

Answer ALL questions in this book

*Leave
blank*

1. Look at Figure 1 (a) in the Resource Book, which is a fact file on Holderness.

(a) What rock is Holderness made of?

.....

(1)

(b) Holderness is an *undulating plain*.

Explain what this means.

.....
.....
.....

(2)

(c) Why is the release of sediments from the Holderness cliffs very important?

.....
.....

(1)

Total 4 marks

2. (a) Study Photograph A in the Photograph Book, which shows a cliff near Easington.

(i) Estimate the height of the cliff.
..... metres (1)

(ii) Give **two** pieces of evidence from the photograph that show the cliff has recently retreated.

- 1.
.....
 - 2.
.....
- (2)

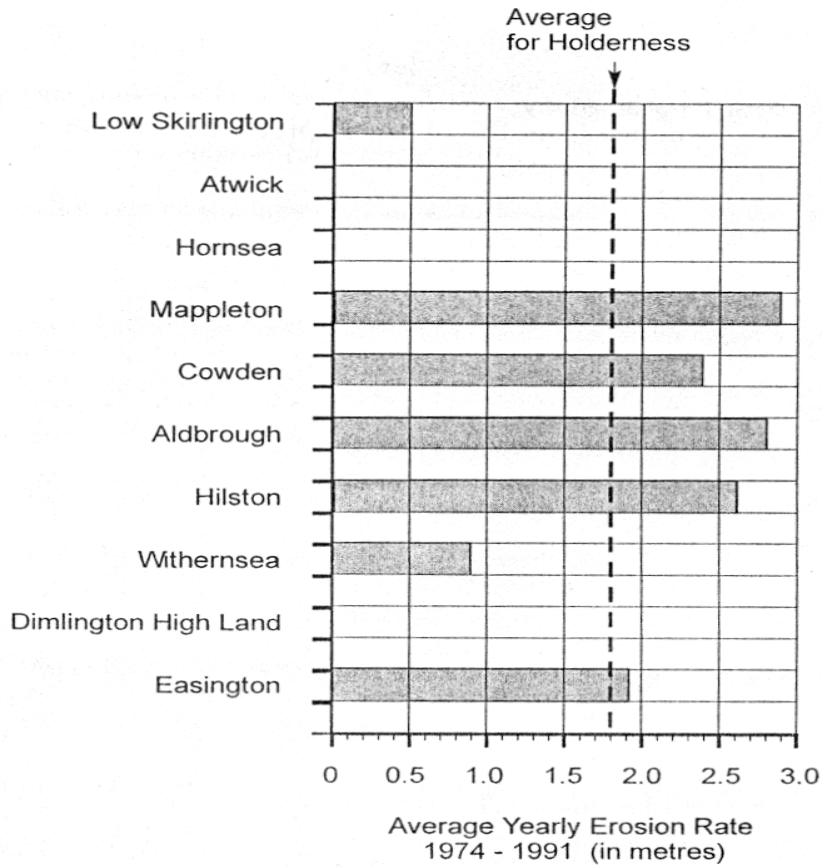
Part (b) begins on the next page

(b) Study Figure 2 in the Resource Book, which gives information about rates of erosion on the Holderness coast.

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(i) Use information from the table to **complete the graph** below.



(3)

(ii) Suggest why the rate of erosion varied so much from place to place. Refer to particular places in your answer. The map (Figure 1(b)) may help you.

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(4)

(iii) The cliffs are eroded by *abrasion*.
Explain the meaning of abrasion.

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(1)

(iv) Name **two sub aerial** processes that affect the cliffs at Holderness.
Use Figure 3 in the Resource Book.

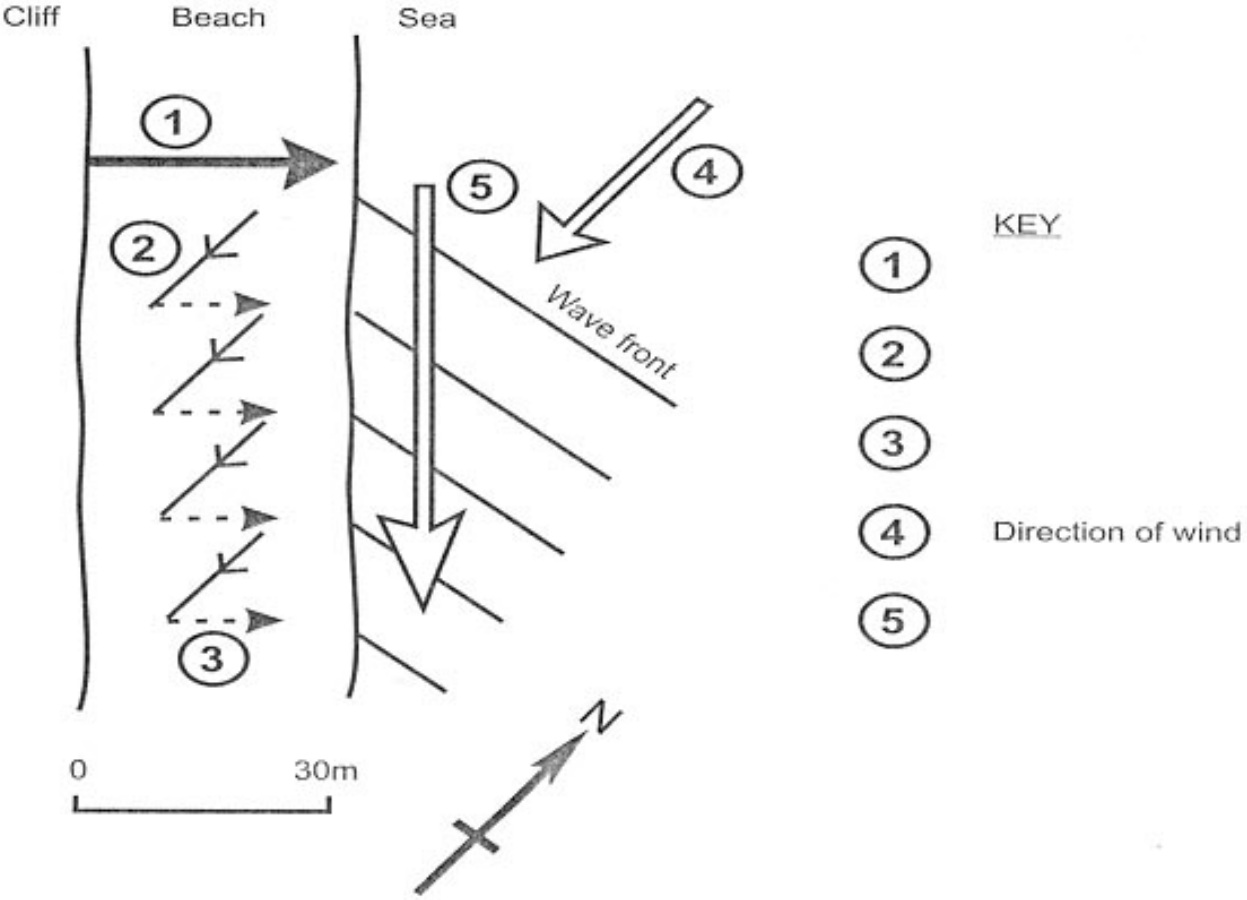
1.
2.

(2)

(c) Study Figure 4 in the Resource Book, which gives information about transport and deposition.

(i) **Long-shore drift** occurs on the Holderness coast.

Complete the key of the diagram below to explain how this happens.



(4)

- (ii) Explain why the dominant winds in Holderness come **from the north and north-east**. The map in Figure 4 may help you.

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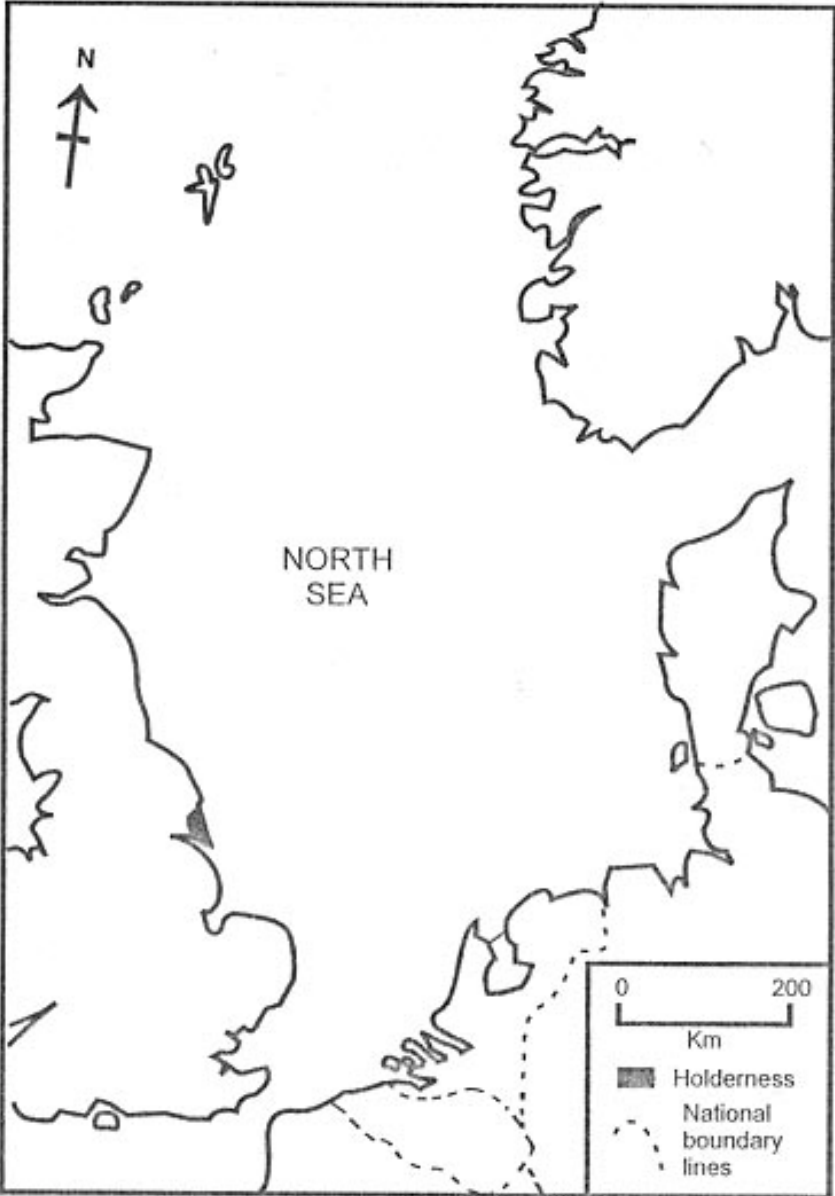
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(1)

- (iii) Sediment from the Holderness cliffs is transported to various places. Two of these places are Denmark and the Netherlands.

Label Denmark and the Netherlands **on the map below**.



Total 20 marks

3. (a) Study Figure 6 in the Resource Book, which gives information about some types of coastal defence used in Holderness.

(i) State four factors which should be considered when deciding the type of coastal defence to build.

- 1.
- 2.
- 3.
- 4.

(4)

(ii) Spurn Head is no longer to be defended against coastal erosion. What evidence in Figure 6 seems to support this statement?

.....
.....

(1)

(b) Study Photographs C and D, which shows the coastal defences built at Mableton in 1991.

After 1991, the rate of cliff erosion **to the south** of Mableton increased. Explain why it increased.

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(3)

- (c) Study photographs E and F, which show the cliffs south of Withernsea. The boulders in Photograph E had been placed there a few months before the photographs were taken.

Leave blank

Comment on the effectiveness of the coastal defences (groynes and boulders) shown.

Use evidence from photographs E and F.

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(4)

Total 12 marks

4. (a) Study Figure 7, which gives information about the Easington area.

(i) The Lagoons are an **SSSI**
What do the letters SSSI stand for?

.....
(1)

(ii) Spurn Head and the Lagoons have been made into a **Heritage Coast**.
Explain what this means.

.....
.....
.....
(1)

(b) Find Easington sewage works on the map in Figure 7.

(i) How far is the Easington sewage works from the cliff-edge (coastline)?

..... metres (1)

(ii) If the cliffs erode at a rate of 2 metres a year, how long will it take for the cliffs to retreat to the sewage works?

.....
(1)

(c) Study Figure 9 in the Resource Book, which gives some people's opinions on protecting the cost at Easington.

(i) The government official says coastal protection schemes must be "economically worthwhile".

Explain what this means.

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(1)

(ii) The British Gas spokesperson says “the gas terminals are vital to the British economy”.

What evidence might support this opinion?

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(2)

(iii) The university lecturer suggests it is more important to protect the coasts bordering the southern North Sea than the coast of Holderness.

Give **one** reason that might support this opinion.

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.....

(1)

(iv) Some features of the trial reef (Option 3 Figure 10) may please conservationists.

State **two** features which may please conservationists, and in each case explain why.

1.
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2.
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(2)

- (v) However, some conservationists may still be against the scheme to build several off-shore reefs along the Holderness coast.

Leave blank

Suggest **two** reasons why.

1.

.....

.....

2.

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.....

(2)

Total 12 marks

5. There are **four** possible responses to the cliff erosion in the Easington area:

- 1. Build a rock revetment to protect just the British Gas terminal.
- 2. Build a longer rock revetment to protect the caravan park, the village and the British Gas terminal.
- 3. Build a trial off-shore reef, made from concrete-filled rubber tyres. If the trial is successful, build a series of larger reefs.
- 4. Do nothing – let nature take its course.

Which **one** of these four responses do you think would be best?

Response chosen

Give reasons for your choice and explain why you have rejected the other responses.

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1311/3H

Edexcel GCSE

Geography B

Paper 3H

Decision Making Exercise

RESOURCE BOOK

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Erosion at Holderness, on the Yorkshire coast

The Issue

- All along the Holderness coast the cliffs are eroding rapidly.
- Easington is a village on the coast of Holderness.
- The buildings on the cliff-top are in danger of falling into the sea.
- What, if anything, should be done to protect the coast of Easington?

Holderness Fact-file

- Holderness is a rural area with a few large settlements. It lies to the south of Flamborough Head, and to the north of the Humber Estuary.
- It is an **undulating plain**, mostly below 25m in height.
- Holderness is formed from **boulder clay**. This is a rock that was deposited by ice-sheets. It consists mainly of clay, but has some sand and larger stones mixed in with it.
- When boulder clay is drained, it provides fertile soils that are good for intensive arable farming.
- All along the Holderness coastline there are soft clay **cliffs**, which erode rapidly. The retreating coast is a major problem for local land owners. 80,000 square metres of good quality agricultural land are lost to the sea each year.
- To the north of Holderness, the cliffs of Flamborough Head are made of **chalk**. They are an important sea bird breeding site.
- The clay cliffs of Holderness have limited wild-life interest. However, the sediments released from the cliffs are very important because they are carried by the sea to form the tidal mud flats of the Humber Estuary and other areas around the North Sea.
- Spurn Head on the Humber Estuary is a **sand and shingle spit**. It is famous for migrating wading birds and wildfowl. It has been made into a National Nature Reserve.

Figure 1(a)

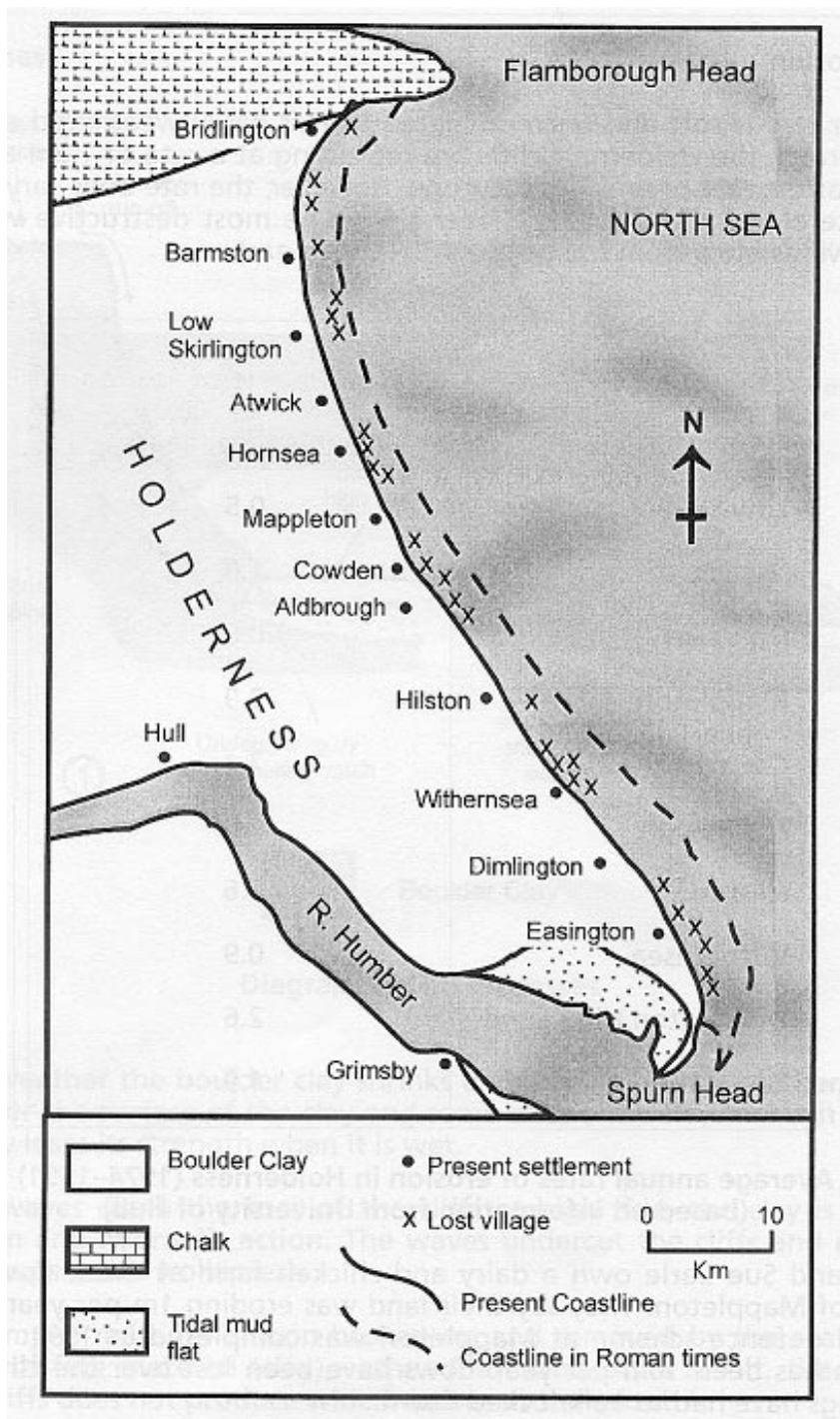


Figure 1(b)

Rates of Erosion

- Boulder clay is soft and unconsolidated so it is easily weathered and eroded. On average, the Holderness cliffs are retreating at a rate of 1.8m a year – this is the fastest rate of erosion in Europe. However, the rate does vary from place to place along the coast, and over time. The most destructive waves occur when winds blow from the north or the north-east.

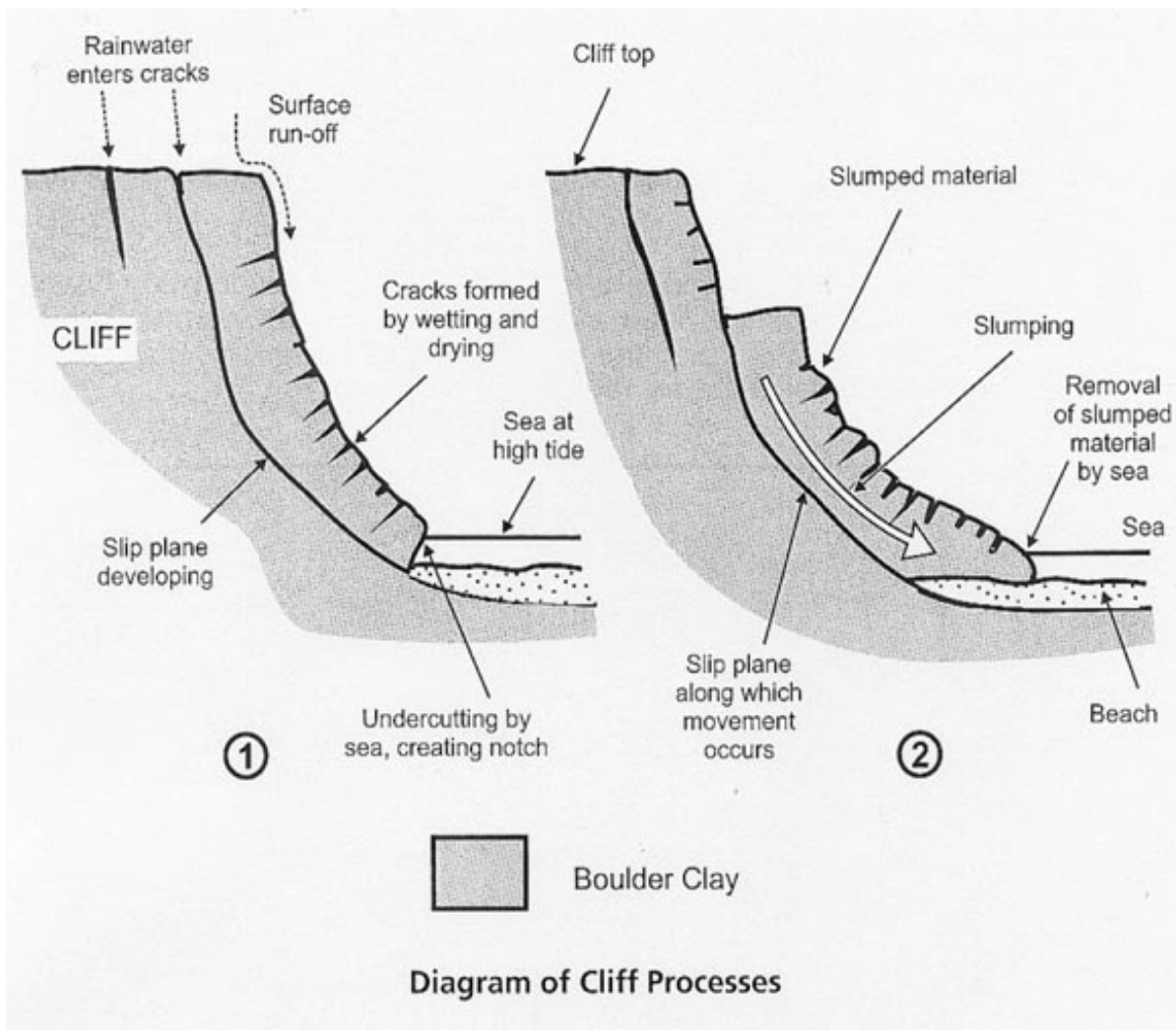
Place	Average rate of erosion (metres per year)
Low Skirlington	0.5
Atwick	1.0
Hornsea	0.6
Mableton	2.9
Cowden	2.4
Aldbrough	2.8
Hilston	2.6
Withernsea	0.9
Dimlington High Land	2.6
Easington	1.9

Average annual rates of erosion in Holderness (1974-1991) (based on information from University of Hull)

- David and Sue Earle own a dairy and chicken farm at Great Cowden, 2 km south of Mableton. They say their land was eroding 1m per year before the coastal defence scheme at Mableton was completed in 1991. Since then, erosion has been 10m per year. Cows have been lost over the cliff and farm buildings have had to be knocked down.
- Shawn and Evonne Mars own a pig farm near Great Cowden. The rate of cliff erosion on their land was 10 times greater after the Mableton defence scheme was built. In 1995, the cliff retreated 15 metres. Shawn and Evonne are suing the council over the loss of their farmland.

Figure 2

Cliff Processes

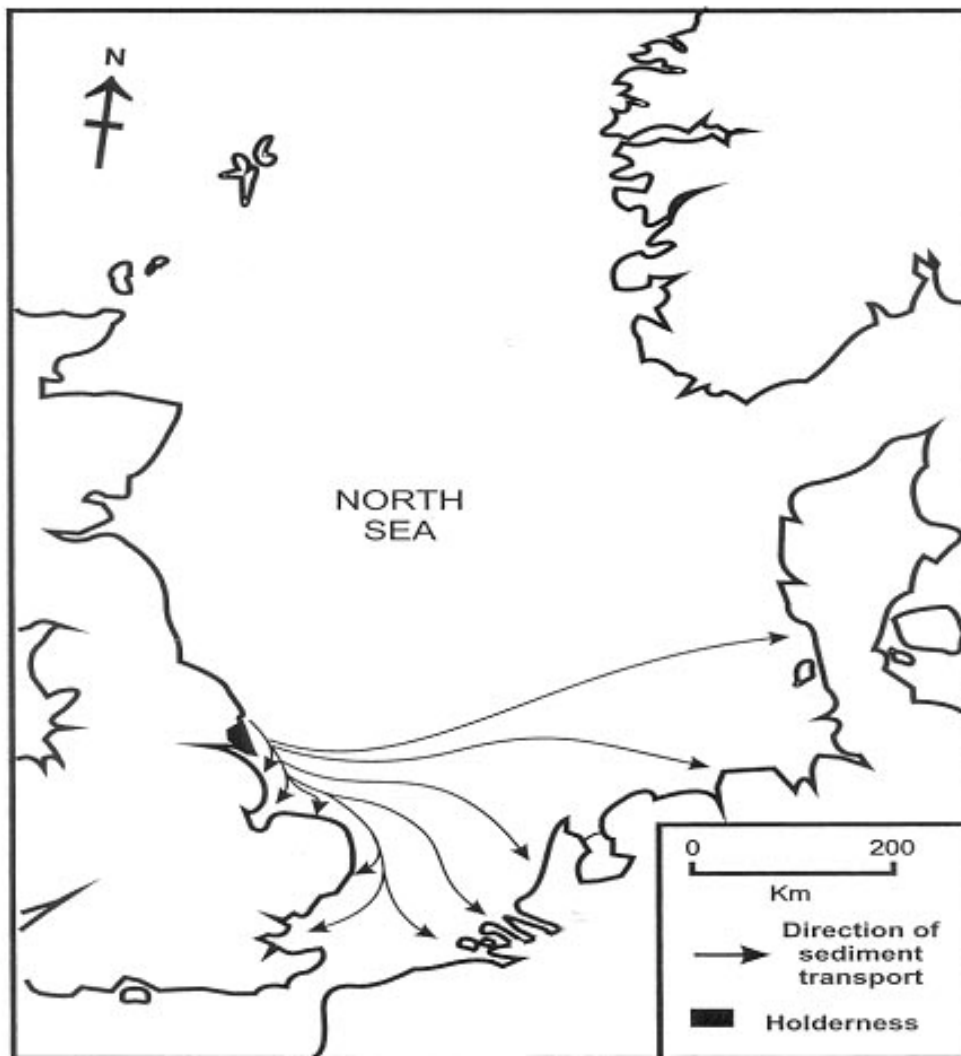


- In dry weather the boulder clay shrinks and cracks. In wet weather, some rain runs over the surface of the clay and some enters the clay through the cracks. The clay loses its strength when it is wet.
- When waves reach the foot of the cliffs at high tide, the clay is eroded by **abrasion** and **hydraulic action**. The waves undercut the cliffs and in time the cliff slumps down (collapses).
- The slumped material is soon broken up and removed by the sea. It consists mainly of fine material (clay), rather than sand. As a result, the erosion of these cliffs does not produce wide **beaches** at their foot.

Figure 3

Transport and Deposition

- One million cubic metres of sediment are eroded from the cliffs of Holderness each year. The dominant winds come from the north or north-east, so the sediment is carried southwards by long-shore drift.
- The sea along the Holderness coast is stained brown because it carries so much sediment.
- Most of the sediment is washed into the Humber Estuary or onto the beaches of Lincolnshire. Some of the finest material travels to the Essex marshes and even to the shores of Denmark, the Netherlands and Germany. Holderness is the largest source of sediment for the North Sea.



Map of sediment transport

Figure 4

Rising Sea Levels

Global warming is likely to cause sea levels to rise between 38cm and 55cm by the year 2100.

The effects of a rise in sea level include:

- Beaches will become narrower and erosion will increase
- High tides will reach the cliffs more often so they will erode faster
- Estuaries and lagoons will become larger and deeper
- If the sea breaks through shingle barriers, the lagoons could become bays

Figure 5

Types of coastal defence already used in the Holderness Area

PLACE	EXISTING COASTAL DEFENCES
<p>Bridlington (pop. 31,000)</p> <p>Fishing port and holiday resort with bathing beaches of EU quality standard</p>	<ul style="list-style-type: none"> ● Sheltered naturally by Flamborough Head <p>Concrete sea walls and wood groynes. Built in the late 19th century and regularly repaired.</p>
<p>Hornsea (pop. 7,500)</p> <p>Holiday resort with bathing beach of EU quality standard.</p>	<ul style="list-style-type: none"> ● Wooden groynes, and concrete sea wall. Built in early 1900s and repaired in 1980s.
<p>Mablethorpe (pop. 100)</p> <p>Small village (on the B1242 coast road) in a farming area</p>	<ul style="list-style-type: none"> ● Rock revetment and rock groynes, with graded cliffs. Built in 1991 at a cost of £1.9m <p>(Photographs C and D)</p>
<p>Withernsea (pop. 6,300)</p> <p>Holiday resort with bathing beach of EU quality standard.</p>	<ul style="list-style-type: none"> ● Wooden Groynes built in late 19th century. <p>New sea wall with rock revetment built in 1980s.</p> <p>Rock toe work in 1990s</p> <p>(Photograph E)</p>
<p>Spurn Head</p> <p>Sand and shingle spit with a lifeboat station, the Humber Pilot's base and a nature reserve. It has Heritage Coast status.</p>	<ul style="list-style-type: none"> ● Clay embankment on the northern shore. ● Small concrete wall, in poor repair, on the western shore. Built in 1940s. ● Concrete blocks and wooden groynes (now derelict) on eastern shore.

Figure 6

The Easington Area

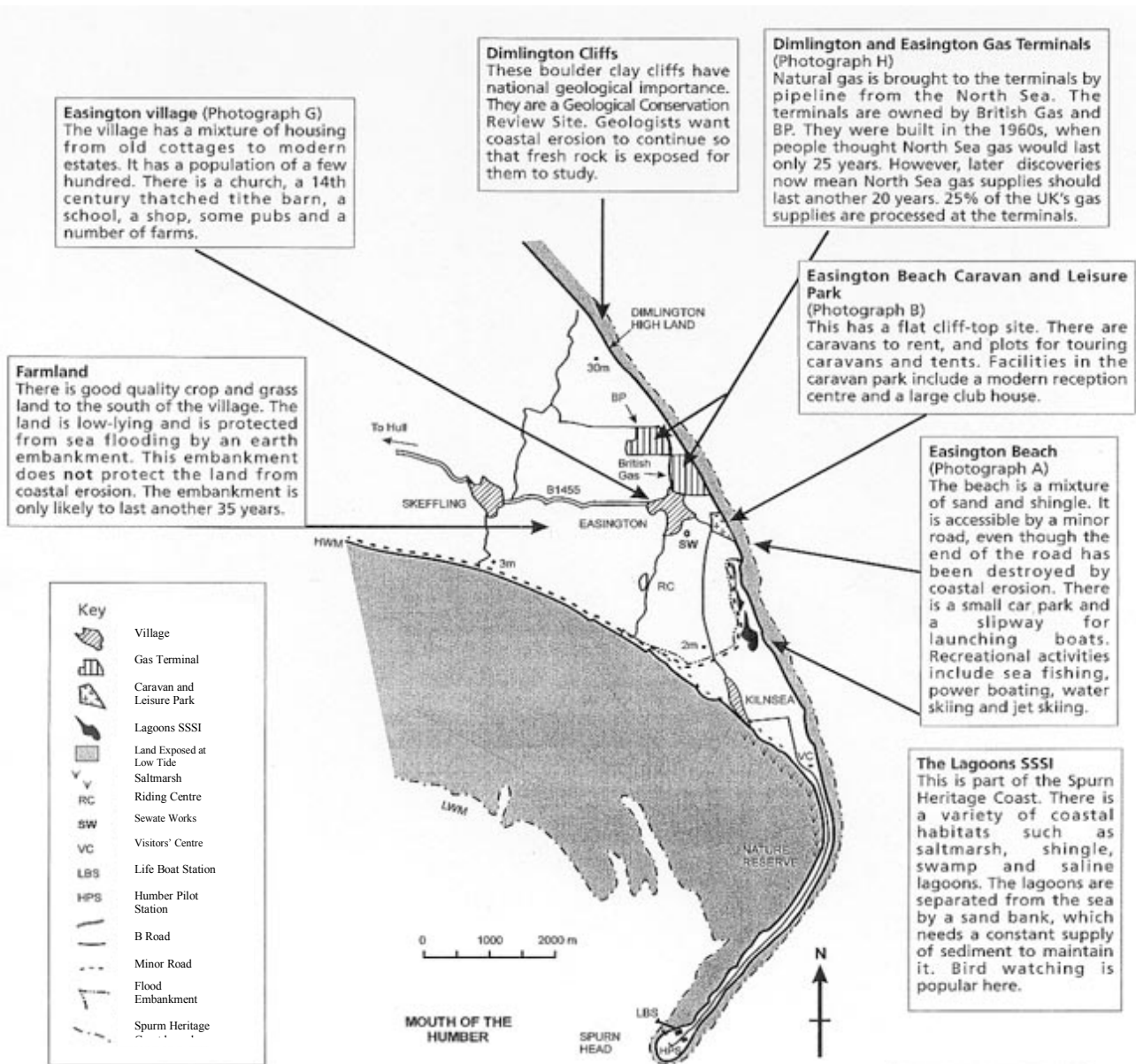


Figure 7

At Easington the average annual rate of coastal erosion since the 1950s is 1.8 metres. In some years the cliffs have been known to erode as much as 10 metres. The caravan site at Easington has already suffered from erosion, and a gas terminal is now within 10 metres of the cliff edge.

Type of Energy	Million tonnes of oil equivalent	%
Petroleum	67	42
Natural Gas	56	35
Electricity	26	16
Coal and Coke	9	6
Others	2	1
Total	160	100

Figure 8 – Energy Consumption in United Kingdom by type of Energy (1996)

Should Easington be protected? Here are some opinions.

Government official	Coastal protection schemes must be technically sound environmentally acceptable, and economically worthwhile, with benefits greater than costs.
Tourist	Our family have spent several happy camping holidays at Easington. It's a lovely, quiet spot right next to the beach. Of course defences should be built to save it.
Conservationist	Interfering with the coast at Easington will endanger the valuable wildlife habitats further south. Spurn Head itself would be at even greater risk of erosion.
British Gas spokesperson	North Sea gas terminals are vital to the British economy. They must be protected.
Easington Caravan Park owner	It would be almost as cheap to build 1,600 metres of revetment while the equipment is there, as it is to build 1,000 metres. My livelihood and several jobs are at stake.
University lecturer	Defending Holderness is not the most important thing. It is more important to ensure the long-term stability of the coasts of EU countries that border the southern North Sea. Major cities like Amsterdam are located there.
Local councillor	Should we only be protecting trans-national companies? What about our own residents?
Engineering consultant	Coastal protection will not work unless you build groynes. A revetment or sea-wall will give short-term protection, but without groynes no system will succeed.
Euro MP	If they only protect the gas terminal then the village will be exposed to even greater erosion. Look what happened after the Mappleton scheme.
Withernsea resident	There are more deserving places in Holderness than Easington. The recent cliff falls at Withernsea mean the sea wall there urgently needs extending.
Environmental group publicity officer	We should not be planning to fight against the sea. We should be planning to work with the natural processes operating along the coast.
County councillor	The council alone cannot afford to pay for expensive scheme. We would need government approval and a government grant to finance it.
Easington resident	Some of the villagers died for their country in the last war. It will be a disgrace if Easington is allowed to fall into the sea.

Figure 9

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What, if anything, should be done to reduce cliff erosion in the Easington area?

Four possible responses are:

- 1. Build a revetment of granite boulders along the foot of the cliffs to protect just the British Gas terminal.**

It would be 1,000 metres long, and similar to the one built at Mappleton in 1991. The cliffs would also be graded. This scheme would cost £4.5 million. BP and British Gas would contribute £750,000 towards it.

- 2. Build a longer rock revetment (1,600 metres) to protect the caravan site and village, as well as the gas terminal.**

The cliffs behind the revetment would also be graded. This scheme would cost £7.0 million and the gas companies would again contribute £750,000 towards the cost.

- 3. Build an Offshore Reef**

Stage 1 – Trial Reef

This should be 6 metres high and about 800 metres offshore, where the water is at least 10 metres deep at low tide. It would be made from 5,500 cubic metres of concrete-filled rubber tyres tied together with ropes. The reef would cost £390,000. Local councils would have to find a sponsor such as the tyre industry to help with the cost. They would need to test the reef for at least 2 years, to see if it was stable, if it affected local currents, and if it caused any pollution.

Stage 2 – Full Scheme

If the trial was successful, a series of larger reefs protecting the entire Holderness coast might be built. It has been estimated that seven reefs, each 2 km long, would last 300 years and use 800 million tyres. The total cost of this scheme would be £300 million. People in favour have suggested that the whole cost could be covered by the money received to dispose of the second hand tyres. The EU has banned the disposal of rubber tyres at rubbish tips.

- 4. Do nothing – let nature take its course.**

The natural marine processes of erosion, transport and deposition would not be interfered with at all.

Figure 10

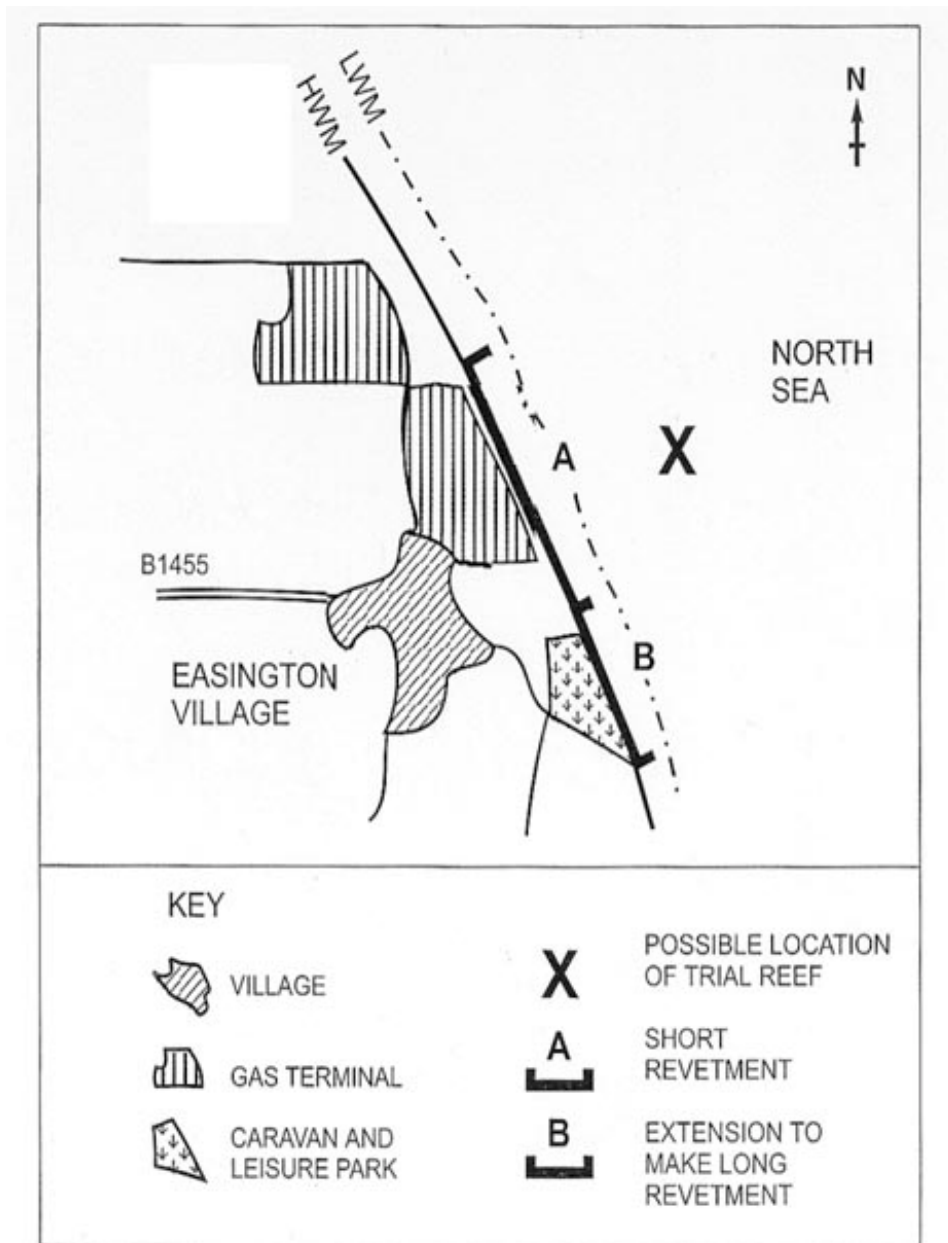


Figure 11
Location of possible coastal defences at Easington

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1311/3H

Edexcel GCSE

Geography B

Paper 3H

Decision Making Exercise

PHOTOGRAPH BOOK

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Photograph A – Easington cliff and beach



Photograph B – Easington Beach Caravan and Leisure Park



Photograph C – Rock revetment and graded cliffs at Mappleton



Photograph D – Rock groyne at Mappleton



Photograph E –Cliffs south of Withernsea



Photograph F – Cliffs south of Withernsea



Photograph G – Easington Village



Photograph H – Easington Gas Terminal

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GCSE

Mark Scheme

GEOGRAPHY 1313

PAPER 3H

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GENERAL MARKING INSTRUCTIONS

The mark scheme is based on a combination of direct credit marking and levels of response marking.

When levels of response marking are used, the examiner should determine the highest level reached by the candidate before awarding marks within the range allocated to that level of response. Do not be afraid to give full marks.

Not all points mentioned in the mark scheme against each level need to be met for an answer to start scoring at that level. It will be possible for a candidate to reach a score through either the breadth or depth of the answer.

Where a points mark scheme is used, candidates should be credited for each valid point made, whether the points give extra breadth or greater depth. The wording of the question should be used to determine the validity of the points offered: for example an answer requiring explanation could not gain full marks if it only describes; a question requiring 'reasons for ...' could not get full marks if only one reason is offered in depth – some breadth would be required.

The answers suggested in the mark scheme are for guidance only. In many cases it will be possible for candidates to offer valid, plausible alternatives. Examiners should use their professional judgement to decide whether a given answer is acceptable. In cases of any doubt, the examiner should refer the answer to their team leader or the principal examiner.

Where appropriate, annotated diagrams are acceptable as a substitute for text and can gain full marks if they meet the requirements of the mark scheme.

- | | | | | |
|-----------|------------|---|--------------|----------|
| 1. | (a) | Boulder clay/clay/clay plus some sand and larger stones | 1 | |
| | (b) | Undulating = hummock/bumpy/rolling/gently rising and falling (1)
Plain = lowland (1) | 1 x 2 | 2 |
| | (c) | They help maintain tidal mud flats elsewhere/in Humber Estuary/
around North Sea | 1 | 1 |

Total: 4 marks

2. (a) (i) 3 to 4 metres 1
- (ii) Fallen rock/clay at cliff-foot (1)
Exposed pipe in cliff-face (1)
Undermined tarmac/path near cliff-top (1)
Scar/hollow in cliff-face (1) 1 x 2 2
- (b) (i) Three correct bars 1 x 3 3
- (ii) 1 mark for reason + 1 for further explanation + 1 for named example. Max 3 marks if no named example.
- Lower where coastal defences built (1), because waves reflected/absorbed (1) eg Withernsea/Hornsea (1)
- Higher down-drift/south of groynes (1), because starved of protective beach (1) which would absorb wave energy (1) eg Mablethorpe/Dimlington (1)
- Lower where sheltered by headland (1), because not affected by strong N. waves (1) Low Skirlington/Atwick (1) 1 x 4 4
- (iii) Grinding action of sand, stones, etc transported by waves (1) 1 1
- (iv) Slumping (1), wetting and drying (1) surface run off (1) 1 x 2 2

- (c) (i) 1 = Slope of beach (1) or force of gravity (1) or material from cliff (1)
 2 = Movement up beach (1) or swash (1)
 3 = Movement down beach (1) or backwash (1) 1 x 4 4
 5 = Longshore drift (1)
- (ii) Direction of maximum fetch or they blow over a wide sea surface (1)
 so the winds are strongest (1) 1 x 2 2
- (iii) Two correct locations 1 x 2 2

Total: 20 marks

3. (a) (i) For example:
 Effectiveness in resisting erosion (1)
 Time taken to build (1)
 Cost (1)
 Durability (1)
 Visual appearance (1)
 Ease on access to beach (1)
 Knock-on effects along the coast (1) 1 x 4 4
- (ii) Some coastal defences derelict/not maintained (1) 1 1
- (b) Groynes at Mableton reduced LSD (1)
 Coast to south starved of beach (1)
 Cliffs therefore exposed to more destructive waves (1)
 Defences at Mableton protected cliffs there (1)
 Therefore less beach material provided for transport south (1) 1 x 3 3
- (c) Groyne checked LSD by trapping sediment (1), so
 Exposing cliffs in foreground to more erosion (1)
 Boulders now protect cliff-foot from wave attack (1)
 by absorbing wave energy (1)
 but cliff still slumping due to rain/weakness of clay (1)
 Sea water stained brown with sediment (1)
 indicates cliff erosion still continues up-coast (1)
 No signs of recent slumping in E where boulders placed (1)
 but fresh slumping in F where no boulders (1) 1 x 4 4

Total: 12 marks

4.	(a)	(i)	Site of Special Scientific Interest	1	1
		(ii)	Coast of scenic/ecological importance ($\frac{1}{2}$) that requires careful management ($\frac{1}{2}$)	$\frac{1}{2} \times 2$	1
	(b)	(i)	Any distance in the range 600 to 700 metres	1	1
		(ii)	300 to 350 years (N.B if answer to (b) (i) is incorrect, credit an answer to this part which is based on a calculation of 2m/year)	1	1
	(c)	(i)	The benefits are greater than the costs (1) It gives value for money (1)	1	1
		(ii)	They handle 25% of UK's natural gas supplies (1) This represents at least 9% of UK's energy supplies (2) Natural gas is used directly in many UK homes/factories, and in power stations for generating electricity (1)	1 x 2	2
		(iii)	The coasts in the southern North Sea include some major cities (1) The coasts in the southern North Sea are more densely populated than Holderness (1)	1	1
		(iv)	It makes use of rubber tyres ($\frac{1}{2}$), a waste/re-cycled Material ($\frac{1}{2}$) It is underwater ($\frac{1}{2}$) so not an eyesore ($\frac{1}{2}$)	$\frac{1}{2} \times 4$	2
	(v)		Reefs interfere with natural coastal processes OR We should plan with natural coastal forces, not against them (1) If reefs check LSD, they may endanger the wildlife habitats to the south (1) If reefs disintegrate, they may pollute the coast (1) Tidal mud-flats elsewhere in the North Sea may be put at risk (1), increasing the risk of flooding there (1)	1 x 2	2

Total: 12 marks

5. No mark for choice of option.
Credit valid reasons for choice of option and for rejecting others.

Relevant criteria to include:

Effectiveness in tackling erosion
Cost
Durability
Ease of access to beach
Nature/importance of the land use(s) protected
Visual impact
Possible knock-on effects elsewhere
Likelihood of getting government permission

Level 1

Only considers a few relevant criteria.
Probably only uses obvious points from Figures 9 and 10.

Makes several simple points lifted from the Resource Booklet, eg:

‘It will cost £4.5 million’
‘North Sea gas is vital to the British economy’
‘It will disturb the wildlife habitats to the south’
‘If the caravan part is destroyed, jobs will be lost’
‘It won’t work unless you build groynes’

1 - 2

Level 2

Considers a number of relevant criteria, possibly using more sources than just Figures 9 and 10.

Makes some simple points but also includes some developed ones, (ie elaborates with more detail, or explanatory comment).

e.g:

‘Option 3 has the advantage of being the cheapest defence scheme’
‘The coast urgently needs protecting now, but the off-shore reef will take two years to test’
‘Spurn Head is a nationally important nature reserve: it should not be endangered by protecting just a caravan park from erosion’

Makes several developed points to reach the top mark at this level.
(Max. 5 marks if no reasons given for rejecting other schemes)

3-7

Level 3

Considers a range of relevant criteria, probably using a variety of sources in the Resource Book. Quite likely to see some implications not directly mentioned there, eg:

‘Scheme 1 will probably attract a government grant because of the gas terminal’s national importance, but Scheme 2 probably won’t’

‘There will be a health and safety risk, as well as economic costs, if the gas installations are not protected from erosion’

Includes some well developed points, eg:

‘The off-shore reef is the most environmentally friendly scheme, because it uses second-hand tyres and so re-cycles waste material’

Probably acknowledges some problems, as well as advantages, of chosen option, eg:

‘Although Option 2 is the most expensive one, I still favour it because’

Makes a number of well developed points in a thoroughly argued, balanced answer to reach the top mark at this level.

(Max. 10 marks if no reasons given for rejecting other schemes)

8 – 12 12

Total: 12 marks

PAPER TOTAL 60

+3 QWC 63

ASSESSMENT OF QUALITY OF WRITTEN COMMUNICATION

Candidates will be assessed for the quality of written communication according to the following criteria:

Level 3	3	Candidates write in sentences which are clear, structured and coherent. They spell, punctuate and use the rules of grammar with few errors using a range of specialist terms appropriately and with precision.
Level 2	2	Candidates write in sentences with a clear and structured style. They spell, punctuate and use the rules of grammar with considerable accuracy.
Level 1	1	Candidates write in sentences with a limited structure. They spell, punctuate and use the rules of grammar with reasonable accuracy

DME HIGHER

			Objective	Marks
1	(a)	(i)	Knowledge	2
		(ii), (iii)	Skills	2
2	(a)		Skills	3
	(b)	(i)	Skills	3
		(ii)	Application	4
		(iii)	Knowledge	1
		(iv)	Understanding	2
	(c)	(i)	Understanding	4
		(ii)	Application	1
(iii)		Knowledge	2	
3	(a)	(i)	Knowledge	4
		(ii)	Skills	1
	(b)		Application	3
	(c)		Skills	4
4	(a)		Knowledge	2
	(b)		Skills	2
	(c)	(i)	Knowledge	1
		(ii), (iii)	Skills	3
		(iv), (v)	Application	4
5			Understanding	6
			Skills	6
Totals			Knowledge	12
			Understanding	12
			Application	12
			Skills	24
			TOTAL	60