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NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2021

GEOGRAPHY: PAPER IIMARKING GUIDELINES

Time: 1½ hours | 100 marks

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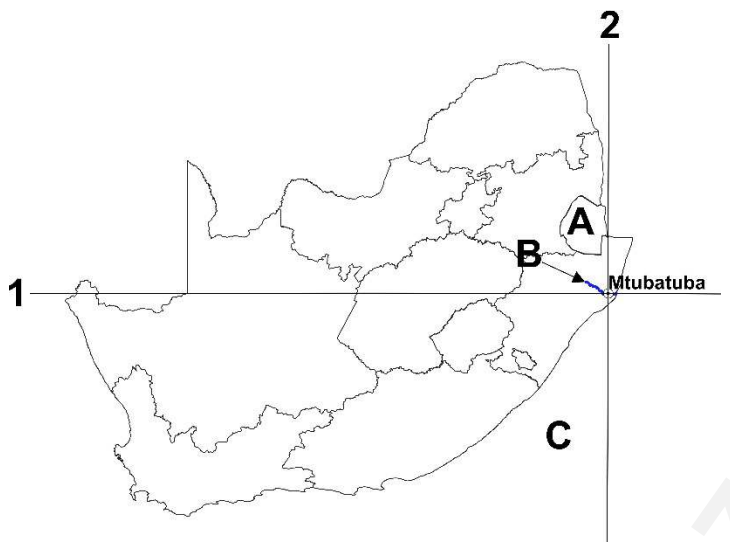
QUESTION 1 THE ECONOMY OF MTUBATUBA, MAP SKILLS, GIS

Figure 1 – Location map



Fact File: Mtubatuba and the Umfolozi Sugar Mill (USM)

- The Umfolozi Sugar Mill (commonly called USM), part of the Illovo Sugar Group, is the industrial flagship of Mtubatuba in Northern KwaZulu-Natal.
- Between 4% and 10% of the caneis delivered by small-scale growers, who farm on numerous plots of approximately 1,5 hectares each along the Mfolozi River.
- The Black and White Mfolozi rivers rise in the Lebombo Mountains and, at their confluence, become the Mfolozi River.

[Source: Examiner]

Refer to the location map above, the topographic map extract 2832 AC MTUBATUBA and the orthophoto map extracts to answer the questions that follow.

1.1 Name the country labelled **A** on the location map in Figure 1.

eSwatini	**x**
Namibia	
Botswana	
Zimbabwe	

1.2 Name the river labelled **B** on the location map in Figure 1.

Berg	
Orange	
Mfolozi	**x**
Breede	

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1.3 Name the ocean labelled **C** on the location map in Figure 1.

Atlantic	
Indian	**x**
Pacific	
Arctic	

1.4 1.4.1 The topographic map extract of Mtubatuba was generated using … data.

vector	**x**
raster	

1.4.1 Using the GIS concepts of point / line / polygon, name each type of feature found inblock D5. Complete the table.

Feature	**GIS concept Choose from: point / line / polygon**
	polygon
	point
	line

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1.5 1.5.1 Choose the correct true bearing from the centre of USM at Point **X** (C6) to the end of the narrow-gauge railway at Point **Y** (C8).

80°	**x**
170°	
260°	
350°	

1.5.2 Calculate the magnetic declination for 2021. Complete the table.

Magnetic declination for 2019	24° 13' W
Change per annum	11' W
Difference in years	**2 years (1 mark)**
Magnetic declination for 2021	**24° 35' W (2 marks)** **(no method marks here)**
Calculations **2 years × 11' W = 22' change** **24° 13' W** **22' change = 24° 35' W**	

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1.6 Complete the table below by choosing the option (from those given) that applies to each photo.

	Primary sector	**Most common farming method used**	**Scale of farming**
	farming, mining, forestry, fishing, hunting	mechanised, manual labour	small scale, large scale
Photograph 1 (A7)	**forestry**	**mechanised**	**large scale**
Photograph 2 (C5)	**farming**	**manual**	**small scale**
Photograph 3 (D6)	**farming**	**mechanised**	**large scale**

[Source: Examiner]

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1.7 Photograph 4 is taken close to the road at Point **Z** (D6).

Photograph 4 – Small train on narrow-gauge railway transporting an agricultural product

1.7.1 What is the likely agricultural product being transported here?

Wheat	
Grapes	
Mangoes	
Sugar cane	**x**

1.7.2 The train is heading towards the sugar mill in C6. In what direction is the train travelling at this point?

West	
South-west	
North-north-east	
West-north-west	**x**

1.7.3 The sugar mill **imports** / **processes** / **markets** the sugar cane. Circle the correct word.

1.7.4 Value-added products, manufactured from the 128 000 tonnes of sugar produced by USM, are sold in shops countrywide. Define the term *value-added product*.

The value of the product is increased by processing the raw material into something more valuable.

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1.8 Study Photographs 5 and 6 below as well as Image 1 on page 8. The locations of Photographs 5 and 6 are shown by the yellow box on the topographic map extract.

Photograph 5

[Source: Examiner]

Photograph 6

[Source: Examiner]

1.8.1 (a) Photograph 5 shows an example of **informal** / **formal** trading.

(b) Photograph 6 shows an example of **informal** / **formal** trading.

1.8.2 Give TWO examples of anchor tenants in Photograph 6.

Truworths, Checkers, Spur, Clicks (any TWO)

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Study Image 1 below.

Image 1 – Google Earth view of Mtubatuba showing the locations of Photographs 5 and 6 (as shown by the yellow box on the topographic map extract)

[Source: Google Earth]

1.8.3 A sustainable method of generating power is visible on a roof in Image 1.

(a) Name this method of sustainable power generation.

Solar/Sun/Photovoltaic

(b) Draw the conventional symbol to reflect this on an updated topographic map.

Conventional symbol	**Something like this**

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QUESTION 2 SETTLEMENT, MAP SKILLS, GIS

2.1 Photograph 6 (on page 7) was taken in A5. It is an example of a …

zone of decay	
regional shopping centre	**x**
central business district	
heavy industry	

2.2 2.2.1 Give evidence from the topographic map extract for TWO site factors favouring sugar cane growth in the mapped area.

- **Flat land (contours far apart, absence of contours)/Open land**
- **Availability of water / wet point (Mfolozi River, subtropical area visible in location map)/on the floodplain**
- **Land is fertile (evidence of lots of farming)**
- **Possible availability of wood resources**
- **Subtropical region at 28°S**

2.2.2 Explain TWO situational factors for the USM and the surrounding cultivated land. Use topographic map extract evidence.

- **Railway access to ports of Richard's Bay and Durban for export (sugar terminal)**
- **Road access (N2) to markets and ports**
- **Good road / rail infrastructure for transporting cane around area**
- **Close to supply of labour in nearby areas**
- **The USM is centrally situated to the nearby farms**

2.3 Orthophoto map extract 2 shows the Glen Barlyn Farm in C7 on the topographic map extract. All the questions in 2.3 refer to this extract.

2.3.1 Which map shows the more recent information?

Topographic map extract	
Orthophoto map extract 2	**x**

2.3.2 Provide a reason for your answer to Question 2.3.1.

The photo shows the cultivated land (contour ploughing) visible on the right (east) of the farm. This is not visible on the map.

New row of trees/new road access/ more buildings/more farmland visible

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(a) Calculate the gradient of the slope from D to E.

Difference in height from D to E	**45m – 15m = 30 m**	
Distance between D and E	**688 m**	
Calculations **1:4 000 ∴ 1 cm → 0,04 km (40 m)** **17.2 cm × 0,04 = 0,688 km (688 m)** **17.0 to 17.4 cm leeway → 0,680 (680 m) to 0,696 km (696 m)**		
Gradient from D to E	**1 : 22,9**	
Calculations **leeway from 1:22,6 (680 m used) to 1:23,2 (696 m used)** **Method marks were awarded if incorrect distance and/or difference in height was used. Max 1 mark**		

(b) The slope from D to E is …

convex	**x**
concave	

(c) Contour farming is visible in this extract. Select the most appropriate options below to describe this farming method

(i) It is used where the land has a sloping profile.	
(ii) It favours infiltration of rainwater as runoff is stopped.	
(iii) The risk of soil erosion is greater with this method of ploughing.	
(iv) The land is ploughed at right angles to the slope.	
Select the best combination of answers from the options below	
(ii), (iii)	
(i), (ii), (iii)	
(i), (ii), (iv)	**x**
All of the above.	

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(d) The most likely platform (where the camera is attached) used for this orthophoto is a …

satellite.	**x**
weather balloon.	
fixed-wing aircraft.	

(e) Did an active or a passive sensor capture this image?

Active	
Passive	**x**

2.4 The areas of River View (C5) and Indlovu (B 4/5) show typical apartheid-style planning characteristics.

2.4.1 Complete the table below. Options are provided for (a) and (b). Choose ONE for each.

	River View (C5)	Indlovu (B 4/5)
(a) Settlement pattern *Choose ONE – planned irregular, planned rectangular*	**planned rectangular**	**planned irregular**
(b) Most likely housing evident *Choose ONE – low-income, upper-income*	**Upper-income**	**Low-income**

2.4.2 Provide TWO examples of an apartheid-style buffer zone between River View (C5) and Indlovu (B 4/5).

Railway line
Green belt (golf course)/Recreational
Vacant land visible
Non-perennial stream

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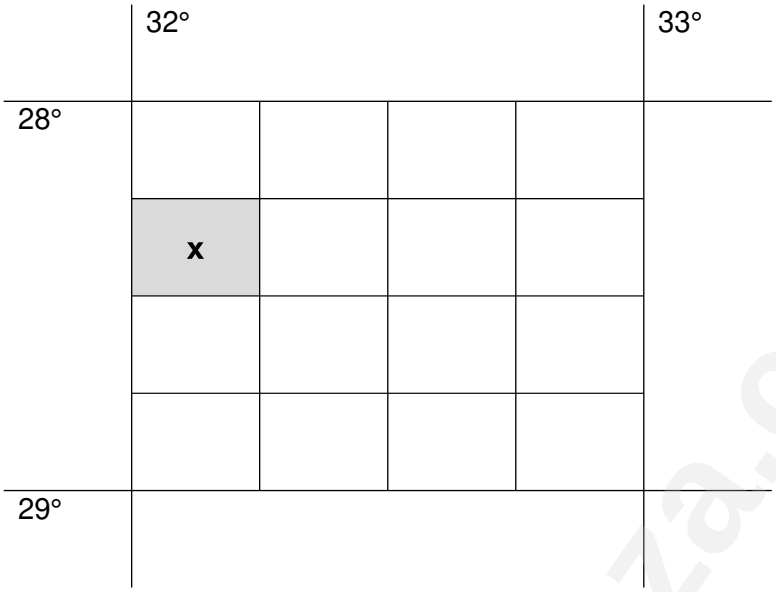
2.5 Mtubatuba's map code is 2832 AC. Using the table below, shade the correct grid reference block for Mtubatuba.



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QUESTION 3 CLIMATE, WEATHER, MAP SKILLS

3.1 Study orthophoto map extract 1.

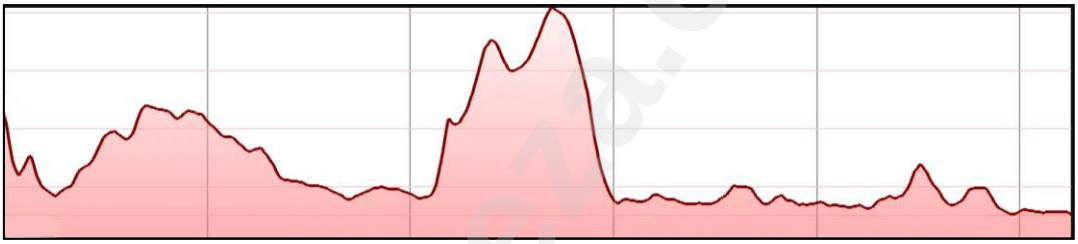
3.1.1 A red line has been drawn from **F** to **G** on orthophoto map extract 1.

Three cross-sectional sketches, (a) to (c), are drawn below. This area is covered in D/E 3/4 on the topographic map extract.

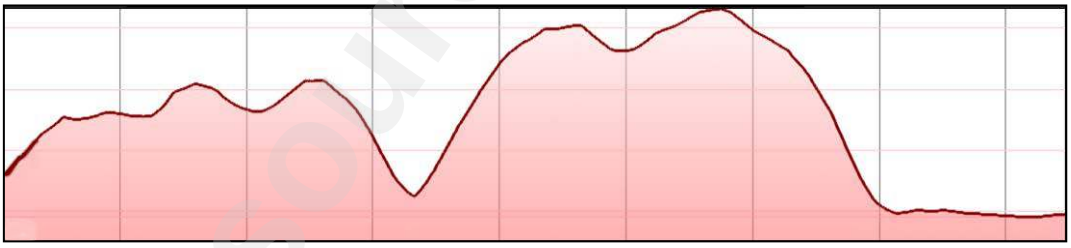
Which option best represents the profile from **F** to **G** on this extract?

(b) or cross-sectional sketch 2

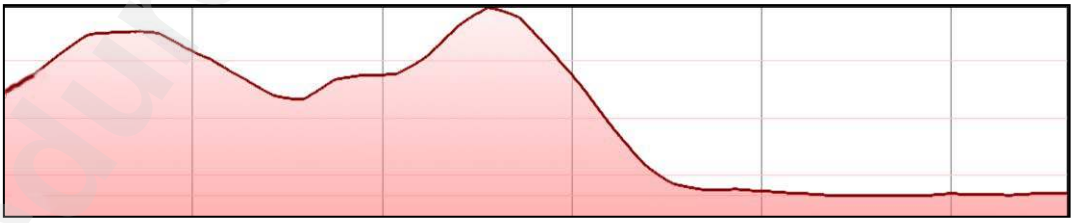
(a) Cross-sectional sketch 1



(b) Cross-sectional sketch 2



(c) Cross-sectional sketch 3



3.1.2 A feature, indicated by the line from **I** to **J** on orthophoto map extract 1, can be described as a …

ridge	
saddle	**x**
waterfall	
terrace	

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3.2 Study the fact file on Lake Eteza (E/F 4) and visible on orthophoto map extract 1.

Fact File: Lake Eteza

- Lake Eteza is located 7 km south of Mtubatuba, on level terrain and at an altitude of 10 m above sea level.
- A major part of the site consists of a shallow lake, rarely more than 1,5 m deep, that forms an integral part of the Mfolozi River system.

[Source: Adapted from <https://www.birdlife.org.za/iba-directory/lake-eteza-nature-reserve/>]

Orthophoto map extract 1 shows that Lake Eteza has dried up significantly.

3.2.1 Provide a climatological reason for this.

Climate change, drought, El-Nino, high temperatures, high evaporation rates, decrease in rainfall

3.2.2 Provide an economic reason for this.

The farmers have used the water for irrigation of the crops during the dry season. Used in the Umfolozi Sugar Mill for cooling and processing.

The farmers have drained the land for more agricultural land

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3.3 Study Photograph 7 below.

Photograph 7 – Umfolozi Sugar Mill's (USM's) pollution plume and the narrow-gauge railway (C6)

3.3.1 The residents of Hill Haven Estate (E/F 5) often complain of a smell produced by the mill.

Choose the most likely prevailing wind to carry the smell (as visible from the cloud in Photograph 7) from USM (C6) to Hill Haven Estate (E/F 5).

South-westerly	
North-westerly	
North-easterly	**x**
South-easterly	

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3.3.2 Umfolozi Sugar Mill produces between 1 150 000 and 1 250 000 tonnes of cane in "normal" climatic conditions in a 36-week milling season.

Based on Mtubatuba's location, complete the sentence to describe "normal" climatic conditions using words from the box below.

Mtubatuba has a ___A___ climate where summers are ___B___ and ___C___.

The ___D___ draws in moisture which results in ___E___. This provides the catchment with sufficient water for irrigation purposes.

continental	hot	South Indian HP	dry	cool
thundershowers	frontal rain	South Atlantic HP	maritime	humid

A	**martime**
B	**hot**
C	**humid**
D	**South Indian HP**
E	**thundershowers**

3.4 Provide map evidence to support the fact that Mtubatuba does not produce an exaggerated heat island.

- **Mtubatuba is quite a small settlement with little industry (other than the sugar mill) and so there isn't a lot of industrial activity contributing to heat.**
- **The presence of lots of farmland and forestry (ruralness) and very little artificial surfaces (tar and concrete, urbanlike / built up) means less heat is retained.**
- **Lots of open water leading to cooling effect**

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3.5 The Mtubatuba Municipality is using a specialist GIS company to report on pollution levels from USM. Data is collected from remote-sensing satellites and stations on the ground.

3.5.1 What is remote sensing?

Collection and interpretation of information about the earth from a distance (i.e.: by satellite)

3.5.2 Using the information from the remote-sensing satellites together with information from stations on the ground is an example of …

data security	
data integration	**x**
buffering	
Standardisation	

3.5.3 A map is produced of areas in Mtubatuba showing concentration of atmospheric pollution.

Name three layers of information that should be on the map to enable people to understand the impact of the pollution from USM. Tick the correct options below.

Umfolozi Sugar Mill	**x**
Mvanyamwanya Lake	
Riverview, Mtubatuba and Indlovu settlements	**x**
Concentrations of pollution	**x**
Golf course	
Railways line	

Please note if all 6 were indicated ZERO marks were awarded. If 4 were indicated then 3 correct answers were accepted

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QUESTION 4 FLUVIAL GEOMORPHOLOGY, MAP SKILLS

4.1 Refer to Lake Eteza (E/F 4) on the topographic map extract.

Complete the table below.

Please note: 1 hectare = 10 000 m^2

Approximate length of Lake Eteza	2 500 m
Approximate breadth of Lake Eteza	1 000 m
Area of Lake Eteza (length × breadth)	**250 ha**
Calculations: **L × B** **= 2 500 m × 1 000 m = 2 500 000 m^2** **2 500 000 m^2 / 10 000 = 250 ha** **No method marks awarded here as information was scaffolded**	

4.2 Study the fact file below as well as Photograph 8 on page 19.

Fact File: Umfolozi Sugar Mill

- Two years after the inception of the mill in 1916, a devastating flood caused extensive damage to the factory and infrastructure.
- Following another flood in 1925, it was decided to re-site the mill on higher ground where it is presently situated. In the early 1930s it was decided to drain the lower Umfolozi flats thus making more silt-rich land available.

[Source: adapted from <https://umfolozisugarmill.co.za/>]

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Photograph 8 – The remains of the 1916 Umfolozi Sugar Mill (at point G in D5)

4.2.1 Refer to the fact file and use TWO pieces of topographic map extract evidence to justify the decision to move the Umfolozi Sugar Mill (USM) to higher land in 1925.

- **EMPHASIS on topographic map evidence needed:**
- **The old mill was at an altitude of between 0 m and 20 m asl at nearly the same altitude of the Mfolozi River so was on the floodplain therefore flooded frequently after heavy rain.**
- **The new mill is much higher (between 20 m and 40 m amsl, spot height 72) so the river is unlikely to reach this height during flood.**
- **If the river floods it is much more likely to breach banks on the south side of river as there is a much larger extent of land at the same altitude here.**
- **The small dam close to USM could have flooding the area if dam wall failed.**
- **The USM has been moved closer to the railway line for ease of transport.**

4.2.2 Geographic Information Systems (GIS) did not exist in 1925.

Explain the geoprocessing concept of *buffering* and how it could have helped to make better decisions about the location of the mill in 1925.

- **Creating an area or distance around a feature**
- **Perhaps if they had mapped the area and created a buffer to show potential flood levels of Umfolozi River, they could have seen the areas in danger of flooding.**

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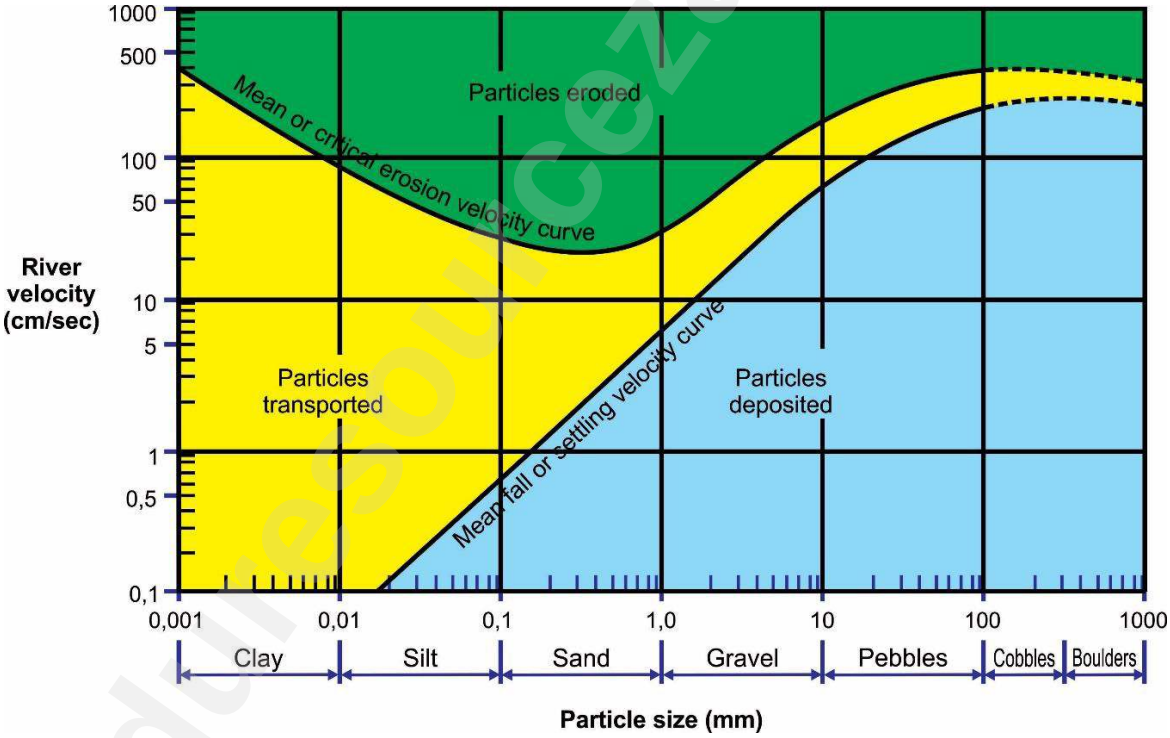
4.3 Study Photograph 9 and Figure 2 below.

Photograph 9 – View from bridge over the Mfolozi River (D5)

[Source: Examiner]

Figure 2 – Hjulström curve



[Source: <www.thegeoroom.co.zw>]

4.3.1 At what velocity will a particle of 0,04 mm be deposited?

0,25 → range of 0,2 – 0,3 accepted

4.3.2 Give THREE pieces of evidence to prove that this river is in its lower course?

(a) Map evidence
Very low altitude above sea level (0 m – 20 m)
Flat gradient (very little altitude change over distance)
Not very far from the mouth of the river/close to the sea
Meandering river
Map shows quite a wide river
There are marshes / vleis evident in the area
Floodplain is very wide

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(b) Photographic evidence
Braiding
Wide U shaped river channel
Channel is not very deep
Lots of deposition
Levees on side of river

4.4 The attribute table below contains data about the Mfolozi River at Point H (D3). Complete the attribute table below.

Mfolozi River in H (attribute table)			
Elevation (m)	Watershed	Riparian vegetation* type 1	Riparian vegetation* type 2
Between 0 m and20 m	**Lebombo Mountain**	**trees**	**sugarcane**
		bushes	**grass**

*riparian vegetation refers to the plant communities growing in the riparian zone.

Total: 100 marks

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