

External assessment 2021

Stimulus book

Earth & Environmental Science

Paper 2

General instruction

- Work in this book will not be marked.

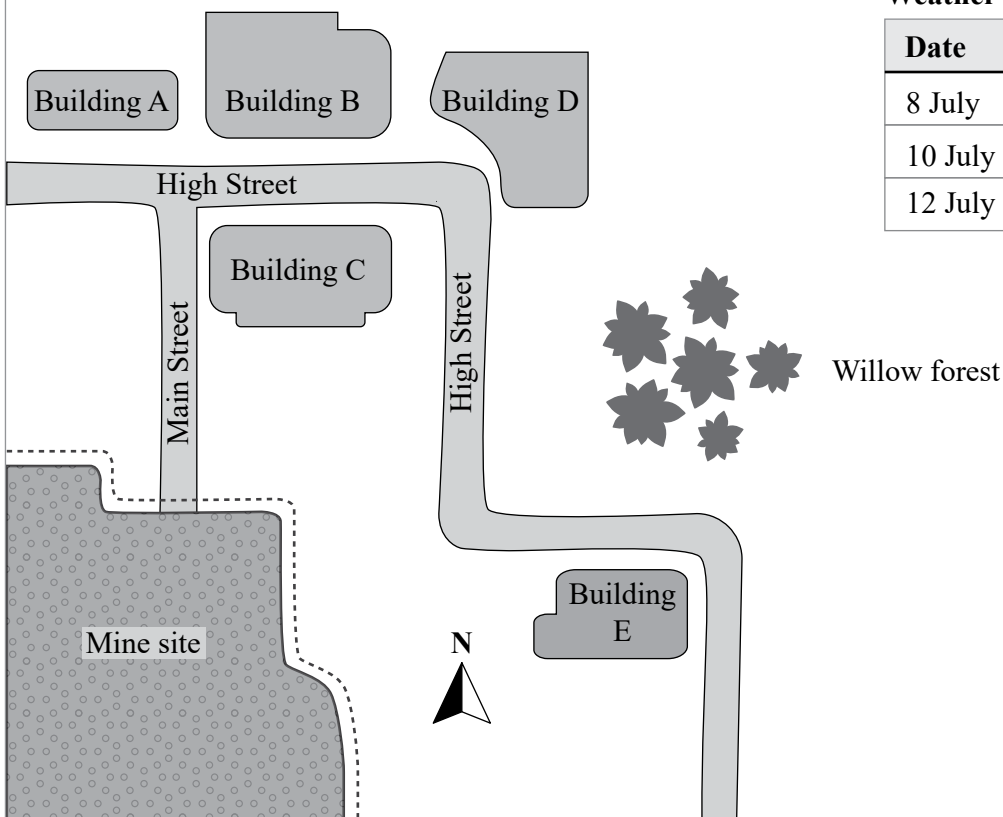
Stimulus 1

National air quality standards have been established in Australia to monitor the potential environmental impacts associated with mining. The allowed average daily concentration (short-term exposure) of sulfur dioxide is $80 \mu\text{g}/\text{m}^3$ and the allowed annual range (long-term exposure) is $20 \mu\text{g}/\text{m}^3/\text{day}$.

The table shows the level of sulfur dioxide in the air at a mine site and three nearby locations, detailed in the map.

Air quality monitoring station	Distance from the mine site (km)	Daily average ($\mu\text{g}/\text{m}^3$)			Annual average 2020 ($\mu\text{g}/\text{m}^3/\text{day}$)
		8 July 2020	10 July 2020	12 July 2020	
Mine site	0	75	91	71	11.1
Main Street	5	10	8	14	3.5
Building B	10	22	10	31	4
Willow forest	20	33	15	16	4.6

Not to scale



Weather data

Date	Wind direction
8 July	↗ SW
10 July	Calm
12 July	↘ SSW

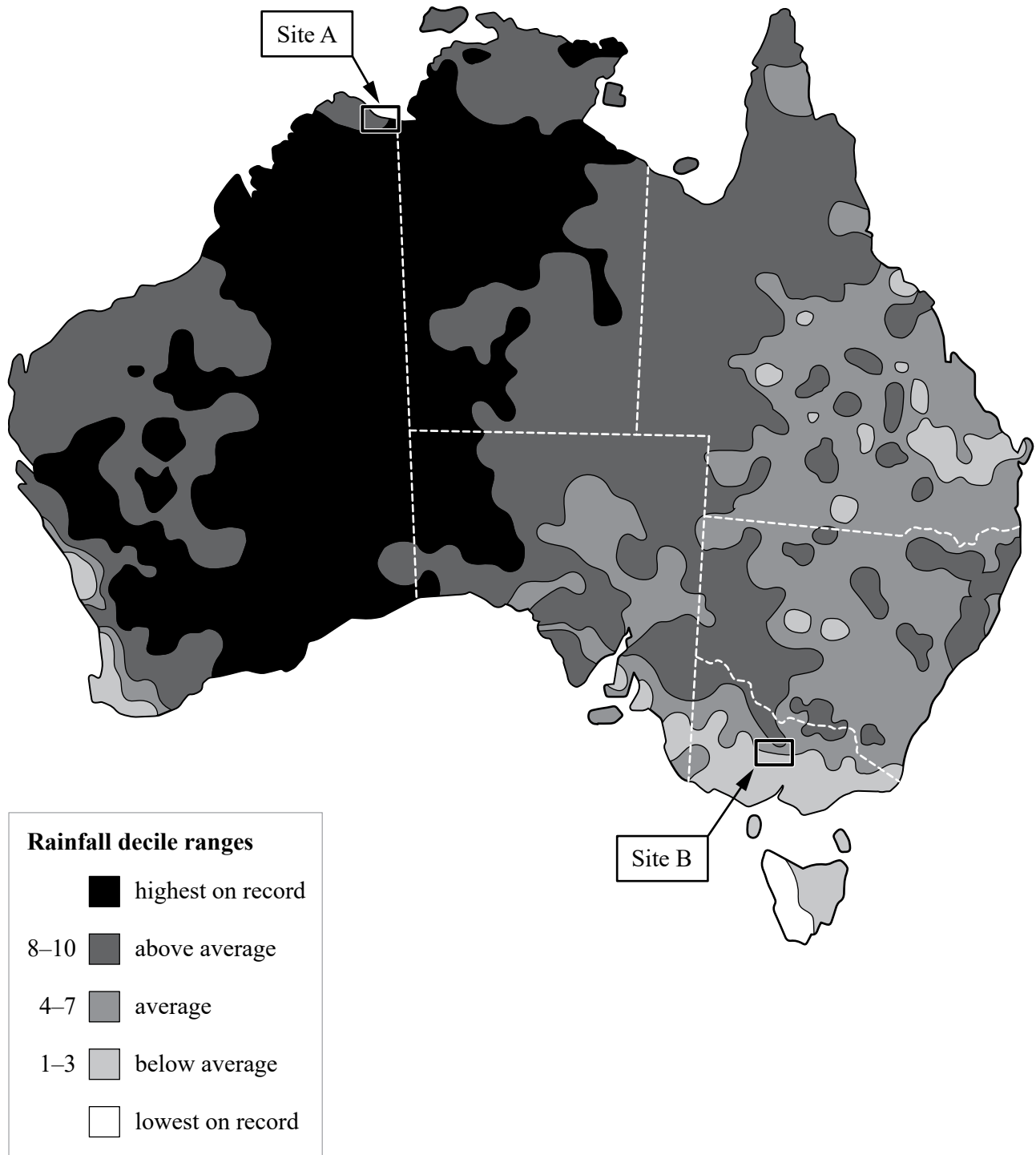
Stimulus 2

The table shows the monthly environmental characteristics for a volcano from January 2019 to December 2020. The volcano erupted in July 2020.

Date		Average ground levels (metres above sea level)	Frequency of minor earthquakes (earthquakes/month)	Level of toxic gases (N = normal, M = moderate, H = high)
2019	January	1.23	5	N
	February	1.24	6	N
	March	1.23	2	N
	April	1.22	3	N
	May	1.24	4	M
	June	1.25	5	N
	July	1.26	3	M
	August	1.27	1	N
	September	1.24	7	N
	October	1.23	4	N
	November	1.24	5	M
	December	1.25	6	N
2020	January	1.25	4	M
	February	1.24	1	M
	March	1.26	2	M
	April	1.27	4	M
	May	1.28	5	H
	June	1.30	3	H
	July	1.34	4	H
	August	1.22	2	N
	September	1.21	1	N
	October	1.21	2	N
	November	1.19	2	N
	December	1.17	3	N

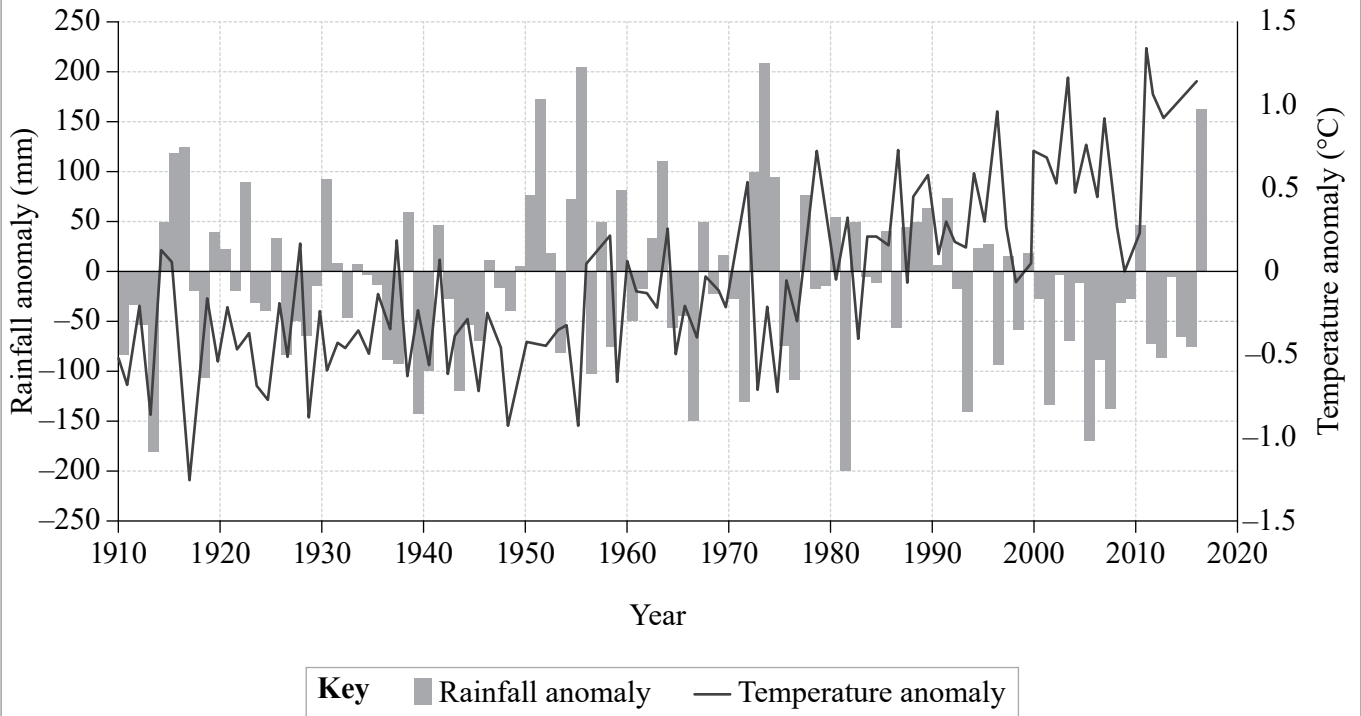
Stimulus 3

The map shows October–April rainfall deciles for 20 years (2000–01 to 2019–20). At Site A, mostly summer crops are grown. Site B is for winter cereal and some irrigated rice production.



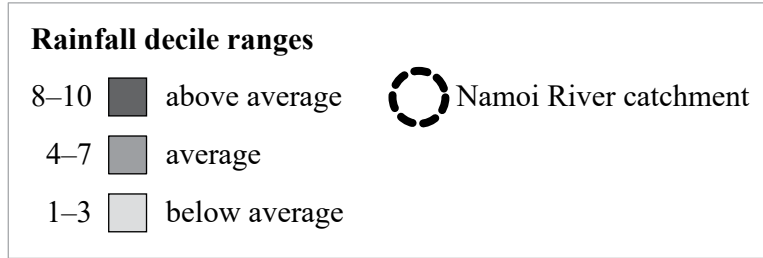
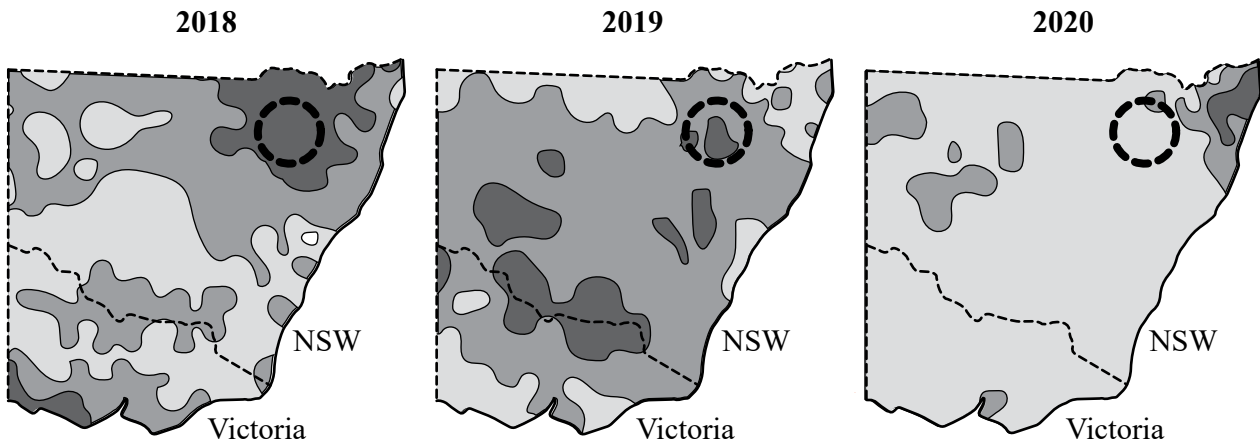
Stimulus 4

The graph shows anomalies for recorded average annual rainfall in south-eastern Australia between April and October from 1910 to 2016, compared to anomalies for recorded surface air temperature in Australia from 1910 to 2016.



Stimulus 5

These graphs show rainfall levels for New South Wales and Victoria for 2018–2020, compared to average Australian rainfall. The trend in annual rainfall for the Namoi River catchment shows a decrease of 30 mm per decade over the past 50 years.



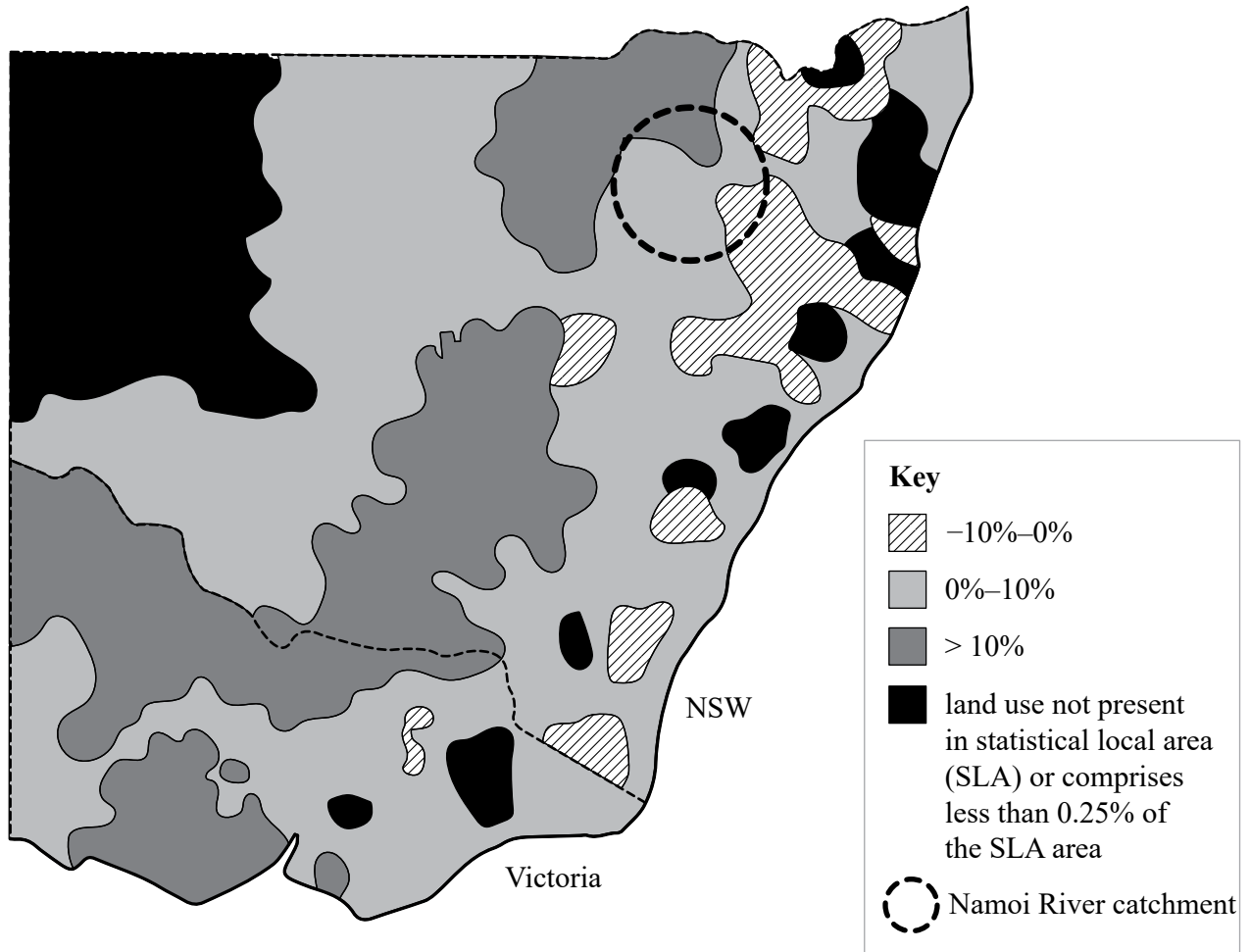
Stimulus 6

The table represents the water quality of the Namoi River, calculated as quarterly averages from March 2019 to December 2020.

	2019				2020				Acceptable local water quality standards
	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	
Turbidity (NTU)	6.8	5.4	4.5	5.6	6.0	8.6	9.1	9.8	< 10
pH	7.1	7.2	6.9	7.2	7.1	6.8	6.9	7.0	6.5–7.5
Dissolved oxygen (% saturation)	95	97	96	93	96	91	89	87	85–110

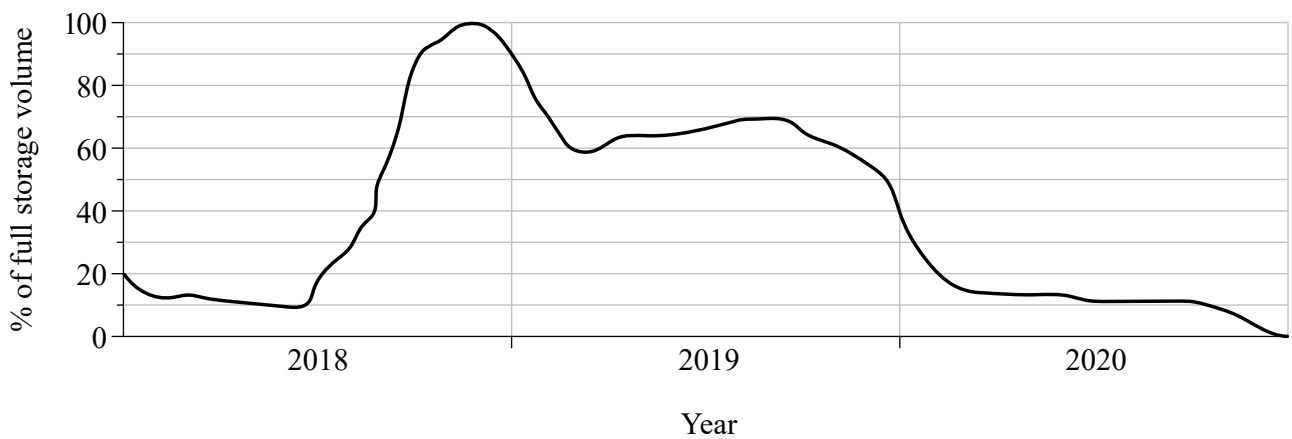
Stimulus 7

The map shows the percentage change in agricultural cropping between 2005 and 2020.



Stimulus 8

Keepit Dam is the second largest surface water reservoir in the Namoi River catchment. The graph shows the Keepit Dam water storage level expressed as a percentage of full storage for the period 2018 to 2020.



References

Stimulus 1

Data from Air pollutants, Department of Agriculture, Water and the Environment,
<https://www.awe.gov.au/environment/protection/air-quality/air-pollutants#criteria>

Stimulus 2

Data sourced from <https://www.usgs.gov/>

Stimulus 3

Adapted from Bureau of Meteorology, *State of The Climate 2018*, p 7 <http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2018.pdf> , taken from <http://www.bom.gov.au/climate/history/rainfall/>

Stimulus 4

Graph adapted from State of The Climate 2018, p 2, sourced from Bureau of Meteorology
<http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2018.pdf>

Stimulus 5

Adapted from Bureau of Meteorology, *122 years of Australian rainfall*
<http://www.bom.gov.au/climate/history/rainfall/> Used under the Creative Commons Attribution Australia
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Stimulus 7

Adapted from *Land Use Change Overview*, Department of Agriculture, Water and the Environment.
www.agriculture.gov.au/abares/aclump/land-use-change-overview
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