**NZQA**

**Approved**

Achievement standard: 90950 Version 3

Standard title: Investigate biological ideas relating to interactions between humans and micro-organisms

Level: 1

Credits: 4

Resource title: Black and grey water from marinas and boats

Resource reference: Science VP-1.11 v2

Vocational pathway: Manufacturing and Technology

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| Date version published | February 2015 Version 2To support internal assessment from 2015 |
| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-90950-02-7300 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

Achievement standard: 90950

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Vocational pathway: Manufacturing and Technology

Learner instructions

# Introduction

This assessment activity requires you to investigate biological ideas relating to interactions between humans and harmful micro-organisms.

You will be assessed on how comprehensively you investigate the biological ideas relating to how humans are affected by two pathogenic micro-organisms found in untreated marine black and/or grey water from marinas and boats.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

Pathogens are micro-organisms such as bacteria, fungi, or viruses that cause diseases. Aircraft, boats and caravans are required to keep black and/or grey water secure to reduce the risk of pathogenic disease spreading to humans. This requires a high degree of technology in their construction to contain and dispose of this water safely.

Refer to Resource A for more information on possible pathogens found in black and grey water.

You are a fabrication engineer for a boat-building company and have been asked to write an article for a boating magazine on how micro-organisms found in black and/or grey water from marinas and boats can affect humans. You have been asked to explain relevant biological ideas in the article.

You will work individually to gather and process information to present your article for publication in a boating magazine.

Complete both parts of this task.

## Part 1: Collect and process information

Carry out your research on two different pathogens from black and/or grey water.

Use a range of resources to collect your information, for example resource sheets, photos, videos, websites, and reference texts.

Before you begin, draw up worksheets to record the details of your research. Use a separate worksheet for each pathogen from black and/or grey water.

### Worksheet guidelines

Head each sheet with your name, and the name of the pathogen from black and/or grey water.

For each pathogen from black and/or grey water:

* describe the pathogen’s life cycle
* describe biological ideas as to how and why the pathogen causes disease or makes humans sick. This may include pathogenic life processes that affect humans.

The information you research should allow you to:

* make links between the specific life processes of the pathogens and the conditions caused in humans
* use biological ideas to explain why and how people combat the micro-organisms or try to limit its effects as a pathogen.

Processing your information usually involves:

* selecting relevant information (sifting, sorting, photocopying, printing, or making notes)
* summarising the relevant information by highlighting text, writing notes, and circling useful diagrams/illustrations
* organising your information
* providing references for all your sources, for example website URL’s, magazine articles, or book titles and authors.

## Part 2: Present your article

You now need to use your collected and processed information to produce an article for a boating magazine that investigates the biological ideas relating to how humans are affected by two pathogenic micro-organisms from black and/or grey water.

The article could be in one of the following formats:

* a written report (including illustrations, diagrams, and graphs, if appropriate)
* a poster presentation (which must include supporting discussion).

Use your findings and biological ideas to explain how or why humans are affected by the two pathogenic micro-organisms from black and/or grey water that you have investigated.

You need to consider:

* biological ideas that could include the structure and life processes of two pathogenic micro-organisms found in black and/or grey water causing disease in humans
* the effect the life processes of these micro-organisms have on the health of humans.

Make significant links relating to the interactions between humans and the two micro-organisms from black and/or grey water, including the impacts of this knowledge on the personal actions or everyday life of humans.

Making significant links may involve explaining, elaborating, applying, justifying, relating, evaluating, comparing and contrasting, and analysing.

Acknowledge all your sources of information.

# Resource A

Black water is any waste from toilets or urinals. It is defined either as treated or untreated (raw). It contains bacteria and viruses that can result in human illness, from direct contact or from consumption of affected fish and shellfish.

Grey water is wastewater that has been used for washing, laundering, bathing or showering. This includes water containing dissolved or undissolved by-products such as fat and oil, food scraps that contain nutrients, household chemicals, soap and detergent rich in phosphate and nitrate, and microbiological pathogens (e.g. bacteria and viruses). Boat users are advised to avoid swimming around vessels following grey water discharges.

Black water does not include grey water unless it is mixed with other black water wastes. If either type of wastewater is discharged into aquatic environments it can damage ecosystems, create algal blooms and pose significant human health risks.

Some micro-organisms found in untreated black and/or grey water from marinas and boats include:

* faecal coliform bacteria, for example *E.coli*
* faecal *streptococci*
* *staphylococci* species
* *enterococci,* bacteriophages and coliphages
* salmonella species, for example *Salmonella Weltevreden*
* viruses, including polioviruses and hepatitis virus A.

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to comprehensively investigate two selected pathogenic micro-organisms found in black and/or grey marine water and the effect of these in humans, and to write an article for a boating magazine about them. The information in the article would be of use to a fabrication engineer, in relation to the technology and design used in the construction of components to contain and dispose of this water in boats and marinas to reduce risk of these pathogens to humans.

# Conditions

Learners will work individually.

# Resource requirements

Learners will need information from a variety of sources such as resource sheets, photos, videos, websites, and reference texts. You could provide learners with the source material or require them to research their own.

## Useful internet links

The Ocean Kleen Salt system <http://www.ozzikleen.com/marine_water_treatment_process>

International Maritime Organisation [www.imo.org](http://www.imo.org)

Marina Association of Australia [www.marinas.net.au](http://www.marinas.net.au)

# Additional information

Mutual exclusion exists between this standard and the externally assessed Achievement Standard 90927 (Biology 1.3) *Demonstrate understanding of biological ideas relating to micro-organisms*.

## Other possible contexts for this vocational pathway

Manufacturing design and the technology relating to preventing contamination in bulk food catering, for example airline food.

# Assessment schedule: Science 90950 – Black and grey water from marinas and boats

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner investigates biological ideas relating to interactions between humans and pathogenic micro-organisms in untreated black and/or grey water in an article for a boating magazine. The learner:* uses observations or findings to describe how humans are affected by two pathogens
* provides all relevant evidence in their article

For example, the learner:* + investigates Salmonella species, describing environmental factor(s) that affect the life functions of the bacteria, describing its life cycle in the human gut, causing food poisoning and effecting the small intestine
	+ investigates how, while large quantities of faecal coliform bacteria in water are not harmful according to some authorities, this may indicate a higher risk of pathogens being present
	+ describes pathogenic diseases that may coincide with faecal coliform contamination and their effect on human health – ear infections, dysentery, typhoid fever, viral and bacterial gastroenteritis, and hepatitis A
	+ investigates the Resource Management Act and biological ideas to describe where and when to contain and dispose of wastewater from marinas and boats.

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner investigates, in-depth, biological ideas relating to interactions between humans and pathogenic micro-organisms in untreated black and/or grey water in an article for a boating magazine. The learner: * uses observations or findings to explain in-depth how and why humans are affected by two pathogens
* uses these findings and biological ideas to give reasons for how or why humans are affected by pathogens in untreated black or grey water
* provides all relevant evidence in their article

For example, the learner:* + investigates Salmonella species, explaining environmental factor(s) that affect the life functions of the bacteria, explaining how its lifecycle can include the human gut, causing food poisoning and effecting the small intestine
	+ explains why large quantities of faecal coliform bacteria in water may indicate a higher risk of pathogens being present
	+ explains pathogenic diseases that may coincide with faecal coliform contamination and their effect on human health – ear infections, dysentery, typhoid fever, viral and bacterial gastroenteritis, and hepatitis A
	+ investigates the Resource Management Act and biological ideas to explain containment and where and when to dispose of wastewater from marinas and boats.

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner investigates, comprehensively, biological ideas relating to interactions between humans and pathogenic micro-organisms in untreated black and/or grey water in an article for a boating magazine. The learner: * uses observations or findings to explain comprehensively how humans are affected by two pathogens
* uses findings and biological ideas to make significant key links about the interactions between humans and pathogens in untreated black or grey water, including the impacts of this knowledge on a human’s personal actions or everyday life
* provides all relevant evidence in their article

For example, the learner:* + investigates Salmonella species, elaborating on the links between how environmental factor(s) affect the life functions of the bacteria, how its lifecycle can include the human gut, causing food poisoning and effecting the lining of the small intestine.
	+ elaborates on the links among key environmental factor(s) affecting the life functions of faecal coliform bacteria, pathogenic diseases that may coincide with faecal coliform contamination and their effect on human health – ear infections, dysentery, typhoid fever, viral and bacterial gastroenteritis, and hepatitis A
	+ elaborates on the links between the Resource Management Act and biological ideas on containment and where and when to dispose of wastewater from marinas and boats.

*The above expected learner responses are indicative only and relate to just part of what is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.