PRACTICE GUIDELINES FOR APPROVED PROFESSIONALS

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1.0 DEFINITIONS

The definitions in this section are specific to these guidelines for work conducted by an Approved Professional (AP) under the BC CSR and related protocols, procedures and guidelines.

"Act" means the British Columbia *Environmental Management Act*.

"Agreement" means the contract, whether formal (written) or informal (verbal or implied), between the Client and the AP, or other legal entity, for conducting the AP work.

"Arm's Length Review" means AP Work consisting of a review by an AP of documents comprising a submission under Protocol 6 where the AP performing the review did not participate in the preparation of the supporting documents to the submission (including preparation and execution of work plans and field work), nor give any direction as to its preparation except through the issuance of general (i.e., non-directed) guidance regarding the approach and methodology to be used in relation to completion and execution of work plans and field work, and of the preparation of the supporting documents.

"Client" means the party who engages the AP to conduct the AP work. This is typically the owner of the site, but can be the Ministry or another party.

"**Confirmation of Remediation Report** means a confirmation of remediation report as defined in the CSR.

"Approved Professional" and "**AP**" mean a Member of the Society who performs work under section 49.1 of the CSR and related protocols, procedures and guidelines as amended from time to time, unless otherwise indicated.

"Contaminated Sites Regulation" and **"CSR"** mean the Contaminated Sites Regulation under the Act.

"AP work" means a submission made by an Approved Professional, including but not limited to advice and recommendations, to the Ministry Director respecting:

i) a determination of status;
ii) a contaminated soil relocation agreement;
iii) an approval in principle of a remedial plan;
iv) a certificate of compliance;
v) a summary of site condition or,
vi) other work permitted under Schedule A of the Society rules.

"**Detailed Site Investigation**" or "**DSI**" means a detailed site investigation as defined in CSR Section 59.

"**Detailed Risk Assessment**" and **"DRA"** means a risk assessment or environmental risk assessment report, other than a Screening Level Risk Assessment, as defined in the CSR that is carried out for an Eligible Site as defined in a protocol established by the Ministry.

"Direct Supervision" means responsibility by an AP for the direction, management and conduct of professional services by others.

"Eligible Site" means a category of contaminated sites eligible for review and recommendation to the Ministry Director for issuance of an Instrument by an AP as defined in a protocol under the CSR.

"Hazardous Waste Regulation" and **"HWR"** means the Hazardous Waste Regulation under the Act.

"Instrument" means a preliminary or final determination of status, contaminated soil relocation agreement, approval in principle of a remedial plan or a certificate of compliance as defined in the Act and Regulations.

"**Member**" means a member of the Society that is also appointed to the Roster of Approved Professionals by the Ministry Director.

"**Ministry**" means the British Columbia Ministry responsible for administering the Act.

"**Ministry Director**" means the "director" as defined in the Act and the CSR.

"**Numerical Standards**" means generic numerical soil standards, generic numerical water standards, matrix numerical soil standards, generic numerical sediment criteria, generic numerical vapour standards, director's interim standards and criteria, and site-specific numerical standards of the CSR.

"Numerical Standards Approved Professional" and **"SAAP"** means a classification of AP's qualified to undertake review of numeric-based standard assessments on Eligible Sites.

"**Parent Organization**" means the Association of Professional Engineers and Geoscientists of British Columbia, the College of Applied Biology, the British Columbia Institute of Agrologists, or the Association of the Chemical Profession of British Columbia.

"**Preliminary Site Investigation**" or "**PSI**" means a preliminary site investigation as identified in CSR Section 58.

"Regulations" means the HWR and CSR.

"**Remediation Plan**" means a remediation plan as defined in the CSR Section 1.

"Risk-based Standards Approved Professional" and **"RAAP"** means a classification of AP's qualified to undertake review of Detailed Risk Assessments and risk-based components of submissions on Eligible Sites.

"**Risk-Based Standards**" means risk-based standards defined in the CSR Section 18 (1).

"Self-Review" means AP work involving review of reports, plans and assessments prepared by the AP engaged to perform the AP work or under the AP's Direct Supervision.

"Site Risk Classification Report" means the Site Risk Classification Report form included in the Ministry of Environment's Protocol 12 – Site Risk Classification, Reclassification and Reporting.

"Society", "CSAP" and "CSAP Society" means the Society of Contaminated Sites Approved Professionals of British Columbia.

"Summary of Site Condition" means the Ministry document with components summarizing site information and submission documents, to be completed and reviewed by the AP.

2.0 INTRODUCTION

APs in British Columbia make recommendations to the Ministry concerning issuance of Instruments. Under this system, the Ministry and the public place a high degree of trust in APs, that issues associated with the investigation, remediation and management of contaminated sites have been appropriately reviewed and addressed, and that requirements of the Act and Regulations have been met.

These guidelines have been developed on behalf of the Society, with funding provided by the Ministry. The guidelines have been prepared with the assistance of a working group of contaminated sites practitioners.

2.1 Purpose of Guidelines

These guidelines are intended to establish practice guidance that APs should follow to fulfill their professional obligation to the Society, the Ministry and for protection of human health and the environment. The guidelines specify tasks and identify general standards of professional practice that APs should follow in conducting AP work. The guidelines also serve as a basis for performance assessments for AP work under the bylaws of the Society. These guidelines identify the major points that APs should consider when undertaking AP work. Additional details are provided through links to appendices identified at the end of these guidelines and should also be considered by APs in conducting their work.

Exercising of professional judgment is an integral part of providing AP services. Accordingly, application of these guidelines will vary depending on the circumstance.

2.2 Scope of Guidelines

These guidelines apply to AP services provided for Eligible Sites. These services involve review of reports, plans and assessments pertaining to the investigation, remediation and management of contaminated sites, and preparation and submission of recommendations and related documents and forms to the Ministry for issuance of Instruments. These guidelines outline professional services that should generally be performed when undertaking AP work.

AP work may also involve taking into account guidelines and requirements of agencies other than the Ministry. APs are expected to have a working understanding of such guidelines and requirements and, in some cases, to resolve issues with other agencies prior to completing the AP work.

2.3 Qualification

Notwithstanding the purpose and scope of the guidelines, a decision by an AP not to follow one or more aspects of these guidelines does not mean that the AP has failed to meet the standard of care in the performance of the AP's professional services. Such judgments and decisions depend on an evaluation of facts and circumstances to determine if other reasonable and prudent APs, in similar circumstances, would have reached similar conclusions. When work has deviated from these guidelines, it is mandatory that the AP clearly document the basis for deviation.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 Common Forms of Project Organization

The organization of AP work varies according to the needs of the project and parties involved. The AP is engaged by the Client who is typically a landowner, but can be another interested party, for example, the Ministry or another environmental professional who is not an AP. This form of project organization is unique for professional services in that the AP maintains a standard of care to the Ministry, which in most instances is not the Client.

3.2 Responsibilities of Participants

3.2.1 Client

The Client should:

a) before commencing the AP work, complete a written agreement with the AP confirming the scope, compensation and schedule for AP services;

b) disclose fully and promptly to the AP being engaged all information (written or otherwise) related to the AP work;

c) disclose promptly to the AP being engaged any previous involvement by other APs regarding issues related to the AP work; and,

d) recognize that the need may arise during the AP work for clarification or additional work associated with the reports, plans and assessments submitted for review before the AP is able to recommend to the Ministry Director for issuance of an Instrument.

e) resolve issues of prohibited practise as described under Section 3.2.3.f).

3.2.2 Ministry

The Ministry should:

a) Respond to questions submitted by APs concerning interpretation and/or application of sections of the Act, Regulations, Protocols, and Ministry policy, procedures and guidance.

3.2.3 Approved Professional

a) The AP is responsible for reviewing reports, plans, assessments and other documents, which are submitted in support of a recommendation for issuance of an Instrument. The final accountability for the merits of the recommendation to the Ministry Director lies with the recommending AP(s).

b) In conducting the AP work, the AP may delegate portions of the work to others, but only under the AP's direct supervision. Nevertheless, the responsibility for the content and quality of the review and recommendations respecting CSR legal instruments made to the Ministry Director remains with the AP(s).

c) Before establishing an agreement for services, the AP should determine if he has a conflict of interest with respect to conducting the AP work:
    i. If the AP has a personal interest in the outcome of the AP work, the AP must not conduct the work.
    ii. If the performance of AP work can reasonably be foreseen to result in a conflict of interest, the AP should not conduct the work.
    iii. If there is a potential conflict of interest at any time before or during performance of the AP work, the AP must inform and resolve the potential conflict with the interested parties.
    iv. If the AP has a current or previous involvement with the site or affected off-site areas, the AP must disclose the nature of that involvement in writing, to the Client prior to conducting AP work.

d) The AP is responsible for confirming that the requested AP work qualifies for AP services and in particular that the site for which the work is requested is an Eligible Site.

e) If the AP intends to perform Self-Review, he is responsible for determining that the AP work is eligible for Self-Review.

f) The primary responsibility of the AP is to determine if the work reviewed meets requirements of the Act, Regulations and Protocols. Because other legislation, regulation, bylaws and guidelines may also need to be complied with or recognized to remediate or manage a contaminated site, it is also the responsibility of the AP to determine, using a reasonable level of diligence, if required aspects of other relevant environmental legislation and guidelines have been followed.

g) If, during the course of his review, the AP becomes aware of deviations from requirements of the Act, Regulations and Protocols (for example, lack of notification of independent remediation, lack of notification of potential for off-site migration of contamination, lack of timely notification of the Ministry of changes to remediation completed under an AiP, relocation of contaminated soil without a CSRA when a CSRA is required, blending of hazardous waste, transporting of a hazardous waste without manifest, etc.), the AP must bring this to the attention of the Client in writing. The Client must resolve the situation to the satisfaction of the AP prior to the AP recommending an Instrument. Resolution of these issues may require discussion with the Ministry.

h) In conducting the AP work, the AP must rely on reports, plans, assessments or other documents prepared by others. Although it is the responsibility of the AP to determine if mandatory requirements of the Act, Regulations and Protocols have been met, it is not the responsibility of the AP to conduct sampling and analysis of environmental media to independently verify the findings of work by others. It is the responsibility

of the AP, however, to make reasonable efforts to confirm that the data have been collected in manners consistent with good practice and that no obvious evidence of systematic or intentional bias exists in the data.

i) In conducting the AP work, the AP may seek clarification in writing regarding reports, plans, assessments or other documents prepared by others. These reports, plans and assessments may have been completed by a number of parties over a period of time. If the AP work determines that there are deficiencies that require additional sampling or other work, the AP should notify the Client, in writing, of the deficiencies. The Client must resolve the deficiencies to the satisfaction of the AP prior to the AP recommending an instrument.

j) If the AP identifies aspects of the AP work that differ from Ministry policy and guidance but in the judgment of the AP conform with the intent of the Act, Regulations, and Protocols, the AP is encouraged to seek written confirmation of this from the Ministry prior to preparing a recommendation for an Instrument.

k) The AP is responsible for preparing the Summary of Site Condition and reviewing the accuracy of the content of the Site Risk Classification Report for accuracy and completeness, and providing recommendations for issuance of an Instrument to the Ministry Director.

4.0 GUIDELINES FOR PROFESSIONAL PRACTICE

The services that APs should consider as part of appropriate practice in carrying out AP work are outlined below. This outline is not intended to be exhaustive. Professional judgment is required in the provision of services.

4.1 General

The scope and complexity of AP work will vary depending on the site conditions, the type of Instrument being sought, and other factors. The AP work may involve the application of numerical standards, the application of risk-based standards/risk assessment, or both.

The type of review may also vary depending on the complexity of the site conditions and objectives of the Client. AP work may involve Self-Review or Arm's-Length Review. Self-review involves providing recommendations to the Ministry Director on sites where investigations, plans, assessments or other work to be reviewed has been performed by the Member engaged to perform the AP work or under the AP's Direct Supervision. Arm's-Length Review involves providing recommendations based on work by others not under the AP's Direct Supervision, which may include professionals in the same firm as the AP engaged for the AP work, or another firm.

4.1.1 Scope of Services

Before commencing the AP work, the AP should communicate with the Client to:

a) Determine the terms of reference and scope of services for the AP work;

b) Disclose professional liability insurance coverage and reach agreement on fees, payment schedule and schedule for completing the AP work;

c) Inform the Client that other fees will be due and owing to the Society and/or the Ministry at the time of application for the Instrument; and,

d) Confirm with the Client that the AP may disagree with conclusions made in the investigations, plans and assessments to be reviewed based on requirements of the Act, Regulations, Protocols or guidelines, policies and procedures of the Ministry and that this may necessitate additional work.

e) Inform the Client of the AP educational review and performance assessment processes and that submissions selected for these will result in delays in the issuance of the requested Instrument.

4.1.2 Role of Numerical Standards Approved Professionals (SAAPs) and Risk-based Standards Approved Professional (RAAPs)

a) For AP work that involves the application of both numerical standards and risk-based standards/risk assessment, the AP work must be performed by one or more AP(s) as follows:

i. AP work involving application of numerical standards must be prepared under the Direct Supervision and signed by an AP approved as a Numerical Standards Approved Professional and the work involving the application of detailed risk assessment must be prepared under the Direct Supervision and signed by an AP approved as a Risk-based Standards Approved Professional.

ii. Where more than one AP is involved in the AP work, each AP must clearly document which portions of the work the AP is responsible for reviewing, complete the Summary of Site Condition, ensure the site risk classification is appropriate for AP review/recommendation, forward to the Ministry Director, and clearly indicate which portions of the resulting recommendations each AP is responsible for.

iii. If the scope of the AP work extends beyond the combined expertise of the AP(s), the appropriate professionals must be retained to provide the required expertise. This may be the case, for example, if the proposed Remediation Plan requires the services of geotechnical engineers, structural engineers or other professionals.

4.1.3 Self-Review and Arms-Length Review

In determining the eligibility of AP work for Self-Review, it is recognized that, a higher degree of objectivity would generally exist when the AP work involves Arm's-Length Review. APs may conduct Self-Review in accordance with the requirements set out in Schedule A of the Society Rules document.

It is also recognized that there may be benefits to the limited early involvement of the AP providing Arm's-Length Review in the preparation stage of plans, assessments, and reports to be reviewed by the AP. Any involvement by an AP providing Arm's-Length Review prior to commencing AP work should be limited and should in no way obstruct the APs objectivity. Under no circumstances should an AP conducting Arm's-Length Review perform any function of project management. While an AP providing Arms-Length Review may provide general advice, the AP should not outline or assign work or specific methods and procedures to be followed, or review or evaluate work for accuracy or adequacy prior to commencing AP work.

4.2 Objectives

The objectives of AP work are to:

a) Confirm that the investigations, plans, assessments and reports documenting site conditions support the necessary conclusions for a recommendation for issuance of an Instrument;

b) Document the findings of the AP review and provide a written recommendation to the Ministry Director concerning issuance of an Instrument including any conditions recommended to confirm that

assumptions made in the investigations, plans and assessments remain valid.

c) Prepare draft Instruments for review and issuance by the Ministry Director.

d) Maintain a duty of care to the Ministry with respect to the AP work as identified in Section 3.2.3.

4.3 Relevant Legislation, Protocols, Procedures, Guidance and Policy

It is the responsibility of the AP to determine that conclusions made in the investigations, plans and assessments comply with: a) the Act, Regulations, and Protocols, and b) relevant Ministry procedure, guidelines, and policy that has been communicated to all practising APs.

In conducting the AP work, APs must maintain a current knowledge of: a) the Act, Regulations, and Protocols and b) relevant Ministry procedures, guidance and policy that has been communicated to all practicing APs as well as relevant laws and guidelines of other agencies / jurisdictions (e.g., Federal government, municipalities).

4.4 Technical Review – Numerical Standards Approved Professional

The scope of AP work for a Numerical Standards Approved Professional (SAAP) for sites involving the application of numerical standards and/or screening level risk assessments will vary depending on the site conditions, the type of Instrument being sought and other factors. Additional guidance for SAAPs is provided in the appendices to these guidelines.

4.4.1 Scope

The scope of technical review by a SAAP may involve review of:

a) PSI reports (Stage 1 and Stage 2),

b) DSI reports,

c) Screening Level Risk Assessments,

d) Remediation Plans that do not involve a Detailed Risk Assessment;

e) those parts of a Remediation Plan involving a Detailed Risk Assessment that pertain to the expertise of the SAAP;

f) Confirmation of Remediation Reports;

g) Site Risk Classification reports, and,

h) Contaminated Soil Relocation Agreements,

4.4.2 Reports

In reviewing reports as part of AP work, the SAAP should consider the suggested review components summarized in the following documents:

a) Appendix A: Guidance for APs Conducting Review of Stage 1 Preliminary Site Investigation Reports

b) Appendix B: Guidance For APs Conducting Review of Stage 2 Preliminary Site Investigation and Detailed Site Investigation Reports

c) Appendix B1: Guidance for APs Conducting Review of Investigations Involving Soil Vapour Assessment

d) Appendix C: Guidance for APs Conducting Review of Remediation Plans In Support of an Approval in Principle

e) Appendix D: Guidance for APs Conducting Review of Confirmation of Remediation Reports

f) Appendix E: Guidance for APs Conducting Review of Contaminated Soil Relocation Agreements.

If the SAAP determines that assessment of all relevant information has not been undertaken, the SAAP should request clarification from the report authors or request that the required information be provided before the AP review is completed.

Prior to review of a Remediation Plan, Confirmation of Remediation Report or an application for a Contaminated Soil Relocation Agreement, an AP must confirm that conclusions developed from PSIs or DSIs are sound. As indicated in Section 3.2.3 of these guidelines, the AP must not provide a recommendation to the Ministry Director for an Instrument if there are technical deficiencies associated with: the PSI or DSI (for example, use of incorrect standards, or inadequate testing for all PCOCs at an APEC) or any other aspect related to the scope of SAAP technical review described in section 4.4.1 above.

4.5 Technical Review – Risk-based Standards Approved Professional

AP work by a Risk-based Standards Approved Professional (RAAP) involves review of Detailed Risk Assessments performed for Eligible Sites as defined in Protocols established by the Ministry.

4.5.1 Scope

The scope of technical review by a RAAP must involve review of the following components if included as part of a submission:

a) human health risk assessment,

b) ecological risk assessment,

c) screening level risk assessment,

d) parts of a Remediation Plan involving a risk assessment that pertain to the expertise of the RAAP, and

e) parts of a CSRA involving a risk assessment that pertain to the experience of a RAAP.

4.5.2 Risk Assessment Reports

In reviewing reports as part of AP work, the RAAP must consider the suggested review components summarized in the following documents:

a) Appendix C: Guidance for APs Conducting Review of Remediation Plans In Support of an Approval in Principle
b) Appendix D: Guidance for APs Conducting Review of Confirmation of Remediation Reports
c) Appendix E: Guidance for APs Conducting Review of Contaminated Soil Relocation Agreements;
d) Appendix F: Guidance for APs Conducting Review of Risk Assessment Reports.

4.6 Reporting and Documentation

4.6.2 Summary of Site Condition report

A satisfactorily completed Summary of Site Condition must be prepared by the AP(s), signed by the AP(s) and be submitted with the application to the Ministry.

4.6.3 Draft Instruments

In preparing a draft Instrument for Ministry issuance, the AP must determine if the following are appropriately addressed:

a) Are all reports used to develop the recommendation listed on the Instrument?

b) Are the applicable CSR standards correctly identified?

c) Are the substances for which the site has been remediated listed correctly and completely?

d) Are conditions listed in the Instrument schedules necessary, sufficient and appropriate?

e) For Preliminary and Final Determinations of Status, have all parties with a registered interest in the subject lands been identified for their receipt of the Instruments?

4.6.3 Record Keeping and Files

Following completion of the AP work, reports must be included with the AP submission for inclusion in Ministry files and referencing in the Site Registry. As indicated in Section 2.3, when work has deviated from Ministry guidelines, it is required that the AP clearly documents the basis for deviation. As appropriate during a Performance Assessment, the AP may be required to submit written

documentation supporting their recommendation. APs must retain complete copies of their review files this needs to be explicitly defined for a minimum of ten years.

APPENDIX A: Guidance for APs Conducting Review of Stage 1 Preliminary Site Investigation Reports[1]

This guideline has been developed based upon Ministry regulations, procedures, policies and guidelines in effect at the time of their preparation. The Approved Professional should always refer to the ministries' current written protocols, guidance, etc. to identify if there are any new or additional requirements.

GENERAL TOPIC	Points of Review (Stage 1 PSI)	Reference[2]
RELEVANCE	1. Were the Stage 1 PSI historical searches and inspection completed within six (6) months of the AP review; or, if not, does the investigator provide a clear statement that onsite and offsite land uses have remained substantially the same?	
AUTHORS AND RELIANCE	2. Does the investigator identify who the major participants are in the investigation and state his/her qualifications?	CSR S. 63
METHODS AND PROCEDURE	3. Does the investigator provide methodology and procedure followed to complete the Stage 1 PSI?	CSR S 58(1a)
SUBJECT SITE DESCRIPTION	4. Has the investigator provided: a. provided site information (e.g., civic address and legal description, etc.) as required in SoSC; b. current and scheduled (i.e. as identified on an Official Community Plan) municipal zoning of subject site; c. photos of subject site and adjoining properties; and. d. a summary of the visits, including, date of visit(s), and a record of the visual inspection of the building(s), property(ies), equipment, land, surface water and biota for indicators or presence of contamination?	CSSAF CSR S58(1)
Physical Setting	5. Has the investigator provided: a. information related to topography (e.g. how it relates to possible groundwater flow and direction of surface runoff); b. an estimate of the percentage of the subject site currently occupied by buildings and paved areas; c. a general description of adjacent land and nearby water resources; d. defined general regional geology beneath the subject site based on information shown on geological maps?	
Water Use Receptors	6. Has the investigator a. reviewed the Ministry well registry database (and other information sources as available) to identify registered water wells to an appropriate distance from the site; and, b. identified surface water bodies within an appropriate distance from the site	

GENERAL TOPIC	Points of Review (Stage 1 PSI)	Reference[2]
DOCUMENTATION	7. Has the investigator:	
Site Activities	a. assessed information from the following sources, as available:	CSR S 58(1)
	i. historical site plans and diagrams;	
	ii. aerial photographs for the subject site and adjacent area;	
	iii. Site Registry records index results indicating the presence of registered sites within 500 m of the subject site (and detailed reports as justified);	CSSAF
	iv. city directories;	
	v. regulatory agency environmental records;	
	vi. historic subject site titles search; and,	
	vii. fire insurance records?	
	8. Has the investigator:	
	a. listed, reviewed, summarized and interpreted data from relevant previous environmental and geotechnical reports?	
	b. described historical activities likely to have occurred at the subject site and, if possible, timing of the activities (i.e. year);	
	c. identified CSR Schedule 2 activities with a potential to have taken place at the subject site;	
	d. identified locations, sizes and ages of storage tanks, distribution systems, etc.;	
	e. listed the types of contaminants likely to have been associated with each potentially contaminating site activity (past/present) and the approximate dates (if possible);	
	f. identified whether and where hazardous materials were or have a potential to have been stored, how they were handled and where they were transferred;	
	g. identified manufacturing processes, raw materials, chemicals or fuels used;	
	h. identified the potential waste streams and method of treatment and disposal;	
	i. assessed whether fill soil was imported to the subject site and, if so, its origin and quality with respect to potentially applicable CSR standards;	
	j. identified current and historic land use and/or activities at neighbouring properties and their relative location to the subject site;	
	k. a summary of interviewed former owners, occupants, neighbours, directors, employees or government officials who can, with reasonable attempts, be contacted respecting information on activities which may have caused contamination; and	
	l. determined if and where non-domestic septic systems currently exist or historically existed on site?	

GENERAL TOPIC	Points of Review (Stage 1 PSI)	Reference[2]
Site Plans	9. Has the investigator: a. provided a scaled plan showing the location of all identified on site and off site APEC and related PCOC and including land use, and showing relevant buildings and water wells found on the subject site, potential preferential pathways, other cultural features, etc.; b. provided topographical information for the area surrounding the subject site; c. included constructed features such as, underground storage tanks, lagoons, ditches, sumps within buildings, and waste storage areas; and d. shown water bodies relative to the site and APECs?	CSSAF
CONCLUSIONS	10. Has the investigator: a. provided a clear statement with respect to the adequacy of previous investigation or remediation documentation and the extent to which it was or was not relied upon; b. provided adequate reasoning if excluding areas of historical or current activities at the subject site or nearby lands as an APEC; and, c. identified <u>on and offsite</u> activities as areas of potential environmental concern (APECs) and associated potential contaminants of concern (PCOCs) for each potentially affected medium?	CSR S58(5)
REFERENCES	11. Has the investigator referenced: a. all data sources, previous studies and other sources (including interviews) that contributed information to the study; and, b. any technical literature that provides additional detail on procedures used in the study?	
APPENDICES	12. Has the investigator provided legible copies of all supporting documents, as listed above including: a. historical site drawings and plans; b. high quality copies of historical air photographs (clearly indicating the site location); c. city directories[3]; d. fire insurance records[4] ; e. plan showing water well locations; f. the results of agency enquiries; g. site registry search results for relevant sites (summary and detailed reports); h. copies of relevant reports[4]; i. site inspection summary[4]; j. record of interviews[4]; and, k. good quality site reconnaissance photographs?	

EMA – Environmental Management Act
CSR – Contaminated Sites Regulation
FS – Fact Sheet, Ministry of Environment
TG – Technical Guidance, Ministry of Environment
AG – Administrative Guidance
P – Protocol
SoSC – Summary of Site Condition
CSSAF – Contaminated Sites Service Application Form

Notes

[1] With reference to Sections 2.3 and 3.6.3 of these guidelines, when work has deviated from MOE regulations, procedures, policies and guidelines, or when applying professional judgement, it is mandatory that the AP clearly document the basis for deviation. It is recommended that the AP(s) prepare a written document that summarizes their comments (agreement/concurrence/approval/disagreement) on all items listed in the above table or to confirm that items were reviewed/considered. This supporting document is not a requirement of the submission, but may be requested during a performance assessment.

[2] Supporting reference documentation to MoE Act, Regulation, Protocols, Guidance and/or other documents also provided for information only; this list of references may be incomplete or inaccurate.

[3] Inclusion of these supporting documents within the report appendices is optional, but must still be researched and commented on within the report, and be made available to CSAP Society and/or MoE if requested

Appendix B: Guidance For APs Conducting Review of Stage 2 Preliminary Site Investigation and Detailed Site Investigation Reports[1,2]

This guideline has been developed based upon Ministry regulations, procedures, policies and guidelines in effect at the time of their preparation. The Approved Professional should always refer to the ministries' current written protocols, guidance, etc. to identify if there are any new or additional requirements.

GENERAL TOPIC	Points of Review (Stage 2 PSI and DSI)	Reference[3]
AUTHORS AND RELIANCE	1. Does the investigator identify who the major participants are in the investigation and state his/her qualifications?	CSR S. 63
PROBLEM DEFINITION *General*	2. Has the investigator: a. provided site information (e.g., civic address and legal description, etc.) as required in SoSC; b. listed, reviewed and summarized data from other previous environmental or geotechnical reports relevant to the site, including interpretations regarding groundwater flow directions and stratigraphy; and, c. provided a rationale for changes to APEC or PCOC indicated in the Stage 1 PSI?	
Context	3. Does the investigator describe the relationship of the current study, in particular: a. how the methods of investigation and findings of the previous stage(s) was/were used to design and carry out the current study; and b. the extent to which the previous investigations were or were not relied on?	CSR 58(5) and 59(3)
	4. Has the investigator: a. provided scaled plans showing site features and relevant land uses and receptors; and, b. provided a scaled site plan or plans showing existing test holes and sample locations relative to each AEC and other relevant site features?	
Groundwater and Receptors	5. Has the investigator described a Conceptual Site Model of the hydrogeology at the site, including (as appropriate): a. identified the presence and possible extent of the major hydrostatigraphic units likely to be of interest to the investigation; b. provided a general interpretation of groundwater flow direction in each hydrostatigraphic unit (aquifer), and between units, considering the effect of tidal or seasonal variations as applicable; c. identified possible recharge or discharge characteristics for each aquifer; d. confirmed with the municipality or other applicable regulatory authority the current and future potential water use in the area; e. confirm the status of the nearby registered water wells; f. identified uses of the surface water bodies; and, g. made an assessment of potential preferential pathways between the site and the receptor(s)?	TG 8

GENERAL TOPIC	Points of Review (Stage 2 PSI and DSI)	Reference[3]
REGULATORY SETTING	6. Has the investigator made clear conclusions with respect to land and water uses, and site-specific factors applicable to the site? 7. In doing so, has the investigator: a. assessed and provided a clear rationale based on hydrogeological data and/or the defaults in Technical Guidance Document 6, and considering the potential for preferential pathways to exist, as to which applicable groundwater standards apply; b. clearly established and provided a rationale for the applicable site-specific factors and assessed, based on current and/or potential future land use and site specific characteristics, the appropriate soil standards to apply; c. assessed, based on the receptor environment, which sediment standards are appropriate to apply and provided a clear accompanying rationale; d. evaluated whether any PCOC have applicable CSR Schedule 10 standards; e. evaluated whether any PCOC have applicable standards in the Hazardous Waste Regulation; and, f. identified where different standards apply for different areas investigated (e.g. subject properties vs. roadways vs. offsite property/lands)?	TG 3 and 6 and CSR S. 59(2)
METHODOLOGY FOR DATA COLLECTION	8. Has the investigator: a. presented the rationale for the sampling and testing plan as it relates to investigation of each APEC/AEC associated PCOCs/CoCs, pathways and potential receptors; b. detailed field methodology descriptions used to collect, record, confirm and verify the data to provide confidence in the results of field sampling; c. carried out field sampling procedures according to Ministry guidelines where available and, if modified, presented justification for such modifications or limitations; d. identified how test holes and sample locations were surveyed in the field; and, e. provided rationale for choosing the area used to represent background conditions, if attempting to establish background conditions? 9. Has the investigator provided: a. a summary of what was done with drill cuttings and monitoring well development/purge water; and, b. details on how boreholes were backfilled? 10. For investigation of groundwater, has the investigator documented: a. appropriate screen lengths for monitoring wells and screened the wells adequately for the type of investigation and site hydrogeology; b. development procedures for monitoring wells, and field observations and measurements during development; c. purging procedures and field observations and measurements; and, d. sample collection, preservation, storage and shipping procedures?	CSR 58(5) TG1 P4, TG 16 TG 8

GENERAL TOPIC	Points of Review (Stage 2 PSI and DSI)	Reference[3]
INTERPRETATION *Previous Reports*	11. If previous data have been relied on: a. has it been compared to current applicable environmental quality standards; b. has it been summarized and presented in the report, and incorporated into the overall interpretation of conditions; and c. if not, has the investigator given reasons for excluding data from previous studies?	
Stratigraphy and Hydrogeology	12. Has the investigator provided: a. an interpretation and description of the stratigraphy and hydrogeology encountered at the property during the subsurface investigations as augmented by available geological and hydrogeological mapping; b. validated or updated the Conceptual Site Model for the site?	TG 8
	13. In making the interpretation, have or has: a. the potential for multiple aquifer and aquitard zones, vertical flow components , and including any limitations that may exist with respect to the hydrogeologic data been considered; b. the investigator considered and discussed the influence of tides, weather conditions and seasonal influences in their sampling plan; c. aquifers and aquitards present been identified and assessed; d. groundwater fluctuation been considered or documented as a result of seasonal or tidal effects; e. groundwater flow direction and gradient in the saturated zone(s) been calculated (monitoring wells must be surveyed to obtain this information); f. groundwater flow velocity and travel time to potential receptors been estimated, if those pathways are being considered closed for purposes of establishing applicable standards?	TG 8
Data Adequacy and Evaluation	14. Have the environmental quality data been compared and evaluated against applicable environmental quality standards and criteria taking into consideration uncertainties in the collected data and groundwater chemistry?	CSR S. 59(2)
	15. Do samples collected and tested adequately represent conditions at the time of measurement (e.g., at equilibrium or transient)?	
	16. Are the data sufficient to: a. demonstrate that the number, locations and depths of test holes and samples are appropriate and representative for each APEC/AEC, media and PCOC/COC being investigated; b. assess potential preferential pathways; c. confirm or refute interpretations made using existing historical data, if the historical data relates to parameters that are no longer regulated under the CSR; d. directly assess the APECs identified in the Stage 1 PSI (if not, provide an explanation for why APECs were not investigated or were indirectly investigated); and, e. for a DSI, delineate (laterally and vertically) the contaminants in each affected media, or, if not, identify where delineation was incomplete and will be completed at a later stage?	CSR S. 58(5), 59(2)(3),

GENERAL TOPIC	Points of Review (Stage 2 PSI and DSI)	Reference[3]
Statistics	17. If the investigator is classifying soil using statistics, has the investigator: a. classified material based on the data being demonstrably representative of one population; and, for that data set: i. the upper 90th percentile of the sample concentrations is less than the standard concentration; ii. the upper 95 percent confidence limit of the average concentration of the samples is less than the standard concentration; and, iii. no sample within the data set has a concentration exceeding two times the standard concentration; or, b. used another defensible scientific method?	TG 2
Use of Specific Protocols	18. If the investigator is using either Protocol 2 (Site Specific Numerical Soil Standards), Protocol 4 (Determining Background Soil Quality) or Protocol 14 (Requirements for Determining a Barite Site) as part of the investigation, has the investigator: a. followed and met the Protocol requirements; b. provided an interpretation of the data as it relates to the applicable protocol; and c. provided conclusions on the use of these protocols during the investigation?	P2, P4, P14
Figures, Drawings and Tables	19. Has the investigator provided: a. a site plan showing interpreted groundwater contours in each hydrostratigraphic zone or aquifer of relevance; b. a scaled site plan or plans showing a graphical representation of the distribution of contaminants for each medium, considering all new and previously collected data for onsite and offsite properties relative to applicable standards and criteria; c. prepared scaled cross sections (longitudinal and transverse with respect to groundwater flow) that provide an interpretation of the stratigraphy and potentiometric heads, showing the locations of test holes and limits of any excavation, and providing the groundwater and soil analytical results relative to applicable standards along the cross sections for the site and adjacent properties; and, d. tabulated analytical results for each PCOC compared with the applicable standards and criteria for each media?	CSSAF, CSR S 58(5), 59(3)
QA/QC	20. Were field and laboratory methods described in sufficient detail such that they could be independently repeated, and was documentation provided describing field calibration procedures?	

GENERAL TOPIC	Points of Review (Stage 2 PSI and DSI)	Reference[3]
	21. Has the investigator completed a quality assurance/quality control (QA/QC) program which includes the following : a. documentation that sample collection, handling, preservation, storage methods and holding times were suitable for minimizing sample losses and maintaining sample integrity for the PCOCs prior to chemical analysis; b. a system for evaluating the potential for systematic bias during the sampling procedure, including collection, preparation and analysis; c. verification of data tables in the report with original analytical records; d. reviewed and commented on laboratory QA/QC, including sample integrity and sample holding times including pre and post sample extraction holding times; e. a system for evaluating precision, such as calculating the relative percent difference (RPD) for sample pairs or relative standard deviation (RSD) for multiple replicate samples, and evaluated the results in terms of stated objectives; and, f. provided a satisfactory explanation where QA/QC data do not meet the stated objectives including implications to interpretation of the environmental quality? 22. Based on the QA/QC program, does the investigator provide a clear assertion of reliability of data that is significant to the study's conclusions?	
CONCLUSIONS	23. Has the investigator: a. provided clear conclusions as to the absence or presence of contamination at each of the APECs for the appropriate PCOCs and media, with respect to applicable standards and whether the site is considered a high risk site or not; b. provided clear conclusions as to whether horizontal and vertical delineation of contamination was achieved at each identified contaminated area for each COC in each medium affected; c. identified limitations, including AECs or preferential pathways not directly investigated (due to limited access) and rationale for why; d. identified which APECs are considered AECs and provided rationale for those that were not considered AECs; and, e. clearly stated whether or not further investigation is needed at any of the AECs? 24. Has the investigator made clear conclusions as to whether or not off-site migration of contaminants is or is likely occurring and, if so, whether a notice of offsite migration has been made?	CSR S. 58(5), 59(3) CSR S 60.1 CSR S.58(5d) S 59(3c)
REFERENCES	25. Has the investigator referenced: a. all data sources, previous studies and other sources that contributed information to the study; and, b. any technical literature that provides additional detail on procedures used in the study?	

GENERAL TOPIC	Points of Review (Stage 2 PSI and DSI)	Reference[3]
APPENDICES	26. Has the investigator provided: a. copies of analytical laboratory reports, in printed form for data used as part of the investigation and interpretation, b. copies of analytical laboratory reports from any historical data relied on[4]; c. copies of all drill logs and test pit logs for the investigation, including from any historical data relied on; d. reports of monitoring data collected from monitoring wells (e.g., depth to water, liquid phase hydrocarbon thickness etc.); e. hydrogeological data and supporting documents (i.e. slug test response data, pump test data, modeling etc.); f. copies of all relevant correspondence with MOE related to site and/or investigations; and, g. copies of all relevant reports (or pertinent sections) that have been relied on[5]?	CSR S 58(5), 59(3)

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Notes

[1] With reference to Sections 2.3 and 3.6.3 of these guidelines, when work has deviated from MOE regulations, procedures, policies and guidelines, or when applying professional judgement, it is mandatory that the AP clearly document the basis for deviation. It is recommended that the AP(s) prepare a written document that summarizes their comments (agreement/concurrence/approval/disagreement) on all items listed in the above table or to confirm that items were reviewed/considered. This supporting document is not a requirement of the submission, but may be requested during a performance assessment.

[2] Soil Vapour Assessment requirements in a Stage 2 PSI and DSI are detailed in Appendix B-1. Refer to this appendix for soil vapour guidelines.

[3] Supporting reference documentation to MoE Act, Regulation, Protocols, Guidance and/or other documents also provided for information only; this list of references may be incomplete or inaccurate.

[4] Provision of these supporting documents can either be within the report appendices or as standalone separate documents listed in the SoSC, and referenced in the report

Appendix B-1: Guidance for APs Conducting Review of Investigations Involving Soil Vapour Assessment[1,2]

This guideline has been developed based upon Ministry regulations, procedures, policies and guidelines in effect at the time of their preparation. The Approved Professional should always refer to the ministries' current written protocols, guidance, etc. to identify if there are any new or additional requirements

GENERAL TOPIC	Points of Review (Soil Vapour Investigations)	Reference[3]
PROBLEM DEFINITION *PCOC's*	1. Has the investigator confirmed that PCOCs at the site include volatile or semi-volatile substances associated with CSR Schedule 2 activities and Schedule 11, and identified appropriate additional PCOCs for soil vapour, in addition to those identified for other media?	TG 4
Conceptual Site Model	2. Has the investigator described a Conceptual Site Model of vapour sources and pathways, including: a. identified the major hydrostatigraphic units relevant to the investigation (those units that contain Schedule 11 substances); b. provided a general interpretation of groundwater flow direction and gradients in those relevant units, and between them; c. discussed potential vapour migration related to and independent of groundwater flow direction (e.g., advective or diffusive mechanisms); and d. identified the presence or absence of potential receptor(s) for the soil vapour pathway(s) and made an assessment of potential preferential vapour pathway(s) between the source and on-site and off-site receptor(s)?	TG 4
Site Plans	3. Has the investigator: a. provided a scaled site plan or plans showing existing or future (if available) buildings found on site; b. provided pertinent information regarding characteristics of the buildings found on and near the site (e.g., slab-on-grade, depth of foundation, crawl spaces, positive or negative pressurization, installed vapour barriers, etc.), including rationale for any assumptions or default values used related to building characteristics (current or future); and c. included construction features (e.g., utility connections, basements, HVAC systems, sumps, etc.) associated with any buildings and rationale for any assumptions regarding construction features?	SAB
Climatic and Soil Cover Conditions	4. Has the investigator provided: a. a discussion of seasonal variations in precipitation and temperature as it relates to vapour migration; and b. precipitation data for all vapour sampling events and a period of 24 hours prior to the sampling event?	
	5. Has the investigator discussed or considered: a. temperature data for all vapour sampling events; b. soil stratigraphy of the vadose zone; c. surface cover; and d. ground conditions at time of vapour sampling (e.g., snow cover, frost, wet, etc.), wetting fronts and estimates of infiltration rates?	SAB

GENERAL TOPIC	Points of Review (Soil Vapour Investigations)	Reference[3]
METHODOLOGY AND DATA COLLECTION	6. If the vapour assessment consisted of sampling of indoor or outdoor air was the sampling methodology and rationale discussed? 7. Has the investigator: a. documented installation and construction details and rationale for soil vapour wells, including screen length and depth of seal for existing or future development conditions (e.g., site grade); b. documented the development and purging procedures for soil vapour wells, field observations and measurements (e.g., flow, vacuum or leak tests); c. collected samples after an amount of time appropriate to the type of well; and, d. identified and discussed any limitations of field sampling methodology?	
INTERPRETATION	8. Has the investigator discussed that soil vapour wells are appropriately designed, installed and sampled to investigate soil vapour sources associated with each affected media, including: a. the validity of samples from well installations with bottom of seals at depths between 1 m and 0.45 m below ground surface; b. the validity and rationale for collecting samples at depths <0.45 m; c. the surface cover and/or use of surface seals (including size of seal and time between seal installation and sampling) for samples collected at depths < 1 m; d. the collection of samples at an appropriate flow rate for a given soil type; and, e. completion of leak testing on all wells after initial installation and then on an appropriate number of wells after the first sampling event?	CSAP Soil Vapour Panel Health Canada
Sampling Events and Data Adequacy	9. Has the investigator: a. conducted at least two seasonal sampling events and discussed variations in concentrations between seasons, and if less than two sampling events were conducted has the investigator provided defensible rationale; and, b. considered and discussed sources of temporal variations such as the influence of tides, seasonal groundwater levels and weather conditions in their sampling plan and the interpretation of results? 10. Do the vapour results reasonably represent the worst case expected concentrations in the breathing zone over time? 11. If concentrations collected after installation of a soil vapour well vary significantly from concentrations collected during a second event has the investigator discussed reasons or implications of the variation? 12. For vapour assessments conducted following source removal, has the investigator discussed whether soil vapours have reached steady state? 13. Were all vapour PCOC assessed, other than those that were not tested because they were not detected in the other media?	SAB CSR S. 59(2)
Attenuation Factors	14. Has the investigator used appropriate attenuation factors to assess and delineate indoor and/or outdoor vapour contamination, considering land use of the subject site and adjacent properties, sampling depth and building configuration(s)?	TG 4

GENERAL TOPIC	Points of Review (Soil Vapour Investigations)	Reference[3]
REFERENCES	15. Has the investigator referenced any soil vapour-specific references in addition to those required in the PSI/DSI?	
APPENDICES	16. Has the investigator provided: a. copies of analytical laboratory reports, in printed form for data used as part of the investigation and interpretation, b. copies of analytical laboratory reports from any historical data relied on[4]; c. copies of all soil vapour test hole logs for the investigation, including from any historical data relied on; d. reports of monitoring data collected from soil vapour probes; e. copies of all relevant reports (or pertinent sections) that have been relied on[5]?	

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SAB - Science Advisory Board

Notes

[1] With reference to Sections 2.3 and 3.6.3 of these guidelines, when work has deviated from MOE regulations, procedures, policies and guidelines, or when applying professional judgement, it is mandatory that the AP clearly document the basis for deviation. It is recommended that the AP(s) prepare a written document that summarizes their comments (agreement/concurrence/approval/disagreement) on all items listed in the above table or to confirm that items were reviewed/considered. This supporting document is not a requirement of the submission, but may be requested during a performance assessment.

[2] This document inherently assumes that adequate site characterization of media other than soil vapour has been completed as part of the PSI and DSI, and that such information is included together with the soil vapour assessment information; otherwise, additional information must be included with the soil vapour assessment (Refer to Appendix B).

[3] Supporting reference documentation to MoE Act, Regulation, Protocols, Guidance and/or other documents also provided for information only; this list of references may be incomplete or inaccurate.

[4] Provision of these supporting documents can either be within the report appendices or as standalone separate documents listed in the SoSC, and referenced in the report

APPENDIX C: Guidance for APs Conducting Review of Remediation Plans In Support of an Approval in Principle[1,2]

This guideline has been developed based upon Ministry regulations, procedures, policies and guidelines in effect at the time of their preparation. The Approved Professional should always refer to the ministries' current written protocols, guidance, etc. to identify if there are any new or additional requirements.

GENERAL TOPIC	Points of Review (Remediation Plans)	Reference[3]
AUTHORS AND RELIANCE	1. Does the investigator identify the primary authors of the plan and state his/her qualifications for remediating sites with similar types of contamination?	CSR S. 63
	2. Does the investigator describe the relationship of the remediation plan to previous work, in particular: a. how the methods of investigation and findings of the previous stage(s) was/were used to design the remediation plan; and b. the extent to which the previous investigations were or were not relied on?	CSR 58(5) and 59 (3)
PROBLEM DEFINITION *Objectives*	3. Are the objectives and scope of the remediation plan: a. clearly stated and applicable numeric or risk-based remediation standard(s) identified for each of the contaminated media (e.g., soil, water, vapour or sediment) considering existing and proposed future land or water use; and, b. are there any limitations to the scope, clearly indicated, that may inhibit achieving the objectives?	CSR S 1(c) SoSC S5.6
	4. Will remediation to numeric standards: a. be achieved within five years (or other time limit specified by MOE), or if not: b. have risk assessments been completed as part of the submission?	
	5. Does the remedial alternative address all identified AECs and respective COCs for all affected media?	SoSC S7.1
Site Characterization	6. Has the investigator: a. provided scaled plans and cross sections showing the boundaries of on-Site and any offsite contamination and the vertical and horizontal extent of contamination relative to applicable AECs and for each contaminated medium (i.e., soil, groundwater, sediment, soil vapour); and, b. provided an interpretation of soil stratigraphy and hydrogeology of the site?	AG 5 CSR S 1(a)
	7. If contamination has not been fully assessed or delineated in the DSI, does the remediation plan: a. provide measures for completing the delineation assessment; and b. incorporate a contingency plan in the event additional contamination is found?	SoSC S4.8
	8. Where applicable, has a "metes-and-bounds" survey been conducted to delineate the extent of contamination on-site and/or off-site?	Site Boundary Procedure

GENERAL TOPIC	Points of Review (Remediation Plans)	Reference[3]
Third Parties/ Consultation	If the remediation plan pertains to off-site lands/property, has the responsible person or their agent: a. provided a Notice of Offsite Migration to the affected parties,; b. obtained the written agreement of the offsite affected parties, where a risk-based approach is considered; c. identified and discussed the effects of known regulatory requirements on remediation, including any federal, provincial or municipal authorizations that will be required to implement remediation; and, d. identified any public consultation or review of remediation that has occurred or which is proposed during remediation?	CSR S 57, 60.1 P6 CSR S1(g) CSR S1(j)
REMEDIAL METHODOLOGY *Evaluation of Remedial Options*	9. Does the remediation plan: a. clearly summarize the proposed remediation/management approach for each AEC and/or media; b. describe and evaluate remedial alternatives that were considered for managing contamination; c. provide justification of the preferred remedial alternative; d. address suitability of the preferred alternative for site-specific factors (e.g., access, geology, hydrogeology); and, e. include remedial system details and schematics, if applicable?	 CSR S 1(b,c) EMA S 56
	10. Has the proponent developed an appropriate remediation plan (may include risk assessment) that considers vapour contaminants that exceed Schedule 11 standards in the breathing zone?	TG 4
Modelling	11. If the proposed remediation technology has not been demonstrated previously as effective for the site-specific conditions and contaminants, has adequate testing been conducted to confirm its applicability for the site conditions, or include details on proof of concept testing? 12. Does the remediation plan identify a contingency if the implemented method does not achieve the objectives? 13. Does the remediation plan include details on the results and methods used to predict or model capture zones for in situ systems, as appropriate, including validation of selected input parameters and appropriate sensitivity analyses? 14. For risk-based remediation plan, will the risk management works satisfy the risk assessment assumptions and limitations? 15. For risk-based remediation plan, does the report clearly indicate what control measures are required to prevent movement of contamination that may remain in place (*i.e.,* to avoid recontamination)?	 CSR S 1 (c,d) CSR S 1(e) and S 18 P6 EMA 53 3(c)
Site Plans	16. Are the proposed remediation works located on scaled drawings?	
MANAGEMENT OF WASTES	17. Does the remediation plan: a. identify waste streams and adequate characterization and disposal methods, alternatives and locations for material to be relocated; b. describe a management plan for wastes (i.e., excavated soil, discharge effluent [water, vapour], etc.); and, c. identify any required authorizations (e.g., CSRA, effluent or emissions discharge permit)?	 CSR S 1(d.1) CSR S 1(g)

GENERAL TOPIC	Points of Review (Remediation Plans)	Reference[3]
CONFIRMATION OF REMEDIATION	18. Does the remediation plan include details regarding a proposed confirmatory sampling and QA/QC plan for all relevant media during and after implementation of the plan, in accordance with ministry guidance or other defensible methods, including: a. clearly stated remedial objectives for each APEC; b. excavation boundaries; c. in-situ treatment performance; and, d. risk management measures?	CSR S 1(h) TG1
Interim Monitoring	19. Does the remediation plan include details on progress monitoring during remediation, and if so: a. is the proposed monitoring program (intensity, duration) appropriate for the contaminant; b. is the proposed monitoring program consistent with MOE requirements (e.g., Schedule B clauses); and, c. is some form of financial security required?	CSR S 1(e) and S 18
REMEDIATION SCHEDULE	20. For a numeric-based remediation plan has the investigator provided a realistic remediation implementation schedule considering the site conditions and constraints of the project, which will result in successful completion of remediation within five years of issuance of an AiP?	CSR S 1(f) P6 SoSC
REFERENCES	21. Has the investigator referenced: a. all data sources, previous studies and other information that was relied upon to develop the remediation plan; and b. any technical literature that provides additional detail on procedures used in preparation of the remediation plan?	
APPENDICES	22. For information not previously included in the PSI or DSI, and used in the remediation plan, has the investigator provided: a. a presentation of all new analytical test or monitoring data, including analytical laboratory reports and summaries of field notes and calculations of relevance to site understanding and/or the remediation plan; b. copies of drill logs and test pit logs; and, c. computer modelling output?	

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Notes:

[1] With reference to Sections 2.3 and 3.6.3 of these guidelines, when work has deviated from MOE regulations, procedures, policies and guidelines, or when applying professional judgement, it is mandatory that the AP clearly document the basis for deviation. It is recommended that the AP(s) prepare a written document that summarizes their comments (agreement/concurrence/approval/disagreement) on all items listed in the above table or to confirm that items were reviewed/considered. This supporting document is not a requirement of the submission, but may be requested during a performance assessment.

[2] This guideline inherently assumes that adequate site characterization has been completed as part of the PSI and DSI, and that such information is included with or has been incorporated into the remediation plan package.

[3] Supporting reference documentation to MoE Act, Regulation, Protocols, Guidance and/or other documents also provided for information only; this list of references may be incomplete or inaccurate.

APPENDIX D: Guidance for APs Conducting Review of Confirmation of Remediation Reports[1,2]

This guideline has been developed based upon Ministry regulations, procedures, policies and guidelines in effect at the time of their preparation. The Approved Professional should always refer to the ministries' current written protocols, guidance, etc. to identify if there are any new or additional requirements.

GENERAL TOPIC	Suggested Points of Review (Confirmation of Remediation)	Reference[3]
AUTHORS AND RELIANCE	1. Does the investigator identify who the major participants are in the investigation and state his/her qualifications? 2. Does the investigator describe the relationship of the current study, in particular: a. how the methods of investigation and findings of the previous stage(s) was/were used to design and carry out the current study; and b. the extent to which the previous investigations were or were not relied on?	CSR S. 63 CSR 58(5) and 59(3)
OBJECTIVES	3. Does the investigator clearly indicate whether the remediation work was completed under an Approval in Principle (AIP) or under the Independent Remediation process? 4. If the work was carried out under an AIP: a. was the work completed within five years of issuance; b. did it follow the remediation plan; and, c. if not, does the investigator describe the differences and why the alternate approach reached the same objectives? 5. If a standalone report, are the objectives of the remediation for the site (or each AEC) clearly stated?	CSR S. 49(2)(c)
PROBLEM DEFINITION *General*	6. If a standalone report, has the investigator: a. provided site information (e.g., civic address and legal description, etc.) as required in SoSC; b. listed, reviewed and summarized data from other previous reports relevant to the site, including interpretations regarding groundwater flow directions and stratigraphy; c. provided a clear summary of the pre-remediation data (AEC and associated COC) for each of the media at the site; d. obtained relevant data for COCs in media to compare with new environmental quality standards that were not applicable at the time of the PSI, DSI or Approval in Principle; e. reviewed current standards for all media (soil, water, vapour, sediment), and re-evaluated the investigation data with respect to current standards if they have changed since the PSI, DSI or remediation plan; and f. reviewed and commented on the Stage 1 PSI if it is more than six months old, using updated investigation information such as newly identified sources or known groundwater flow directions, to assess whether additional APECs or PCOCs exist?	

GENERAL TOPIC	Suggested Points of Review (Confirmation of Remediation)	Reference[3]
Context	7. Has the investigator: a. provided scaled plans showing site features and relevant land uses and receptors; and, b. provided a scaled site plan or plans showing investigation test holes, sample locations and analytical test results relative to each AEC and other relevant site features?	
NOTIFICATIONS	8. If the remediation was completed under Independent Remediation, was notification at commencement and completion sent to the ministry and a copy of each appended to the report? 9. If remedial excavations extended off the property to remove off-site contamination, was a notification of migration provided, if not done already at the site investigation stage?	CSR S. 57 CSR S. 60.1
REGULATORY SETTING *Remediation Standards and Conditions*	10. Has the investigator made a clear statement with respect to land and water uses, and site-specific factors applicable to the site? 11. In doing so, if a standalone report, has the investigator confirmed that the conclusions of the PSI, DSI or Remediation Plan are still valid with respect to applicable standards, and, if not: a. provided a clear rationale based on hydrogeological data and/or the defaults in Technical Guidance Document 6, and considering the potential for preferential pathways to exist, as to which applicable groundwater standards apply; b. clearly established and provided a rationale for the applicable site-specific factors and assessed, based on current and/or potential future land use and site specific characteristics, the appropriate soil standards to apply; c. assessed, based on the receptor environment, which sediment standards are appropriate to apply and provided a clear accompanying rationale; d. evaluated whether any PCOC have applicable CSR Schedule 10 standards; and, e. evaluated whether any PCOC in air or soil vapour associated with the site have applicable standards listed in Schedule 11; and, f. evaluated whether any PCOC have applicable standards in the Hazardous Waste Regulation? 12. Has the investigator: a. identified where different standards apply for different areas remediated (e.g. subject properties vs. roadways vs. offsite property/lands); b. clearly identified the applicable numeric or risk-based remediation standard(s) for each of the contaminated media, considering existing and proposed future land, sediment and water use (as applicable); c. documented requirements and factors for risk-based remediation standards, if used, and how the remediation and/or risk management measures undertaken achieved risk-based objectives?	TG 3 and 6 and CSR S. 59(2)
REMEDIATION APPROACH	13. Has the investigator described the remediation methodology (for each AEC, if it differs)?	

GENERAL TOPIC	Suggested Points of Review (Confirmation of Remediation)	Reference[3]
Permanent Risk Management Systems	14. For risk management solutions, using an engineered system (e.g., vapour management, hydraulic control, physical barrier, etc.): a. has a investigator confirmed in writing that the system was installed and is performing as designed; and, b. for vapour management systems, has the appropriate Approved Professional confirmed that vapour concentrations in the breathing zone will, meet the applicable standards for current and future occupants?	TG4
WASTE MANAGEMENT *Stockpile Sampling*	15. For the characterization of stockpiles, did the investigator: a. provide sufficient details to confirm that soil stockpiles were characterized and classified in accordance with applicable ministry guidance, or was otherwise managed appropriately based on pre-existing in-situ data; b. determine if the material within the pile is sufficiently homogenous to warrant classifying the entire stockpile under a single classification; and, c. carry out a sampling program that ensures a representative assessment of the contaminant concentrations in the entire pile?	TG 1
Disposal/Discharge	16. Did the investigator provide sufficient details to confirm that: a. other waste streams (e.g., air and water) were managed appropriately (e.g., in accordance with a permit); b. non-Hazardous Wastes generated during remediation activities were disposed of appropriately; and c. soil exceeding CSR Schedule 7 standards was either sent to a receiving site under a CSRA or to a permitted landfill?	
Hazardous Waste	17. Did the investigator provide sufficient details to confirm that: a. Hazardous Waste was characterized, stored, transported and disposed of in accordance with provincial regulations and applicable ministry technical guidance; b. field methodologies and controls were sufficient to prevent dilution of Hazardous Waste; c. manifests were completed for all Hazardous Waste transported off-site; d. Hazardous Waste was transported to a facility permitted to accept the Hazardous Waste; e. Hazardous Waste managed on site in accordance with requirements of the HWR (e.g., waste generator registration, operational and performance standards, etc.);	TG1 HWR
BACKFILL MATERIAL	18. If imported backfill was used, has documentation been provided to: a. confirm the source of the imported backfill material; b. adequately confirm the environmental quality of the backfill material; c. confirm the characterization methodology for the backfill; and, d. record the volume of imported backfill?	

GENERAL TOPIC	Suggested Points of Review (Confirmation of Remediation)	Reference[3]
	19. If site material was reused as backfill, has documentation been provided: a. that the material was adequately characterized before reuse, and of sufficient quality so as to meet site remediation standards; and, b. to record the volume of material used?	
CONFIRMATORY SAMPLING *General/Methods*	20. Does the report: a. contain a clear description of the sample locations and methods used to obtain the confirmatory samples; b. reference the relevant technical guidance that was used to develop and implement the confirmatory sampling program, and provide defensible scientific rationale where the sampling program deviated from guidance; c. document the confirmatory sampling results from each stage of remediation if remediation is carried out in multiple stages where appropriate to support conclusions; d. document all field observations, and monitoring measurements collected during the remediation work; where appropriate to support conclusions; and, e. document the sampling methodology and results of all confirmatory analytical test results?	CSR S. 49(2)(b)
Results	21. Has the investigator provided adequate post-remediation data (i.e., confirmatory sampling or, as appropriate, system operation or performance data) to demonstrate that the remediation objectives have been achieved for all identified COCs including those that may have been generated by the remediation (e.g., daughter products)?	CSR S 17, 18
	22. Have sufficient confirmatory samples have been collected at appropriate depths and locations, both within and at the boundaries of the management area, and analyzed at a frequency or density for all COCs that apply for each AEC and relevant media?	TG1, TG4, TG8
	23. Are there any limitations to the remedial scope where professional judgement has been applied, and are they clearly indicated together with supporting rationale?	
	24. Has the investigator clearly differentiated between interim (if included) and final confirmatory samples?	
	25. Has the investigator clearly stated that the confirmatory sampling program has resulted in all AECs being remediated to the appropriate standards or criteria for all COCs in all relevant media?	
Post-Remediation Monitoring	26. Has the investigator considering seasonal or weather-related factors, if appropriate, in the confirmatory data set?	
	27. Has the investigator demonstrated that groundwater or soil vapour conditions have reached steady state following the remediation work?	
	28. If long term monitoring is required (e.g., for risk managed sites): a. is the proposed monitoring program (intensity, duration) appropriate for the contaminant and site risk; b. is the proposed monitoring program consistent with MOE requirements (e.g., Schedule B clauses); and, c. is some form of financial security required?	

GENERAL TOPIC	Suggested Points of Review (Confirmation of Remediation)	Reference[3]
Statistics	29. If the investigator is classifying soil using statistics, is the classified material based on the data being demonstrably representative of one population; and, for that data set: a. the upper 90th percentile of the sample concentrations is less than the applicable standard; b. the upper 95 percent confidence limit of the average concentration of the samples is less than the applicable standard; and c. no sample within the data set has a concentration exceeding two times the applicable standard?	TG 2
QA/QC	30. Were field and laboratory quality assurance/quality control (QA/QC) methods described in sufficient detail such that they could be independently repeated, and was documentation provided describing field calibration procedures? 31. Has the investigator completed a QA/QC program which includes the following : a. documentation that sample collection, handling, preservation, storage methods and holding times were suitable for minimizing sample losses and maintaining sample integrity for the PCOCs prior to chemical analysis; b. a system for evaluating the potential for systematic bias during the sampling procedure, including collection, preparation and analysis; c. verification of data tables in the report with original analytical records; d. reviewed and commented on laboratory QA/QC, including sample integrity and sample holding times including pre and post sample extraction holding times; e. calculated and presented the relative percent difference (RPD) for sample pairs or relative standard deviation for multiple replicate samples, and evaluated RPD results in terms of stated objectives; f. provided a satisfactory explanation where QA/QC data do not meet the stated objectives including implications to interpretation of the environmental quality; and g. provided clear assertion of reliability of data that is significant to the study's conclusions based on QA/QC.	
Figures and Drawings	32. Has the investigator provided a scaled site map(s) clearly showing: a. pre- and post-remediation conditions including land use, relevant structures found on site, and the boundaries of all AECs; b. the extent of remedial excavations (both lateral and vertical) with respect to all AECs and COCs identified during site characterization; c. removed/decommissioned structures (if different from pre-remediation); and, d. a legal sketch plan or survey drawings showing the limits (both lateral and vertical) of all onsite or offsite management areas and property boundaries?	

GENERAL TOPIC	Suggested Points of Review (Confirmation of Remediation)	Reference[3]
	33. Has the investigator provided: a. a scaled site map(s) showing final confirmatory sampling locations and corresponding analytical results that visually confirms all contamination has been remediated, for each relevant media; and b. scaled cross section(s) showing the lateral and vertical extent of contamination that has been excavated or treated in situ? c. post-remediation vapour or groundwater monitoring data in tabulated format (and graph format, if appropriate) and on scaled site map(s), and provided an interpretation of trends and variations in the data?	
REFERENCES	34. Has the investigator referenced: a. all data sources, previous studies and other sources that contributed information to the study; and b. any technical literature that provides additional detail on procedures used in the study?	
APPENDICES	35. Has the investigator provided: a. printed copies of all analytical laboratory results used in this study; b. tabulated analytical data for confirmatory samples compared with applicable remediation standards; c. copies of any waste discharge permits; d. copies of Hazardous Waste manifests for any Hazardous Waste transported from site; e. as-built drawings of any engineered remediation or risk management system(s) implemented at the site (e.g., barriers installed at the property perimeter to prevent recontamination); f. photographs of remediation progress and/or measures; g. copy of Notice of Independent Remediation and Notice of Completion of Independent Remediation; h. copy of the notice for any offsite migration; and i. legal sketch plan or engineering drawing showing boundaries of any off site remediation and any associated “management areas” (e.g., as required for the Certificate of Compliance documentation)?	

EMA – Environmental Management Act
CSR – Contaminated Sites Regulation
HWR – Hazardous Waste Regulation
TG – Technical Guidance, Ministry of Environment
COC – Contaminant of Concern
CSAP – Contaminated Sites Approved Professional Society

Notes

[1] With reference to Sections 2.3 and 3.6.3 of these guidelines, when work has deviated from MOE regulations, procedures, policies and guidelines, or when applying professional judgement, it is mandatory that the AP clearly document the basis for deviation. It is recommended that the AP(s) prepare a written document that summarizes their comments (agreement/concurrence/approval/disagreement) on all items listed in the above table or to confirm that items were reviewed/considered. This supporting document is not a requirement of the submission, but may be requested during a performance assessment

[2] This guideline inherently assumes that adequate site characterization has been completed as part of the PSI and DSI, and that such information is included with or has been incorporated into the confirmation of remediation report package.

[3] Supporting reference documentation to MoE Act, Regulation, Protocols, Guidance and/or other documents also provided for information only; this list of references may be incomplete or inaccurate.

APPENDIX E: Guidance for APs Conducting Review of Contaminated Soil Relocation Agreements[1,2]

This guideline has been developed based upon Ministry regulations, procedures, policies and guidelines in effect at the time of their preparation. The Approved Professional should always refer to the ministries' current written protocols, guidance, etc. to identify if there are any new or additional requirements.

GENERAL TOPIC	Suggested Points of Review (Contaminated Soil Relocation)	Reference[3]
SOURCE SITE *Background*	1. Has the proponent provided: a. a site plan for the source site showing the area where soil to be relocated is situated and associated sampling locations; and, b. a summary of historical activities at the source site and list of associated potential contaminants of concern (PCOCs), as it relates to the soil being relocated. 2. Has the proponent confirmed that disposal of the source site soil doesn't qualify for any exemptions as listed in CSR and EMA (e.g. minimum volume, relocation outside BC, permitted landfill, etc.)?	AG8 CSR 41
Soil Characterization	3. Has the proponent : a. documented the soil quantity to be removed; b. provided adequate information to show that the source site soil to be transferred has been adequately characterized for soil and vapours PCOC; c. provided summary tables of analytical results for PCOCs compared to applicable land use standards for the receiving site and Column II or III of Schedule 7, Column III or IV of Schedule 10, and Column II, III or IV of Schedule 11, as appropriate; d. confirmed that soil concentrations do not exceed Column IV of Schedule 7, which requires an authorization for disposal and, e. confirmed that the source site soil is not considered to be a Hazardous Waste?	EMA S. 55 (4)(a) TG1, TG2, TG4 CSR S. 40(2) and 43(5)
RECEIVING SITE	4. Has the proponent: a. provided methods, evaluation and tabulation of pH of near surface soils at the receiving site in accordance with Ministry Guidance or other scientifically defensible method; b. calculated the median pH for the receiving site; and, c. compared the source site soil concentrations to the appropriate CSR land use standards for the receiving site, using the receiving site median pH (or alternatively the most conservative standard) and verifying that concentrations don't exceed the standards unless the soil is to be treated in a soil treatment facility? 5. If concentrations exceed the applicable numeric land use standards, has the proponent compared the source site soil concentrations to the Ministry approved site-specific standards or the local background standards for the receiving site, if available, and assessed whether the quality of soil at the receiving site is suitable for receiving the source site soil?	TG5

GENERAL TOPIC	Suggested Points of Review (Contaminated Soil Relocation)	Reference[3]
	6. If concentrations of the source soil exceed the above standards, has the proponent provided a risk assessment that supports the soil relocation and any associated risk management measures as necessary, considering the existing and future land use of the receiving site?	
	7. If the soil is being treated in a soil treatment facility, the Approved Professional must provide a statement indicating that the design of the facility will fully contain the contaminated soils during treatment.	AG8
	8. Has the investigator confirmed whether the municipality in which the receiving site is located has any restrictions to import of the soil, or otherwise requires a permit?	AG8
SUPPORTING DOCUMENTS	9. Has the proponent provided: a. copies of the legal title for both the source and receiving sites, obtained within one month of submission of the CSRA application; b. a completed Schedule 8 signed by both the source site and receiving site owners (including legal and civic addresses of the source and receiving sites); c. site plans showing the proposed source and disposal sites; d. analytical laboratory results (source site soil to be moved and receiving site), either in printed form or on a diskette; e. tabulated analytical results for both source site soil to be moved and receiving site, for each COC compared to appropriate standards; and, f. associated laboratory reports?	AG8

EMA – Environmental Management Act
CSR – Contaminated Sites Regulation
FS – Fact Sheet, Ministry of Environment
TG – Technical Guidance, Ministry of Environment
AG – Administrative Guidance
P – Protocol
SoSC – Summary of Site Condition
CSSAF – Contaminated Sites Service Application Form

Notes

[1] With reference to Sections 2.3 and 3.6.3 of these guidelines, when work has deviated from MOE regulations, procedures, policies and guidelines, or when applying professional judgement, it is mandatory that the AP clearly document the basis for deviation. It is recommended that the AP(s) prepare a written document that summarizes their comments (agreement/concurrence/approval/disagreement) on all items listed in the above table or to confirm that items were reviewed/considered. This supporting document is not a requirement of the submission, but may be requested during a performance assessment

[2] This guideline inherently assumes that adequate site characterization has been completed as part of the PSI and DSI, and that such information is included with or has been incorporated into the remediation plan package.

[3] Supporting reference documentation to MoE Act, Regulation, Protocols, Guidance and/or other documents also provided for information only; this list of references may be incomplete or inaccurate.

APPENDIX F: Guidance for APs Conducting Review of Risk Assessments[1,2]

This guideline has been developed based upon Ministry regulations, procedures, policies and guidelines in effect at the time of their preparation. The Approved Professional should always refer to the ministries' current written protocols, guidance, etc. to identify if there are any new or additional requirements.

GENERAL TOPIC	Points of Review (Risk Assessment Reports)	Reference [3]
PART 1: GENERAL CONSIDERATIONS		
AUTHORS AND RELIANCE	1. Does the investigator identify who the major participants are in the investigation and state his/her qualifications? 2. Does the investigator describe the relationship of the current study, in particular: a. how the methods of investigation and findings of the previous stage(s) was/were used to design and carry out the current study; and b. the extent to which the previous investigations were or were not relied on?	CSR 63 CSR 58(5) and 59(3)
RISK ASSESSMENT SUBMISSION ELIGIBILITY	3. Does the risk assessment report meet the requirements for an Arm's Length Review? 4. For SLRA, has the site been properly classified as eligible under Protocol 13 (i.e. no eligible beneficial use exemptions per Section 3.1 or precluding conditions per Section 3.2 apply)?	Procedures for the Roster of APs Nov. 2009, P13
PART 2: SCREENING LEVEL RISK ASSESSMENT		
Problem Formulation	5. Did the SLRA report summarize site conditions? 6. Was a site conceptual model included in the SLRA report and did the conceptual model meet the requirements.	 P13, S. 4.1
Exposure Assessment	7. Were all COCs from the DSI ("potentially harmful concentrations") documented in the report? 8. Was the SLRA Questionnaire, and all applicable forms completed and included in the report?	S P13, S. 4.3
	9. If one or more of Questions HW-3, AW-3, IW-3 or LW-3 of the SLRA Questionnaire were answered "yes", has Appendix A of Protocol 13 been completed and were Forms A-1 and A-2 included in the report?	

GENERAL TOPIC	Points of Review (Risk Assessment Reports)	Reference [3]
	10. If Appendix A of Protocol 13 was applicable: a. were worked examples of the calculations presented and are the calculations accurate; b. Do either Question TS-4 or Questions TS-4 and TS-5 of the SLRA Questionnaire apply? If yes, has a registered professional biologist provided the answer(s) and is this documented; c. If Question TS-5 was answered "yes", was Appendix B of Protocol 13 completed, and were Forms B-1, B-2 and B-3 included in the report; and, d. Were all submitted forms of Protocol 13 completed according to the guidance?	
Risk Characterization and Reporting	11. Have the minimum SLRA reporting requirements been satisfied?	P13, S. 5.0
	12. Were any necessary risk management measures specified?	
	13. Are the conclusions of the SLRA regarding whether contamination poses acceptable or unacceptable risks stated?	P13, S. 4.4
PART 3: ECOLOGICAL RISK ASSESSMENT		
Problem Formulation	14. Have the objectives of the ecological risk assessment been documented?	P1, S. 2
	15. Have original laboratory data reports related to additional risk assessment studies been included in the risk assessment report.	CSR 59 (2) and 59 (3)(b)
	16. If statistics were calculated for RA purposes, were the methods and rationale provided?	TG2 and other guidance documents
	17. Has the Problem Formulation identified the current and potential future land, water and sediment use of the Site and surrounding area, including any terrestrial habitat as defined in Protocol 13?	P1, S.2.2.2
	18. Have the potential contaminants of concern been identified and have toxicity profiles been provided for each COPC? identified?	CSR 59(2)(a)
	19. Have future contaminant concentrations and potential degradation products over time been considered?	
	20. Has an acceptable rationale been provided for screening out any contaminants that exceed the appropriate standards, criteria, or guidelines?	
ROC	21. Has the investigator: a. Conducted a site-specific survey of potential receptors (terrestrial and/or aquatic)? b. Identified on-site/off-site receptors of potential concern based on generally accepted and assessed the site for likely use by rare, threatened or endangered species? practices?	P1, Tier 1 EcoRA Policy Decision Summary
Exposure Pathways	22. Have all reasonable exposure pathways been identified?	
	23. Have assumptions associated with current and future land use been documented and rationale provided (e.g. development scenario)?	
	24. Has the Problem Formulation considered all relevant exposure scenarios (direct and indirect)?	

GENERAL TOPIC	Points of Review (Risk Assessment Reports)	Reference [3]
Conceptual Site Model	25. Has a conceptual exposure model showing the results of the Problem Formulation been included? Is there a clear statement as to which contaminant-pathway-receptor combinations warrant further assessment? 26. Is there a reasonable documented rationale if contaminant-pathway-receptor combinations are excluded from further assessment? 27. Have the assessment and measurement endpoints for complete exposure pathways warranting further assessment been defined? 28. If contaminants that bio-accumulate/ bio-magnify have been identified, have appropriate exposure pathways (e.g. tissue ingestion) been identified? 29. If the assessment of risk will be based on several lines of evidence, have the lines of evidence been identified and given weight in the Problem Formulation?	
Exposure Assessment	30. Has the investigator evaluated: a. Each contaminant-pathway-receptor combination identified for further assessment? b. Each applicable land use scenario (current and future)? 31. Have the most appropriate exposure media (e.g. soil, groundwater, sediment, vapour) within or adjacent to the legal parcel being risk assessed been used to characterize exposure? 32. Are point estimates of exposure concentrations reasonable and is supporting rationale documented? 33. Have appropriate receptor characteristics been selected and documented? 34. Have appropriate exposure equations been used and referenced? 35. Are the tools used in the exposure assessment (e.g. fate and transport) appropriate for the nature of the site, level of investigation and route(s) of exposure? 36. Have fate and transport model assumptions been clearly stated or tabulated with references? 37. Has an example exposure intake calculation been included for each potentially significant exposure route in the risk assessment? If not, has rationale for the decision been documented and are you in agreement with the rationale? 38. For bioaccumulative COPCs identified in the Problem Formulation, has a bioaccumulation assessment been performed for the receptor(s) of concern?	
Toxicity/Effects Assessment	39. Are the toxicity reference values (TRVs) (e.g. EC20, LOAEL) appropriate for use in the current assessment and are they consistent with the exposure data? 40. Have the TRVs been referenced? 41. Are the TRVs consistent with measurement endpoints identified in the Problem Formulation and, has the endpoint associated with each TRV been identified? 42. If reference sites were used in the assessment, were their locations and contaminant concentrations acceptable?	TG7

GENERAL TOPIC	Points of Review (Risk Assessment Reports)	Reference [3]
	43. If ecological surveys (e.g. plant or soil invertebrate community, birds, fish, benthic community) were conducted, was the rationale (incl. methods, sampling locations and seasons) documented? 44. Have the potential interactions (e.g. synergistic or antagonistic effects) of the COPCs been discussed? 45. If site-specific toxicity testing has been conducted: a. was the toxicity testing program reviewed by BCMOE and if so, was supporting documentation provided? b. did the test methods meet quality standards of an agency such as Environment Canada or ASTM? c. were the concentrations used representative of the concentration ranges determined by the DSI? d. were the tests selected appropriate for the site, media and ROC?	
Risk Characterization	46. Have hazards/risks for each complete COPC-receptor-pathway combination been categorized as acceptable or unacceptable, and has the level of protection matched that described in the MOE policy summary for the appropriate land use(s) or media? unacceptable? 47. If hazard quotients were calculated, were HQs documented for each contaminant-receptor-pathway combination identified in the Problem Formulation? If not, was rationale provided for using a different approach (e.g. site observations)? 48. Are the conclusions (i.e., risk characterization) consistent with the assessment endpoints? 49. If summary statistics were used in the exposure assessment, were the implications of maximum concentrations and hotspots above the assessed exposure concentrations discussed? 50. If the risk characterization is based on a weight of evidence approach, is the weight given to each line of evidence appropriate?	P1, S. 8 *There are no definitive risk-based* *standards for ecological receptors in the CSR*
Uncertainty Analysis	51. Were uncertainties in the ecological risk assessment predictions stated explicitly, including their implications on risk predictions? 52. Were sources of uncertainty adequately characterized/quantified? 53. If alternative TRVs (i.e. other than those recommended in TG7) have been selected, did the selected value(s) have a large impact on the conclusions and was this discussed? 54. If ecological hazard quotients exceeded one, were the uncertainties associated with the predicted HQs documented? Was the rationale adequate if the conclusion was that risks were acceptable?	P1, S.8.2 and 8.4
PART 4: HUMAN HEALTH RISK ASSESSMENT		
Problem Formulation	55. Have the objectives of the human health risk assessment been documented? 56. Have original laboratory data reports been included in the risk assessment report and does this data match the data tabulated in the risk assessment report? 57. Have summary statistics been developed and used properly (e.g. per MOE Technical Guidance 2)?	TG 7, HC PQRA (2004) CSR 59 (3)(b) TG2

GENERAL TOPIC	Points of Review (Risk Assessment Reports)	Reference [3]
	58. Has the Problem Formulation identified the current and potential future land use of the Site and surrounding area? 59. Has rationale for the choice of contaminants of potential concern been documented? 60. Has an acceptable rationale been provided for screening out any contaminants that exceed the appropriate standards, criteria, or guidelines? 61. Have assumptions associated with current and future land use been documented and rationale provided (e.g. development scenario)? 62. Has the Problem Formulation considered all relevant exposure scenarios (indirect as well as direct pathways)? 63. Have the most sensitive on- and off-site receptors been included (e.g. toddler vs. adult, most frequent site user, highest consumer)? 64. If food is available from the site, was this pathway addressed in the problem formulation? 65. If contamination has the opportunity to impact the aquatic environment, have all aquatic pathways been included (e.g., recreational use of water, consumption of biota)? 66. If contamination has the opportunity to impact drinking water wells, has domestic water use (e.g. drinking, showering) been included? 67. Have persons who may undertake excavation, maintenance or similar works at the Site been included as receptors of concern and, if not, was rationale provided for excluding such receptors? 68. Overall, have all reasonable exposure pathways been identified? 69. Has a conceptual exposure model showing the results of the Problem Formulation been included and, if so, it accurate? 70. Is there a clear statement as to which contaminant-pathway-receptor combinations warrant further assessment? 71. Is there a reasonable documented rationale if contaminant-pathway-receptor combinations are excluded from further assessment? 72. Have future contaminant concentrations and potential degradation products over time been considered? 73. If contaminants that bio-accumulate/ bio-magnify have been identified, have appropriate exposure pathways (e.g. tissue ingestion) been identified?	CSR 59 (2)
Exposure Assessment	74. Were exposure calculations conducted using the maximum measured on-site concentration(s)? 75. If the maximum concentrations were not used, was the rationale for the selected statistical measures (e.g. mean, upper confidence limit of the mean, specified percentile value, etc.) documented? 76. Have exposures to all relevant receptor age groups (i.e. any or all of infant, toddler, child, teen, adult) on-site and off-site (as applicable) been quantified? 77. If all relevant receptor age groups were not evaluated, were the most sensitive groups assessed, and was supporting rationale for the age groups chosen provided? 78. Were the recommendations in MOE TG7 followed (e.g. human receptor exposure parameters and equations) or, if not, was rationale provided for any deviations from TG7?	TG 7, HC PQRA (2004)

GENERAL TOPIC	Points of Review (Risk Assessment Reports)	Reference [3]
	79. If any alternate sources for receptor or exposure characteristics were used, were the rationale and sources/citations clearly documented? 80. Were assumptions regarding exposure duration and exposure frequency appropriate and adequately justified? 81. Where applicable, were both carcinogenic and non-carcinogenic exposure durations and averaging times considered,? 82. Were exposure intake estimates adjusted for absorption of <100%? If yes, was the rationale for any adjustments documented? 83. Were the contaminant-pathway-receptor combinations identified in the problem formulation as warranting further assessment quantified in the exposure assessment? 84. Does the report include worked example calculations and can those calculations be reproduced? 85. Are all equations dimensionally consistent and are all units correct (i.e., are the dimensions and the units the same on both sides of the equal sign)? 86. Have any models been used to predict environmental concentrations? 87. If models have been used: a. are these considered to be appropriate for the site? b. are they considered to be acceptable by BCMOE? c. was preference given to measured values where available? d. if measured values were not used, was adequate rationale provided to support a greater reliance on modeled values?	
	88. Were exposures amortized over an appropriate time period that is supported by the toxicity data (e.g. an acute exposure period and an acute TRV, a chronic exposure period and a chronic TRV)?	
Toxicity Assessment	89. Does the TRV selection follow the recommendations in MOE TG7? 90. If the TRV selection does not follow TG7 recommendations, is rationale provided for any deviations from TG7? 91. Were the TRVs selected appropriate for the substances and exposure pathways being assessed? 92. Are the TRV values as specific to the route of concern as possible? 93. For dermal exposure: a. Were oral TRVs used? b. Was rationale for the decision documented? c. If oral TRVs were used, were they adjusted for absorbed dose? 94. Were TRVs for both carcinogenic and non-carcinogenic effects considered for substances with both modes of toxicity? 95. Did the toxicity values utilized correspond with the correct isomer/speciation of the chemical identified on site? 96. Were synergistic or antagonistic effects of chemicals considered for any chemicals that would warrant such consideration? 97. If bioavailability factors were used in the exposure assessment, do the TRVs adequately reflect this (i.e. do the TRVs also need to be adjusted for bioavailability, or not)?	TG 7, HC PQRA (2004)

GENERAL TOPIC	Points of Review (Risk Assessment Reports)	Reference [3]
	98. In the absence of a TRV from a reliable agency: a. Has adequate documentation been provided indicating BCMOE acceptance of an alternative value (e.g. literature-based, or from an agency not listed in TG7)? b. If applicable, has adequate documentation been provided regarding a decision to exclude a substance from further assessment?	
Risk Characterization	99. Are the results of the risk assessment clear?	TG 7, HC PQRA (2004)
	100. Have all COPC-receptor-pathway combinations for which TRVs exist been characterized?	
	101. If surrogate receptors with higher exposure were used to conservatively represent receptors that are less exposed: a. were hazards/risks acceptable for all receptors with complete pathways? b. if not, were hazards/risks estimated for the less exposed receptors to assess whether risks were acceptable or unacceptable?	
	102. Have any Hazard Quotients been reported to be greater than unity (1)?	CSR 18 (3)(b)
	103. Have any Incremental Lifetime Cancer Risk Estimates been reported to be greater than 1 in 100,000 (>1E-05)?	CSR 18 (3)(a)
	104. Have worked examples of the risk calculations been provided?	
	105. Are hazard and risk estimates provided for current and future scenarios?	
	106. Was the description and interpretation of the hazard and risk estimates unambiguous, appropriate, objective and well supported?	
	107. Are the conclusions (i.e., risk characterization) consistent with the assessment endpoints and supported by the results?	
	108. For any substances evaluated in the risk assessment: a. Were hazards/risks summed across multiple pathways? b. Were hazards/risks for more than one substance summed? c. If so, was rationale provided for additivity of hazards/risks?	
	109. Have all substances that were concluded to meet or exceed CSR risk-based standards in regulated media been identified and the results documented?	
	110. If risk management measures were concluded to be necessary, is a reference made to where recommended risk management measures are documented?	
Uncertainty Analysis	111. Were uncertainties in the risk assessment predictions stated explicitly, including their implications on risk predictions?	TG 7, HC PQRA (2004)
	112. Were sources of uncertainty documented?	
	113. If alternative TRVs (i.e. other than those recommended in TG7) have been selected, did the selected value(s) have a large impact on the conclusions and was this discussed?	

CSR - Contaminated Sites Regulation
TG – Technical Guidance, Ministry of Environment
P – Protocol
S - Section
SoSC – Summary of Site Condition

CSSAF – Contaminated Sites Service Application Form

Notes

[1] With reference to Sections 2.3 and 3.6.3 of these guidelines, when work has deviated from MOE regulations, procedures, policies and guidelines, or when applying professional judgement, it is mandatory that the AP clearly document the basis for deviation. It is recommended that the AP(s) prepare a written document that summarizes their comments (agreement/concurrence/approval/disagreement) on all items listed in the above table or to confirm that items were reviewed/considered. This supporting document is not a requirement of the submission, but may be requested during a performance assessment

[2] Provision of these supporting documents can either be within the report appendices or as standalone separate documents listed in the SoSC, and referenced in the report

[3] Supporting reference documentation to the Contaminated Sites Regulation, and to BCMOE Protocols, Guidance and/or other documents also provided for information only; this list of references may be incomplete or inaccurate.

This guidance assumes that the site investigation(s), remediation confirmation and/or remediation plan reports that supplied the data for the risk assessment has/have been reviewed and approved by a Standards Assessment Approved Professional and further review of the quality of such reports (e.g. to confirm that contaminant delineation has been achieved) on the part of a risk assessment reviewer is not warranted.

It is noted that a large amount of professional judgment is required to adequately evaluate whether or not a risk assessment has been appropriately completed. This guidance is intended to assist a reviewer to determine if an acceptable approach has been used. Use of the guidance will assist in the assessment of the adequacy of existing data and whether or not a defensible approach has been developed. It is not intended that the guidance be used a tool to prompt/remind the reviewer to check various aspects of the risk assessment, and is not intended for use as a definitive decision-making tool (i.e. a reviewer should not add up the "yes" and "no" responses to determine the adequacy of the investigation).