



MODULE 02 | TEACHER GUIDE

The Silent Spill

Who polluted Bluehaven Bay? | English B1–B2 | Ages 15–18 | 60 minutes

After heavy rain, people find litter and dead fish in Bluehaven Bay. Teams use eight clue cards and a map to discuss possible causes. They choose actions and give a short public update. The case has no single proven culprit: the aim is to distinguish facts from possible explanations.

Learning outcomes

Students can describe how pollution reaches the sea, compare simple data and give reasons for a decision. They can use “may”, “could” and “we do not know” to avoid unsupported claims.

Lesson sequence

Time	Activity	Outcome
0–6 min	Read the case on p. 2. Suggest a possible cause; B2: add another.	Initial ideas
6–15 min	Read the science brief. Trace routes on the map and compare samples on p. 3.	Annotated map
15–30 min	Sort the eight cards on pp. 4–5. Complete the case board on p. 6.	Evidence-based judgement
30–42 min	Choose exactly three actions costing at most six tokens. Prepare the public statement.	Prioritised response
42–56 min	Run paired team press conferences using p. 7. Swap roles halfway through.	Statement and questions
56–60 min	Revise one claim. Discuss what evidence could change the judgement.	Qualified conclusion

Preparation and organisation

Print pp. 2–7 for teams of four; retain p. 8. Print pp. 4–5 single-sided, cut and shuffle the cards. Supply pens and one A3 sheet per team. Students build the case board on A3 using the structure on p. 6. No online research or practical water sampling is required.

Assign a reader, number checker, questioner and speaker. B1 support: read the science text together; divide the cards between pairs; use the sentence starters. B2 challenge: give a second explanation and discuss limits. Allow 75–90 minutes if the class needs more reading time.

Optional extension to 90 minutes

Add 15 minutes to draw and explain two water routes. Add 15 minutes to write a 100–140-word council update with two findings, one uncertainty and a plan. B2 learners add an alternative explanation and a disadvantage of their plan.

All locations, organisations, quotations and numerical records are fictional. Scientific principles are sourced on p. 8. Illustrations show possible pathways and must not be treated as evidence of guilt.

Ocean Literacy principles 1 and 6: rivers connect inland activity to the ocean; human choices affect marine environments.



STUDENT SHEET 1 | CASE BRIEFING

A bay under suspicion

Wednesday, 08:00. Bluehaven Bay has a problem. There is litter on the shore. The water looks cloudy. A fisher has seen dead fish near the boats. It rained heavily on Tuesday evening. An online post blames a factory further up the river.

Your team must help the town. Read the clues. What do you know? What could have happened? What should the town do next? All places, people and numbers in this case are invented.

Your first response

What might have happened? Write one idea. Use: "Perhaps ..." or "The fish may have died because ...". B2: add a different possible explanation.

Science brief

Rain can carry pollution from fields and streets into drains and rivers. Rivers carry water to the sea. Farms, towns and wastewater systems can add nutrients to water. A pipe shows a possible route. It does not prove where the pollution came from. [1]

Plants need nutrients to grow. Too many nutrients can make algae grow. When algae and other natural material break down, tiny organisms use oxygen in the water. Wastewater can add this material too. Fish need oxygen. Too little can harm or kill them. [2, 3]

Litter can come from land or from activities at sea. Moving water can carry it far away. A litter count tells us about the items on the shore. It does not tell us how much oxygen or dissolved pollution is in the water. [4]

Check the dates. Green water seen before a storm cannot have started because of that storm. Litter and dead fish may have different causes. A water test taken later cannot tell us everything that happened.

Language for careful reasoning

"Card ... tells us ..." / "We think ... because ..."

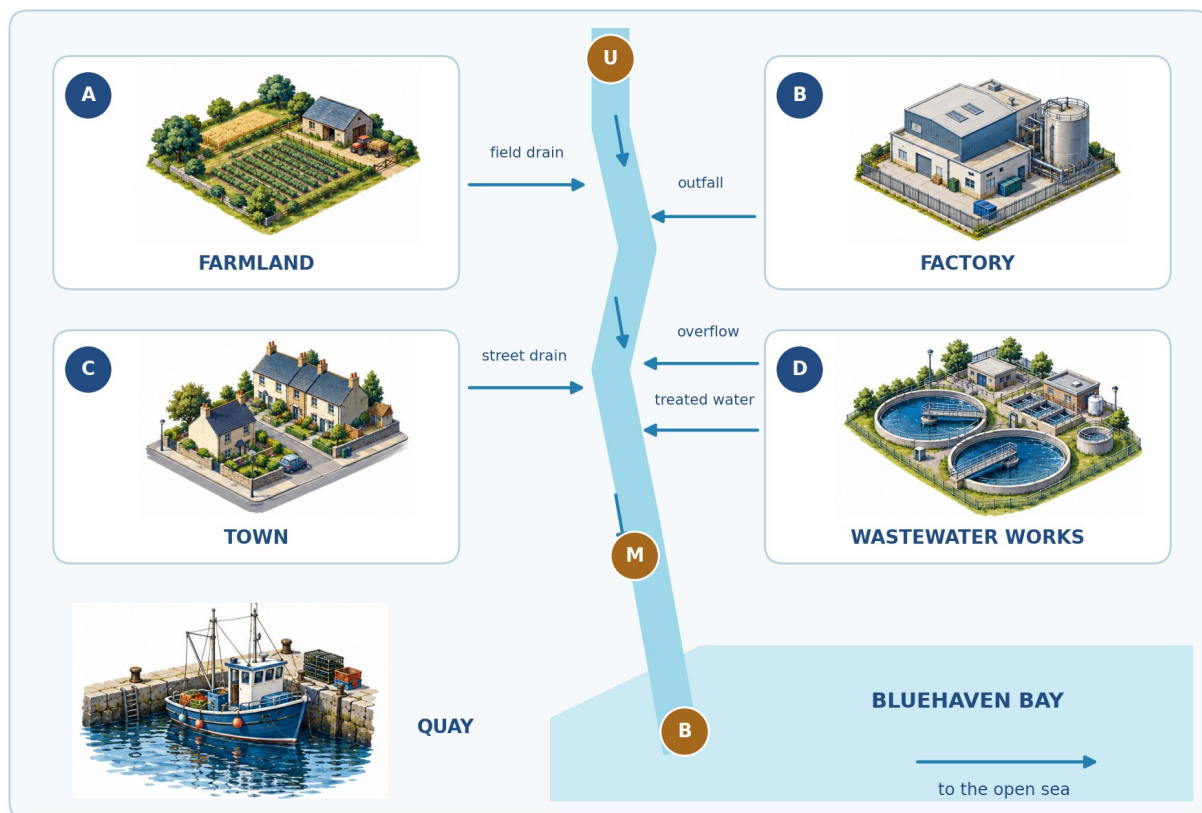
"This may mean ..." / "We do not know ..."

B2: "Another explanation could be ... However, ..."

nutrients = substances that help plants grow • algae = simple organisms growing in water • wastewater = used water from homes or businesses • runoff = water flowing over land • outfall = a pipe or outlet releasing water • evidence = information supporting an idea • turbidity = how cloudy water is

STUDENT SHEET 2 | CATCHMENT AND SAMPLES

Follow the pathways



Gold circles U, M and B show water-sampling sites. Navy circles A–D show places. Follow the arrows towards the sea. The map shows routes, not who caused the pollution. It is not to scale.

Wednesday sampling record

Site	Dissolved oxygen mg/L	Nitrate nitrogen mg N/L	Turbidity NTU
U Upstream	8.1	0.5	5
M Mixed downstream	5.8	3.2	42
B Bay near quay	1.7	2.8	28

Invented results: one sample per site, Wednesday 07:00–07:20, at 0.3 m depth. Equipment was checked. A higher turbidity number means cloudier water. Here, oxygen below 2 mg/L is a warning; different animals have different needs. One result cannot identify the source. [3]

- 1 Describe two routes: “Water goes from ... through ... to the bay.”
- 2 Which site has the least oxygen? Is it below 2 mg/L? Why might fish be in danger?
- 3 B2 challenge: calculate $8.1 - 1.7$. Where is nitrate highest? Can this identify one source?



STUDENT SHEET 3 | EVIDENCE DECK ONE

Records and possible sources

01



HEAVY RAIN

A weather station measured 28 mm of rain on Tuesday, 18:00–22:00. More water flowed through street drains. Nobody tested this water.

Think: Where could the water go?

BLUEHAVEN / EVIDENCE FILE

02



THE FARM

The farmer used nitrogen fertiliser on Monday. A drain carries water from the field to the river. The farmer says the amount used followed the plan. There are no water tests or flow measurements.

Fertiliser helps plants grow.

BLUEHAVEN / EVIDENCE FILE

03



THE OVERFLOW

At D, rainwater mixed with untreated wastewater entered the river on Tuesday, 21:10–21:55. This happened when water overflowed from the sewer system. The amount and chemicals were not measured.

Untreated = not cleaned.

BLUEHAVEN / EVIDENCE FILE

04



THE FACTORY

Factory B says there was no accident. It tested water from its pipe on Tuesday at 09:00. Zinc was within the allowed limit. There were no tests during the storm or results for other substances.

Zinc is a metal.

BLUEHAVEN / EVIDENCE FILE

Give each student two cards. Read them with a partner. Underline dates and useful facts. Circle something we do not know. Then share all eight cards with the team.



STUDENT SHEET 4 | EVIDENCE DECK TWO

Observations and disputed claims

05



THE FISHER

A fisher saw greenish water on Sunday, before the storm. On Wednesday at 06:30 she saw dead fish near the quay. She did not see water leaving a pipe. Nobody else has confirmed her report.

Quay = a place where boats stop.

BLUEHAVEN / EVIDENCE FILE

06



LITTER ON THE SHORE

On Wednesday, volunteers counted 96 litter items along 100 metres of shore: 72 packaging items, 18 pieces of fishing gear and 6 other items. They did not weigh them or test for tiny plastic pieces. The sources are unknown.

BLUEHAVEN / EVIDENCE FILE

07



THE ONLINE POST

A fictional post says: "Factory poison killed the fish." Its pipe photo is from last year, but there is no date on the post. It gives no test results. Many people shared it.

Think: Does sharing make it true?

BLUEHAVEN / EVIDENCE FILE

08



THE LAB REPORT

The samples on p. 3 were taken near the surface after the event. The lab did not test poisons, harmful germs or microplastics. Nobody examined the fish. Low oxygen may have harmed them. More tests are needed.

BLUEHAVEN / EVIDENCE FILE

Which litter group is largest? B2 challenge: calculate $72 \div 96 \times 100$. Does counting litter explain why the fish died?



STUDENT SHEET 5 | TEAM INVESTIGATION

Build your pollution case board

Use an A3 sheet. Draw the river and bay in the centre. Add two possible pollution routes with arrows. Write the relevant card numbers beside them. Add the four sections below. B2: use dashed arrows for ideas that are not proven.

Board section	What to include
What we know	Write two facts and their card numbers. Start: "Card ... tells us ..."
Possible explanations	Write one possible cause: "The fish may have died because ..." B2: add a second idea.
What is uncertain	Finish: "We do not know ..." Check the dates on cards 03 and 05.
Next investigation	Choose one further test. Say what and where to test. B2: add when and explain why.

Choose a response

You have six game tokens. Choose exactly three actions. Spend no more than six tokens. Explain why your actions help. Name one problem your plan does not solve. The costs are invented for this game.

Action	Cost	Purpose and limitation
A Test the water	2	Measure oxygen again and test possible pollutants at sources and downstream. Gives information; does not remove pollution.
B Check the overflow	3	Check why the overflow happened and plan improvements. Takes time; other sources may still cause problems.
C Reduce farm runoff	3	Review when fertiliser is used and plant strips beside fields to slow runoff. May help; this farm's role is not proven.
D Collect litter safely	1	Trained staff remove visible litter. Does not remove dissolved nutrients or explain why the fish died.
E Catch street litter	2	Install and maintain equipment to catch larger litter. Does not catch all pollutants or cover every route.
F Inform the public	1	Tell residents what is known and how to report problems. Improves communication; does not remove pollution.

Our actions: _____ + _____ + _____ = _____ tokens.

Our strongest reason: _____

Our main disadvantage: _____

B2 challenge: what new information could change your plan? Explain why.



STUDENT SHEET 6 | PRESS CONFERENCE

Present your findings

Prepare a one-minute update for the town. Each team member can say one part. Practise with your notes. Then another team asks two questions. Answer using the cards and map. You can say “We do not know yet.”

Statement structure

- 1 “There is a problem in the bay. We know ... Card ... says ...”
- 2 “One possible cause is ... because ... But we do not know ...”
- 3 “The online post is not proof because ...”
- 4 “We choose actions ... They cost ... tokens. We will check ...”

Questioning roles

Perspective	Concern and question
Fisher	You catch fish for work. Ask: “Why might the fish have died?”
Factory worker	You work at the factory. Ask: “What does our zinc test tell you?”
Nature campaigner	You want a clean bay. Ask: “What pollution will your plan help with?”
Council member	You decide how to spend money. Ask: “Why did you choose these three actions?”

Use these roles to ask questions. They do not give you new facts. Do not invent test results.

Useful phrases

- B1: “We think ... because ...” / “Card ... tells us ...”
B1: “We do not know ... We need to test ...”
B2: “This is possible, but ...” / “Another explanation could be ...”
B2: “We chose ... instead of ... because ...”

Peer review and revision

After the questions, improve one sentence together. Add a reason or use “may” or “could” if you are not sure. Then swap roles with the other team.

Our first sentence: _____
Improved sentence: _____
We changed it because: _____



Reasoning and suggested responses

What the evidence supports

U–B oxygen difference: $8.1 - 1.7 = 6.4$ mg/L. B falls below the activity's low-oxygen warning. M has the highest nitrate result (3.2 mg N/L), but receives mixed inputs. Neither comparison identifies a single source. Packaging: $72 \div 96 \times 100 = 75\%$ of counted items, not mass or all pollutants.

Cards 01 and 03 document rain and a sewer-overflow event. Card 02 gives a plausible agricultural pathway, not a measured contribution. Card 04 is relevant but limited to one substance before the storm. Card 05 is a witness account: green water preceded the storm, so a new post-storm bloom cannot explain its onset. Green colour alone does not confirm algae. Card 06 concerns visible litter; 07 supplies no reliable causal evidence; 08 defines major testing gaps.

Plausible explanations and useful checks

Low oxygen could involve decomposition linked to earlier algal growth or organic inputs, including the confirmed overflow. Multiple inputs may contribute. Other untested causes of fish deaths remain possible. No fish examination or pre-event oxygen series is available. Do not infer that plastic caused the deaths, that rain created an immediate bloom, or that zinc compliance rules out all factory contributions.

Useful checks: repeated oxygen profiles at U, M and the bay across depth and time; nutrient and organic-load sampling at field drains, overflow and outfalls during and after rain; relevant contaminant screening and professional examination of fish. Pair locations and times so comparisons are meaningful. A measured source pulse would strengthen attribution; normal source results alone cannot rule out an earlier unobserved release.

Actions and model public statement

Example package: A + B + F = 6 tokens. It prioritises evidence, the confirmed overflow route and accurate communication, but leaves direct litter removal and farm prevention unfunded. A + C + D = 6 is also defensible if the unproven farm contribution and the omitted overflow work are acknowledged. Accept other three-action packages within budget when justified.

"There is very little oxygen in the bay sample. This may have harmed the fish. Dirty water entered the river on Tuesday, but we do not know how much. A fisher saw green water before the storm. The factory test only checked zinc before the rain. We need more information. We choose A, B and F for six tokens. We will test the water again, check the overflow and give people an update. We suggest checking the new results after two days."

Assessment and extension

Award 0–2 each for understanding, use of clues, cautious claims, a plan within budget and clear B1–B2 communication (10 total). B1: accept short linked sentences and the supplied frames. B2: expect developed reasons and an alternative explanation. Assess meaning and evidence, not accent. In the extension, check the routes and whether facts and possibilities are clearly separated.

Sources

[1] US EPA. Sources and Solutions. <https://www.epa.gov/nutrientpollution/sources-and-solutions>

[2] US EPA. Basic Information on Nutrient Pollution. <https://www.epa.gov/nutrientpollution/basic-information-nutrient-pollution>

[3] US EPA. Hypoxia 101. <https://www.epa.gov/ms-htf/hypoxia-101>

[4] NOAA Marine Debris Program. Where Does Marine Debris Come From? <https://marinedebris.noaa.gov/discover-marine-debris/where-does-marine-debris-come>

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