



EXAMINATION GUIDE FOR EXAM CANDIDATES

ROSTER OF APPROVED PROFESSIONALS EXAMINATION REGULATORY PART

Roster Qualifications and Functions

The Roster of Approved Professionals (the Roster) is a roster of individuals who have proven, through examination and experience, their expert knowledge in contaminated site assessment, management, and remediation.

Members of the Roster are authorized, under section 49(1) of the Contaminated Sites Regulation (CSR), to recommend to the BC Ministry of Environment and Climate Change Strategy (BC ENV) issuance of Approvals in Principle, Certificates of Compliance, Determinations that a site is or is not contaminated, Contaminated Soil Relocation Agreements and approval of background release exemptions (as per Table 1 and Table 2 of Protocol 6 - Eligibility of Applications for Review by Approved Professionals).

There are two categories of Approved Professionals: Standards Assessment Specialists, whose recommendations are based on application of the numerical standards of the CSR; and Risk Assessment Specialists, whose recommendations are based on application of the risk-based standards of the CSR.

The qualifying examination is offered in three parts: Technical – Standards Assessment, Technical – Risk Assessment, and Regulatory. To be appointed to the Roster, candidates must achieve a pass in both the regulatory part and the technical part associated with the category in which they seek appointment. Candidates must satisfy all minimum requirements in the year of appointment.

More information on the Roster is available at www.csapsociety.bc.ca. Please email admin@csapsociety.bc.ca for the Approved Professional Roster Pack.

Examination Format

The examination is offered in a computer-based format and is held in a computer lab. The Regulatory part of the examination consists of approximately **70 multiple-choice questions** worth 1 point each. Candidates will be given **4 hours** to complete the Regulatory part of the examination. A basic, non-programmable calculator (Texas Instruments TI-30Xa Solar), a #2 mechanical pencil, an eraser, writing papers and a package of page markers (eg *Post-it Brand* flags) will be provided to, and retrieved from, candidates with their examination paper. Candidates will not be permitted to use their own calculator or writing instruments.

A reference binder will **NOT** be supplied for the examination. Candidates will be provided with a list of reference materials (*see Attachment 2*) to help prepare for the examination. Candidates are expected to prepare their own **printed** reference materials which can be brought into and used during the examination. Laptops or electronic materials are **NOT** permitted. The examination is not limited to testing knowledge of only those materials in the reference list.

Objectives of the Regulatory Part of the Examination

The objectives of the Regulatory part of the Examination include testing of the understanding and application of the statutes, regulations, guidance documents, protocols, policies and procedures governing the identification and remediation of contaminated sites. Successful candidates will also have a detailed understanding of how the identification, investigation and remediation of contaminated sites is regulated not only by the province but also by the federal government and will be able to understand and apply all conventions, provincial or federal, that pertain to contaminated sites practice in BC.

Examination Content and Guide to Preparation

This Guide to Examination Candidates is intended to give candidates guidance in their preparation for the exam. The information contained in this document and its attachments is to assist only and is subject to change. Areas and materials not specifically mentioned may also be examined.

Information useful in preparing for the exam is included in the following attachments:

1. Syllabus
2. List of Reference Materials

ATTACHMENT 1 – SYLLABUS

Candidates should read the Guide to Examination Candidates – Roster of Approved Professionals Examination – Regulatory before reading this syllabus. The percentage in brackets indicates the approximate percentage of the examination that will cover each major content area. **Any statute, regulation, guidance document, protocol, policy, procedure or other applicable convention pertaining to contaminated sites practice in BC is examinable.** However, particularly important areas of knowledge include:

- I. Site Identification & Notification (20%)**
 - a. Notifications
 - i. Offsite Migration
 - ii. AG11 Process
 - b. Independent Remediation
 - c. Site Risk Classification
 - d. Site Profile
 - e. Site Registry

- II. Site Investigation (30%)**
 - a. Identification of Potential Contamination
 - b. Confirmation of Contamination
 - i. Applicable Standards
 - ii. Background
 - iii. Exemptions
 - iv. Statistical and Modelling
 - v. Definition of a Contaminated Site
 - c. Delineation of Contamination

- III. Remediation (20%)**
 - a. Remediation Standards
 - b. Regulatory Remediation Processes
 - c. Remediation Plans
 - d. Confirmation of Remediation
 - e. Risk Assessment

- IV. Regulatory Instruments (20%)**
 - a. Determination
 - b. Approval in Principle
 - c. Certificate of Compliance
 - d. Contaminated Soil Relocation Agreement
 - e. Ministry only instruments (e.g. ORDERS and VRAS)
 - f. Authorizations or Approvals (other than AIP)

- V. Review Process (10%)**
 - a. Administrative Forms
 - b. Ministry Process
 - c. CSAP Process
 - d. Performance Assessment
 - e. AG6 Process

ATTACHMENT 2 – LIST OF REFERENCE MATERIALS

Candidates should read the Guide to Examination Candidates–Roster of Approved Professionals Examination–Regulatory before reading this attachment. While many questions will be drawn from the following list of reference materials, questions may be drawn from any statute, regulation, guidance document, protocol, policy, procedure or other applicable convention pertaining to contaminated sites practice in BC.

1) LEGISLATION, REGULATIONS, GOVERNANCE AND FEDERAL GUIDANCE

- a) Provincial <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/laws-regulations-compliance>
 - i) *Environmental Management Act*
 - ii) Contaminated Sites Regulation
 - iii) Hazardous Waste Regulation
(http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/63_88_00)
 - iv) *Water Sustainability Act* (<http://www.bclaws.ca/civix/document/id/complete/statreg/14015>)
 - v) Groundwater Protection Regulation
(http://www.bclaws.ca/civix/document/id/complete/statreg/39_2016)
 - vi) *Islands Trust Act*
 - vii) *Land Title Act* (only section 85)
 - viii) *Water Act (Part 5)*
 - ix) *Local Government Act* (only sections 946.1 and 946.2)
- b) Federal
 - i) *Fisheries Act* (only definitions and sections 34, 35 and 36)
<http://laws-lois.justice.gc.ca/eng/acts/F-14/>
 - ii) Transportation of Dangerous Goods Regulation (only part 2)
<http://www.tc.gc.ca/eng/tdg/clear-tofc-211.htm>
- c) CSAP <http://www.csapsociety.bc.ca>:
<https://csapsociety.bc.ca/members/guidance-documents/>
 - i) CSAP Bylaws (June 2015)
 - ii) CSAP Rules (April 2016)
 - iii) CSAP Submissions Procedures, Submissions 101
 - iv) CSAP Submissions Fee Schedule

2) PROCEDURES, PROTOCOLS, and POLICIES

- a) BC ENV. Procedure Documents – up to and including Aug 24th 2018.
<https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/procedures>
 - i) Procedure 1: Use of Status Codes in SITE and the Site Registry
 - ii) Procedure 2: Procedures for Managing the Site Registry
 - iii) Procedure 3: Ministry Procedures for the Roster of Approved Professionals. Eff. date Nov 12, 2009
 - iv) Procedure 4: Procedure Regarding Exercise of Powers to Require Additional Remediation Eff. date Aug 30, 2001
 - v) Procedure 6: Establishing the Boundaries of a Site. Eff. date Oct 24, 2008
 - vi) Procedure 8: Definitions and Acronyms for Contaminated Sites. Eff. date Nov 1, 2017
 - vii) Procedure 9: Procedures for processing site profiles. Eff. date Feb 1, 2017
 - viii) Procedure 10: Requirements for Service Application Resubmissions, Withdrawals and Amendments. Eff. date April 1, 2013
 - ix) Procedure 12: Procedures for preparing and issuing contaminated sites legal instruments. Eff. date Feb 1, 2016
 - x) Procedure 13: Protocol for Delisting Residues from Treatment or Incineration of Hydrocarbon Contaminated Hazardous Waste Soil. Eff. date Dec 18, 2007

- xi) Procedure 14: Protocol for Management of Residues from Treatment of Hydrocarbon Contaminated Special Waste Drill Cuttings Treated by Using an Approved Biological Treatment Process. Eff. date Dec 1, 2014
 - xii) Procedure 16: Procedures for determining if a Director should require the submission of a Site Risk Classification Report under Protocol 12. Eff. date April 1, 2013
- b) BC ENV. Protocol for Contaminated Sites Documents - up to and including Aug 24th 2018. <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/protocols>
- i) Protocol 1: Guidance and Checklist for Tier 1 Ecological Risk Assessment of Contaminated Sites in British Columbia
 - ii) Protocol 2: Site-Specific Numerical Soil Standards
 - iii) Protocol 3: Blending, Mixing, or Dilution as a Remediation Approach
 - iv) Protocol 4: Determining Background Soil Quality
 - v) Protocol 6: Eligibility of Applications for Review by Approved Professionals
 - vi) Protocol 7: Regulation of Petroleum Hydrocarbons in Water under the Contaminated Sites and Special Waste Regulations
 - vii) Protocol 8: Security for Contaminated Sites
 - viii) Protocol 9: Determining Background Groundwater Quality
 - ix) Protocol 10: Hardness Dependent Site-Specific Freshwater Water Quality Standard for Zinc
 - x) Protocol 11: Upper Cap Concentrations of Substances
 - xi) Protocol 12: Site Risk Classification System, Reclassification and Reporting
 - xii) Protocol 13: Screening Level Risk Assessment
 - xiii) Protocol 14: Requirements for Determining Barite Sites
 - xiv) Protocol 15: Soil Treatment Facility Design and Operation for Bioremediation of Hydrocarbon Contaminated Soil
 - xv) Protocol 16: Determining the Presence and Mobility of Nonaqueous Phase Liquids and Odorous Substances
 - xvi) Protocol 17: Requirements for Notifications of Independent Remediation and Offsite Migration
 - xvii) Protocol 18: Criteria for Establishing Multiple Land Uses at Sites
 - xviii) Protocol 20: Detailed Ecological Risk Assessment Requirements
 - xix) Protocol 21: Water Use Determinations
 - xx) Protocol 22: Application of Vapour Attenuation Factors to Characterize Vapour Contamination
 - xxi) Protocol 27: Soil Leachate Tests for Use in Deriving Site-Specific Numerical Soil Standards
 - xxii) Protocol 28: Standard Derivation Methods 2016 - Chapter 4
 - xxiii) Protocol 30: Classifying Substances as Carcinogenic
- c) BC ENV. Policies and Standards Documents. <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/policies-standards>
- i) Overview of CSST Procedures for the Derivation of Soil Quality Matrix Standards for Contaminated Sites
 - ii) Contaminated Sites Soil Task Group Workshop on the Development and Implementation of Soil Quality Standards for Contaminated Sites
 - iii) CSST Record of Response to Major Results and Recommendations Forthcoming From Eco-Workshop
 - iv) BC Environment Responses to Expert Panel Recommendations
 - v) Clarification of VPH, LEPH and HEPH Reporting Requirements

3) GUIDANCE

- a) BC ENV. Technical Guidance on Contaminated Sites Documents - up to and including Aug 24th 2018. <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/technical-guidance>

- i) TG1: Site Characterization and Confirmation Testing
 - ii) TG2: Statistical Criteria for Characterizing a Volume of Contaminated Material
 - iii) TG3: Environmental Quality Standards
 - iv) TG4: Vapour Investigation and Remediation
 - v) TG5: Sampling and Determining Soil pH at Soil Relocation Receiving Sites
 - vi) TG6: Assessment of Hydraulic Properties for Water Use Determinations
 - vii) TG7: Supplemental Guidance for Risk Assessments
 - viii) TG8: Groundwater Investigation and Characterization
 - ix) TG9: Chlorophenol Aquatic Life Water Quality Standards
 - x) TG10: Guidance for a Stage 1 Preliminary Site Investigation
 - xi) TG11: Guidance for a Stage 2 Preliminary Site Investigation and Detailed Site Investigation
 - xii) TG12: Statistics for Contaminated Sites
 - xiii) TG 13: Groundwater Protection Model - (Version 2 – Eff date Nov 1, 2017)
 - xiv) TG14: Operations of Soil Treatment Facilities for the Bioremediation of Hydrocarbon Contaminated Soil
 - xv) TG15: Concentration Limits for the Protection of Aquatic Receiving Environments
 - xvi) TG16: Soil Sampling Guide for Local Background Reference Sites
 - xvii) TG17: Background Soil Quality Database
 - xviii) TG19: Assessment and Managing Contaminated Sediments:
 - (a) Volume I – An Ecosystem-Based Framework for Assessing and Managing Contaminated Sediments
 - (b) Volume II – Design and Implementation of Sediment Quality Investigations in Freshwater Ecosystems
 - (c) Volume III – Interpretation of the Results of Sediment Quality Investigations
 - (d) Volume IV – Supplemental Guidance on the Design and Implementation of Detailed Site Investigations in Marine and Estuarine Ecosystems
 - xix) TG20: Applicability of Sodium (Na⁺) and Chloride (Cl⁻) Soil Relocation Standards to Marine and Estuarine Dredge Materials
 - xx) TG22: Use of Monitored Natural Attenuation for Groundwater Remediation DRAFT
 - xxi) TG24: Site Specific Numerical Soil Standards Model Parameters
- b) BC ENV. Administrative Guidance on Contaminated Sites Documents - up to and including Aug 24th 2018. <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/administrative-guidance>
- i) AG1: Completing and Submitting Site Profiles
 - ii) AG2: Site Profile Processing Requirements for Municipalities and Approving Officers
 - iii) AG3: Applying for Contaminated Sites Services
 - iv) AG4: The Site Information Request Process
 - v) AG5: Approved Professional Recommendations Relating to Low to Moderate Risk Sites
 - vi) AG6: Site Profile Decisions and Requesting Releases Where Local Government Approvals are Required
 - vii) AG7: Completing and Submitting and Application for a Soil Relocation Agreement
 - viii) AG8: Contaminated Soil Relocation Agreement Processing Requirements for Approved Professionals
 - ix) AG9: Independent Remediation of Contaminated Sites
 - x) AG10: Site Risk Classification
 - xi) AG11: Expectations and Requirements for Contaminant Migration
 - xii) AG12: The External Contract Review Process
 - xiii) AG13: Guidance on Schedule 2 Purposes and Activities
 - xiv) AG14: Performance Verification Plans, Contingency Plans and Operations and Maintenance Plans
 - xv) AG16: Approved Professional Role in the Administration of Site Profile Releases – Scenarios
 - xvi) AG17: Completing Summaries of Site Condition
 - xvii) AG22: Application of Wildlands Land Use
- c) Ancillary Guidance

- i) BC Approved Water Quality Guidelines (December 2017)
<https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines>
- d) Fact Sheets <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/fact-sheets>
 - i) FS1: An Introduction to Contaminated Sites in BC
 - ii) FS6: Site Profile Administration: Local Government Opt Out Option
 - iii) FS11: Highlights for Realtors, Property Vendors and Purchasers
 - iv) FS19: The Site Profile System
 - v) FS23: The Use of Site Registry Status Codes
 - vi) FS25: Fees for Contaminated Site Services
 - vii) FS31: Remediation of Sites Contaminated by a Spill
 - viii) FS32: Residential Heating Oil Storage Tanks
 - ix) FS33: Obtaining Information from the SWIS, AMS and Compliance and Enforcement Databases
 - x) FS34: Requirements for Responding to Contaminant Migration
 - xi) FS35: Requirements for the Environmental Cleanup of Illegal Drug Manufacturing Sites
 - xii) FS37: Site Profile Freeze and Release Provisions
 - xiii) FS41: Relocation of Soils from Contaminated Sites
 - xiv) FS45: Site Risk Classification
 - xv) FS46: Contaminated Sites Legal Instruments
 - xvi) FS47: Wide Area Sites
 - xvii) FS48: Remediation Liability and Combining Parcels with Different Owners
- e) External Guidance <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/external-guidance>
 - i) Site Registry User's Guide
- e) Forms <https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/forms>
 - i) Site Profile
 - ii) Contaminated Sites Services Application
 - iii) Protocol 6 Preapproval Application
 - iv) Summary of Site Condition Form
 - v) Site Information Request Application
 - vi) File Contents Retrieval Application
 - vii) Notification of Independent Remediation
 - viii) Notification of Likely or Actual Migration
 - ix) Contaminated Soil Relocation Agreement
 - x) Site Risk Classification Report
 - xi) Detailed Ecological Risk Assessment Checklist

4) ANALYTICAL METHODS

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/analytical-methods>

- i) Analytical Method 7 - Aliphatic / Aromatic Separation of Extractable Petroleum Hydrocarbons in Solids or Water by Silica Gel Column Fractionation
- ii) Analytical Method 9 - Soluble Barium by Calcium Chloride Extraction

5) ROSTER OF APPROVED PROFESSIONALS FORM PACK

Please contact admin@csapsociety.bc.ca for the Roster form pack

6) MOE WEBSITE

BC ENV. Questions & Answers (PDF), October 16, 2015.

https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/contaminated-sites/cs_q-a.pdf

- 7) **CCME (Canadian Council of Ministers of Environment).** Environmental Quality Guidelines.
http://www.ccme.ca/publications/list_publications.html#link2
http://www.ccme.ca/publications/ceqg_rcqe.html
- 8) **CCME (Canadian Council of Ministers of Environment).** Contaminated Sites
https://www.ccme.ca/en/resources/contaminated_site_management/index.html

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ATTACHMENT 2 – LIST OF REFERENCE MATERIALS

Candidates should read the **Guide to Examination Candidates – Roster of Professional Experts Examination – Technical – Standards Assessment Part** before reading this attachment. This list of reference materials includes materials upon which some, but not all, of the exam questions have been developed. Other questions are drawn from the general principles to be tested and, in some instances, what is considered to be general knowledge. In addition to those materials listed here, candidates should study generally accepted, up-to-date texts in the subject matter areas to be tested.

1. ALS Laboratory Group. (2006). *Hydrocarbon Distribution Report Reference Library*, ALS Environment.
<http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>
2. BC ENV. All *Technical and Administrative Guidance Documents on Contaminated Sites* - up to and including Dec.8th 2017.
3. BC ENV. All *Protocols for Contaminated Sites* - up to and including Dec.8th 2017.
4. BC ENV (2017). *Procedure 8: Definitions and Acronyms for Contaminated Sites V2.2*.
5. BC ENV. Questions & Answers (PDF), October 16, 2015.
6. BC ENV. All *Fact Sheets on Contaminated Sites*
7. BC Ministry of Environment (2001). *Analytical Method 7 for Contaminated Sites: Aliphatic/Aromatic Separation of Extractable Petroleum Hydrocarbons in Solids or Water by Silica gel Fractionation. Version 2.1*.
8. BC Ministry of Environment, S. Horvath (editor). (2009). *British Columbia Environmental Laboratory Manual. Water and Air Monitoring and Reporting*, Environmental Quality Branch, Ministry of Environment, Victoria, BC.
<https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-environmental-laboratory-manual>
9. BC Ministry of Environment, Land and Parks, W.G. Landis, A.J. Markiewicz, V. Wilson, A. Fairbrother, G. Mann. (1998). *Protocol 1: Recommended Guidance and Checklist for Tier 1 Ecological Risk Assessment of Contaminated Sites in British Columbia*. Victoria, BC, Canada.
10. BC Ministry of Water, Land and Air Protection, M.J.R. Clark. (2003). *BC Field Sampling Manual*. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Victoria, BC, Canada. 312 pp.
<https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-field-sampling-manual>.
11. BC Ministry of Environment. (2004) *Well Protection Toolkit* (electronic resource)
http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/wells/well_protection/wellprotect.html
12. Butler, James J. (1998). *The Design, Performance and Analysis of Slug Tests*. Boca Raton, Florida, CRC Press LLC.
13. Canadian Standards Association. (R2006). *Phase I Environmental Site Assessment. CSA Z768*
14. CCME (Canadian Council of Ministers of Environment). (1994). *Subsurface Assessment Handbook for Contaminated Sites*. Report: CCME-EPC-NCSR-48E, March 1994. Prepared by the Waterloo Centre for Groundwater Research, University of Waterloo for the CCME Hazardous Waste Management Branch.
15. CCME (Canadian Council of Ministers of Environment). (1996). *A Framework for Ecological Risk Assessment: General Guidance*. Prepared by the CCME Subcommittee on Environmental Quality for Contaminated Sites. March 1996.
16. CCME (Canadian Council of Ministers of Environment). (1997). *A Framework for Ecological Risk Assessment: Technical Appendices*. Prepared by the CCME Subcommittee on Environmental Quality for Contaminated Sites. March 1997.

17. CCME (Canadian Council of Ministers of Environment). (2001). *Reference Method for the Canada Wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method*.
18. Contaminated Sites Approved Professionals of British Columbia (CSAP). (2009). *Soil Vapour Advice and Practice Guidelines*. <http://www.csapsociety.bc.ca/members/practice-guidelines>
19. Christensen, J.S., J. Elton. (1996). *Soil and Groundwater Pollution from BTEX*. Groundwater Pollution Primer. Civil Engineering Dept., Virginia Tech. <http://www.webapps.cee.vt.edu/ewr/environmental/teach/gwprimer/btex/btex.html>
20. Crow, E. L., F. Davis, and M. Maxfield. (1960). *Statistics Manual*. Mineola, New York: Dover Publications.
21. Department of Fisheries and Oceans Canada. (1985). Fisheries Act (R.S., 1985, c. F-14).
22. Domenico, P. A., & Schwartz, R. W. (1998). *Physical and Chemical Hydrogeology*. New York, John Wiley and Sons.
23. Environment Canada – Ontario Region. *TAB #2: Site Assessment Procedures*. Prepared for the Federal Facilities operating in Ontario. 2002.
24. Environment Canada – Ontario Region. *TAB #16: Risk Assessment-Exposure Model, Toxicity Analysis and Evaluation*. Prepared for the Federal Facilities operating in Ontario. 2002.
25. Environment Canada – Ontario Region. *TAB #19: Intrinsic Remediation - An Introduction*. Prepared for the Federal Facilities operating in Ontario. 2002.
26. Environment Canada – Ontario Region. *TAB #20: Intrinsic Remediation – Biodegradation*. Prepared for the Federal Facilities operating in Ontario. 2002.
27. Environment Canada – Ontario Region. *TAB #22: In-Situ Remediation Technologies for Contaminated Sites*. Prepared for the Federal Facilities operating in Ontario. 2002.
28. Fetter, C. W., (2008). *Contaminant Hydrogeology* (2nd Ed). Reissued by Waveland Press Inc., Long Grove, Illinois. August 2008.
29. Fetter, C.W., (2001). *Applied Hydrogeology*. Upper Saddle River, NJ: Prentice Hall.
30. Freeze, R. A., & Cherry, J. A. (1979). *Groundwater*. Englewood Cliffs, NH: Prentice-Hall.
31. Gilbert, R. O. (1987). *Statistical Methods for Environmental Pollution Monitoring*. New York: Van Nostrand Reinhold, New York.
32. Groundwater Remediation Technologies Analysis Center (GWRTAC). (1999). *Technology Evaluation Report: In Situ Chemical Treatment*. GWRTAC E Series TE-99-01. <http://www.clu-in.org/download/toolkit/inchem.pdf>
33. *Introduction to Geotechnical Engineering* (2nd Ed). Upper Saddle River, NJ: Prentice Hall.
34. Huling, S.G., and J.W. Weaver. (1991). *Dense Nonaqueous Phase Liquids*. U.S. EPA Groundwater Issue Paper, EPA/540/4-91-002. <http://www.epa.gov/superfund/remedytech/tsp/download/issue8.pdf>
35. ITRC (Interstate Technology & Regulatory Council). (2005). *Permeable Reactive Barriers: Lessons Learned/New Directions*. PRB-4. Washington, D.C.: Interstate Technology & Regulatory Council, Permeable Reactive Barriers Team. Available on the Internet at <http://www.itrcweb.org/documents/PRB-4.pdf>
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40. Maxxam Analytics Inc., *Chromatogram Interpretation Guide*. contact Maxxam. <http://maxxam.ca/>
41. Moffitt, F. H. (1987). *Surveying* (8th Ed). New York: Harper and Row, p. 124.
42. Morrison, R. and Murphy, B. (2006). *Environmental Forensics*. Elsevier Academic Press.
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45. Nyer, E et al (1991). Using the Properties of Organic Compounds, etc., *Groundwater Monitoring Review*.
46. Nyer, E.K. (1992). *Practical Techniques for Groundwater and Soil Remediation*. CRC-Press
47. Nyer, E.K., D.F. Kidd, P.L. Palmer, T .L. Crossman, S. Fam, F.J.Johns II, G. Boettchera, and S.S. Suthersan (1996). *In Situ Treatment Technology*. CRC Lewis Publishers, Boca Raton, Florida.
48. Province of British Columbia. *Contaminated Sites Regulation* (CSR). http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/375_96_00
49. Province of British Columbia. (2016). *Ground Water Protection Regulation* (GWPR) http://www.bclaws.ca/civix/document/id/complete/statreg/39_2016
50. Province of British Columbia. (2017). *Hazardous Waste Regulation* (HWR), B.C. Reg. 63/88, including amendments up to B.C. Reg. 243/2016, November 1, 2017. http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/63_88_00
51. Science Advisory Board for Contaminated Sites in BC (2011) – *Guidance on Site Characterization for Evaluation of Soil Vapour Intrusion*. Prepared by Golder Associates Ltd., Burnaby, BC. [http://www.sabcs.chem.uvic.ca/a%20June%2015%202012%20SABCS%20Golder%20Soil%20Vapour%20Guidance%20Security%20Level%20for%20Posting%20May%2011%20\(2\).pdf](http://www.sabcs.chem.uvic.ca/a%20June%2015%202012%20SABCS%20Golder%20Soil%20Vapour%20Guidance%20Security%20Level%20for%20Posting%20May%2011%20(2).pdf)
52. Shineldecker, C. L. (1992). *Handbook of Environmental Contaminants: A Guide for Site Assessment*, Boca Raton, FL: CRC Press, p. 119, 172, 173.
53. Suthersan, S.S. (1997) *Remediation Engineering Design Concepts*. Boca Raton, FL. CRC Press, Lewis Publishers. P. 271.
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55. US EPA. (2003). *Soil-Gas Measurement*. Fact Sheet 09MB03-FS-Soil Gas. Updated March 2003.
56. US EPA. *Online Risk Assessment Information System*. <http://rais.ornl.gov/>
57. Verschuere, K., 1983. *Handbook of Environmental Data on Organic Chemicals*. (2nd Ed). New York, NY: Van Nostrand Reinhold Company