

9.0 Water Use and Conservation

Many exploration activities require a source of potable and non-potable water. As exploration programs move from early to advanced stage, expect an increase in demand for water and additional stress on water quality. Water is a valued component of the ecosystem.

9.1 Sensitivities and Concerns

Water source protection is of vital public concern. Exploration activities interact with the aquatic environment mainly through road access, camp facilities, hydraulic stripping, drilling, and water consumption (non-potable and potable).

Major concerns associated with water usage are:

- Pollution of watercourses, bodies of water, wetlands, and ground water
- Adverse effects on aquatic and terrestrial life or habitat
- Erosion of the land surface and watercourses
- Conservation and preservation of the watershed

9.2 Planning

Before fieldwork commences:

- Ensure that all permits, including water extraction permits and authorizations, are in hand
- Document and report to appropriate authorities and landowners all pre-existing water discharges or conditions that may impact the environment
- Document any mining, forestry, and third party activities on adjacent properties that may impinge on the environmental integrity of the project site
- Ensure that water requirements do not have an adverse effect on flora, fauna, human habitation, agricultural uses, and community watersheds
- Locate and identify watersheds potentially affected by project activities

9.3 Water Control

Control used water, run-off water, and run-on water to prevent silting and erosion by the use of:

- Ditches
- Culverts
- Berms
- Sumps
- Sediment barriers (e.g., rip-rap, brush barriers, straw or peat bales, sandbags, geotextile filter cloth)

It is important to construct watercourse crossings and shoreline access ramps to prevent silting, erosion, and damage to aquatic life or habitat.

9.4 Potable Water: Location, Supply, and Storage

To ensure high quality potable water (e.g., for human consumption, washing, food preparation, laboratory use):

- Select underground water sources where possible, as surface water quality may be suspect
- Locate a source that is:
 - At a minimum 30 m upstream and away from camp
 - Not within an active drilling area
 - Not within 30 m of a septic, tile field, lagoon or cesspool
 - Not within 30 m of a fuel or waste oil storage area
 - Not within 100 m of a landfill or dumpsite
- Obtain guidance from a local department of health on water sampling and testing protocols, as they can vary with location
- Conduct inorganic/organic water sampling beforehand, using either trained personnel or a qualified service company

Where a water treatment plant is required by legislation, or by the size of the camp:

- Estimate water requirements before the program commences
- Obtain water extraction and treatment permits where required
- Ensure that suitably trained individuals operate the plant, in accordance with the manufacturer's instructions

When constructing a large camp, conduct groundwater pump testing and a rising head test (also known as an "airlift test" in the U.S.) prior to extraction of water, to ensure a perennial supply that meets present and future requirements. As a guideline, use 160 L per person per day.

Also:

- Ensure that water supply pumps and pipelines are installed in consultation with the owner/occupier of the land concerned, and in such a manner that vegetation and soil is not unduly disturbed
- Select, at a minimum, 50 mm polypipe for the water supply feedline. If in doubt, consult engineering criteria
- For large camp operations, select covered fibreglass or concrete water storage tanks, and include a secure lock
- For small camps, store water in dark, cool, insect-proof and animal-proof containers

Make provision for inline microbiological water quality treatment, selecting either:

- Chlorination (use chlorination systems only where Total Dissolved Solids (TDS) and Total Suspended Solids (TSS) are unfiltered)
- Reverse osmosis (RO)
- Ultraviolet (UV)

In cases when potable water is acquired off-site:

- Prior to purchase, inspect and research trucked-in, piped-in water supply sources and ice supply sources, for quality control and quality assurance
- On a regular basis, analyze for microbiological contamination

For all water supply sources:

- Ensure that water supplies are regularly and effectively tested and the results recorded, in accordance with the appropriate regulations
- Ensure that water analyses that are "out of compliance" are reported to senior management immediately, and suitable remediation is undertaken as soon as possible to rectify the problem

In an emergency when suspect water must be used, bring the suspect water to a rolling boil and continue boiling for at least 10 minutes before use. If the suspect water cannot be boiled:

- Use personal water filter systems, such as the Katadyn Combi Filter or the MSR Waterworks Filter
- Use personal water purification tablets, such as Pristine or Katadyn

Use bottled water when other options are unsuitable.

9.5 Non-Potable Water: Location, Design, and Extraction

Non-potable water is often used in activities such as hydraulic stripping, drilling and small-scale heavy mineral separation.

In choosing a water source:

- Identify several possible water sources that can meet peak water requirements during periods of minimal surface precipitation
- Extract water from non-potable sources, except where potable sources are plentiful and perennial
- Consider converting drill holes to water wells, subject to the acceptability of parameters such as water quality, aquifer water depths, and hole stability
- Select a source that is close at hand and has good all-weather, year-round, environment-friendly access
- Ensure that for trucked-in water, the water does not contain any non-indigenous aquatic plant or animal species, and the water quality is in compliance with regulations

For water extraction and storage:

- Obtain water extraction permits where required
- Install water supply pumps and pipelines in consultation with the owner/occupier of the land concerned, and in such a manner that vegetation and soil is not unduly disturbed
- Design water tanks, reservoirs and dams with capacity to meet peak demands
- Locate water supply pumps above the high-water line of any watercourse or water body
- Ensure that the water pump and fuel supply is:
 - Adequately bermed to prevent fuel spills into the watercourse
 - On a solid footing
 - Protected with hydrocarbon absorbent pads

Also, ensure that the water pump motor exhaust system does not come in contact with any flammable material.

9.6 Water Discharge

To minimize environmental impact:

- Ensure that drill cuttings/sludge, material from hydraulic stripping, and the discharge from any de-watering operation does not enter any water source or flow uncontrolled, through the use of:
 - Filtration control devices
 - Settling ponds
 - Straw or peat bales
 - Geotextiles or other devices
- Provide an adequate closed circuit facility for drilling mud and flocculating agents, which may include:
 - A settling pool or sump located a short distance downslope from the drill
 - A series of settling tanks adjacent to the drill
 - A drill cuttings/water filter
- In a timely manner, bury in-situ all material deposited into a sump, unless the material is known to be harmful to flora, fauna, and groundwater or surface waters. In this case the material should be removed and placed in an approved landfill.
- Ensure that, in freezing conditions, discharged water does not build up as a frozen delta that can subsequently flow as an ice tongue downslope into any body of water.

9.7 Artesian Water

Artesian water encountered in drilling or excavating activities must be controlled in order to prevent wasting, water and cross-contamination between aquifers.

In some jurisdictions, all drill holes must be grouted and sealed to prevent the possibility of creating an artesian drill hole.

Drill holes that encounter artesian water must be plugged and sealed in accordance with local regulations or requirements, unless written authorization to do otherwise is obtained from regulatory authorities or the landowner.

Note however that, in some areas of the world, a drill hole "making water" can be an extremely valuable resource if the water is shown to be potable

9.8 Conservation

To conserve water:

- Ensure prudent use in all activities
- Install and use shut-off valves when water supply lines are not in use
- Recirculate non-potable water whenever possible
- Control artesian water flow
- Ensure that all temporary water control and containment structures are removed upon project abandonment, and the site is restored to its original state as per permit requirements, unless written authorization to do otherwise is obtained from regulatory authorities or the landowner

9.9 Protection

To protect water from pollution:

- Minimize activities in and around watercourses, bodies of water, wetlands, snow, and ice
- Dispose of trash, refuse, waste or hazardous material well away from any water or, when necessary, in an approved waste disposal site
- Dispose of wastewater from camps in soak pits, a septic pit or septic tank, or other grey water discharge system
- Exercise extreme care when refuelling motors and transferring fuels or other petroleum products
- Store, transport, and handle hazardous substances, as per regulations
- Ensure that spill and emergency planning and response procedures are in place