

**GEOENVIROLOGIC PROFESSIONAL DEVELOPMENT  
AND  
THE CSAP SOCIETY**

EXAM PREPARATION WORKSHOP  
SESSION 3— “STANDARDS” EXAM

## AGENDA

8:15 - 8:25	Registration and Breakfast
8:25 – 8:30	Introductions and Overview
8:30 – 8:45	Review of Reference Materials <ul style="list-style-type: none"><li>- Minimum qualified candidate</li><li>- Syllabus and reference list</li><li>- Roster practice guidelines and checklists</li></ul>
8:45 – 10:15	Group Topics
10:15 – 11:15	Mini Quiz: writing and discussion
11:15 – 12:00	Group presentation of list of reference and One Key Topic

**A Discussion Forum has been set up at <http://csapexam.proboards.com/>.**

**Materials will also be posted to [tp://www.geoenvirologic.ca/course\\_materials.htm](http://www.geoenvirologic.ca/course_materials.htm).**

## **GROUP #1**

### **A. Historical and Visual Site Information (5%)**

APEC and PCOC: Identify all applicable potential APEC and PCOC based on review of existing information from various sources and based on assessment of site conditions observed during a site reconnaissance.

### **B. Assessment of Affected Media and Migration Pathway (20%)**

Soil: Interpret site geology and soil stratigraphy.

Hydrogeology: Assess groundwater flow and contaminant transport (dissolved and Non-aqueous phase liquids - NAPL).

Surface hydrology: Interpret significance of precipitation on a contaminated site in terms of contaminant transport (surface water, groundwater, soil and sediment).

Sediment: Interpret sediment characteristics and its significance for contaminant distribution and release.

Soil vapour: Understand soil vapour concentrations and migration.

Air: Understand impact on indoor and outdoor air quality by dust and vapours from site contamination.

Biota: Understand significance of food-chain transfers and the significance of observations such as stressed vegetation and effects on aquatic life.

## GROUP #2

### **C. Contaminant Characteristics (15%)**

- Chemistry and biochemistry: Interpret physical, chemical and biological properties of contaminants and their significance on fate, transport, treatment and relative human health and ecological risks.
- Chemical composition of mixtures: Understand the significance of chemical compositions of common types of contamination substances including but not limited to: fuels, lubricants, solvents, paints, wood preservatives, coal tar, metal plating, and landfill leachate.
- Sources of Contamination: Be familiar with common residential, commercial and industrial activities that may result in site contamination including but not limited to: Fuel storage and handling, metal fabrication, wood preservation, solvent cleaning, coal gasification, and landfilling.

### **D. Investigation Approach and Methods (15%)**

- Sampling rationale: Interpret available information to develop a defensible sampling rationale that will satisfy the investigation objectives.
- Sampling plans: Assess sampling plans to determine whether they are consistent with the investigation objectives and sampling rationale.
- Sampling techniques: Understand the significance of the use of proper equipment and methods for sampling of soil, sediment, groundwater, surface water and soil vapour.
- Field observations and records: Assess field records in terms of adequacy for data interpretation included but not limited to: Borehole logs, well installation details, visual/olfactory signs of contamination, sampling details, etc.
- Laboratory testing methods: Understand applicability and limitations of common laboratory sampling methods including but not limited to: Gas chromatography, gas chromatography/mass spectroscopy, infrared spectroscopy, petroleum analytical methods (e.g. LEPH/HEPH vs. EPH).
- Field screening techniques: Understand applicability and limitations of common laboratory sampling methods including but not limited to: soil vapour headspace, immunoassay, colorimetric, pH/conductivity/temperature, X-ray fluorescence.
- QA/QC practices: Assess field and laboratory work in terms of acceptable QA/QC methods and interpretation.

## GROUP #3

### **Data Synthesis and Interpretation (15%)**

- Data integration and presentation: Assess the investigation data in terms of adequate presentation in tables and figures.
- Adequacy of testing: Review sampling programs to assess the adequacy of the testing performed (number, type and location of samples).
- Nature and extent of contamination: Assess APEC and AEC: number, types, characteristics, PCOC, delineation.
- Nature and extent of migration pathways: Assess migration pathways: types, characteristics, preferential routes, relative importance.
- Background conditions: Assess regional and local background conditions.

### **F. Risk Assessment Principles and Screening (5%)**

- Problem formulation: Identify/screen sources, exposure pathways, receptors
- Acceptable risk: Carcinogens Non-carcinogens.
- Exposure scenarios: Interpret current and future site uses.
- High risk: Recognize imminent and high risk to human health and environment, and immediate risks to public welfare (e.g. explosion hazard, etc.).

## GROUP #4

### **G. Remediation Design, Implementation and Confirmation (25%)**

- Remediation techniques: Be familiar with common soil, sediment, groundwater, water and soil vapour remediation methods.
- Remedial design: Understand technical, regulatory and cost aspects of common remediation methods, and be able to evaluate the selection of appropriate alternatives.
- Remediation implementation: Understand health and safety standards, construction techniques/constraints, monitoring requirements, and requirements associated with off-site transport and disposal of contamination and record keeping.
- Remediation Confirmation: Assess confirmatory sampling program and results in terms of adequacy to demonstrate the site meets the applicable requirements of a remediated site.

# Examination Schedule and Location

Standards Assessment Technical Part - Tuesday, Nov 17, 2009 from 8:30am to 1:30pm (5 hours)

Risk Assessment Technical Part - Thursday, Nov 19, 2009 from 8:30am to 1:30pm (5 hours)

Regulatory Part - Wednesday, Nov 18, 2009 from 8:30am to 12:30pm (4 hours)

The examination is offered in a computer-based format and will be held at the following computer test lab:

ICBA Computer Test Lab

211 - 3823 Henning Street, Burnaby, BC, Canada V5C 6P3

# Internet

**Login:**

**Password:**

# CSAP Examinations Summary

## November 2008 Examination Summary:

- Regulatory: 66% of candidates passed
- **Standards Assessment Technical: 87% of candidates passed**
- Risk Assessment Technical: 42% passed
- Candidates were invited to complete feedback forms following each part of the exam and the feedbacks have been [collated](#) [pdf 89kb].

## October 2007 Examination Summary:

- Regulatory: 70% of candidates passed
- **Standards Assessment Technical: 50% of candidates passed**
- Risk Assessment Technical: 33% of candidates passed

# Questions and Answers (Q&As)

The following is a collection of questions and detailed answers regarding the interpretation of applicable contaminated sites legislation, policies, protocols and procedures.

Additional information regarding the application of the contaminated sites regime is presented on our website in numerous [fact sheets](#), [guidance documents](#), [protocols](#), [procedures](#) and [policies](#).

If you require further assistance, please view our [contact list](#) to direct your question to the appropriate ministry staff member.

[Regulatory](#)

[Administrative](#)

[Technical](#)

[Interim Guidance for Site Vapour Assessment](#)

[Draft Guidance for Vapour Investigation and Remediation](#)

# Frequently Asked Questions (FAQs)

The following is a collection of answers to commonly asked questions relating to contaminated sites in B.C. and the basic application of the contaminated sites provisions of the *Environmental Management Act*.

## [Contaminated Sites Legal Instruments](#)

### [General](#)

### [Legislation and Regulations](#)

### [Liability](#)

### [Ministry Services & Fees](#)

### [Site Information Requests & the Site Registry](#)

### [Site Investigation and Remediation Process](#)

### [Standards](#)

### [Types of Contamination](#)

### [Interim Guidance for Site Vapour Assessment](#)

# Group Topic: Site Profiles/Triggers

## References:

- EMA Section 40
- CSR Part 2
- CSR Schedule 1
- CSR Schedule 2
- Land Title Act
- Vancouver Charter/Island Trust etc...
- Administrative Guidance 1 and 2

Discussion topic was recent amendments to Schedule 2 making a marijuana grow- op a Schedule 2 activity and the requirements/exemptions for submitting a site profile for grow-ops

# Group Discussion

## References for Regulatory Instruments

### **Environmental Management Act (EMA)**

- Part 2 – Prohibitions and Authorizations
- Part 3 – Municipal Waste Management
- Part 4 – Contaminated Sites Regulation
  - Division 1 – Interpretation
  - Division 2 – Identification of a Contaminated Site
  - Division 3 – Liability
  - Division 5 – Delegation
  - Division 7 – General Provisions
- Part 8 – Appeals
- Part 9 – Compliance
- Part 10 – Offences and Penalties
- Part 7 – Powers in Relation to Managing the Environment

### **Contaminated Sites Regulation (CSR)**

- Schedule 8 – Contaminated Soil Relocation Agreements (CSRA)
- Part 5 – Contaminated Sites Definitions and Determination
- Part 4 – Fees
- Part 7 – Liability
- Part 9 – Remediation Plan Approval and Completion
- Part 12 – Consultation
- Part 16 – Professional Statements
- Schedule 1.1 – Summary of Site Condition
- Schedule 3 – Fees

# Group - Regulatory Instruments

**Protocols:** Protocol 6

## **Procedures**

- Definitions and Acronyms
- Roster
- Time and Expense Tracking

**Policies:** None

## **Administrative Guidance**

- 3 – Applying for Contaminated Sites Services
- 5 – Approved Professional Recommendations Low to Moderate Risk Sites
- 7 – Completing and Submitting Applications for CSRA
- 8 – CSRA Processing
- **Forms**
- CSRA
- Notification
- Summary of Site Condition

## **Fact Sheets**

- 37 – Site Profile Freeze and Release Provisions
- 22 – External Report Review
- 30 – Roster of Approved Professionals
- 41 – Relocation of Soil from Contaminated Sites
- 25 – Fees for Contaminated Sites Services
- 28 – Overview of Ministry's Contaminated Sites Services

## **FAQ**

- Legal Instruments section

## **Q&A**

- Several questions related to instruments

## **Guidance Documents for CSAP**

- All

# Mini Quiz

Each CSAP exam has been prepared with the expectations that the average candidate would complete the exam in 3 hours. However, additional time has been allowed to minimize time pressure and focus on testing for competency (rather than how quickly someone can recall, process or look up information).

The exams have 75 questions each, which means 2 minutes and 24 seconds per question for an average candidate completing the exam in 3 hours. The extra time given equates to 1 minute per regulatory question (4 hours long exam); and almost 2 minutes for the technical exams (5 hours long exams).

*Answer the following “Practice” questions within the average time of 2.4 minutes per question. Use your reference materials as necessary.*



# Mini Quiz Q – Standards

What volume of soils does a discrete *in situ* sample represent for material designated as commercial quality?

A.5

B.10

C.15


D.20



# Mini Quiz Q – Standards

A contaminated site is located on a commercial property, surrounded by residential properties, some of which have groundwater drinking wells. Groundwater contaminated with LEPHw and various PAH components has been identified in an unconfined sand unit with an average saturated thickness of 0.8 m. The groundwater contamination has been delineated on-site. The sand unit is underlain by a low permeability clay unit. Drilling investigations have determined that the contamination is limited to the unconfined sand unit. A freshwater creek is located approximately 200 m off-site and down-gradient of the site. A hydrogeologic study of the unconfined sand unit has identified the hydraulic conductivity of the sand unit at  $1 \times 10^{-4}$  m/s. It is assumed that any groundwater drinking water wells would have 6 inch (0.0762 m) diameter well screens. What is the appropriate water use for this site?

- A. Drinking Water
- B. Fresh Water Aquatic
- C. Drinking Water and Fresh Water Aquatic, whichever is more stringent
- D. No water use



# Mini Quiz Q – Standards

The expected sequence of correct order of anaerobic natural attenuation of petroleum hydrocarbons would be:

- A. Denitrification, manganese reduction, Iron (III) reduction, sulphate reduction, methanogenesis
- B. Denitrification, , Iron (III) reduction, manganese reduction, sulphate reduction, methanogenesis
- C. Denitrification, , sulphate reduction manganese reduction, Iron (III) reduction, methanogenesis
- D. Denitrification, Iron (III) reduction, manganese reduction, sulphate reduction, methanogenesis



# Mini Quiz Q – Standards

When a result for a discrete sample exceeds the relevant standard, and is classified as waste, what is the required number of step-outs and distance, respectively for a sample to be collected?

A.3,4

B.3, 7

C.4, 7

D.4, 4

# Mini Quiz Q – Standards

You are applying for a local background release for concentrations of dissolved manganese in groundwater at your site in which drinking water standards apply. You have identified three local groundwater wells that are located in a residential area up-gradient from your site, and these wells are all completed in similar lithologic units and are in similar geographic settings. The concentrations of manganese in these wells have been measured in June and December. The manganese concentrations are:

	Well 1	Well 2	Well 3
June	325 mg/L	430 mg/L	50 mg/L
December	295 mg/L	370 mg/L	45 mg/L

The 95<sup>th</sup> percentile of the dataset is 415 mg/L as calculated by a MS Excel formula. What is the local background for manganese in groundwater on the site?


- A. 415 mg/L
- B. 200 mg/L
- C. 207.5 mg/L
- D. There is not enough data to determine the local background concentration of manganese in groundwater.



# Mini Quiz Q – Standards

The groundwater at a site flows to a lake. The characteristics of the aquifer include: Difference in elevation  $\Delta h = 25$  m; Length of flow path  $L = 1500$  m; Hydraulic conductivity  $K = 0.15$  cm/s; Porosity  $n = 0.25$ . How long would it take for the groundwater at the site to reach the lake?

- A. 694.4 days
- B. 173.6 days
- C. 69.4 days
- D. 1736.1 days



# Mini Quiz Q – Standards

The Regulatory sample preservative and hold time requirements for the standard volatile organic analysis in water are:

- A.  $\text{Na}_2\text{S}_2\text{O}_3$ , maximum 7 days
- B.  $\text{Na}_2\text{S}_2\text{O}_3$ , maximum 14 days
- C.  $\text{NaHSO}_4$ , maximum 7 days
- D.  $\text{NaHSO}_4$ , maximum 14 days



# Mini Quiz Q – Standards

A risk-based remediation plan was prepared and submitted to the Ministry of Environment in June 2004. An Approval in Principle was issued later that year, with no specific time requirements stipulated. Due to owner-related issues, the remediation work could not be completed until February 2010. In preparation for the review for a Certificate of Compliance, an Approved Professional was approached to undertake the review work. The Approved Professional (numerical and risk-approved) can:

- A. accept the assignment, given the risk-based nature of the AiP
- B. decline the assignment, due to the fact that remediation did not occur within 5 years of the AiP issuance
- C. accept the assignment, as the Approved Professional helped with the investigation and remedial planning for the site
- D. decline the assignment, as the Approved Professional's company was not involved in the project



# Mini Quiz Q – Standards

A site is being assessed in a well-known and heavily investigated area of a municipality. The consultant involved in the assessment has conducted studies on the adjacent, surrounding properties, and has a thorough knowledge of conditions in the area. A series of boreholes were drilled on an approximately 20 metre grid pattern, and a monitoring well was installed. Soil and groundwater samples were collected and tested for the PCOCs identified. No contamination was found in any of the APECs at the site. A report was prepared, documenting the general area conditions and the results of the investigation. A Determination was requested from the Ministry of Environment, and an Approved Professional was approached to review the documentation. The review could not be completed as:


- A. the Approved Professional's company was involved in the investigation and assessment of the property
- B. the Approved Professional is not permitted to review reports for a Determination of a Contaminated Site
- C. the investigation locations were on an approximate 20 metre grid-based pattern, and were not more closely spaced
- D. data from general area knowledge cannot be used to establish site-specific groundwater conditions, and one well cannot determine groundwater flow direction



# Mini Quiz Q – Standards

Which of the following media is not considered a soil?

- A. fill
- B. sediments deposited on land
- C. composted organic materials
- D. unconsolidated mineral or organic material



# Mini Quiz Q – Standards

The aquifer underneath a site is contaminated with tetrachloroethylene (PCE). A groundwater sample contains 200 ppb of PCE. The aquifer soil was found to contain 1% organic carbon. Assuming the adsorption follows a linear model, what would the estimated PCE concentration absorbed on the aquifer material be?

- A. 5 mg/kg
- B. 2.51 mg/kg
- C. 0.5 mg/kg
- D. 0.05 mg/kg



# Mini Quiz Q – Standards

For the purposes of establishing a water use, freshwater is defined as water having a natural salinity:

- A. Less than 1.0 g/L
- B. Less than 1.5 g/L
- C. Less than 2.5 g/L
- D. Less than 5.0 g/L



# Mini Quiz Q – Standards

A Site has concentrations of lead in soil exceeding the land use standards. Which of the following in-situ remedial options would be expected to be the most effective in reducing lead concentrations?

- A. Fracturing
- B. Bioventing
- C. Soil Flushing
- D. Thermal Treatment



# Mini Quiz Q – Standards

A farm uses groundwater for livestock watering, drinking water and for irrigation of crops (primarily grain crops, such as barley and wheat). An environmental consultant, acting on behalf of the farmer, tests the water and finds that the concentration of boron is at approximately 1,500 micrograms per litre (ug/L). The consultant correctly concludes:

- A. the water standards for livestock and drinking water are both 5,000 ug/L, and as they represent the most serious risk scenario, the water is not contaminated
- B. boron was not identified as a potential contaminant of concern, and therefore it can be ignored
- C. the water is contaminated with respect to the irrigation use water standards
- D. the water is not contaminated, because the farmer intends to switch to asparagus crops



# Mini Quiz Q – Standards

A routine round of monitoring at a monitoring well site located next to a freshwater creek detected a number of dissolved metal concentrations in groundwater, including antimony (175 ug/L), cadmium (0.81 ug/L), copper (89 ug/L) and zinc (1,500 ug/L). The pH of the water was recorded at 8.3 (pH units), and the hardness of the water was recorded as 250 milligrams per litre (mg/L; as CaCO<sub>3</sub>). The consultant correctly concludes that:

- A. the lack of cadmium standards for hardness values greater than 210 mg/L as CaCO<sub>3</sub> in Schedule 6 makes interpretation impossible
- B. the lack of cadmium standards for hardness values greater than 210 mg./L as CaCO<sub>3</sub> in Schedule 6 requires risk assessment
- C. the cadmium concentration detected at this site exceeds the freshwater aquatic life standards
- D. the water meets the freshwater aquatic life standards, for these parameters