817 trunk road.



MAP 21: ALNESS POINT TO INVERGORDON 1:25 000
MORAY FIRTH SURVEY Grid ref: NH 66-69/65-70

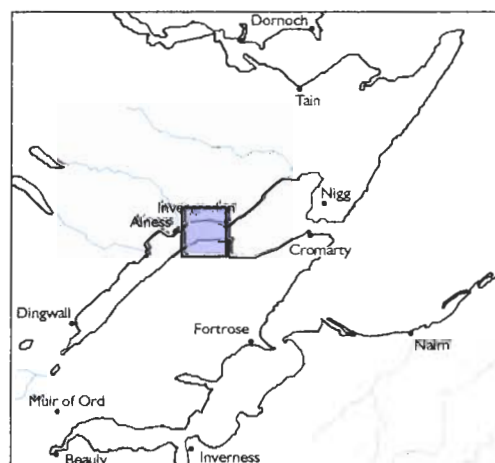
Basemap: O.S. *Pathfinder* Series
Sheet 144
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EROSION CLASS

Assessment date: 16 September 1998

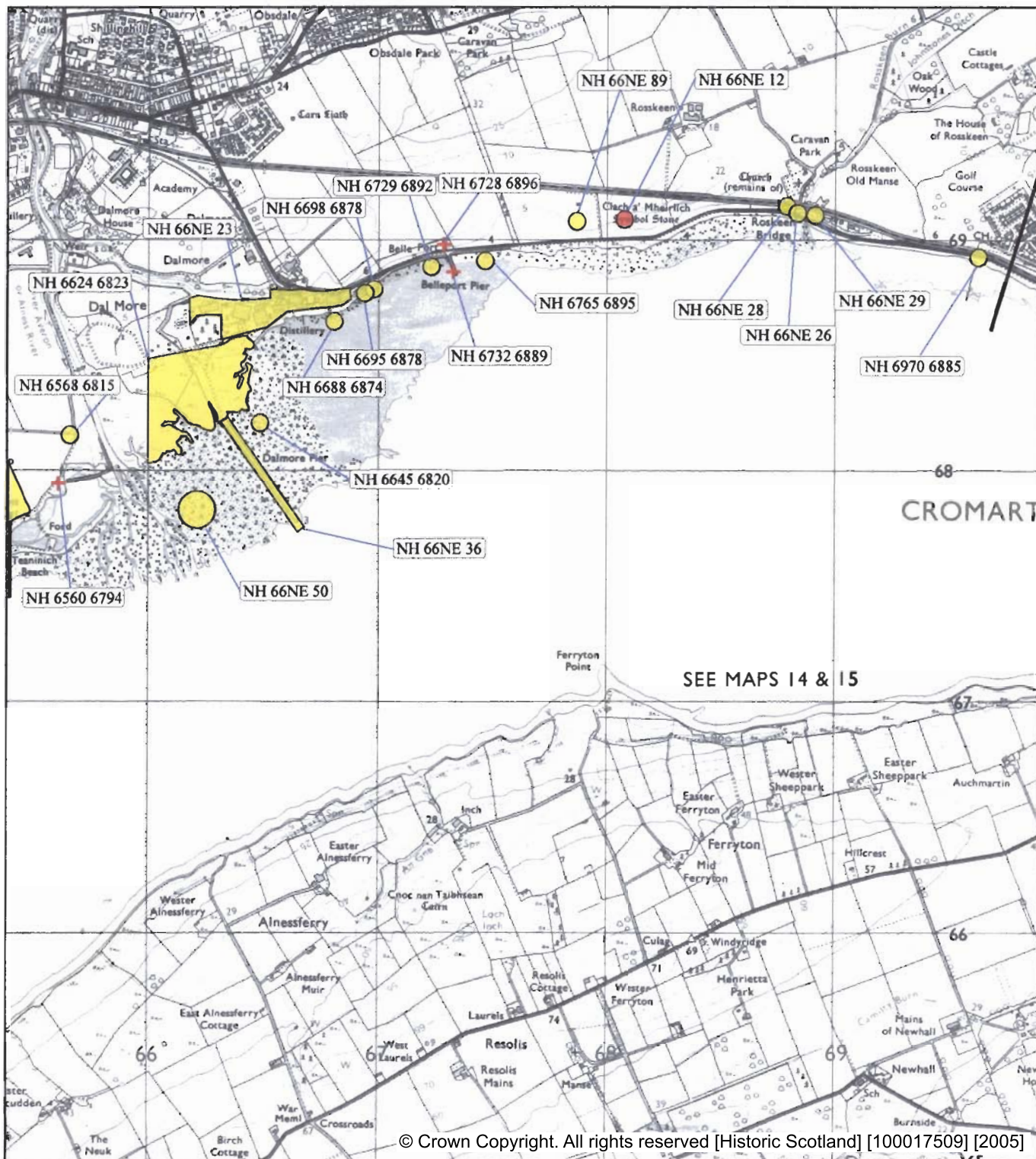
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 21: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites on the Coastal Edge & Foreshore	Sites in the Hinterland	Sites in the Hinterland
NH66NE 50 NH 662 678 area ALNESS POINT Fishing cairns 19 th -20 th century AD Poor Survey	NH 6729 6892 BELLEPORT Possible fish trap Uncertain Poor Survey NH66NE 30 - Listed C NH 6732 6889 BELLEPORT Jetty / pier 19 th /20 th century AD Fair Monitor NH 6765 6885 BELLEPORT Possible fish trap mound Uncertain Poor Survey Sites in the Hinterland NH 6513 6775 ALNESS POINT Ruined building 19 th century AD or earlier Poor Monitor NH66NE 52 NH 6515 6794 ALNESS POINT Royal Air Force seaplane base (site of) 20 th century AD; WWII Fair Nil NH66NE 24 - Listed B NH 6560 6794 ALNESS POINT Giraln 17 th /18 th century AD Good Nil	NH66NE 23 NH 6658 6870 DALMORE Distillery 19 th /20 th century AD Good Nil NH66NE 88 -Grade C NH 6728 6896 BELLEPORT HOUSE Residential house 19 th century AD Good Nil NH66NE 89 NH 6787 6915 ROSSKEEN Anti-aircraft battery (site of) 20 th century AD; WWII Poor Nil NH66NE 12 - Scheduled NH 6810 6902 ROSSKEEN, CLACH A' MHEIRLICH Pictish Class I symbol stone 7 th /8 th /9 th century AD Fair Monitor	NH66NE 28 NH 6886 6914 ROSSKEEN Railway bridge 19 th /20 th century AD Good Nil NH66NE 26 NH 6886 6915 ROSSKEEN Railway bridge 19 th /20 th century AD Good Nil NH66NE 29 NH 6893 6913 ROSSKEEN Railway bridge, ornamental 19 th /20 th century AD Good Nil NH 6970 6885 INVERGORDON Military pillbox 20 th century AD, WW II Good Nil



MAP 21: ALNESS POINT TO INVERGORDON

1:25 000

MORAY FIRTH SURVEY Grid ref: NH 66-69/65-70

Basemap: O.S. Pathfinder Series
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

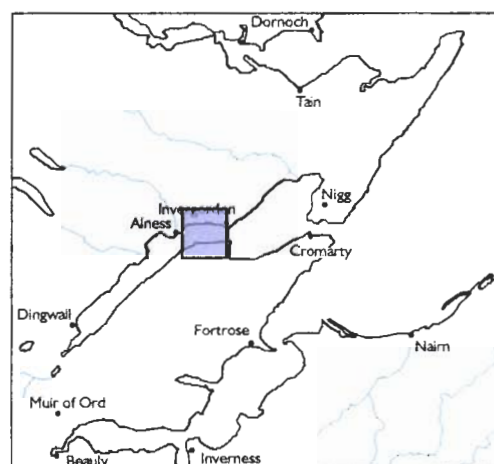
 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile



Map 22: INVERGORDON TO BARBRAVILLE

Hinterland Geology and Coastal Geomorphology: Old Red Sandstone forms the basement geology. The drift component within this unit is derived from marine incursions with sand and gravel forming three distinct regions of fossil shoreline. The terraces are discontinuous overlying patches of glacial deposits in the region of Invergordon harbour. The raised beach escarpments are mapped for up to 2.5km and run parallel with the present shoreline.

Erosion class: A concrete promenade with fronting rock armour protects most of this coastal unit. In front, mud is accreting. The intertidal area is mainly mud and shingle and at the time of the survey there was no indicators of active erosion.

Built Heritage and Archaeology: The built heritage in this area is mainly the various sites in Invergordon town. These include the warehouses, gironal and residential housing along the coastal hinterland strip. On the foreshore the sites include the harbour, Naval dockyard and the ferry pier designed by Telford. Further to the east Saltburn is a good example of a late 19th century planned linear village. Balintraid pier, designed by Telford, appears to be in a poor state of repair. Further fish trap mounds were recorded below HWM to the east of the pier

Map 22: Hinterland Geology and Coastal Geomorphology

1. INVERGORDON to SALT BURN

NH 714 686

3.7

Mainly sand

Low edge (<10m)

Raised beach and marine deposits

Industrially modified hinterland. The underlying geology is marine deposits. The foreshore consists of mainly sand

2. SALT BURN to BALINTRAID PEIR

NH 733 750

1.8km

Estuarine mud, sand and shingle

Low edge (<10m)

Raised beach and marine deposits

The hinterland consists of raised beach deposits behind a linear coastal edge. The foreshore consists of a mud and shingle on tidal flats.



MAP 22: INVERGORDON TO BALINTRAIID

MORAY FIRTH SURVEY Grid ref: NH 70-74/68-73

1:25 000

Basemap: O.S. *Pathfinder* Series

Sheets 133 & 144

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 17 September 1998

Hinterland:

- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 22: EROSION

1. INVERGORDON

NH 270 686

0.5km

Definitely eroding

This unit is defended by quarried rubble. Local erosion is occurring where the base of the rubble is scoured by wave action. The foreshore comprises mud and shingle that appears to be stable.

2. INVERGORDON to INVERGORDON PIER

NH 710 684

2.4km

Stable

Sea defences are at the present lending stability to this unit of coastline that is heavily developed by oil and fabrication installations. Mud flats are accreting along the foreshore.

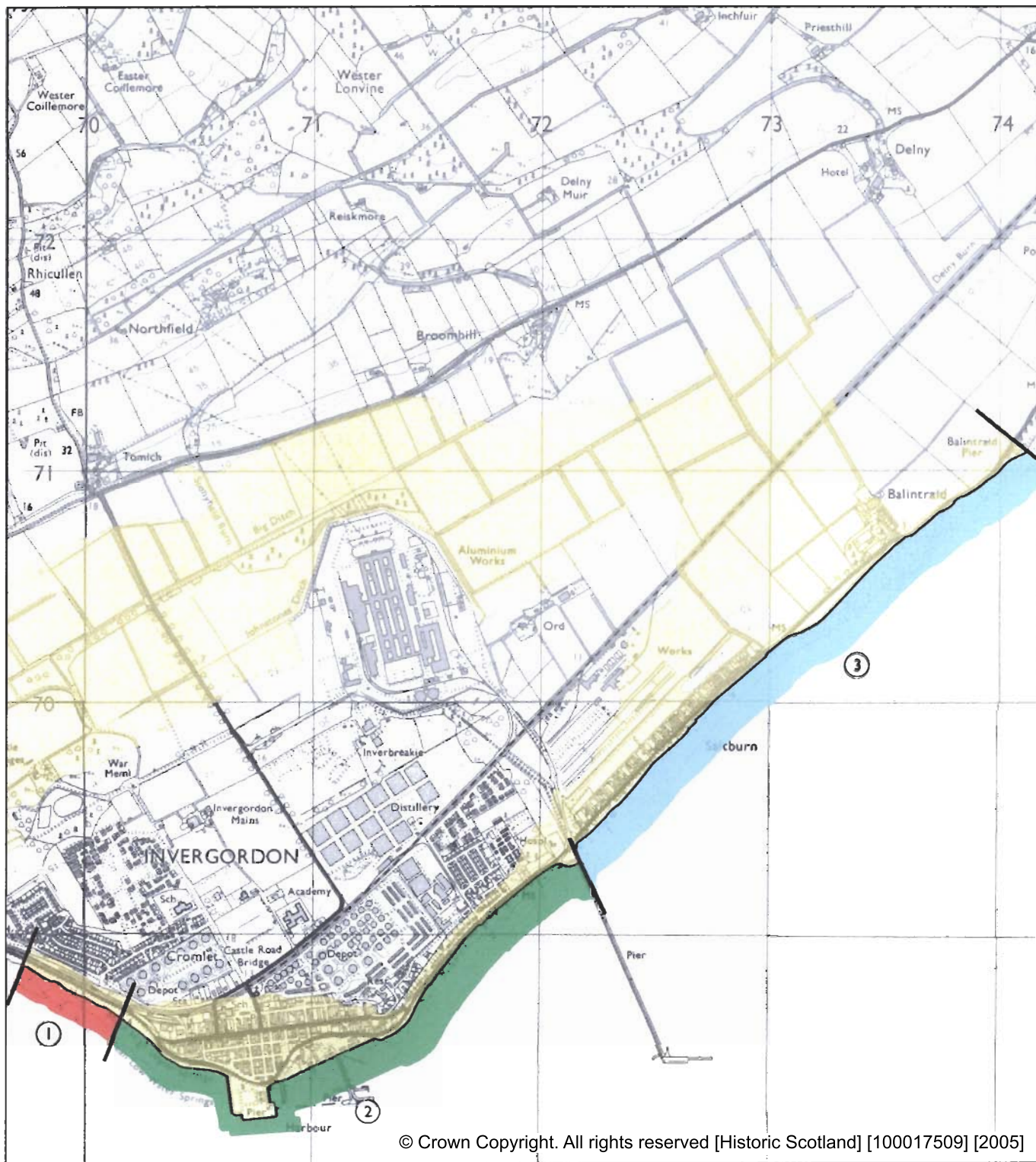
3. SALT BURN PIER to BARBRAVILLE

NH 740 710

2.5km

Accreting or stable

Saltburn town is defended by a concrete promenade fronted by quarry stone and there no indication of erosion. The beach is mainly sand and appears to be stable. At Pollo House region the shore is protected by natural outcropping sandstone.



MAP 22: INVERGORDON TO BALINTRAID

MORAY FIRTH SURVEY Grid ref: NH 70-74/68-73

1:25 000

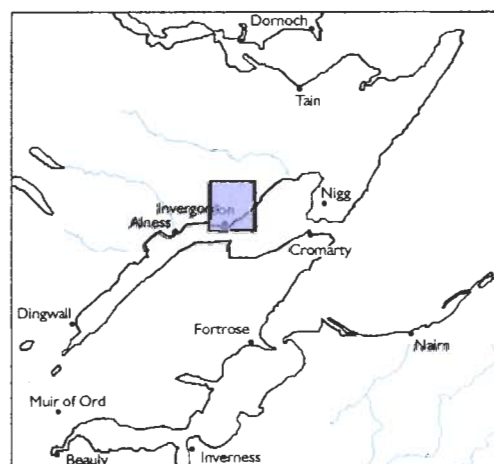
Basemap: O.S. *Pathfinder* Series
Sheets 133 & 144
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EROSION CLASS

Assessment date: 17 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 22: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH77SW 11 - Listed C
NH 7415 7106
BALINTRAID PIER
Pier designed by Telford
19th century AD; 1803-21
Poor
Monitor

NH 7425 7115
BALINTRAID PIER
Fish trap mounds
Uncertain
Fair
Survey

NH 7028 6843
INVERGORDON
Fish traps
Uncertain
Poor
Survey

NH76NW 21
NH 7086 6832
INVERGORDON
Harbour
18th/19th century AD
Good
Nil

NH76NW 64
NH 7102 6848
INVERGORDON
Naval dockyard
20th century AD
Good
Nil

Sites on the Coastal Edge & Foreshore

NH76NW 23
NH 7101 6841
INVERGORDON, Ferry Pier
Pier designed by Telford
19th century AD; 1803-21
Good
Nil

NH 7151 6876
INVERGORDON
Timber jetty posts
Uncertain
Poor
Monitor

NH 7177 6902
INVERGORDON
Slipway
20th century AD
Good
Nil

NH 7300 7021
SALTBURN
Concrete breakwater and pipe
20th century AD
Poor
Nil

NH 7442 7158
POLLO HOUSE
Fish trap mound
Uncertain
Good
Survey

Sites in the Hinterland

NH76NW 22
NH 7079 6836
INVERGORDON, 37 Shore Rd
Warehouse
18th/19th century AD
Good
Nil

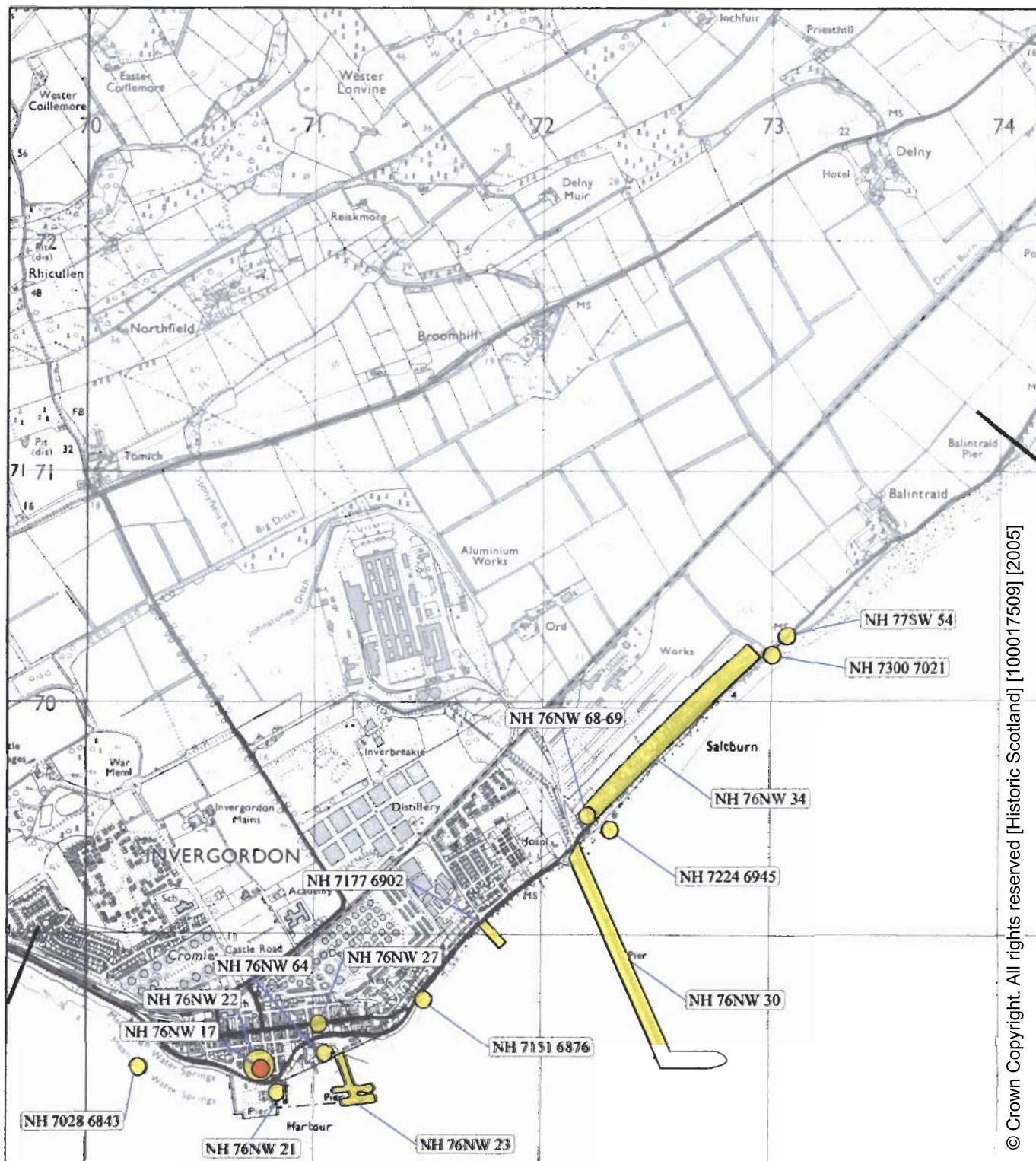
NH76NW 17 - Listed B
NH 7096 6849
INVERGORDON, Shore Rd
Girnal or storehouse
17th/18th century AD
Good
Nil

NH76NW 27
NH 7101 6856
INVERGORDON, High St
Warehouse
18th/19th century AD
Good
Nil

NH76NW 68-69
NH 7220 6948
SALTBURN
Residential buildings
19th century AD
Good
Nil

NH76NW 34
NH 7255 6983 centre
SALTBURN
Village
19th century AD
Good
Nil

NH77SW 54
NH 7305 7037
SALTBURN
Anti-aircraft battery (site of)
20th century AD; WWII
Poor
Monitor



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MAP 22: INVERGORDON TO BALNIRAIA

MORAY FIRTH SURVEY Grid ref: NH 70-74/68-73

1:25 000

Basemap: O.S. Pathfinder Series
Sheets 133 & 144
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile



Map 23: BARBRAVILLE TO EAST OF MILTOWN CASTLE

Hinterland Geology and Coastal Geomorphology: This unit of coastline forms the sheltered head of Nigg Bay and is underlain by Upper Old Red Sandstone. The drift cover in this area is dominated by marine deposits. Raised beach deposits are extensive forming a series of sinuous degraded cliff-lines that converge into a single cliff towards Tarbat House. A plateau below 10m OD has been formed. Development in the area is low.

Erosion class: Nigg Bay has extensive intertidal flats that are exposed for about 3km. The bay is sheltered according to the low-energy wave environment promoted by the position of the North Sutor cliffs which defuses the impact of wave swell from gales emanating from the NE quadrant. The backshore is predominantly banked shingle leading down to the mudflats. Gabion baskets protect the shoreline east of Milton Castle. Erosion at the base of the merse was noted, this is due to overtopping in adverse conditions.

Built Heritage and Archaeology: The foreshore archaeology in the south west of this area contains many examples of linear and mound type fish traps. Towards the east the foreshore sites include a target stance situated in the intertidal zone and a maritime wreck of unknown age or type. The hinterland built heritage includes the 18th century Barbaraville watermill, now a well maintained residential property and other 18th and 19th century houses in the Barbaraville village.

Map 23: Hinterland Geology and Coastal Geomorphology

1. South POLLO FARM to south of
MILNTOWN CASTLE

NH 760 728

4km

Estuarine mud, sand and shingle

Low edge (<10m)

Raised beach and marine deposits

Unbroken stretch of coastline consisting of mud
flats. The hinterland contains raised beach
deposits of sand and gravel.

2. South of MILNTOWN to south of CAMPACK
BURN

NH 780 733

2.7km

Estuarine mud/saltmarsh

Low edge (10m)

Raised beach and marine deposits

Upper reaches of Nigg Bay consisting of a coastal
edge colonised by saltmarsh. The hinterland is
defended by flood banks and is low lying. The
basal deposits consist of marine derived sand and
gravel.



MAP 23: BALINTRAD TO MILTOWN CASTLE 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 76-80/70-75

Basemap: O.S. Pathfinder Series
Sheet 133

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 17 September 1998

Hinterland:

- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 23: EROSION

1. POLLO HOUSE

NH 564457

1km

Accreting or stable

The shoreline is dominated by mud and shingle and is well exposed at low tides. There is no indication that conditions are not stable.

2. BARBRAVILLE

NH 749 720

0.3km

Stable and eroding

Quarried stone defences protect this small hamlet. The shoreline is mainly shingle and at the time of the survey there was no indication that conditions are not stable.

3. BARBRAVILLE to TARBAT MAINS

NH 758 726

1.9km

Stable

This unit of coastline consists of exposed sandstone with some rubble defences towards Tarbat Mains. The beach is stable with banked cobble and shingle leading down to accreting mudflats.

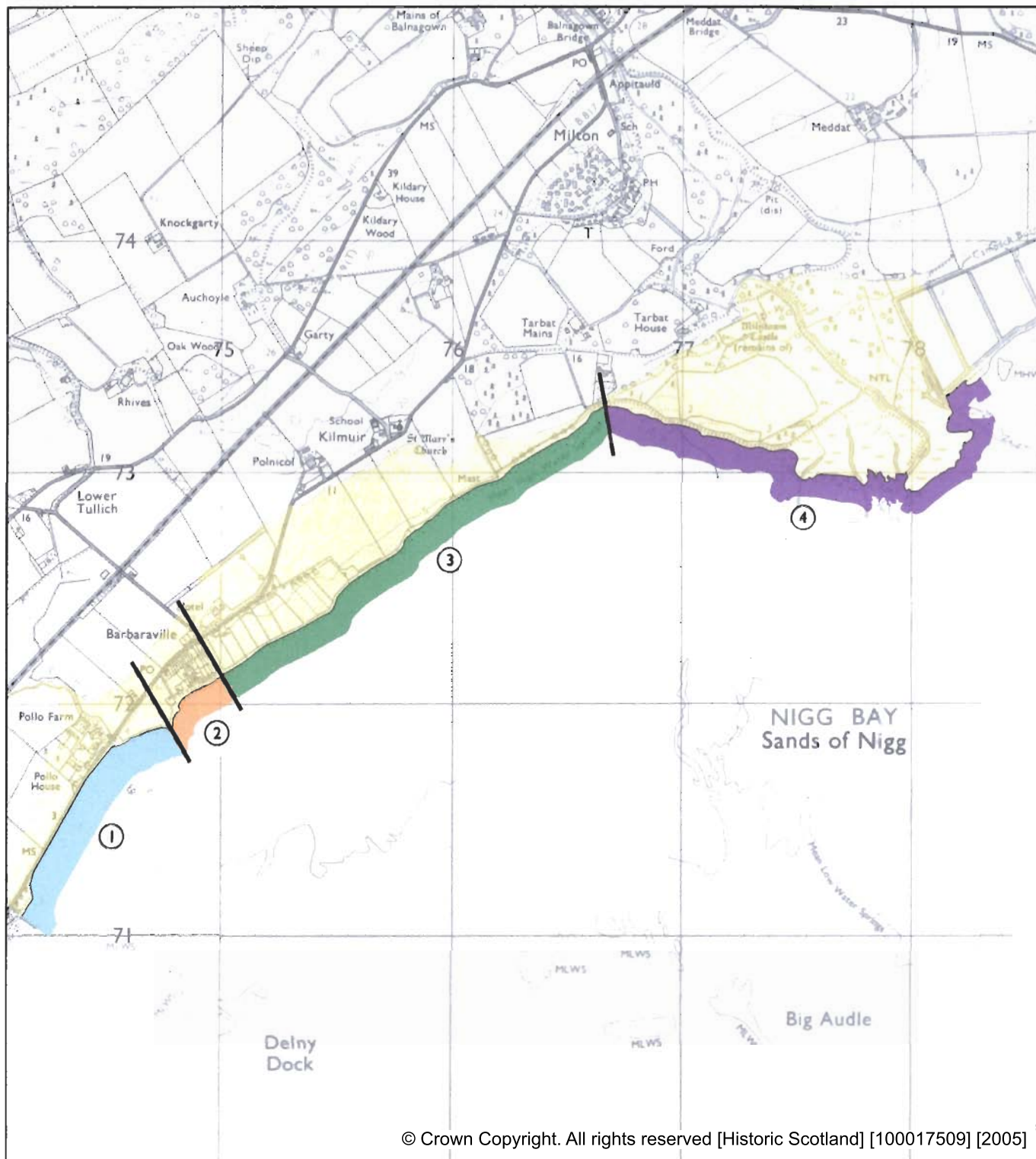
4. TARBAT MAINS to south of MILTON CASTLE

NH 776 730

1.2km

Both accreting and eroding

Mudflats show evidence of accretion but in parts channel migration where the Balnagowen River outfalls into the Cromarty Firth. At the MHWL shingle is banking up.



MAP 23: BALINTRAD TO MILTOWN CASTLE 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 76-80/70-75

Basemap: O.S. Pathfinder Series
Sheet 133

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EROSION CLASS

Assessment date: 17 September 1998

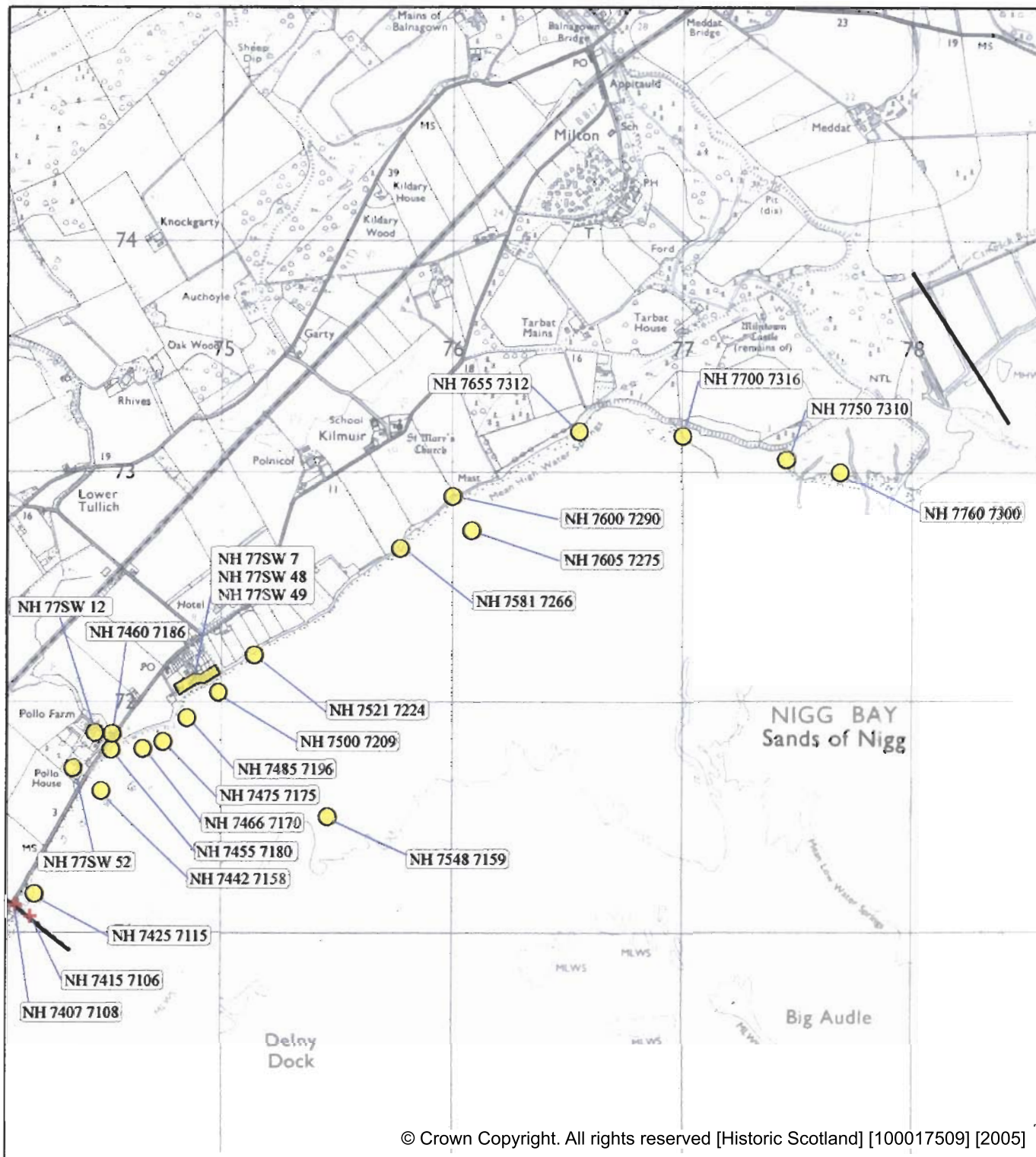
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 23: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites on the Coastal Edge & Foreshore	Sites in the Hinterland	Sites in the Hinterland
NH 7455 7180 BARBRAVILLE Fish trap mounds Uncertain Good Survey	NH 7655 7312 TARBAT HOUSE Possible fish trap Uncertain Poor Survey	NH77SW 53 - Listed C NH 7407 7108 BALINTRAID PIER Residential house 19 th century AD Good Nil	NH 7548 7159 NIGG BAY Maritime craft: wreck Uncertain Poor Monitor
NH 7466 7170 BARBRAVILLE Possible fish trap mound Uncertain Good Survey	NH 7700 7316 TARBAT HOUSE Timber posts, possible fish trap Uncertain Good Survey	NH77SW 52 NH 7435 7174 POLLO HOUSE Residential house 18 th /19 th century AD Good Nil	NH 7581 7266 KILMUIR Timber breakwater Uncertain Poor Monitor
NH 7475 7175 BARBRAVILLE Fish trap mounds Uncertain Good Survey	NH 7750 7310 TARBAT HOUSE Timber posts, possible fish trap Uncertain Poor Survey	NH77SW 7 NH 7492 7211 - 7497 7213 BARBARAVILLE, Sea View Residential cottages 18 th /19 th century AD Good Nil	NH 7605 7275 KILMUIR Military target stance 20 th century AD Poor Monitor
NH 7485 7196 BARBRAVILLE Fish trap Uncertain Good Survey	NH 7760 7300 TARBAT HOUSE Hulk 20 th century AD Poor Nil MAP 24	NH77SW 48 NH 7497 7214 BARBARAVILLE, Rosslyn Residential house 19 th century AD Good Nil	
NH 7500 7209 BARBRAVILLE Fish trap Uncertain Good Survey	NH783 733- 796 738 MEDDAT Embankment and quarry pits 20 th century AD Fair Nil	NH77SW 49 NH 7495 7213 BARBARAVILLE, The Shore Residential house 19 th century AD Good Nil	
NH 7521 7224 BARBRAVILLE Fish trap Uncertain Good Survey	NH 7460 7186 BARBARAVILLE Two roofed buildings 18 th /19 th century AD Good Nil	NH 7600 7290 KILMUIR Target butts 20 th century AD, WW II Fair Nil	
NH77SW 12 NH 7450 7186 BARBARAVILLE MILL Watermill 18 th /19 th century AD Good Nil			



MAP 23: BALINTRAD TO MILTOWN CASTLE 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 76-80/70-75

Basemap: O.S. Pathfinder Series
Sheet 133

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

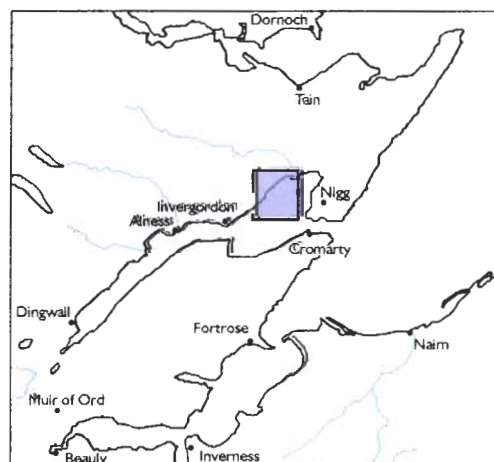
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 24: MILTON CASTLE TO CARSE OF BAYFIELD

Hinterland Geology and Coastal Geomorphology: This unit of coastline is very sheltered and low-lying with a basal geology derived from Middle Old Red Sandstone. Raised marine deposits dominate the drift geology and these continue inland forming the lowland eastwards to Balintore. Fossil shorelines are discontinuous but are attributed to at least three marine incursions. Alluvial deposits underlie saltmarsh development in the region of Milton Castle. Floodbanks defend the carse clay which is intersected by drainage channels relating to reclamation in the last two centuries.

Erosion class: The sheltered position behind the land mass of the North Sutor and the low energy wave environment is controlling accretion of mud on the foreshore. Saltmarsh is well distributed and lends greater stability to the backshore.

Built Heritage and Archaeology: The extensive embankment and drainage system from Meddat to Carse of Bayfield was constructed to create large tracts of fertile farmland at the head of Nigg Bay. The construction included the cutting of small square quarry pits in front of the embankment.

Map 24: Hinterland Geology and Coastal Geomorphology

1. CAMPACK BURN to west of CARSE OF BRAYFIELD

NH 805 736

1.8km

Estuarine mud/saltmarsh

Low edge (<5m)

Carse clays overlying marine deposits

Head of Nigg Bay defended by flood banks and low lying. Saltmarsh and tidal flats with mud and sand flank the foreshore.

2. Head of NIGG BAY

NH 800736

0.5km

Saltmarsh

Low edge (<5m)

Carse clays overlying marine deposits

Head of Nigg Bay. A small alluvial fan overlies carse clays. The foreshore is dominated by saltmarsh.

3. South of CARSE of BRAYFIELD to LOWER PITCALZINE

NH 794 716

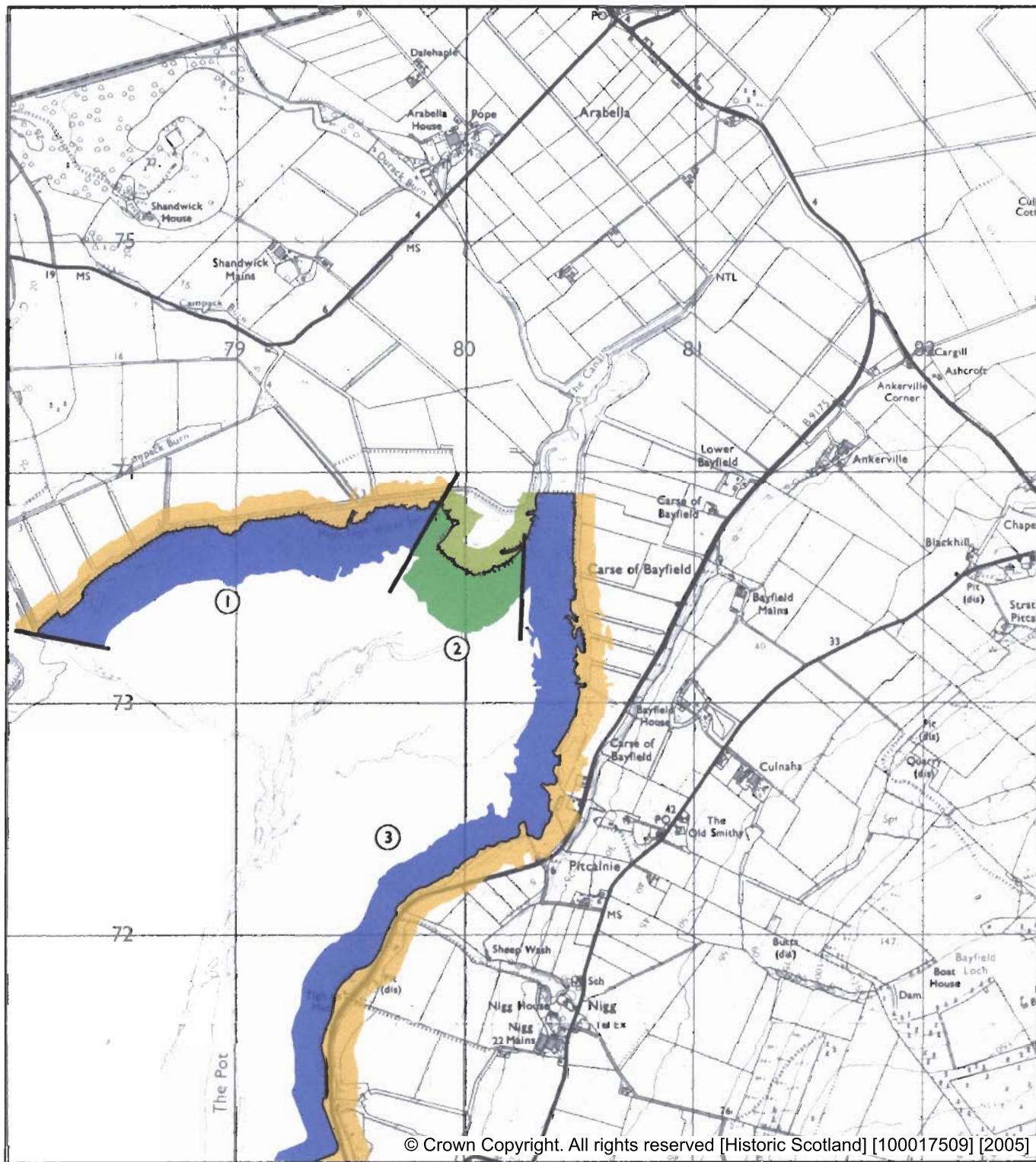
2.7km

Estuarine mud and sand

Low edge (<10m)

Raised beach and marine deposits

Irregular shoreline with carse clays overlying marine sand and gravel in a low-lying hinterland. The foreshore consists of tidal sand and mud flats.



MAP 24: MILNTOWN CASTLE TO NIGG MAINS

MORAY FIRTH SURVEY Grid ref: NH 78-82/71-76

1:25 000

Basemap: O.S. Pathfinder Series
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 18 September 1998

Hinterland:

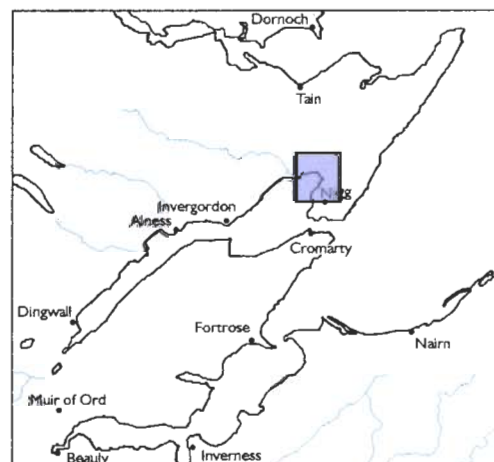
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 24: EROSION

1. East of MILTOWN CASTLE

NH 790 738

1.7

Accreting or stable

Gabbion basket sea defences protect part of this unit of coastline. Conditions are on the whole stable with mud accreting up to the HWM. The sheltered aspect of this stretch of coastline will be promoting sediment deposition. Erosion of the shore is due to the weak nature of the merse clays.

2. NIGG BAY

NH 800 738

3.5km

Accreting or stable

Modified by reclamation and flood banks the shoreline is stable. An additional factor leading to the stability of the foreshore is saltmarsh that extends down onto a muddy beach. Extensive mud flats are accreting in this sheltered bay.

3. East of NIGG

NH 800 723

1.5km

Accreting or stable

Hard sea defences protect the coastal road. Saltmarsh vegetation is lending stability to the softer earse clays that outcrop along the foreshore. Further offshore mudflats are accreting.

MAP 24: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH783 796 738

MEDDAT

Embankment and quarry pits

20th century AD

Fair Nil

NH 8028 7245 - 7951 7389

NIGG BAY

Site of track across bay

19th century AD or earlier

Poor

Nil

NH 7922 7210

TIGH NA MARA

Fish traps

Uncertain

Poor

Survey

NH 7951 7186

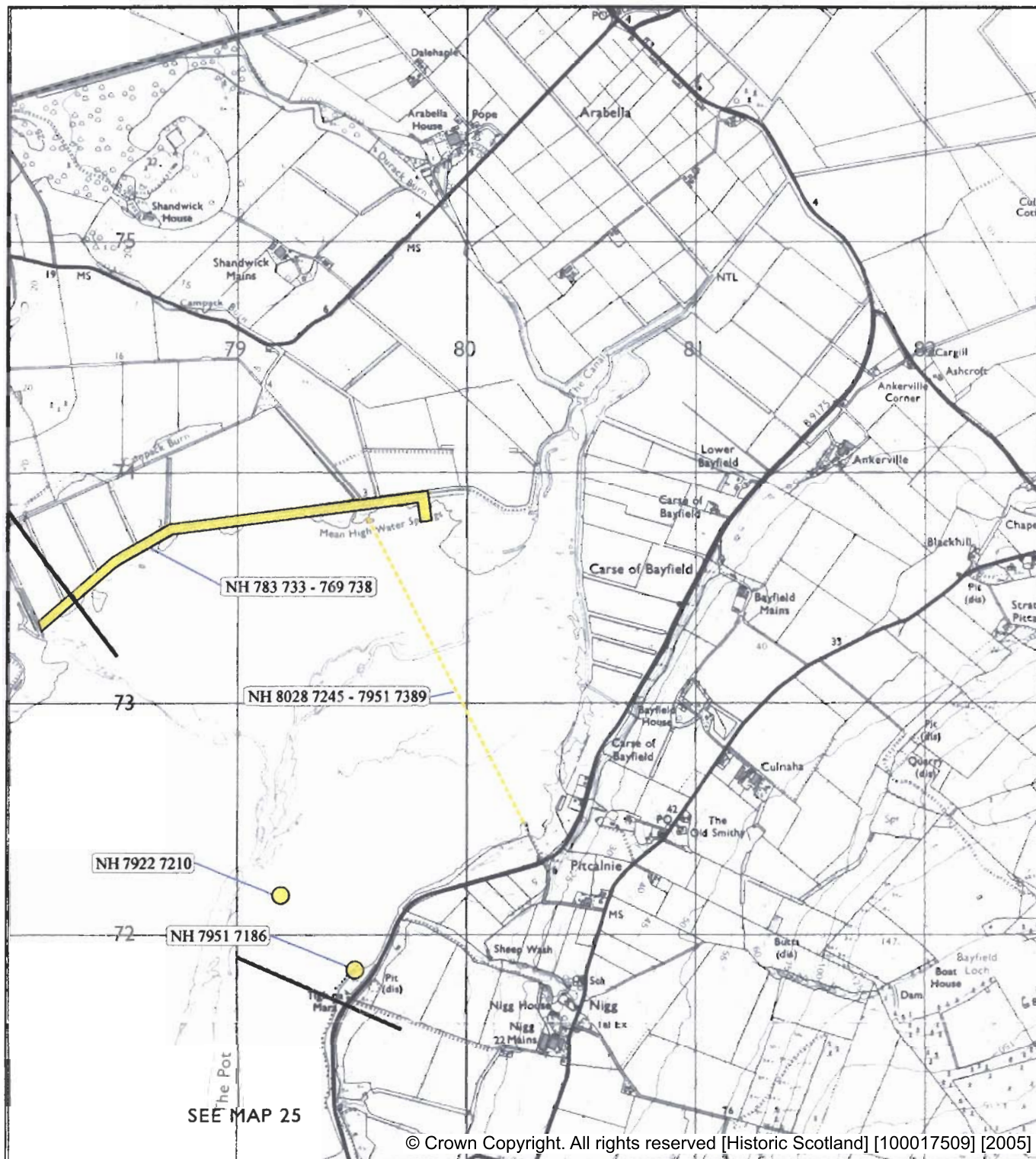
TIGH NA MARA

Hulk

20th century AD

Poor

Nil



MAP 24: MILTOWN CASTLE TO NIGG MAINS

1:25 000

MORAY FIRTH SURVEY Grid ref: NH 78-82/71-76

Basemap: O.S. Pathfinder Series
Sheet 134

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

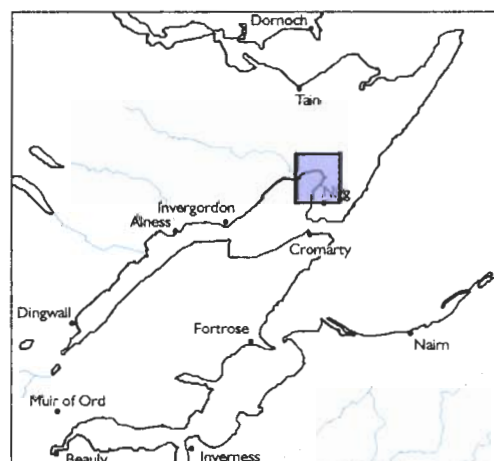
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 25: NIGG BAY

Hinterland Geology and Coastal Geomorphology: This section of coastline comprises the eastern side of Nigg Bay. The head of the bay lies below 10m OD. Underlying Old Red Sandstone continues with an extensive cover of marine sand and gravel. The development of the artificial land mass of the Nigg Fabrication Terminal dominates this area of the coastline.

Erosion class: The coastal edge towards the east of the bay is sheltered and accreting with extensive saltmarsh developed at the backshore. Here conditions are stable. Extensive mud flats are exposed for several kilometres down to the LWMS tide mark.

Built Heritage and Archaeology: The remnants of a trackway or route across Nigg Bay was re-located on both the northern shoreline and eastern edge of the bay. The northern point was not marked, however, the eastern side was marked by a large concrete block in the intertidal zone and a trackway leading from above HWM towards the northern shoreline. The oil industries fabrication yard at Nigg is a huge modern complex built partially on reclaimed intertidal zone. The remains of a sandstone quay at Nigg ferry has been used as the setting for a military pillbox. The hinterland sites at Nigg ferry village includes the 17th century giral which is now a hotel.

Map 25: Hinterland Geology and Coastal Geomorphology

1. NIGG OIL TERMINAL AND OFF SHORE

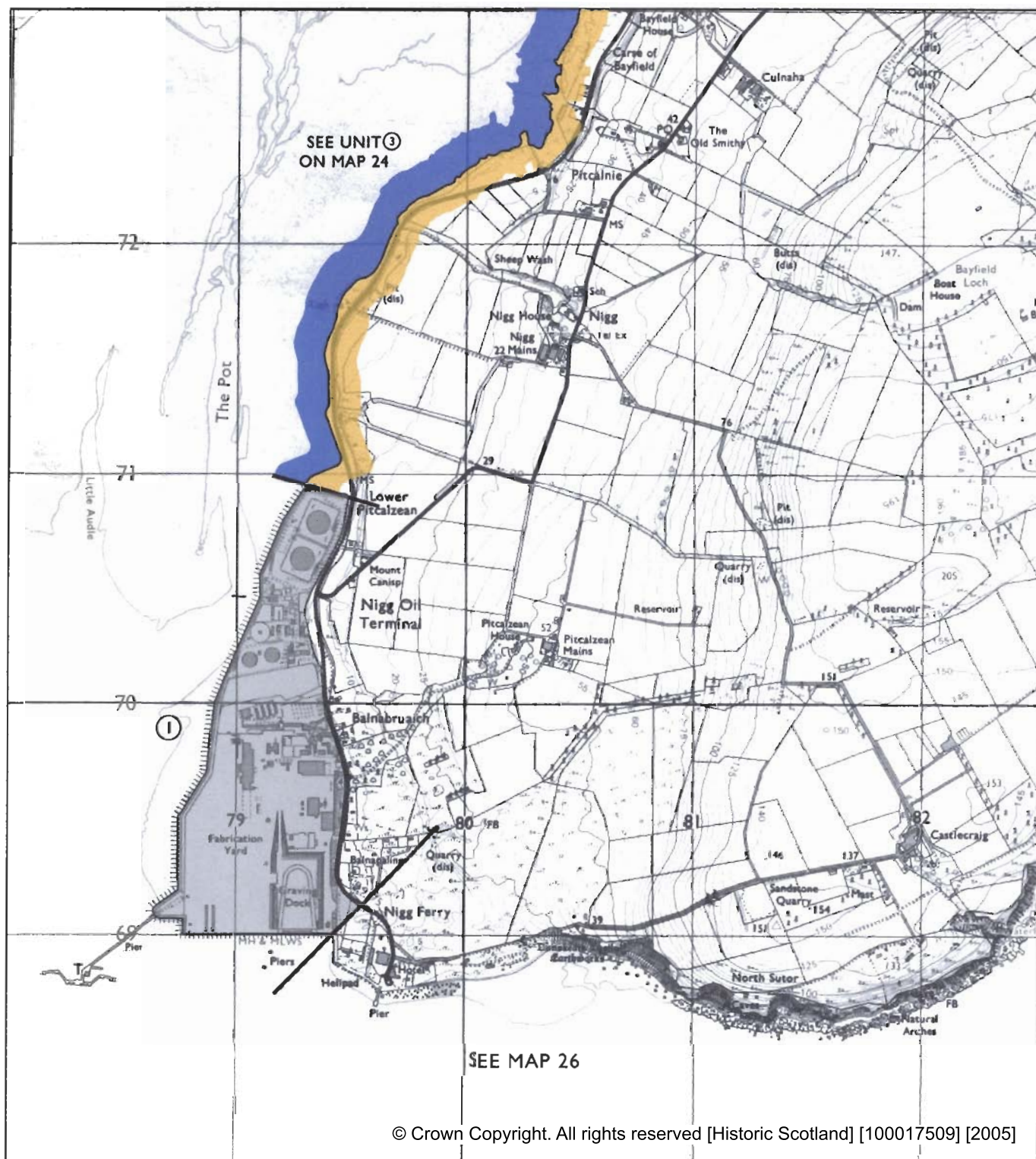
FABRICATION YARD

NH 710 700

2.5km

Artificial land form

A full account is given on its construction in Smith and Mather 1973. Shows plate under construction. Major effect is the impact on longshore drift.



MAP 25: NIGG BAY

MORAY FIRTH SURVEY Grid ref: NH 78-82/68-73

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 134

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 18 September 1998

Hinterland:

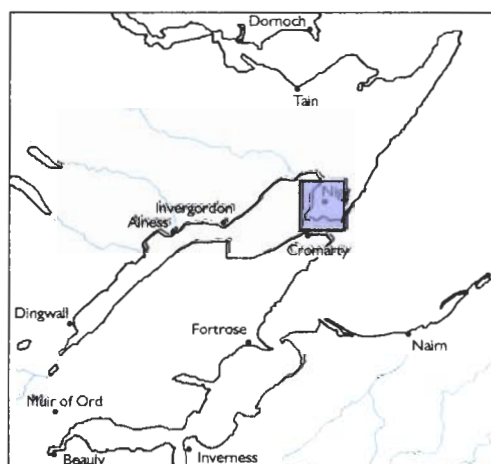
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 25: EROSION

1. East of NIGG to LOWER PITCAIRN

NH 794 714

0.8km

Accreting or stable

Conditions remain stable with well-developed saltmarsh over carse clay. The foreshore is mainly mud that is accreting.

2. NIGG OIL TERMINAL AND FABRICATION YARD

NH 790 870

2.7km

Not surveyed

This unit was not surveyed on the grounds that any archaeology associated with the former land surface was destroyed when the yard was constructed.



MAP 25: NIGG BAY

MORAY FIRTH SURVEY Grid ref: NH 78-82/68-73

1:25 000

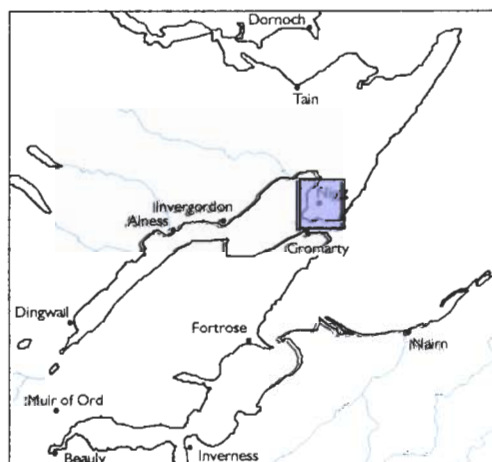
Basemap: O.S. Pathfinder Series
Sheet 134
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EROSION CLASS

Assessment date: 18 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 25: BUILT HERITAGE AND ARCHAEOLOGY

Sites in the Hinterland

NH76NE 52

NH 79 69 area

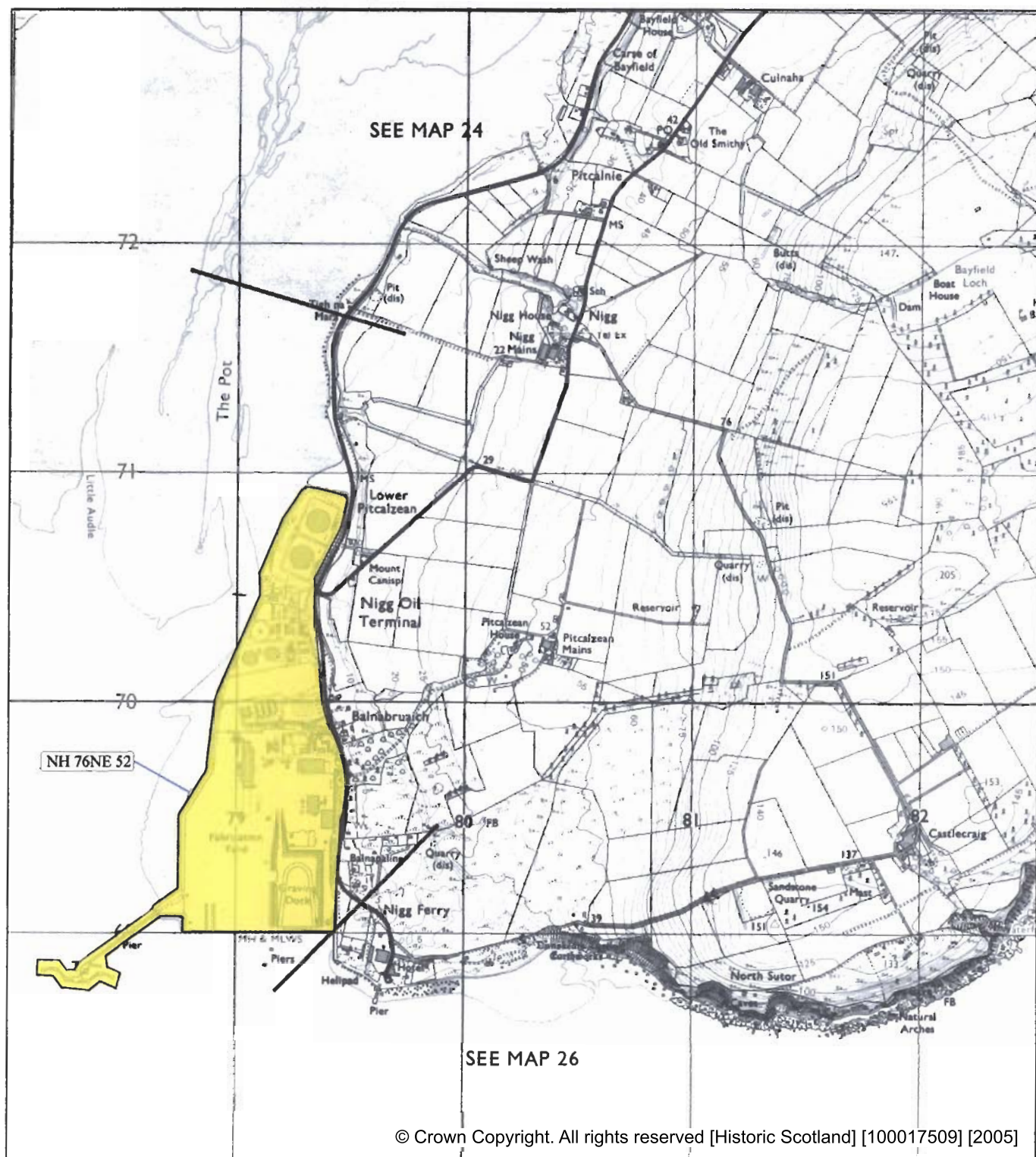
NIGG

Fabrication yard; oil industry

20th century AD

Good

Nil



MAP 25: NIGG BAY

MORAY FIRTH SURVEY Grid ref: NH 78-82/68-73

BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument, or area of designated wreck

Listed Historic Building

Monument formally proposed by Historic Scotland for scheduling, or wreck for designation

Other known Ancient Monuments, or Undesignated wreck

Designated Landscape

Insufficient information; more work needed

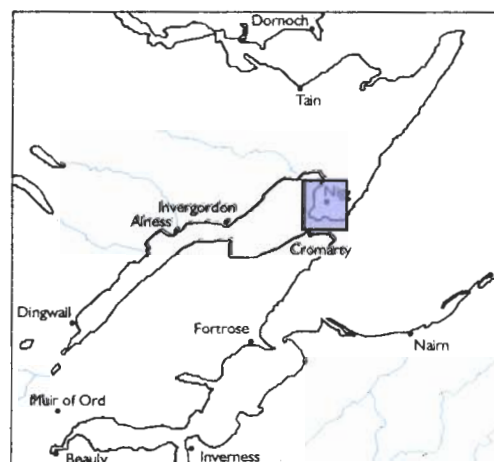
Probably archaeologically sterile

1:25 000

Basemap: O.S. Pathfinder Series

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Map 26: NIGG FERRY TO KINGS CAVE

Hinterland Geology and Coastal Geomorphology: North Sutor forms a headland overlooking Nigg Ferry and rises to a height of 635m. The basement geology is dominated by undifferentiated Moine schist and Old Red Sandstone. Nigg Ferry is a cusped foreland built out at present and the post-glacial epoch. The foreland consists of a dune system the western side of which was used to create the fabrication yard.

Erosion class: The beach at Nigg Ferry is accreting with a high proportion of gravel and shingle increasing eastwards. Smith and Mather (1973) noted that the dune system fronting the low gradient beach was undergoing serious erosion. This was due to recreational use of the dune by a caravan park. Today the dune system is stable as it has only limited visitor pressure. The dune-beach margin is however undergoing rabbit erosion and dune blow-out. The latter was seen within the sides of the cuttings that are used as pathways. The low gradient beach is stable and becomes noticeably rockier eastwards where the sand ends and boulder cover dominates. Rock armour defends the shoreline immediately in front of Nigg Ferry Hotel.

Built Heritage and Archaeology: The built heritage archaeology of this area includes the military complex and coastal batteries on both the hinterland, on top of the cliffs and near the HWM at the North Sutor and Dunskeath castle. The 12th century motte of Dunskeath castle was recorded in a fair state and the earthworks were damaged by rabbit erosion. The 19th century fishing station at Caarnrigh indicates one of the previous industries of this coastline and its current state demonstrates the erosion potential of the environment.

Map 26: Hinterland Geology and Coastal Geomorphology

1. NIGG FERRY

NH 796 689

1km

Sand

Low edge (<10m)

Blown sand/dune formation

Formed on a cusate foreland is sequence of dune sand. Low lying at 10m below OD, the dune can be trace landwards for c. 0.3km. The beach is sandy. (Further note on dune significance in Smith and Mather 1973)

2. NIGG FERRY to south of CASTLECRAIG

NH 816 687

1.7km

Rock Platform

High cliff (25m)

Glacial deposits over exposed rock

Irregular high cliff of the North Sutor overlain by glacial drift on exposed rock. The cliff edge is irregular and precipitous with sea caves and rock platforms.

3. South of CASTLE CRAIG to south of Kings

Cave

NH 823 690

2.8km

Rock platform

High cliff (c. 75-80m)

Glacial till over visible rock

Irregular sheer cliff-line with sea arches and offshore stacks. The hinterland geology is dominated by glacial till over exposed rock.

MAP 26: EROSION

1. NIGG FERRY

NH 800 688

0.9km

Accreting or eroding

Part defended by recent boulder armouring at the ferry terminal and pier region. Eastwards these hard defences give way to an extensive dune system that is undergoing erosion in parts by rabbit damage and visitor stress, particularly where tracks through the dune are well pronounced. The beach has a shallow gradient becoming increasingly stonier towards the east.

2. NORTH SUTOR

NH 814 686

2.km

Eroding or stable

This section of coast lies in front of precipitous cliffs that rise steeply. The coastline is strewn with large boulders and exposed rocky platforms that are under constant wear by wave action. Given the fairly resilient nature of the sandstone cliff erosion at the base is considered to be reasonably slow.

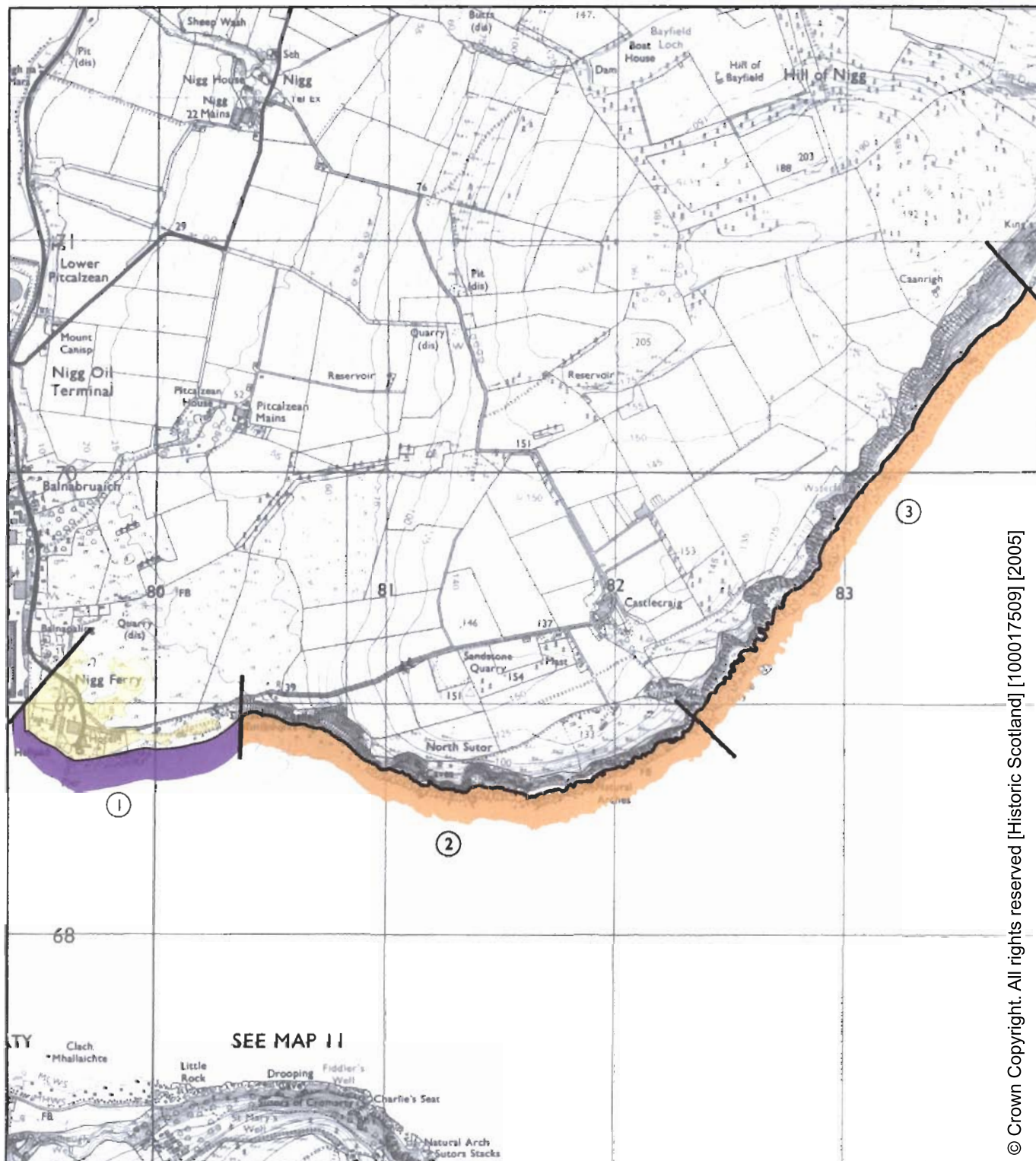
3. East of CASTLECRAIG to KINGS CAVE

NH 830 870

2.6km

Eroding or stable

Exposed precipitous cliffs overlook a rock platform shoreline. The cliff base is undergoing constant erosion by wave attack but the rate of erosion is considered to be slow owing to the resilient nature of the sandstone cliff and sea platforms.



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MAP 26: NIGG FERRY TO KING'S CAVE

MORAY FIRTH SURVEY Grid ref: NH 80-84/67-72

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 134

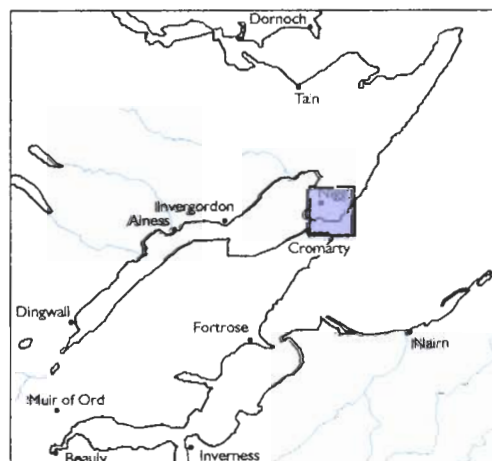
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EROSION CLASS

Assessment date: 21 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 26: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH76NE 45
NH 7961 6869
NIGG FERRY
Pier
20th century AD
Good
Nil

NH 7973 7872
NIGG FERRY
Car ferry slipway
20th century
Good
Nil

NH 7965 6879
NIGG FERRY
Sandstone quay
Uncertain
Fair
Monitor

NH 8240 6867
NORTH SUTOR
Coastal defence lookout posts
20th century AD; WWI and WWII
Poor
Monitor

NH 8350 7050
CAANRIGH
Timber hut, salmon fishing station
19th/20th century AD
Poor
Survey and monitor

Sites in the Hinterland

NH 7965 6879
NIGG FERRY
Pillbox
20th century AD; WW II
Good
Nil

NH76NE 42
NH 7968 6882
NIGG FERRY
Girnal/hotel
17th/18th century AD
Fair
Nil

NH 8040 6898
NIGG FERRY
Concrete faced tunnel
20th century AD
Fair
Nil

NH86NW 7
NH 8048 6901
BALNAPALING
Shell midden
Uncertain
Fair
Survey and monitor

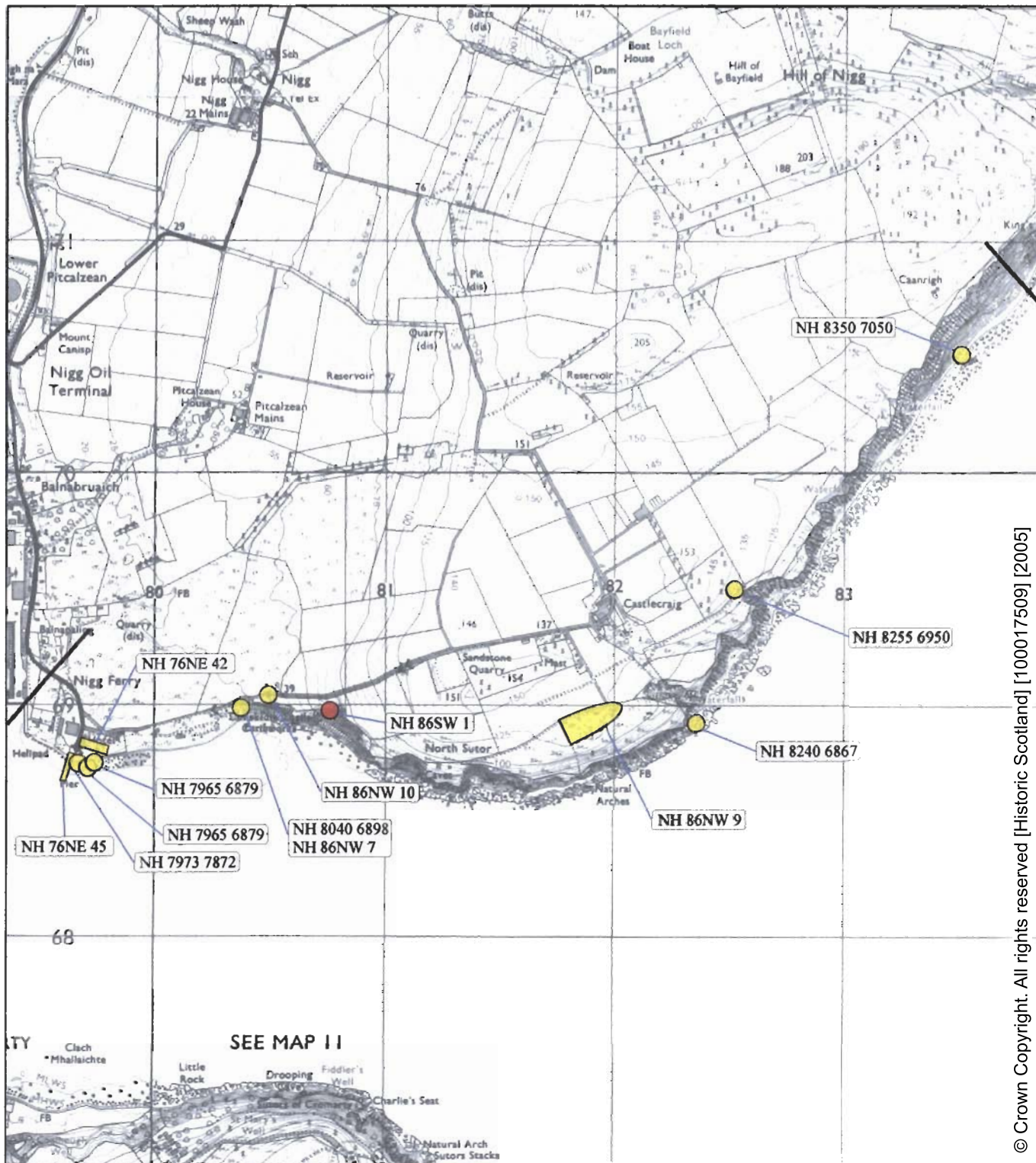
NH86NW 10
NH 8050 6903
DUNSKEATH CASTLE
Coastal battery
20th century AD
Poor
Monitor

Sites in the Hinterland

NH86NW 1 - Scheduled
NH 8070 6898
DUNSKEATH CASTLE
Motte
12th century AD
Fair
Monitor

NH86NW 9
NH 8210 6877 & 8195
6896
NORTH SUTOR
Coastal batteries; military
20th century AD; WWI and
WWII
Fair
Monitor

NH 8255 6950
NORTH SUTOR
Military buildings
20th century AD; WWI and
WWII
Good
Monitor



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MAP 26: NIGG FERRY TO KING'S CAVE

MORAY FIRTH SURVEY Grid ref: NH 80-84/67-72

1:25 000

Basemap: O.S. *Pathfinder* Series
Sheet 134
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

 Protected Ancient Monument,
or area of designated wreck

+ Listed Historic Building

 Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

 Other known Ancient Monuments,
or Undesignated wreck

 Designated Landscape

 Insufficient information;
more work needed

 Probably archaeologically sterile



Map 27: KINGS CAVE TO PORT AN RIGH

Hinterland Geology and Coastal Geomorphology: This section of coastline is exposed to the full force of gales from the NE quadrant. Undifferentiated schist of the Moine Series extend northwards. Precipitous cliffs rise to above 150m. The cliff edge is highly indented overlooking exposed abrasion platform and gullies. A narrow discontinuous platform forming a marine terrace runs parallel with the shoreline. Morainic drift forms a thin mantle over the near-surface sandstone outcrops.

Erosion class: The exposed nature of the cliff to wave hammer and storm surges is sculpting the cliff base. The cliff cover soils are prone to loss by deflation. However, this unit is eroding at such an immeasurably slow rate that much of it has to be classified as stable.

Built Heritage and Archaeology: The King's cave is purportedly the abode of king Nechtan, although the site may also have earlier connections. The site of the 18th/19th century farm buildings was one of the few sites recorded. The shell midden at Port an Righ was found to be severely eroding and a whetstone and rubber stone were both found on the surface below the exposed section.

Map 27: Hinterland Geology and Coastal Geomorphology

1. South of KINGS CAVE to south of PORT AN RIGH

NH 830 707

2.2km

Rock platform/sea arches/boulders

High cliff (>75m)

Glacial till over visible rock

Exposed high cliff with irregular edge forming discontinuous platforms and terraces. The shoreline is composed of rock ledges of Old Red Sandstone.

2. South of PORT AN RIGH to OLD SHANDWICK

NH 854 735

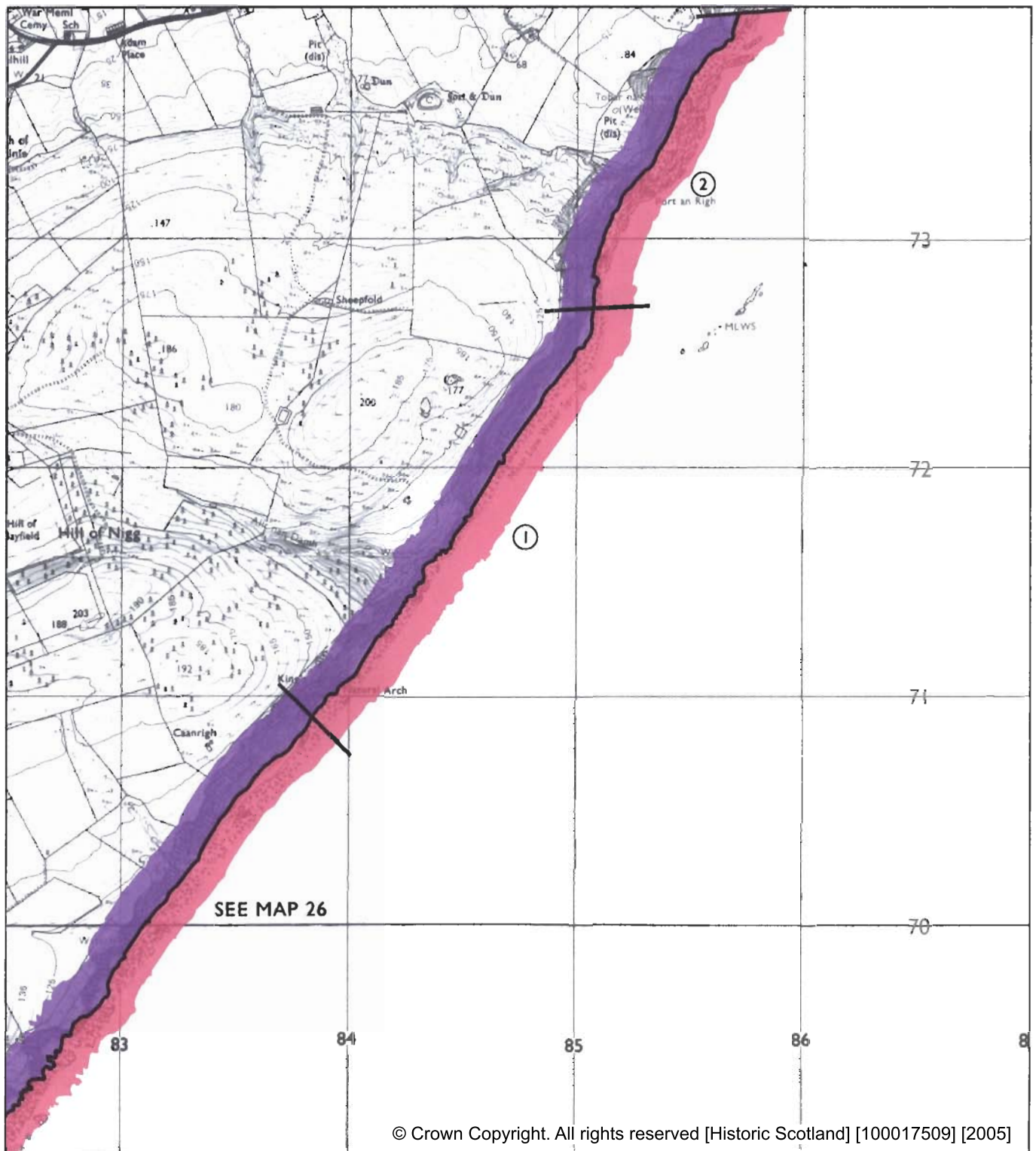
1.3km

Rock platform/boulders

High cliff (100m)

Glacial deposits over visible rock

Exposed high cliff overlain by glacial drift over visible rock. Terrace formation with steep gradients. The foreshore is exposed rock platform.



MAP 27: KING'S CAVE TO PORT AN RIGH

MORAY FIRTH SURVEY Grid ref: NH 83-87/69-74

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 134

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 21 September 1998

Hinterland:

- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 27: EROSION

1. KINGS CAVE to

NH 843 715

2.4km

Eroding or stable

Exposed precipitous cliffs continue northwards from Kings Cave. Stable rock platforms outcrop at the base of the cliff. Conditions are generally stable.

2. PORT AN RIGH

NH 852 732

1.3km

Eroding or stable

Exposed precipitous cliff and terrace overlook a rock and platform shoreline. Conditions are considered to be stable based on the hard nature of the outcropping sandstone.

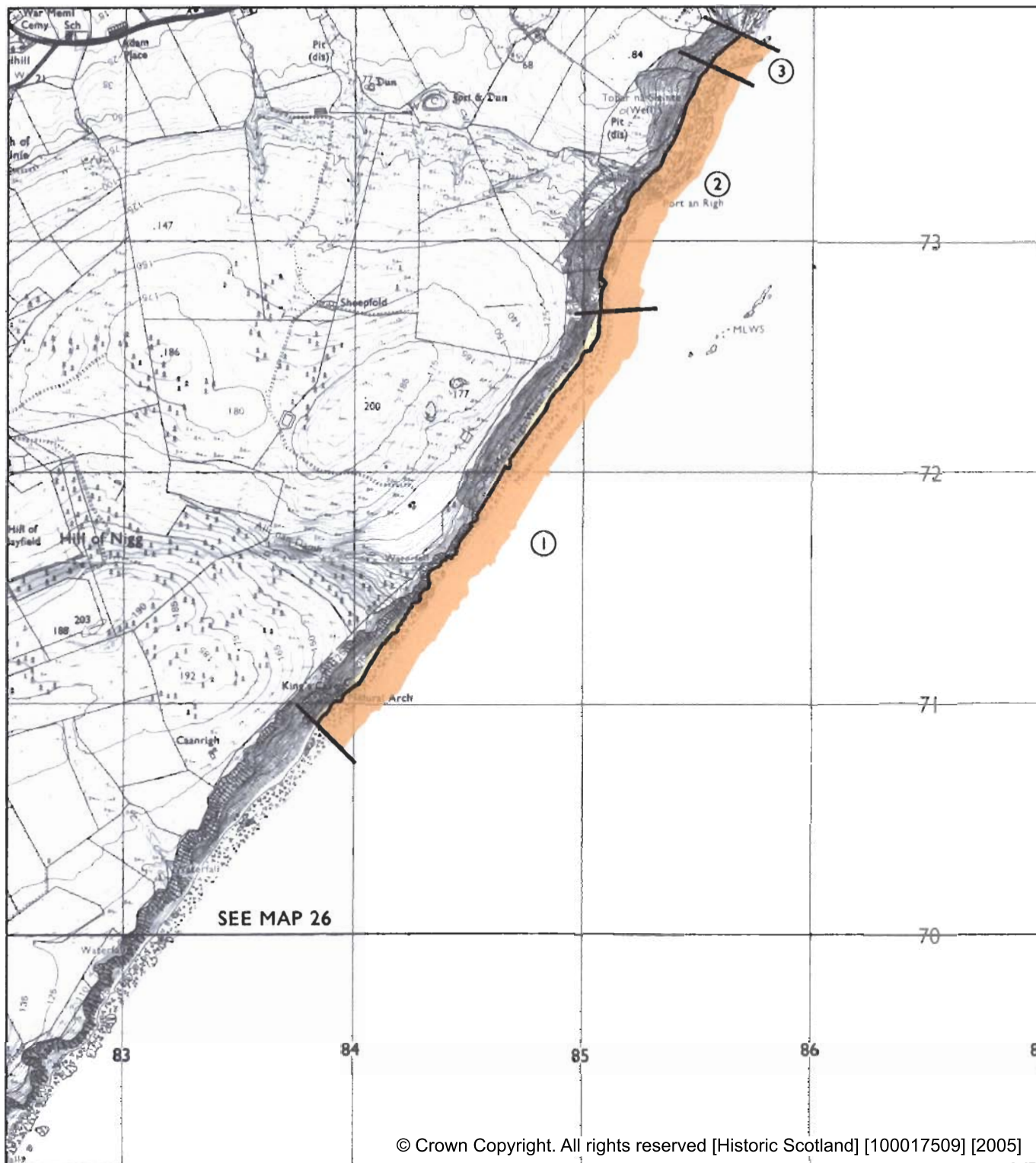
3. North of PORT AN RIGH

NH 857 738

0.1km

Eroding or stable

Landslides have led to a steep inclining cliff face that is eroding onto the beach and being reworked at the cliff base. Gullies are scoured by wave attack albeit at a slow rate.



MAP 27: KING'S CAVE TO PORT AN RIGH

MORAY FIRTH SURVEY Grid ref: NH 83-87/69-74

1:25 000

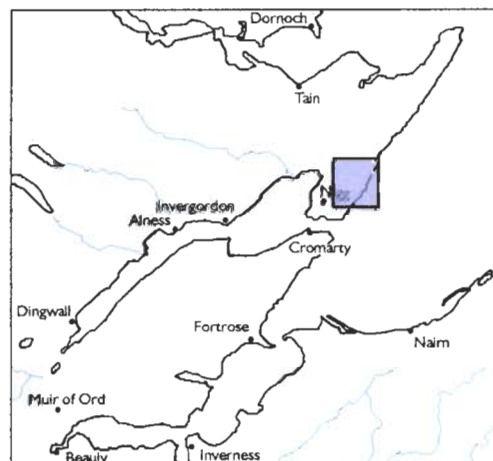
Basemap: O.S. Pathfinder Series
Sheet 134
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EROSION CLASS

Assessment date: 21 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 27: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH87SW 15

NH 8393 7104 - 8365 7080

KING'S CAVE;

Two natural caves, alleged abode of

King Nechtan

8th century AD

Fair

Nil

NH 8523 7326

PORT AN RIGH

Building remains

18th/19th century AD

Poor

Monitor

NH 8542 7352

PORT AN RIGH

Shell midden

Uncertain

Poor

Survey and monitor

Sites in the Hinterland

NH87SW 20

NH 8425 7185

HILL OF NIGG

Deserted farmstead; enclosure

Uncertain

Poor

Monitor

NH 8545 7360

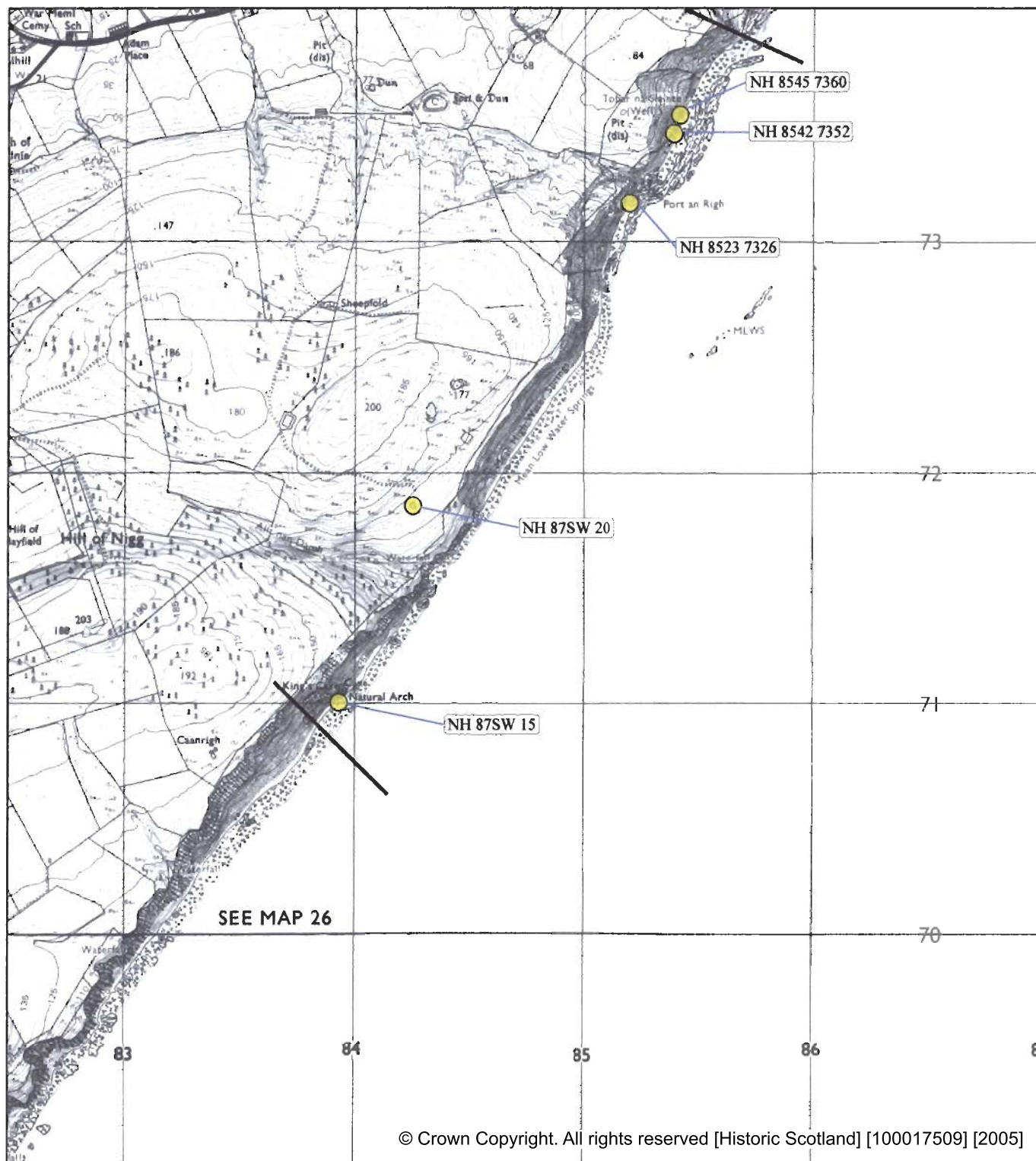
TOBAR NA SLAINTE

Well

Uncertain

Good

Nil



MAP 27: KING'S CAVE TO PORT AN RIGH

MORAY FIRTH SURVEY Grid ref: NH 83-87/69-74

1:25 000

Basemap: O.S. *Pathfinder* Series
Sheet 134
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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

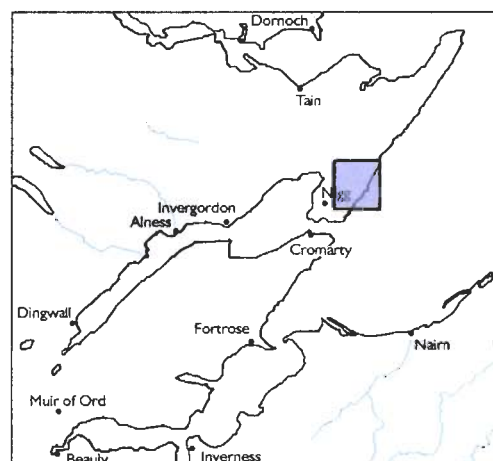
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 28: PORT AN RIGH TO CADBOLL

Hinterland Geology and Coastal Geomorphology: This coastal unit is underlain by Middle Old Red Sandstone which is itself overlain by boulder clay and morainic drift deposits. The coast cliff overlooks block-strewn abrasion platforms. The settlement of Shandwick Bay and Balintore are within this unit of coastline and occupy part of the only embayment in the largely cliff-girt eastern coastline of the Tarbat Ness Peninsula. The villages are built on an old cliff line at the point where a low coll leads over to the Fern-Nigg lowland. North of Ballintore Harbour the shoreline consists of soft shingle set between abrasion platform. A wide beach and dune complex occupies the area south of Ballintore. Here, Middle and Upper Jurassic sediments are well exposed on a wave-planed foreshore.

Erosion class: Concrete seawalls protect part of the Shandwick Bay. At Ballintore Harbour adjacent to the parking area, rip-rap armouring is now falling away from a low cliff. Beyond Ballintore, the coastline is very rugged with block-strewn abrasion platform and isolated sporadic sand patches. In 1973, Smith and Mather noted that the dune system at Shandwick Bay was stable, but armour defence works are now present presumably showing that at sometime prior to this year, parts of the dune had become unstable.

Built Heritage and Archaeology: This section of coastline includes two of the accessible foreshore areas, where the villages of Balintore and Hilton of Cadboll are situated. The sites in this area include landing places and harbours and a number of piers and breakwaters, affording shelter from the north easterly exposure. At Shandwick the remains of the 15th century castle, chapel and burial ground are important sites.

Map 28: Hinterland Geology and Coastal Geomorphology

1. South of PORT AN RIGH to OLD SHANDWICK

NH 854 735

1.3km

Rock platform/boulders

High cliff (100m)

Glacial deposits over visible rock

Exposed high cliff overlain by glacial drift over visible rock. Terrace formation with steep gradients. The foreshore is exposed rock platform.

6. North-east of CADBOLL HOUSE to CADBOLL POINT

NH 872 772

1.2km

Rock platform/.sand

Low cliff (10m)

Boulder drift over visible rock

Raised beach deposits front backshore terrace. The foreshore consists of rock platform broken by small bay at Jessie Port.

2. SHANDWICK

NH 860750

0.8km

Mainly Sand

Low cliff

Blown sand over marine deposits

Shandwick Bay has a sandy beach backed by a low cliff edge. The hinterland consists on wind blown sand forming a low dune system. The underlying geology is predominantly marine sand and gravel.

3. BALINTORE HARBOUR

NH 862 755

0.5k

Rock platform/blown sand

Low edge (<10m)

Raised beach deposits

An outcrop of Old Red Sandstone forms the harbour where raised beach deposits form the backshore region.

4. BALINTORE HARBOUR to north of HILTON OF CADBOLL

NH 871 763

1.5km

Rock platform/sand

Low edge (<10m)

Raised beach deposits

Raised beach deposits are distributed along this unit of coastline. The foreshore consists of rocky scars with sand and shingle also present. The hinterland is low lying.

5. North east of CADBOLL HOUSE

NH 873 767

0.2km

Sand bordered by rock outcrop

Low edge (<10m)

Blown sand/raised beach deposits

A small bay formed in a cleft of Old Red Sandstone outcrop. Sand entrapment with blown sand towards the backshore zone. The hinterland is low lying.



MAP 28: PORT AN RIGH TO CADBOLL

MORAY FIRTH SURVEY Grid ref: NH 85-89/73-78

1:25 000

Basemap: O.S. *Pathfinder* Series
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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment dates: 21-23 September 1998

Hinterland:

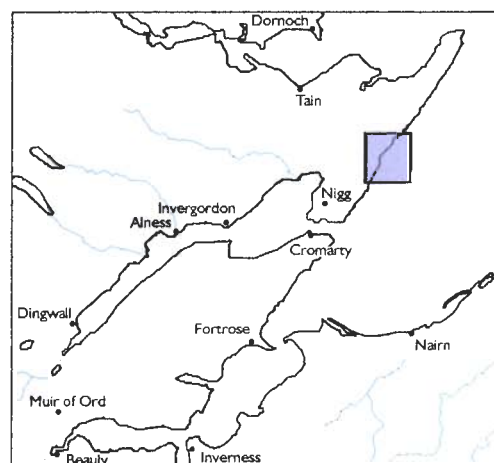
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 28: EROSION

1. OLD SHANDWICK

NH 859 742

0.9k

Eroding or stable

The cliff face is less precipitous than in the previous units and is mantled in parts by marine sands and gravel. These are actively eroding above the cliff caused by weathering. The shoreline consists of rock platform with deep gullies. Again as in the previous units erosion is considered to be constant but slow.

2. SHANDWICK BAY

NH 860 754

0.8km

Eroding or stable

Sand dunes and concrete sea walls protect the bay. Rock and sand are exposed and appear to be stable. Conditions are generally stable with some erosion of rubble tipping that is being scoured by wave action.

3. BALINTORE HARBOUR

NH 8633 7558

c.20m

Definitely eroding

Rip Rap stone defences are collapsing out of the face immediately behind the harbour. Where the stones have collapsed marine sand is exposed and prone to further erosion by deflation.

4. BALLINTORE VILLAGE

NH 865 755

0.2km

Stable

Conditions here are stable owing to sea defences. The beach is sandy with no evidence of erosion.

5. BALLINTORE to HILTON OF CADBOLL

NH 870 760

1km

Stable

Exposed rock platform and sand filled gullies dominate are present throughout this unit of coastline. Conditions are stable owing to the stabilising effect of the rock platforms that absorb the effect of wave attack on the backshore.

6. HILTON OF CADBOLL to JESSIE PORT

NH 878 770

1.4km

Stable

Exposed rock platform with accreting sand and shingle. No evidence for active erosion was seen.



MAP 28: PORT AN RIGH TO CADBOLL

MORAY FIRTH SURVEY Grid ref: NH 85-89/73-78

1:25 000

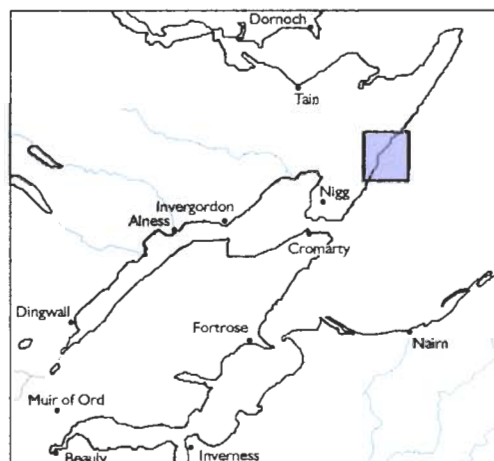
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EROSION CLASS

Assessment dates: 21-23 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 28: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH87NE 19
NH 8598 7515
SHANDWICK
Landing place
Uncertain
Poor
Monitor

NH87NE 17
NH 8649 7549
BALINTORE
Harbour
19th/20th century AD
Good
Nil

NH87NE 18
NH 8728 7634
HILTON OF CADBOLL
Pier
19th/20th century AD
Good
Nil

NH 8731 7657
HILTON OF CADBOLL
Pier
Uncertain
Poor
Nil

NH 8737 7683
CADBOLL
Breakwater
20th century AD
Fair
Nil

NH 8776 7690
CADBOLL
Breakwater
20th century AD
Fair
Nil

NH 8788 7716
JESSIE PORT
Natural enhanced harbour
Uncertain
Poor
Nil

Sites in the Hinterland

NH 8582 7427
SHANDWICK
Buildings, possible WW II installations
20th century AD
Good
Nil

NH 8582 7450
SHANDWICK
Quarry and associated buildings
20th century AD
Fair
Monitor

NH87SE 2
NH 8582 7451
SHANDWICK
Castle (remains)
15th century AD
Poor
Monitor

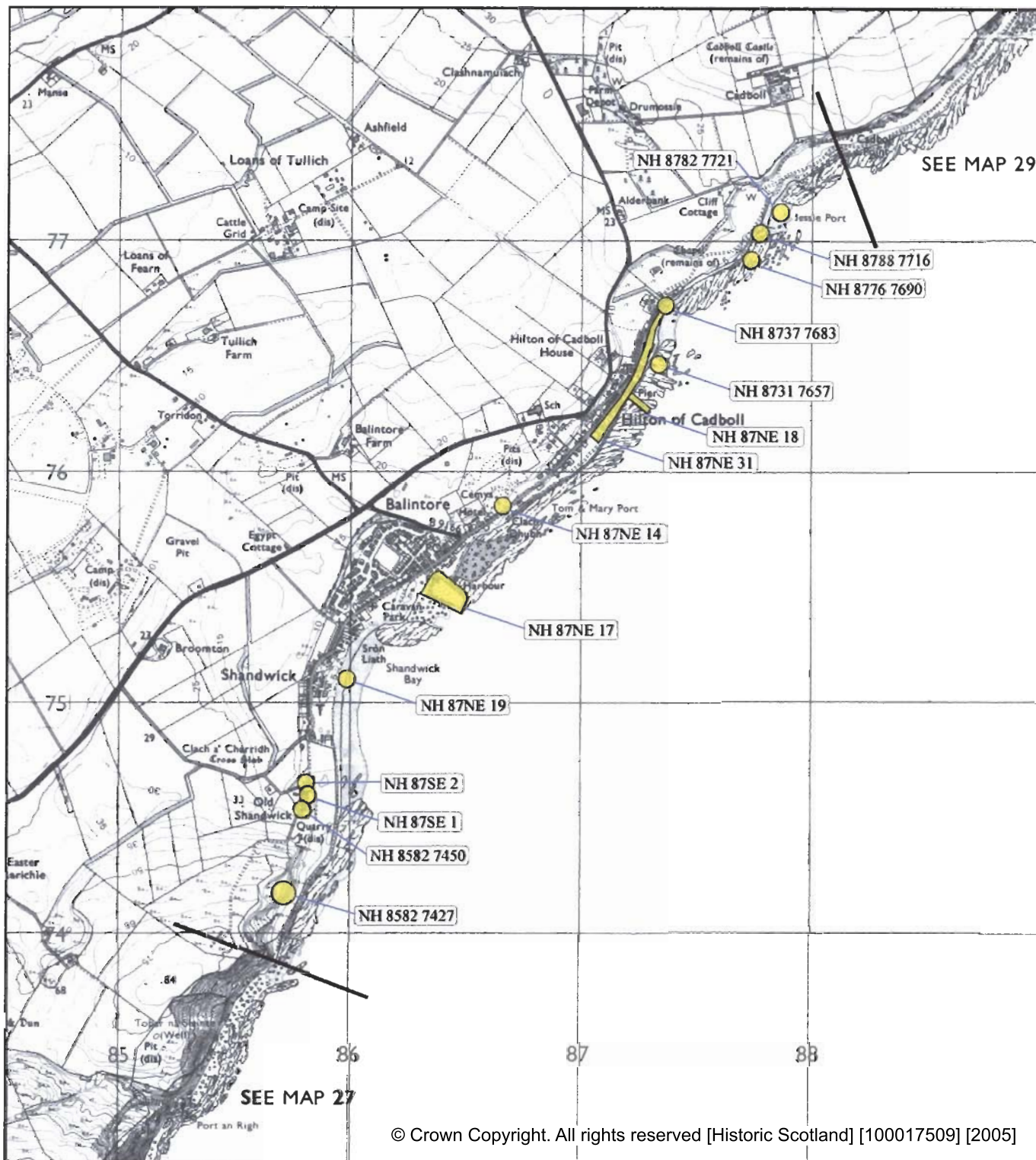
NH87SE 1
NH 8582 7453
SHANDWICK
Chapel; burial ground
15th century AD
Poor
Monitor

NH87NE 14
NH 8667 7585
BALINTORE
Cist burials
Uncertain
Fair
Monitor

Sites in the Hinterland

NH87NE 31
NH 871 763
HILTON OF CADBOLL
Village
18th/19th century AD
Good
Nil

NH 8782 7721
CADBOLL
Gravel pit
19th/20th century AD
Fair
Nil



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MAP 28: PORT AN RIGH TO CADBOLL

MORAY FIRTH SURVEY Grid ref: NH 85-89/73-78


BUILT HERITAGE AND ARCHAEOLOGY


Assessment period: September 1998


Key:


 Protected Ancient Monument, or area of designated wreck


 Listed Historic Building

 Monument formally proposed by Historic Scotland for scheduling, or wreck for designation

 Other known Ancient Monuments, or Undesignated wreck

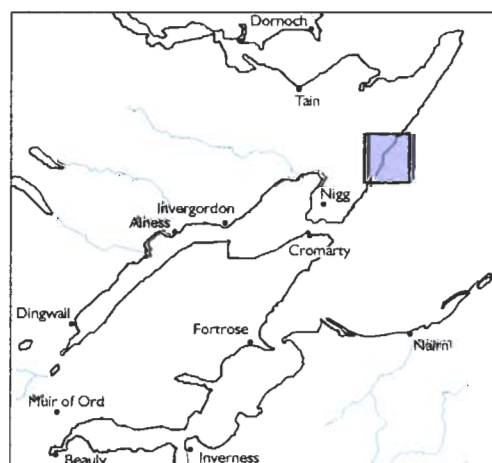
 Designated Landscape

 Insufficient information; more work needed

 Probably archaeologically sterile

1:25 000

Basemap: O.S. Pathfinder Series
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Map 29: CADBOLL TO MEIKLE TARREL

Hinterland Geology and Coastal Geomorphology: This unit of coastline forms the lower section of Tarbat Ness and has a linear coastal edge. The basement geology continues with Old Red Sandstone. This is overlain with a well pronounced wave cut platform forming the Post-glacial raised beach. Boulder clays mantle the higher cliff edge. The foreshore continues to be extremely rugged with abrasion platform and gullies.

Erosion class: This section of coast, as in the previous two sections, is very exposed. Wave hammer and scour is effecting the cliffs base albeit at a very slow rate. Attrition of the upper cliff face is ongoing but cliff fall will be occurring at an immeasurably slow rate.

Built Heritage and Archaeology: At Cadboll point the modern fishing station demonstrates continued use of this part of the coastline and a number of other sites in the area are the remains of previous stations. The hinterland archaeology includes the 18th century listed Geanies House and designed landscape. A number of ruined buildings on the foreshore around Meikle Tarrel may be the remains of fishing stations along this area of exposed coastline.

Map 29: Hinterland Geology and Coastal Geomorphology

1. CADBOLL POINT to GENIES POINT

NH 892 785

2.1km

Rock platform

High cliff (40m)

Raised beach platform

Raised beach deposits of postglacial age are mantled by boulder clay. The foreshore consists of rock platform and boulders.

2. GENIES POINT to south of CREAG

MHOAL

NH 910 810

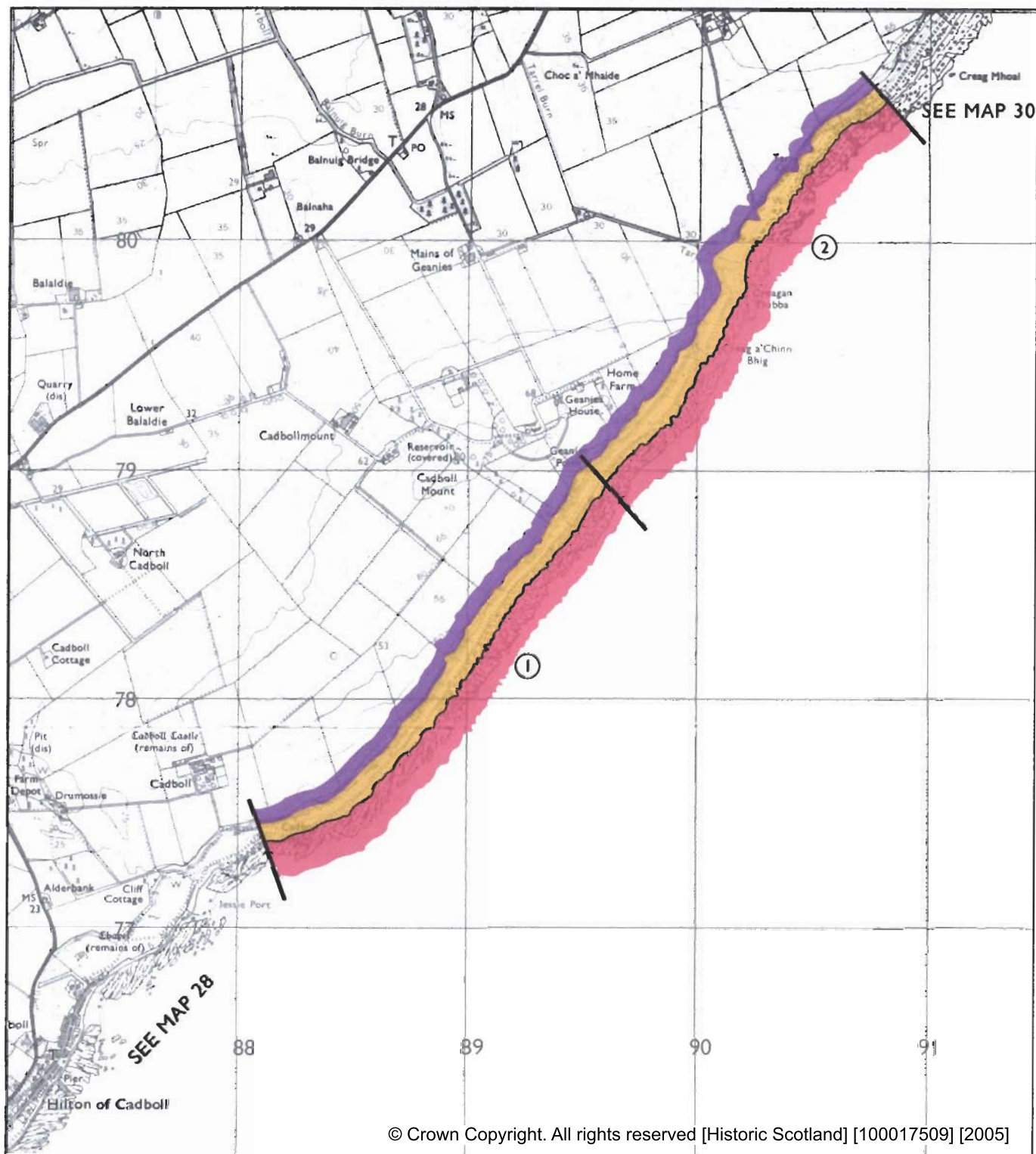
2km

Rock platform

High cliff (20m)

Raised beach platform/boulder clay

Exposed cliff with raised beach deposition and wave cut platform of Postglacial age. Boulder clays occur above the raised beach deposits.



MAP 29: CADBOLL TO MEIKLE TARREL

MORAY FIRTH SURVEY Grid ref: NH 87-91/76-81

1:25 000

Basemap: O.S. Pathfinder Series

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 24 September 1998

Hinterland:

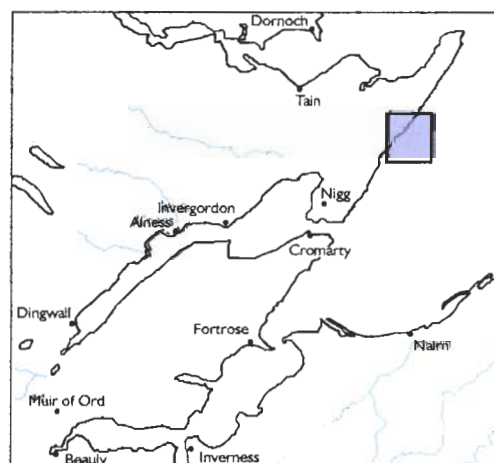
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 29: EROSION

1. JESSIE PORT to GEANIES POINT

NH 890 780

2.4km

Accreting or stable

Accreting cobble beach behind exposed rock platforms. No indicators of active erosion were encountered at the time of the survey.

2. HOME FARM to south of CREAG MHOAL

NH 910 810

4.5km

Stable or eroding

This unit of coastline contains steep rock ledges locally exposed at low tides. The cliff is discontinuous with deposits from relict shorelines. Erosion tends to be isolated slips the cliff. Conditions at the cliff base are eroding slowly.

MAP 29: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH 8815 7729
CADBOLL POINT
Fishing station complex;
harbour, breakwater
20th century AD
Good
Nil

NH 8891 7809
CADBOLL
Breakwater
20th century AD
Good
Nil

NH 8951 7872
GEANIES POINT
Breakwater
20th century AD
Good
Nil

NH 8950 7885
GEANIES POINT
Roofed building
19th century AD or earlier
Poor
Monitor

NH 8952 7885
GEANIES HOUSE
Ruined rectangular buildings
Uncertain
Poor
Nil

NH98SW 39 Listed A
NH 9288 8365
BALLONE CASTLE
Enclosures
Uncertain
Poor
Monitor

Sites on the Coastal Edge & Foreshore

NH 9025 8000
MEIKLE TARREL
Ruined building
18th/19th century AD
Poor
Monitor

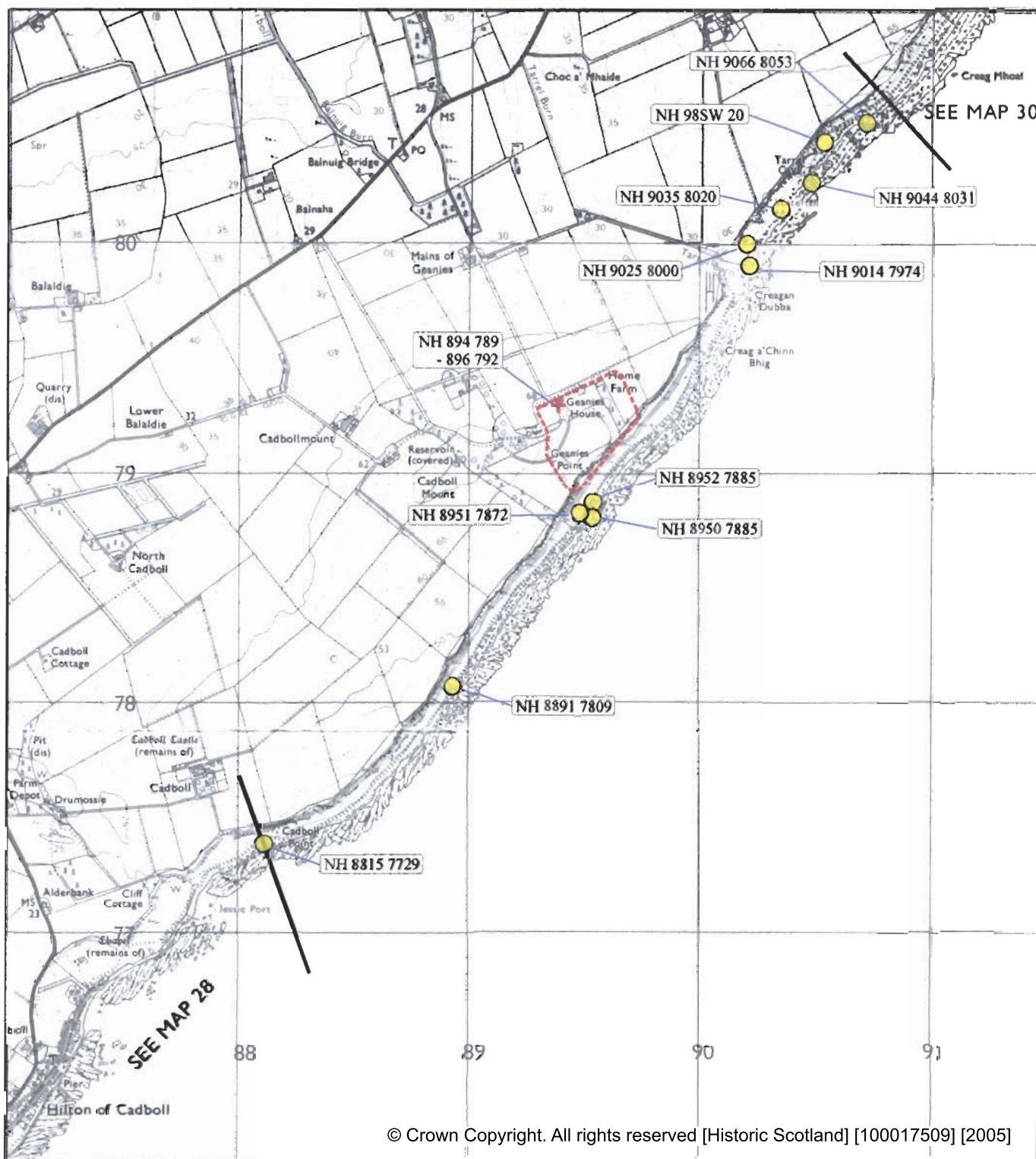
NH98SW 50
NH 9035 8020
MEIKLE TARREL
Ruined buildings
Uncertain
Poor
Monitor

NH 9044 8031
TARREL CAVE
Uncertain
Cave
Fair
Nil

Sites in the Hinterland

NH 894 789 - 896 792 Listed B
GEANIES HOUSE
House and designed landscape
18th/19th century AD
Good
Nil

NH 9014 7974
TARREL BURN
Ruined building
Uncertain
Poor
Nil



MAP 29: CADBOLL TO MEIKLE TARREL

MORAY FIRTH SURVEY Grid ref: NH 87-91/76-81

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 124, 134

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

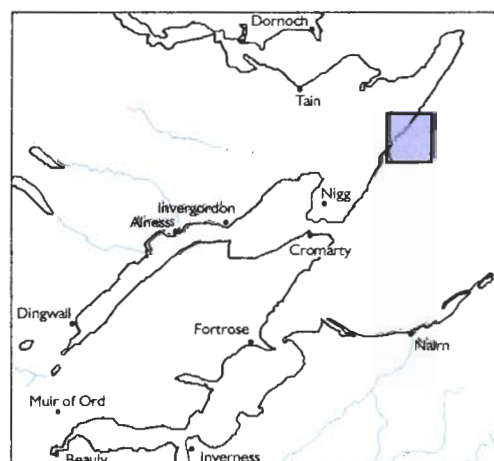
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



Map 30: MEIKLE TARREL TO EASTER BINDEL

Hinterland Geology and Coastal Geomorphology: Old Red Sandstone extends northwards towards Tarbat Ness. The overlying drift is boulder clay with a thin strip of marine sands and gravel forming a discontinuous platform along the cliff edge. The cliff is very indented, with a section of terraces formed at Beacon Hill (NH 972 837). The cliff overlooks extensive abrasion platform.

Erosion class: This section is eroding at a slow rate due to its exposed position to gales from the NE quadrant. The configuration of the cliff edge is also being sculpted, but slow rate, therefore conditions along this unit are stable.

Built Heritage and Archaeology: The hinterland archaeology includes the village of Rockfield that comprises 18th, 19th and 20th century residential housing. Ballone castle, the scheduled and listed 16th century tower house, has recently been restored and has been protected from foreshore coastal erosion.

Map 30: Hinterland Geology and Coastal Geomorphology

1. CREAG MHOAL to HORSESHOE CRAIG

NH 912 830

1.4km

Rock platform/boulders

High cliff (25m)

Raised beach deposits/boulder clay

Exposed coastal edge consisting of high cliff with raised beach platform. The foreshore is rock platform with boulders. Boulder clay mantles the cliff edge.

2. HORSESHOE CRAIG to WHITE HILLOCK

NH 924 830

2.6

Rock platform/boulders

High cliff (20m)

Raised beach deposits

Post Glacial raised shoreline mantled by boulder clay. The shoreline consists of rock platform and boulders.

3. WHITE HILLOCK to EASTER BINDELL

NH 935 835

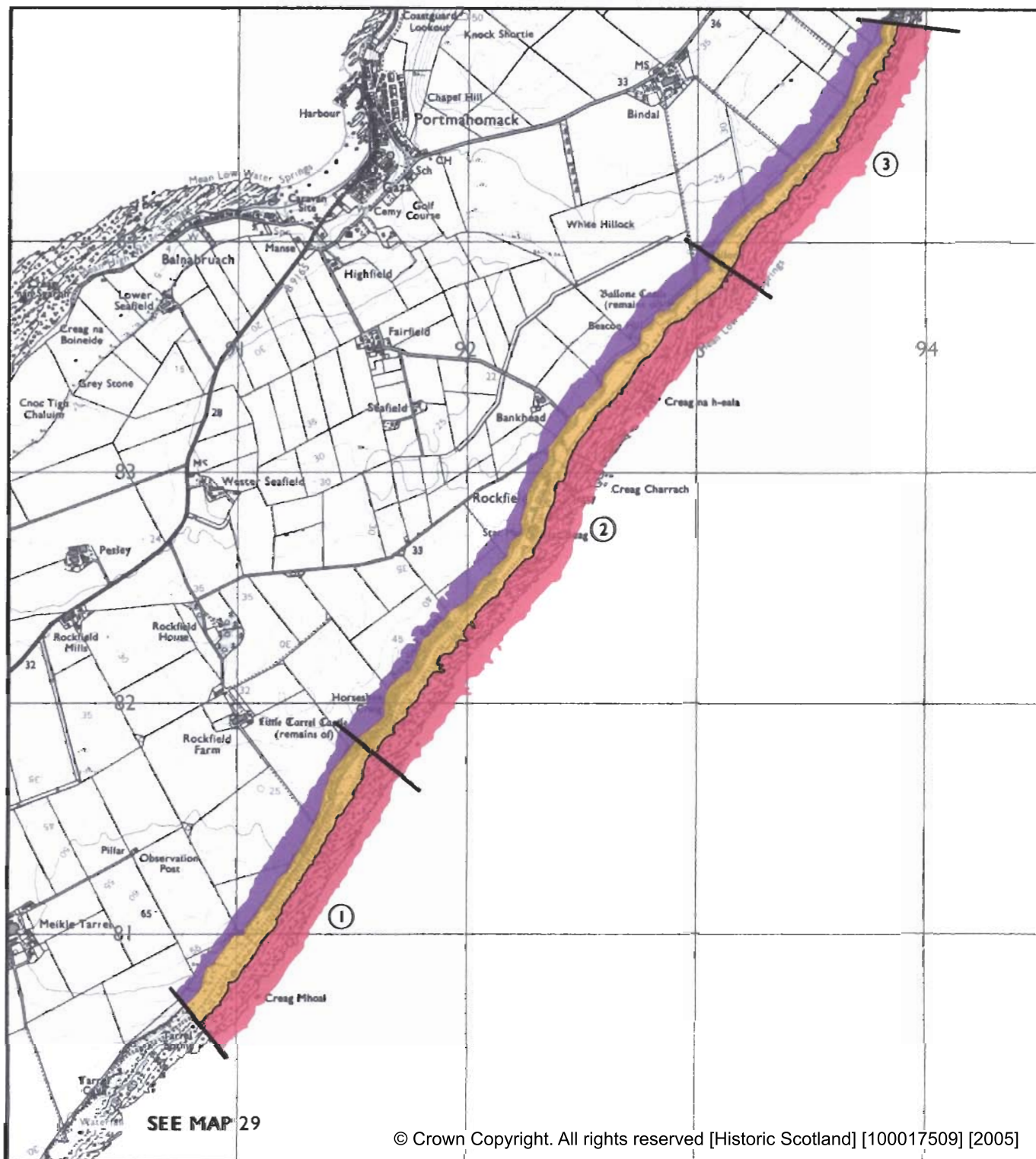
1.3 km

Rock platform/boulders

High cliff (c.20m)

Raised beach deposits

Wide Post Glacial raised platform mantled by boulder clay. The shoreline consists of rock platform and boulders.



MAP 30: MEIKLE TARREL TO EASTER BINDAL 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 90-94/80-85

Basemap: O.S. Pathfinder Series
Sheet 124

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 24 September 1998

Hinterland:

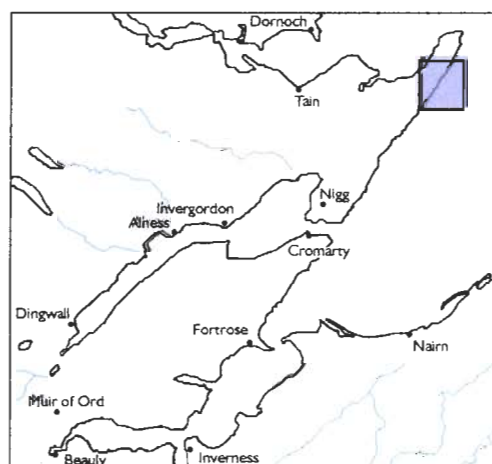
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 30: EROSION

1. CREAG MHOAL to ROCKFIELD

NH 917820

2.5km

Eroding or stable

Exposed shoreline of Old Red Sandstone cut into gullies and abrasion platforms. Erosion is occurring albeit at a slow rate.

2. ROCKFIELD

NH 924 829

0.3km

Accreting or stable

Sheltered behind the cliff and built on a relict sea cut platform Rockfield is protected by sea defences. The cobble beach is stable.

3. BEACON HILL

NH 927 835

1.2km

Stable or eroding

A series of wave cut terraces overlook a rocky shore with exposed rock platforms and gullies. Rubble sea defences have been placed at Ballone.

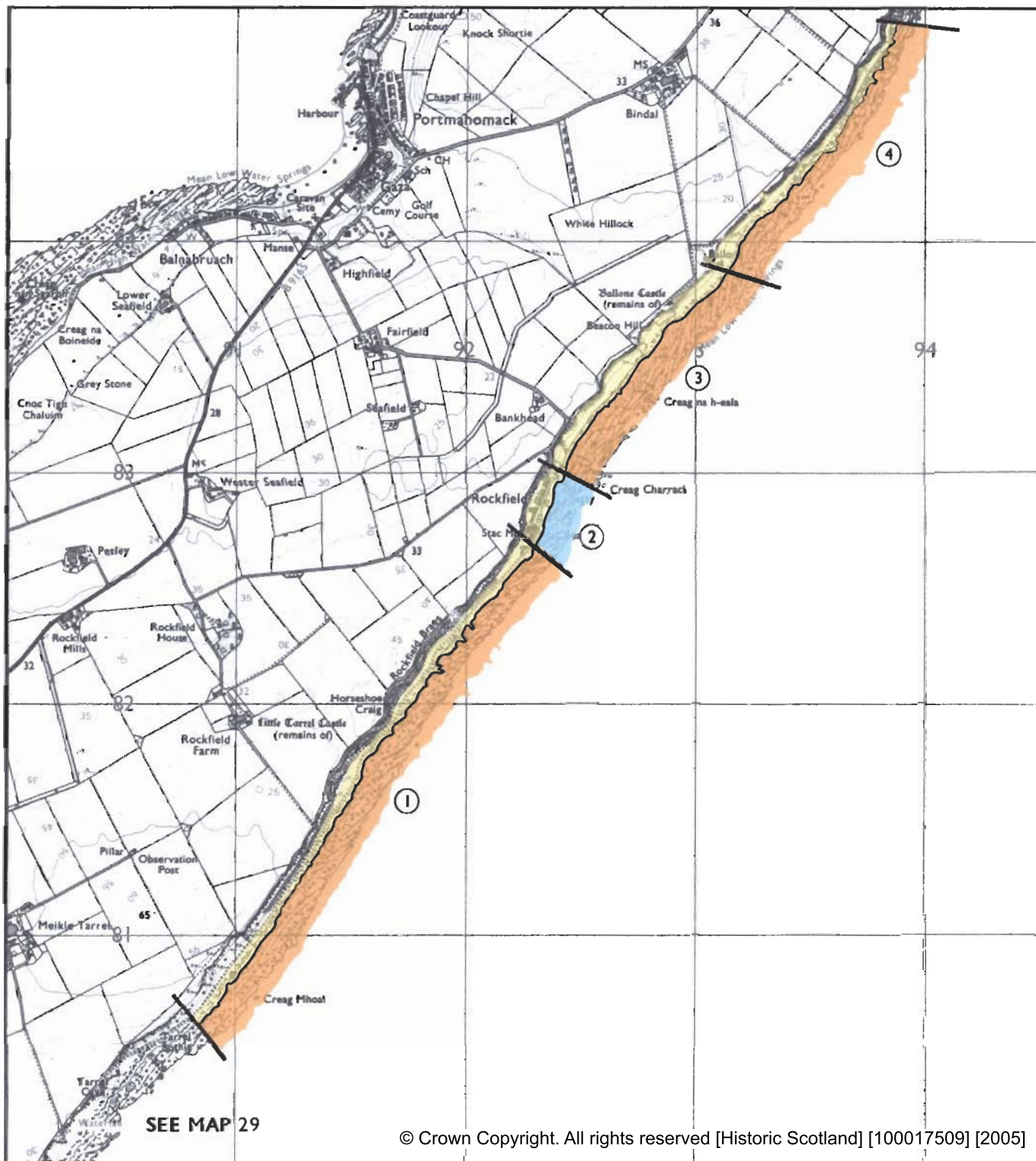
4. East of EASTER BINDAL

NH 936 856

1.3km

Stable or eroding

Incised shoreline of exposed rock platform scoured into a series of discontinuous platforms. Scour and cliff fall is ongoing but at a slow rate.



MAP 30: MEIKLE TARREL TO EASTER BINDAL 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 90-94/80-85

Basemap: O.S. Pathfinder Series
Sheet 124

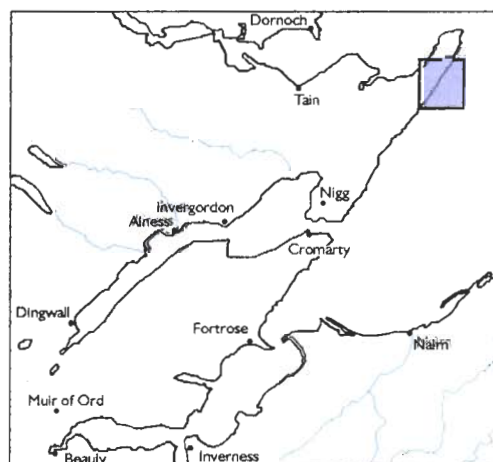
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EROSION CLASS

Assessment date: 24 September 1998

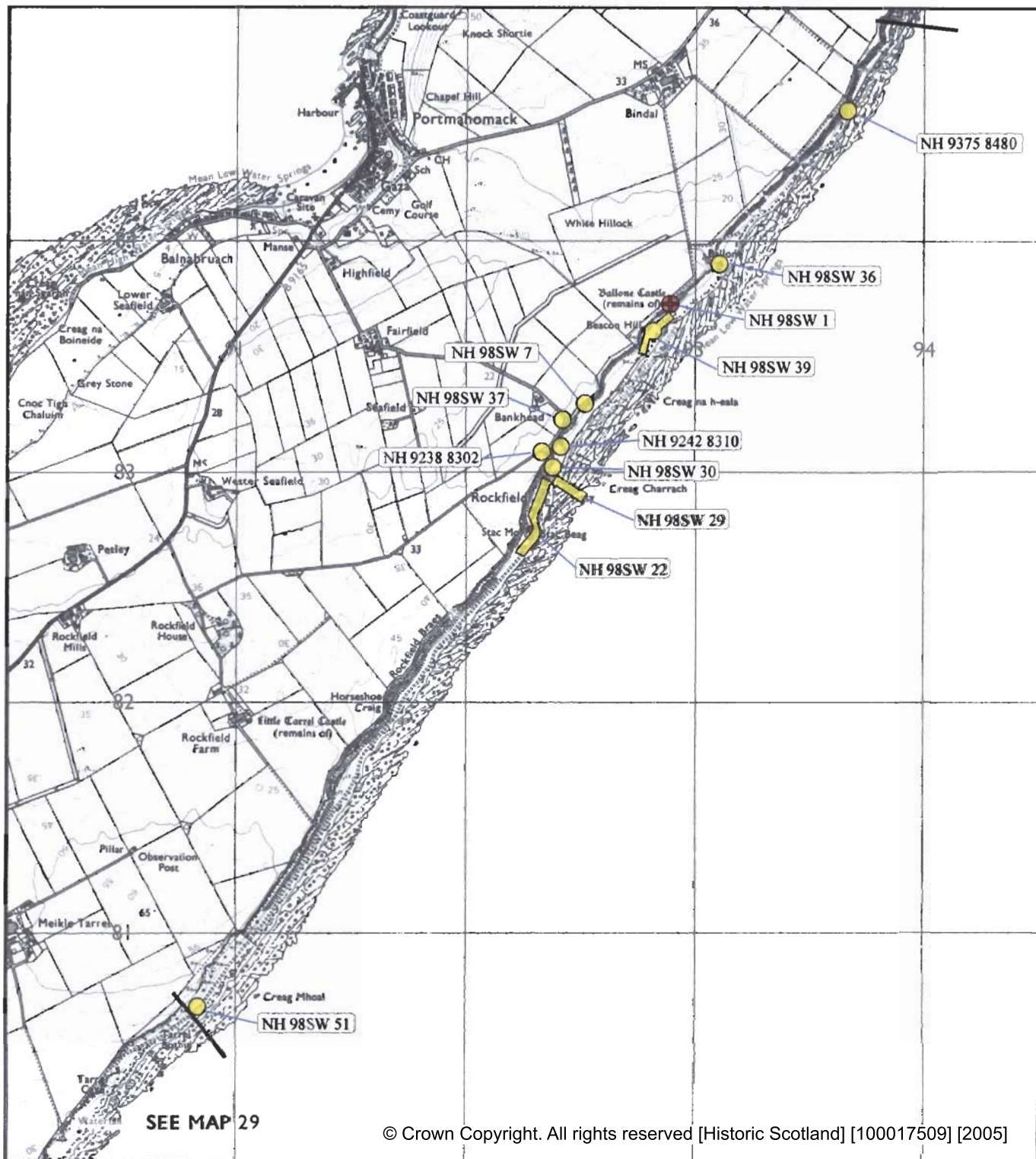
Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 30: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore	Sites in the Hinterland	Sites in the Hinterland
NH98SW 51 NH 9082 8065 MEIKLE TARREL Enclosure Uncertain Poor Monitor	NH98SW 22 NH 9235 8285 ROCKFIELD Village; houses 18 th /19 th century AD Good Nil	NH98SW 36 NH 9309 8390 BALLONE MILL Water mill; pond 18 th /19 th century AD Poor Monitor
NH98SW 29 NH 9245 8293 ROCKFIELD Pier 19 th century AD Good Nil	NH 9238 8302 ROCKFIELD Building 20 th century AD Fair Nil	
NH98SW 30 NH 9240 8298 ROCKFIELD Fishing station 18 th /19 th century AD Good Nil	NH 9242 8310 ROCKFIELD Ruined building Uncertain Poor Monitor	
NH98SW 7 NH 9265 8343 BALLONE CASTLE Chapel; graveyard 18 th /19 th century AD Poor Monitor	NH 9238 8302 ROCKFIELD Roofed building 18 th /19 th century AD Fair Nil	
NH98SW 39 NH 9288 8365 BALLONE CASTLE Enclosures Uncertain Poor Monitor	NH98SW 37 NH 9242 8310 BANKHEAD Two deserted cottages 18 th /19 th century AD Fair Nil	
NH 9375 8480 EASTER BINDAL Ruined building Uncertain Poor Nil	NH98SW 1 - Scheduled & Listed A NH 9288 8373 BALLONE CASTLE Residential castle 16 th /17 th /18 th centuries AD Good Nil	



MAP 30: MEIKLE TARREL TO EASTER BINDAL 1:25 000

MORAY FIRTH SURVEY Grid ref: NH 90-94/80-85

Basemap: O.S. Pathfinder Series
Sheet 124

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BUILT HERITAGE AND ARCHAEOLOGY

Assessment period: September 1998

Key:

Protected Ancient Monument,
or area of designated wreck

Listed Historic Building

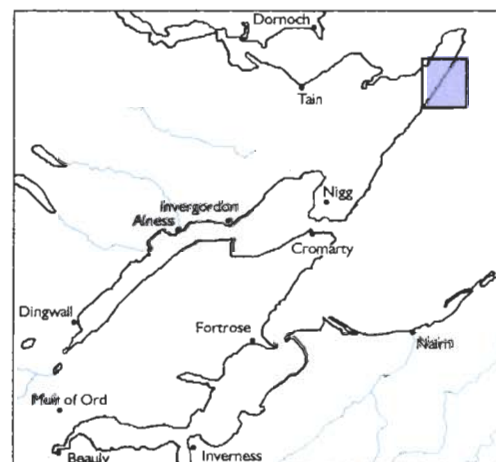
Monument formally proposed by
Historic Scotland for scheduling,
or wreck for designation

Other known Ancient Monuments,
or Undesignated wreck

Designated Landscape

Insufficient information;
more work needed

Probably archaeologically sterile



MAP 31: TARBAT NESS

Hinterland Geology and Coastal Geomorphology: The rock bounded coast of Tarbat Ness rests on Old Red Sandstone which is mantled by a cover of boulder clay and morainic drift. Raised beach platform continues to the point of the Ness. At Wilkhaven a small fringing beach near the tip of the rock bounded peninsula is about 10m wide with banking shingle. The till capped cliffs behind the beach are about 20m high and capped by marine deposits.

Erosion class: Although the peninsula is exposed to the NE gales the cliff is resilient in terms of erosion and is considered to be stable at the present. Some rubble dumping was noted at the tip of the Ness but this is not connected with sea defence, rather tipping of demolition material.

Built Heritage and Archaeology: The hinterland archaeology in the southern part of this area comprises the possible hermitage site at Bindal Muir, consisting of a walled enclosure. In the north, the Tarbat Ness lighthouse, cottages and helipad are the built heritage. The foreshore archaeology in this area includes the possible promontory fort at Wilkhaven, which is a poor state of repair. Other sites include the ruined building and

Map 31: Hinterland Geology and Coastal Geomorphology

1. EASTER BINDELL to south of TIGH NA CREIGE

NH 945 867

1km

Rock platform/boulders

High cliff (c.20m)

Raised beach deposits

Wide Post Glacial raised platform mantled by boulder clay. The shoreline consists of rock platform and boulders.

2. South of TIGH NA CREIGE to WILKHAVEN

NH 945 866

0.1km

Rock platform

High cliff (20m)

Raised beach deposits

Wide Post Glacial raised platform mantled by boulder clay. The shoreline consists of rock platform and boulders.

3. WILKHAVEN PEIR

NH 945 871

0.2km

Rock platform

High cliff (c.20m)

Raised beach deposits

Small cliff girt beach with a sand component comprising fringing beach extending to the foot of the degrading cliff. Boulder clay mantles relict shore platform.

4. WILKHAVEN PEIR to TARBAT NESS

NH 948 876

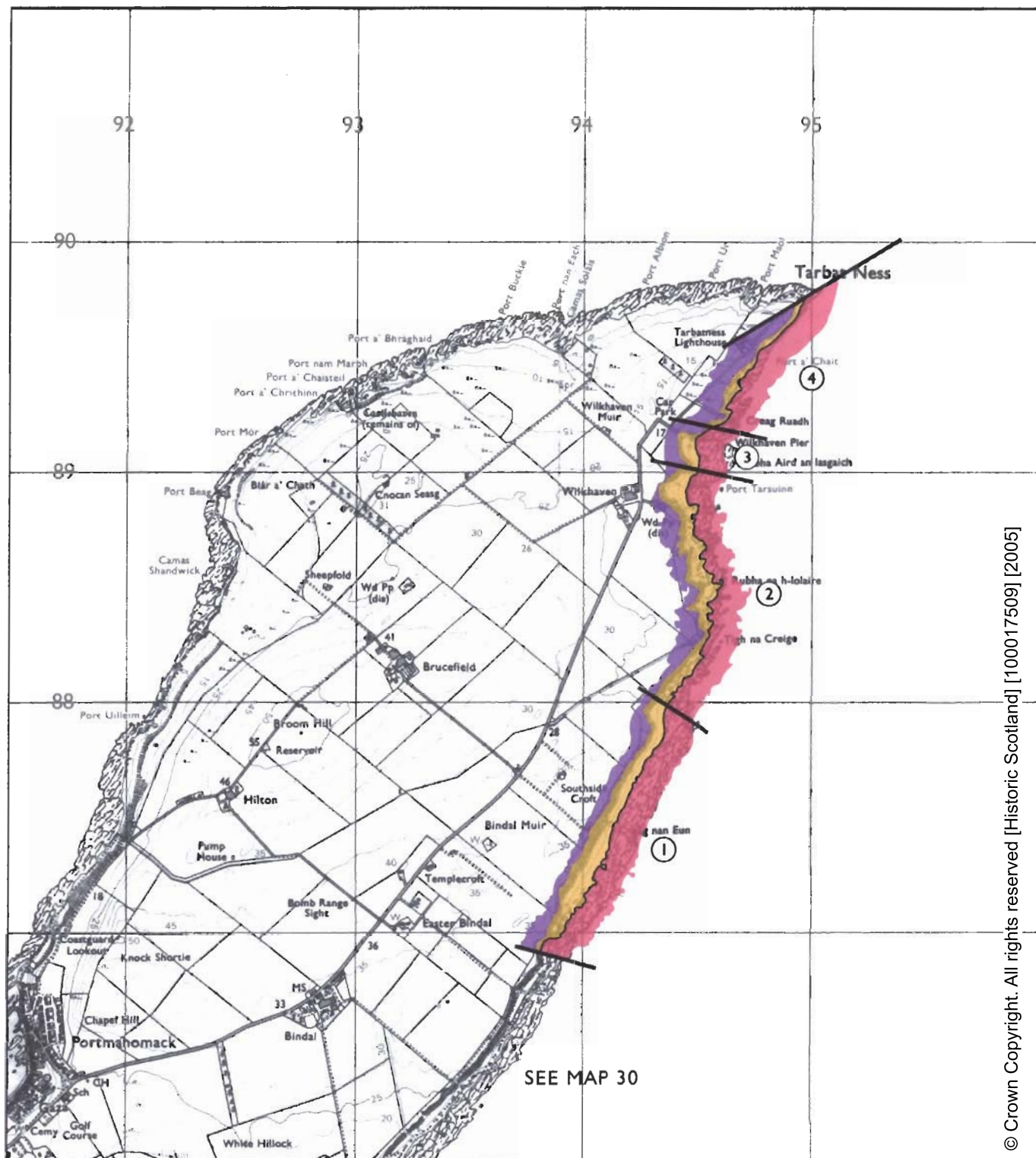
0.8km

Rock platform

High cliff (>10m)

Raised beach deposits

Peninsula with raised beach deposits overlying exposed rock platforms. The foreshore is exposed comprising of rock platform and boulders.



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MAP 31: TARBAT NESS

MORAY FIRTH SURVEY Grid ref: NH 92-96/86-91

1:25 000

Basemap: O.S. Pathfinder Series
Sheet 124

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HINTERLAND GEOLOGY AND FORESHORE GEOMORPHOLOGY

Assessment date: 24 September 1998

Hinterland:

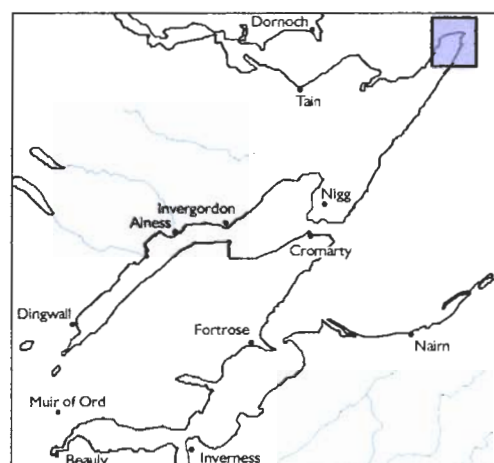
- Drift, boulder clay
- Drift, boulder clay over visible rock
- Raised beach and marine deposits
- Blown sand
- Glacial sand and gravel
- Alluvium

Coast edge:

- Low edge (< 5m tall)
- Cliff over 5m tall
- Man made barrier
- Shingle/storm bank
- Human disturbance

Foreshore:

- Mainly rock platform
- Mainly sand
- Mainly alluvial/marine mud
- Marsh



MAP 31: EROSION

1. EASTER BINDAL to south of TIGH NA CREIGE

NH 942 945

1.1km

Stable or eroding

Wide wave cut platform overlooking exposed rock platform scoured into a deep gullies scoured by wave action. Attrition at the base of the cliff is constant owing to exposure to easterly gales. Erosion considered to be slow owing to the fairly resilient nature of the Old Red Sandstone.

2. WILKHAVEN

NH 945 869

1.2km

Stable or eroding

Irregular coastal edge modified by wave action overlooking gullies and rock platforms. The beach at Wilkhaven is receiving sufficient sand supply and is classified as stable.

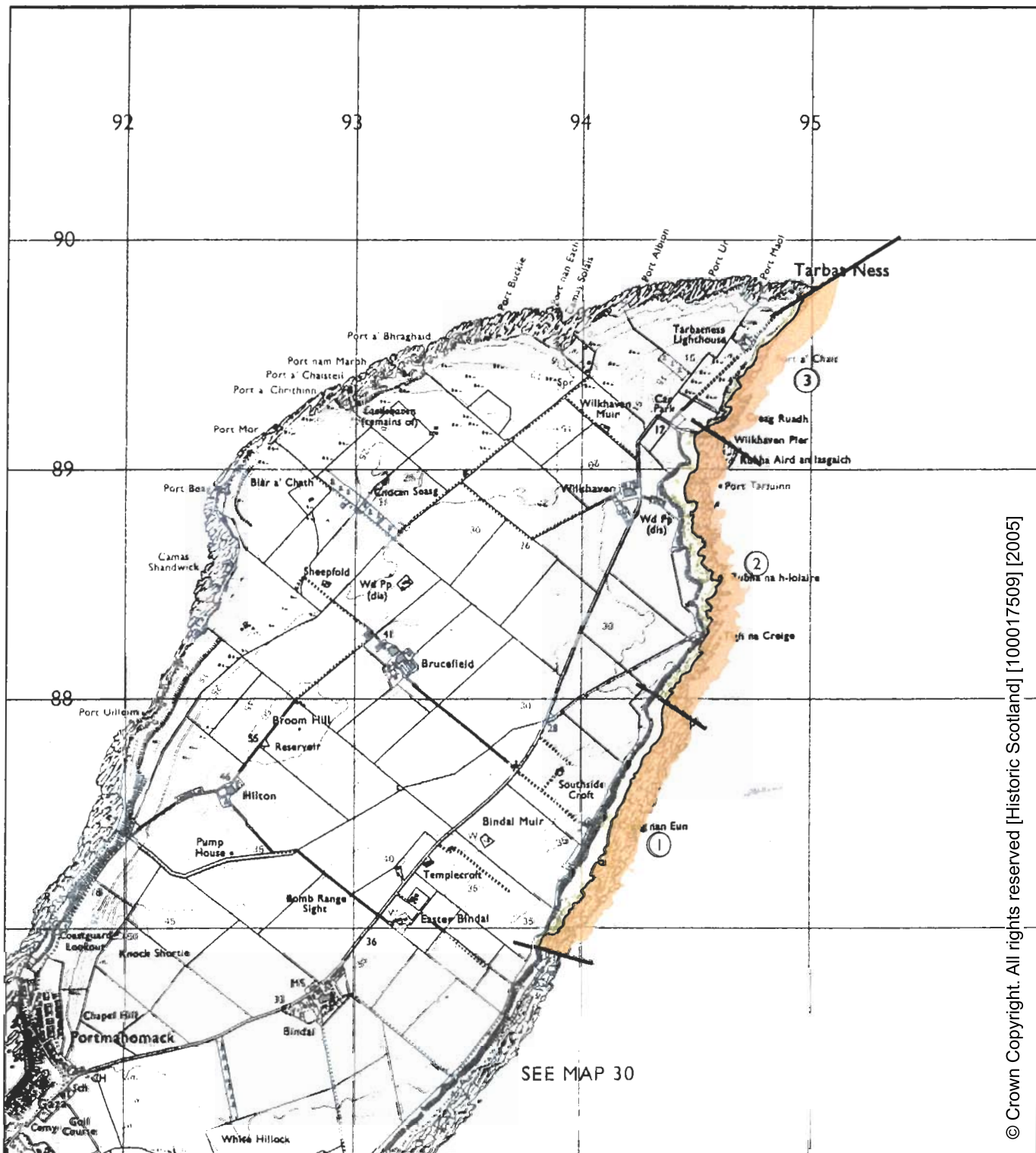
3. TARBAT NESS

NH 947 875

0.8km

Stable or eroding

Exposed peninsula consisting of irregular cliff face overlooking exposed rock platforms. As described in the previous units the coastal edge is undergoing constant erosion but at a considerably slow rate.



MAP 31: TARBAT NESS

MORAY FIRTH SURVEY Grid ref: NH 92-96/86-91

1:25 000

Basemap: O.S. Pathfinder Series

Sheet 124

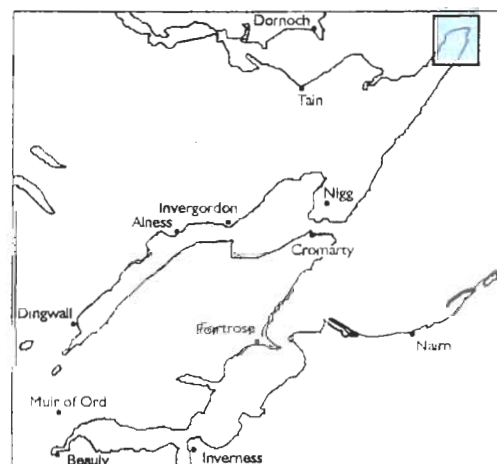
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EROSION CLASS

Assessment date: 24 September 1998

Key:

- Definitely accreting
- Accreting or stable
- Stable
- Eroding or stable
- Definitely eroding
- Both accreting and eroding
- No access
- Land below 10m



MAP 31: BUILT HERITAGE AND ARCHAEOLOGY

Sites on the Coastal Edge & Foreshore

NH98NW 9

NH 9443 8662

WILKHAVEN

Promontory fort (possible)

Uncertain

Poor

Monitor

NH 9437 8683

WILKHAVEN

Roofed terrace above scarp

18th/19th century AD

Fair

Nil

NH 9447 8704

WILKHAVEN

Ruined building

Uncertain

Poor

Monitor

NH 9453 8716

WILKHAVEN

Pier and buildings

19th century AD

Fair

Nil

Sites in the Hinterland

NH98NW 1

NH 9387 8502

BINDAL MUIR

Hermitage (site of); walled enclosure

18th/19th century AD

Good

Monitor

NH98NW 11

NH 9469 8756

TARBAT NESS

Lighthouse, keeper's cottages and helipad

19th century AD

Good

Nil

3. SURVEY RESULTS

Introduction

Based on the results of the field survey this section examines the findings concerned with the erosion record of the Beaully, Moray and Cromarty Firths. The percentage of the total length of coastline cited is based on the straight- line measurement of each unit as mapped on each of the coloured 1:25,000 map sheet (Maps 1-31). The combined length of all units is 166.8km. This figure was used to establish the percentage frequency of each erosion class. 166.8km is an underestimate of the true length of the coastline surveyed, as it does not incorporate the mean length of meandering rivers, deeply incised cliff-edges and indeed other topographical irregularities along this coast, but it does provide an indication of the relative significance of the results.

Erosion Survey

Erosion classes are used as defined in the Historic Scotland procedure document. An analysis of the results are shown in a series of histograms (Figures 3-8) and summarised in Table 2.

The *Stable* and *Definitely accreting* class are more or less equal with 11.2 and 12.4% respectively (n= 14 and 13). The coastal units identified as *Eroding or stable* achieved the highest frequency with 40%. The *Definitely eroding* class is represented by 6.1% with a total of 15 individual coastal units. The *Accreting or eroding* or *Accreting or stable* class is represented by 9.8 and 20.4% respectively.

Erosion Class	Number of units	Total unit length (km)	Total length (%)
Stable	14	18.8	11.2
Eroding or stable	46	69.3	40.8
Definitely eroding	15	10.1	6.1
Definitely accreting	13	20.8	12.4
Accreting/eroding	14	16.5	9.8
Accreting/stable	22	34.1	20.4

Table 2 Summary statistics of the erosion class units lengths.

The results from the *Definitely eroding* class (Figures 5 and 6) confirm that only 6% of the total length of coastline examined is being effected by serious erosion. This class includes areas where there are breaches in existing sea defences (see South of Kiltarn Cottage to Balcarse Point NH 6232 6528) or on undefended cliffs such as St Brighs Chapel (NH 577 615 see below). A great majority of the *Eroding or stable* units are confined to the exposed rocky coastline of the North and South Sutors where erosion is ongoing albeit at a slow rate. Owing to the slow rate at which the cliff is eroding one could also classify the region as relatively stable.

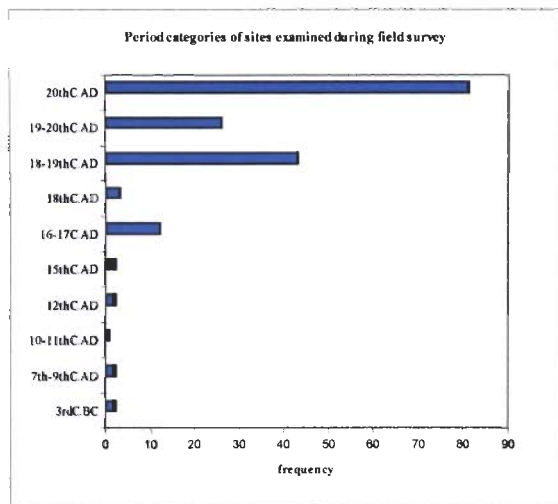


Figure 3. Period categories of sites identified during the survey

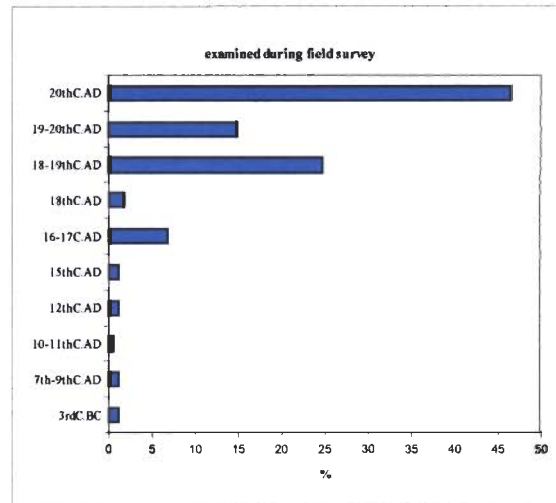


Figure 4. Percentage frequency of period categories

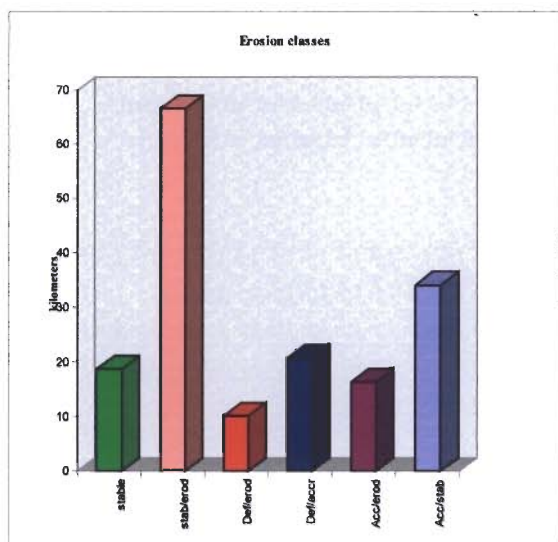


Figure 5. Distance versus erosion/stability class

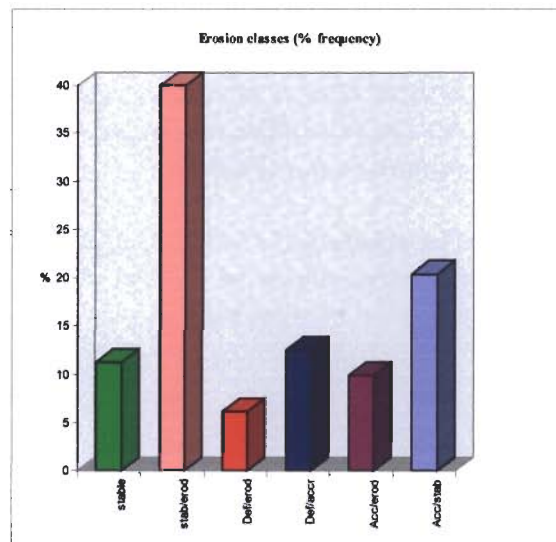


Figure 6. Percentage frequency of distance versus classification

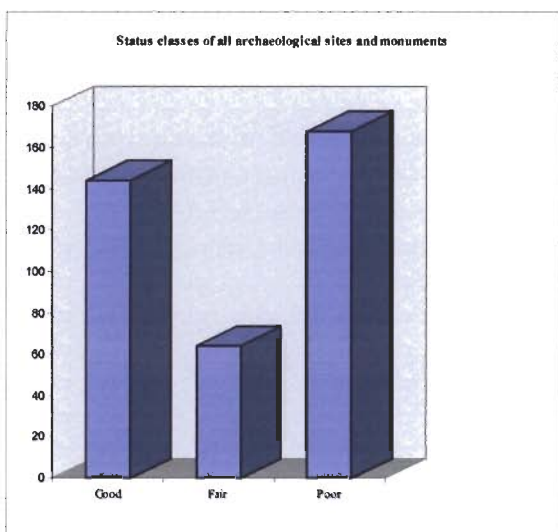


Figure 7 Frequency and condition of all archaeological sites

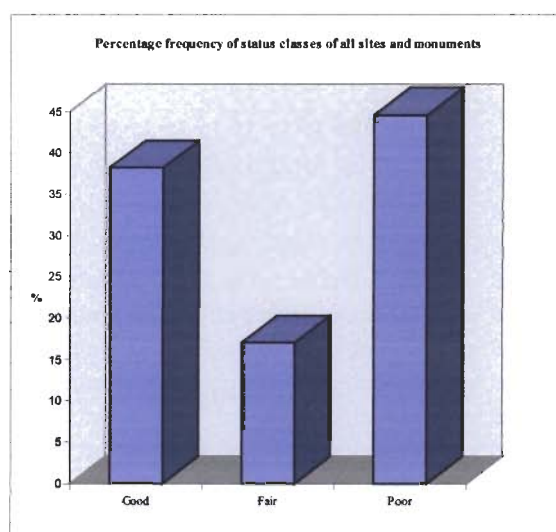


Figure 8. Percentage frequency and condition of all archaeological sites

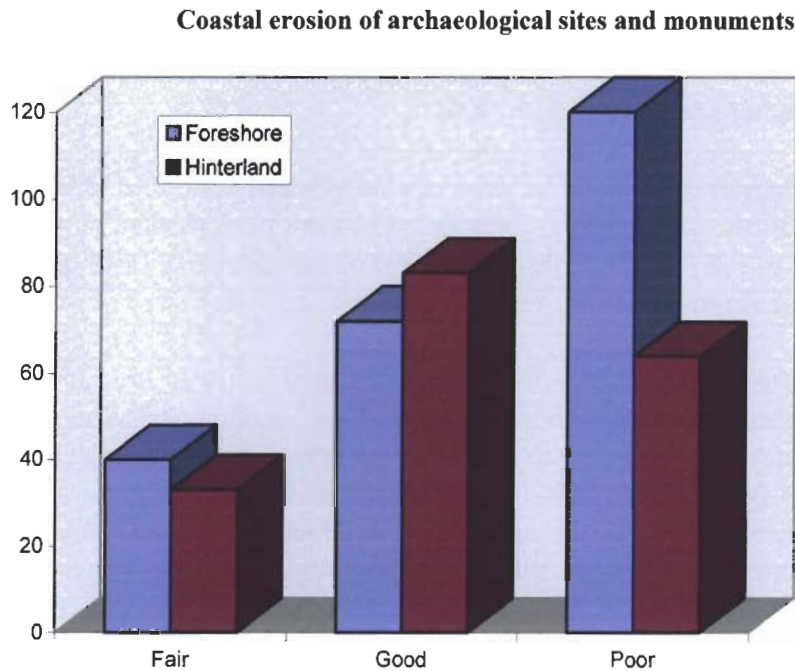


Figure 9. Erosion classes: Foreshore versus Hinterland.

Figure 9 demonstrates three preservation criteria for archaeological sites and monuments within the foreshore and hinterland. Within the foreshore category of sites, 40 are identified as *Fair*, Seventy-two sites were seen to be in a *Good* state of preservation whilst 120 were seen as *Poor*. In the hinterland category, 33 sites were found to be in a *Fair* state, 83 sites were found to in a *Good* state of preservation with 64 sites in a poor state of preservation.

These data show that there is a two-fold increase in the number of sites classified as *Poor* in the foreshore category. This pattern is not unexpected given the number of sites seen to be undergoing active erosion. Unlike sites located on the foreshore, archaeological sites and monuments in the hinterland are susceptible to other forms of attrition leading to their decline, these might include; neglect, abandonment, weathering, and quarrying.

Archaeology

Evidence of Mesolithic activity in the study area was confirmed by the excavations of two shell middens in Inverness (Myers & Gourlay 1991). Lithic scatters associated with shell middens suggested that one of the sites was a tool production site. The sites occupy a terrace on the delta at the mouth of the River Ness, at approximately 8-10 m above current sea-level. Worked flint tools of Mesolithic and Neolithic age are also recorded from Seafeld West, near Inverness (NH 694 455).

South of the study area, Neolithic sites include Clava-cairn type sites whilst to the north, the Orkney-Cromarty types are common monuments. Additionally, henge and hengiform sites have been discovered, including the concentration of sites around Muir of Ord and Beaully.

Bronze Age sites include the two cist cemetery sites at Dalmore and Seafield. The site at Dalmore was adjacent to the survey area and contained a series of cists containing urns, vessels and burnt bone (Jolly 1879). The site at Seafield, Inverness was recently excavated and found a cist cemetery. One of the graves included a Butterwick type bronze dagger in a leather sheath (Cressey 1996).

Iron Age sites in the region include the hillforts of Craig Phadrig and Ord Hill at the mouth of the Beauly Firth. Additionally, forts and duns have been located on the hills to the south and west of the Beauly Firth. To the west of the Cromarty Firth lies the vitirified hillfort site of Knockfarril.

There are large number of Pictish symbol stones located in the area of the survey. The Clach A'Mheirlich, class 1 symbol stone dates to the 7th-9th century AD. The stone is sandstone pillar bearing a step symbol on one side and a crescent above what appears to be a pair of pincers symbol on another. Other Pictish symbol stones in the region include the Rosemarkie cross-slab, now held in Groam House museum, Rosemarkie, the Nigg cross-slab and the Shandwick stone, now contained in a glass house. Although further from the current shoreline these two like Clach A'Mheirlich appear to have been positioned in close proximity to their contemporary coastal margins.

The pre-reformation chapel at Newhall point, now built on by recent housing, is associated with an extensive burial ground, from which radiocarbon dating on the skeletal remains produced dates of the 10th and 11th centuries AD (Reed 1986). A shallow ditch was found to surround the burial ground during the excavations. There was little evidence of the chapel buildings found by excavation. The Dunscaith castle site is the only motte site in the survey area. It was fortified by William the Lion in 1179 and currently consists of two concentric semi-circular ditches. Substantial plough damage has affected the upstanding remains of the site.

Four castles in the survey area dating from this period appear in various states of repair and condition. Shandwick castle was built around 1460 is completely destroyed. Stone was robbed from the site in 1942 for road ballast. Castle Craig on the southern shore of the Cromarty Firth is the upstanding remains of a four storey vaulted floored tower house. The remains, which comprise the roofed NE wing and some low-lying walling, have been damaged by general climatic weathering, the effect of which has caused some large pieces of masonry to fall on to the foreshore below the castle. The Redcastle on the northern shoreline of the Beauly Firth is reported to be located on the site of Ederdour, erected by William the Lion in the 12th century AD. The castle was greatly added to in the 16th century and now stands as a roofless shell, affected by general climatic weathering and deterioration.

Surrounding the Inner Moray and Cromarty Firths are five 17th century grain stores or girnals. These large multi-storey, rectangular plan buildings were used by agricultural producing estates to store grain which could be accessed from both the production zones and the Firth. The girnals are associated with trackways leading from the hinterland to the shoreline, where landing places for boats have been located. In the case of the Foulis point gignal a number of hulks were recorded around the adjacent foreshore during the current survey.

The Caledonian canal was one of the largest engineering projects in the early 19th century in the survey area. The sea lock and associated basin, cottages, workshops and hand crane are currently all in good states of repair and are an excellent example of Industrial heritage of the region. Quarries and associated piers and quays are a feature in the Beaully Firth, providing stone for the canal and also a concentration of similar sites were recorded on the southern shore of the Cromarty Firth. The quays and stone piers are all in poor states and require monitoring and many of the quarries have suffered cliff failure and are now overgrown.

Early 20th century monuments include WWI and II military complexes on the North and South Sutors. This heavy military presence attests to the importance of the Cromarty Firth, especially as a Naval base during both wars. The Firth has had military connections since the mid 19th century during which Admiralty building occurred at places such as Cromarty harbour. Other later military sites include the remains of the large airfield at Evanton and the RAF seaplane base at Alness Point.

Currently the greatest visual impact in the survey area is the oil fabrication yard at Nigg and the various other associated sites around the Cromarty Firth. The Firth itself is a deep water terminal for oil rigs and platforms, which can often be seen along the middle of the firth, during periods of refitting and renovation.

4. CASE STUDIES

Introduction

Three case studies are provided to illustrate in further detail the range of coastal erosion or accretion that is effecting a variety of archaeological remains on the Moray coast. The first case study considers the marine crannogs in the Beauly Firth which have been dated recently using radiocarbon assay to the later 1st Millenium BC. The second case study is based on the chapel site of *Cille Bhrea* (also known as St. Brighs) where severe coastal erosion has truncated part of the site. The third case study concerns the various types of fish trap remains located along the entire length of the survey area. Examples of their typology and distribution within the survey area are presented. The archaeological importance of the case studies is contrasted by the affects of the various coastal processes reported in the previous chapter.

CASE STUDY ONE: BEAULY FIRTH MARINE CRANNOGS

Four large stone mounds have been recorded below high water mark in the Beauly Firth. These marine crannogs are large stone mounds situated on sandbanks or surrounded by mudflats. Although not visited during the current survey a number of physical characteristics were recorded from the fieldwork and the preliminary aerial photographic archive survey. The sites vary in size from approximately 20 to 70 m in length, they are oval in plan, with the exception of the Redcastle site which is irregular. The sites are all low mounds capped with large regular sized stones which appear similar to those on the current shorelines. They are all fully submerged at high tide and become exposed at various times during the ebb tide, depending on their relative heights

Brief history

Documentary evidence records descriptions and previous investigations of the marine crannogs in the Beauly Firth, including the following from the Old Statistical Account of Scotland (1799):

“There are three cairns at considerable distances, one from the other. The largest is in the middle of the frith (sic), a huge heap of stones. This cairn is accessible at low water”.

Odo Blundell, renowned for diving on Highland freshwater crannogs, visited the largest site in the middle of the firth, Carn Dubh in the summer of 1908 with the intention of diving. However, he discovered that it was high and dry on a sandbank. He rowed out to the site and found a number of large wooden timbers and possible artefacts (Blundell 1909).

Recent research

More recent research has surveyed and sampled all of the sites and produced a chronology based on radiocarbon dates from a sequence of structural timbers, showing that they were used during the 3rd century BC (DES 1995). Sampling specific to the Redcastle site has identified two structural sequences; the initial phase consisted of oval, wattle-sided pits, approximately 1-2 m diameter dug into the sub-surface sands. These pits appeared to be partially clay lined and were possibly used as hearths. The second phase was directly on top of the first and consisted of an extensive horizontal

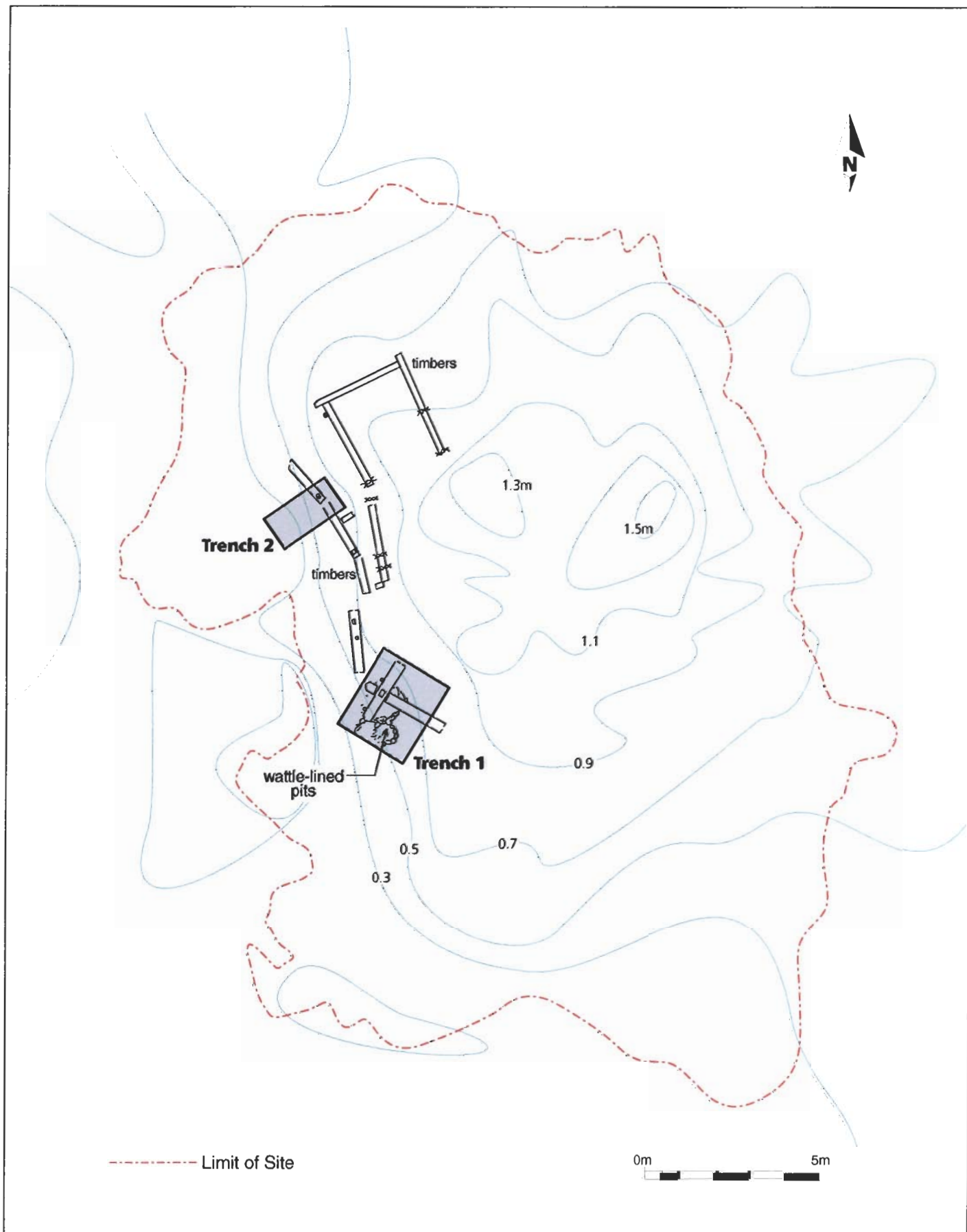


Figure 10. Contour plan of Redcastle Intertidal Crannog.

timber framework made up of large alder (*Alnus glutinosa*) planks that had been cut to shape with an adze-like tool. Associated with both construction phases were large quantities of animal bones, organic remains including woodchips and small fragments of leather. The research only investigated a small part of the site but the quality and variety of preservation of structural, artefacts and ecofacts was excellent

Sedimentary survey

Over a period of 18 months During 1996-7, the Redcastle crannog was monitored for sedimentary movement. The survey monitored points both on-site and adjacent to the exposed archaeology in undisturbed areas. There were also monitoring points off-site designed to measure changes of sediment levels on both the exposed and leeward sides of the site. During the survey a number of vulnerable areas were identified, these included the area sampled for both structural remains and radiocarbon dating. Disturbed by previous sampling, this area became consistently more exposed with animal bone loosened and occasionally removed. The timbers exposed during sampling were also subject to localised erosion and in the case of one horizontal timber, the western end became totally exposed. Despite protection measures using sandbags these areas continue to erode.

The results indicate various changes on and off-site which are identified as diurnal, seasonal or annual events, these included the erosion of sediment from the exposed south west edge of the site with accretion around the leeward north-east side. It was also evident that the surface stone cover and interstitial sediments act as protection of the underlying deposits. However, once exposed the underlying archaeological remains are threatened by a number of damaging processes ranging from plant colonisation, erosion of sediment, accretion and scouring by stone movement.

CASE STUDY TWO: CILL BHREA CHAPEL

Introduction

Cille Bhrea, Lamlair, Highland (NMRS ref: NH 56 SE 3) was chosen for this case study on the grounds that it provides an excellent example of coastal erosion directly effecting a medieval archaeological site. Recent excavations at the site are part of Historic Scotland's policy of *Managed Retreat* with the main criterion of removing skeletal material from an eroding cliff which are likely to be exposed as the cliff continues to recede.

Brief history

Cill Bhrea was reputedly founded in 1198 (Wordsworth 1997 citing Woodham). Cross slabs found at the site by R Gourlay in 1983 suggest that there may have been an earlier church. The present chapel is one of seven in the parish of Kiltearn (Wordsworth 1997). The church was first excavated in 1966 by Dr Tony Woodham. His unpublished excavation revealed a rectangular building with walls less than a metre high, a stone font, a possible communion table and grave slabs. Numerous burials were also recorded (Wordsworth *ibid*). The site was afforded *Scheduled Monument Protection* in 1970. A detailed survey of the site was carried out by RCHAMS in 1979. Further work was undertaken by Gourlay in 1983. His sketch of the site denotes that 15m of cliff with a height of 6m was actively eroding (see Figure 4 in Wordsworth 1997) with six burials exposed in the cliff section. Sometime after

1966 a revetment wall was built at the base of the cliff in an attempt to slow down the rate of erosion, this has subsequently been lost. Based on the findings of the *Damage Assessment Report* undertaken by Wordsworth 1997, which noted the exposure of human skeletal remains in the cliff section and scattered on the foreshore, further remedial work was undertaken in 1998.

Recent Record

Historic Scotland commissioned AOC Scotland to carry out an excavation and survey of the site, which resulted in the partial excavation of the chapel and graveyard covering a total area of 155 m². The strategy developed to address the objectives identified by Historic Scotland consisted of:

- cleaning and recording the site before excavation
- cleaning and recording the erosion face
- excavating the church, complete with a 2m wide strip all round it (Areas A, B, C & D in (Figure 4*))
- excavating a 3m wide strip along the erosion front of the site (Areas E & F in (Figure 11))
- recording the church structure in full.

Further work following the excavation at the cliff-edge included sowing grass seed over geotextile matting to promote greater stability.






The results of the excavation (carried out between 10th-31st August 1998) recovered valuable information on the density and nature of burials within the graveyard and chapel. In particular the presence of deep, complex archaeological deposits beneath the chapel suggest a long and complex use of the site (Rees 1998). The archaeological deposits were found to be shallow within the exposed cliff section (c0.90m) resting on unconsolidated marine sand and gravel.

Erosion

It would appear that the sites along this stretch of coastline are effected by predominantly south-easterly gales and high storm-tide surges, this appears to be the only explanation to account for causative factors leading to erosion in what is considered to be a fairly sheltered location. Prior to the recent excavation, the unconsolidated nature of the exposed cliff was estimated to be retreating at about 1m every 10 years. The archaeological and remedial work mentioned will undeniably reduce the loss of skeletal material from the cliff section for the next 20 years. However we are of the opinion that until the cliff is better protected by rock armour to effectively reduce direct wave hammer and cliff under-cutting, erosion will continue to effect the site. In conclusion this case study demonstrates that the soft character of the underlying geology is a causative factor in coastal erosion at this site and further east along the Kiltarn Parish shoreline (see MAP 19 NH 620650). It can be concluded that erosion has been active over a long period of time thus resulting in the loss of part of the chapel and skeletal remains.

SCALE: 1:230

KEY:

-  Limit of excavation
-  Context boundary (broken is inferred)
-  Limit of stone feature
-  Areas excavated
-  Slope

ORIENTATION:

North 



Figure 11: Site plan of Cille Bhrea chapel (courtesy of AOC Scotland).

CASE STUDY THREE: INTERTIDAL FISHTRAPS

Fish-traps are one of the most common foreshore monuments to be recorded during this survey and their forms and uses deserve further discussion. Similar features have been recorded in both Welsh and Irish estuaries and this research aims to complement their study.

Location

The fish-traps recorded during the survey are positioned in the intertidal zone between Mean High Water Mark and Mean Low Water Mark. They are concentrated in two main locations; the Beaully Firth and the Cromarty Firth. They were designed primarily to catch salmon that were abundant in the Moray Firth during and prior to the 17th, 18th and 19th centuries. Seasonal runs of migratory salmon and sea trout swim through marine river channels that at low water often act as holding pools. The fish then use the flood tide to progress further upstream. The traps were placed at right-angles or oblique to the channel so the fish could be funnelled into the traps interior. The remains currently vary from low mounds or arcs of stone, small concentrations of wooden stakes protruding from the foreshore and composite wooden and stone structures.

Brief history

Fish-traps or 'yairs' in the Moray Firth have been in use as early as 1638 (RHP 561, 1820). The 1837-8 'Chart of the Firth of Cromarty' showed the different yair and stake net sites. A record in the Old Statistical Account for Scotland describes their use:

'there are a good number of salmon caught on the sea coast, chiefly by means of yaires, or small enclosures, built in a curve or semicircular form near the shore. At high water the salmon comes within these yaires, and at low water is easily taken, having no way of escape. This is the simplest and cheapest mode of fishing that can be derived. There are usually four or five yaires kept up in the parish; and each proprietor takes enough to supply himself and a few friends. In a good season he can send some to market. Flounders, herring-fry or sprats are frequently taken in these yaires' (OSA 1799, 488).

The siting of the traps appears to have been a critical factor in their productivity and both good and bad seasons were encountered. An OSA entry for Dingwall Parish provides an interesting pointer to low catch-rates:

'Owing to the distance to which the tide recedes at ebb, the muddy nature of the bottom, the freshness of the water from the influx of the Conon, and the other streams which discharge themselves into it here, the firth in this parish is very unproductive, - affording no fish, with the exception of a few flounders and some salmon, the latter of which are taken in yairs in the summer' (Vol.14 214)

The fish-traps were built up until the late 1830s when they were declared illegal, in favour of portable fishing rights. A map of all fish traps recorded between 1817 and 1909, has been compiled to show their distribution with previously unrecorded traps (see Figure 12).

Structural variations

Three different types of fish-trap were identified from the documentary evidence these include; yairs, stake nets and bag nets. Yairs are curvilinear stone mounds that are positioned perpendicular to the shore. They bend almost at right angles in places at which point small semicircular features are included in the plan. In places, wooden stakes were recorded in the semicircular features and evidence from English, Welsh and Irish examples point to the use of wattle panels in their construction (Aston 1988, O'Sullivan 1995). Some yairs show double semicircular features at points along their length and others have curved features towards Low Water Mark. Others fishtraps are recorded as a zig-zag plan that also included semicircular features. Cruives-type traps were recorded on the lower stretches of the River Beaully in *Country Life Magazine*, (1904) and they were designed to restrict the available passage for the migrating salmon. Yairs were built in the shallow estuarine areas of the Moray Firth and were also designed to trap salmon, although other fish were caught.

Stake nets were illustrated on the 1837-8 map of the Cromarty Firth with lines of stone mounds interconnected by netting. The stone mounds were small, often circular and supporting posts onto which the nets were strung. During the survey, one of the mounds still contained the remains of wooden stakes.

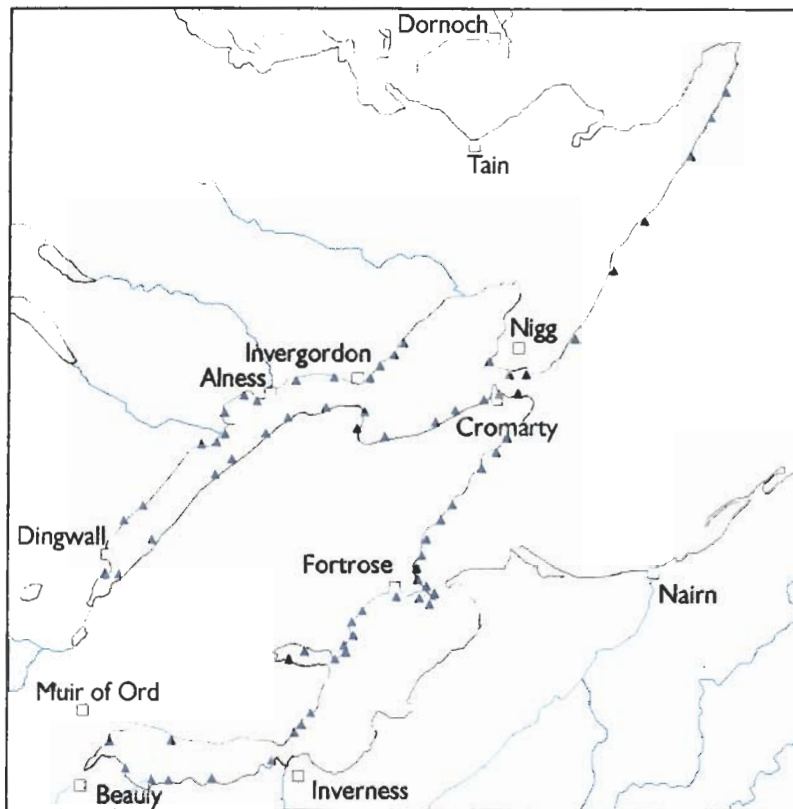
The third group of sites are bag nets that consist of single lines of nets with a stake at the Low Water end of the structure and at right angles to the main net line was a shorter net. During the current survey evidence of these types of yairs were found only as single mounds in the intertidal zone.

Current condition

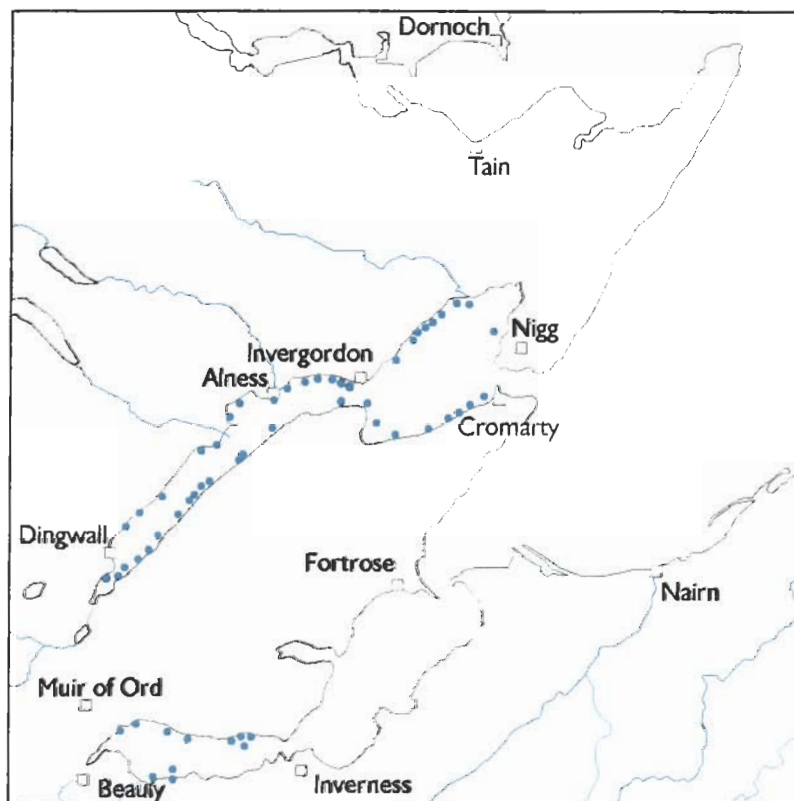
All the sites recorded were in poor condition that indicates both their fragility and the extent to which they have been affected by coastal erosion or accretion. Sixty-two remaining fish traps were recorded along the length of the survey area and the different forms and frequency are shown in Table 3.

Fishtrap Type	Morphology	Frequency
Yairs	Curvilinear	8
-----	Curvilinear, complex	7
-----	Zig-zag	0
Stake net mounds	Linear	3
-----	Linear, multi-mound	2
-----	Curvilinear, multi-mound	3
Bag nets	----	0
Uncertain	Wooden piles	5
-----	Stone mounds	9
-----	Stone lines	13
-----	Unclear	12
-----	-----	62 Total

Table 3 Summary table showing the frequency and a preliminary typology of fish-traps within the survey area.



Distribution of fishtraps observed from cartographic sources (1817 - 1909)



Distribution of fishtraps observed during the 1998 Coastal Survey

FIGURE 12: DISTRIBUTION OF FISHTRAPS IN THE SURVEY AREA

5. SUMMARY AND RECOMMENDATIONS

Coastal Erosion

The survey results are summarised in Table 4 below. Within the classification associated with erosion, 69km (40%) of the coastline was seen to be *Stable or eroding* and 10.8km (6.1%) was classified as *Definitely eroding*. A distance of 18.8km (11.2%) was classified as *Stable*. The *Accreting or stable* and *Accreting or eroding* class attained a distance of 34.1 (20%) and 16.5km (9.8%) respectively.

Erosion classification	distance	% frequency
Stable	18.8	11.2
Stable or eroding	69.3	40.8
Definitely eroding	10.18	6.1
Definitely accreting	20.8	12.4
Accreting or eroding	16.5	9.8
Accreting or stable	34.1	20.4
Total unit distance	169.68	100.7

Table 4 Summary table of classification units by distance and % frequency

The study also demonstrates that coastal units formed in areas derived from Holocene marine sand and gravel which are found mainly within the Beaulay and Cromarty Firths are more susceptible to erosion than the harder sandstone geologies of the North and South Sutors. The survey has identified a number of other important factors controlling erosion within given coastal units. Erosion is not only occurring as a result of wave hammer and scouring during storm conditions, but also as a result of continuing wastage through water currents and shifts in river channel configuration at the head of the Beaulay and Cromarty Firths. A good example at the latter location can be seen in the partial loss of the fishtrap on the foreshore at Dingwall (NH 5619 5818 Map 17). There are a number of other factors occurring that may have little to do with storm-wave activity and these have to be considered as part of the ongoing processes of erosion. These include heavy rain and run off, cryoturbation (freeze-thaw action in the case of exposed soft sections), local topography and geological structure. Recent land use and drainage regime along with modern or 19th century sea defences can also be a contributing factor in limiting or promoting erosion.

Short- term effects on archaeological sites and monuments

Within the limitations of the rapid survey methodology, our results show that post-medieval archaeology is well represented and that many of these archaeological sites are located well within the intertidal area. We have also demonstrated that a great deal of the intertidal archaeology is being severely eroded. With reference to the fish trap sites we have increased the number from 31 previously known sites to 62 an increase of 31. Table 5 below demonstrates the disparity and general condition at the time of the survey between sites and monuments located on the foreshore and those recorded in the hinterland.

LOCATION	FAIR	GOOD	POOR
FORESHORE	40	72	120
HINTERLAND	33	83	64

Table 5 Summary of relative condition of archaeological sites and monuments

General Recommendations

It is recommended that all the sites identified as fish-traps that are currently effected by active erosion should be surveyed as soon as possible. The final loss of these sites is imminent and their remains should be subjected to detailed analyses and survey. These sites are part of the local economic history and should be afforded full recognition as important wetland sites.

The marine crannogs in the Beaully Firth are a part of the total sample of similar sites from around the Scottish coastline and as such represent an important resource. Their survival in the intertidal environment appears to be under threat and future research is recommended to assess the nature of these sites, their use and propose measures to protect the resource.

The severe erosion on the south-east facing cliff around Port an Righ and the discovery of a new shell midden containing possible Iron Age artefacts demonstrates the need for more detailed survey. Excavation and sampling of the midden with adjacent landscape survey would explore the hypothesis that the area was an important locality of Iron Age occupation, given the proximity to the hinterland fort and dun at NH 8434 7362.

The results of this coastal survey should be fully integrated into any future policy on Coastal Zone Management and future Shoreline Management Plans.

This work must be considered only as a snapshot and reflecting observations during the months of August and September 1998. A new survey should be commissioned within five years to compare and assess the changes that have occurred since this present work was carried out.

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Plan of the mouth of the River Ness and Beauly and part of the Moray Firths, coasts and adjoining; showing stake nets. Dated 1860. RHP 6341.

Alness Ordnance Survey 6" Plan marked to show the agreed march between the Salmon fishings *ex adverso* the lands of Easter Teininch and Wester Teininch (formerly Culmlockie) and Culcraggie. Dated 1909 RHP 2923

Chart of the Cromarty Firth from Invergordon to Cromarty showing stone nets and fishings in Udale Bay. Dated 1851 RHP 159/1

Chart of part of Udale Bay showing stake nets and fishing stations. Dated 1851 RHP 159/2

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Ordnance Survey 1" Plan marked to show the fishings in Moray Firth, Cromarty Firth and River Conon. Dated 1876. RHP 1702

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Aerial photographs (RCAHMS)

Monochrome series:

1946 photograph run B663, B40, B663 1066/SCOT/UK 112 & 114 23.5.46

Frame numbers: 3036-3038, 3041-3043, 3053-3058, 3065-3063, 3083-3090, 3097-3103, 3142-3148, 3179-3181, 3186-3190, 3214-3226, 3302-3304, 3306-3308, 3338-3341, 4001-4404, 4032-4138, 4160-4158, 4169-4172, 42010-4204, 4208-4213, 4235-4238, 4247-4250, 4358-4366.

Clyde Colour series:

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B743 5: 392-400, 402-405, 437-448, 452-465, 473-506, 508-511, 515-520, 522-529

B744 6: 553-562, 604-608

Aerial Photographic survey also included searching the collections held by SNH, Foddarty Way, Dingwall, Highland Region.



Plate 1. Chapel site at Cille Bhrea and eroding cliff edge



Plate 2. Kilmuir foreshore showing dump defence and erosion.

Appendix1



Plate 3. Eroding shell midden at Port An Righ.

Appendix 1

