

Surface water source and intake

A. GENERAL INFORMATION

A.1. Surface water source information^a

Surface water source location (e.g. catchment, village, town, community, parish, district, province, state)

Name of waterbody

Average flowrate
(if known; including units)

A.2. Intake structure information

Intake structure location

State the reference system and units, if using coordinates (e.g. national grid reference coordinates, GPS coordinates)

Name of entity responsible for management of the intake structure (e.g. name of water utility, community group, private operator)

Year of construction of the intake

Intake structure material

Tick (✓) the appropriate box(es) and provide further information where applicable

☐ Masonry

☐ Concrete

☐ Earthen clay

☐ Other. Describe:

Approximate number of households using this water supply
Circle one of the options

1–50

51–100

101–500

501–1000

>1000

Circle the options below

If **Yes**, describe (e.g. what happens, how often, for how long)

Is the intake structure affected by flooding?

☐ Unsure

☐ No

☐ Yes

Is the intake structure affected by drought?

☐ Unsure

☐ No

☐ Yes

Does the responsible management entity have a *Water safety plan* in place
(or an equivalent risk management approach)?

Circle one of the options below

If **Yes**, details (e.g. how long it has been in place)

☐ Unsure

☐ No

☐ Yes

A.3. System functionality

Circle **Yes** or **No** to indicate if water is currently available from the intake. If **No**, describe why (e.g. damaged or blocked component, low water level) and then go to Section B. In Section C, record the corrective actions needed to ensure the intake can provide water, and record the details of any alternative water source(s) currently being used.

Is water currently available from the intake structure?

If **No**, describe why (then go to Section B)

Yes

No

^a This sanitary inspection package is for flowing surface water sources, such as a river or stream. For non-flowing surface water sources (e.g. pond, lake, reservoir) see the *Technical fact sheet* for additional considerations.

A.4. Weather conditions during the 48 hours before inspection

Circle the temperature and precipitation options below to indicate the main conditions during the 48 hours before the inspection. More than one option may be circled if conditions changed during this time. Record additional information in Section C if needed.

Temperature	<0 °C	0–15 °C	16–30 °C	>30 °C
Precipitation	Snow	Heavy rain	Rain	Dry

A.5. Water quality sample information

Record details of any water quality samples taken during the inspection. Include information for any parameters tested. Add **NA** if information is not applicable. Record additional information in Section C if needed.

Sample taken? Circle No or Yes		Sampling location		Sample identification code		Other information					
No (go to A.6)	Yes										
Parameter tested		<i>E. coli</i> ^b		Thermotolerant (faecal) coliforms ^b		Additional parameter		Additional parameter		Additional parameter	
		Results	Units	Results	Units	Results	Units	Results	Units	Results	Units
Results and units											

A.6. Water treatment

Tick (✓) the appropriate box(es) and provide additional information as needed.

☐ **No treatment applied.**^c

☐ **Treatment applied at the intake structure.** Describe the treatment steps (e.g. coagulation, roughing filter, chlorination).^d

☐ **Treatment applied downstream of the intake structure** (e.g. at a water treatment plant, household water treatment). If so, describe treatment steps if known (e.g. coagulation/flocculation, sedimentation, filtration, disinfection).

- ^b The presence of *E. coli* (or thermotolerant [faecal] coliforms) suggests recent faecal contamination, which is common in surface water sources. Detection at levels of concern (e.g. significantly higher than established background levels) should lead to consideration of further action, such as optimizing downstream water treatment processes (e.g. increased disinfection at a water treatment plant), and further sampling and investigation of potential sources of contamination. *Note* – thermotolerant (faecal) coliforms are distinct from “total coliforms”, where total coliforms do not necessarily indicate recent faecal contamination.
- ^c Surface water sources are often vulnerable to contamination and rapid changes in water quality - even frequent water quality testing of surface waters cannot give a reliable indication of safety. For this reason, surface water should always be treated/disinfected before consumption.
- ^d Where chlorine is applied, the free chlorine residual concentration in the drinking-water should be tested and the result recorded in Section A.5. Where possible, turbidity and pH should also be measured. For general information on chlorination, refer to [Technical notes on drinking-water, sanitation and hygiene in emergencies: measuring chlorine levels in water supplies](#) (WHO & WEDC, 2013).

B. SANITARY INSPECTION**IMPORTANT: Read the following notes before completing the sanitary inspection**

1. Tick (✓) the appropriate box for each question. For guidance, refer to the numbered risk factors in Figure 1; the numbers in the figure are linked to the questions. Record any additional risk factors present in Section C. Refer also to the *Technical fact sheet* for information on the individual components of the surface water source and intake structure. *Note* – the questions in this section are example risk factors only, which can be used as a starting point for adapting the form to the local context.
2. Tick the **NA** (not applicable) box if the question **does not apply** to the surface water source and intake structure being inspected.

3. Tick the **No** box if the question does apply to the surface water source and intake structure being inspected, but the risk factor *is not present*.
4. Tick the **Yes** box if the risk factor *is present*. For important situations that require attention, record the corrective actions to be taken in the last column. These notes can be used to develop a detailed improvement plan, documenting what will be done, who will do it, by when it will be done and what resources are required. For guidance, refer to the *Management advice sheet*. Where possible, address the most serious risk factors first, considering low-cost or no-cost improvements that can be made immediately.
5. If a question cannot be answered because access to a component is not possible, tick the **Yes** box. Record these issues in Section C for further investigation.



Figure 1. Typical risk factors associated with a surface water source and intake structure

Sanitary inspection questions		NA	No	Yes	If Yes, what corrective action is needed?
Intake structure					
1	Does the intake lack a functioning protective structure? Contaminants could enter the intake water if there is no protective structure in place (e.g. no protective wall or intake channel). This could also happen if there is a protective structure in place but it is in poor condition (e.g. damaged, deep cracks, significant erosion).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	Does the intake structure lack a functioning screen? Contaminants could enter the intake water (e.g. animals, vegetation) if there is no screen in place. This could also happen if there is a screen in place, but it is in poor condition (e.g. missing or bent bars, severely corroded). A clogged screen could also reduce the flow rate, which could reduce the quantity of water available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	Does the intake structure lack a functioning flow control mechanism? Uncontrolled flows could pass through the intake structure if a flow control mechanism is absent, or if it is damaged (e.g. broken or seized valve). This could damage the intake components (or affect downstream water treatment processes, if present).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	Is there a build-up of sediment around the intake structure? Sediment could block the intake channel, which could reduce the flow rate and affect the quantity of water available. Sediment may also contain harmful microorganisms and other contaminants (e.g. metals) that could affect the quality or acceptability of the water.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	Is there a build-up of vegetation around the intake structure? Excessive vegetation growth (e.g. aquatic weeds) could reduce the flow rate and affect the quantity of water available. Decomposing vegetation could also affect water quality.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	Is the area around the intake structure dirty? Contaminants could enter the intake water if there is pollution (e.g. faeces, rubbish) around the intake structure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Sanitary inspection questions		NA	No	Yes	If Yes, what corrective action is needed?
7	<p>Is the fence or barrier around the intake missing or inadequate, so that animals could enter the intake area?</p> <p>Animals could contaminate or damage the intake area if the fence or barrier around the intake is missing. This could also happen if the fence or barrier is broken or poorly built (e.g. has large gaps), or the entry point (e.g. gate) does not close securely.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8	<p>Does the intake structure lack a functioning weir?</p> <p>If the surface water source has periods of low flow, an absent or damaged weir (or dam) could reduce the quantity of water available when water levels are low. This could also affect water quality.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9	<p>Are there signs of an algal bloom around the intake structure?</p> <p>An algal bloom could block the intake structure (and affect downstream water treatment processes, if present). Certain algal blooms could affect the taste and odour of the water, and in some cases, may be harmful to health (e.g. in the case of cyanobacteria blooms).</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10	<p>Is there any human activity around the intake structure?</p> <p>Contaminants could enter the intake water if there is human activity taking place around the intake (e.g. washing, bathing, swimming).</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Surface water source					
11	<p>Are there human settlements upstream of the intake structure?^e</p> <p>Contaminants could enter the source water from run-off from human settlements (e.g. containing harmful microorganisms from open defecation or domestic waste).</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12	<p>Is there any sanitation infrastructure upstream of the intake structure?^e</p> <p>Contaminants could enter the source water from direct discharges, seepage or run-off from sanitation infrastructure (e.g. containing harmful microorganisms in effluents from latrine pits, wastewater treatment facilities).</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Sanitary inspection questions		NA	No	Yes	If Yes, what corrective action is needed?
13	Is there any stormwater infrastructure upstream of the intake structure?^e Contaminants could enter the source water from stormwater discharges (e.g. containing harmful microorganisms or chemicals in storm drain effluent).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14	Are there any farming activities upstream of the intake structure?^e Contaminants could enter the source water from direct discharges or run-off from farming activities (e.g. containing harmful microorganisms from manure spreading, chemicals from fertilizer or pesticide application). This could also happen if there is livestock directly within, or adjacent to, the surface water source.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15	Are there any roads upstream of the intake structure?^e Contaminants could enter the source water from run-off from roads (e.g. containing fuel, oil, sediment, metals).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16	Are there any other commercial or industrial activities upstream of the intake structure?^e Contaminants (e.g. harmful microorganisms, petroleum products, radioactive substances, heavy metals, pesticides, nutrients, sediments) could enter the source water from direct discharges or run-off from commercial or industrial activities (e.g. former or current markets, mechanics, fuel stations, vehicle washing, livestock sales yards, slaughter houses, manufacturing facilities, mining, military sites, waste dumps, forestry, aquaculture, boat traffic).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Total number of Yes responses					

^e It is not possible to prescribe a “safe” distance for direct (including faecally-loaded) upstream discharge into surface waterbodies, in particular if the surface water is consumed without treatment. Appropriate minimum safe distances for polluting activities upstream of the intake structure must consider local factors (refer to Section A of the *Management advice sheet*).

The person conducting the inspection should aim to visually inspect a distance upstream of the intake structure that can be practically observed during the inspection. These questions can also be answered by speaking with community members, the water supply management entity or stakeholders present during the inspection. For further information, refer to the *Management advice sheet*.

Include any additional risk factors,^f recommendations, observations or remarks from users of the water source (e.g. problems with the taste, odour or appearance of the water, water source reliability). Attach additional sheets and photographs if needed.

[illegible]

D. INSPECTION DETAILS

Signature (if available): _____ Date: _____



**World Health
Organization**

Surface water source and intake

This technical fact sheet provides background information on a surface water source (such as a river) and intake, which supports the sanitary inspection of a drinking-water supply.

An intake structure collects source water and directs it to a defined location via gravity or pumping (e.g. to a storage reservoir or directly to a water treatment plant).

Surface water sources are vulnerable to contamination (e.g. from catchment run-off), and are typically poorer quality than groundwater sources. The quality of surface water sources can change rapidly. For this reason, appropriate treatment/disinfection of surface water is required before consumption.

The intake should be located where sediment is unlikely to build-up (e.g. avoiding river bends), and where flowing water can be abstracted (i.e. avoiding low-

flow areas that may be stagnant and poorer quality). Where possible, the intake should be located upstream of polluting activities, and the structure should be accessible to operational staff at all times of the year for inspection and operations and maintenance.

Intake structures vary greatly in their scale and design depending on the volume of water they abstract and the characteristics of the surface water source. Figure 1 shows a common type of surface water intake for a river source (referred to as a protected side-intake configuration). A section view of the intake is shown in Figure 2. These figures show a typical design, although other designs are possible.

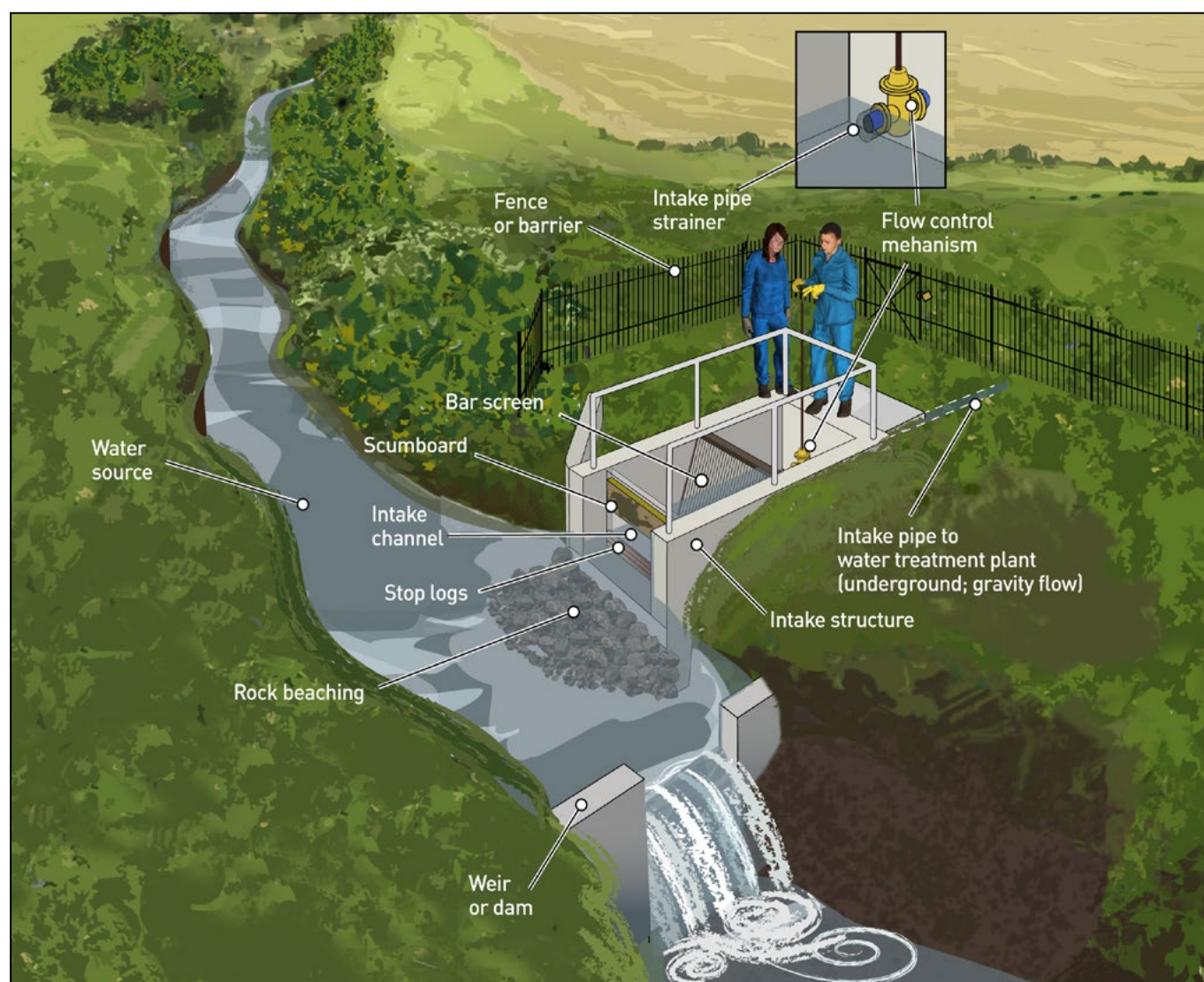


Figure 1. A common surface water intake structure (for flowing waterbodies, such as a river) in a sanitary condition

Typical risk factors associated with surface water sources and intake structures are presented in the corresponding *Sanitary inspection form*.

Surface water intake structures typically include the following main components.

- **Water source:** The source of water for the drinking-water supply. In this example, the source is river water that is diverted via the intake structure and flows by gravity to a downstream water treatment plant.
- **Intake structure:** Protects the intake components from damage (e.g. from debris or rocks during high-flow events). The intake structure typically consists of protective walls (e.g. concrete or masonry) and erosion control (such as **rock beaching** or boulders) to prevent scouring.
- **Intake pipe:** Transfers surface water via the **intake channel** to a defined location. Typically, the intake pipe is constructed from ductile iron (DI), polyethylene (PE), high density polyethylene (HDPE) or polyvinyl-chloride (PVC). The pipe should be protected by the intake structure, and located close to the riverbank. The intake pipe should be at a depth that can draw water at all times of the year, but it should be raised above the riverbed to avoid sediment.
- **Flow control mechanism:** Typically a valve (such as a sluice or gate valve) that controls the flow rate through the intake pipe. The mechanism protects the intake pipe (and downstream water treatment processes, if present).
- **Intake pipe strainer:** Perforated metal cover that is secured over the mouth of the intake pipe to prevent smaller debris (such as grit, stones, sediment), animals or fish entering the intake pipe.
- **Screen:** Consists of parallel metal bars that prevent larger debris (e.g. branches, logs) from damaging or blocking the intake pipe. There may be just one screen in place, or there may be several screens in a series (e.g. with decreasing width between the bars to improve the removal of debris). *Note* – to improve screening, the intake structure may also have a **stop log** (for larger material that may be dragged along the river bed) and/or a **scumboard** (for floating material or scums).
- **Weir or dam:** A barrier across the width of a river to help ensure a minimum water level for abstraction. A weir or dam is used in rivers that have periods of low flow (i.e. when water levels are low). The weir or dam is typically constructed from rocks, masonry or metal plates, and is located downstream of the intake structure.

- **Fence or barrier:** A physical barrier to prevent animals from contaminating the intake area or damaging the components. It may also prevent unauthorized access by people. The fence or barrier should have an entry point (e.g. a gate) that can be closed tightly and locked.

Additional considerations

The design of the intake structure should allow safe and efficient abstraction of source water at all times of the year, considering factors such as flow rate, water level fluctuation, sediment load, and the riverbed depth and physical characteristics (e.g. rocky, sandy, muddy).

In addition to what is shown in Figure 1, intake designs can also include floating intakes (used to abstract water near the surface to avoid sediment which may form at the bottom of riverbeds), riverbank filtration, and sand spears (both suitable for rivers where water levels change significantly across seasons).^a

Intakes may also require a spillway which allows excessive flows (e.g. during a flood) to be diverted away from the intake to protect the structure.

In some settings, water may be treated or pretreated at the intake structure itself. This can include the addition of coagulants, filtration (e.g. roughing, sand or gravel filters) and/or chlorination.

Any materials used (e.g. pipes, fittings, valves) should be safe for contact with drinking-water (e.g. using materials approved through an appropriate certification scheme) when constructing new intake structures or rehabilitating old ones.

Considerations for non-flowing surface water sources

Non-flowing surface waterbodies (such as ponds, lakes and reservoirs) have certain characteristics that are different from flowing surface waters (such as rivers, streams). This may include different risk profiles for sediment accumulation, erosion (e.g. from wind and wave action in lakes), pollutant dilution (in particular, faecal contamination), stagnation, stratification, and algal (i.e. cyanobacterial) blooms.

Intake structure configurations for non-flowing surface waterbodies can include multi-level intake structures such as abstraction towers in lakes or reservoirs, and floating pontoons.^a

This sanitary inspection package should be adapted for non-flowing surface water sources considering the locally-relevant waterbody characteristics and risk factors.

^a For additional information, refer to *Compendium of drinking-water systems and technologies from source to consumer* (WHO, in preparation).

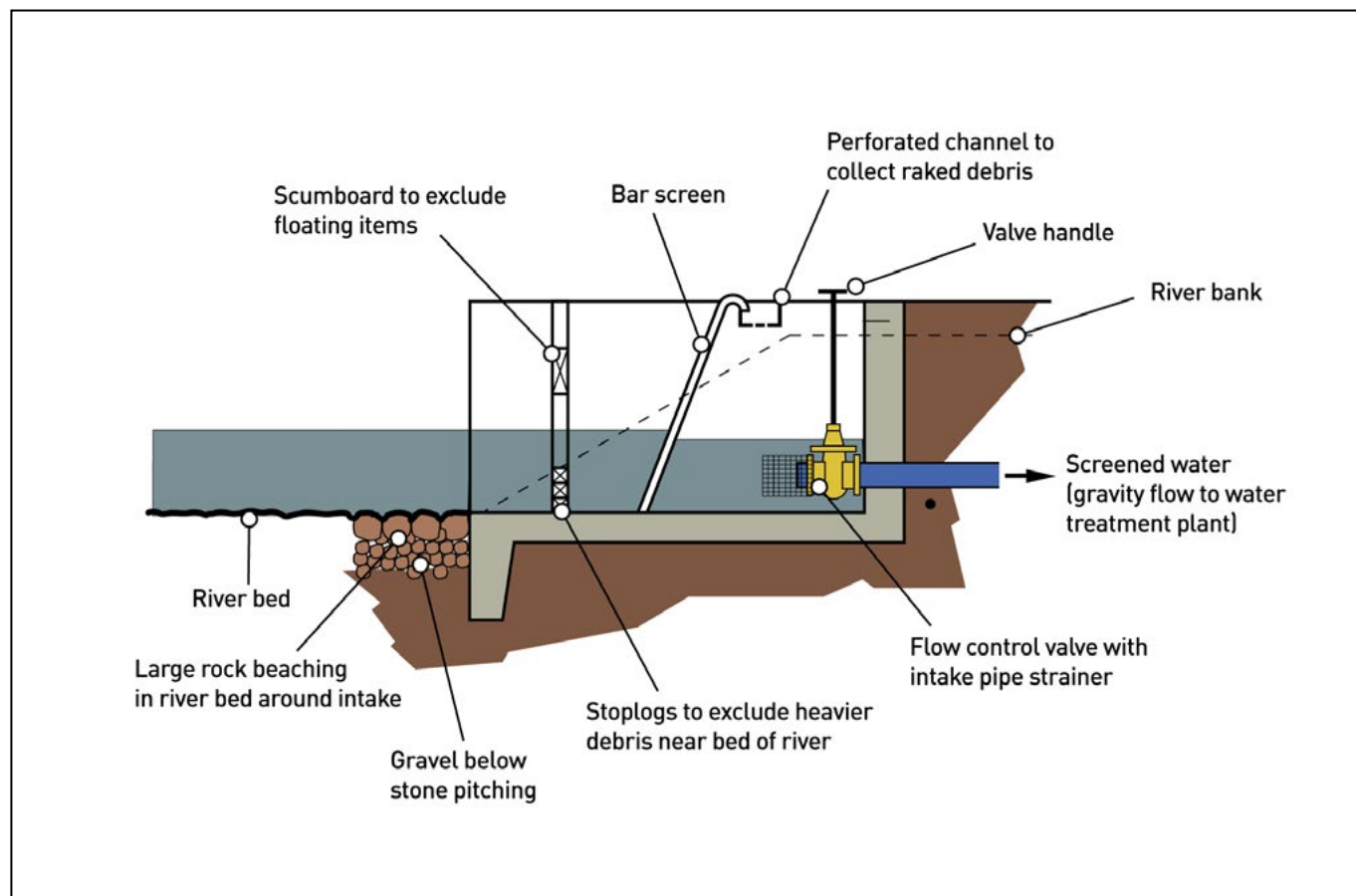


Figure 2. A common surface water intake structure for flowing surface water bodies (section view)

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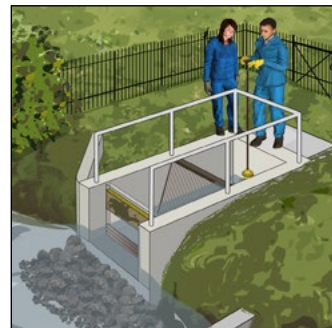
Surface water source and intake

This management advice sheet provides guidance for the safe management of a surface water source (such as a river) and intake, which supports the sanitary inspection of this water source.

Guidance for typical operations and maintenance (O&M) activities is provided in Table 1 including suggested frequencies for each activity. These activities are important for keeping the intake in good working condition and protecting drinking-water quality.

Table 2 lists potential problems that may be identified during a sanitary inspection, and provides basic corrective actions to consider for each problem.

This management advice sheet can also support routine management and monitoring practices, which are required to help ensure the ongoing safety of the water supply.



A. OPERATIONS AND MAINTENANCE

Basic O&M can usually be carried out by a trained caretaker or operator (e.g. simple maintenance tasks such as clearing the screen). Larger repairs and maintenance tasks (e.g. repairing the intake structure, maintaining the flow control valve, dredging the weir) may need skilled labour which can be provided by local craftspeople, or with support from outside of the local area.

The condition of the intake structure should be inspected routinely to help prevent contaminants entering the water supply. Any damage or faults should be repaired immediately (e.g. damaged screen, seized flow-control valve, broken fence). Standard operating procedures (SOPs) should be developed for important O&M tasks (e.g. cleaning the intake channel, inspecting the intake pipe strainer). These should be followed by trained individuals so the work is carried out safely and the water supply is not contaminated during the work.

Vegetation management programmes should be in place to help ensure that excessive vegetation (e.g. aquatic weeds) does not block screens and reduce the flow rate, or damage the structure (e.g. masonry damage from tree roots, fallen branches). Decomposing vegetation (e.g. aquatic weeds around the intake) can also affect water quality.

Where possible, the surface water should be selectively abstracted (e.g. closing the flow control mechanism when water quality deteriorates following a heavy rainfall event, and re-opening the intake once the water quality improves). The water supplier should also establish and maintain communication protocols with catchment stakeholders, so that source water abstraction can be stopped in the event of planned works upstream of the intake (e.g. annual pesticide spraying by the catchment authority, dredging works in the river) or in the event of an emergency (e.g. fuel spillage following a road accident adjacent to a surface water source).

Sources of pollution upstream of the intake (e.g. open defecation, sanitation infrastructure, washing/bathing, agriculture, commercial activity, roads) should be investigated to determine their potential impact on source water quality. The risks from such polluting activities depends on several factors, including:

- the type and intensity of the activities
- the distance of the activities from the intake structure
- the nature and concentration of the contaminant
- the natural reduction in the contaminant concentration during contaminant transport on land and in the waterbody (e.g. through natural processes, such as degradation, adsorption, dilution)
- the catchment characteristics (e.g. slope of the land, vegetation coverage)
- the presence and effectiveness of source protection and contaminant containment measures
- the presence and effectiveness of measures at the abstraction site (e.g. variable-level intake, raw (untreated) water storage reservoir).

External support should be sought as needed to help the water supplier assess the risks from polluting activities in the catchment (e.g. drinking-water quality surveillance agency representatives, hydrologists, hydrogeologists, microbiologists, chemists, catchment managers).

The water supplier should routinely inspect the catchment area upstream of the intake (e.g. every 1-3 years), and maintain an inventory of polluting activities, and the effectiveness of existing protection measures. Consideration should also be given to catchment activities that affect the quantity of water available (e.g. surface water extraction for irrigation, mining, power production). Catchment authorities may already have an existing list of catchment activities that can be used as a starting point. This list can then be verified through field inspection and built upon as needed (e.g. through several field visits over time).

Although the entity managing the water supply often does not have direct responsibility for implementing surface water protection measures in the catchment, they may be able to indirectly influence such actions, for example, through close cooperation between the water supplier, relevant authorities, catchment land users, the community and other stakeholders. Authorization of new upstream activities in surface water catchments (e.g. new wastewater treatment facility, commercial forestry site, mine) should be based on site-specific assessments to demonstrate that they will not affect the supply of safe drinking-water.

Routine monitoring is required to help ensure the integrity of potentially polluting structures (e.g. septic tanks, wastewater sludge storage bunds, fuel or chemical storage tanks) and the effective operation of protective measures within the catchment (e.g. rock beaching at riverbank bends, riverbank vegetation strips, stock exclusion fencing). Such monitoring is often not the responsibility of the water supplier. For this reason, this advice sheet provides broad guidance regarding activities that can be conducted by the operators of the water supply, as well as recommendations for engaging with other responsible authorities and stakeholders.

Surface water sources are typically vulnerable to contamination and often experience rapid changes in water quality (e.g. from surface run-off after rain). For this reason, surface water should always be treated/disinfected before consumption (e.g. at a water treatment plant, and/or at the household level as an interim solution). If not already in place, the responsible management entity should work towards the development of a water safety plan (or equivalent risk management approach). This should cover the entire water supply (i.e. source/catchment, water treatment plant (if present), distribution and storage, and user practices). This will help ensure the safe management of the water supply. The water safety plan should reflect the complexity of the water supply and the local resources and capacity (e.g. a more basic water safety plan is appropriate for simple water supplies where resources and capacity are limited).^a

Table 1. Guidance for developing an operations and maintenance schedule

Frequency	Activity
Daily to weekly	<ul style="list-style-type: none"> • Check that the intake area is clean. Remove any polluting materials (e.g. faeces, rubbish) and clean the area as needed. • Check that the bar screen is clear. Remove debris as needed (e.g. vegetation, fish, animals, debris, sediment). • Check that the intake pipe strainer is clear. Remove debris as required, back-flushing the pipe if needed. • Check that the intake channel is clear. Remove debris as needed. • Check that the fence or barrier is in good condition and that the entry point (e.g. gate) can be closed securely and latched shut/locked. Repair as needed. • Check for evidence of polluting activities around the intake. Notify the relevant authorities as necessary.
Annually	<ul style="list-style-type: none"> • Perform a detailed inspection of the intake structure (including the walls, intake channel, intake pipe, valves, weir or dam) for signs of damage or failure. Repair as needed.

^a For information on water safety planning, refer to [Water safety planning for small community water supplies: step-by-step risk management guidance for drinking-water supplies in small communities](#) (WHO, 2012).

Table 1. ...continued

Frequency	Activity
As the need arises ^b	<ul style="list-style-type: none"> • Repair the intake infrastructure (e.g. repair cracks in protective wall, weld screens). • Adjust the flow control mechanism to regulate flows or to selectively abstract water. • Where present, adjust the height of the stop log and scumboard (e.g. when seasonal water levels change). • Dredge the weir or dam area. • Remove vegetation from the intake area. • Monitor water levels and use to identify changes (e.g. during periods of flooding or drought). • Ensure procurement of any materials in contact with drinking-water and water treatment chemicals (where used) are safe for drinking-water use.

^b See Table 2 for potential issues that could trigger these activities.

General notes

- The suggested frequencies in Table 1 are a minimum recommendation. More frequent checks may be required during the rainy season or flood events. However, less frequent checks may be needed for practical reasons (e.g. where intake structures are hard to access due to seasonal track closures). A suitable O&M schedule should be made for each site, including who is responsible for the work. Completion of activities as per the O&M schedule should be recorded, including additional details for any problems identified and corrective actions undertaken.
- Only people with relevant training and skills should undertake the activities in Table 1. Appropriate safety measures should be in place when undertaking any activities that require entering the water (e.g. inspection of the intake pipe strainer).
- For guidance on appropriate frequencies for monitoring (e.g. sanitary inspections, water quality testing), refer to [Guidelines for drinking-water quality: small water supplies](#) (WHO, 2024).

B. PROBLEMS AND CORRECTIVE ACTIONS

Each problem in Table 2 is linked to the same question number in Section B of the *Sanitary inspection form*. Where relevant, corrective actions should be completed by trained individuals according to SOPs. Where needed, develop awareness raising and education programmes, and if necessary, rules or regulations, to support safe drinking-water management in the context of the guidance provided in Table 2.

In addition to the corrective actions listed for problems 10-16 in Table 2, the following general actions should be considered in the local context, engaging the relevant local authorities and stakeholders as required.

- Consult with upstream catchment stakeholders and waterbody users to raise awareness on how their activities can contaminate the water supply; incentivize actions where appropriate.
- Where practical, relocate polluting activities downstream of the intake, or alternatively, relocate the intake structure upstream of polluting activities.
- In the immediate-term, optimize downstream water treatment processes to ensure surface water contaminants are removed.

Table 2. Common issues associated with a surface water source and intake, and suggested corrective actions

Question	Problem identified	Corrective actions to consider
Intake structure		
1	The intake lacks a functioning protective structure, which could allow contaminants to enter the intake water.	<ul style="list-style-type: none"> • If there is no protective structure in place, seek the relevant skilled help to construct a protective wall and erosion control around the intake. • If the protective structure is in poor condition, repair the structure as needed (e.g. repair mortar or brickwork) and provide adequate protection to minimize future damage (e.g. reinforce walls, provide rock beaching to minimize erosion).
2	The intake structure lacks a functioning screen, which could allow debris to damage the intake, or contaminate the intake water.	<ul style="list-style-type: none"> • If there is no screen in place, seek the relevant skilled help to construct a screen. • If the screen is in poor condition, repair the screen (e.g. via welding), or replace it. • If the screen is blocked, clear the screen to remove debris.
3	The intake structure lacks a functioning flow control mechanism, which could allow uncontrolled flows to damage the intake (or affect downstream water treatment processes, if present).	<ul style="list-style-type: none"> • If there is no flow control in place, seek the relevant skilled help to construct one. Consult with an engineer on the appropriate flow rates to be maintained, accounting for seasonal flows and flood events. • If the flow control mechanism is damaged (e.g. broken, heavily corroded, seized), repair or replace the mechanism.
4	There is a build-up of sediment around the intake structure, which could allow contaminants to enter the intake water, or reduce the flow rate.	<ul style="list-style-type: none"> • Remove the sediment from the intake area (e.g. by dredging, ensuring that the intake valve is closed during the works). • Consult with the relevant authorities to explore upstream management options to reduce sediment entering the waterbody (e.g. riverbank vegetation strips, riverbank reinforcement via rock beaching).
5	There is a build-up of vegetation around the intake, which could allow contaminants to enter the intake water, or reduce the flow rate.	<ul style="list-style-type: none"> • Remove the vegetation from the intake area. • Establish a routine vegetation management programme to prevent future vegetation build-up. • Consult with the relevant authorities to explore longer-term options for reducing nutrient loads in the catchment to manage aquatic weed growth (e.g. optimize slurry or fertilizer application practices, establish riverbank vegetation strips).
6	The area around the intake structure is dirty, which could allow contaminants to enter the intake water.	<ul style="list-style-type: none"> • Where practical, remove the pollution (e.g. remove animal faeces, rubbish). • Communicate the importance of maintaining the intake area in a clean condition. • Consult with the local community to raise awareness that their activities around the intake structure (e.g. open defecation, presence of animals, rubbish disposal) can contaminate the water supply.

Table 2. ...continued

Question	Problem identified	Corrective actions to consider
7	The fence or barrier around the intake structure is missing or inadequate, which could allow animals or unauthorized people to contaminate or damage the intake area.	<ul style="list-style-type: none"> • If missing, construct a robust fence or barrier with a lockable gate that closes securely. • If a fence or barrier is present but inadequate to prevent access, repair or replace it. • If the entry point (e.g. gate) to the intake area is damaged and/or does not close securely, repair or replace it.
8	The intake structure lacks a functioning weir (or dam), which could affect the quality or quantity of water available for abstraction during periods of low flow.	<ul style="list-style-type: none"> • If there is no weir in place, and one is required, seek the relevant skilled help to construct one. • If the weir is damaged, repair or replace it. • If excessive sediment has accumulated in the weir area (i.e. reducing its effectiveness), remove the sediment (e.g. by dredging).
9	There are signs of an algal bloom around the intake structure.	<ul style="list-style-type: none"> • If there is adequate water storage capacity (e.g. an off-stream raw water storage reservoir), close the intake structure and wait for the bloom to pass. • If present, ensure the scumboard is set at an appropriate height to remove surface algal scums. • Consult with the relevant authorities to explore longer-term options for reducing nutrient loads in the catchment to manage algal growth (e.g. optimize slurry or fertilizer application practices, establish riverbank vegetation strips).
10	Human activity is taking place around the intake structure which may contaminate the surface water source.	<ul style="list-style-type: none"> • Encourage sanitary behaviour around the intake area (e.g. avoiding bathing or open defecation in the waterbody, avoiding water contact in case of illness). This can be done through direct communication with the population, distributing leaflets or through installing information signs. • Consult with relevant authorities to encourage relocation of these activities downstream of the intake structure. This can be done through participatory processes, installing information signs, or by fencing the area where activities should be discouraged or banned.
Surface water source		
11	Human settlements are present upstream of the intake structure, which could allow contaminants to enter the surface water source. ^c	<ul style="list-style-type: none"> • Encourage sanitary behaviour (e.g. avoiding open defecation, dumping of rubbish). This can be done both through direct communication with the population, distributing leaflets or by installing information signs. • Consult with the relevant authorities to promote the installation of safe sanitary facilities and their ongoing inspection, with regular maintenance and waste collection.

Table 2. ...continued

Question	Problem identified	Corrective actions to consider
12	Sanitation infrastructure, activities or discharges are present upstream of the intake, which could allow contaminants to enter the surface water source. ^c	<ul style="list-style-type: none"> • Where periodic overflow of sewerage systems cannot be avoided in the shorter-term (e.g. following heavy rainfall where there are combined stormwater and sewerage systems), develop a protocol for temporary closure of the intake, re-opening only when the event has passed. • Consult with the local authorities to: <ul style="list-style-type: none"> ◦ encourage the provision of adequate coverage and capacity of sanitation systems that are accepted by the population to avoid open defecation ◦ promote the design and construction of sanitation systems that can avoid overflow ◦ raise awareness that any new sanitation infrastructure, activities or effluent discharges should be located downstream of the intake structure, or at a safe distance upstream ◦ encourage the safe containment, reuse or disposal of human wastes.
13	Stormwater infrastructure or discharges are present upstream of the intake structure, which could allow contaminants to enter the surface water source. ^c	<ul style="list-style-type: none"> • Where stormwater discharges cannot be avoided in the shorter-term, develop a protocol for temporary closure of the intake during storm flow events (e.g. heavy rainfall), re-opening only when the event has passed. • Consult with the local authorities to: <ul style="list-style-type: none"> ◦ raise awareness that new infrastructure or discharges should be located downstream of the intake structure, or at a safe distance upstream ◦ encourage the safe containment, reuse or disposal of stormwater ◦ encourage optimized operation of storm water systems and ongoing maintenance ◦ promote the design and construction of stormwater systems that can avoid overflow.
14	Farming activities are present upstream of the intake structure, which could allow contaminants to enter the surface water source. ^c	<ul style="list-style-type: none"> • Fence the area in which farming activities should be avoided and livestock excluded. • Consult with the local farmers to: <ul style="list-style-type: none"> ◦ raise awareness that any new farming activities should be located downstream of the intake structure, or at a safe distance upstream ◦ raise awareness of the need to keep livestock out of the waterbody and away from the riverbank; where necessary, encourage the provision of off-stream watering for livestock ◦ encourage best practice application of animal manure, fertilizers and pesticides (e.g. avoiding application when rain is forecast) ◦ raise awareness on the importance of safe containment of animal wastes (e.g. slurry, manure), fuels and chemicals.

Table 2. ...continued

Question	Problem identified	Corrective actions to consider
15	Traffic or roads are present upstream of the intake structure, which could allow contaminants to enter the surface water source. ^c	<ul style="list-style-type: none"> Discourage vehicle washing in, or adjacent to, the waterbody. This can be done through direct communication with the population, distributing leaflets or by installing information signs. Consult with the relevant authorities to encourage the construction of interception channels to divert road run-off away from, and preferably downstream of the intake.
16	There are other commercial activities present upstream of the intake structure which may contaminate the surface water source. ^c	<ul style="list-style-type: none"> Consult with the relevant authorities to: <ul style="list-style-type: none"> raise awareness that any new commercial activities should be located downstream of the intake structure, or at a safe distance upstream encourage the construction of interception barriers to prevent run-off from commercial activities discourage the disposal of untreated commercial wastewater upstream of the intake encourage safe storage and containment or disposal of substances hazardous to health raise awareness on, and encourage reduced use of, substances hazardous to water, or replace them with less hazardous alternatives promote the design and construction of facilities in a way that enables them to operate with minimal impact to the surface water.

^c The term “upstream” in this context refers to a reasonable distance upstream of the intake structure that can be practically observed during the inspection.

It is not possible to prescribe a “safe” distance for direct (including faecally-loaded) upstream discharge into surface waterbodies, in particular if the surface water is consumed without treatment. Appropriate minimum safe distances for polluting activities upstream of the intake structure are dependent on a number of local factors, as outlined in Section A. For more detailed guidance on managing surface water risks, refer to [Protecting surface water for health: identifying, assessing and managing drinking-water quality risks in surface-water catchments](#) (WHO, 2016).

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