

**SC 307**

**Environmental Site Assessment**

**3 Credits**

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## SC 307 Version: 12



# Environmental Site Assessment

## Calendar Description

Students gain a basic understanding of how to evaluate contaminated sites through the processes of a Site Assessment, Site Characterization, and the parallel process of Environmental Risk Assessment. More and more frequently, the effective management of environmental risks (i.e. contamination) and remediation of contaminated sites requires a basic understanding of the science, policy and culture of risk assessment and risk management.

## Rationale

This is a required course for the students in the Environmental Sciences diploma majors: Conservation & Restoration Ecology major, Environmental Conservation & Reclamation major, and Applied Environmental Sciences major. This course is also a required course for students who are in the Bachelor of Applied Science: Environmental Management (BAppSci:EM), Remediation and Reclamation major and did not already meet this competency in their prior diploma or degree. Increasingly, environmental staff must manage environmental risks. To best do this they must first have a basic understanding of how to assess environmental risk using the processes of site assessment, site characterization and risk assessment. Secondly, they must understand how to assess the potential reduction (or increase) in risk associated with various courses of action that might be taken to address an apparent environmental hazard.

## Prerequisites

SC 110 and SC 200 or equivalent

## Co-Requisites

None

## Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. decide and design what is required in a Phase I site assessment and where to obtain the information to complete that assessment for an upstream oil & gas setting and a commercial/industrial setting.

2. determine and design what is required to complete a Phase II preliminary site characterization for an upstream oil & gas setting and a commercial/industrial setting.
3. estimate the additional level of effort and the activities that are required to complete a Phase III detailed site characterization for an upstream oil & gas setting and a commercial/industrial setting.
4. compare the difference between typical site assessment and characterization processes and activities for a commercial/industrial setting vs. an upstream oil & gas setting.
5. design and be able to defend the process and role of environmental risk assessment, risk management and risk communication for the management or remediation of environmental risk.

## Essential Employability Skills

Essential employability skills are critical for workplace success and lifelong learning. Lakeland College prepares its graduates for the workplace and lifelong learning by integrating and promoting essential employability skills development in its curricula. Each credit course offered at Lakeland College emphasizes one or more of the following five essential employability skills:

- A. **Communication Skills** that enable individuals to listen, interpret, express, and convey knowledge and ideas so that they are received and understood.
- B. **Teamwork Skills** that enable individuals to respect the thoughts and opinions of others as they work together to plan activities, meet deadlines, complete projects, and contribute to an organization's goals.
- C. **Critical Thinking Skills** that enable individuals to conceptualize and analyze issues from various perspectives while rationally evaluating the strengths and limitations of each perspective and deciding what action to take.
- D. **Adaptability Skills** that enable individuals to respond quickly, willingly, and positively to new conditions and changing times.
- E. **Positive Attitude and Behavioural Skills** that enable individuals to be confident about themselves and to deal with people, problems, and situations with honesty, integrity, and personal ethics.

Please refer to the Knowledge/Skills Matrix of this course outline to review the essential employability skills emphasized in this course.

## Resource Materials

### ***Required Textbook:***

None

### ***Recommended Reference Resources:***

Alberta Environment. January 2019. Alberta Tier I soil and groundwater remediation guidelines.

Alberta Environment, Edmonton. (Also available online from the Alberta Environment Website).

Alberta Environment. January 2019. Alberta Tier II soil and groundwater remediation guidelines. Alberta Environment, Edmonton. (Also available online from the Alberta Environment Website).

Alberta Environment. May 2016. Alberta Environmental Site Assessment Standard. Alberta Environment, Edmonton. (Also available online from the Alberta Environment Website).

Government of Alberta, Alberta Labour & Immigration. 2020. Hazard Assessment and Control: a handbook for Alberta employers and workers. Alberta Government, Alberta Labour & Immigration, Edmonton.

<https://open.alberta.ca/dataset/854e3880-1417-4c10-a494-feecc22336b3/resource/fc1e12fb-7d07-4713-8ff1-c0f64c4017d2/download/lbr-hazard-assessment-and-control-a-handbook-for-alberta-employers-and-workers-2020.pdf>

[http://www.library.ualberta.ca/permalink/opac/8974320/LAKELND\\_LLWEB](http://www.library.ualberta.ca/permalink/opac/8974320/LAKELND_LLWEB)

Alberta Environment. May 2001. Salt Contamination Assessment & Remediation Guidelines. Alberta Environment, Edmonton. (Also available online from the Alberta Environment Website).

Canadian Council of Ministers of the Environment. 1999. Canadian environmental quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg.

### ***Required Field Trip Supplies:***

Field Trips - the student must supply their own CSA approved safety glasses or prescription glasses with side shields and steel toe boots. (Hard hats and fire resistant nomex cover-alls are provided for you; however, you may wish to have your own.)

### **Conduct of Course**

This course includes lectures, laboratory sessions and field trips. In the lab, students work in small teams or occasionally in pairs. Students are expected to have safety glasses and steel-toed boots by their first lab period. Students are required to write lab reports and field trip reports based on all of their trips.

### **Evaluation Procedures**

Students are evaluated using both exams related to lecture theory and assignments related to laboratory material. The final grade is the sum of the following components.

Midterm Exam	30%
Final Exam	35%
Lab/Field Trip Reports	30%
Subjective Grade	<u>5%</u>
Total	100%

To obtain credit in this course, all lab/field trip reports must be completed and handed in on time. Reports are generally due one week after each lab or trip unless otherwise discussed in class. Late reports are NOT accepted; they are assigned a mark of zero.

The marks for this course are derived from lecture exams and lab marks. Percentage marks are converted to the College grade system using the equivalencies in the table below.

## Knowledge/Skills Matrix

### Students apply and demonstrate their knowledge and skills to use

#### A. Communication Skills

<b>A1. by listening, reading, interpreting information, and communicating effectively</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>A2. by using written, spoken, and/or visual formats and media to communicate and meet needs of each particular audience</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>A3. by using libraries, Internet, technical publications, journals and other sources to find pertinent information</b>
Evaluation(s)/Goal(s): Lab/Field Trip Reports/ Goals 1-4

#### B. Teamwork Skills

<b>B1. by using interpersonal skills to create an atmosphere that maximizes the strengths of group members to accomplish tasks</b>
Evaluation(s)/Goal(s): Lab/Field Trip Reports/ Goals 1-4
<b>B2. by using interpersonal skills to resolve conflict, relate to others, and assist others</b>
Evaluation(s)/Goal(s): Lab/Field Trip Reports/ Goals 1-4
<b>B3. by contributing and listening to others as group determines realistic objectives, prioritizes tasks, and identifies resources and timelines</b>
Evaluation(s)/Goal(s): Lab/Field Trip Reports/ Goals 1-4
<b>B4. by treating other members of the group open-mindedly and fairly</b>
Evaluation(s)/Goal(s): Lab/Field Trip Reports/ Goals 1-4
<b>B5. by developing tactics/strategies to accomplish tasks</b>
Evaluation(s)/Goal(s): Lab/Field Trip Reports/ Goals 1-4

#### C. Critical Thinking Skills

<b>C1. by seeing critical thinking as a lifelong process of self-assessment</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4

<b>C2. by examining problems closely</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>C3. by examining beliefs, assumptions, and opinions, and weigh them against the facts</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>C4. by seeking out the truth</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>C5. by finding solutions; make decisions</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>C6. by incorporating new ideas that may not necessarily agree with previous thought on the topic</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>C7. by seeing connections between topics and use knowledge from other disciplines to enhance reading and learning experiences</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4

**D. Adaptability Skills**

<b>D1. by working independently or as part of team</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>D2. by carrying out multiple tasks or projects</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>D3. by being innovative and resourceful: identify and suggest alternative ways to get the job done</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>D4. by being open and respond constructively to change and uncertainty</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4

**E. Positive Attitude and Behavioural Skills**

<b>E1. by dealing with people, problems, and situations with honesty, integrity, and personal ethics</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>E2. by showing interest, initiative, and effort</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>E3. by affirming the need for positive solutions and encourage positive interaction and feedback</b>
Evaluation(s)/Goal(s): Written Exam 1 and 2; Goals 1-5; Lab/Field Trip Reports/ Goals 1-4
<b>E4. by balancing personal and family activities with job-related activities</b>
Evaluation(s)/Goal(s): Lab/Field Trip Reports/ Goals 1-4

**Grade Equivalents and Course Pass Requirements**

*A minimum grade of D (50%) (1.00) is required to pass this course.*

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

**Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.**

## **Attendance**

Classroom and laboratory attendance is considered vital to the learning process and as significant to the students' evaluation as examinations and reports, therefore absenteeism is recorded.

- a. Students having a combination of excused and/or unexcused absence of 20 percent or higher for the scheduled course hours can be required to withdraw and would then automatically receive a "RW" (required withdrawal) for the course, regardless of any other evaluation results. (RW is a failing grade).
- b. An excused absence is one that is verified with your instructor. Verification should be prior to the absence or the next class day following the absence. Verification of the absence may take the form of a note from your doctor/College nurse regarding illness, or a note from another instructor regarding a field trip or other activity, or authorization by your instructor following an in-person meeting. Be sure to contact your instructor and ask what they will require from you as verification of each absence. An unexcused absence is anything NOT verified by the instructor prior to the absence or the next class day following the absence.

NOTE: Any exceptions to the above attendance policy (e.g. timetable conflicts, work-related issues) must be approved in writing by the Department Chair prior to the beginning of the course.

It is the students' responsibility to know their own absentee record.

Normal hours are 8:30 a.m. to 6:30 p.m., with potential for evening courses, exams or extended field trips. Students are expected to be available for classes during these times.

## **Course Units/Topics**

### ***Lecture Component:***

#### **1: Introduction to Environmental Site Assessment (ESA)**

- Objectives of an ESA
- Alberta Environment Site Assessment process (Phase 1, 2 , 3)
- Applicable Regulations
- Stakeholders roles and responsibilities

#### **2: Phase I Environmental Site Assessment for upstream oil & gas sites and commercial/industrial settings.**

- Objectives of Phase I ESA

- Phase I ESA components
  - Scope of work
  - Record Review
  - Site Visit
  - Interviews
  - Reporting

**3: Introduction to Phase II Environmental Site Assessment for upstream oil & gas sites and commercial/industrial settings.**

- Objectives of Phase II ESA
- Scope of work
- Steps involved
- Regulatory drivers

**4 & 5: Planning and Conducting Phase II Environmental Site Assessment for upstream oil & gas sites and commercial/industrial settings**

- Conceptual site model (CSM)
  - Source, pathways and receptors
- Detailed work plan
  - Site characteristics
  - Substance release
  - Proposed soil sampling and analysis
- Sampling plan
- Site specific risk assessment
- Field screening tools
- Contaminant delineation
- Testing methods
  - Non-intrusive (EM, GPR): to identify COPCs
  - Intrusive methods (auger, test pits, boreholes)

**6: Result Interpretation and Reporting of Phase II Environmental Site Assessment**

- Applicable guidelines
  - Tier 1 (land uses, soil types, COPCs)



- Tier 2 (guideline modification, pathway exclusion)
- CCME
- Exposure control
- Reporting

**7: Introduction to Phase III and beyond for upstream oil & gas sites and commercial/industrial settings**

- Objectives of Phase III ESA
- Phase III ESA Components
- Common remediation techniques

***Lecture/Laboratory Component (as available, weather dependent):***

1. Site Visit execution for Phase I Environmental Site Assessment
2. Desktop review and Air Photo assessment execution for Phase I Environmental Site Assessment using Abadata software
3. Phase II Information review and result interpretation
4. Ground Disturbance Level II Training
5. Introduction to Phase III: remediation technologies



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