



SUMMARY OF CONSULTATION COMMENTS

MAKING CONTAMINATED SITES CLIMATE READY DISCUSSION PAPER

Prepared for:
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Land Remediation Section

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Summary of Consultation Comments on the 2022 “Making Contaminated Sites Climate Ready” Discussion Paper

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Background to the Consultation Process

Climate change affects all aspects of our environment, including the long-term effectiveness of cleaning up land that may be contaminated through industrial or commercial usage, such as gas stations, storage facilities, or processing plants.

The Ministry of Environment and Climate Change Strategy (the ministry) is reviewing potential actions to address climate change adaptation and further incorporate sustainability in B.C.'s contaminated sites framework. The ministry is reviewing how we can ensure the cleanup efforts of contaminated sites adapt to our changing climate by focusing on:

- Including climate change adaptation and sustainability into [provincial site remediation](#) requirements; and
- Strengthening remediation requirements to protect groundwater quality.

Ministry Discussion Paper and Consultation Process

The [Making Contaminated Sites Climate Ready discussion paper](#) was posted on the Engage BC website in October 2022.

The discussion paper:

- Summarized recent work of the ministry in support of B.C.'s Climate Preparedness and Adaptation Strategy;
- Reported on themes and key messages heard from engagement with Indigenous groups on risk assessment and contaminated sites in a changing climate;
- Outlined proposed principles, key concepts, and potential opportunities and actions under six outcomes, to incorporate climate change adaptation and sustainability in B.C.'s contaminated sites policy and legislative framework; and
- Sought comment on outcomes and potential opportunities as the ministry considers next steps in moving forward with making contaminated sites climate ready.

The ministry hosted two information webinars (on December 14th and 15th, 2022) presenting the contents of the discussion paper. More than 500 participants in total attended the webinars. Feedback was accepted until December 23rd, 2022, through an online questionnaire and written submissions.

A recording of the December 14th webinar was posted on the ministry's "[site remediation webinars](#)" website on January 17th, 2023. The "making contaminated sites climate ready" portion of the webinar begins at the 59-minute mark of the recording. Interested parties can receive updates on next steps in the consultation process by registering for the (free) [site remediation news email subscription service](#).

Purpose and Format of the Summary of Consultation Comments Document

This document has been prepared by C. Rankin & Associates, contracted by the ministry to compile and summarize comment on the discussion paper. The summary is arranged by topic and question as presented in the discussion paper and online questionnaire.

All feedback received through the consultation process, including individual submissions, online comment forms, and questions from participants in the two information webinars, has been compiled and passed to the ministry for detailed review and consideration.

Overview of Respondents

A total of 31 responses were received, including fourteen email or pdf submissions and seventeen electronic comment forms (see figure 1 below).

Eleven separate responses were received from individual professional consulting firms involved with contaminated site assessment and/or remediation, as well as a joint submission with eleven signatories involved with redevelopment of contaminated sites. Three professional or business associations related to property development and/or remediation of contaminated sites also submitted comments.

Four Indigenous Nations submitted comments within this process and those comments are included in this summary document. Note that the ministry also hosted separate engagement sessions on this topic for Indigenous Peoples. Notes and related comments from those engagement sessions are being addressed in ongoing discussions with Indigenous Peoples.

Government respondents included one federal government agency, two municipal governments and four B.C. government ministries. Responses were also received from one provincial utility, one environmental non-government organization, one private property developer and three individuals.

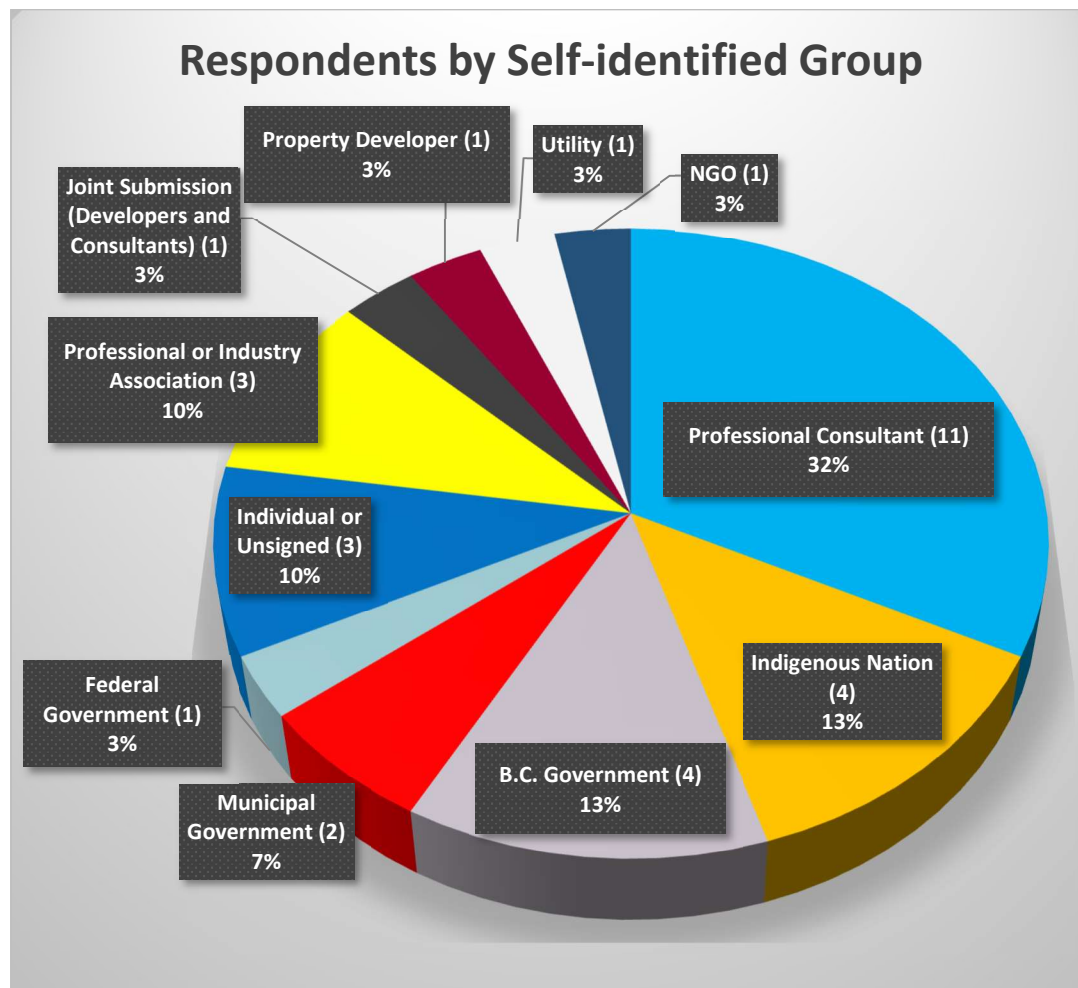


Figure 1 Respondents by Self-identified Group

Respondent Comments

Summary of Comments

Respondents provided considered and detailed comments on the discussion paper. The importance of recognizing the effects of climate change (such as frequency and intensity of extreme weather events, rising sea level and storm surges), as well as their potential influence on assessment and remediation of contaminated sites, was commonly noted. Respondents also frequently commented that impacts from a changing climate, and consequent remediation measures, are “site-specific” and vary across regions of B.C.

Many respondents encouraged the ministry to develop guidance regarding remediation practices that address the risks associated with climate change, recognize the vulnerabilities of ecosystems and protect human health. Professional remediation practitioners, as well as other respondents, commonly expressed a desire to be engaged in subsequent steps that the ministry may take in adapting the contaminated sites framework to climate change. Respondents also suggested drawing on related work from other jurisdictions or sources such as the Contaminated Sites Approved Professional Society toolkit for sustainable remediation, municipal climate change adaptation strategies, modeling tools and related technical guidance materials.

Engagement of Indigenous Peoples in consideration of risk assessment and remediation was seen as “important” or “essential” by respondents who commented on this topic. Some professional respondents expressed concern that additional requirements could “lead to lengthy delays and/or legal conflicts” and encouraged the ministry to develop a clear process and expectations in concert with First Nations, as well as other parties with interests in remediation of contaminated sites.

Respondents provided many comments and suggestions regarding remediation alternatives evaluation for the ministry to consider. For example: “[include] the footprint of remediation [i.e., GHG emissions and environmental impacts associated with excavation and transport of contaminated soils];” “give preference to remediation alternatives that provide permanent solutions to the maximum extent possible;” and “consider... federal contaminated sites [Health Canada guidance] on scoring and evaluation criteria.”

Many respondents expressed support for ongoing monitoring of sites in light of climate change. However, several professional respondents commented that B.C.’s existing contaminated sites framework includes requirements and guidance for monitoring and assessment of higher risk sites. These respondents expressed a concern that revising monitoring and/or remediation requirements subsequent to granting of a certificate of compliance would create uncertainty and could significantly limit interest in remediating some sites.

Respondents commonly viewed assessment, classification and ranking of aquifers as an important topic. While monitoring of “high risk” aquifers was almost universally supported by respondents, some cautioned that “[a needed] first step is defining which high ranking aquifers would be... classified as high risk.”

Most respondents expressed support for financial security requirements. However, some suggested that existing provisions are sufficient, commenting, for example, that current requirements for security address “high risk conditions... [and] include risk controls, need for ongoing maintenance, annual inspections, risk of failure, etc.”

General Comments

Respondents commonly provided specific comments on discussion paper outcomes and responses to comment form questions. Several respondents also provided information related to their organization or interests, and their experience with contaminated sites in British Columbia. A sample of these general comments is provided below.

- “In order to make contaminated sites ‘climate ready,’ processes must be adjusted to better manage, remediate, and monitor sites to prepare for the ongoing climate crisis. Better communication and engagement with First Nations are needed by both licensees and government, as Indigenous Peoples are exercising their Rights and living on the land and hold the knowledge of the areas being affected. The water, land, wildlife and habitat, and community health are then most important values requiring protection. The environment, and in turn contaminated sites, will continue to change due to climate change. These sites will require more frequent and consistent site evaluation, testing, reporting of information, and require involvement of local First Nations by establishing a consent-based model for joint decision making. Many sites may also require new regulations such as long-term monitoring and remediation that can help gather data on how climate change is affecting contaminated sites and the environment.”
- “[Our professional industry association] deeply understand[s] the adverse effects of climate change and recognize that the earth’s climate is changing at an unprecedented rate – we believe that this contaminated site consultation reinforces B.C.’s leadership on climate change and will provide a framework for other, similar initiatives across the country.”
- “We note that the discussion paper was general in approach and request further opportunities for review as details are developed by the ministry. [Our professional association] would like the opportunity to comment/collaborate on additional versions of the policy and draft documents related to this topic prior to release... We suggest that development of components of the policy/guidance should be staged... [to] provide an opportunity to learn and adapt... for example, understanding the potential future impacts of climate change hazards on contaminated sites in B.C. would be useful to inform how to manage these sites or monitoring requirements.”
- “[Our utility] suggests that direction from the ministry on changing contaminated sites policies should be provided as guidance, not protocol, to reflect the evolution of climate change understanding.”
- “Provide some context as to the issue that needs to be addressed. Avoid putting too much effort into solving the problem before it is defined... Reference... local sources of information before going directly to those of other countries (but use those as well). I have seen many B.C. and Canadian papers that have excellent information. Make sure the language is positive to motivate action... move away from fear... move towards empowerment.”
- “We understand that climate change is an evolving science, as is the science behind soil remediation in general. [Our organization] recognizes that updates are needed to ministry requirements to meet these changes. However, it is difficult to navigate these updates when they are retroactively applied or tied to active projects... if costs, approval times and/or liabilities increase [our members] may not be able to proceed with remediation projects... This would be counterproductive to the ministry’s objectives to clean brownfields and reduce GHG emissions, as well as undermine the ability of the Government to meet its housing goals.”
- “There needs to be a broader discussion... among stakeholders, including builders, financial institutions, environmental professionals, insurance representatives, and legal advisors to discuss the

ramification of [potential] proposed policies... [our organization's] contaminated sites committee would like to be involved in any future policy consultations."

- "Proposing a future more stringent remediation regime for the protection of viable aquifers lacks an overall strategy to remediate all contaminated sites that potentially could impact viable drinking water aquifers. New cleanup requirements would not result in cleanup of sites that were previously remediated, or in the identification and cleanup of unknown contaminated sites beyond those that would be captured in the contaminated site process... in other jurisdictions, such as the Flanders Belgium, the government administration does have such a strategy to identify all contaminated sites and pay for their remediation if deemed necessary."
- "Should the proposed discussion paper be made policy, the impacts on our [redevelopment] industry would be significant. The increased costs, time delays, risk management liabilities and overall uncertainty would reduce the production of housing and industrial projects, and would limit economic recovery from activity associated with development... The potential time delays [and associated uncertainties would] restrict development and subsequent remediation thereby reducing the overall number of remediated sites and increasing the number of lingering brownfield sites. We believe... redevelopment of brownfield sites should be encouraged as we are addressing the environmental liabilities site by site."

Discussion Question Comments

Guiding Principles

Incorporating Indigenous Peoples' intimate knowledge of their traditional lands, waters and the ecosystems that depend on them is key to ensuring contaminated sites policies protect human health and the environment for future generations.

In addition, the ministry is considering three guiding principles to address adaptation to climate change and protect groundwater resources in remediation of contaminated sites:

1. Future climate conditions in B.C. and worldwide are anticipated to change as greenhouse gas emissions continue, and understanding of the changes will evolve with climate science.
2. Prediction of future climate conditions is based on understandings and uncertainties at a given point in time, and needs to be continually re-evaluated to ensure the continued protection of human health and the environment over time.
3. Viable groundwater aquifers impacted by contaminated sites should be restored to beneficial use wherever practicable, drawing on Indigenous, community and other science-based knowledge. Water quality values, and the intertwined web of ecosystems, should be protected in the context of changing climate conditions, for the benefit of future generations.

Comment form question: What principles should guide the ministry in making contaminated sites climate ready?

Most respondents commented on this topic and many suggested additional principles for consideration. Several respondents recommended "science-based," "data-informed" or "scientific and evidence-based" guidance. "Collaboration with stakeholders" was suggested as a principle by several respondents. For example, one respondent noted that as "many governing bodies already have climate change [guidance] for protecting

against flooding and groundwater resources... collaboration with... municipalities/regions, communities, owners and end-users [would] reduce duplication of effort." Several respondents commented that "guiding principles should balance resource protection/use, sustainability, and remediation practicability."

Several respondents provided extended statements regarding suggested approaches and actions in their responses to this question. A synopsis and sample of these comments is included in the above "general comments" section.

Examples of suggested principles included:

- "[Consider] prevention in the policy – trying to prevent issues from becoming a concern in the future... [e.g.,] by looking at vulnerable sites or types of contaminants and developing measures to protect/prevent the contamination from occurring;"
- "Using the 'polluter pays' principle to ensure that those impacting the environment are responsible for cleanup costs;"
- "Working towards positive reconciliation;"
- "Precautionary principle;"
- "Enhancing community resilience should be a key guiding principle... although predictions of future climate conditions have some inherent level of uncertainty, there are conditions that have a high probability of occurring that should be considered;"
- "Engagement of the public and Indigenous Peoples, focusing on directly affected participants and sustainable, forward-seeking solutions;"
- "Clarity of expectations and requirements;"
- "No significant impact on the economy;"
- 'Consider enhanced pollution prevention in industry in parallel to this work;"
- "Future proofing ... we should operate on a very conservative worst-case scenario that anticipates the highest degree of distortion from climate change;" and
- "Long-term management of groundwater and soil resources, based on realistic assumptions of future land use and groundwater use."

Additional suggestions or comments related to supporting policies or approaches to guide adaptation to climate change included:

- "The ministry [could] adopt the B.C. Contaminated Sites Approved Professionals (CSAP) sustainable remediation guidance (Toolkit 4);"
- "You may wish to review and borrow from the Ministry of Transportation and Infrastructure Engineering Branch Climate Change technical circular T04-19 (<https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/engineering-standards-and-guidelines/technical-circulars/2019/t04-19.pdf>);"
- "[Consider] incentives for GHG reductions/'green' remediation;"
- "Consider... climate change mitigation, rather than just climate adaptation... Risk assessment can often have less environmental impact, this method not only assesses risk from contamination but decreases the carbon footprint of the remediation;"

- “Include greenhouse gas (GHG) emissions... risk assessments often represent the preferred sustainable option for remediation and avoids the GHG emissions associated with dig and dump excavations and limits ecological effects associated with physical remediation;” and
- “Western University has a precipitation modelling tool for different warming [scenarios]... modelling gauged locations allows for the development of [intensity-duration-frequency] IDF curves to predict streamflow and groundwater flow for changing scenarios (<https://www.idf-cc-uwo.ca/home>).”

Outcome 1: Incorporate Indigenous Nation Engagement as a Component of Remediation Plans

Engagement with Indigenous Peoples and stakeholder consultation supports transparency, and facilitates input on contaminated site concerns, potential remediation alternatives and proposed remediation activities. The provincial government has an obligation under the Declaration Act to align laws with the UN Declaration in consultation and co-operation with Indigenous Peoples. This is further supported by the recent amendments to the Interpretation Act in Bills 18 and 29 where it states that every act and regulation must be construed as being consistent with the Declaration Act. This extends to policies as well under ministers’ mandate letters.

Comment form question: How can engagement and communication requirements be designed to take into account Indigenous Peoples’ consideration of risk assessment and remediation?

Responses to the discussion paper were received from representatives of four Indigenous Nations. Comments on this outcome from these Indigenous groups highlighted the need for “better communication processes... to improve engagement with First Nations.” Specific suggestions included: “more frequent updates and reporting to the local nations and membership [to] help build a relationship and provide opportunity for discussion and feedback;” “proper consideration [of] communities’ current capacity and internal processes;” and “a priority ranking on [referrals] submitted to Nations so that they can implement appropriate time management... to complete the required work [needed] to respond.” One Nation, for example, recommended that “First Nation run environmental companies and monitoring programs should... be hired to work in their Territories... by following a consent-based model, remediation plans must include First Nation directives and the plan overall must be agreed upon by First Nations.”

Responses from non-Indigenous individuals and organizations commonly expressed “support for [early] engagement with Indigenous Peoples and stakeholders” while several respondents also noted that engagement involves time, commitment and budget/resources. One respondent, for example, commented that “mandatory engagement with multiple Indigenous Nations on a site-specific basis could put a considerable administrative burden on Indigenous nations, as well as Responsible Persons.”

Additional recommendations or comments included:

- “Engagement with Indigenous Peoples should be incorporated on a project-by-project basis and may not be necessary on all projects;”
- “Consideration should be given to differences between urban centres and more rural areas;”
- “Consider a passive notification system like that being implemented for soil relocation so Nations have an option but not an obligation to respond;”

- “The level of engagement should depend on a clearly defined area in the vicinity of the proposed work... a clear process should be provided outlining the engagement process and expectations... if First Nation involvement becomes a requirement for remediation planning, we suggest a tiered process for the level of required engagement based on location, degree of contamination, and potential impact to the environment;”
- “Indigenous communities could provide additional historical information on the uses of a site, in addition, the risk assessment and remediation alternatives considered should [include] the traditional land use and future use of the area;”
- “The Province already has a robust framework for Indigenous Peoples’ consultation... the time delays of requiring consultation and uncertainty of a defined remediation criteria and standard for each site would significantly impede development [and] in a worst-case scenario... [would] render some proposed redevelopment unviable resulting in less remediation overall;”
- “Include an Archaeological Overview Assessment and related investigations, if necessary, as part of the supporting information for a remediation plan;”
- “Engagement with Indigenous Peoples could include having them be contacted during the Notification of Independent Remediation Initiation process – this could be built into the NIR form... any feedback received, would be forwarded to the Land Remediation Section for follow-up and actioning, if required;”
- “The process should be developed in a manner that does not result in remediation not occurring because it is locked in a multi-year consultation process;”
- “You start by asking and working with First Nations, first, and always;” and
- “We suggest that consultation with Indigenous Nations be conducted by the ministry at a policy level (not at the site level) for risk assessments and remediation plans... adding consultation for individual remediation plans would increase timeline and costs.”

Outcome 2: Incorporate Climate Change Adaptation in the Contaminated Sites Framework

Investigation and remediation activities for contaminated sites currently involve an assessment of historical and current site conditions as the basis for predicting and addressing future conditions. However, future conditions under a changing climate may differ from historic ranges. Resilient remediation methods will ensure long-term effectiveness under changing climates. By accounting for regionally-specific climate change impacts like sea level rise, flooding and wildfires, we can better protect the significant investment in time, resources and money that make remediation happen. This could be described as future-proofing remediation activities and plans.

Comment form question: How should adaptation to climate change be addressed in B.C.’s contaminated sites framework?

Many respondents commenting on this topic recommended adaptation to climate change be addressed in “guidance documents” (rather than in regulation or protocols). Several respondents highlighted the importance of “consistency... in how practitioners evaluate/measure impacts from climate change” and guidance documents that “provide summaries for different areas/regions of B.C.” One respondent suggested, for example, “developing a provincially accessible GIS-based tool to depict climate change projections and

site vulnerabilities, sites with high value of Indigenous use or high risk areas where assessing adaptation is required (i.e., within flood zones)."

Several respondents suggested that "in addition to climate adaptation, climate mitigation is also important to consider as part of this process." These respondents pointed to consideration of the GHG emissions associated with "dig and dump" remediation (relative to in-situ remediation), or to the value of redeveloped urban brownfield sites as "denser mixed-use communities that are well served by transit." Respondents also commented "climate change should be part of the assessment and evaluation framework, as well as part of the considerations for ongoing monitoring requirements."

Additional suggestions and comments included:

- "Climate change should be considered at each stage of the investigation process (from Stage 1 through to remediation), similar to how the Federal Contaminated Sites Action Plan (FCSAP) has developed their process;"
- "Create a risk matrix/flow chart for determining risk levels associated with each potential climate change condition;"
- "Evaluate if receptor pathway elimination performed during a risk assessment will be affected by a changing climate;"
- "The ministry should prepare guidance (including reference to regional climate risk sources and community adaptation plans) to assist with [remedial options] evaluation;"
- "Require climate vulnerability studies for contaminated sites (with risk or on-site containment) in locations sensitive to climate change (shore line, flood plain, etc.);"
- "Emphasis on 'green' remediation and soil reuse in appropriate settings;"
- "If projects meet a certain threshold [in terms of climate threats] in the due diligence stage, large bonds should be put forward to [affected/potentially affected] Nations for future restoration initiatives;"
- "The ministry needs to distinguish between situations where and when the original polluter is remediating the site versus circumstances in which a new owner is addressing cleanup issues after potentially years, decades and even generations of neglect;"
- "A complete rethink of the existing system may be appropriate... an alternative process could include requirements for ministry review of remedial plans of certain sizes prior to them being initiated;"
- "It would be most wise to take a risk avoidance-based approach at the earliest moment of any site remediation;"
- "Current operating practices will no longer suffice when it comes to [B.C.'s] contaminated sites framework... more frequent testing and monitoring of contaminated sites [is needed] as well as more long-term monitoring and remediation... [and] ongoing evaluation of adaptation and remediation measures as a part of risk management... to help predict impacts to other sites;"
- "There is a major concern among many of our clients about forecasting potential costs in the future based on climate change... often our clients are no longer involved in the project after construction, and it is unclear who would be responsible for ongoing climate change evaluation when the final owner is a strata or individual owner;"
- "Adaptation to climate change is not generally an area of expertise for contaminated sites professionals – education and tools will be required to understand adaptation issues – qualifications need to be identified for professionals recommending climate change accommodations;" and

- “An option is to create a category for contaminated sites that qualify for climate readiness similar to the existing system of classifying high risk sites.”

Outcome 3: Incorporate Remediation Alternatives Evaluation more fully in the Contaminated Sites Framework

Section 56 of the *Environmental Management Act* (EMA), specifies that preference must be given to remediation alternatives that provide permanent solutions to the maximum extent practicable. A “remediation plan” defined in the CSR may include consideration of remediation alternatives and the evaluation methods used in identification of alternatives. However, there are no regulations, policies or guidance that specify the process for identifying, considering and evaluating remediation alternatives.

Comment form question: How should requirements for remediation alternatives evaluation be set out in B.C.’s contaminated sites framework?

Many respondents reiterated the rationale underlying comments to previous questions, commenting, for example, that “in-situ bio-remediation should be prioritized as it has the least impact and is the most sustainable remediation [option] in many cases,” that the process should “provide a positive weighting for remediation alternatives that reduce GHG emissions” and that “there should be recognition that some contamination is better to be left in place when considering the overall location, depth and realistic potential for future drinking water use.” In referring to their previous comments, one respondent recommended that “remediation alternatives evaluations should be communicated to additional stakeholders when current and future water use will be impacted in high value areas that may need to use groundwater for climate adaptation” noting that “[our municipality] is concerned with the lack of tracking of limits to water use by risk assessment and the lack of coordination with other levels of government.”

Several respondents recommended development of guidance materials on remediation alternatives, suggesting, for example, that “a general framework that lists the typical remedial evaluation of options should be considered” or that “remediation options analysis should be a requirement of a remediation plan.”

A response from an Indigenous Nation highlighted that “[our Nation] requires further information on methods and criteria use for risk assessments and remediation evaluations – these methods should be discussed and thoroughly reviewed through engagement with First Nations... we [also] require the exact definition and current process for the ‘remediation alternatives evaluation’ [process].” Another response from an Indigenous Nation noted that “[the process] needs to take into account the current capacities and gaps of First Nations to be able to participate in a meaningful manner.”

A response from a provincial utility described their process for assessment of “remedial alternatives in work planning... remediation is generally decided considering a number of values/factors: site status (operational, change in use, or site closure); regulatory compliance; human health and ecological risk; feasibility (access, depth, level of contamination); short- and long-term costs; site location and proximity to disposal facilities; current and future land use, etc.” The respondent recommended “a scalable remedial alternative evaluation approach... [with] a more thorough evaluation for sites going into closure or change of use... guidance should be provided by [the ministry] but focused on the process, not on specific requirements or laid out as protocols.”

Additional comments included, for example:

- “[We] suggest that legacy sites with existing certificates be exempt from further review;”

- “More nuance is needed to address differing situations – for example, a large decommissioned mine in Northern British Columbia is fundamentally different than the redevelopment of a small gas station with multiple adjacent properties in a heavily urbanized area;”
- “Issue guidance on remediation alternatives evaluation... similar to technical guidance provided by the ministry for land remediation (technical guidance [documents] 10 and 11);”
- “Focus on ensuring that the investigation [process] (and the corresponding re-evaluation of remediation alternatives) advances toward remediation for all contaminated sites, and not just sites undergoing redevelopment or applying for certificates of compliance;”
- “Use the carrot and not the stick approach;”
- “Promote reuse rather than disposal – new technology exists that allows for contaminated soils to be cleaned of environmental and geotechnical contamination and reused... encourage circular solutions that support sustainable climate adaptation... resource regeneration enables productive use of... soils while maximizing redevelopment potential for a site;” and
- “Consider an option like the [national contaminated sites] federal score evaluation criteria.”

Comment form question: What process steps and criteria should be included in remediation alternatives evaluation?

Several respondents pointed to the federal contaminated sites action plan, commenting, for example, that it “provides guidance on integrating climate change adaptation at each stage of site assessment and remediation... [and] could be adapted for B.C. projects.” Respondents also commonly commented that remediation alternatives evaluation “is site-specific” and any guidance regarding process steps and assessment criteria should take this into consideration. One respondent commented, for example, that “remediation within the City is almost exclusively conducted during redevelopment with the form of development driving the remediation methods and costs.”

Suggestions for process steps and criteria included:

- “Vulnerability assessments will be an important step to add to this process, especially when faced with unpredictable and new impacts due to climate change;”
- “Process steps [should] include listing and describing all feasible remediation options;”
- “Build on existing guidance on remedial options assessment... we don’t want it to be too prescriptive... provide the framework that practitioners can use;”
- “How the remediation was evaluated [and] chosen, with a consideration for the footprint and sustainability of the remediation;”
- “The key criteria for selection of remedial options needs to [put] the focus on the elimination of pathways for exposure, rather than just reducing concentration of the source;”
- “GHG performance indicators, future climate indicators (e.g., 100-year flood magnitude), stakeholder (including First Nations) acceptability, (and) local service capacity (contractors, landfill distance, treatment possibilities);”
- “Encourage circular solutions that support sustainable climate adaptation;”
- “Go local... integrating innovations in design with democratic principles of homegrown solutions;”
- “Avoid using information or taking guidance from foreign based policy makers or organizations;”
- “Look to other countries or areas that have successfully moved materials and use their methods;”

- “Feasibility, timelines, waste generation, location of waste disposal, power and water requirements, cost – criteria... should be based on guidance and not protocols and should provide flexibility;”
- “Soil types, regional climate information, groundwater and surface water conditions, proximity to sensitive lands/species, proximity to public;”
- “Priority ranking, capacity of the impacted First Nations, timing (for meaningful consultation and referral review and response), consideration for FN Community internal processes..., expert advisors to work with the First Nations, government and industrial proponents in a team environment to develop appropriate mitigation and response plans;”
- “Size of contamination... whether the source of contamination is still there... location... as well as time the contamination has been in place;” and
- “Cost, duration/care measures... risks of failure, transferral of risks to other environmental media, decrease in responsibilities/liabilities, Indigenous Peoples’ acceptance, public nuisance and safety... compute a total score for each option... and assign a weighting factor [if needed].”

Outcome 4: Incorporate Periodic Review of Remedial Actions for Sites with Risk Assessment or Risk Management Approaches

In B.C.’s current contaminated sites framework, some sites using risk assessment or risk management as a remediation approach are required to review their long-term remediation plans and monitoring at specified intervals. However, the specified intervals and provisions are not consistent. Also, current provisions do not explicitly consider climate change or assess continued effectiveness of remediation considering changing climate conditions over time.

Comment form question: What provisions for periodic review of sites should be considered for inclusion in B.C.’s contaminated sites framework?

About half of respondents chose not to comment on this question. Comments from professionals working with contaminated site assessment and management included: “periodic review... [based on] a scheduled monitoring plan;” “current triggers [for monitoring] (ownership transfer, redevelopment, etc.) are sufficient;” and “periodic review is likely only required for a handful of sites.” Some professional respondents suggested specific timeframes for review, for example: “annual review of erosion features and discharge monitoring [and] of king tide or storm surge events (e.g., dykes);” “a review period [of] ten years... or following extreme climate events that may have changed the site conditions;” and “review of sites with risk assessment every five years [as well as] one year after an extreme climate event (e.g., flooding, wildfire).”

Additional comments included:

- “Funding should be provided by the Province for physical remediation of contamination in areas that limit critical climate change adaptation strategies, such as the use of groundwater;”
- “Sites reliant on containment in climate sensitive areas (e.g., permafrost) or located in possible flood zones should have shorter durations between periodic reviews;”
- “[Rather than] periodic review after Certificate of Compliance issuance, there should be more robust requirements to model many future scenarios prior to... issuance... communicated in standard ministry technical guidance documents for risk assessment;”

- “Consider linking the timeframe or necessity for follow-up review to the results of the climate change assessment (i.e., be site-specific);”
- “[We] recommend that the ministry be cautious about making periodic review [and] timing requirements prior to knowing the potential impacts of climate change hazards on contaminant fate and transport;”
- “The assumption of residual monitoring requirements and costs would serve to create uncertainty and encumbrances;”
- “[Our First Nation] requires further information on methods and criteria used for risk assessments and remediation evaluations – these methods should be discussed and reviewed through engagement with First Nations;” and
- “The process for reviewing sites needs to be updated to reflect... environmental changes and include much more consistent intervals of monitoring, evaluation and possible testing to consider changes in contamination, movement of contaminants, and assessment of other vulnerabilities... community health, wildlife, water, biodiversity, etc. are all impacted by activities on the land which contribute to cumulative effects, therefore looking only at contaminated sites does not fully mitigate impacts on the land.”

Comment form question: How should sites with risk management plans (i.e., sites with in situ contamination) be monitored and assessed over time to assess changes due to changing climate?

Note that respondents provided common or overlapping points across the three comment form questions under this outcome (i.e., some respondents did not distinguish between commenting on periodic review provisions in general and specific comments regarding sites with risk management plans).

Several respondents noted that review clauses are already included in current risk-based certificates of compliance commenting, for example, that “high risk sites in B.C.... (that more likely to require periodic review) already have ministry oversight/involvement and provisions for periodic review can be made on a case by case basis.” Some respondents favoured a set timeframe suggesting, for example, that “it would make sense for there to be a 5-10 year update and monitoring process to assess the impact of climate change.”

Respondents offered differing views on how the ministry should approach monitoring and assessment. For example, one respondent commented that “as it stands now, many ministry certification documents do not age appropriately and don’t necessarily meet current standards, expectations, ministry policy, etc. ... I think that certificates of compliance should expire within 10-25 years of being issued, or at the least, go through an amendment process whereby an approved professional states that all assumptions, etc. remain valid at the site.” Another respondent recommended “that re-assessment of these sites should be completed in a smart, educated way [as] not all sites are financially/ environmentally worth [reassessing] – as sampling and long-term monitoring has negative effects on the environment and climate and financially, the time and money required could be better used elsewhere.” One respondent raised a number of questions regarding the practicality of monitoring requirements: “If standards change... does the current or former owner have the liability...? If there is a significant climate event... how do you know that the adjacent site... is not affecting your site? What about smaller developers that are no longer in operation after development? Who would conduct [and pay for] the work?”

Related comments and suggestions included:

- “Monitoring needs to be more frequent and at consistent intervals unless an event occurs in which immediate response and evaluation is required – sites may change due to environmental impacts,

therefore, risk management plans will need to be updated on an ongoing basis and risk assessments may need to be carried out more frequently;”

- “A future conceptual site model that includes climate change information (e.g., the assessment of relevant climate hazards... under a specified climate scenario) ... could be used as the basis of determining if further review is warranted;”
- “Sites with anthropogenic contamination and no certificate of compliance should have site monitoring requirements based upon an established site risk rubric;”
- “Sampling downgradient on sites and off-site to assess any potential contaminant movement;”
- “Note that many sites that are remediated/redeveloped in the City will have a building covering the entire site, so monitoring would be limited to wells on City property – currently it is very difficult to hold well owners/ installers liable for their decommissioning, so having some guidance on how long these wells have to be maintained would be helpful;”
- “On site monitoring should be a component – use of numerical models would also be helpful;”
- “The requirement to consider this [assessment of changes due to a changing climate] and include appropriate evaluation in the performance verification plan should be stipulated;”
- “The ministry should institute periodic reporting requirements backed by financial security on a site-by-site basis based on regional climate risks;”
- “Combine western science with traditional knowledge from the affected Nations to determine proper timeframes and courses of action;”
- “Consider monitoring/reviews as a requirement for sites with regulatory obligation relating to risk management... similar to current conditions related to performance verification plans;” and
- “Once a site shows a stable or decreasing plume, further monitoring should not be required, unless there is justification for monitoring on a site-by-site basis.”

Comment form question: What elements should be included in guidance for periodic reviews?

Several respondents commented that “periodic review responsibilities should be transferred [with ownership if] ownership and representatives of sites... change hands.” Respondents also noted, for example, “concern... [that] to mandate climate adaptation reassessments of sites with changing criteria over time will lead to both unknown surprise costs and potential liabilities.” To address some of this concern, some respondents also recommended that “legacy sites that already have existing certifications be exempt from periodic reviews.”

Respondents who expressed support for “more frequent” or “periodic review requirements” provided suggestions that included “a risk ranking system to establish what the periodic review [period] should be,” “triggers for reviews after extreme climate events (pre-determined and clearly communicated to stakeholders),” and “triggers for periodic reviews [identified] in the original climate assessment.”

Suggested elements for inclusion in guidance for periodic reviews included:

- “Review of new technologies, as higher levels of remediation may be possible with technical innovation;”
- “A checklist for approved professionals... [that] could include comparison of past analytical results to current standards, recommendations to conduct additional sampling... addition or retraction of potential contaminants of concern (PCOCs)... and recommendations for additional monitoring or removal of conditions based on current practice;”

- “The site risk should dictate the frequency of periodic reviews... guidance should be incorporated into the site risk classification report to focus attention on sites where contamination has a greater chance of reaching receptors;” and
- “An updated vulnerability assessment using current data/climate models.”

Outcome 5: Incorporate Remediation Requirements for Viable Groundwater Aquifers

The current contaminated sites framework specifies that drinking water use applies to viable aquifers as evaluated using criteria described in Protocol 21 (Water Use Determination). When an aquifer is classified as viable to support current or future drinking water use, site investigations must be completed to confirm if contamination is present; however, there is no requirement to physically remediate the aquifer to meet the drinking water standards. Instead, remediation can be based on risk assessment, where the risk is managed by adding institutional controls preventing the use of the aquifer for drinking water purposes. The water resource cannot be used for drinking water purposes without additional physical remediation.

Comment form question: Should the ministry limit the use of risk assessment that utilize institutional controls preventing future use of the water for drinking water purposes?

Note that many respondents provided general comments on groundwater and remediation rather than addressing each of the comment form questions specifically (e.g., many respondents commented on classification and ranking under this, rather than subsequent, questions).

Most respondents commenting on this question expressed support for protection of “high value” aquifers for drinking water. Many also noted that “high value needs to be defined” and suggested that B.C.’s aquifer classification system be used as a starting point. One respondent, for example, commented that “B.C.’s aquifer classification system considers... productivity, vulnerability, aquifer area, demand, type of water use and quality... however... additional criteria will [be needed] to define the value of aquifers and to determine which are high value (e.g., proximity to urban centres... water quality criteria in areas experiencing extreme drought).” Another respondent recommended that “aquifer classification should reflect regional water security plans.”

Some respondents recommended that the ministry exercise “caution” before proceeding with any limitations, commenting, for example, that “in many cases it would result in redevelopment being cost prohibitive” and that “it will be critical to address the issues of the costs, who pays, and the practicality of the cleanups [for groundwater remediation] ... few sites and aquifers will be remediated at all in urban areas if brownfield redevelopments become unviable.”

Related comments included:

- “This question needs to be clarified [with our First Nation] before a response can be submitted... risk assessments should be carried out equally and the findings communicated [to Indigenous Nations, as well as others] – this is a very important topic that should not be misconstrued... further information is needed on the exact definition and use of ‘institutional controls;’”
- “[We] suggest that limiting the use of risk assessment and requiring physical remediation is not always the most green and sustainable option over the project lifecycle – many factors need to be considered before making the decision to limit the use of risk assessment;”

- “The proposed changes do not provide a solution to remediate contaminated aquifers... existing Schedule 2 uses and brownfield sites may continue to be a source of contamination [while the proposed changes focus on sites already remediated by redevelopment];”
- “Remediation of contaminated sites that have the potential to impact groundwater aquifers due to climate change effects should be prioritized;”
- “Removal of institutional controls for groundwater remediation is consistent with mitigation of seasonal water shortages, i.e., protecting more aquifers for future use;”
- “This should be considered in populated areas where aquifers are a potential resource, not only for ‘drinking water’ but also non-potable uses;”
- “Work should be advanced by the Province to engage with Indigenous communities and local governments to identify vulnerable and priority areas for groundwater use as part of climate adaptation;”
- “The only reason to prevent the future use of water for drinking water purposes is the remoteness of the site and very unlikely development potential for the site;”
- “Yes, and/or establish a process for evaluating whether institutional controls are being followed;”
- “The ministry should consider reviewing the risk assessment requirements in light of elevated future groundwater use;” and
- “There will be a tangible benefit if there is a true likelihood that the aquifer could serve as a source of drinking water in the event surface water becomes scarce – [however, the] definition of useable aquifer under Protocol 21 [1.3 L/min] is currently based on criteria for single family household... this is not [realistic] for an aquifer to supply drinking water through a municipal water distribution system.”

Comment form question: Should all viable drinking water aquifers be protected equally or should remediation requirements depend on aquifer classification?

Comments and associated rationales were divergent in response to this question. Some respondents commented, for example, that “all viable drinking water aquifers should be protected and treated equally as they are one of the most important resources we have.” In contrast, other respondents felt that “remediation requirements should depend on aquifer classification” commenting, for example, that “it does not make sense to protect all aquifers equally... shallow aquifers in highly urban environments should not receive the same level of protection as an aquifer that has a moderate to high potential [of being] utilized in the future.” Other comments included, for example, “protecting all drinking water should be the goal but the ministry would likely have to prioritize resources in the highest value areas” and “remediation requirements should depend on likelihood of future use (e.g., proximity to current uses, high aquifer production, high demand aquifer).”

Additional comments and suggestions included:

- “Higher ranking aquifers (most likely to become drinking water) and their remediation requirements require more in-depth discussion and engagement as this is a very important topic;”
- “If alternative drinking water sources are necessary in the future based on climate changes, then the highest yield aquifers in each region [should] be targeted first... different aquifers also have different natural groundwater quality... drinking water standards have also not [to date] incorporated the concept that a water supply will be treated before consumption as drinking water;”
- “The Province should assume that in the future there will be an increased demand on groundwater resources in populated areas – some of these populated areas have commercial/industrial lands,

which may have legacy contamination or may be more prone to new contamination – extra protections and requirements should be in place to prevent and/or remediate contamination to groundwater in these areas (e.g., precluding risk assessment that does not consider future use)... valued aquifers in these and other areas should be identified through engagement with Indigenous Peoples and local governments to prioritize remediation efforts – the climate risk and adaptation assessment conducted as a part of the remedial options evaluation should consider the likelihood of groundwater being used during drought conditions or for emergency purposes where feasible;”

- “Not all groundwater beneath urban centres should be considered viable groundwater aquifers – notwithstanding [this]... given that many municipalities such as Chilliwack or Langley, are located over a viable aquifer, [this proposal] would significantly restrict and, in a worst-case scenario end, redevelopment in those areas;”
- “Major flood events that affect sanitary sewers and other contaminants from housing, businesses, farms, and cars, etc. provide risks to aquifers that would far outweigh the potential risks from climate change events in risk assessed remediated sites;”
- “Consider looking at what some European countries do to classify aquifers so that the classification system can capture future developments (e.g., growth of urban centers);”
- “There should be the possibility to complete a site-specific technical evaluation of potential risk to a viable aquifer prior to requiring remediation to numerical standards;”
- “[The] aquifer classification program will need to be expanded and conducted independently of contaminated sites assessments;”
- “Aquifer classification is a good measure to allow for more or less leniency for protection, however all aquifers should be protected in some regard, and ones that are predicted to have a lot of use should be highly protected;” and
- “[We] support aquifer ranking and those classified as high should continue to be protected... the current criteria for determining drinking water standard applicability should also allow flexibility for locations where future drinking water use is highly unlikely... in areas where aquifer protection is crucial, incentives to risk assessment could be considered... investment in development of time- and cost-effective groundwater remedial technologies should be encouraged/considered, including use of pilot studies at existing sites.”

Comment form question: Should sites with high ranking aquifers be classified as high risk and require ministry oversight?

Respondents commonly reiterated related comments or provided consolidated under related questions concerning groundwater and aquifer classification. Those who commented with a “yes” often added provisos, for example, “yes... if they affect a community’s climate adaptative capacity,” “yes, with exceptions... type/persistence of contaminant, effects... and level of contamination,” “yes, well [it] depends...” Respondents who expressed reservations noted concerns regarding the potential for the ministry to get “bogged down” with oversight responsibilities and/or that “locations [that] are automatically high risk... [may] result in property owners actively avoiding any action that could trigger a risk evaluation... the end result being that less remediation will happen.”

Related comments included:

- "Consideration should be given to the actual risk to the aquifer that results from the contamination... it is important to consider the scale of the contamination that could potentially affect an aquifer;"
- "Sites with high ranking must be remediated first and rapidly in order to protect the high yield source of water;"
- "There should be mandatory reporting and compliance verification for these sites to ensure a clean water supply in areas of aquifers with a high likelihood of utilization;"
- "The concern with this is how many more sites would be classified as high risk and then require ministry staff oversight... defining which high-ranking aquifers would be... in this category would be a... first step... and then a step in the risk classification process could be included to designate some of these sites as high risk if there is [persistent] contamination greater than a certain level;"
- "Aquifers designated as high-ranking could be determined in a similar way as priority areas in the Agricultural Code of practice... areas were designated based on specific criteria and information available... [and] the list can be expanded as additional information becomes available;" and
- "All sites should require ministry oversight."

Comment form question: Should the ministry impose a timeframe for differing classes of aquifers?

Many respondents expressed support for development of remediation timeframes based on differing classes of aquifers. Several respondents suggested that more information would be needed regarding the classification framework and criteria before being able to comment on or support specific direction on the part of the ministry. Some respondents raised practicality concerns commenting, for example, that "technical feasibility may be a limitation" and "this would be difficult to implement across the board because of differing levels of toxicity for substances, remediation viability, mobility and degradation rates."

Additional comments included:

- "Standard timelines for remediation [should be] based on depth of contamination, contaminant, volume of impacted area and likelihood of aquifer being used, etc. ... all aquifers with a high chance of utilization should be required to be remediated in advance of use;"
- "Areas with more established protected aquifers should be remediated on a when needed basis while those in remote areas should be [remediated] first;"
- "Unless additional requirements to force investigations [are] created, this policy would result in less remedial progress;"
- "High value aquifers that are actively being used should have shorter remediation timelines than high value aquifers that are not actively being used;"
- "Establish a timeline similar to the Dormancy Regulation so that a timeframe is prescribed to complete the remediation;" and
- "If contamination is within a high value aquifer, that the remediation timeframe should be prioritized in the remedial options evaluation – the timeframe should also consider the type, magnitude and extent of contamination to define site-specific timeframes...[and] input from the community and Indigenous Peoples... when determining remediation endpoints and timeframes."

Comment form question: What criteria should be used to evaluate the feasibility and technical practicality of remediation options?

Several respondents recommended that the ministry “build on existing guidance.” Suggested criteria included “aquifer classification [and/or] vulnerability,” “site risk classification,” “the type and relative concentration of contaminants,” “disturbance to existing environment,” “cost,” “availability of technology,” “availability of remediation resources,” “remediation viability of substance,” “potential for contamination to reach a receptor,” “sustainability” and “stakeholder acceptance.”

Additional comments and suggestions included:

- “Degradation rates for natural attenuation and whether substances may be naturally occurring;”
- “Resilience to climate change;”
- “Time allowance... contaminant/liability reduction;”
- “Provide the framework that practitioners should use... don’t be too prescriptive;”
- “Look to other areas [countries or areas of Canada] that have had success with remediation options;”
- “Any contamination should and can be remediated;”
- “Implementation of monitored natural attenuation is a preferred remediation alternative in cases where the concentrations and types of contaminants allow for this method;” and
- “Expected timeframe of completion of remediation... it should be defined... from 10-25 years... the target timeline should be reasonable and somewhat predictable (demonstrate that it is plausible).”

Outcome 6: Incorporate Financial Security for Sites with Risk Assessment or Risk Management Provisions

B.C.’s contaminated sites framework includes requirements and a general approach to provision of financial security for remediation of contaminated sites (Protocol 8). Currently, financial security is applied on a case-by-case basis, generally for high risk sites. Amendments to financial security requirements are needed to ensure long-term protection of human health and the environment at sites where risk controls are in place.

Comment form question: In what circumstances should financial security be required for contaminated sites to ensure long-term protection of human health and the environment?

About half of those responding to the discussion paper commented on this topic. Most respondents expressed support for financial security requirements. Related comments included: “financial security should be required for all sites with anthropogenic contamination at the time a site risk classification report is submitted;” “for future projects that are predicted to impact the environment, significant financial allowances must be set aside for future remediation efforts;” “a good idea in any case where there is significant risk;” and “contaminated sites should always have significant financial security requirements for remediation.”

Some respondents suggested that existing requirements [as set out in Section 48 (4) of the Contaminated Sites Regulation and Protocol 8] sufficiently address potential impacts of climate change, commenting, for example, that current requirements for security address “high risk conditions... [and] include risk controls, need for ongoing maintenance, annual inspections, risk of failure, etc.”

Related comments and suggestions included:

- “Level of financial security could be ascertained based on risk and historical performance of permittee and likelihood of their still being around in the future;”
- “Risk of continued contamination in populated areas with marginalized populations;”
- “Many remediation projects may never be undertaken if there is too much financial risk, uncertainty or long-term exposure to a party buying or redeveloping a property;”
- “If long-term requirements are placed on groundwater or aquifer remediation or risk management, the government body required to oversee these long-term requirements must be made clear and that body must be given the opportunity to set and collect required security – note that many site developers resist long-term obligations as they intend to wind up development companies within a few years after redevelopment – the ministry may wish to consider a provincially run team that monitors and collects security or payment for ongoing long-term obligations, especially considering groundwater and aquifers can cross municipal or regional district bodies and smaller regional districts may not have capacity for this type of work;”
- “[Financial security should be required] by the Province in every instance where long-term remediation/risk management is the approved method at a high risk site on a high value aquifer;”
- “As an example, [our municipality] requires an applicant to enter into a remediation agreement and provide financial security for remediation of City lands conducted in conjunction with zoning applications – the City returns the security when the applicant receives a Certificate of Compliance and completes post-remediation monitoring requirements – where risk-assessment is the accepted method of remediation, the City will also require financial security for future anticipated costs of remediating the in-situ contamination during planned or anticipated utility or transportation works – the applicant may also make a lump-sum payment in settlement of anticipated future costs incurred by the City on a case-by-case basis;”
- “There could be selection criteria... predicated on the value of land, risk classification status and type of industry operating (i.e., industries that are more prone to boom and bust cycles) – for example, contaminated sites that are located in Metro Vancouver may not require financial security if the value of the land superseded the expense of managing current and or expected levels of contamination – however, a large industrial site in a rural area, which may not have much redevelopment potential, would be subject to financial security as the value of land is unlikely to cover the expense of remediating the site and redeveloping;”
- “The size of the site or scale of contamination can be factors to inform whether financial security should be collected... [our government agency] utilizes a permittee capability assessment program to assess the financial health of permit holders, requiring security for environmental liabilities when potential financial risks are identified;” and
- “Financial security can place an undue burden on responsible persons and stakeholders, however, where contamination could be detrimental... if action is not taken, risk can increase over the remediation timeframe – in such cases, financial security to specifically protect climate objectives is necessary – it is recommended that any such financial security be renewed annually or in conjunction with the anniversary of any approved professional statements – for sites [where] it may not be possible to impose financial burden on previously responsible parties, the abandoned and orphan mine sites program may provide a framework for [needed actions to address climate readiness].”

Comment form question: In the context of climate change, how should Protocol 8 be revised?

A limited number of comments specific to this question were received. Related suggestions and comments included:

- “Simplify Protocol 8 and reduce the amount of options – there could be a standardized calculation for an irrevocable letter of credit that is based on the ability of the proponent to support the payment and also cover a percentage of the potential liabilities of the remediation;”
- “Risk control that is vulnerable to climate change needs to be maintained [for the] long-term;”
- “In step 7 of Protocol 8, significant risks to remediation and risk management due to climate impacts should be considered by the ministry when evaluating whether financial security is required;”
- “Industry activities... (e.g., mining) should have bonds increased to an amount that will sufficiently cover remediation and [to] carry out any other activities under their management plans (such as meaningful engagement with First Nations, wildlife mitigation plans and environmental assessments);”
- “[The current] Protocol 8 is sufficient... as stated in [the protocol], ‘items that shall be considered before financial security is requested include the significance of *any risks* (emphasis added) from conditions at the site...’ no new financial security mechanism is needed;”
- “Some sites previously classified as low or medium risk, could increase their risk, therefore a definition of high risk site needs to be incorporated to Protocol 8;” and
- “The calculation of the amount of security should include a remediation strategy which accounts for future climate models down scaled to a site-specific level.”

Comment form question: Is there a need for a new form of financial security in addition to those already in use?

A limited number of comments specific to this question were received. Related suggestions and comments included:

- “Funds should be collected from more sites, and... put in a pool to be claimed by impacted parties including municipal governments, in the event of orphaned sites – City governments in many cases have to pay for additional soil management costs for sites with Risk-based Certificate of Compliance on City right of ways – these costs can be occurred decades after CoC issuance – it would be useful to have a fund that could be used to recover these real costs – these costs should be paid for by the polluter;”
- “There [already] is a wide variety of financial security instruments;”
- “Long-term financial security is needed to fulfill requirements for ongoing monitoring, site testing, and more frequent and ongoing site reviews. More oversight and security is needed to ensure activity, engagement/communication, mitigation and remediation plans are being followed and that there is enough to cover any incidents, infractions or unforeseen events. Some remediation and contamination will be ongoing for hundreds of years;”
- “A re-evaluation of the polluter pays principle should be considered as the legislation is outdated. For municipalities, where the polluter can be identified, implementation can be difficult – the polluter may be unable to pay and the parent corporation or shareholders cannot always be held liable for the activities of a subsidiary – not every municipality has a well-established legal team to handle these

cases... legal process is often very lengthy and costly which often results in claims not being made and the affected person is left with the costs and management of contamination that is not theirs;"

- "No, reduce options, simplify methodology;"
- "Yes, I haven't heard of any financial security working yet;"
- "The use of surety bonds or reclamation bonds (as well as other securities) for contaminated sites is being explored as part of the [provincial] bonding working group – bonds may be a good tool in cases where the magnitude of financial risks exceeds the resources available to address those risks (e.g., in the oil and gas context), where the magnitude of risk exceeds the budget of the orphan fund;" and
- "[We] need more info on all types in use [before being able to comment]."

Comment form question: How often should securities be reviewed in light of climate change?

Respondents commenting on this question suggested a range of periods, including: "every second month;" "annually;" "on a regular basis;" "every three years and no more than once per year;" "at least every five years;" and "10-25 years." One respondent commented that "review would make sense for the same period that is selected for the climate change review process [e.g.,] (every ten years and after major events)." Another respondent recommended that "securities must be reviewed after a severe event occurs on or nearby a contaminated site, while remediation plans are being adjusted, and while amendments or new permits are being considered."

Additional Comments

A number of respondents provided additional comments or questions for the ministry that were not specific to outcomes in the discussion paper or comment form questions. A sample of these additional comments is provided below.

- "Long-term financial security is needed to fulfill requirements for ongoing monitoring, site testing, and more frequent and ongoing site reviews. More oversight and security is needed to ensure activity, engagement/communication, mitigation and remediation plans are being followed and that there is enough to cover any incidents, infractions or unforeseen events. Some remediation and contamination will be ongoing for hundreds of years."
- "Risk assessment represents an obvious form of green and sustainable remediation as it avoids the ecological effects and heavy emissions associated with unnecessary dig and dump excavations. A lot of municipalities strongly challenge the use of risk assessment as a green remediation approach. What efforts are the Ministry engaged in to convince local governments to cease fighting against risk assessment as a remedial approach when it is established as the preferred green remediation choice?"
- "There is an opportunity to divert excess soils from brownfield excavations away from landfills and, through a cleaning and sorting process, put them to beneficial reuse... resource regeneration... offers a sustainable alternative to the typical dig and dispose paradigm... potential suggestion – recommend or require that contaminated soils be sent to a beneficial reuse facility... where such a facility exists within a feasible distance from a site... with new technologies and supportive legislation, we believe contaminated soil and relocated soil can be put to higher use, becoming a resource rather than a liability."

- “This process should... [be considered as a] first step in engagement [with First Nations] surrounding the impacts of climate change on contaminated sites.”
- “Will the ministry be looking at soil washing as a remediation alternative?”
- “[Our company] is a privately owned real estate developer... we would like to respectfully request an opportunity for further discussion and engagement. The potential impacts and unintended consequences are potentially very significant to industry, the community, and the economy... further communication and targeted, one-on-one consultation will go a long way to reaching a common understanding.”
- “[Our organization] is also concerned about the level of service delivery from the ministry if new requirements are introduced... if there is an expanded role for the ministry, information is needed regarding the number of additional staff that will be needed to increase current service levels and reduce processing times... [Our organization] has recommended in the past that the role of [approved professionals with contaminated site expertise] be expanded and there may be an opportunity for [a professional association] to take on additional services. This would mitigate some of the pressure on ministry resources. However, ministry requirements would need to be very clear and workable for [professional association] members to take on these new roles.”
- “What types of tools does the ministry envision consultants using to determine potential future client impacts? Ministry-developed tools, or just publicly-available climate change info? Would there be a prescribed list of sources that would need to be checked? Without guidance, there could be widely varying levels of evaluation happening.”
- “What kind of tools does the ministry envision practitioners using to determine if climate change would have an impact on contamination in the ground? Most of us are good at contaminated sites investigations but know little about climate change modelling.”
- “When undertaking utility trench excavations in a municipality, we often have chloride ion exceedances resulting from road salting which means we need to truck the soil 100's of kms for disposal. There are obviously greenhouse gas and budget implications for this this otherwise clean soil. Are there any plans to increase the chloride ion standard of 100 units for all land types, to both address its toxicity and the impacts of having to treat it as hazardous waste?”
- “What is being considered on investigation... Right now, most of the focus is on remediation and risk assessment, but I think there will need to be additional changes on the investigation side of things – especially as smear zone thicknesses change, soil temperatures go up, etc.”
- “Is there a way to factor in ‘intergenerational equity’ without implementing policies which would affect currently living Canadians in a relatively negative way?”
- “If we look at what is happening in other parts of the world, drought cycles are becoming more frequent and depletion of underground aquifers more common, is there going to be more emphasis on enforcing the treatment contaminated groundwater?”

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