

CCME National Classification System for Contaminated Sites (2008, 2010 v 1.2)
Pre-Screening Checklist

Question	Response (yes / no)	Comment
1 Are Radioactive material, Bacterial contamination or Biological hazards likely to be present at the site?	No	If yes, do not proceed through the NCSCS. Contact applicable regulatory agency immediately.
2 Are there no contamination exceedances (known or suspected)? Determination of exceedances may be based on: 1) CCME environmental quality guidelines; 2) equivalent provincial guidelines/standards if no CCME guideline exists for a specific chemical in a relevant medium; or 3) toxicity benchmarks derived from the literature for chemicals not covered by CCME or provincial guidelines/standards.	No	If yes (i.e., there are no exceedances), do not proceed through the NCSCS.
3 Have partial/incompleted or no environmental site investigations been conducted for the Site?	No	If yes, do not proceed through the NCSCS.
4 Is there direct and significant evidence of impacts to humans at the site, or off-site due to migration of contaminants from the site?	No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated (e.g., for comparison with other Class 1 sites).
5 Is there direct and significant evidence of impacts to ecological receptors at the site, or off-site due to migration of contaminants from the site?	No	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are considered to be severe, the site may be categorized as Class 1, regardless of the numerical total NCSCS score. For the purpose of application of the NCSCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction.
6 Are there indicators of significant adverse effects in the exposure zone (i.e., the zone in which receptors may come into contact with contaminants)? Some examples are as follows: -Hydrocarbon sheen or NAPL in the exposure zone -Severely stressed biota or devoid of biota; -Presence of material at ground surface or sediment with suspected high concentration of contaminants such as ore tailings, sandblasting grit, slag, and coal tar.	No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated (e.g., for comparison with other Class 1 sites).
7 Do measured concentrations of volatiles or unexploded ordnances represent an explosion hazard ?	No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, and do not continue until the safety risks have been addressed. Consult your jurisdiction's occupational health and safety guidance or legislation on explosive hazards and measurement of lower explosive limits.

If none of the above applies, proceed with the NCSCS scoring.

CCME National Classification System (2008, 2010 v 1.2)

(I) Contaminant Characteristics

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Soils: PHCs exceed guideline for F1 in one location. PFOS exceed guideline in 2 locations. Soil Exceedances are documented in these reports: 1. Site Activities Report, Cambridge Bay Airport FTA, March 2015 Final Report, Dillon Consulting Limited (Final Sidewall 6 @0.6m with F1 concentration of 920 mg/kg) 2. Closure Report, Cambridge Bay Airport FTA, November 2015, Dillon Consulting Ltd. (PFOS in soil and groundwater above Interim Federal PFOS guidelines, October 2015) Sediments: Not assessed Surface Water: Limited, not assessed	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline). Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124 . For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc/sup-appui/sum_guide-res_recom/index_e.html .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	Yes			
Yes No Do Not Know				
B. Groundwater	Yes			
Yes No Do Not Know				
C. Surface water	No			
Yes No Do Not Know				
D. Sediment	Do Not Know			
Yes No Do Not Know				
"Known" - score	4			
"Potential" - score	1			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)? High Medium Low Do Not Know	High	PHC F1 is listed as 'high' on the list of hazard rankings proposed by FCSAP. PFOS is not listed on the list of hazard rankings proposed by FCSAP.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site. The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file. <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" - score	8			
"Potential" - score	---			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")? Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	Low (1x to 10x)	Highest exceedance factor PHC F1, 2.89X CCME PHC CWS Highest exceedance factor PFOS, 6.7X Interim Federal Guidelines for PFOS	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME</i> environmental quality guidelines. Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks. Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria. Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" - score	2			
"Potential" - score	---			

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(I) Contaminant Characteristics

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
4. Contaminant Quantity (known or strongly suspected)				
What is the known or strongly suspected quantity of all contaminants? <div> <div>>10 hectare (ha) or 5000 m³</div> <div>2 to 10 ha or 1000 to 5000 m³</div> <div><2 ha or 1000 m³</div> <div>Do Not Know</div> </div>	<div><2 ha or 1000 m³</div> <div></div>	PHC F1 exceedance is a single occurrence, isolated and not at surface level. PFOS impacts have not been fully delineated in soil or groundwater south of the FTA.	Measure or estimate the area or quantity of total contamination (i.e. all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" -score	2			
"Potential" - score	---			
5. Modifying Factors				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment? <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>Yes</div> <div></div>	PFOS is not listed herein however; is known to not degrade in the environment	Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: <div> <div>(a) in air,</div> <div>(i) its half-life is equal to or greater than 2 days, or</div> <div>(ii) it is subject to atmospheric transport from its source to a remote area;</div> <div>(b) in water, its half-life is equal to or greater than 182 days;</div> <div>(c) in sediments, its half-life is equal to or greater than 365 days; or</div> <div>(d) in soil, its half-life is equal to or greater than 182 days.</div> </div> <p>This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.</p>	<i>Examples of Persistent Substances are provided in attached Reference Materials</i>
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location? <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div></div>	There are no utilities or infrastructure on site that could be damaged by the presence of PFOS in groundwater.		Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances? <div> <div>one</div> <div>two to four</div> <div>five or more</div> <div>Do Not Know</div> </div>	<div>two to four</div> <div></div>	Light extractable petroleum hydrocarbons and PFOS	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	<i>Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.</i>
"Known" - Score	4			
"Potential" - Score	---			

Contaminant Characteristic Total

Raw Total Scores- "Known"	20
Raw Total Scores- "Potential"	1
Raw Combined Total Scores	21
Total Score (Raw Combined / 40 * 33)	17.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
1. Groundwater Movement				
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.				
<p>i) For potable groundwater environments, 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For non-potable environments (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non-potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.</p>	12	Groundwater has PFOS impacts. Groundwater is seasonal (melted permafrost active layer). Non-potable. Marine aquatic receptors within 100 m of site. (Cambridge Bay is located approximately 100 m downgradient). No drinking water quality guidelines for PFOS.	<p>Review chemical data and evaluate groundwater quality.</p> <p>The evaluation method concentrates on 1) a potable or non-potable groundwater environment; 2) the groundwater flow system and its potential to be an exposure pathway to known or potential receptors</p> <p>An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis.</p> <p>Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils.</p> <p>Seeps and springs are considered part of the groundwater pathway.</p> <p>In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.</p>	<p>The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries.</p> <p>Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links.</p> <p>Note that for potable groundwater that also daylight into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered.</p> <p>Selected References</p> <p><u>Potable Environments</u></p> <p>Guidelines for Canadian Drinking Water Quality: www.hc-sc.gc.ca/wh/semtpubs/water_sau/doc_sup-appui/sum_guide-res_recom/index_e.html</p> <p><u>Non-Potable Environments</u></p> <p>Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME. 1999 www.ccme.ca</p> <p>Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.</p>
<p>ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.</p>	9			
<p>iii) Meets GCDWQ for potable environments; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or</p> <p>Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).</p>	0			
	12			
Score	12			
NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)				
B. Potential for groundwater pathway.				
<p>a. Relative Mobility</p> <p>High</p> <p>Moderate</p> <p>Low</p> <p>Insignificant</p> <p>Do Not Know</p>			<p>Organics Koc (L/kg)</p> <p>Metals with higher mobility at acidic conditions</p> <p>Metals with higher mobility at alkaline conditions</p> <p>Koc < 500 (i.e., log Koc < 2.7)</p> <p>Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7)</p> <p>Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5)</p> <p>Koc > 100,000 (i.e., log Koc > 5)</p> <p>pH < 5</p> <p>pH = 5 to 6</p> <p>pH > 6</p> <p>pH > 8.5</p> <p>pH = 7.5 to 8.5</p> <p>pH < 7.5</p>	Reference: US EPA Soil Screening Guidance (Part 5 - Table 39)
Score	2			<p>If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.</p>
<p>b. Presence of engineered sub-surface containment?</p> <p>No containment</p> <p>Partial containment</p> <p>Full containment</p> <p>Do Not Know</p>			<p>Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved.</p> <p>Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for "Full Containment" scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.</p>	<p>Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.</p> <p>Selected Resources:</p> <p>United States Environmental Protection Agency (USEPA) 1998, Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128, Environment Canada – Ontario Region – Natural Attenuation Technical Assistance Bulletins (TABS) Number 19 –21.</p>
<p>c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway</p> <p>3 m or less including no confining layer or discontinuous confining layer</p> <p>3 to 10 m</p> <p>> 10 m</p> <p>Do Not Know</p>			<p>The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow.</p> <p>Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway.</p> <p>The evaluation of this category is based on:</p> <p>1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or</p> <p>2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).</p>	
Score	0.5			
<p>d. Hydraulic conductivity of confining layer</p> <p>>10⁻⁴ cm/s or no confining layer</p> <p>10⁻⁴ to 10⁻⁶ cm/s</p> <p><10⁻⁶ cm/s</p> <p>Do Not Know</p>			<p>Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on:</p> <p>1) The presence and hydraulic conductivity ("K") of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or</p> <p>2) The presence and permeability ("K") of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.</p>	
Score	0.5			

(II) Migration Potential (Evaluation of contaminant migration pathways)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for groundwater pathway.				
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor) High Moderate Low Very Low None Do Not Know			Precipitation Refer to Environment Canada precipitation records for relevant areas. Divide annual precipitation by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). Permeability For surface soil relative permeability (i.e., infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0). Multiply the surface soil relative permeability factor with precipitation factor to obtain the score for precipitation infiltration rate.	
Score	0.4			
f. Hydraulic conductivity of aquifer >10 ⁻² cm/s 10 ⁻² to 10 ⁻⁴ cm/s <10 ⁻⁴ cm/s Do Not Know			Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).	
Score	1			
Potential groundwater pathway total	5.9			
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.		
Groundwater pathway total	12			
2. Surface Water Movement				
A. Demonstrated migration of COPC in surface water above background conditions				
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (e.g. toxicity testing; or other indicator testing of exposure).	12	Some surface water was observed on-site. Nearest surface water receptor supporting aquatic life is approx. 100 m south (Cambridge Bay). Strongly anticipated that groundwater impacts reach surface waters, surface water impacts unknown.	Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, e.g., recreation, irrigation, aquatic life, livestock watering, etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.	General Notes: Someone experienced must provide a thorough description of the sources researched to classify the surface water body in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. Selected References: CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life www.ccme.ca CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) www.ccme.ca Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality.
ii) Same as (i) except the information is not known but <u>strongly suspected</u> based on indirect observations.	8			
iii) Meets CWQG or absence of surface water exposure pathway (i.e., Distance to nearest surface water is > 5 km.)	0			
Go to Potential	---			
Score	---			
NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you can skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)				
B. Potential for migration of COPCs in surface water				
a. Presence of containment No containment Partial containment Full containment Do Not Know		There is no containment present on site.	Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.	
Score	No containment 5			
b. Distance to Surface Water 0 to <100 m 100 - 300 m >300 m Do Not Know		West arm of Cambridge Bay is approx. 100 m downgradient from site	Review available mapping and survey data to determine distance to nearest surface water bodies.	
Score	0 to <100 m 3			
c. Topography Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is flat Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know		Site is relatively flat.	Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
Score	At/below and flat 0			
d. Run-off potential High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know		Closest Environment Canada to the site is Cambridge Bay Airport, NU. Average total precipitation = 170 mm = 0.17, Silty Gravel = 0.2 Run off potential = 0.17 x 0.2 = 0.03	Rainfall Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of "annual rainfall" did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor.	Selected Sources: Environment Canada web page link: www.msc.ec.gc.ca Snow to rainfall conversion apply ratio of 15 (snow):1 (water)

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes					
Score	Very Low 0.2		Permeability For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.						
e. Flood potential 1 in 2 years 1 in 10 years 1 in 50 years Not in floodplain Do Not Know	1 in 2 years 1	The Site is not in a flood plain. Annual spring freshet considered annual flood event, 1 in 2 year.	Review published data such as flood plain mapping or flood potential (e.g., spring or mountain runoff) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.						
Potential surface water pathway total	9.2	Note: If a "known" score is provided, the "potential" score is disallowed.							
Allowed Potential score	9.2								
Surface water pathway total	9.2								
3. Surface Soils (potential for dust, dermal and ingestion exposure)									
A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)									
COPCs measured in surface soils exceed the CCME soil quality guideline.	12	Exceedances were noted in surficial soils (< 1.5 m bgs) in one location for PHC F1 and one location for PFOS.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e. agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: CCME. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health www.ccme.ca					
Strongly suspected that soils exceed guidelines	9								
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0								
	12								
Score	12								
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)									
B. Potential for a surface soils (top 1.5 m) migration pathway									
a. Are the soils in question covered? Exposed Vegetated Landscaped Paved Do Not Know	0		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.					
Score	0								
b. For what proportion of the year does the site remain covered by snow? 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3								
Potential surface soil pathway total	3								
Allowed Potential score	---								
Soil pathway total	12	Note: If a "known" score is provided, the "potential" score is disallowed.							
4. Vapour									
A. Demonstrated COPCs in vapour.									
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Neither indoor or outdoor vapours have been assessed at the site. Soil vapour headspace screening has been conducted for the site. Risk-based calculations have not been performed.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.						
Strongly suspected (based on observations and/or modelling)	9								
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0								
	Go to Potential								
Score	---								
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)									
B. Potential for COPCs in vapour									
a. Relative Volatility based on Henry's Law Constant, H [*] (dimensionless) High (H [*] > 1.0E-1) Moderate (H [*] = 1.0E-1 to 1.0E-3) Low (H [*] < 1.0E-3) Not Volatile Do Not Know	Low 1	Henry's Law Constant for PHCs are low.	Reference: US EPA Soil Screening Guidance (Part 5 - Table 36) Provided in Attached Reference Materials	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.					
Score	1								
b. What is the soil grain size? Fine Coarse Do Not Know	Coarse 4								
Score	4								
c. Is the depth to the source less than 10m? Yes No Do Not Know									

(II) Migration Potential (Evaluation of contaminant migration pathways)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes			
Score	Yes 2						
d. Are there any preferential pathways? Yes No Do Not Know	No 0	There were no observed preferential pathways for vapour migration.	Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.			
Potential vapour pathway total	7	Note: If a "known" score is provided, the "potential" score is disallowed.					
Allowed Potential score	7						
Vapour pathway total	7						
5. Sediment Movement							
A. Demonstrated migration of sediments containing COPCs							
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	Strongly suspect PFOS in sediment however; not tested.	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.			
Strongly suspected (based on observations and/or modelling)	9						
Sediments have been contained and there is no indication that sediments will migrate in future. or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0						
Score	9						
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)							
B. Potential for sediment migration							
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")? Yes No Do Not Know	Do Not Know 2		Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.				
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash? Yes No Do Not Know	Do Not Know 2						
c. For rivers, are the contaminated sediments in an area prone to sediment scouring? Yes No Do Not Know	Do Not Know 2						
Potential sediment pathway total	6						
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.					
Sediment pathway total	9						
6. Modifying Factors							
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	No 0	No utility corridors	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.				
Known Potential	0 0						

Migration Potential Total	
Raw "known" total	33
Raw "potential" total	16.2
Raw combined total	49.2
Total (max 33)	25.4

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
1. Human				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22	No HHRA performed, go to potential.	"Where adverse effects on humans are documented, the site should be automatically designated as a Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either >10 ⁻⁶ or >10 ⁻⁵). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 ug/dL) or other health based testing.	Selected References: Health Canada – Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessments (www.hc-sc.gc.ca/ewh-semt/pubs/contam/site/index_e.html) United States Environmental Protection Agency, Integrated Risk Information System (IRIS) – http://toxnet.nlm.nih.gov
No quantified or suspected exposures/impacts in humans.	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 ⁻⁶ or 10 ⁻⁵).	
Go to Potential				
Score	---			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
B. Potential for human exposure				
a) Land use (provides an indication of potential human exposure scenarios) Agricultural Residential / Parkland Commercial Industrial Do Not Know			Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
Score	1			
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination) Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know		Limited access by public. Limited access to potentially impacted groundwaters. Groundwater not used for drinking water.	Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
Score	0			
B. Potential for human exposure				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential). i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know		Not anticipated as commercial site	If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
Score	0			
ii) inhalation (i.e., inhalation of dust, vapour) Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know		No inhabitable buildings on-site	If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (II) Migration Potential worksheet, 4B.a), <i>Potential for COPCs in Vapour</i> for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion. Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
Score	0			
Dust - If there is contaminated surface soil (e.g. top 1.5 m) , indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture		Soil is coarse. Surficial impacts observed (< 1.5 m bgs, Dillon, 2014, 2015)	Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. Selected References: Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332. www.ccme.ca Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Score	Coarse			
	1			
inhalation total	1			

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for human exposure				
iii) Ingestion (i.e., ingestion of food items, water and soils [for children]), including traditional foods. Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future). 0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know	100 to 300 m Score 2.5	Water Lake is the drinking water source for Cambridge Bay, and is located > 1 km from the site. There is the potential for ingestion of traditional foods (fish). Cambridge Bay is located approx. 100 m from the site. Multiple freshwater lakes in vicinity.	Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure. The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport.	Selected References: Guidelines for Canadian Drinking Water Quality: www.hc-sc.gc.ca/hecs-sesc/water/publications/drinking_water_quality_guidelines/toc.htm Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable. Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
Is an alternative water supply readily available? Yes No Do Not Know	Yes Score 0	Site is not directly used for hunting or traditional land use.	If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.	
Is human ingestion of contaminated soils possible? Yes No Do Not Know	No Score 0	Site is not directly used for hunting or traditional land use.	Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings? Yes No Do Not Know	No Score 0	Site is not directly used for hunting or traditional land use.		
Ingestion total	2.5			
Human Health Total "Potential" Score	4.5	Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.		
Allowed "Potential" Score	4.5			
2. Human Exposure Modifying Factors				
a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.) Yes No Do Not Know	Yes Known Potential 6 --- Raw Human "known" total 6 Raw Human "potential" total 4.5 Raw Human Exposure Total Score 10.5 Human Health Total (max 22) 10.5	Strong reliance of local people on natural resources for survival. Local residents fish and hunt (i.e. seal, whales).		
3. Ecological				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18	No ERA for PFOS. Go to potential.	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life. www.ccme.ca CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. www.ccme.ca Sensitive receptors- review: Canadian Council on Ecological Areas; www.cceaa.org . Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in <i>A Framework for Ecological Risk Assessment: General Guidance</i> (CCME 1996). Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.	
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.	
Go to Potential Score ---				
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)				
a) Terrestrial i) Land use Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know	<div>Score</div> <div>Commercial</div> <div>1</div>		Review zoning and land use maps. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration). Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
ii) Uptake potential Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know	<div>Score</div> <div>Yes</div> <div>1</div>	Surficial soils impacted (Dillon, 2014, 2015)	If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water) Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know	<div>Score</div> <div>Do Not Know</div> <div>0.5</div>	Unlikely.	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know	<div>Score</div> <div>No</div> <div>0</div>	Impacts not at surface for animal uptake.	Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
Can the contamination identified bioaccumulate? Yes No Do Not Know	<div>Score</div> <div>Yes</div> <div>1</div>	Yes, PFOS bioaccumulates.	Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines.	
Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	<div>Score</div> <div>0 to 300 m</div> <div>3</div>	Approx. 100 m to Cambridge Bay.	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org .	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Raw Terrestrial Total Potential Allowed Terrestrial Total Potential	<div>6.5</div> <div>6.5</div>	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
B. Potential for ecological exposure (for the contaminated portion of the site)				
b) Aquatic i) Classification of aquatic environment Sensitive Typical Not Applicable (no aquatic environment) Do Not Know	<div>Score</div> <div>Typical</div> <div>1</div>	No known sensitive ecological areas in immediate vicinity.	"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species. "Typical aquatic environments" include those in areas other than those listed above.	
ii) Uptake potential Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know	<div>Score</div> <div>Do Not Know</div> <div>0.5</div>	Groundwater pathways not assessed at water's edge	Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.	
Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	<div>Score</div> <div>0 to 300 m</div> <div>3</div>	Cambridge Bay approx. 100 m distance from the site.	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org . Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and fens and other aquatic environments.

CCME National Classification System (2008, 2010 v 1.2)

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Cambridge Bay Airport Fire Training Area

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	Yes 1 Score	Concentrations in biological tissues not known; however, PFOS bioaccumulates	1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential	5.5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Aquatic Total Potential	5.5			
4. Ecological Exposure Modifying Factors				
a) Known occurrence of a species at risk. Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	Yes 2 --- Score	Unlikely, but may occur in the general area (> 1 km distance)	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer, Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act (http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMWLAP, 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection. http://srmwww.gov.bc.ca/atrisk/red-blue.htm .
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor). Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	No 0 --- No 0 --- No 0 --- No 0 --- No 0 --- Ecological Modifying Factors Total - Known Ecological Modifying Factors Total - Potential Raw Ecological Total - Known Raw Ecological Total - Potential Raw Ecological Total Ecological Total (Max 18)	Not observed during site visit.	Documentation may consist of environmental investigation reports, press articles, petitions or other records. Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat. A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients e.g., nitrogen or phosphorous releases to an aquatic body can act as a fertilizer. Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
5. Other Potential Contaminant Receptors				
a) Exposure of permafrost (leading to erosion and structural concerns) Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	Yes 4 --- Do Not Know --- 1	Site is located in an Arctic environment. Permafrost is present. Unsure	Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides. Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	4 1			
Exposure Total				
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	12 17.5 29.5 21.8	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

CCME National Classification System (2008, 2010 v 1.2) **Score Summary**

Scores from individual worksheets are tallied in this worksheet.
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics

	Known	Potential
1. Residency Media	4	1
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	2	---
4. Contaminant Quantity	2	---
5. Modifying Factors	4	---

Raw Total Score 20 1

Raw Total Score (Known + Potential) 21

Adjusted Total Score (Raw Total / 40 * 33) 17.3 (max 33)

II. Migration Potential

	Known	Potential
1. Groundwater Movement	12	---
2. Surface Water Movement	---	9.2
3. Soil	12	---
4. Vapour	---	7
5. Sediment Movement	9	---
6. Modifying Factors	0	0

Raw Total Score 33 16.2

Raw Total Score (Known + Potential) 49.2

Adjusted Total Score (Raw Total / 64 * 33) 25.4 (max 33)

III. Exposure

	Known	Potential
1. Human Receptors		
A. Known Impact	---	
B. Potential		
a. Land Use		1
b. Accessibility		0
c. Exposure Route		
i. Direct Contact		0
ii. Inhalation		1
iii. Ingestion		2.5
2. Human Receptors Modifying Factors	6	---
Raw Total Human Score	6	4.5

Raw Total Human Score (Known + Potential) 10.5

Adjusted Total Human Score 10.5 (maximum 22)

3. Ecological Receptors

A. Known Impact	---	
B. Potential		
a. Terrestrial		6.5
b. Aquatic		5.5
4. Ecological Receptors Modifying Factors	2	---
Raw Total Ecological Score	2	12

Raw Total Ecological Score (Known + Potential) 14

Adjusted Total Ecological Score 14.0 (maximum 18)

5. Other Receptors

4	1
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Total Other Receptors Score (Known + Potential) 5

Total Exposure Score (Human + Ecological + Other) 29.5

Adjusted Total Exposure Score (Total Exposure / 46 * 34) 21.8 (max 34)

Site Score

Cambridge Bay Airport Fire Training Area

Site Letter Grade B

Certainty Percentage 75%

% Responses that are "Do Not Know" -7%

Total NCSCS Score for site 64.5

Site Classification Category 2

Site Classification Categories*:

Class 1 - High Priority for Action (Total NCS Score >70)

Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)

Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)

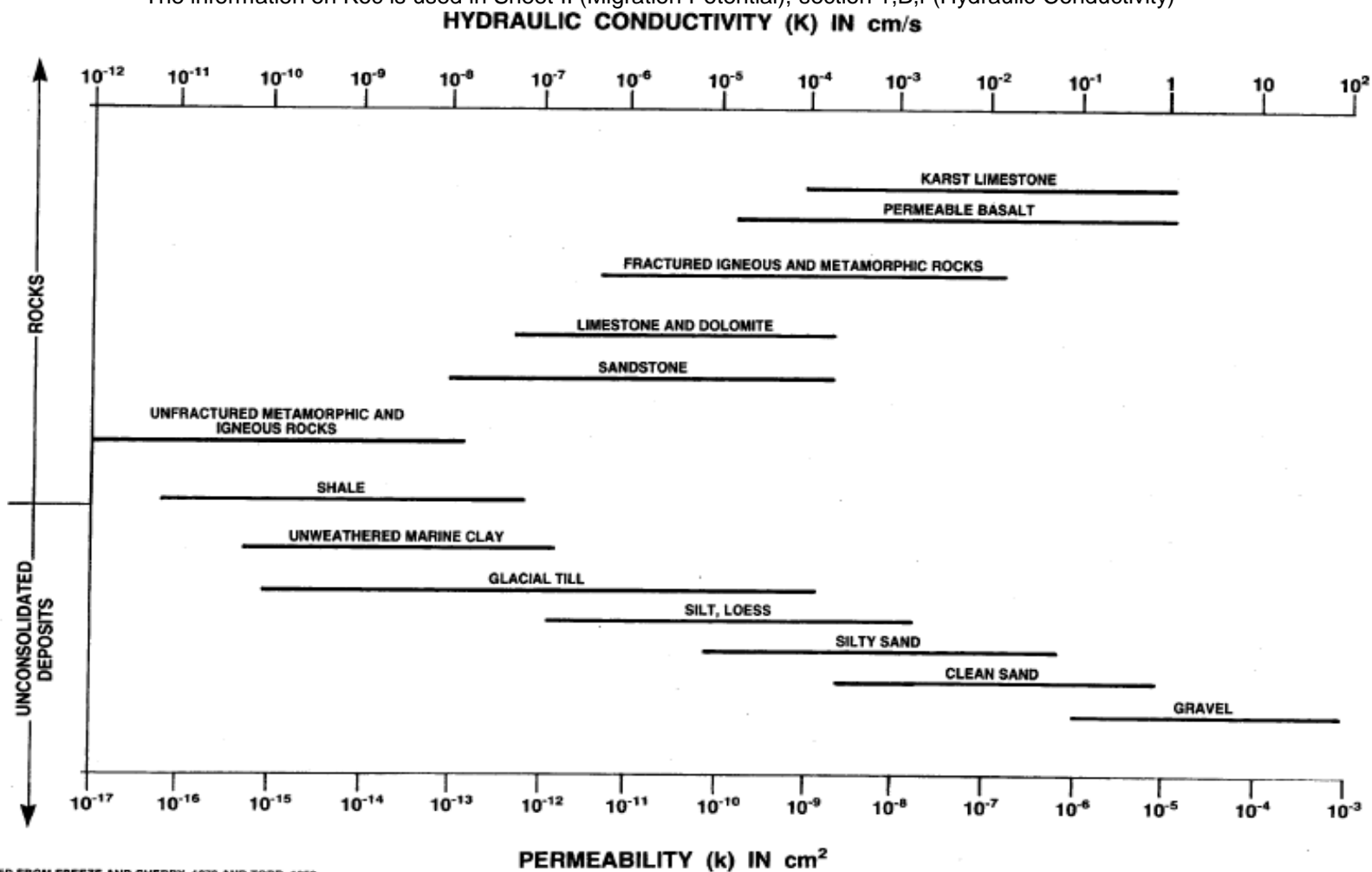
Class N - Not a Priority for Action (Total NCS Score <37)

Class INS - Insufficient Information (>15% of responses are "Do Not Know")

* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

RANGE OF VALUES OF HYDRAULIC CONDUCTIVITY AND PERMEABILITY

The information on Koc is used in Sheet II (Migration Potential), section 1,B,f (Hydraulic Conductivity)



MODIFIED FROM FREEZE AND CHERRY, 1979 AND TODD, 1959