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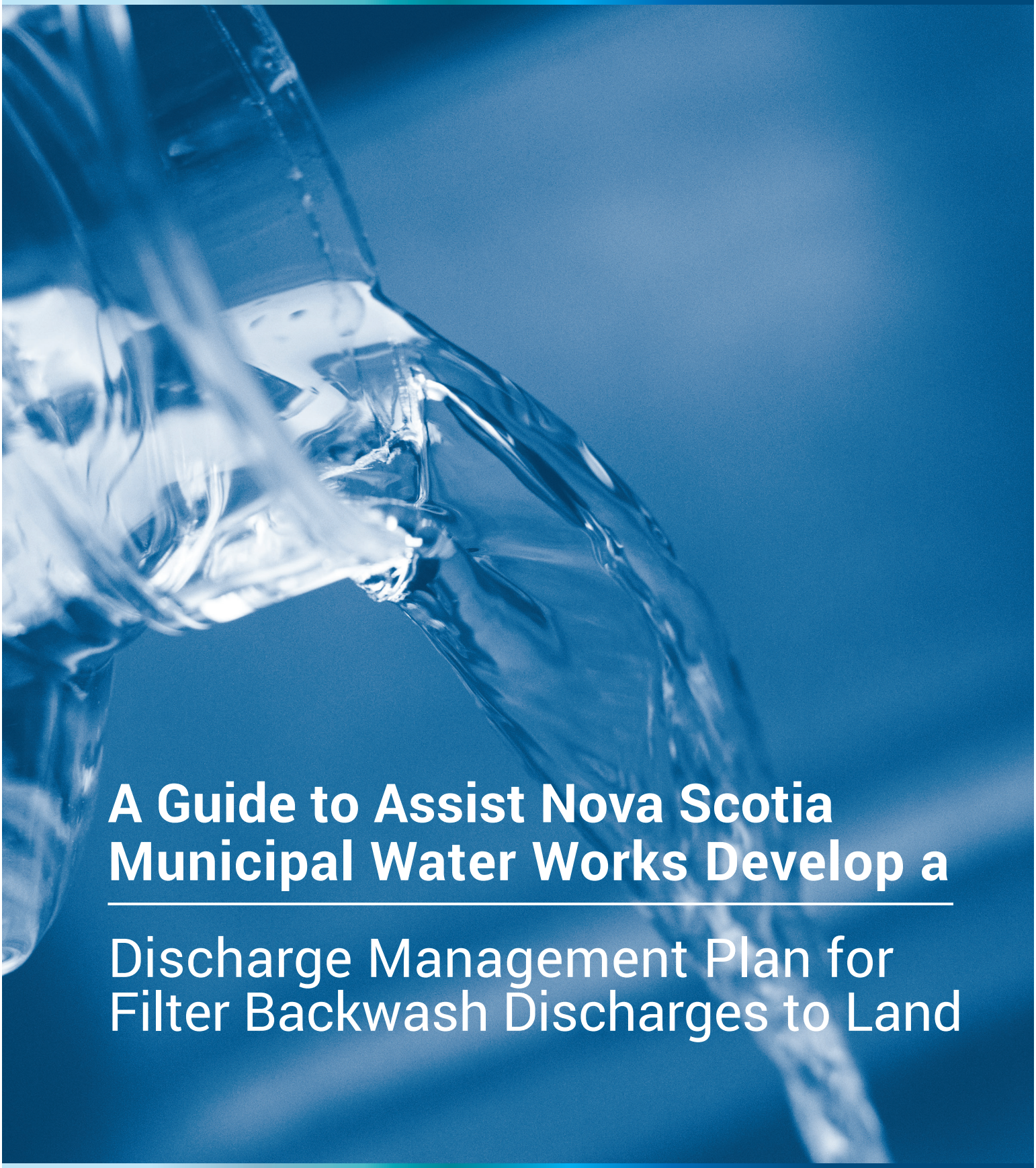

A Guide to Assist Nova Scotia Municipal Water Works Develop a

Discharge Management Plan for Filter Backwash Discharges to Land

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Department of Environment and Climate Change

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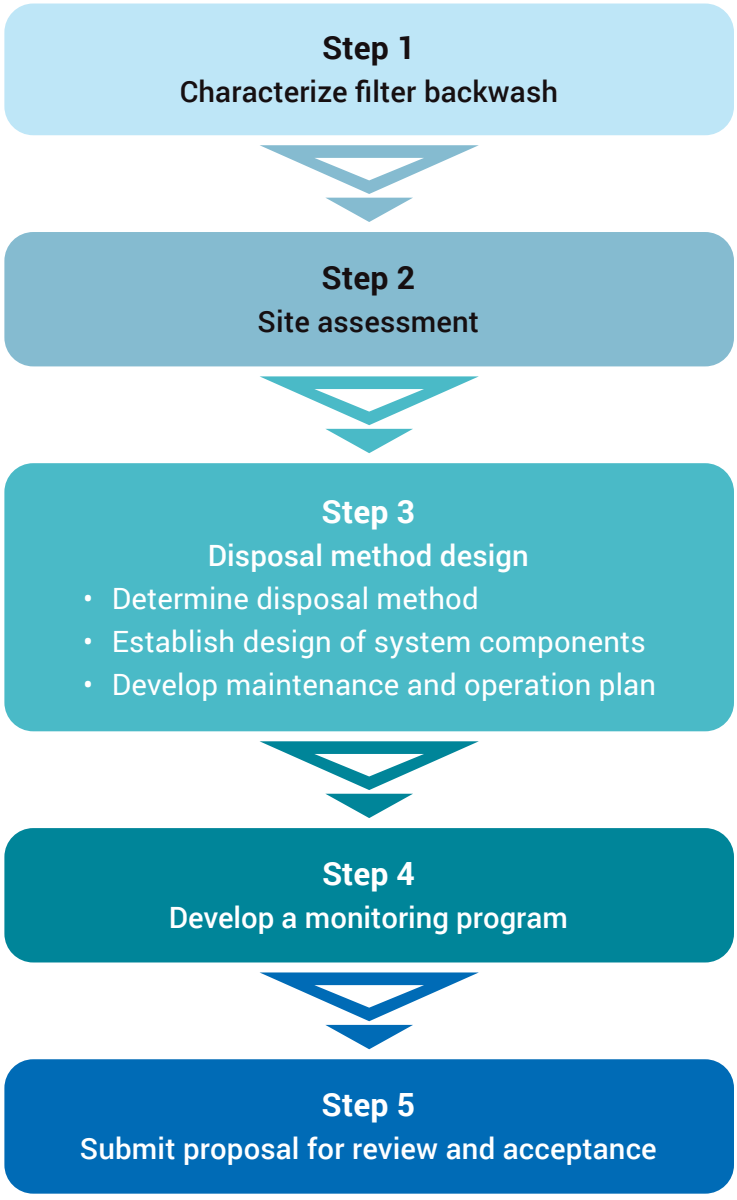
Contents

Introduction

This guide is intended to outline acceptable management practices for filter backwash discharging to land or soil[1]. It does not include discharges to watercourses or wetlands, including locations that can reasonably be determined to lead to a watercourse or wetland. In accordance with the **Nova Scotia Treatment Standards for Municipal Drinking Water Systems**, a plan is required to be submitted for review and acceptance by the Nova Scotia Department of Environment and Climate Change (Department). This guidance outlines a series of steps to assist Approval Holders to prepare such proposals.

A summary of the steps for establishing criteria is outlined in Figure 1 below and further explained in this guidance.

Figure 1 – Pathway to developing a plan for managing discharge to a non-aquatic environment to submit to the Department.



1 The department may consider alternative approaches to establishing an acceptable management plan. It is recommended that Approval Holders seek acceptance from the department before undertaking an alternative approach.

Step 1: Characterize Filter Backwash

A characterization of the backwash material is required to understand the potential substances of concern. The characterization shall include the volume of backwash created during each backwash cycle. This information will be used in the design of system components, meeting management plan objectives, and the creation of a monitoring program.

The characterization shall be based on a minimum of 10 samples taken prior to settling and should be representative of average backwash concentrations. Samples shall be tested for the following, at a minimum:

- General Chemistry
- Metals
- Any chemicals or substances added to the treatment process that may be present in the filter backwash

If a treatment system is not yet operational and backwash is unavailable for testing an estimate can be used. If an estimate is used it shall be confirmed in accordance with this section once backwash effluent is available for testing.

Step 2: Site Assessment

A site assessment is required to understand the site constraints that may exist and to help in determining available disposal options. The assessment should include, but is not limited to, the following:

- slopes and surface drainage on the site;
- changes in grade that may impact surface drainage on the site;
- surface watercourses and wetlands on the site and within 500 m of the proposed discharge area;
- traffic areas;
- well locations within 500 m;
- any nearby source water protection zones;
- availability of municipal water services in the area;

- property boundaries;
- rights of way;
- existing and proposed building locations.
- A subsurface investigation that includes the following:
  - Depth of organic layer
  - Total soil depth over water table and/or bedrock
  - Depth of root penetration
  - Depth to and description of bedrock
  - Determination of highest seasonal water table
    - Presence and depth of mottling
    - Depth to water
    - Estimate of capillary saturated zone
    - Moisture content (saturated, moist, dry, etc.)
  - Soil profile and characteristics:
    - Description of soil (including all soil encountered in the test pit)
    - Permeability for each layer
    - Depth of each layer
    - Texture of soil
    - Moisture content (saturated, moist, dry, etc.)
    - Density (loose, medium, compact, tight)
    - Colour
    - Structure

Step 3: Disposal Method Design

The Approval Holder will use the characterization and site assessment to make decisions on the best disposal method for their site. System designs will be constructed to meet environmental and human health objectives but shall also consider the establishment of a monitoring program and ease of inspection and maintenance.

Solids that accumulate in the system components are considered a residual and must be included in the facilities Residual Management Plan as per the **Nova Scotia Treatment Standards for Municipal Drinking Water Systems**.

Additional considerations based on the disposal pathway are included in the following sections.

3.1 Subsurface Disposal

Subsurface discharge includes any system located at or below grade that allows for the discharge to infiltrate into the native soil. The primary objective of the system is to introduce the effluent into the soil in a way that does not impact the surrounding groundwater, including any water supply wells.

Other design considerations include;

- A subsurface discharge system should only be used in an area with soil that, in its natural state, has a saturated hydraulic conductivity (permeability) between 0.000003 (3×10^{-6}) and 0.0005 (500×10^{-6}) m/sec. Soil with a permeability greater than 500×10^{-6} is considered too permeable to slow the movement of effluent and provide natural filtration prior to reaching groundwater
- The infiltrative surface shall be shallow (less than 1 m below finished grade).
- The system should be designed to reduce the ability for clogging, including clogging due to iron ochre.
- The system shall include inspection ports to allow for the inspection and cleaning of infiltration pipes.
- System design, construction, and management practices should minimize the impact of surface water flow (e.g. stormwater) and/or contaminants in the discharge to maximize the protection of ground water quality.

3.1.1 Pretreatment

Pretreatment is required before the use of subsurface disposal. The main purpose of pretreatment is to remove debris and sediment which would reduce the infiltration capacity or lifespan of the subsurface discharge system.

The goals of pretreatment include:

- Equalization of flows to avoid overloading the infiltrative capacity of the soil
- Permit periods of no discharge to allow for restoration of the system
- Remove easily settleable solids to prevent clogging of the system

Pretreatment options can include, but are not limited to, the following:

- Sedimentation tanks/basins
- Vegetative Filter Strips/Water Quality Swales
- Stormwater Wetlands

3.1.2 Horizontal Setbacks

Proposed backwash disposal systems utilizing subsurface discharge should meet the minimum clearance distances provided in the following table.

Horizontal Distance to Confining Feature	Distance (metres)
All lot boundaries	3
Downslope lot boundary	9
Lateral gradient water supply well or other drinking water supply	15
Down gradient water supply well or other drinking water supply	30
Surface watercourse or wetland	30
Downslope ditch or drain that flows intermittently	15
Any water distribution system	6
Foundation drainage system	6
Water Supply line	3

3.1.3 Vertical Clearances

The minimum vertical separation distance between the base of the infiltrative surface and groundwater, bedrock, or too permeable soil shall be 1.2 m when seasonal high groundwater table and mounding from the subsurface discharge are considered.

3.1.4 Subsurface System Maintenance

The infiltration system shall be designed to facilitate monitoring of the overall subsurface discharge system and its effectiveness. This includes, but is not limited to:

- The ability to monitor discharge from the pretreatment portion of the system prior to entering the infiltration component.
- The ability to visually inspect perforated infiltration pipes.

A maintenance plan shall be prepared that includes, but is not limited to, the following:

- Monitoring and cleaning methods for pretreatment infrastructure and basins.
- Inspection methods and frequencies for underground pipes, inlets, and overflows for sediment/debris accumulation, blockage, drainage, and damage.

- Inspection methods to confirm overland flow or other discharges are not entering the subsurface discharge system.
- Disposal methods and locations for sediments.
- Winter related preparation or maintenance requirements.

3.2 Surface Disposal

3.2.1 Containment

Backwash may be stored and transported from the site to an acceptable disposal location. Storage can be in tanks or natural basins. Unless an impermeable membrane is used any natural basin should be constructed on soil with a permeability less than $3x10^{-6}$ m/sec. Disposal of the stored material shall be as per the residuals management plan required by the **Nova Scotia Treatment Standards for Municipal Drinking Water Systems**.

3.2.2 Discharge Off Site

The goal of a management system that discharges backwash from the site is to prevent environmental and public health issues in downstream terrestrial environments. The potential for buildup of parameter concentrations in soil as well as localized flooding issues should be considered.

Various pretreatment practices may be required to achieve this goal. These can include, but are not limited to:

- Vegetative Filter Strips/Water Quality Swales
- Stormwater Wetlands
- Filtration Practices (E.g., Surface Sand Filters)

Other design considerations include;

- The system shall include a structure to provide final settling and a location to collect samples while a discharge from the structure is occurring, such as an outlet sediment trap.
- Any backwash effluent discharged from the site should not exceed 25 mg/L for Total Suspended Solids
- Any backwash effluent discharged from the site should be within a range of 6.5-9 for pH, unless it is demonstrated background source water quality is outside of this range.
- System design, construction, and management practices should minimize the impact of surface water flow (e.g. stormwater) in the discharge to prevent flushing or scouring of the pretreatment and settling areas.

3.2.3 Surface Disposal System Maintenance

A maintenance plan shall be prepared that includes, but is not limited to, the following:

- Monitoring and cleaning methods for any storage infrastructure and basins.
- Inspection methods and frequencies for underground pipes, inlets, and overflows for sediment/debris accumulation, blockage, drainage, and damage.
- Disposal methods and locations for sediments.
- Winter related preparation or maintenance requirements.

Step 4: Develop a Monitoring Program

4.1 Groundwater Monitoring

If subsurface discharge is utilized a program for monitoring groundwater quality is required. The objective of the program is to confirm parameter concentrations in groundwater are not increasing because of the backwash discharge.

An acceptable monitoring program shall include, at a minimum, the following:

- The location of any wells used to monitor groundwater quality up and down gradient of the subsurface discharge system.
- An assessment of existing background groundwater quality, or baseline conditions
- Sampling of monitoring wells for general chemistry, metals, or other parameters based on the backwash characterization.
- A proposed sampling frequency (minimum of annual for monitoring wells).

4.2 Effluent Monitoring

If a backwash effluent discharge from the site is proposed an effluent sampling program is required. The program shall include sampling at the final settling location, at a minimum. An acceptable monitoring program shall include, at a minimum, the following:

- Monthly TSS and pH sampling of effluent if a discharge has occurred during the month.
- A list of other parameters of concern to be sampled in the effluent based on the backwash characterization.
- Effluent discharge sampling frequency (minimum of annual) and location(s) for other parameters of concern.

4.3 Sediment Monitoring

Sediment samples are required from the pretreatment structure located prior to a subsurface discharge feature or from the point of final settling for an effluent discharge from the site. An acceptable monitoring program shall include, at a minimum, the following:

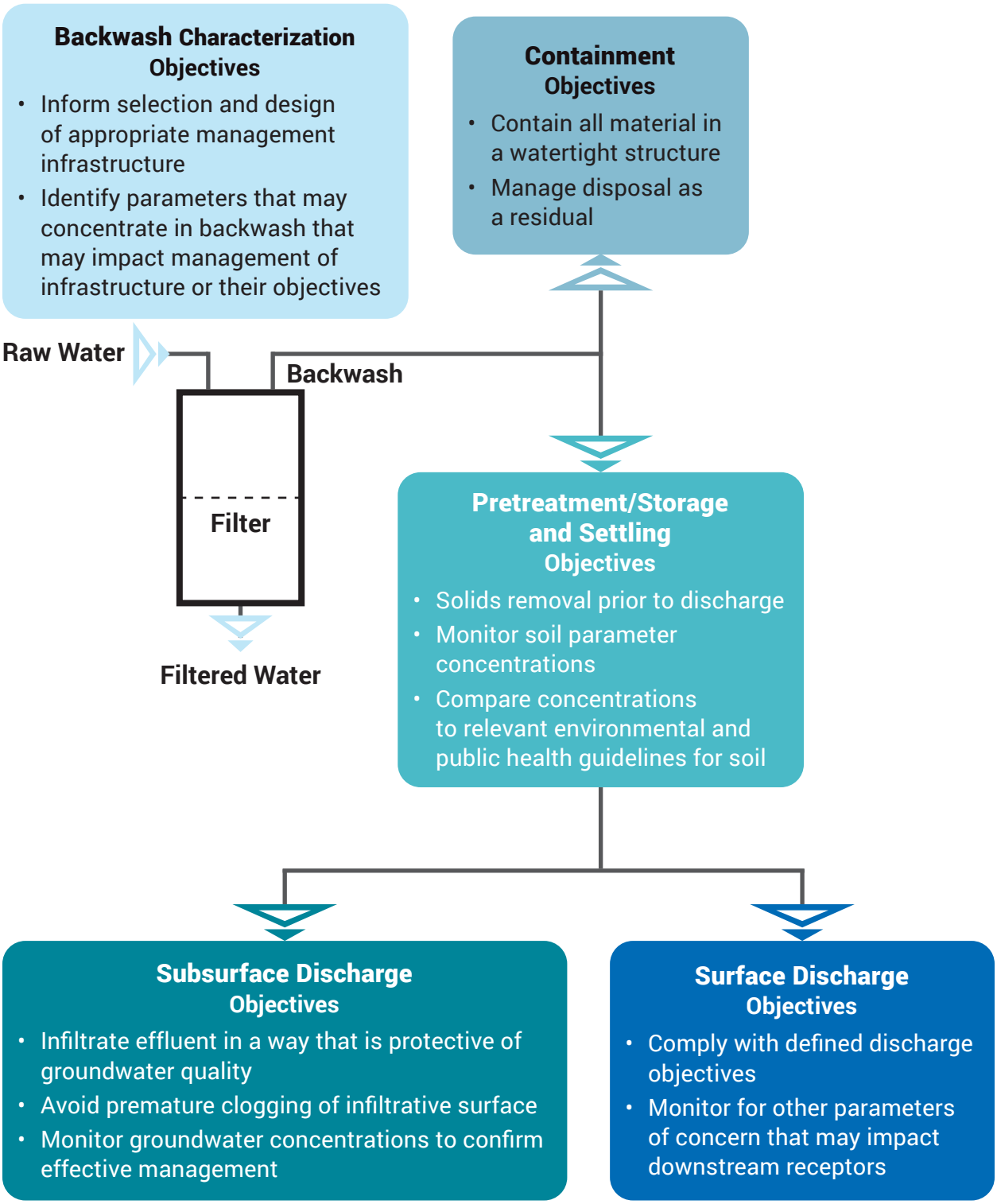
- Sampling for general chemistry and metals.
- Sediment sampling frequency (minimum of annual) and location(s).

Step 5: Submit Proposal for Review and Acceptance

Once you have completed Steps 1 to 4, append all supporting documentation, and submit the report to your local District Office for review and acceptance.

As per the **Nova Scotia Treatment Standards for Municipal Drinking Water Systems** any discharge of backwash material to a non-aquatic environment must be done in accordance with the accepted Discharge Management Plan. Any changes to the contents of the plan may require submission of a revised plan for review and acceptance.

Appendix A: Summary of Discharge Management Plan Objectives

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