National Defence / Défense nationale

Canada

MILITARY ENVIRONMENTAL PROTECTION

CANADIAN ARMED FORCES

ENVIRONMENTAL AIDE-MÉMOIRE FOR DEPLOYED OPERATIONS

October 2017
Edition 3

Military Environmental Protection
Canadian Armed Forces Environmental Aide-Mémoire for Deployed Operations

Cette publication est aussi disponible en version française

This publication is issued under the authority of the Commander, Canadian Joint Operations Command, and is also available in electronic format

Office of Primary Interest:

Canadian Joint Operations Command
Joint Engineer Branch
Environmental Engineering
101 Colonel By Drive
Ottawa, Ontario
K1A 0K2

ISBN (Print): D2-377/2017E 978-0-660-07974-5

ISBN (PDF): D2-377/2017E-PDF 977-0-660-07973-8

Cover image: A marked nest-box for Coracias garrulus *(European Roller), a European Union Protected Species, as seen from a dugout in Military Training Area Ādaži, Latvia*

Environmental Aide-Mémoire for Deployed Operations

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Introduction

Military operations, by their very nature, may be destructive to human and environmental health. The goal of military environmental protection (EP) is to prevent or mitigate the adverse effects of military activities by adopting suitable practices and procedures.

EP on deployed operations protects the health of the force and maintains its legitimacy to operate. It is a way to meet legal obligations, manage residual risks, and reduce liability in foreign jurisdictions. The responsibility of commanding deployed forces must be reinforced by policies, advice, and evidence on environmental matters.

The environmental ethic of the Department of National Defence is stewardship, which is the responsibility to care for property—the environmental commons—and the well-being of others—the people who live there (DAOD 4003-0, 30 July 2004). Environmental stewardship can be challenging. In deployments to countries with limited standards of environmental protection or support, the force itself may need to take an active role in managing waste. When the aim of an operation is to apply combat power to meet strategic objectives, environmental impacts will be inevitable. However, even in high-intensity combat operations, environmental protection should be considered. Storing fuel safely provides both environmental protection and some extent of tactical energy security. Siting camps with due regard for cultural property protection and sensitive ecosystems is ethically, and often legally, the right thing to do.

The aim of this aide-memoire is to provide direction and guidance to the chain of command on environmental topics which may arise during Canadian Armed Forces (CAF) deployed operations. It is intended to help commanders and environmental personnel alike to identify and manage environmental issues.

Section 1 – Risk Management

Risks of environmental impact are reduced by following a few principles:

1. Respecting Applicable Laws and Agreements. The most important measure is to know and obey the law. This principle does not conflict with the primacy of operations, because all operations must be conducted in accordance with applicable laws. However, applicable environmental laws vary from place to place and from one mission to another. In general, the more restrictive of Canadian or host-nation laws will apply to a given situation, but this principle alone is not enough. Most Canadian federal (and all provincial, territorial, and municipal) laws and regulations apply only inside Canada, but federal requirements for environmental impact assessment, as of the time of writing, apply around the world. This includes military operations, unless they have been specifically exempted. In addition, a theatre or mission may have a Technical Arrangement, a Status of Forces Agreement, or other legal agreement in effect that places legal obligations on deployed forces. Most such agreements deal with proposals for construction, land-use, and utilities. Co-ordination on environmental matters with military engineers, logisticians, and policy and legal advisors—to clarify real property use, leases, and contracted support in theatre—is essential. Deployed forces must understand which laws, treaties, and agreements apply to them.

2. Following Policy, Direction, and Guidance. As a matter of policy, the Department of National Defence has committed to respecting the letter and spirit of Canadian environmental laws and regulations to the extent practicable (DAOD 4003-0). These laws and regulations can serve as a reference for environmental standards and a guide to action. The Department also implements Public Service policies with respect to waste management and safety that relate to the environment. Additional direction and guidance is provided through the CJOC Directives for International Operations (CDIO). The CDIO also implement NATO Military

Committee policy on environmental protection (MC 469), NATO standards, and doctrine (the Allied Joint Environmental Protection Publications, or AJEPPs). Environmental terms of reference for United Nations missions are specified in the UN Directorate of Peacekeeping Operations Department of Field Support Reference 2009.6, *Environmental Policy for UN Field Missions*.

3. Planning. One of the results of environmental impact assessment is a collection of mitigation measures. These measures, as well as the policy, direction, and guidance mentioned above, should lead to operational or standing orders that give deployed personnel enough information to maintain environmental equipment, to respond to environmental incidents (such as spills and releases of chemicals), to report incidents properly, and to meet other legal obligations.

4. Taking Action. Personnel need to read or receive training on relevant orders in order to be aware of environmental issues related to their duties. In turn, they need to execute their duties in an environmentally acceptable way.

5. Checking and Correcting. Operational activities should be monitored to ensure consistency with the commander's environmental protection orders. In addition to in-theatre activities, Staff Inspection Visits (SIVs) and Technical Assistance Visits (TAVs) may be conducted in accordance with direction by the Canadian Joint Operations Command (CJOC), depending on the nature and location of the visit. Lessons observed should be reported to the chain of command to improve environmental performance.

Section 2 – Organization and Responsibility

2.1 – Organization

Task Forces vary in size and organization, but the responsibility to provide in-theatre environmental advice to the TF Commander will usually be assigned to the TF Engineer. The TF Environmental Advisor is responsible for preparing environmental plans for command approval and seeking answers to questions. In turn, depending on their duties, all Task Force personnel have the responsibility to execute and obey the EP plans established by the TF Commander.

In addition to environmental staff, an air–land Joint Task Force may have line engineering, technical, and contracting capability in the form of a Construction Engineering Troop or Engineer Support Squadron.

2.2 – Communication

The technical line of communication from the TF Environmental Advisor extends to Canada through CJOC Joint Engineer Operations and Environmental staff. CJOC approves of environmental plans (e.g. Environmental Effects Determinations) and obtains specific environmental advice from the Departmental functional authority—the Assistant Deputy Minister (Infrastructure and Environment).

ADM(IE) directorates will review environmental plans, and, if necessary, seek answers from the Ministry of the Environment and Climate Change and other departments or agencies.

CJOC JEngr will also refer questions on environmental and land-use matters to the Canadian Forces Legal Advisor (CFLA) and to Environmental Advisors of other Level 1 organizations, such as the Canadian Army and Royal Canadian Air Force.

2.3 – Responsibility

A Task Force Environmental Advisor should:

1. Understand applicable legal and policy requirements;
2. Support the mission by providing advice on environmental aspects and impacts—an environmental plan or management system;
3. Be familiar with environmental standards;
4. Advise on Environmental Impact Assessments (EIA);
5. Coordinate the completion of Environmental Baseline Studies (EBS), Environmental Condition Reports (ECR), and Environmental Close-out Studies (ECS);
6. Advise on environmental reporting requirements, particularly for spills and other incidents;
7. Collaborate with other staff, support agencies, stakeholders, and experts;
8. Maintain and archive pertinent documents and records; and
9. Plan for mission termination, transition, and closure.

Section 3 – Environmental Plan

An environmental plan contains all the measures needed to protect the environment before, during, and after an operation. Such a plan may differ from an Environmental Management System (EMS) in its scope and level of detail, but it may accomplish similar goals, such as the fulfilment of compliance obligations and the documentation and improvement of environmental performance.

An environmental plan may contain the following elements:

1. *Environment* paragraphs in orders, such as Appendix 3 (Environmental Protection) to Annex EE (Engineer) of an Operations Order or Contingency Plan;
2. A commander's environmental policy;
3. Theatre- and mission-specific Standing Orders for EIA, EBS, ECS, ECR, spill-reporting, and auditing;
4. Environmental indoctrination and training of personnel before deployment and during reception, staging, and onward movement (RSOM); and
5. Record-keeping of environmental information.

Section 4 – Environmental Studies

Environmental Baseline and Close-out Studies (EBS/ECS) are conducted, respectively, near the beginning and before the end of an operation.

4.1 – Environmental Baseline Study (EBS)

The aim of an EBS is to provide an initial assessment of a given site by evaluating and documenting its condition, including any accommodations, installations, and utilities found there. An EBS provides evidence to meet statutory and contractual obligations and to support human and environmental health. It can help to determine what precautionary measures should be taken to prevent personnel from being exposed to environmental contaminants of concern. Its results ensure that the Department is not held liable, at some future date, for contamination or damage—whether caused by others or occurring naturally. The results of the EBS are to be documented in an engineering report that clearly identifies areas of contamination, contaminant concentrations, and the environmental media (air, water, soil) affected. The report should also make recommendations regarding appropriate mitigation measures to prevent exposure.

4.2 – Environmental Close-out Study (ECS)

The aim of an ECS is to determine whether or not contamination has been caused by CAF activities. Thus, it is a follow-up of conditions identified by the EBS and by reports during site use. Investigations should be focused on hazardous material and waste storage areas; petroleum, oil, and lubricant storage areas; vehicle maintenance areas, ammunition storage areas; firing and demolitions ranges; wastewater works; and refuelling points.

If ongoing monitoring activities have been conducted properly during the period of occupation, there should be few new contaminated sites identified during the draw-down or decommissioning of an operation. If new contamination is found, it should be outlined, documented, and where possible, remediated

before departure. If the contamination cannot be remediated before departure, it will be disclosed to the host nation or property owner, and negotiations should take place to determine future action.

4.3 – Scope

The scope of any environmental study will depend on the nature and duration of the operation and the purpose of the study. Study activities could range from review of previous studies to a detailed sampling program, with test pits, boreholes, and groundwater monitoring wells. The TF Environmental Advisor will recommend a suitable level of effort. Timely and accurate documentation is essential.

A study report is a technical report, and should contain an aim, methods, results, and recommendations. Detailed studies will require support from environmental engineers and technicians, and may be conducted through contract. An environmental study could be completed concurrently with infrastructure surveys and Environmental Health Site Assessments (EHSA). CJOC JEngr staff will provide advice as required.

4.4 – Support Requirements

When sampling and analytical work are required, chain-of-custody procedures should be observed and suitably accredited laboratories used. Laboratories should be certified by a third party in accordance with ISO 17025 for the analytes of interest. If samples are sent to Canada for analysis, the laboratory should be accredited by the Canadian Association for Laboratory Accreditation (CALA). If a laboratory outside Canada is used, it is good practice to send a random selection of duplicate samples for analysis by a CALA-accredited laboratory.

4.5 – Reporting

An environmental study report should be forwarded to the TF Legal Advisor and Policy Advisor for review, and then to the host nation, property owner, or agent. The TF should seek concurrence

that DND is not responsible for the initial condition of a site and that DND will not be held liable for improving it or any future impact caused by outside influences. Before returning a site to the host nation, a final disclosure report, based on an ECS, should be produced for similar purposes: to make the host nation authorities aware of any changes to the environmental condition of the site during the period of occupation, to demonstrate the CAF's commitment to environmental protection, and to provide a record in the event there are future claims against the Crown. These studies could be combined with real property agreements with the host nation.

4.6 – Format

The format for an environmental study report in the CAF is intended to be consistent with the NATO format specified in AJEPP-6, which simplifies camp handover/takeover with NATO Allies and partner nations that have implemented NATO standards. This format can be used during initial occupation, close-out, or handover procedures. Therefore, it is recommended that the report contain the following parts:

1. Executive summary;
2. Main body;
3. Study checklist (Table 1);
4. Site plan, including list of infrastructure;
5. Site photos (Figure 1);
6. Sampling log (if samples were taken); and
7. Laboratory results (if samples were taken).

Table 1: Example Environmental Study Checklist

SECTION A – EVALUATION PARTICULARS	
1. Mission/Operation	
2. Current Occupant	
3. Unit Commander (Name/Rank/Position)	
4. Unit EP Officer (Name/Rank/Position)	
5. Evaluation Level	Preliminary [ ] Detailed [ ]
6. Camp Name	
7. Date of Evaluation	
8. Evaluator (Name/Rank/Classification)	
9. Evaluator's Experience with Environmental Studies	1 2 3 4 5 None Extensive
10. Local Point of Contact	
11. Workers Interviewed	
12. Reviewers (Name/Rank/Position)	
13. Climatic details	Temperature (°C):
	Wind Speed:
	Wind Direction:
	Humidity:
	Air Quality:
	Odours/Fumes/Smoke/Dust:
	Other:
SECTION B – SITE IDENTIFICATION	
1. Location Name and Alternate Names	
2. Map Reference/Grid (Military Grid Reference System (MGRS) or other system and datum)	
3. Current Site Use	
4. Historical Site Use	
5. Current Site Use – Surrounding Lands	
6. Historical Site Use – Surrounding Lands	
7. Other Identification Information	

SECTION C – SITE DATA	
Construction	
1. Listing of structures, location, size, basic construction type, storeys and approximate age.	
2. Heating/Cooling for structure (include fuel source and amount on hand)	
3. Stains and corrosion. Describe stains on floors, walls, and ceilings	
4. Drains and sumps. Describe floor drains and sumps.	
5. Ranges: location, description, and past use.	
6. Description of Utilities Layout	
7. Raw Sewage from defective piping	
8. Abandoned sewer lines or open sewers	
9. Manholes	
10. Asbestos-Containing Material	
11. Lead-based Paint, Paint Chipping or Peeling	
12. Hot Water Temperature	
13. Indoor Ventilation	
14. Laundry Outlets	
15. Vehicle Washing Locations	
16. Polychlorinated Biphenyl (PCB)-Containing Equipment	
17. UFFI (Urea Formaldehyde Foam Insulation)	
18. Other	
CULTURE/HISTORY	
19. Graveyards	
20. Battlefields – Presence of Explosive Remnants of War	
21. Monuments	
22. Archeological Features	
23. Other	
Ecology	
24. Vegetation	
25. Fauna/Insects	
26. Sensitive Ecosystems	
27. Other	

Geography	
28. Landfill Proximity	
29. Mining Industry Proximity	
30. Refinery Proximity	
31. Sources of Noise and Proximity	
32. Other	
Hydrogeology	
33. Drinking Water	
34. Supply Wells	
35. Monitoring Wells	
36. Soil Composition	
37. Soil Layer Pattern	
38. Underlying Aquifers	
39. Other	
Existing Risks	
40. High-Risk Neighbours	
41. Known HAZMAT Handled on Site	
42. Spill Reports	
43. Environmental Condition Reports	
44. Underground Storage Tanks: Proximity, MGRS, Number and Content.	
45. Medical Waste, Location and Disposal Method	
46. Other	
Local Practices	
47. Waste Collection &, Disposal	
48. Sewage and Sludge Collection, Treatment and Disposal	
49. Incineration	
50. Containment Mechanisms about Contaminants	
51. Storage of Fuel/Petroleum/Oils/Lubricants	
52. Storage of Used Oil/Coolant/Anti-Freeze/Batteries/Other Chemicals	
53. Use of Cleaning Products	
54. Use of Drip Trays/Pans in Vehicle Compounds	
55. Use of Halocarbons.	
56. Local Power Generation Methods	
57. Other	

Topography	
58. Existing Watercourses or Ditches	
59. Flood Potential	
60. Horizontal Distance to Surface Water	
61. Runoff Potential	
62. Sinkholes	
63. Slopes	
64. Stagnant Water	
65. Other	
Observed Contamination	
66. Oil sheen on water	
67. Observed Environmental Accidents	
68. Stained/Discoloured Soil	
69. Evidence of Petroleum Contamination	
70. Other	
SECTION D – Recommendations	
General Comments/Actions Required	
References:	
A.	
B.	

Figure 1: Example Environmental Baseline Study Sampling Locations Annotated with Military Grid Reference System Coordinates

Section 5 – Environmental Impact Assessment

Environmental impact assessment is a planning and decision-making tool. It is a way to estimate the environmental effects of a proposed project, policy, plan, or program before carrying it out. An EIA may show the need for control measures, or that a course of action is not environmentally sensible. The process should start as early as practicable, and before firm decisions are made, so that environmental factors are considered during a military decision-making process such as the Operational Planning Process or Battle Procedure.

5.1 – Policy and Plan Environmental Assessments

The 1999 *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals* requires a strategic environmental assessment whenever a proposal is submitted to an individual minister or Cabinet for approval (e.g. a proposed deployment), and when implementation of the proposal may result in important environmental effects, either positive or negative.

5.2 – Project and Activity Assessments

The *Canadian Environmental Assessment Act, 2012*, at sections 67 and 68, requires DND and the CAF to assess any activity on federal lands or outside Canada that has the potential to have significant adverse environmental effects before proceeding with it. Exemptions (under section 70 of the *Act*) apply only to cases of national security or emergencies. Military operations, domestic or overseas, are not automatically exempt from assessment. The 15 July 2016 ADM(IE) *Directive Regarding Environmental Impact Assessment* specifies the requirements for DND Environmental Effects Determinations (EED) that ensure compliance with the federal system. A flowchart (Figure 2) guides selection of the right format and level of effort for assessment. CJOC HQ and ADM(IE) will review and approve project and activity submissions. CJOC HQ will upload approved submissions to the DND EIA database (the Portal), where they will receive a tracking number.

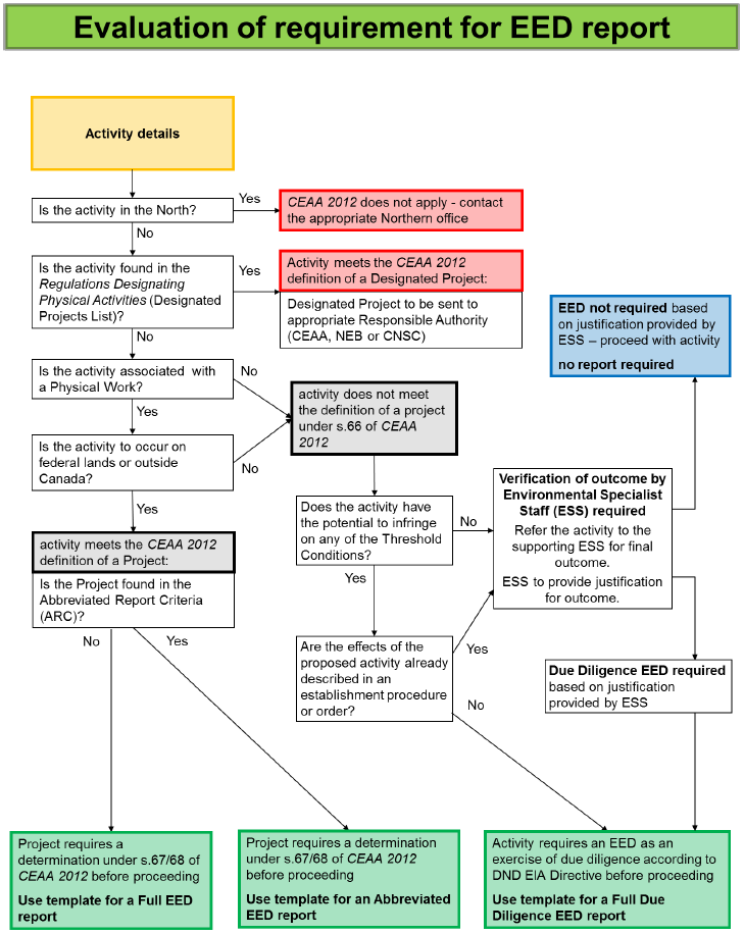


Figure 2: Environmental Effects Determination Flowchart

5.3 – Abbreviated Environmental Effects Determinations

5.3.1 – Abbreviated Report Criteria

Only projects for which the entire scope of work is described by the Abbreviated Report Criteria, shown on the following pages, may be assessed using the Departmental Abbreviated Environmental Effects Determination template.

1. Continuation and Maintenance Projects
1.1. The proposed maintenance or repair of a physical work.
1.2. The proposed resumption or continuation of the operation of a physical work, the operation of which is otherwise exempted under these Criteria.
1.3. The proposed operation or proposed resumption of the operation of a physical work, the operation of which is not otherwise exempted under these Criteria, if
(a) the operation is the same as an operation of the Physical Work for which an EA has been conducted under either the repealed Canadian Environmental Assessment Act or the Environmental Assessment Review Process (EARP) Guidelines Order;
(b) as a result of the assessment, the operation was determined to be unlikely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures, if any; and
(c) the mitigation measures, if any, have been implemented.
1.4. The proposed continued operation or continued decommissioning of a physical work, the operation or decommissioning of which is not otherwise exempted under these Criteria, if
(a) the continued operation or decommissioning is the same as the current operation or decommissioning and there is no interruption between the current and proposed operation or decommissioning;
(b) a federal authority determined the current operation or decommissioning to be unlikely to cause significant adverse environmental effects, taking into account the implementation of any mitigation measures; and
(c) the mitigation measures and follow-up program, if any, have been substantially implemented.
Note: a change of operator does not in itself mean that the proposed continued operation or decommissioning is different from the current operation or decommissioning.

2. Building Construction and Decommissioning Projects
2.1. (1) The proposed construction, installation, operation, expansion or modification of a Building that is only to be used in for one or more of the following uses:
(a) providing residential, hotel, institutional or other accommodations;
(b) providing offices, meeting rooms and related facilities;
(c) providing facilities and services to passengers of common carriers;
(d) providing retail sales facilities;
(e) providing medical facilities and services;
(f) providing educational or informational facilities and services; (g) providing recreational facilities and services;
(h) providing restaurant and food take-out services;
(i) providing parking facilities;
(j) providing classroom training;
(k) presenting artistic, cultural, sporting and other community related events;
(l) storing any article or substance that is not hazardous to human beings or the environment;
(m) providing facilities and services for the posting, receipt, sorting, handling, transmission or delivery of mail; and
(n) providing facilities essential to the practice of farming and is not to be used to store a Polluting Substance.
(2) and, if the Project, while respecting the Threshold Conditions, is to be carried out on
i a Serviced building lot on which the Building is to be connected to the lot's hook-ups to water and sewage mains, or
ii unserviced land and the Project does not result in a Building with a footprint greater than
A. in the case of construction or installation, 500 m^2, and
B. in the case of an expansion, the greater of
I. 500 m^2, and
II. an area that is 10% larger than its existing footprint.

2. Building Construction and Decommissioning Projects (Cont'd)
2.2. The proposed construction, installation, operation or modification of a building, other than a Building to be used exclusively for one or more of the purposes set out in paragraph 2.1(1), if the Project does not result in a Building with a footprint greater than 100 m^2 or a height greater than 5 m and respects the Threshold Conditions.
2.3. The proposed expansion of a building, other than a Building to be used exclusively for one or more of the purposes set out in paragraph 6(1), if the Project while respecting the Threshold Conditions:
(a) results in a Building with a footprint no more than the greater of 100 m^2 and a footprint that is 10% larger than its existing footprint;
(b) results in a Building with a height no more than the greater of 5 m and a height that is 10% more than its existing height.
2.4. The proposed decommissioning of a Building with a footprint no more than 1000 m^2 and respects the Threshold Conditions.
2.5. The proposed demolition of a Building with a footprint no greater than 1000 m^2 if the respects the Threshold Conditions.
2.6. The proposed operation of a nursing station or health centre having a footprint of no more than 1000 m^2, or a treatment centre having a footprint of no more than 2000 m^2 and respects the Threshold Conditions.
2.7. The proposed construction, installation, operation, expansion or modification of a sidewalk, a boardwalk, a path, a pedestrian ramp or an access road if the Project, while respecting the Threshold Conditions, is to be carried out
i. on a Serviced building lot,
ii. on unserviced land and the Project does not affect permafrost and results in a Physical Work with a length no more than
A. in the case of construction or installation, 100 m, and
B. in the case of an expansion, the greater of 100 m and a length that is 10% more than the existing length of the physical work, or
iii. for a sidewalk, boardwalk, path or pedestrian ramp, on unserviced land alongside a Building or road and the Project does not affect permafrost.

3. General Projects
3.1. The proposed construction, installation, operation, expansion, modification or decommissioning of a Physical Work which respects the Threshold Conditions, and that is not otherwise referred to in these Criteria, if the Project
(a) in the case of a decommissioning, is not to be carried out on a Physical Work with a footprint greater than 25 m^2; and
(b) does not result in a Physical Work with a footprint greater than 25 m^2.
3.2. The proposed construction, operation, expansion or modification of a hard surface if the Project, while respecting the Threshold Conditions, is to be carried out on
i. a Serviced building lot, or
ii. unserviced land and the Project does not affect permafrost and results in a hard surface having an area no more than
A. in the case of construction, 500 m^2, and
B. in the case of an expansion, the greater of 500 m^2 and an area that is 10% larger than the existing area of the hard surface.
3.3. The proposed construction, installation, operation, expansion, modification or removal of a fence which respects the Threshold Conditions and
(a) in the case of the construction or installation of a fence that prevents the passage of wild animals, is to be carried out entirely within 30 m of a non-linear physical work; and
(b) in the case of the expansion of a fence that prevents the passage of wild animals, results in a fence with a length or height that is no more than 35% greater than its current length or height.
3.4. The proposed construction, installation, operation, expansion, modification, decommissioning, abandonment or removal of a hydrant or hook-up if:
(a) the hydrant or hook-up is part of a farm or municipal system of distribution; and
(b) the Project does not involve the crossing of a water body, other than an aerial crossing by a telecommunication or electrical power line.
3.5. The proposed construction, installation, operation, expansion, modification or removal of a sign that respects the Threshold Conditions.
3.6. The proposed construction, installation, operation, expansion, modification or decommissioning of an environmental scientific data collection instrument, including its housing and enclosure, that respects the Threshold Conditions.

3. General Projects (Cont'd)
3.7. (1) The proposed construction, installation, operation, expansion or modification of a radiocommunication antenna and its supporting structure that is
(a) not to be carried out within 30 m of a water body, if
i. the antenna and supporting structure are either affixed to a Building or located entirely within 15 m of a building, or
ii. the antenna, its supporting structure, or any of its supporting lines has a footprint of no more than 25 m^2; or
(b) to be carried out within 30 m of a water body, if
i. the antenna and its supporting structure are affixed to a Physical Work;
ii. the Project results in an antenna with a height no more than the greater of 5 m and a height equal to 25% of the height of the Physical Work to which it is affixed; or
(2) and
(a) does not involve the likely release of a Polluting Substance;
(b) does not have the potential to impact protected species; and
(c) is not to be carried out within 250 m of an environmentally sensitive area.
3.8. The proposed construction, installation, operation, expansion, modification or removal of a temporary field camp used for scientific or technical research, or for reforestation, and which respects the Threshold Conditions if the temporary field camp will be in use for fewer than 200 person-days.
3.9. The proposed installation, operation, expansion, modification, removal or decommissioning of an aboveground storage tank system to be used for storing petroleum products or allied petroleum products if the Project, while respecting the Threshold Conditions:
(a) results in a system with a total capacity of no more than 4000 L; and
(b) is conducted in accordance with the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*.

4. Electrical Energy Projects
4.1. (1) The proposed construction or installation of an electrical power line with a voltage of not more than 130 kV if the Project, while respecting the Threshold Conditions, is to be carried out alongside a road, a railway line, an electrical power line, a telecommunication line or any other linear physical work.
4.2. The proposed expansion or modification of a telecommunication line or an electrical power line if the Project, while respecting the Threshold Conditions:
(a) results in a line that is no more than 10% longer than on the day of completion of its original construction;
(b) is to be carried out alongside a road, a railway line, an electrical power line, a telecommunication line or any other linear physical work;
4.3. The proposed construction, installation, operation, expansion or modification of a substation that is associated with an electrical power line having a voltage of not more than 130 kV or with a telecommunication line if the Project, while respecting the Threshold Conditions, is to be carried out adjacent to a telecommunication or electrical power line.
4.4. The proposed expansion or modification of a wind turbine farm if the Project, while respecting the Threshold Conditions:
(a) in the case of an expansion of a wind farm having no more than 15 turbines, the expansion results in no more than 3 additional wind turbines on the farm and a production capacity that is no more than 50% greater than its capacity on the day of completion of its original construction;
(b) in the case of an expansion of a wind farm having more than 15 turbines, the expansion results in the farm having a production capacity that is no more than 20% greater than its capacity on the day of completion of its original construction.

5. Pipelines Projects
5.1. (1) In relation to an existing onshore Oil and Gas Pipeline or other onshore commodity pipeline, the proposed installation, operation or modification of any of the following components:
(a) connections;
(b) piping;
(c) cathodic protection systems, including rectifiers;
(d) valves, including valve vaults and pressure transmitters;
(e) compressor and pump station components, including compressors, pumps, motors, silencers, scrubbers, gas seals, system boilers, scraper traps, switch gear, transformers and uninterruptible power supply;
(f) a storage tank located within a tank farm if the Project is conducted in accordance with the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*;
(g) storage tank components, including mixers and ladders;
(h) metering and regulating facilities; (i) quality measurement systems, including analysers for water or basic sediment, densitometers, calorimeters, in-line viscometers, gas chromatographs and automatic/composite samplers;
(j) mechanical and electrical systems of a facility building, including plumbing, air conditioning, heating and ventilation systems, not involving the use or disposal of chlorofluorocarbons;
(k) detection and monitoring systems; or
(l) pollution reduction systems if those systems are to be added to a compressor station, a pump station, a tank farm or a gas plant for the purpose of reducing the release of pollutants produced in the operation of the facility;
(2) and the Project respects the Threshold Conditions.
5.2. The proposed relocation and subsequent operation of a section of an onshore Oil and Gas Pipeline or other onshore commodity pipeline if the Project, while respecting the Threshold Conditions, does not extend the pipeline beyond the limits of the property that was allocated for the construction of the present pipeline.

5. Pipelines Projects (Cont'd)
5.3. (1) In relation to an existing onshore Oil and Gas Pipeline or other onshore commodity pipeline, the proposed construction, installation, operation, expansion or modification of
(a) a security fence;
(b) a component needed for an in-line mechanical device used for inspecting or cleaning the pipeline;
(c) a salt cavern for natural gas storage;
(d) a brine pond or brine pond cover;
(e) an emergency power gas tank; (f) a microwave dish and associated cables;
(g) a containment alarm;
(h) a corrosion inhibitor tank; or
(i) a pump and associated tubing;
(2) and the Project respects the Threshold Conditions.

6. Water-Related Projects
6.1. The proposed construction, operation, expansion, modification or demolition of a structure associated with the use of water craft, if the Project
(a) results in a structure with a footprint no more than 100 m^2 and a height no more than 5 m;
(b) does not involve the likely release of a Polluting Substance;
(c) does not have the potential to impact protected species; and
(d) is not to be carried out within 250 m of an environmentally sensitive area.
6.2. The proposed construction, installation, operation, expansion or modification of a fish habitat improvement structure if the Project
(a) does not involve the likely release of a Polluting Substance;
(b) does not have the potential to impact protected species; and
(c) is not to be carried out within 250 m of an environmentally sensitive area.
6.3. The proposed construction, installation or operation of a floating wharf or dock or a wharf or dock that has legs or piles that are not inserted into the substrate if the project
(a) is not attached to the shore below the annual high-water mark;
(b) does not involve the likely release of a Polluting Substance;
(c) does not have the potential to impact protected species; and
(d) is not to be carried out within 250 m of an environmentally sensitive area.

6. Water-Related Projects (Cont'd)
6.4. The proposed re-installation, expansion or modification of a floating wharf or dock or a wharf or dock that has legs or piles that are not inserted into the substrate if the Project
(a) in the case of an expansion, results in a wharf or dock that has an area no more than 10% larger than its area on the day of completion of its original construction;
(b) does not involve the likely release of a Polluting Substance;
(c) does not have the potential to impact protected species; and
(d) is not to be carried out within 250 m of an environmentally sensitive area.
6.5. The proposed modification of a wharf or dock that has legs or piles that are inserted into the substrate, or of a breakwater that is accessible by land, if the Project
(a) is not to be carried out below the annual high-water mark;
(b) does not involve the likely release of a Polluting Substance;
(c) does not have the potential to impact protected species; and
(d) is not to be carried out within 250 m of an environmentally sensitive area.
6.6. The proposed demolition of all or part of a wharf or dock if the Project
(a) does not involve the use of explosives;
(b) involves the removal from the water of all demolished portions of the wharf or dock;
(c) does not involve the likely release of a Polluting Substance;
(d) does not have the potential to impact protected species; and
(e) is not to be carried out within 250 m of an environmentally sensitive area.
6.7. The proposed construction, installation, operation, expansion, modification, decommissioning, removal or abandonment of a single-span bridge and any supporting structures if the Project
(a) results in a bridge that is no more than 30 m long and 20 m wide;
(b) is not to be carried out in a water body;
(c) does not involve the likely release of a Polluting Substance;
(d) does not have the potential to impact protected species; and
(e) is not to be carried out within 250 m of an environmentally sensitive area.
6.8. The proposed construction, installation, operation, expansion, modification, decommissioning or abandonment of a single-span aerial cable and any supporting structures if the Project
(a) is not to be carried out in a water body;
(b) does not involve the likely release of a Polluting Substance;
(c) does not have the potential to impact protected species; and
(d) is not to be carried out within 250 m of an environmentally sensitive area.
6.9. The proposed construction, installation, operation, modification,

decommissioning or removal of a device used for the capture or enumeration of fish for resource management purposes if the Project
(a) does not involve the likely release of a Polluting Substance;
(b) does not have the potential to impact protected species; and
(c) is not to be carried out within 250 m of an environmentally sensitive area.
6.10. The proposed operation of a Physical Work for which approval is required under Section 9 of the Navigation Protection Act, if the Project
(a) does not involve the likely release of a Polluting Substance;
(b) does not have the potential to impact protected species; and
(c) is not to be carried out within 250 m of an environmentally sensitive area.
6.11. The proposed construction, installation, operation, expansion, modification or decommissioning of a domestic or farm water supply system or Dugout or Irrigation System on agricultural land if the Project
(a) is not to be carried out, except in respect of an intake pipe, within 30 m of a water body;
(b) does not involve the likely release of a Polluting Substance;
(c) does not have the potential to impact protected species; and
(d) is not to be carried out within 250 m of an environmentally sensitive area.
6.12. The proposed construction, operation, modification, expansion or decommissioning of a drainage structure on agricultural or forested land, other than a structure that drains into a water body, if the Project:
(a) results in the structure being no more than 10% longer than on the day of completion of its original construction;
(b) does not have the potential to impact protected species; and
(c) is not to be carried out within 250 m of an environmentally sensitive area.

7. Transportation Projects
7.1. The proposed expansion or modification of a runway, taxiway, parking area or other paved or gravel area used for the operation or servicing of aircraft within the boundary of an airport, as defined in subsection 3(1) of the Aeronautics Act if the Project, while respecting the Threshold Conditions, results in the paved or gravel area having an area that is no more than 10% larger than its existing area.
7.2. The proposed modification and replacement of aircraft manoeuvring lights or navigational aids.
7.3. The proposed construction, installation, operation, expansion or modification of an automatic warning structure at a railway level crossing.
7.4. The proposed construction, installation, operation, expansion or modification of a railway traffic control signal structure if the Project is to be carried out adjacent to a railway line.
7.5. (1) The proposed construction, installation, operation, modification, abandonment or replacement of a portion of:
(a) an Oil and Gas Pipeline or other commodity pipeline;
(b) a water pipe;
(c) a sewer or drain;
(d) a steam line or tunnel; or
(e) a buried telecommunication or electrical power line
(2) if that portion is located alongside or underneath a railway or road; and
(3) if the Project respects the Threshold Conditions.
7.6. The proposed expansion or modification of a railway line, and the proposed construction, expansion, modification or replacement of a culvert that crosses under the railway line, if the Project, while respecting the Threshold Conditions:
(a) is to be carried out within
i. the property that was acquired for the construction of the existing railway line, or
ii. 100 m of the centre line of the existing railway line for a distance of no more than 3 km; and
(b) does not result in a culvert that extends more than 10 m beyond the railway roadbed.

7. Transportation Projects (Cont'd)
7.7. The proposed modification or closure of a road crossing, as defined in section 100 of the Canada Transportation Act, if the Project, while respecting the Threshold Conditions:
(a) is to be carried out within the property that was acquired for the construction of the existing railway or road; and
(b) does not require an authorization under subsection 101(3) of the Canada Transportation Act.
7.8. The proposed construction or operation of a railway spur line no more than 500 m in length, and the proposed construction of any culvert that crosses under the spur line if the Project, while respecting the Threshold Conditions, does not result in a culvert that extends more than 10 m beyond the railway roadbed.
7.9. The proposed expansion or modification of a road, and the proposed expansion, modification or replacement of a culvert that crosses under the road, if the Project, while respecting the Threshold Conditions:
(a) does not lengthen the road;
(b) does not widen the road by more than one lane beyond the number of lanes contained within the road on the day of completion of its original construction; and
(c) does not result in a culvert that extends more than 10 m beyond the roadbed.

5.3.2 – Threshold Conditions

Threshold Conditions include any of the following:

- 30-m proximity to a water course;
- 250-m proximity to a culturally or ecologically sensitive area, such as a park, nature preserve, or monument;
- The likely release of a polluting substance; or
- The potential to impact a protected species (e.g. a Canadian federal Listed Species, a European Union Protected Species)

5.4 – Full Environmental Effects Determinations

For quick reference, a DND Full Environmental Effects Determination template is reproduced on the following pages.

Part 1. Project Information

1.1 Title of Proposed Project

[Insert title]

1.2 Originating Directorate, Base, or Unit

[Identify the group from which the proposed project is originating or is responsible for its overall coordination.]

1.3 Location of Proposed Project

[Latitude and longitude of the project location must be provided. If on DND property, provide a precise location; e.g. what part of RTA or what street (include civic address) within administrative area. If the project consists of off-site training provide location in relation to the nearest populated place or physical feature: e.g. city, town, lake, park or military installation. Satellite views (i.e. obtained from Google Earth) can be inserted here or provided in an annex.

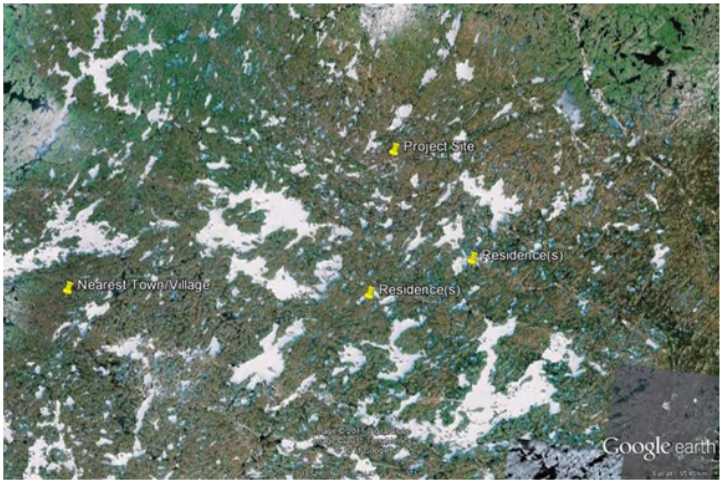


Figure 1. Example of the satellite view of the location of a proposed project in reference to the nearest town. Please include a scale bar to indicate distances in meters or kilometres.]

1.4 Project Summary

[Provide a brief description of the proposed project throughout its full life span (e.g. construction, operation, site restoration).]

1.5 Applicability of *CEAA, 2012*

This activity meets the definition of a project under section 66 of the *CEAA, 2012* as it is a physical activity to be carried out on federal lands or outside Canada and is in relation to a physical work. Therefore, an Environmental Effects Determination is required under section 67/68 before it can proceed.

This project is not found in the DND Abbreviated Report Criteria; therefore, a full report must be prepared.

1.6 EED Start Date

[Provide the start date of the effects determination process.]

1.7 DGIEGPS EED number

[This number is provided by DGIEGPS after the project has been registered in the Defense Environmental Assessment Portal (DEAP).]

1.8 Provincial and Municipal Government Involvement

[Briefly describe the Provincial and municipal government environmental requirements, if any, for the area in which the proposed project is to occur.]

1.9 Other Federal Departments

[List federal departments that may also have a determination requirement under s.67 or s.68 of *CEAA, 2012*. If a department other than DND is leading the environmental effects determination process it should be identified here.]

1.10 Contacts

1.10.1 EED Point of Contact

[The project lead is normally local DND environmental specialist staff unless by agreement with another federal department or agency.]

a) Name, Rank, and Title:

b) E-mail Address:

1.10.2 Project OPI

[The person who is responsible for ensuring that the EED is conducted and resulting mitigation measures are implemented.]

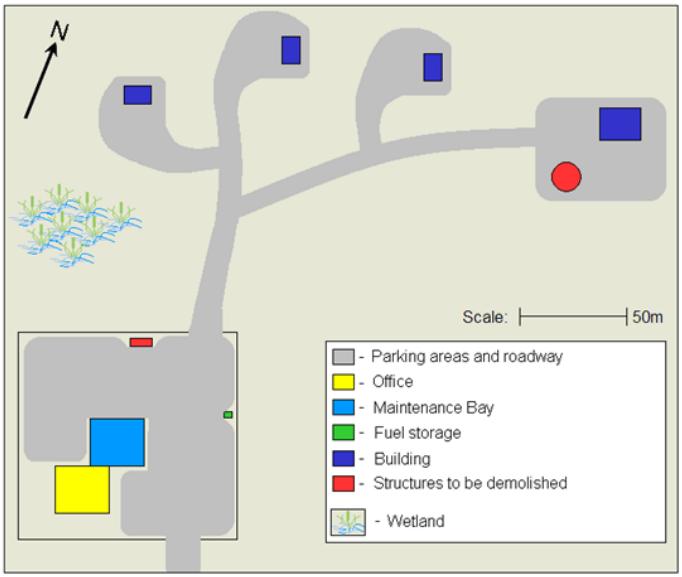
a) Name, Rank, and Title:

b) E-mail Address:

Part 2. Environmental Effects Discussion

2.1 Description of Project Components, Project Schedule and Project Site

[List and describe the components of the project throughout its full life span (e.g. phases of construction, aspects of operation) including the estimated start and completion dates. Provide sufficient detail for the public or a third party to understand what activity is being proposed. Site Layout drawings, if needed, can be inserted here or in an appendix.]



[Figure 2: Example drawing of site layout (Insert a detailed drawing for the project's site)]

2.2 Identification of Valued Ecosystem Components (VECs)

[The Environmental Effects Matrix can be used to identify potential interactions between project components and identified VECs.

- In the left-hand column of the matrix, list the components of the project identified in Section 2.1.
- Across the top of the matrix is a suggested list of VECs that should be considered. Please add any that may be relevant to the study area but were not included in this template.

Systematically examine each place where a project activity intersects with an environmental component and mark where there is a potential significant adverse effect.]

Table 1. Environmental Effects Matrix

PROJECT COMPONENTS Enter each component e.g. phases of construction, aspects of operation.	VALUED ECOSYSTEM COMPONENTS (VEC) *[modify as necessary]*																			
	PHYSICAL							BIOLOGICAL					SOCIAL AND CULTURAL							
	Atmosphere	Surface Water	Groundwater	Soils and Geology	Ambient Noise	...	...	Terrestrial Animals and Habitat	Aquatic Animals and Habitat	Vegetation	Species at Risk and Migratory Birds	...	Land Use	Parks and Recreational Areas	Population	Cultural Resources	Aboriginal / Traditional Activities	...

Legend: [*Blank*] = No Effect | [X] = Potential Significant Adverse Effect

2.3 Description of Valued Ecosystem Components

General Description

[Give a general description of the environment in the study area including surrounding land use, built environment and any historical or archaeological artifacts. Provide sufficient detail for the public or other third party to understand what the environmental conditions are on the proposed project site, noting any environmentally sensitive attributes in the region such as wetlands, watercourses, terrestrial or avian species/habitat etc.]

Valued Ecosystem Components (VECs):

[In Section 2.3.1 below, provide a description for, at minimum, each of the VECs for which an X appears in the matrix. Please note that description of effects is included in the interaction tables in Section 2.4 and should not be discussed]

2.3.1 Physical Components

i) Atmosphere

[Climatic norms for the project site should be identified.

Where operations are expected to produce air quality impacts (e.g. dust, other airborne particulates, chemical vapours, greenhouse gases or odours), pre-existing sources of air contaminants in the local study area should be identified. Describe the potential human receptors. Where the project could create air emissions, it should meet local, provincial and federal guidelines.]

ii) Surface Water

[Provide a description of surface water bodies and their proximity to the project.]

iii) Groundwater

[Provide a description of groundwater sources on the project site. Allocation/licensing issues should also be discussed.]

iv) Soils and Geology

[Information on soils should be provided including the type, agricultural capability, and distribution of soils. Use the Canadian Soil Classification System to identify soil type(s).

The geology of the project site should be described. Where geological formations or features are expected to enhance or mitigate the effects of the project, those components should be evaluated and described.]

v) Ambient Noise

[Inventory and summarize existing sources of noise in the study area. Determine the distances from the project site to potential receptors (e.g. residential areas, schools, health care facilities).]

2.3.2 Biological Components

i) Terrestrial Animals and Habitat

[A general description of the fauna at the project site must be provided. Where impacts are expected to animals, including birds, the species impacted should be identified, including Latin and common names. Information should also be provided on mature and interior forest habitat, where present.]

ii) Aquatic Animals and Habitat

[Identify any water bodies which may be considered aquatic habitat and identify fish species which may be present.]

iii) Vegetation

[A general description of the flora at the project site should be provided. Where the project is expected to impact native or other vegetation of value, the vegetation should be identified and inventoried, including both common and Latin names, and a map provided that shows the distribution in the area, including rare and endangered species.]

iv) Species at Risk and Migratory Birds

[Endangered flora or fauna, wildlife species and their ecosystems should be identified from the appropriate database. Based on the results of the database search and surveys conducted in the project/activity area, the potential for at-risk species to be present either at or near the site should be identified along with the habitat ranges of those species.]

2.3.3 Social and Cultural Components

[The indirect effects of changes to socio-economic conditions caused by project activities should be considered. An example of an indirect socio-economic effect would be the loss of a water body for recreational swimming as a result of contamination. However, where appropriate, DND recommends the inclusion of both indirect and direct effects to socio-economic conditions within the DND EED Report. An example would be an increase in vehicular traffic experienced by local residents during construction and operation of the project. As such, sections should be included that provide baseline information on the socio-economic components that may be affected, both directly and indirectly, by the project.]

i) Land Use

[Describe existing, planned and adjacent land use.]

ii) Parks and Recreational Areas

[National and/or Provincial parks as well as tourist destinations, lakes and other common recreational areas that may be affected should be identified, including their proximity to the project site.]

iii) Population

[Human populations surrounding the project site should be identified in terms of their proximity to the site.]

iv) Cultural Resources

[Existing information on the presence or potential presence of any archaeological, cultural, or heritage resources should be summarized.]

2.4 Project Effects and Associated Mitigation Measures

[Sections 67 and 68 of the *CEAA, 2012* require that departments make a determination only with regards to likely significant adverse environmental effects of a project. Therefore entries in the interaction table need only be created for each VEC where there is a potential significant adverse effect due to an interaction with a project component. These interactions will have been marked in the Environmental Effects Matrix (Table 1, above).

Using Table 2 below, add a row for each VEC and follow these instructions for completing the rest of the interaction table.

Columns 2 and 3: Description of Potential Project Interaction with VEC

Project Component(s)

Name each project component that could potentially have a significant adverse effect on the VEC. Potential significant adverse effects would be those impacts that could typically diminish environmental quality, natural resources or features, or diminish the existing, or potential land use within a study area.

Each component of the project that may produce potential significant adverse effects should be evaluated.

Description of Effects

Describe each effect and its relative significance on each VEC. In evaluating the significance of the effects, the following criteria should be considered and included in the interaction table(s):

- **Magnitude** – How heavily will the effect impact on the environment and community?
- **Spatial Extent** – Over how large an area could the effect have an impact (immediate, local or regional area)?
- **Duration of Impacts** – How long could potential significant adverse effect(s) impact the environment and community (short term, long term)? Are they likely to be seasonal, intermittent or continuous?
- **Reversibility** – Could the potential effects of a project component be reversed once the effects have been stopped? Could the VEC be returned to its pre-existing (pre-project) state?

Column 4 – Mitigation Measures

For the purposes of this report, mitigation measures are defined as measures for "the elimination, reduction or control of the identified potential significant adverse effects of the Project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means". Considering this, specify mitigation measures that can:

- **Eliminate** the threat/risk to a VEC completely (alternate approaches, different chemical/material used etc.);
- **Prevent /reduce** impacts of the threat/risk to a VEC (berms, training, pollution prevention equipment/technologies, etc.);
- **Respond** to the threat/risk to a VEC when it occurs (emergency response, clean up, etc.).

Where monitoring is required to ensure proper operation and minimize potential significant adverse effects, this should also be identified.

Column 5 – Are residual significant adverse effects likely?

Indicate whether significant adverse effects are likely after the described mitigation measures are implemented by entering a Yes or No response. The significance of residual environmental effects is defined below and should be used as a reference to quantify the expected level of residual effect associated with implementing each mitigation measure for each project component. This evaluation forms the basis of the EED determination and will be used in selecting the outcome in Part III of this report.

Entering **No** indicates that residual adverse effects **are not** likely to be significant since:

- Potential residual effect(s) may result in a slight decline in resource in study area during the life of the project. Research, monitoring and/or recovery initiatives would not normally be required; or
- Potential residual effect(s) may result in a slight decline in resource in study area during construction phase, but the resource should return to baseline levels.

Entering **Yes*** indicates that residual adverse effects **are** likely to be significant since:

- Potential effect(s) could threaten sustainability of the VEC and should be considered a management concern. Research, monitoring and/or recovery initiatives should be considered; or
- Potential effect(s) could result in a decline in the VEC to lower-than-baseline but stable levels in the study area after project closure and into the foreseeable future. Regional management actions such as research, monitoring and/or recovery initiatives may be required

* It is important to note that if it is determined that residual effects are likely to be significant, the project will need to be referred through the chain of command to the Governor in Council for their determination on whether the project is justified to proceed.]

VEC(s) Affected	Project Component(s)	Description of Effects	Mitigation Measures (numbers appearing after a measure indicate the project component(s) with which it is associated)	Are residual significant adverse effects likely?
Atmosphere	**1) Ignition and Burning**	Air quality will be negatively affected due to the smoke created. Smoke generated may present a health risk to workers or other people in the immediate area.	1) Burns will be attempted only during optimal conditions [Fine Fuel Moisture Code (FFMC), Initial Spread Index (ISI), Fire Weather Index (FWI), and wind are considered], and contained within the proposed areas by following the pre-approved procedures and protocols described in **Annex B.** 1) Staff managing the fire will wear appropriate respiratory protection. 1) Workers nearby will be notified of the potential reduction in air quality.	No
Soils	**1) Spill Suppression** **2) Firebreak construction**	Accidental fuel spills may occur during both ignition or suppression activities as equipment will be on-site. Petroleum based fuels and products can create soil contamination, put staff at risk of exposure and pollute wetlands. The construction of firebreaks (if required) will create exposed soils increasing the potential for soil erosion that could enter nearby wetlands. Increased suspended solids can have a detrimental effect on aquatic species in wetlands including mortality and sub-lethal effects.	1) Spills will be cleaned up and reported as per Task Force Standing Order 1000-7 (Spill Reporting and Remediation). 2) Sediment control measures such as silt fences or sand bags must be placed in areas where there is a potential for surface runoff to aquatic receptors. A re-vegetation program will be implemented to limit exposed soils.	No

2.5 Public Participation

[Public participation under the *CEAA, 2012* is not mandatory for EED processes. The Lead Authority will make a determination of whether public consultation is required.

This Section should include a description of the public participation that was conducted for the EED process, including an identification of the parties involved, a description of when and where the public participation took place, and an identification of issues/concerns raised and how these were addressed. If no public participation was undertaken, provide a rationale as to why it was not required – e.g. operation overseas.]

2.6 Aboriginal Community Engagement

[Indicate that this Section does not apply to operations outside Canada.]

2.7 References and Expertise from Other Federal Government Bodies

[List and state the relevance of any applicable laws, regulations, policies, guidelines, SOPs, reports, etc. used to complete the DND EED Report.

1. List the federal departments that provided expertise which aided in conducting the EED.]

Part 3. Environmental Effects Determination

[Parts I, II and a signed Part III of the DND EED Report must be submitted to the local EED point of contact as is listed in Section 1.10.1 for submission to DGIEGPS in order for the determination to be registered on the Portal.]

On the basis of this DND EED Report, it has been determined that the impact of this project on the environment is as follows: [double click on a checkbox to mark it with an X]

☐ Project is not likely to cause significant adverse environmental effects. The project **can** proceed with application of the mitigation measures specified in the interaction tables in this report.

☐ The project is likely to cause significant adverse environmental effects that cannot be mitigated. The project **cannot** proceed without Governor in Council approval.

☐ Refer the project, through the chain of command and **only on the recommendation of Environmental Command and DGIEGPS**, to Governor in Council for a decision on whether the project is justified to proceed.

DND EED Report Prepared by: [Add signature blocks where necessary]:

Name: **Title:**

_____ _____

Signature Date (dd-mm-yyyy)

DND EED Report Reviewed by: [This report should be reviewed by all L1s affected by the activity. Add signature blocks where necessary]:

Name: **Title:**

_____ _____

Signature Date (dd-mm-yyyy)

DND EED Report Accepted and Approved by: [Add signature blocks where necessary]

The undersigned accepts the determination and recommendations of this environmental effects determination report. The undersigned also accepts the responsibility to incorporate the recommendations of the report into the project design and implementation.

Name: **Title:**

_____ _____

Signature Date (dd-mm-yyyy)

Section 6 – Environmental Reporting Tools

By Departmental policy (ADM(IE) Environmental Directive 4003–1/2003), spills and releases on deployed operations must be reported.

6.1 – Environmental System of Record

The environmental system of record is the Defence Resource Management Information System (DRMIS), which has replaced SpillNet and the Halocarbon Management System.

Following a spill or release, an Environmental Incident Notification (**HX**) must be raised in DRMIS using Transaction Code **IW21** in the command field of the standard toolbar of the SAP Client.

A release of halocarbons from DND equipment may also require a corresponding Halocarbon Maintenance (**HH**) Notification.

6.2 – Locally Reproducible Report

When the TF has no access to DRMIS, a locally produced spill/release report must be sent to CJOC HQ with the following information in a suitable format and means of communication:

1. Date and time of the spill.
2. Source and location of the spill.
3. Type and quantity of material spilled.
4. Cause of the spill.
5. Effects of the spill.
6. Details of actions taken or proposed to mitigate the effects of the spill.
7. Names of other agencies that responded or were notified of the spill.

A Significant Incident Report may also be required to raise command attention and ensure rapid resolution.

Section 7 – Environmental Training

Military environmental training courses are shown in Table 2.

Table 2: Environmental Training

Training	Target Audience
United Nations Institute for Training and Research (UNITAR) Environment, Natural Resources, and UN Peacekeeping Operations Course Available Online	Task Force and National Command Element Engineers and Environmental Advisors on UN peacekeeping missions
NATO Environmental Management for Military Forces Course (M3-77) NATO School Oberammergau, Germany	Task Force and National Command Element Engineers and Environmental Advisors on NATO operations or exercises
NATO Military Environmental Protection Policies and Practices Course (NMEPPPC) NATO Military Engineering Centre of Excellence, Ingolstadt, Germany	Task Force Engineers and Environmental Advisors on NATO operations or exercises
Environmental Incident Reporting (HX Notifications in DRMIS) Available Online	Task Force Engineers, Environmental Advisor, Maintenance Officer, and Fire Marshal
Unit Environmental Officer Course (Qualification Code AJDE) Available at Bases and Wings	Task Force Environmental Advisor
Mission-Specific Environmental and Nature-Protection Training, Before Deployment or In-Theatre	All Task Force Personnel

Section 8 – Environmental Health Site Assessment

The purpose of an EHSA is to identify environmental, health, and safety conditions that may pose health risks to deployed personnel. It is conducted by Directorate of Force Health Protection (D FHP) personnel with the assistance of other specialists. This differs from the goal of an EBS, which is to document the condition of an environment before deployed forces conduct activities there. However, given the commonality of sampling protocols, an EHSA may be combined with an EBS. If possible, sampling, analysis, and reporting should be shared between an EHSA and EBS to save effort.

Section 9 – Best Practices

9.1 – Deployed Soil Sampling Protocols

9.1.1 – General

Environmental sampling is anything but straightforward: it demands attention to detail and adherence to procedures, and it takes practice. Even when procedures are followed exactly, there are bound to be both systematic and random errors. A sampling program should correct these errors as far as is practical.

Soil samples are collected to determine the general characteristics of the soil or to identify any potential contaminants of concern from previous site use. If chemicals of concern are detected, then a more comprehensive soil sampling program will be needed.

Following are general guidelines for collection, documentation, and shipment of samples, adapted from the Canadian Council of Ministers of the Environment *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites, Volume I* (PN 1101) as well as ASTM D3694 and D4220 and ISO 5667 and 10381. However, specific requirements for a given study will depend on the analytes of interest and the analytical method used by the laboratory. Thus, in preparation for an environmental study, the exact sampling protocols should be confirmed, reviewed, and practised as necessary.

9.1.2 – Sample Collection

Samples will be collected within the perimeter of CAF locations. Detailed instructions are contained in the following sections. The quantity of samples to be collected will be determined based on site usage and a general risk assessment. The following equipment will be required to collect surface soil samples:

- Field notebook
- Rulers and measuring tape
- Chain-of-custody forms
- Global Positioning System, other navigation aids

- Digital camera
- Mixing bowl
- Soil sample scoops/trowels, disposable or washable
- Gloves
- Chemicals for cleaning tools and preserving samples
- Cooler with passive or active cooling
- Shovel/pickaxe (depending on soil composition)
- Sample jars (varying sizes, depending on analyses required)

9.1.3 – Site Survey

Two copies of the site plan (or a rough map of the general site layout indicating major landmarks or reference points) should be obtained for each location. Each map should indicate the following:

General site layout – accommodation, parking, administration and workshop, maintenance areas, petroleum, oil, lubricant (POL) points, and medical facilities;

Surface characteristics – areas of soil types/vegetation cover, surface water drainage pathways; visible staining of surface soil or vegetation stress.

Co-ordinates and their associated precision must be indicated on the site survey map. Photographs or video may be used for additional evidence.

9.1.4 – Sampling Locations

Composite samples should be collected down-gradient from POL and maintenance facilities, around generators, accommodations, kitchens, messes, ablutions, and medical facilities.

Locations that appear to be stained or that show other evidence of possible contamination, as well as wastewater works and any industrial buildings located within the site should be sampled.

9.1.5 – Grab Samples

Grab samples should be taken from a central location, representing the estimated point source of a spill, and must be collected immediately upon excavating in order to accurately measure the Volatile Organic Compound (VOC) content in the soil. A 15-20 cm depth from the surface is recommended as a sample location. The depth should be noted. Sample jars should be filled so that no headspace is left in the jar.

9.1.6 – Composite Samples

Composite samples should consist of five to nine sampling points within a given area to fill a jar (i.e. scoops of soil from a variety of locations within an area). Representative quantities from all five to nine sample holes (15-20 cm depth) should be mixed in a mixing bowl and then transferred to the sample jars.

9.1.7 – Cross-Contamination

Traces of a contaminant from one location may be detected in following samples unless care is taken to prevent cross-contamination, which is a severe systematic error. Single-use, disposable sampling tools and frequent replacement of gloves will help prevent cross-contamination as well as limiting the exposure of personnel to contaminants. If field-washable sampling equipment is used, then care must also be taken with wash-bottles and field chemical stores, both to ensure thorough cleaning and to prevent this source of cross-contamination.

9.1.8 – Field Duplicates

For a field duplicate, material taken from one sampling location is divided between two containers. This has the effect of 'blinding' the analysis and reducing systematic errors. At least one duplicate sample shall be collected at each location and for every ten samples after that.

9.1.9 – Analytical Request

Samples collected at areas of suspected POL contamination should be analysed for Total Petroleum Hydrocarbons at a minimum. Other samples that are collected based on a perceived hazard (e.g. staining, vapours, ammunition) should be analysed for the contaminant of concern (e.g. VOCs, solvents, propellants, energetics, heavy metals).

9.1.10 – Field Documentation

Proper documentation of all site activities is an integral part of the field investigation. The following section outlines standard procedures to be used when documenting sampling activities. Documentation include procedures field note-taking, sample labelling, and demonstration of a chain of custody. Proper completion of all documentation with waterproof ink is necessary to support the use of these records in an investigation. Incorrect data entries should not be made illegible; instead, they should be stricken through with a single line and annotated with the correct information, the recorder's initials, and the date. Following site activities, all project documentation becomes a part of the final project file and will be the basis of the field report.

9.1.10.1 – Field Notebooks

A field notebook should contain enough information to reconstruct and verify the sampling activity independently, later on, by someone not present during the initial activity. Field notebooks should be bound and have numbered, water-resistant pages. The sampling activity name (e.g. operation or exercise name) should be recorded on the inside front cover of notebook. All pertinent information regarding the site and sampling procedures must be documented in chronological order.

At the end of each day, the person maintaining the logbook should sign and date the day's entries. Notations should be made in logbook fashion, noting the time and date of all entries. Following site activities, or when the notebook is completely filled, the notebook becomes a part of the project file.

Weather conditions on the day of sampling, and any additional environmental conditions or observations pertinent to field activities, should be annotated.

The sample collection method and any sample handling procedures, such as composite sampling, should be documented.

The sample locations should be documented. If a composite sampling scheme is used, locations of all individual samples should be recorded.

A dimensional sketch of the general surroundings of the sampling site should be prepared, and may be supported by other documents (e.g. photographs).

Sample numbers, volumes, containers (number, size, type), the date and time, and any quality control samples—or factors that may affect quality—should all be recorded, as shown in Table 3.

Table 3: Sample Table

Sample Number:	**Location:** (MGRS, WGS 84)	**Date/ Time:**	**Container Type:**	**Container Volume:**	**Remarks:**
NA11-SS1	*20X NS 11804 59430*	*20 0904 JUL 2016*	*Glass vial w/PTFE septum*	*50 mL*	*Surface sample with preservative (sodium thiosulfate)*
NA11-SS2	*20X NS 11804 59430*	*20 0904 JUL 2016*	*Glass vial w/PTFE septum*	*50 mL*	*Surface sample duplicate with preservative (sodium thiosulfate)*

Any field measurements, field screening/analytical results generated, calibration methods used, field results, Quality Control information, maps, and photographic logs of the sampling site should also be recorded.

The number of shipping coolers packed should be specified by noting chain-of-custody (COC) numbers or by attaching a copy of

COC forms, and by recording the mode of transportation and applicable tracking numbers.

Coordinates should be in military grid reference system (MGRS) and have 8- or 10-figure precision, including the map reference and datum. Other co-ordinate systems and data may be used but these should be noted explicitly.

It may be necessary to use a vector, with a distance and an angle from a fixed reference point (e.g. 10 m from the Headquarters flagpole at a bearing of 345 degrees or 6133 mils) to locate a sample.

The recommended method for sample numbering is to use a mission- or site-specific identifier followed by the type of media (e.g. **S**urface **S**oil, **S**urface **W**ater, **G**round**w**ater) and a sample number. For instance, NA11-SS1 could represent Operation NANOOK 11, Surface Sample 1.

It is important that the same sample identification be used for all samples taken at a composite sample location. Therefore, one sample location may have 3-5 sample jars, depending on the analytical requirements; however, each sample jar will have the same sample ID for that location.

9.1.10.2 – Photographic Documentation

If possible, all sampling points should be photographed digitally. A photograph of the act of collecting the sample with date superimposed provides additional evidence. Photographs are a convenient record of field observations. Photographs taken to document sampling points should include two or more reference points to allow locating the point at a later date (e.g. the location of the sample taken in relation to the flagpole could include a road or high feature). Records of photographs taken are crucial to confirm their validity. Photographic or video documentation may be useful at a future date to support investigations. For each photograph or video taken, the following items should be noted in the field logbook:

- Date

- Time
- Photographer (signature)
- Name of site
- General direction faced and description of the subject
- Sequential number of the photograph

9.1.10.3 – Documentation Quality Requirements

All original data recorded in field logbooks and on sample labels, COC records, and receipt-of-samples forms should be written in waterproof ink. If an error is made on an accountable document, corrections should be made simply by crossing out the error and entering the correct information with the writer's initials and the date. The erroneous information should not be made illegible. Any error discovered on a document should be corrected by the person who made the entry.

The photographer should review all photographs and compare them with the photographic log to confirm that the log and photographs match.

Although most sample labels are made with water-resistant paper and are filled out using waterproof ink, inclement weather can affect the legibility of sample labels. It is recommended to cover labels with clear tape after they are filled out and affixed to the container to preserve their legibility. COC and analysis request forms should also be protected when samples are shipped in coolers with ice-packs. These forms should be placed inside a plastic zipper bag or similar waterproof protection and taped to the inside lid of the secured shipping container with the samples.

9.1.11 – Shipping

Samples should be placed into a sturdy container with inert packing material and dunnage that will protect the samples during transport. The following general procedures apply to the packaging of all environmental samples:

Each sample cap/lid should be secured on the bottle, and each sample placed in a plastic bag. Evidence tape or custody seals

may be placed over the sample lid and container, or over the seal of the bag for additional security, if needed. If using numbered seals, each seal number should be recorded in the notebook. If more than one shipping container is being sent, a log should be kept that relates the seals to the corresponding container.
The shipping container should be prepared for use. For a commercial cooler, this includes taping the drain plug shut inside and out. 7.5 cm of inert, flexible, packing material, both in the bottom of the container and as necessary to ensure separation of samples, is usually enough for glass jars containing soil.

All environmental samples should be shipped to the laboratory as soon as practicable while cooled to 4 (± 2)°C. Some parameters tolerate wider temperature ranges and longer storage times. If stopwatches and thermometers with maximum/minimum logging functions are available, they should be set and placed inside the cooler to log the temperature history inside the container.

The COC and sample analysis request form should be placed inside a plastic bag taped to the inside of the cooler lid, along with appropriate labelling. The cooler should be closed, sealed with strapping tape, and initialled across the edge of the tape.

At least two custody seals should be placed on the outside of the cooler—one on the front and one on the back. More custody seals may be used at the discretion of the sampler.

The original waybills should be kept by the sampler.

9.1.12 – Importing Soil

Before sampling soil with the intent to ship it to Canada, the operator must have copies of a valid Soil Import Permit issued annually by the Canadian Food Inspection Agency (CFIA). One copy must be attached to the outside of the shipping container.

The laboratory should be notified of sample shipment at least 3-4 days before the estimate time of arrival. Before shipment, the operator must provide the laboratory the following information:

- Method of shipment (military or civilian aircraft; courier)

- Estimated time of arrival and port of debarkation
- Waybill number
- Number of shipping containers (e.g. 3 coolers)
- Permit information

Samples arriving in Canada may be met by a laboratory representative. Before arrival of the flight, customs officials should be notified to arrange customs pre-clearance of the samples. Samples should be shipped as non-accompanying baggage in order to be pre-cleared and placed into refrigeration as soon as possible. Information required by the customs clerk usually includes the following:

- Permit number
- Flight number and Estimated Time of Arrival
- If samples require refrigeration or special handling
- Waybill information
- Description of shipping containers (e.g. coolers, barracks boxes)

Samples arriving via courier companies require customs clearance. Before shipping samples, the operator must contact the Canadian Materiel Support Group Headquarters (CMSG HQ) Customs Services Officer, who will coordinate the customs clearance requirements with the courier and arrange customs pre-clearance of the samples.

Packages with samples to be analysed at the Environmental Sciences Group should be addressed as follows:

Environmental Sciences Group
Building 36 – Operations
8 Vérité Avenue
Royal Military College of Canada
PO Box 17000, Station Forces
Kingston, Ontario
K7K 7B4

Table 4: Parameters in Soil Samples

Parameter	Sample Container	Preservation	Holding Conditions	Comments
Total Petroleum Hydrocarbons Volatile Organic Compounds Polycyclic Aromatic Hydrocarbons	Amber glass bottles, screw-capped or with fluorinated polymer septa Foil-wrapped glass or fluorinated polymer bottles	4 (± 2)°C	No headspace Kept in darkness Shipped and analysed as soon as practicable	Avoid using polyethylene containers
Metals	Screw-capped glass bottles	4 (± 2)°C	No established time limits given sample refrigeration	Avoid using aluminium-lined containers

9.2 – Deployed Water Sampling Protocols

9.2.1 - Purpose

Water sampling may be conducted as part of an environmental study. It could consist of sampling representative surface- or groundwater sources, such as lakes, streams, or wells. Field procedures (sample handling, storage, analysis, documentation and shipment) are similar to those outlined for soil sampling. This section will deal specifically with the field protocols for water sampling. The following equipment may be required:

- Field notebook
- Rulers and measuring tape
- Chain of custody forms
- Adhesive tape
- Global Positioning System, other navigation aid
- Digital camera
- Gloves
- Distilled–deionized water
- Sample containers (sizes vary, depending on analysis required)
- Cooler
- Ice packs
- Peristaltic pump and power source
- Polyethylene tubing
- 0.45-mm filters

9.2.2 – Surface Water Samples

Surface water samples will be taken from surface water sources on or near the proposed location. These may include streams, rivers or ponds. The samples will be collected by dipping the collection bottle directly into the surface water source if the site permits. An alternate method is to use a peristaltic pump to collect the surface water sample. If a filtered sample is required due to high levels of sediment, use a 0.45-mm filter, in conjunction with a

peristaltic pump and polyethylene tubing. If VOC analysis is required, the sample will be decanted from a glass bottle.

9.2.3 – Groundwater Samples

Groundwater samples will be taken from existing on-site wells. Sampling will normally be conducted using a peristaltic or similar pump, requiring a filter to ensure that particles do not enter the sample container. In Table 5 to Table 7 are shown the sizes and types of sample containers, preservation, handling, and storage requirements for groundwater samples. Despite added preservatives, and as for soil samples, water samples should be maintained at the target storage temperature of 4 (±2)°C.

Procedures for storage and shipment of samples will generally be as indicated in the soil sampling section. It is important to consult the appropriate environmental specialist or the laboratory conducting the analysis to confirm the quantity and type of preservative required.

Field duplicates and blanks should also be prepared for analysis.

Table 5: Inorganic Parameters in Water Samples

Parameter	Sample Container	Preservation	Holding Conditions	Comments
Aluminium	500 mL, glass or plastic (PET)	Nitric acid to pH < 2 done immediately upon collection	Up to 6 months	Bottles with aluminium-lined caps are unacceptable
Antimony				
Arsenic				
Barium				
Boron				
Cadmium				
Chromium				
Copper				
Cyanide				
Fluoride				
Iron				
Lead				
Manganese				
Selenium				
Uranium				
Zinc				
Cyanide (Free)	100 mL, glass or plastic	Sodium hydroxide to pH > 12	Up to 30 days (if preserved)	
Mercury	100 mL, glass	0.5-1.0 mL concentrated nitric acid (minimum 20 drops per 250 mL) and approximately 5 - 10 drops of potassium dichromate (mercury-free) solution per 250 mL, pH must be < 2 and sample must be yellow colour	Up to 28 days	

Table 6: Volatile Organic Parameters in Water Samples

Parameter	Sample Container	Preservation	Holding Conditions	Comments
1,2-Dichlorobenzene	2 × 50-mL EPA-type glass vials with PTFE-clad silicon rubber septa	Sodium thiosulfate pill (10 mg) for chlorinated water or 2 drops per vial of 25% w/v sodium thiosulfate solution	Up to 14 days in darkness at 5 (± 3)°C	Headspace in the sample container will result an unsuitable sample for analysis Preservation is required only for chlorinated water (raw water sources do not require preservative)
1,4-Dichlorobenzene				
1,2-Dichloroethane				
1,1-Dichloroethylene				
Benzene				
Carbon tetrachloride				
Dichloromethane				
Ethylbenzene				
Monochlorobenzene				
Tetrachloroethylene (perchloroethylene)				
Toluene				
Trichloroethylene				
Trihalomethanes				
Vinyl Chloride				
Xylenes				

Table 7: Other Parameters in Water Samples

Parameters	Sample Container	Preservation	Holding Conditions	Comments
Total Organic Carbon	100 mL, HDPE	None	Up to 30 days at 5 (± 3)°C	
Sulfate				
Nitrate				
Nitrite				
Fluoride				
Sulfide	250 mL, glass	2 $mL \cdot L^{-1}$ zinc acetate followed by the dropwise addition and mixing of 5% sodium carbonate solution until precipitation is complete	Up to 30 days at 5 (± 3)°C	
Chloride	50 mL	None	Up to 30 days at 5 (± 3)°C	
Diquat	500-mL HDPE bottles	None	Up to 20 days in darkness at 5 (± 3)°C	
Paraquat				
Glyphosate	500-mL HDPE bottles	For chlorinated water add 1 mL of 25% w/v sodium thiosulfate solution	Up to 20 days in darkness at 5 (± 3)°C	
Total Phenol	250 mL, amber glass	Phosphoric acid, pH < 4 5°C ± 3°C		
Bromate	50 mL PET		Up to 28 days at 5 (± 3)°C	

9.3 – Secondary Containment

The use of secondary containment for hazardous materials (HAZMAT) during deployed operations—even when not specifically required—will reduce the risk of contamination of the local environment and demonstrate due diligence. Adequate secondary containment will also reduce the risk and cost of remediation. The CCME *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* (PN 1326) specifies that secondary containment for a single tank be sized to hold 110% of the volume of liquid being stored. Secondary containment for more than one tank is sized using a formula in the *Code of Practice*. However, specific design requirements vary by jurisdiction.

Secondary containment should be used in the following areas:

- POL and HAZMAT storage (Figure 3)
- Generator farms
- Vehicle parking and maintenance

Figure 3: Combined Secondary Containment for HAZMAT

Different methods to achieve secondary containment are possible, and the choice of technique will depend upon the length of time and durability required.

Examples of increasingly durable (but decreasingly mobile) secondary-containment techniques include the following:

- Movable polymer containment dykes (Figure 4)
- Drip trays for parked vehicles and generators (Figure 5)
- Polymer-lined concrete pads with dykes (Figure 6)

Figure 4: Separate Secondary Containment Dykes for HAZMAT

Figure 5: Secondary Containment for a Generator

Figure 6: Concrete Secondary Containment Dykes for Fuel and Generator

9.4 – Soil Remediation

In spite of technologies, policies, and other control measures that are intended to prevent spills on deployed military operations, there will always be the risk of spills. Spills happen. When they do, additional techniques may be needed to *remediate* soil, which means to remove unwanted substances or transform them into harmless products.

POL and other HAZMAT can certainly be harmful in the environment, but the environment itself has physical, chemical, and biological ways of rendering these substances harmless to human and ecological health. The right amount of sunlight, water, nutrients, and naturally occurring microbes in the soil can cause this transformation.

For instance, liquid volatile organic compounds (VOCs), when spilled onto soils, will evaporate to the atmosphere in the right conditions. Evaporation reduces the risk of the compound remaining in the soil, but may result in local air pollution. Still, it is usually preferable for a VOC to evaporate and be transformed in the atmosphere, rather than for it to remain in soil where it may continue to affect groundwater, plants, animals, or human health.

Remediation techniques may be applied *in situ* (in-place, where the soil was affected) or *ex situ* (out-of-place, by removing the soil and treating it somewhere else).

Monitored natural attenuation is a recognized way to reduce risk. It is not a 'do-nothing' option. Indeed, the act of monitoring the progress of natural attenuation is critical, because it shows when an environmental standard has been met. Monitoring demands engineering, technician, and operator effort, as well as data collection, analysis, and reporting.

If one of the physical, chemical, or biological aspects of remediation is missing, then unwanted substances will remain and will not be transformed. These missing parts can be added back through biostimulation (more nutrients), bioaugmentation (more

microbes), or both. Recent Canadian military experience with diesel (F-54) spills in Afghanistan (2010) and Kuwait (2017) is in agreement with most applied environmental research: bioaugmentation, even with commercial-off-the-shelf products, is not necessarily the most effective remediation method.

A soil remediation pad may be suitable for *ex situ* treatment of relatively small quantities of affected soil. The construction of a pad will depend on the extent of camp construction and the availability of time and military resources for environmental technology. As an example, a 20-m × 20-m soil remediation pad would permit treatment of 200 m^3 of affected soil. The following aspects should be considered in the design:

- Drainage and control of precipitation
- Leachate (percolating liquid) collection and treatment
- Containment volume
- Ramp for vehicle access

Affected soil should be placed in 0.15-m lifts to a maximum thickness of 0.45 to 0.50 m and considering the slope stability of the pile. This approach allows natural weathering processes, including evaporation, hydrolysis, and degradation by existing microbial cultures to take place, but it controls liquid run-off. Since it allows volatile compounds to evaporate and may allow particles to become suspended in the wind, the decision to use it must be weighed against the risks of local air pollution. An example soil remediation pad is shown in Figure 7.

Figure 7: Example Soil Remediation Pad

To conclude the discussion on remediation (and this aide-mémoire), deployed military environmental-protection requirements are not necessarily the same as those of governments and industries in Canada. What works for one user group may not be suitable for another.

Remediation techniques, such as thermal destruction, may now be less-commonly used on large scales in Canada and other developed nations. However, these tried-and-tested techniques may be the only feasible means to achieve demanding environmental-quality standards on short-term deployments.

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