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Building *Nunavut* Together
Nunavut liuqatigiingniq
Bâtir le *Nunavut* ensemble

ENVIRONMENTAL GUIDELINE

Contaminant Spill Remediation



How to Report

Spills must be reported to the **NU Spill Report Line** without delay in one of the following ways:



Calling the NU Spill Line
at (867) 920-8130



Emailing a completed Spill
Report to spills@gov.nt.ca



Faxing a completed Spill
Report to 867-873-6924

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the Environmental Protection Act.

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards, and best management practices associated with Contaminant Spills. This Guideline does not replace the need for the owner or person in charge, management, or control of Contaminants to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities, and qualified persons with expertise in the management of these substances.

Copies of this Guideline are available upon request from:

Department of Environment Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
867-975-7700

An electronic version of this Guideline is available at www.gov.nu.ca/environment/

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1 List of Acronyms and Units

Acronym	Definition
CCG	Canadian Coast Guard
CCME	Canadian Council of Ministers of the Environment
CEQGs	Canadian Environmental Quality Guidelines
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CCF	Chain of Custody Form
COPCs	Contaminants of Potential Concern
ENV	Department of Environment, Government of Nunavut
DU	Decision Unit
ECCC	Environment and Climate Change Canada
EPA	Environmental Protection Act (1988)
ESA	Environmental Site Assessment
IOL	Inuit Owned Lands
NWB	Nunavut Water Board
NWT	Northwest Territories
PHCs	Petroleum Hydrocarbons
PID	Photo-Ionization Detector
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance / Quality Control
RAP	Remedial Action Plan
RMM	Risk Management Measure
VOCs	Volatile Organic Compounds
WHMIS	Workplace Hazardous Materials Information System

Units	Description
µg	Microgram (1/1,000,000 gram)
mg	Milligram (1/1,000 gram)
Kg	Kilogram (1,000 grams)
L	Litre
ppm	Parts per million
ppb	Parts per billion
mg/L	Milligrams per litre (ppm)
mg/kg	Milligrams per kilogram (ppm)
µg/L	Micrograms per litre (ppb)

2 Introduction

This Guideline presents information on remediating impacts from **Contaminant** spills in Nunavut. It may be used by those responsible for spills, those conducting **Remediation**, contractors working to assist in **Remediation** work or other stakeholders who need to be aware of the process. As a guideline, this document does not carry the force of law. It is intended to assist in compliance with the laws, specifically the *Environmental Protection Act (EPA)* (1988) and its associated regulations.

This Guideline presents the roles and responsibilities of the main agencies involved in regulating contaminant spills in Nunavut. It also covers the main steps of the remediation process including containing the spill, assessing the site, developing a **Remedial Action Plan**, removing the **Contaminants** or eliminating the risk they present, and confirming the site is safe.

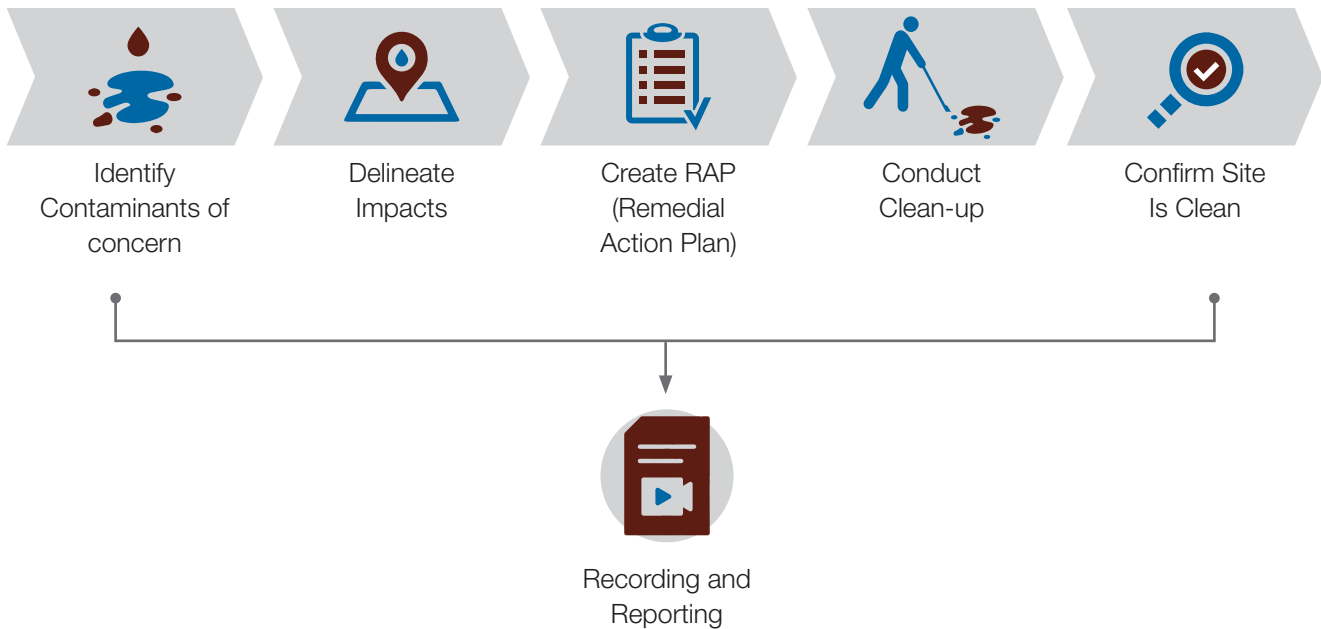
The definitions of most words in **Bold** can be found in Section 15, [Definitions](#).

The *EPA* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *EPA* provides the Minister of Environment with authority to develop, coordinate, and administer this Guideline.¹



¹ Environmental Protection Act 1988 RSNWT (Nu) c E-7 s 2(2)

3 Remediation Process



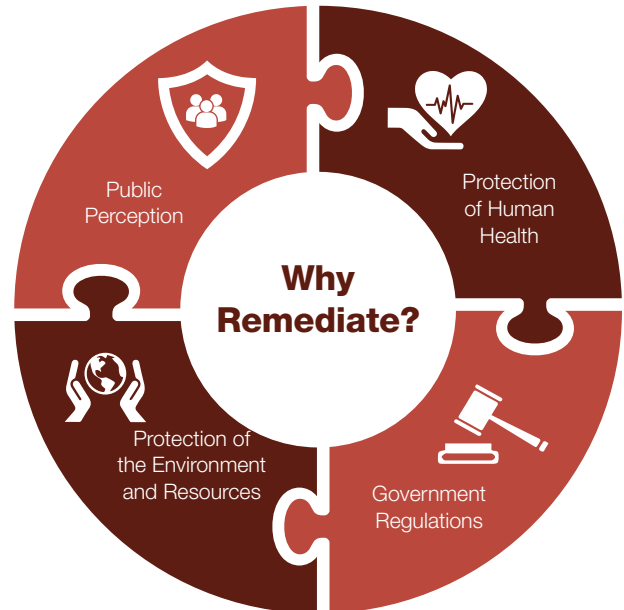
Remediation is necessary for many reasons:

Protection of Human Health: Many contaminants have health impacts for people exposed on or near the impacted site. Eliminating or limiting these contaminants and their impacts is always the top priority.

Protection of the Environment and Resources: The natural environment has value that must be protected. **Contaminants** may harm species (directly or indirectly) that are harvested by communities.

Public Perception: People have a right to live in a clean environment free from the impacts of pollution.

Government Regulations: The *Environmental Protection Act* (1988) and associated regulations state clearly that those responsible for environmental impacts have the obligation to fix any damages caused.



According to the *EPA*: “no person shall discharge or permit the discharge of a contaminant into the environment.”²

Furthermore, an Inspector of the Department of Environment (ENV) “may order a person who conducts or permits this discharge to repair or remedy any injury or damage to the environment that results from the discharge.”³

This Guideline will refer to the person or organization that discharged or permitted the discharge of a contaminant into the environment, and is thus responsible for repairing or limiting the damage to the environment, as the **Responsible Party**.

Most contaminant spills in Nunavut involve **Petroleum Hydrocarbons (PHCs)** (e.g., gasoline, jet fuel, diesel, home heating fuel). For this reason, this Guideline focuses on the management of **PHC**-contaminated soil and water. Other contaminants will be addressed but not discussed in detail. In most cases the principles and methods described in this guideline may still be applied.



² Environmental Protection Act 1988 RSNWT (Nu) C-E-7 s 5

³ Environmental Protection Act 1988 RSNWT (Nu) C-E-7 s 7

4 Roles and Responsibilities

4.1 Responsible Party

A **Responsible Party** who becomes aware, or has reason to believe that a spill has occurred, must immediately take measures to manage the contamination and prevent or minimize impacts to people and the environment. The spill must be stopped as soon as possible. Once the safety of workers and any affected members of the public is assured, the **Responsible Party** should report the spill to the **NU Spill Report Line** at **867-920-8130**. An email can also be sent to spills@gov.nt.ca.



Spills above or likely to be above the **Reportable Quantities** ([Appendix E](#)), must be reported in accordance with the *Spill Contingency Planning and Reporting Regulations* (1993).⁴

Once these initial measures have been taken, the **Responsible Party** is required to assess the presence and extent of contamination and develop and implement a **Remedial Action Plan**.

Contractors may conduct **Remediation** on behalf of the **Responsible Party**. However, the **Responsible Party** remains responsible for ensuring that their own responsibilities under all applicable statutes, regulations, and standards are fulfilled.

When a spill occurs, officers of the ENV conduct **Inspections** or an **Investigation** to determine the **Responsible Party**. In some cases, the Department may determine that two (or more) organizations or individuals are responsible for the incident. In these cases, both parties will be named as **Responsible Parties** and both will be liable to remediate damages. If there is disagreement among these parties as to the portion of responsibility borne by each, it can be resolved as a civil matter outside of this management process.

4.2 Government Of Nunavut

Department of Environment

The ENV's authority comes from the *Environmental Protection Act (EPA)* (1988), which prohibits the discharge of contaminants to the environment and enables the Minister of Environment to take actions to ensure appropriate management measures are in place.⁵



Although the *EPA* applies to the entire Territory, the ENV is a signatory to the *NWT-NU Spills Working Agreement* (2014), which sets out which agency will act as principal response agency called the **Lead Agency**.

This agreement states that the Government of Nunavut (and thus the ENV) “shall act as the lead agency on Commissioner’s Land, Territorial Roads and Communities in Nunavut.”⁶ Exceptions are made at facilities authorized under federal legislation such as landfills and mines, federal facilities, and at facilities regulated by the Canadian Energy Regulator, such as oil and gas exploration sites.⁷

⁴ Spill Contingency and Reporting Regulations 1993 NWT Reg (Nu) 068-93 s 9

⁵ Environmental Protection Act 1988 RSNWT (Nu) C-E-7 s 2(2), s 5

⁶ NWT-NU Spills Working Agreement 2014 p.12

⁷ NWT-NU Spills Working Agreement 2014 p.12

The ENV conducts inspections of contaminant storage tanks and facilities that store and manage contaminants in order to prevent spills. The Department also reviews **Spill Contingency Plans** filed in accordance with the *Spill Contingency Planning and Reporting Regulations* (1993).⁸

When spills occur, the ENV assists with public safety during the response and ensures that the **Responsible Party** fulfills its obligations during the initial response to the incident.

During the rest of the **Remediation** process the ENV will engage with the **Responsible Party** to monitor compliance with the *EPA*. The spill will remain “open” until the Department receives confirmation that the site is fully remediated and can conduct a final inspection. If the site passes this final inspection, the **Responsible Party** will receive notification from the Department that the spill is “closed” and its responsibilities have been fulfilled.

The ENV also assists Environment and Climate Change Canada (ECCC) to enforce the *Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (2021) under the *Canadian Environmental Protection Act* (1999). **Hazardous Waste** generated during **Remediation** work must be transported and stored by organizations registered with the ENV. According to the Regulations, any transportation of **Hazardous Waste** within Canada must be accompanied by a **Movement Document/Manifest**.⁹ These manifests can be provided by the ENV.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission derives its authority from the *Workers' Compensation Act* (1988) and the *Safety Act* (1988). The Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The laws above require an employer to maintain a safe workplace and ensure the safety and wellbeing of workers. The **Workplace Hazardous Materials Information System (WHMIS)** is used to provide information to workers on the safe use of any hazardous material in the workplace.

Department of Community and Government Services

The Nunavut Fire Marshal's Office derives its authority from the *Fire Prevention Act* (1988), *National Fire Code of Canada* (2015) and *National Building Code of Canada* (2015). The Fire Marshal is responsible for regulating the safe storage, handling, and use of flammable and combustible liquids.

⁸ Spill Contingency Planning and Reporting Regulations 2006 s 6

⁹ Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations 2021

Department of Health

Some **Contaminant** spills may threaten or may be reasonably expected to threaten public health. These spills therefore meet the requirements to be a **Health Hazard** under the *Public Health Act* (2016) of Nunavut.¹⁰ **Health Hazards** must be reported as soon as possible to the Chief Public Health Officer.¹¹

4.3 Government Of Canada



Environment and Climate Change Canada

Environment and Climate Change Canada (ECCC) is responsible for enforcing the *Canadian Environmental Protection Act* (1999) including the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (2008). ECCC is also responsible for regulating the interprovincial and international movement of hazardous waste through the *Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (2021) and for administering the pollution prevention provisions of the federal *Fisheries Act* (1985).

Crown-Indigenous Relations and Northern Affairs Canada

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) enforces several pieces of legislation in Nunavut including the *Territorial Lands Act* (1985), *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (2002), *Nunavut Planning and Project Assessment Act* (2013) and the *Fisheries Act* (1985). The *NWT-NU Spills Working Agreement* (2014) gives CIRNAC responsibility to act as **Lead Agency** in cases where spills occur at facilities authorized under federal legislation (such as landfills and mines), as well as most spills on Territorial Land and spills on water, with exceptions made for spills from ships, **Mystery Spills**, and spills from oil and gas facilities.¹²

Fisheries and Oceans Canada

The Department of Fisheries and Oceans' (DFO) operational arm is the Canadian Coast Guard (CCG). The Coast Guard enforces the *Canada Shipping Act* (2001), the *Oceans Act* (1996), the *Arctic Waters Pollution Prevention Act* (1985), and others. The *NWT-NU Spills Working Agreement* (2014) gives the CCG responsibility to act as **Lead Agency** in cases where spills occur from ships and barges, including refuelling shore-based tanks and **Mystery Spills** on water.¹³

¹⁰ Public Health Act 2016 s 13

¹¹ Public Health Act 2016 s 21

¹² NWT-NU Spills Working Agreement 2014 p.12

¹³ NWT-NU Spills Working Agreement 2014 p.12

4.4 Community Governments, Designated Inuit Organizations and Co-Management Boards

Local Community Governments

Community governments are key participants in the proper local management of waste from contaminated sites. Under the *Nunavut Land Claims Agreement* (1993), communities are entitled to control their own solid waste and sewage treatment facilities. Waste from contaminated sites may be deposited or treated at community waste facilities only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.



Designated Inuit Organizations

The administration of land-related matters on Inuit Owned Land (IOL) is the responsibility of the Qikiqtani Inuit Association, Kivalliq Inuit Association and Kitikmeot Inuit Association. Authorization is required in order to access and occupy IOL for the purposes of any private, commercial, or public nature.



Co-management Boards and Agencies

Co-management boards and agencies established under the *Nunavut Land Claims Agreement* (1993), also referred to as Institutions of Public Government, have broad authority for land use planning, impact assessment and the administration of land and water. Activities involved in spill **Remediation** may be controlled through setting terms and conditions in plans, permits, and licenses issued by the Nunavut Planning Commission, Nunavut Impact Review Board, and Nunavut Water Board (NWB).

5 Key Government Policy Considerations

Protection of the Environment

Government policy related to the **Remediation** of contaminated sites recognizes the importance protecting the environment for its own sake. This is in keeping to the Inuit societal value of *Avatittinnik Kamatsiarniq*.



There are many sites within Nunavut that have been impacted by spills that occurred in the distant past and were not reported or documented. A good example of this **Historical Contamination** is from activities by the United States’ and Canada’s armed forces during and after the Second World War in and around certain communities in Nunavut. When a spill occurs, **Remediation** work might reveal evidence of possible **Historical Contamination**, complicating the process.

The Environmental Protection Division maintains an inventory of known historically contaminated sites on Commissioner’s land in Nunavut. Any organization or individual planning to conduct an investigation or assessment of possible **Historical Contamination** on Commissioner’s land should contact the Environmental Protection Division of the ENV.

In keeping with the Polluter Pays principle, the ENV requires **Responsible Parties** to demonstrate that any contamination remaining on a spill site following a **Remediation** is not a result of their actions.

Modern laboratory analysis of soil samples can usually provide strong evidence that contamination did not enter the environment recently. This, as well as other evidence such as historical photographs, can be used by **Responsible Parties** to make their case that their responsibilities have been fulfilled. Officers of the ENV consider each case carefully and make the final determination to close a spill.



Image: www.caanc-cimac.gc.ca/eng/1405714238475/1537372985915

Focusing on Prevention

Contaminant spills cause serious damage to the environment. Even if contaminated soil is removed, vegetation may take decades to regrow. Preventing a spill using regular maintenance and preventative measures is always much less costly than conducting a **Remediation**.

The ENV requires facility managers to file **Spill Contingency Plans** as stipulated in the *Spill Contingency Planning and Reporting Regulations* (1993). These plans can prevent spills and lessen their impact should they occur. The ENV also undertakes an extensive inspection program throughout the communities of Nunavut in order to inform homeowners and organizations of risks associated with their specific **Contaminant** storage infrastructure and setup.

Remediation Standards

After a spill, stakeholders must decide to which standard the land must be remediated. In other words, how much of the **Contaminant** can be left in the soil and water given that concentrations below a certain level can be assumed to be of no harm to the environment or human health.

The **Canadian Council of Ministers of the Environment (CCME)** publishes *Canadian Environmental Quality Guidelines (CEQGs)* in order to provide science-based goals for the quality of aquatic and terrestrial **Ecosystems**. The ENV has adopted these standards in the case of most **Contaminants** present in the Territory. This guideline reviews the **CCME** environmental quality standards in more detail in [Selection of Remediation Criteria](#).

Naturally Occurring Health Hazards

There are cases where certain elements, such as arsenic and chromium, occur naturally in relatively high levels in Nunavut. Some of these elements can cause health risks and are thus included in the *CEQGs*. If naturally occurring substances are found in concentrations above *CCME Guidelines*, the ENV will not ask landowners to remediate these substances. However, landowners must be careful if soils containing these elements are moved onto other sites.

Identification of Spill Sites

As stated in previous sections, efforts must be made by individuals and organizations storing and handling **Contaminants** to prevent spills. Anyone who observes a spill incident, or notices a possible spill by observing staining on soil, a sheen on water, or any other sign of contamination in the environment should report the incident to the **NU Spill Report Line** at **867-920-8130**. Those who own or handle **Contaminants** and cause a spill or neglect to take the actions necessary to prevent a spill from occurring have committed an offence under the *EPA*. They must report the incident if it is above or likely to be above the **Reportable Quantities** ([Appendix E](#)) of the *Spill Contingency Planning and Reporting Regulations* (1993).¹⁴



¹⁴ Spill Contingency Planning and Reporting Regulations 2006 s 9



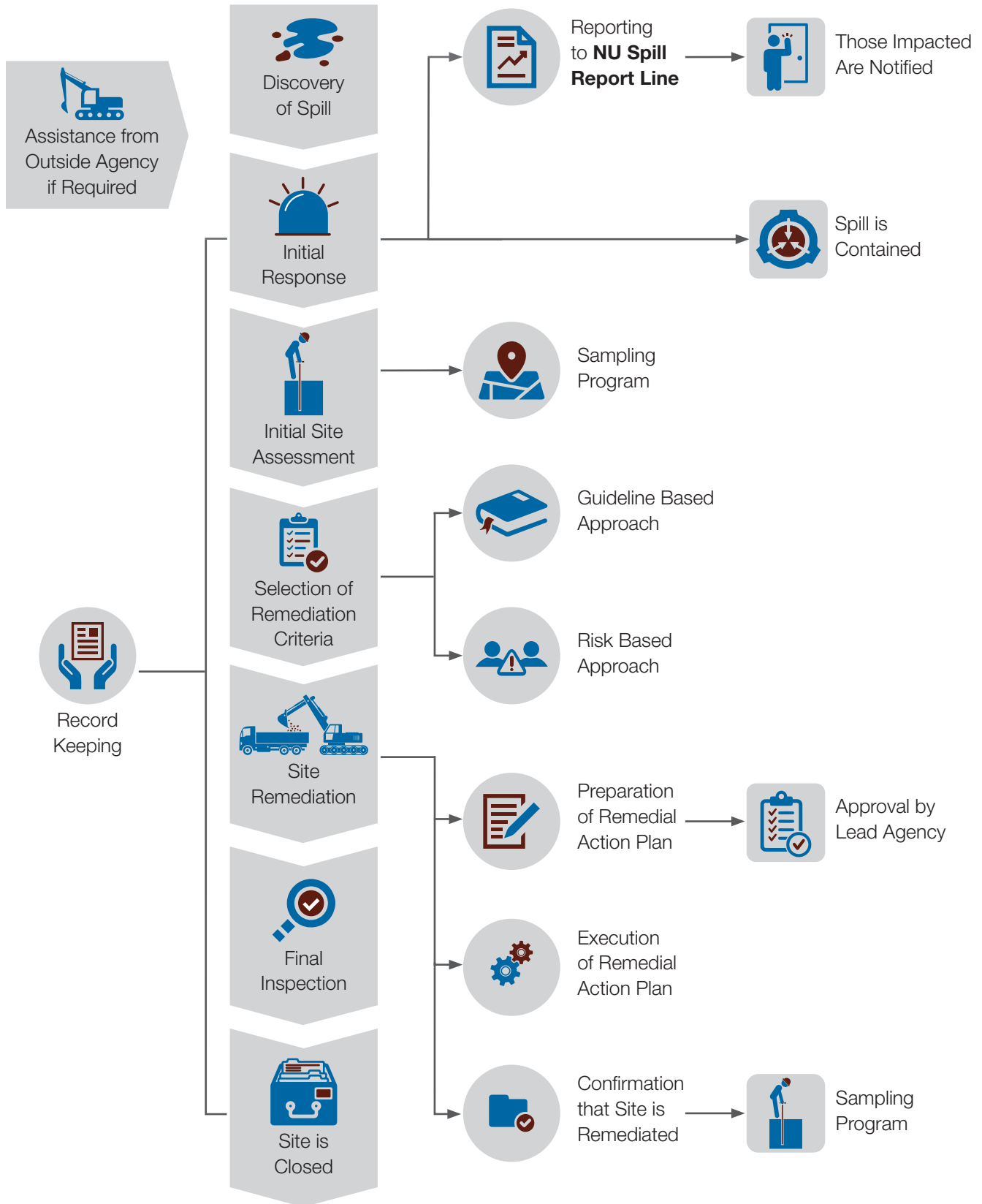
Important

Conducting regular inspections of facilities and storage systems can identify spill risks before they happen and limit the extent of spills and their damage by discovering them early.

For information on preventing spills from heating fuel tanks, refer to the Environmental Guideline for *Home Heating Fuel Tanks*, also from the ENV.



Process For Managing A Contaminant Spill





Record Keeping

Officers of the ENV investigate **Contaminant** spills under the authority of the *Environmental Protection Act* (1988). They attend spills as soon and as often as possible and record events with pictures and notes. However, Officers cannot be everywhere all the time. It is the responsibility of **Responsible Parties** to record activities on their property before, during, and after spills occur, in order to protect themselves from additional liability, scrutiny, and costs. This means taking notes and pictures of:



The preventative measures taken (like regular maintenance)



When the spill is discovered



During and after work to contain contaminants



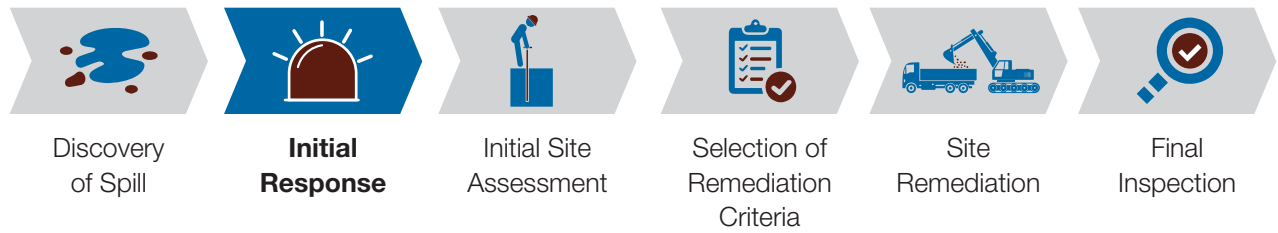
During Remediation work



When wastes are packaged and removed from the site



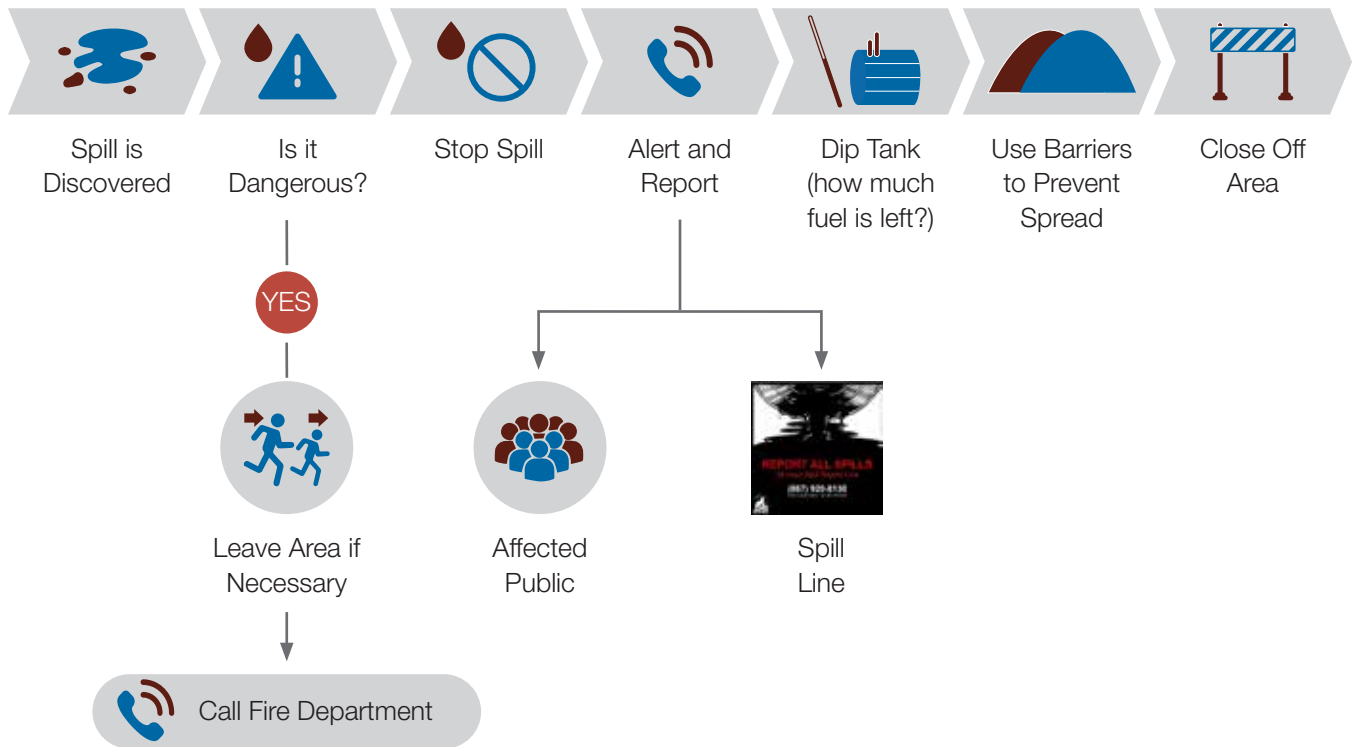
7 Initial Response



7.1 Contain Spill



A **Responsible Party** who finds a spill must immediately do everything possible to stop the spill and prevent contaminants from spreading. This is called Spill Containment.



Important

When a spill is found it is important to act as soon as possible to limit the damage to the community and the environment. Acting fast will also make the cleanup less expensive.

Here are the main steps when containing a spill:



1. Safety First

If you are worried about your safety or the safety of others near the spill, move yourself and any others away from the spill site and call the local fire department before taking further action.



2. Stop the Spill

Close valves or use containers to catch leaking fuel.



3. Alert and Report

Anyone in the area that might be affected by the spill must be alerted.

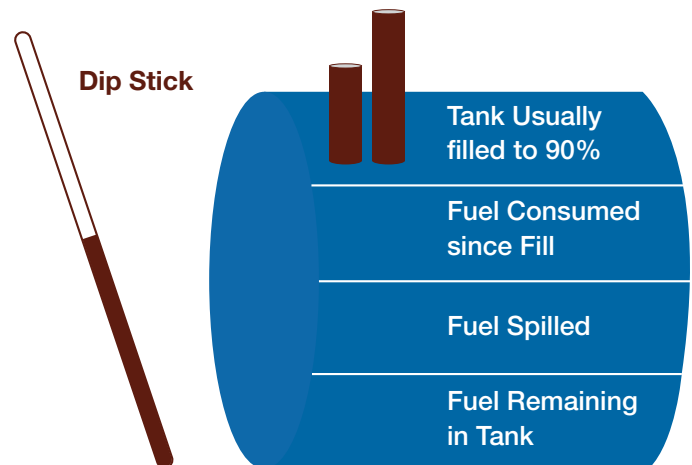
The ENV recommends that all spills be reported. If the spill might be more than the **Reportable Quantities** (100L for fuel or oil) the **Responsible Party** must report the spill to the **NU Spill Report Line: 867-920-8130** or spills@gov.nt.ca.



4. Determine How Much has Spilled

Once a spill has been stopped, it is important to find out how much was spilled.

This is done by “Dipping” the tank. This means putting a stick or other long object inside the tank and measuring the height of fuel left. This height in inches can be converted to a volume in Litres using a chart specific to the tank type. A chart for an upright 275 gallon tank, the standard tank for houses in Nunavut, is included as [Appendix C: Chart for 275-gallon Tank](#). Other charts are available online.





5. Use Barriers if Necessary

Barriers can be used to stop the **Contaminant** itself, as well as to stop water and snow from mixing with the **Contaminant** and spreading it further.

Absorbent spill pads or other instruments should be used to collect as much of the **Contaminant** as possible in order to prevent it from spreading. Spills that happen in the winter may not be able to be completely cleaned because the ground is frozen. When this happens, clean up and remove as much **Contaminant** as possible with available tools and equipment. Focus on preventing further spread until the site can be fully cleaned when the ground thaws. Putting effort into containing the spill early will save time and money later in the cleanup process.

[Section 7.2](#) has information about how barriers can be used.



6. Close Off Area

Once the spill is contained and the **Contaminant** is no longer spreading, it is important to close off the area to vehicles, people, and animals to the furthest extent possible. This will help protect people and animals from harm and prevent spread of **Contaminants**. After the **Contaminant** is contained, the next steps in the **Remediation** process can begin.



Record Keeping

Officers of the Department of Environment investigate **Contaminant** spills under the authority of the *EPA*. They attend spills as soon and as often as possible and record events with pictures and notes.

However, Officers cannot be everywhere all the time. It is a good idea for property owners and **Responsible Parties** to take pictures of their property before, during, and after spills occur. With a camera on most cell phones, it is easy to do!

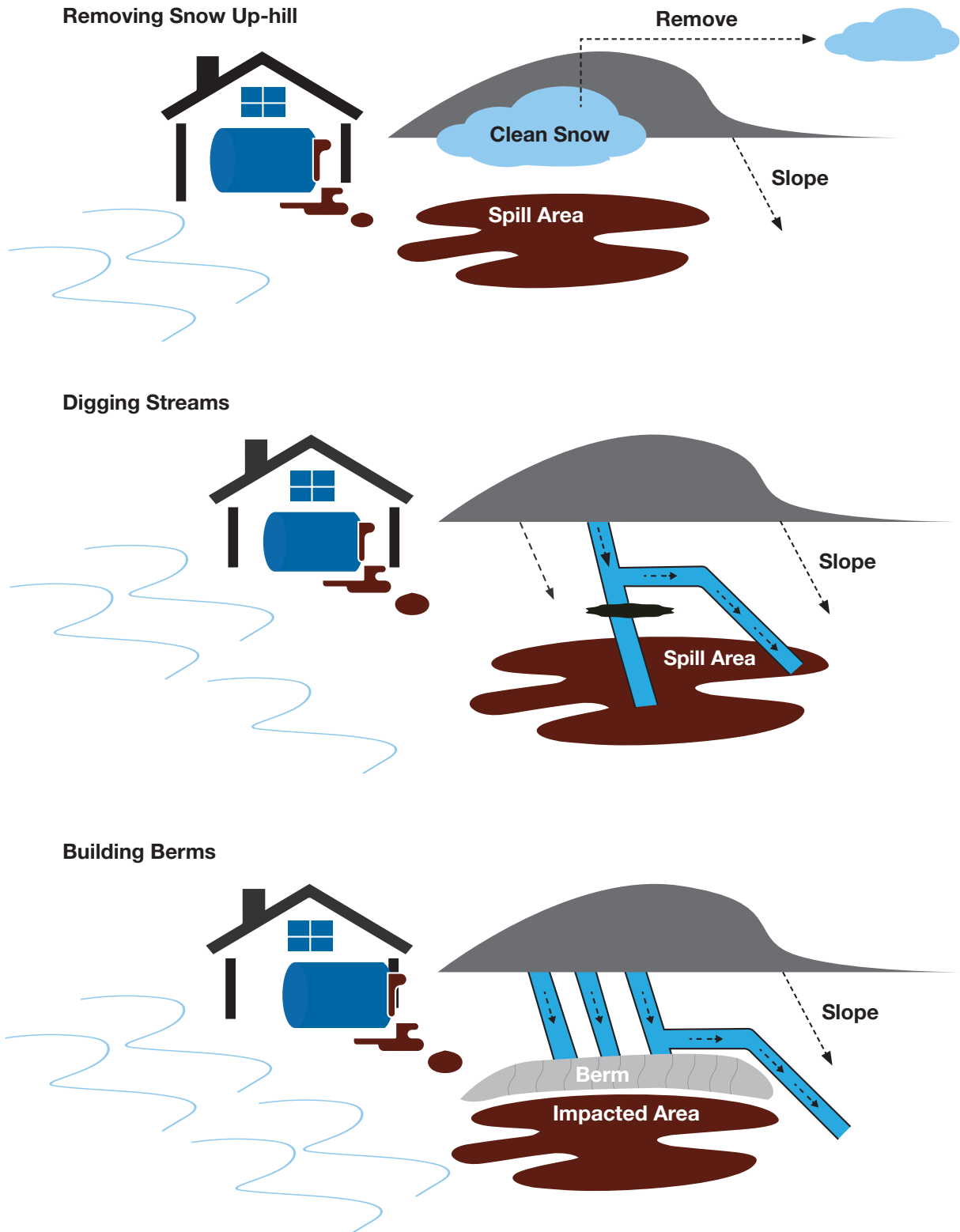
Using a home heating oil tank as an example, this would mean having pictures of: what the tank and surrounding area looked like before the spill, preventative measures like draining the **Drip Leg**, what the tank looked like when the spill was discovered, and images taken during and after work to prevent the spill from spreading.

7.2 Containment Methods

Here are a few containment methods that are commonly used in Nunavut:



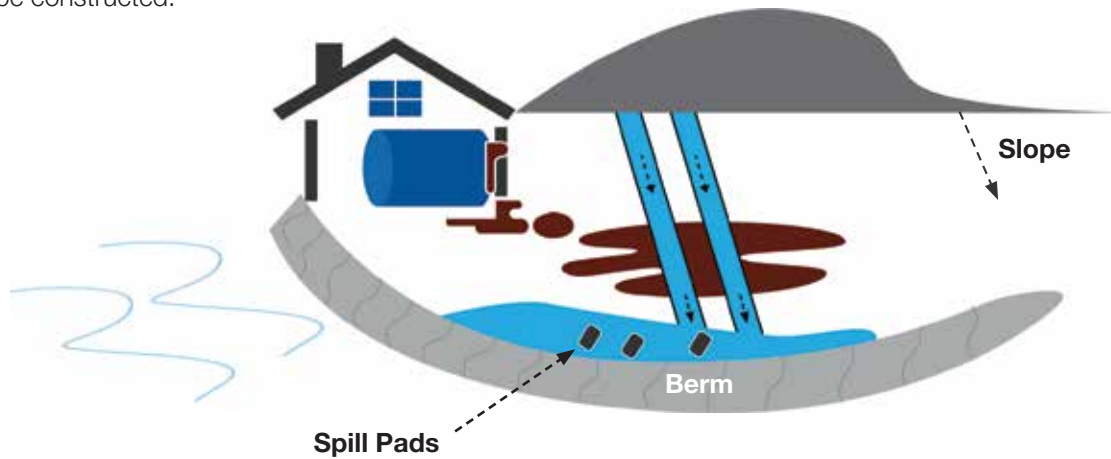
1. Preventing Water from Entering Spill Area



2. Preventing Water Mixed with Fuel from Leaving Site

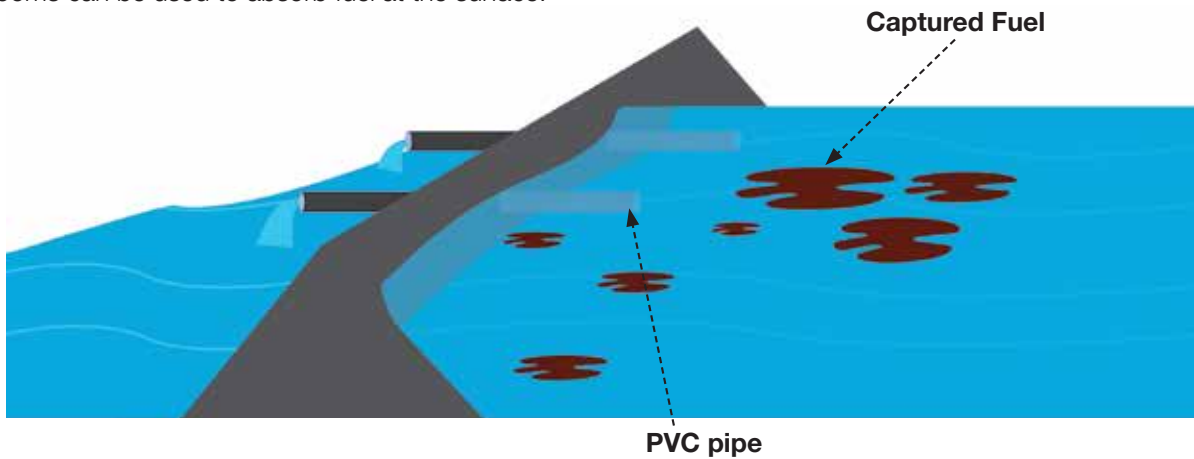
Building Berms

Spill pads can be used to absorb fuel on the surface. If too much water accumulates, an underflow dam can be constructed.



Underflow Dam

This device is used to allow water to pass through but still capture fuel floating on the surface. Spill pads or booms can be used to absorb fuel at the surface.



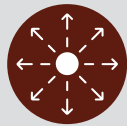


Once the spill site has been stabilized it is time to conduct an assessment of the site in a process called an **Environmental Site Assessment (ESA)**. This process is also called site characterization, and the **CCME** provides detailed guidance on how to conduct an effective site characterization process in their *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment*.¹⁵

An ESA is designed to:



Identify the nature and extent of contamination on a site



Characterize the actual and potential migration of contaminants



Assess the actual and potential adverse effects to public health and the environment

There are three potential phases of Environmental Site Assessments, each of which is described below. It is not necessary to conduct all three phases or to conduct the phases in sequence.

8.1 Phase I ESA

The objectives of a **Phase I ESA** are to determine:

- If the property is subject to actual contamination or potential sources of contamination
- If there are potential off-site sources of contamination to the property
- The locations on the property where contaminants are potentially present
- If additional assessment, such as a **Phase II ESA**, is recommended or required¹⁶



¹⁵ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME. p.6

¹⁶ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.7

Phase I ESAs are typically conducted remotely without physically attending the site in question. They are often conducted if a long period of time has elapsed since a spill was documented at a site, or someone is purchasing a property and wants to determine if contamination is present. A **Phase I ESA** might also be conducted if evidence of **Historical Contamination** is found and there is a need to find sources of contamination in the historical record.

The Canadian Standards Association (CSA) describes the principles and practices applicable to a **Phase I ESA**.¹⁷

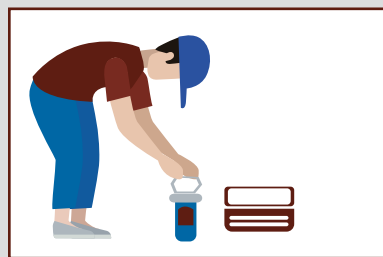
Phase I ESA

- Usually conducted remotely
- Is there likely contamination at the site?
- What are potential sources of contamination?
- Where on the site should we look for contaminants?
- Is a Phase II ESA required?



Phase II ESA

- Conducted on-site
- What are the environmental liabilities on the site?
- Where are the **Contaminants** and what are their concentrations?
- What do we need to know to prepare a **Remediation** program or a **Risk Assessment**?



8.2 Phase II ESA

A **Phase II ESA** involves intrusive investigations (e.g., boreholes/monitoring wells, test pits) and assessment through sampling, monitoring, and chemical analysis of applicable media (e.g., soil, groundwater, sediment, and/or vapours). It is usually completed by a professional engineer or environmental scientist. The type of report that is prepared should be determined at the beginning of the **ESA** process and meet the overall project objectives.¹⁸



¹⁷ Canadian Standards Association (2001) Z768- 01 (R2016). *Phase I Environmental Site Assessment*. Ottawa: CSA Group

¹⁸ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.7

The objectives of a **Phase II ESA** may include:



Determining potential environmental risks or environmental liabilities



Determining the location and concentration of **Contaminants** on or under a specific property area



Collecting data to inform other decisions such as the planning of **Remediation** programs or **Risk Assessments**



Assisting in the preparation of a **Remedial Action Plan**



Supporting the completion of a **Risk Assessment**

Within the approved scope, the site investigation should identify, characterize and/or delineate the nature and extent of contamination on, in or under the property.

The components of a **Phase II ESA** should include:

Developing data quality objectives

- Retaining licensed and qualified contractors such as utility locators, drillers, and excavators to conduct intrusive investigations as required
- Undertaking investigations and inspections when they can be done safely (e.g., utility locates, overhead clearance) and effectively (e.g., ground thawed, availability of equipment)
- Recovering representative soil, groundwater, surface water, sediment and/or soil vapour samples to characterize property conditions
- Retaining an appropriately accredited analytical laboratory to conduct laboratory analysis of samples collected
- Selecting the appropriate regulatory standards to compare the collected analytical data
- Interpreting and reporting sampling results to the client / **Responsible Party**
- Identifying if the **ESA** objectives have been met
- Providing recommendations for additional work¹⁹

¹⁹ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.7

The sampling methods used will be influenced by the types and concentrations of **Contaminants** encountered or suspected to be present, and by the environmental media to be sampled. Specific methods can range from **Field Screening** to more complex **Analytical Sampling**.

The CSA describes the principles and practices applicable to a **Phase II ESA**.²⁰

8.3 Phase III ESA



A **Phase III ESA** is very similar to a **Phase II ESA** but is conducted with a limited scope to address gaps in knowledge from a previous **ESA**.

A **Phase III ESA** is necessary if:

- **Phase II** testing provided insufficient data to characterize the site and any potential risk to human health, safety, and the environment, or
- **Phase II** testing indicates that significant and wide-spread contamination or information gaps exist.²¹

A **Phase III ESA** may include:

- Targeting and delineating the boundaries of identified contamination
- Defining physical site conditions and possible contaminant **Pathways** in greater detail, particularly with respect to possible **Risk Assessment**
- Providing **Contaminant** and other information necessary to finalize the selection of **Remediation** criteria or another suitable risk-based approach
- Providing all other information that is required in order to develop a **Remedial Action Plan** and prepare contract specifications and tender documents
- Developing a **Remedial Action Plan**; and
- Developing a cost estimate for the **Remediation**.²²

The **Phase III** detailed testing program will focus on areas identified in the **Phase II** program and involves a similar systematic approach to sampling, analysis, and evaluation.

²⁰ Canadian Standards Association (2000) CAN/CSA Z769-00 (R2018). *Phase II Environmental Site Assessment*. Ottawa: CSA Group

²¹ CCME (1997) PN 1279. *Guidance Document on the Management of Contaminated Sites in Canada*. Winnipeg: CCME. p.21

²² CCME (1997) PN 1279. *Guidance Document on the Management of Contaminated Sites in Canada*. Winnipeg: CCME. p.21

9 Testing for Contaminants

Testing for **Contaminants** typically occurs as part of a **Phase II ESA**.

Before undertaking any sampling program, it must be determined what **Contaminants** will be tested for—these are called **Contaminants of Potential Concern (COPCs)**. Limiting the scope of the sampling program in terms of what chemicals will be investigated is important as chemical analyses are expensive and time consuming.

Understanding the source of contamination will guide this decision, which should be made in dialogue with the ENV or **Lead Agency**. You must know the **Contaminant(s) of Potential Concern** before undertaking any sampling in order to ensure the appropriate protocols are being followed.

For example, if a motor oil spill occurs, the **Responsible Party** must develop a testing plan based on identifying the presence of heavy **Petroleum Hydrocarbons (PHCs)** as well as heavy metals. The site of a gasoline spill on the other hand will need to be investigated for the presence of light **Petroleum Hydrocarbons (PHCs)** and also **BTEX**, a group of toxic chemicals found in lighter fuels. A more detailed description of what chemicals are found in fuels and oils follows in [Section 10.1](#).

This section will discuss types of testing (**Field Screening vs. Analytical Sampling**) before discussing the elements of an effective sampling program. Finally, there is information on quality assurance and quality control.



Know what you are testing for!



Sampling Protocols

The **CCME** publishes protocols that must be followed when conducting **Analytical Sampling**. They vary depending on the **COPC** as well as the media being sampled (water, soil, or sediment).

The protocols are very detailed and specific, stipulating:

- Type of container
- Method for taking the sample
- Preservative agent (if required)
- Hold Time, etc.



Field Screening

Some **Contaminants** can be detected in a soil or water sample without requiring analysis in a laboratory. This analysis is called **Field Screening** and the objective is not to quantify the concentration and define the extent of contamination precisely, but rather to assist in identifying areas requiring **Analytical Sampling** and the selection of samples for analysis.

Several methods of **Field Screening** exist and the number of instruments available grows steadily each year. Officers of the ENV use **Field Screening** when responding to and inspecting spills of **Petroleum Hydrocarbons (PHCs)** such as gasoline and heating fuel.

Photo-Ionization Detectors (PID)

PIDs are devices commonly used by Officers of the ENV and environmental technicians in Nunavut.



Analytical Sampling



Analytical Sampling refers to the process of taking a small amount (sample) of matter and testing it in an accredited laboratory to determine what **Contaminants** are present in the sample, and in what concentrations.

An **Analytical Sampling** program is the only effective way to both accurately and precisely determine what **Contaminants** are present, in what locations, and in what concentrations.

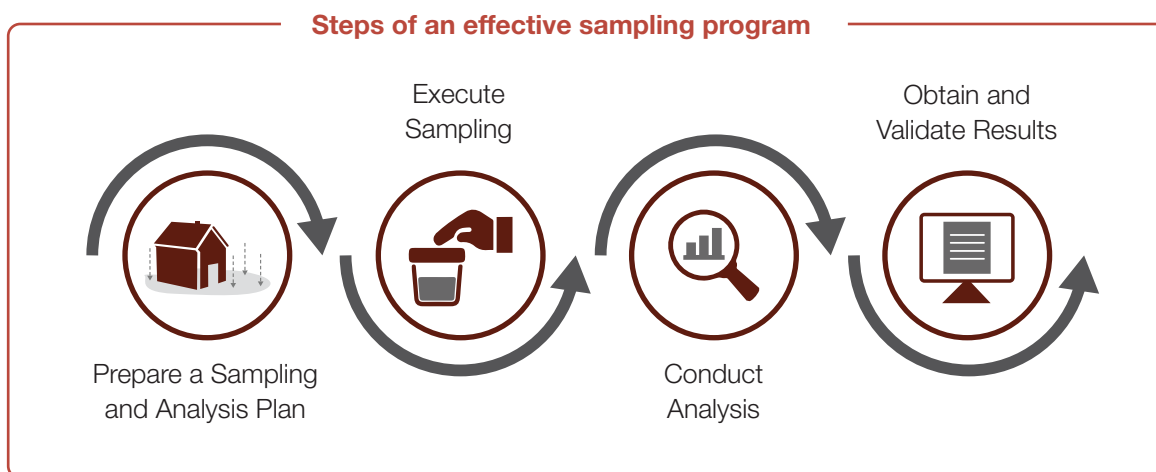
This section describes some general principles of a good sampling program, but a comprehensive guide is beyond the scope of this Guideline. More information is provided by **CCME**.²³

²³ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME



9.1 Conducting a Sampling Program

Before physically attending a site and taking samples, thought needs to be put into designing and planning the sampling program in order to be sure the objectives will be met. This section describes the steps of an effective sampling program.



Prepare a Sampling and Analysis Plan

Review existing data

- Determine sampling media, investigation tools
- Schedule program around seasonal and local resource limitations
- Design sampling program (number, type, location of samples)
- Plan sampling and analysis methods and **Quality Assurance Project Plan (QAPP)**²⁴



Execute Sampling

A sampling design indicating the number of samples to be taken in what locations should be created before beginning the actual sampling.

Many sampling design methods exist. Furthermore, the number of samples taken must be sufficient to provide an accurate representation of the site. **CCME** resources can offer more information on these important considerations.²⁵

²⁴ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME. pg. 16

²⁵ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME.

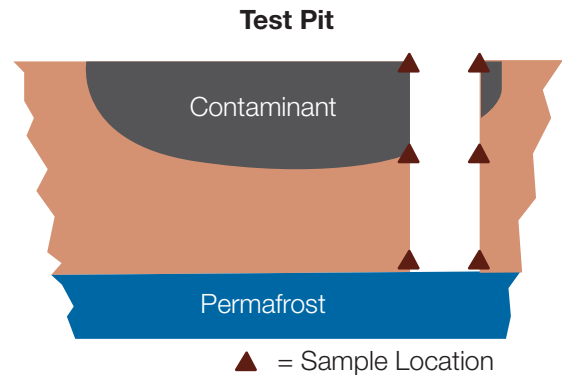


Important

If sampling is taking place to inform a **Risk Assessment**, the specific objectives of the **Risk Assessment** should be incorporated into the sampling design where applicable.

Soil Sampling

If the intention is to delineate the area on the site impacted by a **Contaminant**, it is usually necessary to dig **Test Pits** to determine the depth of the **Contaminant** plume in a given area.



Discrete Sample vs Composite Sample

Discrete Sample:

Taken from a single sampling point or location.

Composite Sample:

Obtained by combining multiple discrete samples. Requirements for use of composite samples is included as [Appendix D](#).

Soil composition is often irregular, with many soil elements having significant variability over distances as short as one metre. For characterization of contaminated sites, use of only discrete sampling type can result in missing this short-range variability. To achieve reasonably representative sampling using only discrete sampling, a large number of samples is often required. It is often practical to combine a number of discrete samples into one composite that represents the area of concern.²⁶

²⁶ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME. pg. 88



Important Note on Permafrost

Permafrost consists of ice, water, air, and soil. Melting of ice in the summer can create pathways for Contaminants to travel. Therefore, one should not assume that permafrost represents a barrier to Contaminant migration.²⁷



²⁷ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME. pg.45



Conduct Analysis of Samples

Samples being sent outside of the Territory for analysis should be accompanied by appropriate **Chain of Custody Form (CCF)** documentation.

Depending on the community in which samples are being taken and the **Contaminants of Potential Concern**, it may be difficult to ensure that samples are received at the analytical laboratory within the designated **Sample Hold Times**. In these cases, the laboratory report will include a note to the effect that the analysis may be affected by the time elapsed between the time the sample was taken and the subsequent analysis. The interpretation of the results should take this possible effect into consideration as will the ENV or designated **Lead Agency**.



Obtain and Validate Results

Once obtained, sampling results are used to create a map of impacted areas.

This can be rendered using a variety of software programs. Volumes of impacted media can then be calculated to inform the creation of a **Remedial Action Plan** or **Risk Assessment**. If data are insufficient to allow a decision on next steps for managing, a **Phase III ESA** may need to be conducted to fill in the gaps in knowledge.

9.2 Quality Assurance/Quality Control



The goal of representative sampling is to collect samples which will yield results that accurately characterize site conditions. The goal of quality assurance and quality control (QA/QC) is to limit errors and bias in sampling and analysis through management, assessment, and control measures.²⁸

A **Quality Assurance Project Plan (QAPP)** identifies all aspects of the **Environmental Site Assessment** process that may influence data quality.

To support the **QAPP**, field quality control checks are necessary.

The most important of these are:



Field Duplicates:

Two samples are taken from the same location and submitted to the laboratory (without being marked as a duplicate). These are used to assess sampling and analysis precision. It is recommended to have a minimum of 1 in 10 samples be field duplicates.²⁹



Background Sample:

A sample is taken updrift or upstream of the suspected spill source. The location of these samples should be recorded. This is used to determine background concentrations of the **COPCs**.³⁰



Chain of Custody Form:

This form, completed at the time of sampling, states information about the sample including the date and time the sample was taken. This ensures that the laboratory can verify if samples were received within prescribed **Sample Hold Times**.³¹

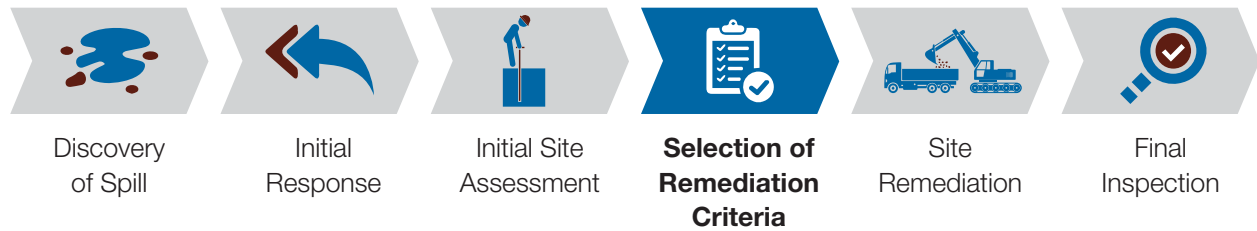
²⁸ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME. pg. 25

²⁹ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME. pg. 29

³⁰ CCME (2016) PN 1551. *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume 1 Guidance Manual*. Winnipeg: CCME. pg. 85

³¹ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.13

Selection of Remediation Criteria



Once the nature, extent, and quantity of contamination at a site have been characterized, *Canadian Environmental Quality Guidelines (CEQGs)*³² should be used to establish **Remediation** criteria and objectives. A brief description of the principal CEQGs employed in the **Remediation** of spill sites in Nunavut is provided in this section. Soil standards will be discussed followed by those for water. Finally, a section on a risk-based approach to managing spill sites is included.

It must be noted that these standards change regularly as the science behind them improves. It is up to the **Responsible Party** to ensure that **Remediation** is undertaken using the most up-to-date standards to ensure the protection of environmental and human health. The **Responsible Party** should discuss what standards will be used with the ENV or designated **Lead Agency** prior to the commencement of remedial activities.

The CEQGs may be adopted directly as the **Remediation** criteria and incorporated into the **Remedial Action Plan** or they may be modified within certain limits.

The potential for exposure to a given **Contaminant** by a given **Pathway** (e.g., inhalation, dermal contact) are at the heart of most CEQGs. Assessing the applicability of these **Pathways** to a given site, and the risk of exposure given the concentration of **Contaminant** present, are the principal components of a **Risk Assessment**. This risk-based approach is discussed in more detail in [Section 10.5](#).



Why are Petroleum Hydrocarbons (PHCs) a concern?

- The chemically reactive nature and volatility of **PHCs** can pose a fire/explosion hazard, especially if vapours enter confined spaces.
- Most **PHC** constituents are toxic to some degree.
- Lighter hydrocarbons (e.g., those of lower molecular weights) are mobile and can become a problem at considerable distances from their point of release due to transport in ground, water or air.
- Larger and branched-chain hydrocarbons are persistent in the environment.
- **PHCs** may create aesthetic problems such as offensive odours, tastes or appearances.³³

³³ CCME (2008). *Canada Wide Standards for Petroleum Hydrocarbons in Soil*. Winnipeg: CCME. p.3.

³² CCME (2021). *Canadian Environmental Quality Guidelines*. Winnipeg: CCME



10.1 Soil Quality Guidelines

The **CCME** publishes guidelines for most **Contaminants** that may be present in soil, including **Petroleum Hydrocarbons (PHCs)**, metals, chlorinated and non-chlorinated solvents, and various toxic organic compounds. Because most **Contaminant** spills in Nunavut involve **Petroleum Hydrocarbons**, this section will focus on **PHCs**. Criteria for select other contaminants can be found from **CCME** at www.ccme.ca.

CCME Soil Quality Standards for **PHCs** can be applied in any of three “Tiers”:

- **Tier 1: Generic Numerical Levels**
- **Tier 2: Adjustments to Tier 1 levels based on site-specific information**
- **Tier 3: Site-specific risk assessment**

A discussion of Tier 3 will be left to the final section on risk-based site management.

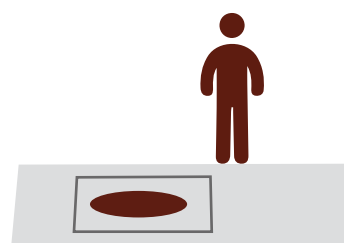
Tier 1
Guideline is applied directly



Tier 2
Guideline is modified as
specific pathways are
eliminated



Tier 3
Risk-based approach



The **CCME Soil Quality Standards** are based on four common uses of land: agricultural, residential/parkland, commercial, and industrial. Definitions of these land uses can be found in Section 15, [Definitions](#).

Petroleum Hydrocarbons are a complex mixture of organic molecules which have various chemical and physical properties. In their simplest form, these molecules are comprised of chains of carbon atoms with atoms of hydrogen along their length (see image). The number of carbon atoms in a molecule is abbreviated with the letter C. For example, a molecule with 10 carbon atoms is abbreviated as C10.

For the purposes of the **CCME Soil Quality Standards**, **PHCs** are divided into four fractions (F) to distinguish between lighter and heavier compounds. They are called F1, F2, F3 and F4.³⁴

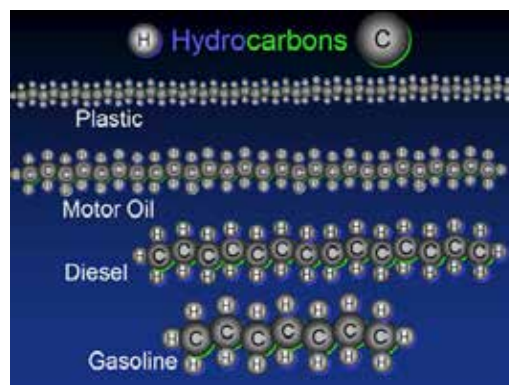


Image: <https://sites.google.com/site/microbesbyalice/what-is-a-hydrocarbon>

Lighter compounds will typically be more mobile in the environment, and have higher volatility and solubility when compared to the heavier compounds.

³⁴ CCME, CWS for PHCs in Soil: Scientific Rationale - Supporting Technical Document. p. 2-9

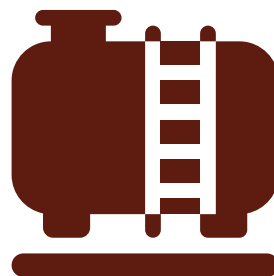
F1 (C6 - C10)

Found in light fuels such as gasoline.



F2 (>C10 - C16)

Found in kerosene, jet fuel, and light fuel oils (e.g., No. 2 fuel oil, Arctic diesel).



F3 (>C16 - C34)

Found more commonly in medium fuel oils such as bunker fuel and lubricants.



F4 (>C34 - C50)

Found in tars and waxes.



Because the fate and availability of **PHCs** depends on the type of soil in which it is contained, soil texture must be considered in the **CCME Soil Quality Standards**.

Simply put, coarse soils are defined as having more than 50% sand by mass and fine soils are defined as having less than 50% sand by mass.³⁵

Fine textured soils	greater than 50% by mass particles <u>less than</u> 75 µm mean diameter (D50 < 75 µm)
Coarse textured soils	greater than 50% by mass particles greater than 75 µm mean diameter (D50 > 75 µm)

³⁵ CCME (2008) PN 1399. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil: Scientific Rationale Supporting Technical Document*. Winnipeg: CCME. pp 3-23.



10.2 Tier 1: Generic Numerical Values

CCME Canada-Wide Standards Soil Quality Standard for PHCs in Surface Soil: Tier 1 Levels (mg/kg).³⁶

Land use	Soil Texture	Fraction 1 ^a (C6-C10)	Fraction 2 ^a (>C10-C16)	Fraction 3 ^a (>C16-C34)	Fraction 4 ^a (>C34)
Agricultural/Wildland	Fine-grained soil	210(170 ^b)	150	1300	5600
Residential/Parkland	Coarse-grained oil	30 ^c	150	300	2800
Commercial/Industrial	Fine-grained soil	320(170 ^b)	260(230 ^b)	2500	6600
	Coarse-grained oil	320(240 ^b)	260	1700	3300

^a All values are expressed as milligrams per kilogram (mg/kg).

^b Where applicable, for protection against contaminated groundwater discharge to an adjacent surface water body or for protection of potable groundwater.

^c Assumes contamination near a residence.

Tier 1 values are obtained by evaluating all possible contaminant **Pathways** and applying the lowest value.

Pathway-specific values for coarse soils (most common in Nunavut) can be found in the *CCME User Guidance* document.³⁷



Important note on BTEX

Four **Volatile Organic Compounds (VOCs)** are commonly singled out for special consideration. They are Benzene, Toluene, Ethylbenzene and Xylenes: shortened to **BTEX**.

Even though these compounds fall in the F1 range, they are measured and considered separately due to their toxicity, solubility and volatility.

CCME Tier 1 values for **BTEX** can be found on their website at www.ccme.ca

³⁶ CCME (2008). *Canada Wide Standards for Petroleum Hydrocarbons in Soil*. Winnipeg: CCME. p.6.

³⁷ CCME (2008) PN 1398. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil User Guidance*. Winnipeg: CCME.



10.3 Tier 2: Site-Specific Adjustments to Tier-1 Levels

Tier-2 levels may be generated and used when site conditions exist that modify human or ecological exposure to **PHC** (or other) contamination and, thereby, alter risks significantly, relative to the generic conditions used to derive Tier-1 levels.

In other words, if contaminant **Pathways** can be eliminated on a given site, the safe levels needed to eliminate the risks from those **Pathways** do not need to be applied to the **Remediation** standard employed.

Specific guidance on situations where modifications to the Tier 1 levels are appropriate, as well as details concerning implementation of the approach, is provided in the **CCME's User Guidance** document.³⁸

Tier-2 levels are derived on a site-by-site basis using site-specific parameters where necessary.

The potentially adjustable parameters and corresponding calculation protocols are summarized and referenced in a **CCME Technical Supplement**.³⁹

To apply Tier 2 levels to a site, the **Responsible Party** must present an application to the ENV or designated **Lead Agency** for approval. Suggested levels should be presented with sufficient scientific rationale and explanations.

10.4 Water Quality Guidelines



Water quality in Nunavut is subject to oversight by many regulatory agencies including the **Nunavut Water Board (NWB)**, **CIRNAC** and **ECCC**. These regulators enforce legislation specifically designed to protect and administer water such as the *Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002)* and *Fisheries Act (1985)*.

As such, the ENV will defer to these agencies and their enforcement of applicable legislation in most cases involving **Contaminants** in water on impacted sites or water being discharged to the environment.

However, the *Environmental Protection Act (1988)* applies to all discharges of **Contaminants** not sanctioned under federal law.

For most **Contaminants of Potential Concern**, standards set by the **CCME** in the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* will be used. These standards can be found on the **CCME** website at www.ccme.ca.

For water as for soil, a Tier 2 approach can be adopted for site-specific adjustments to Tier 1 levels. More details can be found in **CCME's** site-specific guidance on water quality.⁴⁰

³⁸ CCME (2008) PN 1398. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil User Guidance*. Winnipeg: CCME.

³⁹ CCME (2008). *Canada Wide Standards for Petroleum Hydrocarbons in Soil Technical Supplement*. Winnipeg: CCME

⁴⁰ CCME (2003). *Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives*. Winnipeg: CCME.



10.5 Risk-Based Approaches

An application of Tier 3 Environmental Quality Standards involves the completion of a site-specific **Risk Assessment** and the development of a risk management plan.⁴¹

A **Risk Assessment** is an examination of a given impacted site to evaluate the risk posed to humans and the natural environment from exposure to **Contaminants**.

The purpose of a **Risk Assessment** is to develop property-specific standards that will protect the uses that are being proposed to take place on the property.⁴² The technical activities of Tier 3 must be conducted by professionals competent in the field of human health and ecological risk assessment, which includes the disciplines of contaminated site characterization, toxicology, fate and transport modelling, exposure assessment and risk management.⁴³

The risk-based approach is a complex and time-consuming process that involves at least the following two steps:⁴⁴

- Evaluation of the hazard and risk from **Contaminant** to potential receptors on a site-specific basis to determine an appropriate **Remediation** objective
- Design and implementation of a risk management plan to address remedial objective exceedances

A **Risk Assessment** approach to managing site contamination may be the preferred option when:⁴⁵

- Full **Remediation** to applicable criteria is not financially feasible or is not technically practical
- Site conditions are unique and exposure **Pathways**, receptors or other site characteristics differ significantly from the assumptions used to develop the *Canadian Environmental Quality Guidelines*.
- **Remediation** is required over a long period of time and a **Risk Assessment** is required to protect health and safety of users of the site during the interim; OR
- It supports sustainable practices (such as reducing the need for the transportation and disposal of soil).

The **Risk Assessment** should consider the following but not be limited to:⁴⁶

- Evaluation of the potential risks to human health or ecological receptors based on site-specific **Contaminants** and exposure **Pathways**
- The current use and/or proposed future use
- Development of site-specific criteria for a **Contaminant** (which may or may not have a published criteria)
- Development of risk-based **Remediation** targets
- Determination of appropriate **Risk Management Measures (RMM)**.

⁴¹ CCME (2008) PN 1398. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil User Guidance*. Winnipeg: CCME. pg. 39.

⁴² Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.39

⁴³ CCME (2008) PN 1398. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil User Guidance*. Winnipeg: CCME. pg. 39.

⁴⁴ CCME (1999). *Guidance Manual for Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites in Canada*. Winnipeg: CCME.

⁴⁵ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.9

⁴⁶ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.9

For the purposes of **Risk Assessment**, it is essential that all sources of soil contamination and the distribution of **Contaminants** in soil be understood in order to assess potential exposure **Pathways**. (See note on sampling below).

Risk Management Measures (RMM) are actions or infrastructure to control potential **Contaminant** exposure **Pathways**. The application of site-specific standards may be contingent on the implementation of **RMMs**.⁴⁷

RMMs are designed to achieve the same target level of risk as the applicable generic criteria and may include administrative and/or engineered solutions.

Examples of administrative **RMMs** include:



Land uses restrictions



Soil and ground water management plans



Building restrictions and building use restrictions



Worker health and safety plans

Examples of engineered **RMMs** include:



Physical barriers to eliminate contact with contaminated media



Vapour intrusion mitigation systems



Control of contaminated groundwater flow

Engineers recommending and designing engineered **RMMs** require professional accreditation and familiarity with applicable regulations and codes.



Sampling Design Objectives for Risk Assessment

The site investigator, with input from the risk assessor, should develop sampling objectives that are consistent with the goals of the **Risk Assessment**.

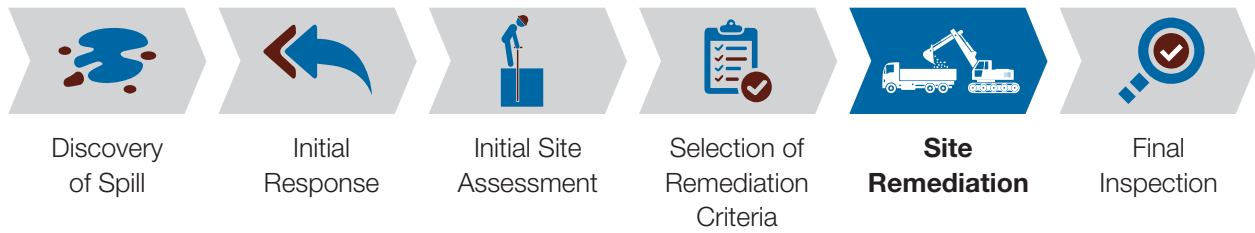
For more detailed information on **Risk Assessments** and risk management the following sources should be consulted:

CCME (2008) PN 1398. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil User Guidance*. Winnipeg: CCME.

CCME (1999). *Guidance Manual for Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites in Canada*. Winnipeg: CCME

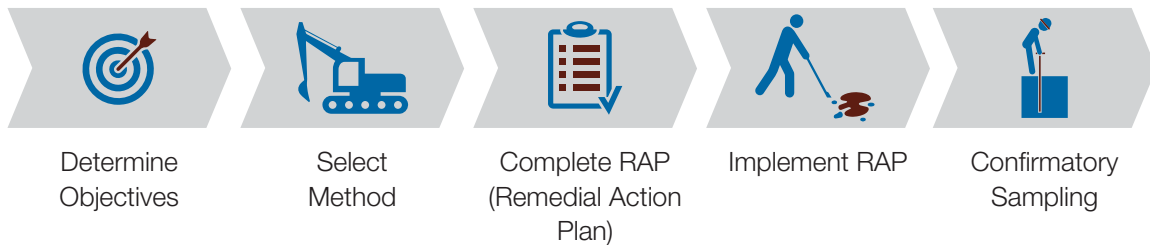
⁴⁷ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.9.

11 Site Remediation



This section is not intended to provide a technical guide on **Remediation** techniques. The appropriate procedures and activities for the **Remediation** of any particular site must be determined based on the specific circumstances related to that site. These activities are usually overseen by a qualified engineer. This section will provide an overview of the **Remediation** process and the requirements of the ENV.

Steps of Contaminated Site Remediation



11.1 Determine Objectives



Reviewing the information gathered during the **Environmental Site Assessment** and evaluating contamination levels in relation to appropriate *Canadian Environmental Quality Guidelines* guide the process of setting **RMM** objectives. Site-specific conditions also largely determine what is achievable, practical, and affordable.

Typically, the objective of **Remediation** is to return an impacted property/site to an environmental condition that will sustain its intended reuse without the need for administrative or engineering **RMMs**.

The awareness of environmental issues among community governments and the public has increased significantly in recent years. Property owners or site operators should consider developing a **Community Information Program** early in the planning process to help guide their relationship with these important stakeholders. In addition to informing the public of planned or ongoing activities, the **Community Information Program** should facilitate opportunities for the public to comment on and provide input to objectives of the **Remediation** as well as technical decisions of public interest (e.g., noise, traffic, and public safety). In this way, a consensus can be achieved which will help to facilitate successful **Remediation** and avoid potential future conflict.

11.2 Select Remediation Method



There are two general approaches for remediating contaminated soil/materials in Nunavut:

On-site (in-situ) treatment: Contaminated material is treated in place without removal. On-site treatment relies on either the degradation of **Contaminants** such as **PHCs** or their gradual removal through an extraction process.

- Degradation of contaminants can be accelerated with the use of heat, air, or micro-organisms.
- Extraction can be achieved using Soil Vapour Extraction.

These treatments do not lend themselves well to the environmental conditions in Nunavut and are rarely approved and employed.

Off-site (ex-situ) treatment or disposal: Contaminated material is removed from the site for treatment or disposal.

Treatment:

Soil impacted with **PHCs** can be treated in a **Landfarm** where aeration and micro-organisms contribute to the accelerated degradation of contaminants. Water can be filtered through a specialized apparatus to remove most **Contaminants** present. Such treatment methods must be conducted at a designated **Hazardous Waste Management Facility** registered with the ENV.

Disposal:

If no treatment options are available in a given community, contaminated materials can be shipped to southern Canada for disposal.

In many cases, consultation with the ENV and/or other regulatory agencies may be necessary to ensure the overall strategy meets regulatory requirements.

11.3 Completion Of A Remedial Action Plan



The goal of a **Remedial Action Plan (RAP)** is to communicate to the ENV or designated **Lead Agency** the information known about the site and the plans for **Remediation**.

The **Remedial Action Plan** must include:

- Contact information for the **Responsible Party** and any contractors assisting in **Remediation** work
- Information regarding the spill: product, quantity, date of spill, etc.
- Risks of contamination to nearby water courses
- Actions that have been taken or will be taken to contain the released product
- Description of chosen **Remediation** method and implementation plan
- Fate of contaminated media if they are to be removed from the site
- Description of difficulties foreseen during **Remediation**
- Scheduled containment date (no more product leaving the site)
- Scheduled start date for remedial activities
- Scheduled completion date for remedial activities

The **Remedial Action Plan** can include when necessary:

- Objectives and **Remediation** targets, including any specific remediation standard to be achieved
- Stakeholder concerns
- Overview of the site contamination and site conditions affecting **Remediation**
- Requirements for a site-specific health and safety plan
- Risk management plans
- Types of small-scale tests to confirm the viability of specific options, including treatment equipment, if any
- Government regulatory approval requirements
- Methods to manage accumulated water, dust, noise, odour and traffic contingency plans
- Identification of the fate of residual contaminants
- **Remediation** verification and long-term monitoring plans

Requirements, recommendations, and additional guidance for the development of **Remedial Action Plans** can be found within the *Environmental Site Assessment, Remediation and Management Guideline*.⁴⁸

The ENV has created a **RAP** template that includes all the required information that must be provided by the **Responsible Party**. This template is included as [Appendix B](#).

Remedial Action Plans are subject to review by the regulatory authorities, specifically the designated **Lead Agency**. The **RAP** should be submitted to authorities before the intended mobilization date to ensure all regulatory requirements are being met and avoid unnecessary delays.

A Worker Health and Safety Plan may also need to be developed and submitted to the **Workers' Safety and Compensation Commission**.

Remedial Action Plan

This form is to be completed by the responsible party of a spill or by an organization designated to do so on their behalf. This form should be complete and submitted to the Department of Environment by the date set on page 3. It can be returned to the local Conservation Office or sent to the appropriate Environmental Protection Officer (EPO) at the contact information provided.

If you need more space, attach extra pages as required. Please include diagrams and photos as well.

This form will be used as a remediation plan as outlined in the Property Owner's Guide to Contaminated Site Remediation or Manual produced by the Government of Ontario. Any changes can be submitted to the Department of Environment.

PART 1: Contact Information

Responsible Party: _____

In the case of an organization, the primary and secondary people of contact are: _____ and _____

Contact Phone numbers: _____

Primary: _____ Secondary: _____

E-mail addresses: _____

Primary: _____ Secondary: _____

1-800-387-7292 1-800-387-7292 1-800-387-7292 1-800-387-7292

⁴⁸ Professional Engineers Ontario (2020). *Environmental Site Assessment, Remediation and Management Guideline*. Toronto: PEO. p.11



11.4 Implementation of a Remedial Action Plan

Site clean-up usually involves using a backhoe, excavator, or other heavy equipment to remove contaminated soil. This soil should be brought to a **Landfarm** or other storage area. Contaminated soil must be placed in Liners or Containment Bags to prevent fuel from leaking out.

Transportation of Contaminated Soil

Soils contaminated with fuel may meet the definition of a **Dangerous Good** under the *Transportation of Dangerous Goods Regulations* (2001) and thereby become **Hazardous Waste** under the *Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (2021).

Soils are **Dangerous Goods** if they meet the criteria for a Class 4.1 Flammable Solid. These criteria are listed in the **TDG Regulations** Section 2.21. Section 2.21 refers to substances determined to be “readily combustible” in accordance with Section 2.4.2.2 of the UN Recommendations.⁴⁹

If soils are confirmed to be **Dangerous Goods** they must be packaged according to the *Transportation of Dangerous Goods Regulations* (2001).



Site Control and Access

Controlling access to the spill site during the investigation and **Remediation** stages will help to minimize exposure of the public, workers, and unaffected adjacent areas, as well as protect the public from site hazards and prevent vandalism. The remedial activities and site conditions will influence the types and extent of necessary measures. For small, short-term projects, temporary snow fencing and hazard tape may be all that is required. For large long-term projects, access may need to be controlled through fencing and site security.



⁴⁹ Transportation of Dangerous Goods Regulations (2001), Section 2.21



Changing Site Conditions

Unanticipated developments can occur during any **Remediation** project. The **Remedial Action Plan** must be flexible enough to enable changes to be made. Any significant changes to the **RAP** must be submitted for review.

For example, requirements for **Personal Protective Equipment (PPE)** might need to be adjusted as **Contaminant** levels encountered are higher or lower than anticipated.

Water Management

Most remedial activities in Nunavut take place during the summer months. When excavating contaminated soil, there is a high likelihood of finding groundwater. Water may also flow into an existing excavation after rainfall. In anticipation of these outcomes, a management plan for water should be prepared before any excavation work.

Water located in an excavation is likely to be contaminated by the surrounding soil. This water cannot simply be pumped out onto an adjacent area as this will spread contamination and may constitute an infraction such as a **Discharge of Contaminants** prohibited under the *Environmental Protection Act* (1988). Wastewater from a contaminated site must be removed and temporarily stored for testing. Regulatory approval for discharge can then be obtained once it has been demonstrated to meet relevant criteria before or after treatment.



Record Keeping



All remedial activities that take place on a contaminated site should be recorded. This is to demonstrate due diligence in case of accidents or failures, communicate progress to the regulatory authorities, and keep track of events that may be important in later stages of work. Notes and photographs should be taken by the site manager and other staff working at the site.



11.5 Confirmatory Sampling



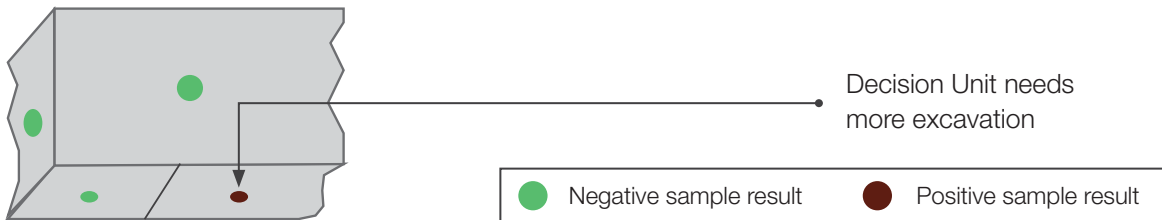
Confirmatory testing and analysis must be undertaken to demonstrate that the contamination has been successfully removed or stabilized, and the **Remediation** objectives achieved.

If the **Remediation** was an excavation of contaminated soil, samples must be taken inside the excavation. The excavation may be divided into **Decision Units (DU)** and one composite sample taken for each **Decision Unit**.

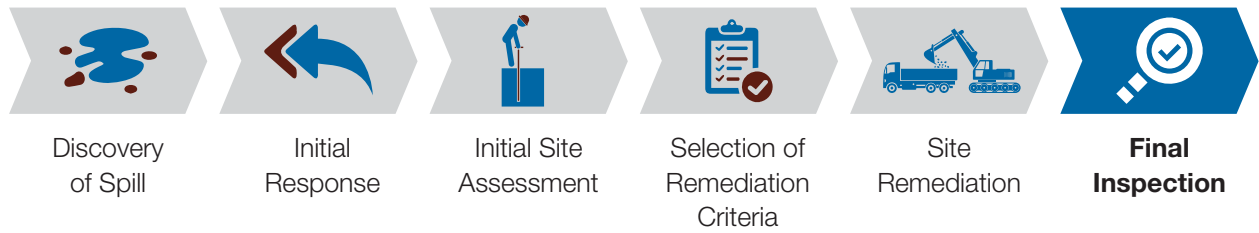
For example, if each wall and each half of the floor is a **DU**:



If the sample result for one **DU** comes back above the level of the relevant criteria, then that **DU** area needs to be excavated further.



12 Final Inspection and Closure Confirmation



Confirmation



Important

In cases where an excavation has taken place, the excavation must remain open (if conditions allow) until an Officer has been able to inspect the site.

Once confirmatory testing has demonstrated that **Remediation** is complete, the **Responsible Party** must notify the ENV or designated **Lead Agency** and request an inspection of the site.

Once the **Lead Agency** has determined that the contamination has been removed or stabilized, they will “Close” the spill. A confirmation of this closure will be sent to the **Responsible Party** and should be kept for their records.

A spill file that has been closed can always be re-opened if it is found that the **Remediation** is in fact incomplete.

The Government of the Northwest Territories maintains a database of all spills reported to the **NU Spill Report Line**. The status of the spill (open or closed) is tracked. Keeping records of past spills and all **Remediation** work is the responsibility of the **Lead Agency**.

Members of the public have the right to request information from the Government of Nunavut regarding spills and site **Remediation** under legislation such as the *Access to Information and Protection of Privacy (ATIPP) Act* (1994) and the *Environmental Rights Act* (1988).

13 Long-Term Monitoring



The landowner or site operator may be required to undertake long-term monitoring as a condition of the **Lead Agency** and other regulatory authorities providing conditional closure. Long-term monitoring programs should always be developed in consultation with regulatory authorities and may consist of soil, groundwater, surface water and air sampling and analysis; and periodic inspections of on-site containment and treatment facilities, stabilized structures, and restricted site access measures. The landowner or site manager should anticipate having to implement a long-term monitoring program wherever a risk-management approach to site **Remediation** is undertaken.

14 Conclusion



Contaminant spills pose a risk to the health of the public and the environment in Nunavut. Although prevention is the best strategy to mitigate this risk, spills cannot always be prevented. When spills do occur, laws and standards are in place to ensure that those responsible take the necessary measures to remedy the impacts they have had on their community and the surrounding natural environment.

This **Guideline** is intended to provide an overview of the steps required and industry best practices for remediating **Contaminant** spills in the Territory. The focus of the guide is on **Petroleum Hydrocarbon** spills due to their high frequency in Nunavut. It should be noted that, in most cases, spills of other contaminants can be remediated using the same principles and methods described in this Guideline.

This Guideline does not replace the need for the **Responsible Party** to be aware of their legal responsibilities and comply with all applicable federal and territorial legislation and community by-laws.

15 Definitions

Accuracy:

How close a measured value is to the true value.

Agricultural Lands:

In Nunavut, refers primarily to lands that provide habitat for resident and transitory wildlife and native flora.¹

Analytical Sampling:

The measurement of **Contaminant** concentration in a small amount of matter taken from an area under investigation. The measurement is performed in a laboratory where instruments can precisely and accurately detect the contaminant in question and provide a concentration.

BTEX:

Four Volatile Organic Compounds (**VOCs**) commonly singled out for special consideration due to their toxicity. They are Benzene, Toluene, Ethylbenzene, and Xylenes.

Canadian Environmental Quality Guidelines (CEQGs):

Produced by **CCME**, these standards provide science-based goals for the quality of aquatic and terrestrial ecosystems.

Canadian Council of Ministers of the Environment (CCME):

The **CCME** is the primary minister-led intergovernmental forum for collective action on environmental issues of national and international concern.

Chain of Custody Form (CCF):

A document that accompanies samples (or other evidence) to register their ownership history from the time they are collected in the environment at a site, to the time they are analyzed in a lab. A **CCF** is used to track samples as they are shipped to a laboratory for **Analytical Sampling**. Sometimes the **CCF** will have information related to what analysis is requested of the laboratory.

Commercial Lands:

Lands where the primary activity is commercial and there is free access to all members of the public, including children. The use may include, for example, commercial day-care centres.²

Commissioner's Land:

Land subject to and defined in the *Commissioner's Land Act* (1988). **Commissioner's Lands** typically surround Nunavut communities. However, most public lands in Nunavut are not under the administration of the Commissioner.

Concentration:

The amount of chemical or substance per unit mass or volume. **Concentration** of a **Contaminant** is typically expressed as milligrams per liter (mg/L) or micrograms per liter (µg/L) in water, milligrams per kilogram (mg/kg) in soil and food and micrograms per cubic meter (µg/m³) in air. **Concentrations** may also be expressed as parts per million (ppm) or parts per billion (ppb).

1 mg/liter = 1 ppm or 1000 ppb

1 µg/liter = 1 ppb

1 mg/kg = 1 ppm or 1000 ppb

¹ CWS for PHCs in Soil: Scientific Rationale - Supporting Technical Document, p.2-13

² CWS for PHCs in Soil: Scientific Rationale - Supporting Technical Document, p.2-13

Contaminant:

A substance that has been released into the environment and has the potential to harm people, plants and/or animals.

Defined in the *Environmental Protection Act* (1988) as:

“any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,

- endangers the health, safety or welfare of persons,
- interferes or is likely to interfere with normal enjoyment of life or property,
- endangers the health of animal life, or
- causes or is likely to cause damage to plant life or to property;”

Contaminants of Potential Concern (COPCs):

Chemicals that may present a risk to environmental or human health on a given site or in a given area.

Criteria:

Numerical standards that are established for chemical substances in soil, water, sediment or air to determine the acceptability of a site for a specific intended land use.

Decision Unit (DU):

A defined area being sampled in order to assess whether or not it requires more remediation work.

Ecosystem:

A community of plants and animals and their environment.

Environmental Site Assessment (ESA):

The scientific analysis of a specified piece of land intended to identify and quantify environmental contamination.

Field Screening:

The use of instruments to detect **Contaminants** in a sample without the need for analysis in a laboratory.

Hazardous Waste:

Hazardous Waste is defined by the *Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (2021) under the *Canadian Environmental Protection Act* (1999).

According to these, Hazardous Waste is:

1. Included in **Dangerous Goods Classes** 2 to 6, 8 or 9
2. Requires special handling and disposal of the materials that meets safety requirements.
3. Not household in origin, or being returned directly to the manufacturer.³

Headspace:

The empty volume in a container between the cap and the solid or liquid level of the sample.

Historical Contamination:

Potentially harmful chemicals that have been introduced into the environment in the distant past and for which a **Responsible Party** has not or cannot be identified.

³ Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (2021) SOR/2021-25

Industrial Lands:

Lands where the primary activity involves the production, manufacture, or construction of goods. Public access is restricted, and children are not permitted continuous access or occupancy.⁴

Inspection:

The physical examination of a thing or area permitted under specified legislation. Typically an inspection occurs to verify compliance with a law or regulation.

Investigation:

The process of determining the details surrounding a suspected offence under specified legislation.

Lead Agency:

The government regulator designated by the *Northwest Territories–Nunavut Spills Working Agreement* to take on specified responsibilities as it pertains to a given contaminant spill. These responsibilities are listed in the Agreement and include evaluating and coordinating government actions related to the spill response and its remediation.

Mystery Spill:

A spill of a pollutant from an unknown source in Canadian waters.

Northwest Territories–Nunavut Spills Working Agreement:

An agreement between the principal environmental regulators of Nunavut and NWT aimed at ensuring cooperative and efficient responses to contaminant spills. The Agreement was last revised in 2014 and is maintained through ongoing collaboration of regulators in the NWT-NU Spills Working Group.

NU Spill Report Line:

A 24-hour service for reporting contaminant spills in Nunavut. A call can be made to **867-920-8130** or email sent to spills@gov.nt.ca.

Pathway:

The mechanism by which a contaminant affects human or ecological health. Examples include direct ingestion, inhalation, contact with the skin, etc. A pathway leads from a source to a **Receptor**.

Personal Protective Equipment (PPE):

Equipment used to protect workers from the harmful effects of chemicals or physical injury that may occur in a given area.

Petroleum Hydrocarbons (PHCs):

Petroleum Hydrocarbons (**PHC**) is a general term used to describe mixtures of organic compounds found in or derived from geological substances such as oil, bitumen and coal. For the purposes of environmental standards, **PHCs** exclude known carcinogens such as benzene and benzo(a)pyrene, which are addressed as target compounds. Because of the relatively long history of managing toluene, ethylbenzene, and xylenes (TEX) as target compounds, these are also excluded from **PHC**.⁵

Photo-Ionization Detector (PID):

An instrument used to detect **Volatile Organic Compounds** in air.

Precision:

How close measured values are to each other; exactness.

⁴ CWS for PHCs in Soil: Scientific Rationale - Supporting Technical Document, p.2-13

⁵ Canada Wide Standards for Petroleum Hydrocarbons in Soil, p.3

Quality Assurance Project Plan (QAPP):

A set of measures that will be taken both during sampling and analysis to ensure that the information obtained **Accurately** represents conditions at the site being assessed.

Receptor:

A person or organism subjected to chemical exposure or an ecosystem component that is, or may be, adversely affected by a pollutant or other stress emanating from a contaminated site. Receptors may include biological or abiotic (e.g., air or water quality) components.

Remedial Action Plan (RAP):

A document submitted to regulatory authorities that includes specific information on a spill site including what impacts are known and what remediation is proposed. A RAP template including all required information for submission to the ENV is included as [Appendix B](#).

Remediation:

The actions taken to reverse or limit the damage caused by a **Contaminant Spill**.

Reportable Quantity:

The amount of a given product that when spilled requires a report to be sent to the **NU Spill Report Line**. This amount is shown in [Appendix E](#).

Residential/Parkland Lands:

Lands where the primary activity is residential or recreational activity. The ecologically-based approach assumes parkland is used as a buffer between areas of residency, but this does not include wild lands such as national or provincial parks, other than campground areas.⁶

Responsible Party:

The person, or organization, that discharged or permitted the discharge of a contaminant into the environment and is thus responsible for repairing or limiting the resulting damage to the environment.

Risk Assessment:

A scientific examination of the risk posed to humans and the natural environment from exposure to a contaminant on a given site. The purpose of a risk assessment is to develop property specific standards that will protect the uses that are being proposed to take place on the property.⁷

Risk Management Measure (RMM):

The actions or infrastructure implemented to eliminate or control potential contaminant exposure **Pathways**.⁸

Sample Hold Times:

The amount of time permitted by a given method for sampling and analysis that may elapse between a sample being taken and the subsequent analysis in a laboratory.

Special Waste:

The ENV defines **Special Waste** as any unwanted substance that can bring significant harm to people or the environment. It is a waste that must be handled, stored and disposed of separately from regular solid waste.

⁶ CWS for PHCs in Soil: Scientific Rationale - Supporting Technical Document, p.2-13

⁷ Professional Engineers Ontario, Environmental Site Assessment, Remediation and Management Guideline, p.15

⁸ Professional Engineers Ontario, Environmental Site Assessment, Remediation and Management Guideline, p.15

Spill Contingency Plan:

A document intended to prepare a facility for the possibility of a contaminant spill. A Spill Contingency Plan is prepared in accordance with the *Spill Contingency Planning and Reporting Regulations* (1993).

Test Pit:

An excavation conducted to obtain samples below the surface of the ground and thereby delineate the extent of contamination in a given area.

Volatile Organic Compounds (VOCs):

Chemicals made primarily of carbon and hydrogen that have a low boiling point and therefore evaporate easily into the air. Many of these are harmful to human and environmental health.

Workplace Hazardous Materials Information System (WHMIS):

Canada's national workplace hazard communications standard. Administered by Health Canada.

16 References

- Canadian Council of Ministers of the Environment (CCME) (1997) PN 1279. *Guidance Document on the Management of Contaminated Sites in Canada*. Winnipeg: CCME. Available from: https://ccme.ca/en/res/guidance_management_cs_e.pdf [Accessed 30 November 2021].
- Canadian Council of Ministers of the Environment (CCME) (1999). *Guidance Manual for Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites in Canada*. Winnipeg: CCME. Available from: <https://ccme.ca/en/res/guidance-manual-for-developing-site-specific-soil-quality-remediation-objectives-for-contaminated-sites-in-canada-en.pdf> [Accessed 30 November 2021].
- Canadian Council of Ministers of the Environment (CCME) (2003). *Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives*. Winnipeg: CCME. Available from: <https://ccme.ca/en/res/guidance-on-the-site-specific-application-of-water-quality-guidelines-in-canada-en.pdf> [Accessed 30 November 2021].
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- Canadian Council of Ministers of the Environment (CCME) (2008) PN 1399. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil: Scientific Rationale Supporting Technical Document*. Winnipeg: CCME. Available from: <http://registry.mvlwb.ca/Documents/MV2010L1-0001/MV2010L1-0001%20-%20Canada%20Wide%20Standard%20for%20Petroleum%20HydroCarbons%20PHC%20in%20Soil%20-%20May12-10.pdf> [Accessed 30 November 2021].
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- Canadian Council of Ministers of the Environment (CCME) (2021). *Canadian Environmental Quality Guidelines*. Winnipeg: CCME. Available from: <https://ccme.ca/en/resources#> [Accessed 30 November 2021].
- Canadian Council of Ministers of the Environment (CCME) (2008) PN 1398. *Canada-Wide Standard for Petroleum Hydrocarbons in Soil User Guidance*. Winnipeg: CCME. Available from: https://ccme.ca/en/res/cws_phc_user_guide_1.1_e.pdf [Accessed 30 November 2021].
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- Canadian Standards Association (2001) CAN/CSA Z768-01 (R2016). *Phase I Environmental Site Assessment*. Ottawa: CSA Group. Available from: <https://www.csagroup.org/store/product/Z768-01/> [Accessed 30 November 2021].
- Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations 2021 SOR/2021-25. Available from: <https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-25/page-1.html> [Accessed 26 May 2022].
- Environmental Protection Act 1988 RSNWT (Nu) c E-7. Available from: <https://canlii.ca/t/8l5s> [Accessed 30 November 2021].

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Spill Contingency Planning and Reporting Regulations 2006 NWT Reg (Nu) 068-93. Available from: <https://canlii.ca/t/khb5> [Accessed 30 November 2021].

For additional information on the remediation of contaminant spills, or to obtain a complete listing of guidelines, go to the Department of Environment website or contact the Department at:

Environmental Protection Division
Department of Environment
P.O. Box 1000, Stn. 1360
Iqaluit, Nunavut, X0A 0H0

Phone: (867) 975-7700

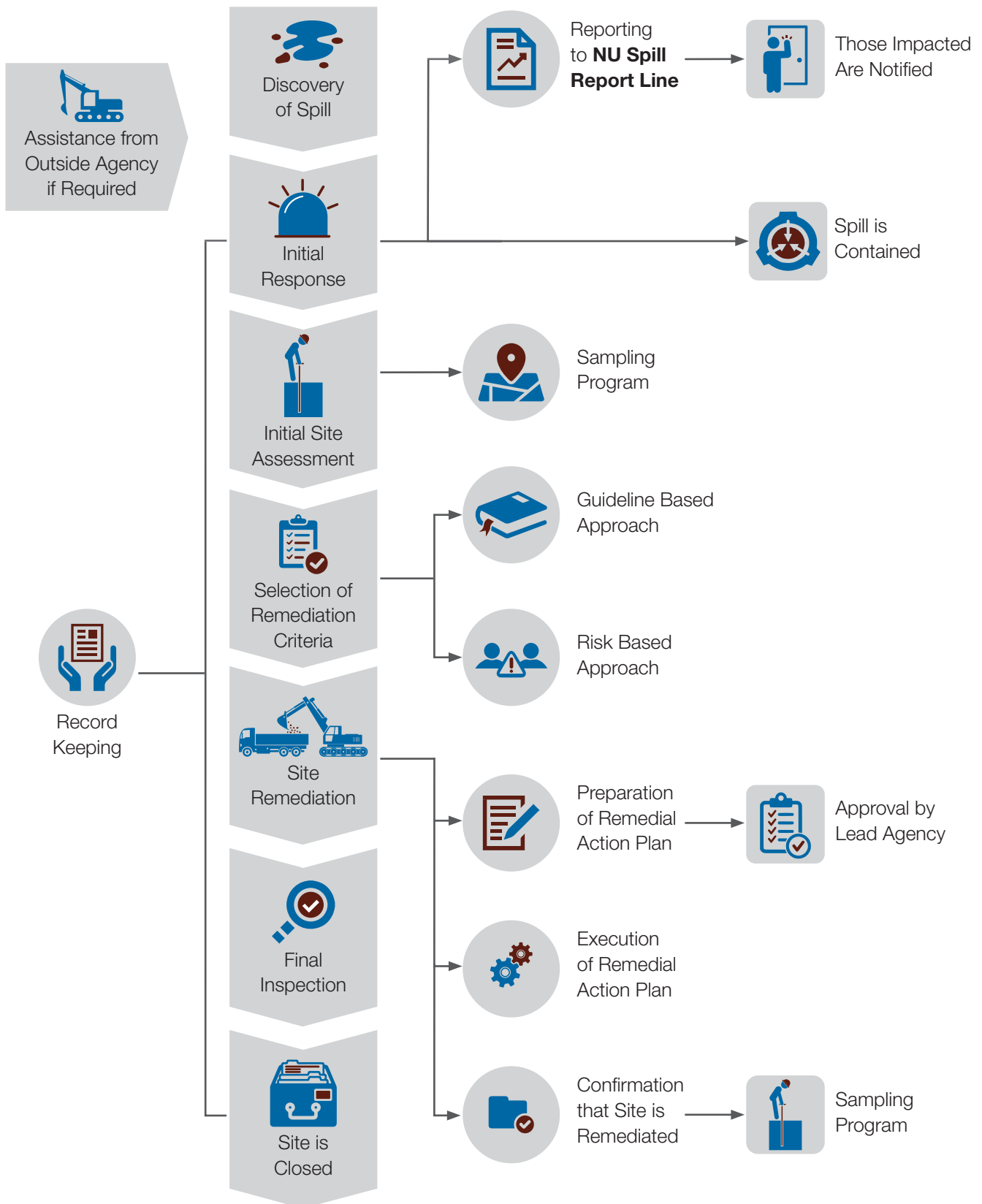
Fax: (867) 975-7742

www.gov.nu.ca/environment

Contingency plans are to be submitted to the above address.



Appendix A: Spill Remediation Flow Chart



Appendix B: Remedial Action Plan Template



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Building *Nunavut* Together
Nunavut luqatigiingniq
Bâtir le *Nunavut* ensemble

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Department of Environment
Avatiliqyikkut
Ministère de l'Environnement

Remedial Action Plan

This form is to be completed by the responsible party of a spill or by an organization designated to do so on their behalf. This form should be completed and submitted to the Department of Environment by the date set on page 5. It can be returned to the local Conservation Officer or sent to the appropriate Environmental Protection Officer (EPO) at the contact information provided.

If you need more space, attach extra pages as required. Please include diagrams and pictures as well.

This form will be used as a remediation plan as outlined in the *Property Owner's Guide to Contaminated Site Remediation in Nunavut* produced by the Government of Nunavut. Any changes can be submitted to the Department of Environment.

PART 1: Contact information

Responsible Party:

In the case of an organization, the primary and secondary people of contact are:

_____ and _____

Contact Phone numbers:

Primary: _____ Secondary: _____

e-mail addresses:

Primary: _____ Secondary: _____

P.O. Box 1000, Stn.1360

C.P. Box 1000, Succursale1360

☎(867) 975-7726

Iqaluit, Nunavut X0A 0H0

Iqaluit, Nunavut X0A 0H0

☎(867) 975-7742

www.gov.nu.ca

Appendix B: Remedial Action Plan Template



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Building *Nunavut* Together
Nunavut iluqatigilngniq
Bâtir le *Nunavut* ensemble

ᑭᑎᑎᑎ ᑭᑎᑎᑎ
Department of Environment
Avatiliqiyikkut
Ministère de l'Environnement

PART 2: Spill details and containment

Product released: _____

Date of release: _____

Spill Report # (If known): _____

Estimated quantity released: _____

Explain how you estimated the quantity released:

Size of area affected (m² or ft²): _____

Describe any water courses in the spill area that need to be taken into consideration:

What courses of action have been taken, or will be taken in order to prevent the released product from spreading further.

Diagram or other information:

P.O. Box 1000, Stn.1360

C.P. Box 1000, Succursale1360

Iqaluit, Nunavut X0A 0H0

Iqaluit, Nunavut X0A 0H0

1(867) 975-7726

1(867) 975-7742

www.gov.nu.ca

Appendix B: Remedial Action Plan Template



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Building *Nunavut* Together
Nunavut iluqatiglingniq
Bâtir le *Nunavut* ensemble

ᑲᑲᑲ ᑲᑲᑲᑲᑲᑲᑲ
Department of Environment
Avatiliqiyikkut
Ministère de l'Environnement

PART 3: Remediation

The party deemed responsible for the spill must ensure that a proper clean-up is conducted. This party, be it an individual or an organization, is encouraged to seek qualified people if required to properly fulfill its duties. It is often much easier and cheaper in the long run, to seek professional advice.

What outside agencies will be assisting you as the responsible party:

Describe in detail what will be done to remediate the spill site:

If excavation is to be undertaken, describe what will be done with contaminated soil:

Describe what will be done with contaminated water collected:

Describe any difficulties foreseen as they relate to this site:

Appendix B: Remedial Action Plan Template



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Building Nunavut Together
Nunavut iluqatigiingniq
Bâtir le Nunavut ensemble

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Department of Environment
Avatliqiyikkut
Ministère de l'Environnement

Work undertaken to prevent any further spread of the product will be completed by:

Date: _____

The remediation work will **begin** no later than:

Date: _____

The remediation work will be **completed** no later than:

Date: _____

PART 4: Submission

Please submit this form to your local Conservation Officer or to the regional Environmental Protection Officer by:

Date: _____ (to be completed by DoE staff)

The responsible party is committed to undertaking the work described above and will have the work completed by the dates provided. Any changes will be submitted to the Department of Environment.

This form has been completed by:

Name: _____ Date: _____

Signature: _____

P.O. Box 1000, Stn.1360

C.P. Box 1000, Succursale1360

1(867) 975-7726

Iqaluit, Nunavut X0A 0H0

Iqaluit, Nunavut X0A 0H0

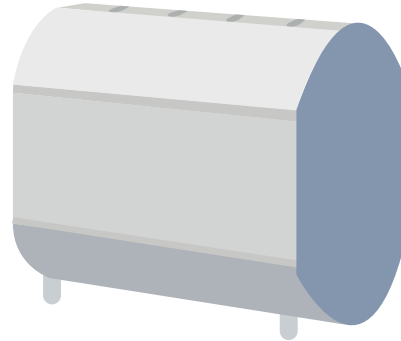
3(867) 975-7742

www.gov.nu.ca

Appendix C: Chart for 275-gallon Tank

275-gallon Tank (Vertical) Oil Tank Level Chart¹

Length: 60 Inches
Width: 27 Inches
Height: 44 Inches



Inches	Gallons	Inches	Gallons	Inches	Gallons
1"	2	16"	94	31"	201
2"	5	17"	101	32"	209
3"	9	18"	108	33"	216
4"	14	19"	115	34"	223
5"	19	20"	123	35"	230
6"	25	21"	130	36"	236
7"	31	22"	137	37"	243
8"	37	23"	144	38"	249
9"	44	24"	151	39"	254
10"	51	25"	158	40"	260
11"	58	26"	166	41"	265
12"	65	27"	173	42"	269
13"	72	28"	180	43"	272
14"	80	29"	187	44"	275
15"	87	30"	194	-	-

¹ Fuel Snap (2021). *Home Heating Oil Tank Charts*.

Appendix D: Requirements For Use Of Composite Sampling

A composite soil sample should meet all of the following requirements:

- Collected from a single soil unit and contamination unit at one location.
- Spatial extent over which discrete samples are collected is dependent upon sampling objectives.
- From ground surface to 1.5 m depth, obtained over a maximum 0.5 m vertical interval; below 1.5 m depth, obtained over a maximum 1 m interval.
- Not collected across the interface between the unsaturated and saturated zones.
- Not made up of a mixture of contaminated and non-contaminated material as determined from field observations and tests.¹
- Composite sampling should never be conducted where volatile or semi-volatile analyses are required, as the compositing process can result in the losses of volatile constituents.²



¹ CCME (2016) Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment (PN 1551, 2016), p. 89

² CCME (2016) Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment (PN 1551, 2016), p.2

Appendix E: Reportable Quantities

Spills of the following quantities must be reported to the **NU 24-hr Spill Line:**

867-920-8130 / spills@gov.nt.ca

 Contaminant	 Quantity
Explosives	Any amount
Compressed gas (flammable)	Any amount of gas from containers with a capacity greater than 100 L
Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 L
Compressed gas (toxic)	Any amount
Compressed gas (corrosive)	Any amount
Flammable liquid	100 L
Flammable solid	25 kg
Spontaneously combustible solids	25 kg
Water reactant solids	25 kg
Oxidizing substances	50 L or 50 kg
Organic peroxides	1 L or 1 kg
Poisonous substances	5 L or 5 kg
Infectious substances	Any amount
Radioactive substances	Any amount
Corrosive substances	5 L or 5 kg
Miscellaneous products or substances, excluding PCB mixtures	50 L or 50 kg
Environmentally hazardous substances	1 L or 1 kg
Dangerous wastes	5 L or 5 kg
PCB mixtures of 5 or more parts per million	0.5 L or 0.5 kg
Other contaminants	100 L or 100 kg

Appendix F: Spill Report Form

Fillable form: <https://gov.nu.ca/environment/documents/spill-response>



NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE

TEL: (867) 920-8130

FAX: (867) 873-6924

EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR		REPORT TIME		<input type="checkbox"/> ORIGINAL SPILL REPORT, OR <input type="checkbox"/> UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER _____
	B OCCURRENCE DATE: MONTH – DAY – YEAR		B OCCURRENCE TIME			
C	LAND USE PERMIT NUMBER (IF APPLICABLE)			WATER LICENCE NUMBER (IF APPLICABLE)		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION				REGION <input type="checkbox"/> NWT <input type="checkbox"/> NUNAVUT <input type="checkbox"/> ADJACENT JURISDICTION OR OCEAN	
E	LATITUDE			LONGITUDE		
	DEGREES	MINUTES	SECONDS	DEGREES	MINUTES	SECONDS
F	RESPONSIBLE PARTY OR VESSEL NAME		RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION			
G	ANY CONTRACTOR INVOLVED		CONTRACTOR ADDRESS OR OFFICE LOCATION			
H	PRODUCT SPILLED		QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES		U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE)		QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES		U.N. NUMBER	
I	SPILL SOURCE		SPILL CAUSE		AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY		DESCRIBE ANY ASSISTANCE REQUIRED		HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT	
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS					
L	REPORTED TO SPILL LINE BY		POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
	M ANY ALTERNATE CONTACT		POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY						
N	RECEIVED AT SPILL LINE BY		POSITION	EMPLOYER	LOCATION CALLED	REPORT LINE NUMBER
			STATION OPERATOR		YELLOWKNIFE, NT	(867) 920-8130
LEAD AGENCY <input type="checkbox"/> EC <input type="checkbox"/> CCG <input type="checkbox"/> GNWT <input type="checkbox"/> GN <input type="checkbox"/> ILA <input type="checkbox"/> INAC <input type="checkbox"/> NEB <input type="checkbox"/> TC				SIGNIFICANCE <input type="checkbox"/> MINOR <input type="checkbox"/> MAJOR <input type="checkbox"/> UNKNOWN		FILE STATUS <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED
AGENCY		CONTACT NAME		CONTACT TIME	REMARKS	
LEAD AGENCY						
FIRST SUPPORT AGENCY						
SECOND SUPPORT AGENCY						
THIRD SUPPORT AGENCY						

Appendix F: Spill Report Form

Instructions for Completing the NT-NU Spill Report Form

This form can be filled out electronically and e-mailed as an attachment to spills@gov.nt.ca. Until further notice, please verify receipt of e-mail transmissions with a follow-up telephone call to the spill line. Forms can also be printed and faxed to the spill line at 867-873-6924. Spills can still be phoned in by calling collect at 867-920-8130.

A. Report Date/Time	The actual date and time that the spill was reported to the spill line. If the spill is phoned in, the Spill Line will fill this out. Please do not fill in the Report Number: the spill line will assign a number after the spill is reported.
B. Occurrence Date/Time	Indicate, to the best of your knowledge, the exact date and time that the spill occurred. Not to be confused with the report date and time (see above).
C. Land Use Permit Number /Water Licence Number	This only needs to be filled in if the activity has been licenced by the Nunavut Water Board and/or if a Land Use Permit has been issued. Applies primarily to mines and mineral exploration sites.
D. Geographic Place Name	In most cases, this will be the name of the city or town in which the spill occurred. For remote locations – outside of human habitations – identify the most prominent geographic feature, such as a lake or mountain and/or the distance and direction from the nearest population center. You must include the geographic coordinates (Refer to Section E).
E. Geographic Coordinates	This only needs to be filled out if the spill occurred outside of an established community such as a mine site. Please note that the location should be stated in degrees, minutes and seconds of Latitude and Longitude.
F. Responsible Party Or Vessel Name	This is the person who was in management/control/ownership of the substance at the time that it was spilled. In the case of a spill from a ship/vessel, include the name of the ship/vessel. Please include full address, telephone number and e-mail. Use box K if there is insufficient space. Please note that, the owner of the spilled substance is ultimately responsible for any spills of that substance, regardless of who may have actually caused the spill.
G. Contractor involved?	Were there any other parties/contractors involved? An example would be a construction company who is undertaking work on behalf of the owner of the spilled substance and who may have contributed to, or directly caused the spill and/or is responding to the spill.
H. Product Spilled	Identify the product spilled; most commonly, it is gasoline, diesel fuel or sewage. For other substances, avoid trade names. Wherever possible, use the chemical name of the substance and further, identify the product using the four digit UN number (eg: UN1203 for gasoline; UN1202 for diesel fuel; UN1863 for Jet A & B)
I. Spill Source	Identify the source of the spill: truck, ship, home heating fuel tank and, if known, the cause (eg: fuel tank overflow, leaking tank; ship ran aground; traffic accident, vandalism, storm, etc.). Provide an estimate of the extent of the contaminated/impacted area (eg: 10 m ²)
J. Factors Affecting Spill	Any factors which might make it difficult to clean up the spill: rough terrain, bad weather, remote location, lack of equipment. Do you require advice and/or assistance with the cleanup operation? Identify any hazards to persons, property or environment: for example, a gasoline spill beside a daycare centre would pose a safety hazard to children. Use box K if there is insufficient space.
K. Additional Information	Provide any additional, pertinent details about the spill, such as any peculiar/unique hazards associated with the spilled material. State what action is being taken towards cleaning up the spill; disposal of spilled material; notification of affected parties. If necessary, append additional sheets to the spill report. Number the pages in the same format found in the lower right hand corner of the spill form: eg. "Page 1 of 2", "Page 2 of 2" etc. Please number the pages to ensure that recipients can be certain that they received all pertinent documents. If only the spill report form was filled out, number the form as "Page 1 of 1".
L. Reported to Spill Line by	Include your full name, employer, contact number and the location from which you are reporting the spill. Use box K if there is insufficient space.
M. Alternate Contact	Identify any alternate contacts. This information assists regulatory agencies to obtain additional information if they cannot reach the individual who reported the spill.
N. Report Line Use Only	Leave Blank. This box is for the Spill Line's use only.

