AEC: VP112

USERS GUIDE FOR LEVEL 1 SCREENING OF CUMULATIVE EFFECTS

Yukon DIAND Northern Affairs Program

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1.0 INTRODUCTION

1.1 PURPOSE OF THE GUIDE

The Department of Indian Affairs and Northern Development (DIAND) is the principle Federal Authority in the Yukon Territory and is, therefore, responsible for the review and approval of various development projects. For some of these projects, DIAND is also a Responsible Authority (RA) under the *Canadian Environmental Assessment Act* (CEAAct) and must accordingly conduct screenings and assessments.

This Guide is specifically intended for use by DIAND staff who are involved in the assessment of Level 1 projects in the Yukon. The purpose of the Guide is to provide assistance in completing a screening process that includes the consideration of cumulative effects. It includes a detailed step by step description of the process as well as an example screening. A Glossary of Terms, a brief introduction to cumulative effects, and a selected bibliography of reference material on Cumulative Effects Assessments (CEAs) are also provided as appendices to the Guide to assist Level 1 Screeners in understanding the screening process and the nature of cumulative effects and their assessment.

The information provided and the review process recommended in this Guide is based on discussions during two workshops attended by DIAND staff in March and May, 1997. These workshops provided an opportunity for staff to learn about approaches to cumulative effects, and to assist in the development of a review process that was appropriate to their needs.

1.2 USE OF THE GUIDE

This Guide should be used as follows:

Section 2 **Instructions for DIAND Level 1 Screeners**: Level 1 Screeners should read this section to familiarize themselves with how to proceed in the overall screening process, from acceptance of the project proposal to final decision.

Section 3 **Level 1 Screening Instructions**: This step provides detailed instructions on how to complete each step in the screening process.

Section 4 **Screening Example**: For illustrative purposes, this section provides completed screening forms for a "case-study" project application.

2.0 INSTRUCTIONS FOR DIAND LEVEL 1 SCREENERS

Completion of a Level 1 Screening involves a two-step process that assists in the identification and evaluation of potential project-specific impacts as well as possible regional cumulative effects associated with the project under review (see Figure 1). The first step involves the request of information from referrals listed on the Referral List for project review. This includes the identification of: 1) valued environmental and cultural components (VECCs) within the assessment area; 2) potential interactions between project activities/disturbances and VECCs; 3) regional issues of concern; 4) existing projects and land uses that may cumulatively interact with the project under review; and 5) possible local and regional cumulative effects. The second step involves the assessment of possible project-specific and cumulative effects and an evaluation of their significance.

2.1 STEP 1: PREPARATION OF REFERRAL INFORMATION REQUEST

As part of the Information Request stage, the Level 1 Screener is required to assemble the necessary information related to the proposed project for distribution to the referrals. This includes the project application, the DIAND cover letter which stipulates the deadline for submission of information from the Referrals, maps of the project area, and Forms 1 through 8 of the Screening process. It is the responsibility of the screener to partially complete Forms 2 and 5 according to the instructions below. These and the remaining forms are to then be filled out by the referrals.

1) In Form 2, identify the months during which project activities would occur (if applicable, add other activities in the blank rows provided).

2) In Form 5, circle the spatial bound that you would recommend. This becomes the assessment area. On a map, indicate the project footprint and draw the suggested spatial boundary of the assessment area around the project.

3) Provide Forms 1 to 8 (with instructions, map, and cover letter) to referrals on the Information Referral List.

2.2 STEP 2: LEVEL 1 SCREENING

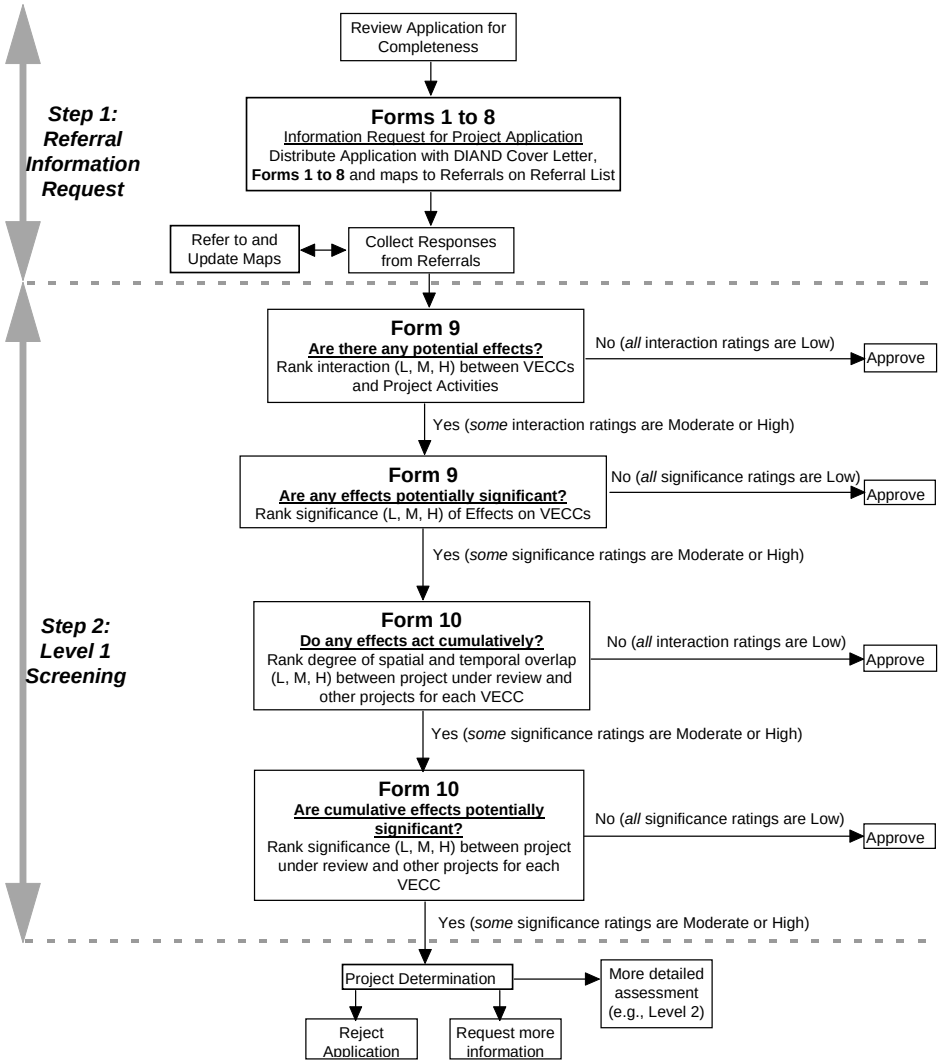
Upon return of information from the referrals, the following steps are to be completed by the screener:

1) Review the Forms. It is recommended that the information from all referrals is consolidated into one set of screening

forms. This should include any additional information obtained during further discussions with the referrals, from internal DIAND resources or from the experience and knowledge of the screener.

2) Following the instructions provided in Section 3, complete Forms 9, 10 and 11 (an example is provided in Section 4.0).

3) Complete the final DIAND Screening Report (not provided in this Guide).



Rankings: L = Low, M = Moderate, H = High

3.0 LEVEL 1 SCREENING INSTRUCTIONS

3.1 FORM 1: IDENTIFICATION OF VECCS

1) In column A, list an environmental component from the table below for which you have identified VECC(s). You may add other components as appropriate.

2) In column B, list the Valued Environmental and Cultural Components (VECCs) that may be affected by the project (e.g., water quality, moose, merchantable timber) for each environmental or cultural component.

3) In column C, provide a brief rationale for the selection of each.

Examples of Components

Environmental	**Cultural**
Air	Cultural
Surface Water (Quality/Quantity)	Aboriginal Land/Resource Use
Groundwater	Commercial Land Use
Soils/Landforms/Terrain	Historical/Cultural Land Use
Vegetation	Historical/Cultural Sites
Fish	Human Health/Safety
Raptors/Songbirds	Recreational Use
Waterfowl	Residential Land Use
Furbearers	Visual Aesthetic
Ungulates	
Carnivores	

Form 1: Identification of VECCs

DIAND Information Request for Project Application

A	*B*	*C*
Component Type	**VECCs**	**Justification**
Environmental		
Cultural		

3.2 FORM 2: IDENTIFICATION OF TEMPORAL BOUNDING

1) In column A, under the title “VECCs”, enter the VECCs identified in Form 1.

2) In column B, check-off (✓) the months during which the VECCs are present, particularly active, or sensitive to the

project-related activity or disturbance identified in column A.

Form 2: Identification of Temporal Bounding

DIAND Information Request for Project Application

A	B											
	Month (✓)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
VECCs												
Project Activity/Disturbance												
alteration of surficial geology												
disturbance of soils												
removal of vegetation												
controlled burns												
contaminant discharge												
solid waste disposal												
water consumption												
water diversion												
facility construction												
human presence												
motorized vehicle use												
aircraft use												
boat use												
resource extraction												

OF LOCAL EFFECTS AND THEIR MITIGATION

1) In column A, list the environmental and cultural effects that may potentially occur as a result of the project activities and disturbances identified in Form 2. Although it is not always the case, the probability of a VECC being affected increases if the activity occurs at the same time in which the VECC is identified as active or present. Refer to the table below for examples of environmental and cultural effects.

2) In column B, enter the VECCs (identified in Form 2) that are affected by each effect.

3) In column C, identify whether the effect is likely to be mitigable or not.

4) In column D, briefly describe appropriate mitigation measure(s).

5) In column E, identify the probable degree of success of each mitigation measure in eliminating or reducing the effect.

Examples of Effects

Environmental	**Cultural**
Altered Air Quality	Cultural
Altered Water Quality: Chemical (e.g., acid drainage)	Reduced Quality of Resource (e.g., water, fish, plants)
Altered Water Quality: Physical (e.g., sediment)	Reduced Quantity of Resource (e.g., wildlife)
Altered Surface Water Flows	Loss of Cultural Value (e.g., spiritual values)
Soil Erosion	Altered Human Health (e.g., by drinking water)
Disturbance of Permafrost	Reduced Resource Use/Harvest (e.g., trapping, hunting)
Vegetation Loss or Change	Alteration of Visual Appeal
Direct Habitat Loss	
Sensory Disturbance/Habitat Alienation (e.g., due to noise)	
Habitat Fragmentation (e.g., by creating patches of habitat)	
Blockage of Wildlife Movements	
Direct Wildlife Mortality	

Form 3: Identification of Local Effects and their Mitigation

DIAND Information Request for Project Application

A	*B*	*C*		*D*	*E*		
Possible Types of Project Effects	**VECCs Affected**	**Effects Mitigable? (✓)**		**Mitigation Description**	**Mitigation Success (✓)**		
		Y	**N**		**None**	**Partial**	**Complete**
Environmental							
Cultural							

3.4 FORM 4: IDENTIFICATION OF REGIONAL ISSUES

1) For those Special Features (shown in column A) that are applicable to the assessment area under review, describe the nature of the issue in column B. The location of these features should be shown on the map of the project area.

2) Describe any thresholds for the environmental and cultural component types shown (in column A) (e.g., regulated levels of water contaminants, air quality standards, wildlife population management goals).

3) Describe any regional land use management initiatives, including their objectives, that currently exist or have been considered for the assessment area under review.

Form 4: Identification of Regional Issues

DIAND Information Request for Project Application

A	*B*
Special Features	**Description**
Protected Areas nearby	
Critical Habitat nearby	
Unique Landscape Features nearby	
Rare/Endangered Species nearby	
Heavily Disturbed Areas nearby	
Road Proliferation in region	
Thresholds	**Description**
Air	
Water	
Soils	
Vegetation	
Wildlife	
Resource Use	
Land Use	
Regional Land Use Management Initiatives	**Description**

FORM 5: GUIDELINE TO SPATIAL BOUNDING

Review the spatial bounds suggested in Form 5 by DIAND within which other projects may be included in an assessment of cumulative effects (their suggestion is circled). If other bounding may be more appropriate, indicate these on Form 5 by circling them as well. Follow the next steps to make this selection.

***Note**: These bounds and the bounding approach used in the Form are provided only as a guideline to assist you in determining a reasonable limit to the area being assessed. Many factors unique to the project and the surrounding environment may suggest the need for new bounds. Use professional judgement in selecting the most appropriate bounds.*

1) Select a project type in column A that best describes the project under review.

2) An initial bounding (i.e., Bound #1) is provided in Column B, based on the proximity of other projects.

3) From column C (i.e., Bound #2), select the environmental component that will likely be of greatest concern or for which you believe is most affected by the project. Select the bounds (as a distance in kilometers) for that component and the project type that reflects the zone of influence of the project on that VECC. If more than one environmental component is affected under these criteria, proceed by selecting the largest bounds.

4) Select the larger of Bounds #1 and #2 as the final bounds. The bounding may be modified if warranted to include a different area depending on the unique characteristics of the project and environmental components affected. For example, watersheds often provide a suitable spatial bounding for impact assessment if water based VECCs are affected (e.g., fish due to sedimentation). However, the bounds must be reasonable in size to allow existing information to be used (i.e., a bounds of many hundreds of km^2 would probably be too large in most cases for a screening level assessment).

5) If this approach still does not provide acceptable bounding, define a new bounding and provide an explanation for this selection. Draw the bounding on the map provided by DIAND or a map you are providing. The shape of the bound will either cover a large “area” around the project (i.e., as in a circle) or follow along a “linear route” (e.g., for roads and linear developments). Bounds should surround all components of a project (e.g., a timber cutblock and its associated access road).

Form 5: Guideline to Spatial Bounding

DIAND Information Request for Project Application

A	*B*	*C*								
Project/Activity	**Bound #1**	**Bound #2 (km)**								
		air	**low flow water body**	**flowing waterbody**	**vegetation/habitat**	**terrestrial mammals**	**fish**	**birds**	**recreational/cultural use**	**other resource extraction**
Timber harvesting	Nearest other clearing/cutblock within watershed or valley	1	water body	5	5	10	5	5	5	5
Linear development	Nearest other disturbance	1	"	5	5	5	5	5	5	5
Roads	Nearest other road not associated with project under review	5	"	5	5	5	5	5	5	5
Placer mine	Nearest upstream and downstream sources of discharge or disturbance within watershed	1	"	20	1	5	20	5	5	5
Hardrock mine	Nearest other disturbance	5	"	20	5	5	5	5	5	5
Permanent land occupation	Nearest other occupied area within watershed or valley	5	"	5	20	20	20	20	10	5
Burning	Nearest other source within airshed	20	"	1	5	5	5	5	5	1

3.6 FORM 6: PROJECT INCLUSION LIST

1) In column B, identify any projects and land uses (e.g., by common name or permit/license) within the assessment area and your area of jurisdiction that may have an influence or detrimental effect on the environmental components for which your agency is responsible (provide location on maps). Please note:

- Single *large* projects should normally be uniquely identified by their name.
- For areas in which there are *many* relatively small projects, the projects can be grouped together under a common name (e.g., “Placer mines” where there are many active claims along the same stream). If possible, at least try to identify the number of these projects in the assessment area.
- A project just outside the spatial bounds may be included if it is believed that the project may cumulatively interact with the project under review.

2) In column C, indicate whether the projects or activities are past (i.e., no longer active or abandoned), currently exist, or are expected to exist in the future because the project is currently under regulatory review or its application is imminent (i.e., reasonably foreseeable).

Form 6: Project Inclusion List for Cumulative Effects Assessment

DIAND Information Request for Project Application

A	*B*	*C*		
Type of Project	**Name or Description**	**Status (✓)**		
		Past	**Current**	**Future**
Forestry Harvesting				
Mining				
Linear Developments				
Roads				
Settlements				
Resource Harvesting				
Recreational				

7: IDENTIFICATION OF REGIONAL CUMULATIVE EFFECTS AND THEIR MITIGATION

1) From column A, identify any concerns related to cumulative effects within the assessment area (see the "Background on Cumulative Effects" on the next page for more information). Enter any other cumulative effects that may also occur within the assessment area of the project. In general, cumulative effects have more regional implications than the effects identified earlier in Form 3. *Note*: *Habitat fragmentation includes the effects of wildlife alienation due to sensory disturbance.*

2) For each cumulative effect, enter those VECCs from Form 3 that are most likely to be affected by the project under review.

3) In column C, indicate whether the effects are likely to be mitigable or not. Mitigation for cumulative effects is beyond that identified in Form 3 (i.e., mitigation of local effects), and is usually coordinated throughout a region (e.g., timber harvest plans, wildlife management plans).

4) In column D, briefly describe the appropriate mitigation measure(s).

5) In column E, indicate the anticipated degree of success of each mitigative measure in eliminating or reducing the effect.

BACKGROUND ON CUMULATIVE EFFECTS

DIAND is obligated under (s. 16(1)) of the Canadian Environmental Assessment Act to assess cumulative effects for any project reviewed under the requirements of that Act. A cumulative effect is the incremental change on the environment as a result of the combined influences of various projects and other human activities (e.g., fishing, hunting). The magnitude of the combined effect can be equal to the sum of individual effects from each project (additive) or be equal to an effect greater than the sum (synergistic). A cumulative effect often results if too many projects are occurring in too small an area (spatial crowding). The environment is often then overwhelmed, a threshold is exceeded, and the environment cannot recover to pre-disturbance conditions. A cumulative effect is therefore more likely if effects occur at the same time and over the same area, and if the project under review is proposed in an area that is close to other disturbances

This process can happen over long periods of time before the effects become significant. If these changes occur due to many individually small projects that collectively have a significant influence on the environment, the cumulative effect is referred to as a “nibbling” effect. Furthermore, each new project can induce new projects to occur, such as the proliferation of roads in previously inaccessible areas.

A cumulative effect most often occurs in one of the following three ways:

Physical-chemical Transport: The introduction of a chemical or physical contaminant into the environment (e.g., into the air or waterways) where the contaminant is transported elsewhere and interacts with contaminants from other projects, or interacts with environmental components (e.g., vegetation) that are also affected by other projects.

Landscape Nibbling: Landscape nibbling affects plants and animals, and results from the combination of four distinct effects: landscape fragmentation, loss of habitat connectivity, and mortality. The availability of habitat for plants can be lost through direct removal as well as indirect changes in microclimate. The availability of habitat for wildlife can be lost through direct removal (e.g., clearing of land), indirect effects (e.g., changes in drainage) and/or sensory disturbances (e.g., noise). Together, these changes can break a landscape up into increasingly smaller pieces that may no longer meet the needs of resident species (fragmentation) and can reduce the ability of plants and animals to move between the remaining habitat patches (connectivity).

Socio-economic: The combined effects of various projects in a region may result in effects on human communities (e.g., social services and employment), use of the land (e.g., recreation), and traditional and cultural activities. Cumulative socioeconomic effects may result in economic redistribution and changes to services and quality of life.

Form 7: Identification of Regional Cumulative Effects and their Mitigation

DIAND Information Request for Project Application

A	*B*	*C*		*D*	*E*		
Possible Types of Cumulative Effects	**VECCs Affected**	**Effects Mitigable? (✓)**		**Mitigation Description**	**Mitigation Success (✓)**		
		Y	**N**		**None**	**Partial**	**Complete**
Environmental							
Long-range transport of chemical contaminants							
Long-range transport of physical constituents							
Direct habitat loss/habitat alteration							
Habitat fragmentation							
Blockage of regional wildlife movements							
Direct-mortality of wildlife							
Cultural							
Changes to community services and quality of life							
Economic redistribution (e.g., income)							
Alteration of traditional/cultural activities							

3.8 FORM 8: BASELINE INFORMATION

1) In column A, enter the VECCs which the information addresses.

2) For each VECC, identify sources of information that will assist DIAND screeners in assessing potential impacts of the project under review.

3) In column C, indicate whether information has been provided to DIAND on accompanying maps.

Form 8: Baseline Information

DIAND Information Request for Project Application

A	*B*	*C*
VECC	**Information Sources and/or Information Provided**	**Maps Provided? (✓)**

.9 FORM 9: SCREENING OF LOCAL EFFECTS

The screening of local effects is in three parts: Form Preparation, Ranking Interactions and Ranking Significance.

In completing Form 9, provide any additional information in the Audit Record (Form 11) regarding assumptions, rationale for decisions, and background data. Enter an audit number in brackets (e.g., "(3)") in the appropriate cell of Form 9 (starting with "1" for the first record that occurs in Form 11).

Form Preparation

1) In column A, enter any additional project-related activities earlier identified in Form 2.

2) In column B, enter the VECCs from Form 3 (write length-wise within the space provided).

Ranking Interactions

1) Rank the interaction between each activity and VECC. Select the category in the table below that best describes the duration, magnitude and geographic extent of the activity. Enter a ranking of Low (L), Moderate (M) or High (H) in the appropriate cell of Form 9. Enter the rank on the left side of the cell (to allow room for the significance rating). Where no effect on a VECC is expected to occur, the cell should be left blank.

2) Proceed to "Ranking Significance" for those interactions that have been ranked Moderate or High. If all interactions are rated as Low, the project can be approved.

Interaction Rankings

Duration and Magnitude	**Extent**			
	Local	**Regional**	**Territorial**	**National/ International**
Short-term and Low	L	L	M	M
Short-term and Moderate or High	L	M	M	M
Medium-term and Low	M	M	M	M

Medium-term and Moderate or High	M	M	M	H
Long-term and Low	M	M	H	H
Long-term and Moderate or High	M	H	H	H

(Definitions on next page)

Definitions

Term	*Rankings*
Duration: The period of time during which an activity may cause a disturbance to a VECC	**Short-term**: Less than 1 year **Medium-term**: 1 to 10 years **Long-term**: More than 10 years
Magnitude: The portion of the VECC that may be affected by the activity	**Low**: Less than 10% **Moderate**: 10% **High:** More than 10%
Extent: The area that may be affected by the activity	**Local**: Within the immediate project "footprint" **Regional**: Within the larger region surrounding the project (e.g., a watershed) **Territorial**: Throughout the Yukon **National/International**: Across Canada or the U.S./Canada border

Ranking Significance

The significance of an effect in Form 9 is determined after the application of mitigation. Possible mitigation measures were identified earlier in Form 3, but should also be described in the Audit Record (especially for effects that remain significant or for the application of unique mitigation measures).

1) Consider the effects that may occur on a VECC (possible effects were identified earlier in Form 3) due to each activity with an interaction rated as Moderate or High. It is recommended that the effects chosen are recorded in the Audit Record (Form 11).

2) Rank the significance of the effect using the table below. Select the series of questions that best apply to the VECC that will be affected (a VECC will fall under one of the three categories: Biological Species, Physical-Chemical, or Socioeconomic). The series of questions will lead to a conclusion on one of the three significance ratings (i.e., Low (L), Moderate (M) or High (H)). Enter the ranking in the appropriate cell in Form 9. Separate the interaction ranking from the significance ranking by a "/".

3) Proceed to Form 10 (i.e., Cumulative Effects Screen) if any effects are ranked as Moderate or High significance. The project can be approved if all project related effects are expected to be insignificant (i.e., Low ranking).

Significance Rankings

Questions for each VECC Type	Significance Rankings			Significance
	Low (L)	Moderate (M)	High (H)	Conclusion
Biological Species VECCs				
1. How much of the population may have their reproductive capacity and/or survival of individuals affected? Or, for habitat, how much of the productive capacity of their habitat may be affected?	<1%	1-10%	>10%	L if Low. If M or H, go to question 2.
2. How much recovery of the population or habitat could occur, even with mitigation?	Complete	Partial	None	L if Low. If M or H, go to question 3.
3. How soon could restoration occur to acceptable conditions?	< 1 year or 1 generation	1-10 yrs or 1 generation	>10 yrs or > 1 generation	L, M or H
Physical-chemical VECCs				
1. How much could changes in the VECC exceed that associated with natural variability in the region?	<1%	1-10%	>10%	L if Low. If M or H, go to question 2.
2. How much recovery of the VECC could occur, even with mitigation?	Complete	Partial	None	L if Low. If M or H, go to question 3.
3. How soon could restoration occur to acceptable conditions?	< 1 year	1-10 yrs	>10 yrs	L, M or H

Socio-economic VECCs				
1. Could the effect be of concern to local residents or administrative authorities, or directly impact on commercial operations or subsistence livelihood, or alter quality of life of residents or recreational enjoyment by visitors?	Little or no concern or change	Some concern or change	Substantial concern or change	L if Low. If M or H, go to question 2.
2. Could the effect be unacceptable to users even after the application of compensation measures, mitigation or the ready availability of reasonable alternatives?	Acceptable to most people	Somewhat acceptable	Unacceptable to most people	L if Low. If M or H, go to question 3.
3. How soon could restoration occur to acceptable conditions?	< 1 year	1-10 yrs	>10 yrs	L, M or H

Form 9: Screening of Local Effects

DIAND Level 1 Screening

A	*B*								
Activities	**VECCs**								
alteration of surficial geology									
disturbance of soils									
removal of vegetation									
controlled burns									
contaminant discharge									
solid waste disposal									
water consumption									
water diversion									
facility construction									
human presence									
motorized vehicle use									
aircraft use									
boat use									
resource extraction									

3.10 FORM 10: SCREENING OF CUMULATIVE EFFECTS

The screening of cumulative effects is in three parts: Form Preparation, Ranking Interactions and Ranking Significance.

In completing Form 10, provide any additional information in the Audit Record (Form 11) regarding assumptions, rationale for decisions, and background data. Enter an audit number in brackets (e.g., "(3)") in the appropriate cell of Form 10 (starting with "1" for the first record that occurs in Form 11).

Form Preparation

1) In column C, enter the names of other projects and activities identified in Form 6 that occur within the assessment area of the project under review.

2) In column B, enter the names of each VECC identified earlier in Form 9 that may be significantly affected (i.e., ranked as M or H). Enter the name of the VECC next to the cumulative effect(s) in column A that would most likely be of greatest concern (a single VECC could be affected by more than one of the types of cumulative effects shown).

Ranking Interactions

1) In column C, rank the likelihood of the cumulative effect as Low (L), Moderate (M) or High (H) according to the ranking criteria provided in the table below.

2) Proceed to "Ranking Significance" for those effects that have been ranked Moderate or High. If all interactions are rated as Low, the project can be approved.

Interaction Rankings

Temporal Overlap	**Spatial Overlap of Effects**		
	None	**Partial**	**Complete**
Never/Rarely	L	M	M
Sometimes	L	M	H
Often	L	H	H

(Definitions on next page)

Definitions

Term	Rankings
Temporal Overlap: A period of time in which activities from various projects occur simultaneously.	**Never/Rarely**: A temporal overlap does not occur or rarely occurs. **Sometimes**: A temporal overlap sometimes occurs (as to how often is "sometimes" will vary for every different situation; the decision must be made on a case-by-case basis by the screener) **Often**: A temporal overlap often occurs
Spatial Overlap: An overlap of the geographic areas in which the effects of a project are detectable. This area is referred to as the "zone of influence".	**None**: No spatial overlap of zone of influence **Partial**: A partial overlap of the zone of influence (see diagram below for an example) **Complete**: A full or complete overlap of the zone-of-influence for two or more projects

A Simplified Illustration of Partial and Complete Spatial Overlap

Ranking Significance

The significance of the effect is determined after the application of mitigation. Possible mitigation measures were documented earlier in Form 7, but should be described in the Audit Record (especially for effects that remain significant or for the application of unique mitigation measures).

1) Rank the significance of the cumulative effects using the table below. Read each successive question, and select the most appropriate answer from the two answers provided. Enter the ranking in Form 10. Separate the effect ranking from the significance ranking by a "/".

2) If the significance of any cumulative effects are expected to be Moderate or High, identify this project in the final Screening Report as having significant and unmitigable effects. A determination must then be made by DIAND if the project is to be rejected, if further information should be requested, or if the project should proceed to more detailed review (e.g., Level 2).

Significance Rankings

Questions on Significance of Cumulative Effects	**Significance Ranking**	
	No	**Yes**
1. Is the effect due to interaction between the projects detectable?	L	Go to Question 2
2. Could the effect due to interaction between the projects result in an exceedance of regulated thresholds; or if specific thresholds are unavailable, is there a risk of such interactions causing regional changes of concern?	L	Go to question 3
3. Could the incremental effect cause a substantial adverse change in the population or distributional characteristics of the VECC?	M	H

Form 10: Screening of Cumulative Effects

NAP Level 1 Screening

A	*B*	*C*					
Type of Cumulative Effect	**VECCs**	**Other Projects/Activities**					
Physical-chemical Transport							
Chemical contaminants							
Physical constituents							
Landscape Nibbling							
Direct habitat loss							
Habitat fragmentation							
Blockage of wildlife movements							
Direct-mortality of wildlife							
Socio-economic							
Changes to community services and quality of life							
Economic redistribution							
Alteration of traditional							

1) In column A, enter the audit number.

2) In column B, enter the descriptive notes associated with that audit number (e.g., facts, references, calculations, reliability of data, assumptions or rationale for decision made).

Form 11: Audit Record

DIAND Level 1 Screening

A	*B*
Audit #	**Notes**

SCREENING EXAMPLE

In this section, the Level 1 Screening Forms have been “filled out” through the use a semi-fictitious case study to demonstrate how the forms can be completed. The example is provided to assist users of this Guide to view how information may be entered onto the Forms, and to better understand the reasoning used.

As Forms 1 to 8 are completed (with some exceptions) by referrals, what appears here should be considered as a compilation, done by the screener, of the information provided from the various sources. Forms 9 to 11 represent what the DIAND screener would do for completion of the Level 1 Screen.

4.1 PROJECT DESCRIPTION

Taiga Timber Ltd. has applied for a Commercial Timber Permit for two adjacent harvest cutblocks near Jakes Corner, southwest of Whitehorse. According to the Yukon Timber Regulations, this project is subject to review under CEAA as the combined annual harvest exceeds 1000 m^3. The proponent has provided two maps (see Figures 1 and 2 in section 4.3) that illustrate the surrounding and local project area. Figure 3 is a regional map of the area obtained by the DIAND screener.

The total cutblock area is 7.8 ha. Harvesting is to take place over two winters. A short access road from the nearby highway will be required to join the cutblocks to a nearby highway; however, issuance of the requisite Land use Permit is contingent on a valid Commercial Timber Permit (this case study will therefore focus only on the screening process for the Timber Permit). As is typical for this region, harvesting operations will occur in the winter. No waterbodies are within the cutblock area.

4.3 COMPLETED SCREENING FORMS

This section provides the three maps and completed Forms 1 to 11.

APPENDIX A: GLOSSARY

Audit Record: A description of the data, assumptions and rationale used in reaching an assessment decision.

Alienation: An effect on biological species due to sensory disturbance (e.g., noise, light, smell).

Assessment Area: The area within the selected spatial bound. It is in this area that projects for the project inclusion list are selected, and that effects are assessed.

Baseline Information: A description of existing environmental, social and economic conditions at and surrounding a project.

Combined Effects: The effects that arise due to various components of the same project.

Connectivity: The ability of biota to move between remaining blocks of usable habitat in a fragmented landscape.

Cumulative Effects Assessment: An assessment of the incremental effects of a project on the environment when the effects are combined with those from other existing and future projects. The combined effect from project interactions may be greater than the effect observed only from each project in isolation.

Cumulative Regional Effects: The effects that are described in a cumulative effects assessment.

Direction: The degree to which an effect on a valued environmental component will worsen or improve as the project proceeds.

Duration: The period of time during which an activity may cause a disturbance to a VECC

Environmental Components: Fundamental elements of the natural environment. Components usually includes: air, water, soils, terrain, vegetation, wildlife, fish and avifauna.

Evaluation: The determination of the significance of effects. Evaluation often involves making judgements as to the value of what is being affected and the risk that the effect will occur and be unacceptable

Extent: The area that may be affected by the activity

Fragmentation: The breaking up of contiguous blocks of habitat into increasingly smaller blocks as a result of direct loss and/or sensory disturbance (i.e., habitat alienation)

Frequency: The number of occurrences of an event within a specific period of time.

Interaction Matrix: A matrix that identifies if a project activity affects an environmental component

Interaction Matrix: A table of columns, representing impacts or activities, and rows, representing valued components. The intersection of a row and column may indicate a possible effect on the valued component.

Interactions: An action or influence resulting from the mutual relationship between two or more impacts or an impact and a valued component.

Issue: A subject of concern to anyone involved in the assessment or affected by the project. A concern usually has adverse implications to either the environment or people.

Magnitude: The portion of the VECC that may be affected by the activity

Mitigation: The process of determining and implementing means of reducing the significance of adverse effects.

Monitoring: A continuing assessment of conditions at and surrounding the project. This determines if effects occur as predicted, and if mitigation measures are as effective as predicted.

Project Footprint: The area of land or water directly occupied by the project.

Recovery: The return of environmental conditions to the state they were prior to the project.

Residual Impacts: Effects that still remain significant after mitigation has been applied.

Significance: A measure of how adverse or beneficial an effect may be on a valued environmental. Significance is typically determined by asking: 1) is the effect likely to occur, 2) is the magnitude of the effect unacceptable, 3) is the effect permanent, and 4) how long before recovery may occur?

Spatial Bounds: The area examined in the assessment.

Spatial Overlap: An overlap of zones of influence from different projects

Study Area: The geographic limits within which an impact to a valued ecosystem is likely to be significant.

Temporal Bounds: The period of time examined in the assessment.

Temporal Overlap: A period of time in which activities from different projects occur simultaneously.

Valued Environmental and Cultural Component: Any part of the environment or human society that is considered important by the public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern.

Zone of Influence: A geographic area, extending from a project, in which an effect is non-trivial

APPENDIX B: INTRODUCTION TO CUMULATIVE EFFECTS

B.1 REQUIREMENTS UNDER THE CEAACT

The *Canadian Environmental Assessment Act* states that a screening or comprehensive study of a project must consider "any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out" (s. 16(1)).

The CEAAct does not define what cumulative effects is or Cumulative Effects Assessments (CEA) are; nor does it explain how to do CEAs (it only states what is required as a result of the assessment). However, the Canadian Environmental Assessment Agency (CEAAgency), responsible for administering the federal environmental assessment process, does provide some background

information on addressing cumulative effects (CEAA 1994).

B.2 DEFINING CUMULATIVE EFFECTS

A cumulative effect is the incremental change on the environment as a result of the combined influences of various projects. The magnitude of the combined effect can be equal to the sum of individual effects from each project (additive), or be equal to an effect greater than the sum (synergistic). A cumulative effect often results if too many projects are occurring in too small an area (spatial crowding), and/or if too many projects are occurring in too short a time frame (temporal crowding). The environment is often then overwhelmed, a threshold is exceeded, and the environment may not recover to pre-disturbance conditions.

Cumulative effects often occur due to far reaching “agents of change” in which either the valued environmental and cultural components (VECC) moves away from a project area (e.g., wildlife with large home ranges, contaminants in rivers or airsheds), or the project includes an activity that covers a large area (e.g., road traffic, aircraft flights). If this occurs, an interaction is likely to occur between various projects, except possibly in the furthest hinterlands.

This process can occur over long periods of time before the effects become significant. If these changes occur due to many individually small projects that collectively have a significant influence on the environment, the cumulative effect is referred to as a “nibbling” effect. Furthermore, each new project can induce new projects to occur, such as the proliferation of roads in previously inaccessible areas.

The following questions are examples of what are typically asked when practitioners begin to think “cumulatively”. The questions are organized according to examples of VECCs.

- **Fish habitat**: will additional inputs of sediment or chemical contaminants reduce habitat quality sufficiently to threaten resident fish populations?
- **Air and water quality**: will additional sources of emissions or effluents result in exceedance of ambient air or water quality standards?
- **Population of large animals**: will additional developments and human activity fragment habitat and block movements to the extent that the remaining habitat is too small to support viable populations of wildlife?
- **Municipal and social services**: will the project, and secondary economic activities that it stimulates, create a surge in demand for services that nearby communities cannot absorb?

Spatial and Temporal Overlap

Fundamental to the concept of cumulative effects is the overlap of effects due to interactions between projects and the gradual encroachment of those effects over a larger and larger area. Such interactions have a spatial and a temporal component. The spatial component is a physical overlap of effect between two or more projects, and the temporal component is an occurrence of events at the same time. The following are examples of overlap:

- two streams bearing a contaminated substance that converge after each passing by a project;
- the combined noise levels from road traffic and a mine;
- timber removal affecting a species of bird only during its annual passage during migration;
- the effects of changes in drainage patterns as a result of a road and subsequent changes in vegetation overlapping with effects from nearby timber harvesting areas; and
- sediment plumes from various placer mines along the same stream.

Combined and Regional Cumulative Effects

Cumulative effects can occur between various components of the same project (combined project effects), as well as the more commonly understood cumulative effect of the project under review and other projects in the region (regional cumulative effects). Combined effects occur when a single “project” involves many components (e.g., an application for a timber permit may result in the need to also construct a new access road). The cutblock and road then become two combined components of the same project, the road extending the influence of the forest harvesting project. It is therefore important to include all components of a project when considering cumulative effects.

Environmental effects should also be considered for various project phases, such as exploration, construction, operations and abandonment. Although an activity may occur throughout the life of the project (e.g., water use), the amount used, the frequency of use and the risk of contamination may substantially differ in each phase of project development.

Smaller components of a project may often later become quite important in their effects. For example, although the focus of attention for a mining or forestry harvesting project is the resource extraction process, nearby facilities and road access, there may be indirect implications of the project due to changes in human use of new access roads built for the project. Increased road access into previously inaccessible areas may promote further industrial development (e.g., more timber harvesting) due to the use of established

access, and it may also promote increased recreational use (e.g., hunting). The cumulative effect of “road proliferation” has been recognized as an issue in the Yukon.

Major Types of Cumulative Effects

Cumulative effects can be categorized according to three basic types. Table B.1 provides examples of each type of cumulative effect: Physical-chemical transport, Landscape Nibbling, and Socio-economic.

Physical-chemical Transport

Physical-chemical transport is the introduction of a chemical or physical contaminant into the environment (e.g., into the air or waterways) where the contaminant is transported elsewhere and interacts with contaminants from other projects, or interacts with environmental components (e.g., vegetation) that are also affected by other projects.

Landscape Nibbling

Landscape nibbling affects plants and animals, and results from the combination of four distinct effects: landscape fragmentation, loss of habitat connectivity and mortality. The availability of habitat for plants can be lost through direct removal as well as indirect changes in microclimate. The availability of habitat for wildlife can be lost through direct removal (e.g., clearing of land), indirect effects (e.g., changes in drainage) and/or sensory disturbances (e.g., noise). Together, these changes can break a landscape up into increasingly smaller pieces that may no longer meet the needs of resident species (fragmentation) and can reduce the ability of plants and animals to move between the remaining habitat patches (connectivity).

Socio-economic

The combined effects of various projects in a region may result in effects on human communities (e.g., social services and employment), use of the land (e.g., recreation), and traditional and cultural activities. Cumulative socioeconomic effects may result in economic redistribution and changes to services and quality of life.

B.3 ASSESSING CUMULATIVE EFFECTS

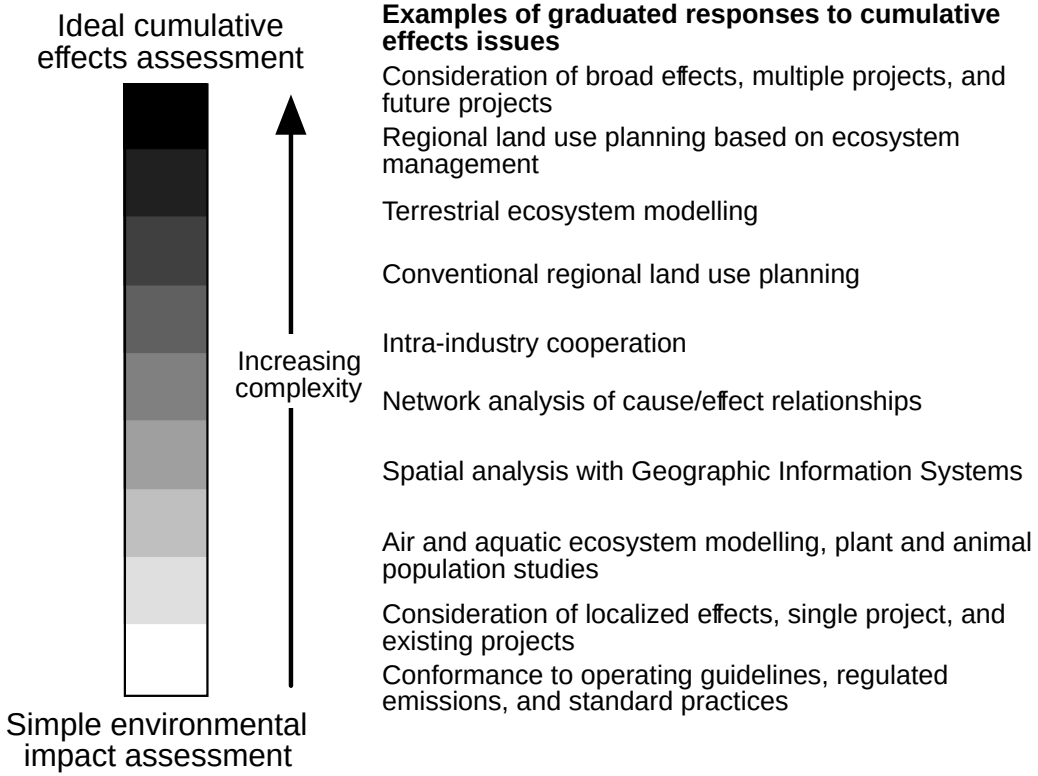
A Cumulative Effects Assessment is fundamentally no different from the current practice of environmental impact assessment (EIA) — cumulative effects assessment is EIA done properly. Where there is a difference is in how far a cause-effect relationship is pursued that investigates the implications of one or more projects on one or more VECCs.

There are varying responses or levels of effort that practitioners may use to conduct CEAs. Figure B.1 illustrates how various approaches may be used, each becoming progressively more sophisticated in assessing a wider range of more complex effects.

Table B.1: Examples of Cumulative Effects of a Heap Leach Mine

Environmental Component	Dominant Effect Type	Example of a Combined Cumulative Effect	Example of a Regional Cumulative Effect
Air Systems	Physical-chemical	Interaction between electrical generator emissions and other combustion products	Plumes from stack emissions combining with the plumes from nearby burns
Surface Water	Physical-chemical	Road construction causing sedimentation and accidental spills into waterways	Combined reductions of river water volumes due to use by the project, other energy projects and nearby communities
Aquatic Resources	Physical-chemical	Temporary disruption of shorelines from road and bridge construction	Decrease in productivity of spawning habitat due to combined sedimentation from the project and regional forestry operations and activities
Soils and Terrain	Nibbling loss	Grading of land for mine pit and roads	Clearing of land and erosion results in continued loss of soils
Vegetation	Nibbling loss	Clearing of vegetation for various surface facilities	Clearing of land results in less representation of certain plant species on a regional scale
Wildlife	Nibbling loss	Noise from road traffic and equipment	Increased road access and changes to habitat result in further regional changes to numbers and distribution of certain wildlife species
Resource Use	Nibbling loss	Changes to access to hunting and trapping grounds	The combined effects of forestry activities, land use by the project, and increased road access changes the harvest potential for furbearer species

Figure B.1: The EIA Continuum



ref: Hegmann and Yarranton 1995

Environmental impact assessments in the past have typically only assessed impacts resulting from a single project, over an area relatively local to the project (e.g., over the project "footprint"), and for a relatively brief period of time into the future (e.g., until the project is first operational). Such an approach is often quite suitable for certain projects and effects (e.g., exploration camp construction and use) where the effects are temporary, the magnitude low and the probability of significant impacts are low.

However, in some cases, such an approach is inadequate. For example, *many* projects (in the same regional area and/or

over the same period of time) may be affecting one or *more* VECCs that are also affected by the project under review. This may also occur over a large area (e.g., in the order of many hectares) and over extended periods of time (e.g., years), which would necessitate a broader scope of review than that immediately local to the project.

This does not necessarily always mean a substantially more costly and time consuming assessment; a CEA, just like an EIA, can be performed based on different levels of information. However, the degree of certainty in assessment conclusions will be directly related to the quality and availability of data, and the confidence placed on interpretation and reliability of that data.

Due to the inherent complexity of cumulative effect's interactions, they are often too difficult or impossible to define and predict. A CEA, therefore, often requires the use of best professional judgement, subjective valuation and risk assessment (i.e., judging the probability and magnitude of a significant event) to determine what the appropriate issues are, and the significance of those issues (e.g., do we know enough about the effect to consider it trivial or non-trivial?).

In summary, CEAs are expected to:

- Assess effects over a larger (e.g., "regional") area than would usually be applied for a conventional EIA; and
- Consider effects associated with the proposed, as well as effects due to interactions with other past, existing and future (i.e., reasonably foreseeable) projects.

Moving Beyond Project-Specific CEAs

Cumulative effects assessments should be looked upon as one tool that may be used to assist those making decisions about applications for resource use or development projects, and for resource management and conservation. The assessment of cumulative effects can be triggered by the submission of a single project for regulatory review (the more common reason) or, in some cases, as a proactive approach to regional based land use planning that is not necessarily triggered by the submission of any specific project. In the latter case, the examination of cumulative effects provides the assessment of many projects and effects *before* they occur to facilitate the development of acceptable limits to change over a large regional area.

A number of such initiatives have taken place in Canada, particularly in the Canadian north (e.g., Northern Rivers Basin Study, Hudsons Bay Programme, Beaufort Regional Environmental Assessment and Monitoring Program). Such initiatives take many years to complete and require substantial resources. Common to all of these is the evaluation of effects over a large region in which it is known or suspected that existing or future projects may cause long-term adverse environmental effects. In the Yukon, initiatives of a

similar nature have already occurred, including the Stream Classification for Yukon Placer Authorization, Greater Kluane Regional Land Use Plan, and the Yukon North Slope Wildlife and Conservation Plan.

These types of regional-level initiatives are often required because of a significant weakness in common EIA practice: cumulative effects cannot be adequately assessed on a project-by-project basis unless there is some prior understanding and acknowledgment of:

- environmental conditions on a regional basis;
- land uses on a regional basis; and
- limits to growth based on standards or thresholds that future developments may not exceed, and against which the effects of each new project application may be compared (e.g., number of hectares of forest harvested per year in a watershed, density of roads in a wildlife management area).

The cumulative effect of nibbling loss is particularly difficult to examine by a reviewing agency when only single project reviews are conducted. The assessment of nibbling loss requires the availability of spatially correlated biophysical and land use databases (e.g., as would be provided in a geographic information system). Physical-chemical effects, particularly for air and water, usually are relatively less difficult to assess due to the use of standardized assessment tools (such as water and air quality models) and greater certainty regarding the paths of contaminants (e.g., along a river).

An agency should begin to address nibbling loss by identifying particular areas of concern or “hotspots”, and to tier approval of projects to avoid each successive project reducing opportunity for other existing and future projects. The fact that such information remains largely unavailable in many jurisdictions is an indication of the difficulty and considerable resources required for an adequate response to regional cumulative effects. Nonetheless, until such an approach becomes available, the addressing of cumulative effects concerns will continue to be handicapped by the lack of regional data.

Establishing Reasonable Expectations

Unrealistic expectations are often made of what can be accomplished in a CEA. These expectations are usually not met because of limitations in the analysis of complex environmental effects, and lack of appropriate data on environmental conditions from the microscopic through to the regional scale. The following are some examples of goals commonly suggested for CEAs:

- to ensure that human disturbances do not exceed a threshold, beyond which irreparable harm or loss would result to the VECCs;
- to provide guidance for future environmentally sustainable development;
- to make better use of existing resources;
- to maintain ecological carrying capacity and ecosystem integrity;
- to ensure long-term population viability of species;
- to reduce or slow down the gradual loss of land that supports VECCs; and
- to consider effects at global scales due to trans-boundary effects.

Ultimately, any assessment will address, to varying degrees, the intent of these goals (although the meaning of some still remain imprecise). However, what can now be reasonably accomplished includes:

- the assessment of effects on a few specific valued environmental and cultural components;
- defining best available mitigation to reduce or eliminate adverse effects before they interact with other projects and become cumulative effects;
- qualitative judgement on the ultimate effect and its significance on many VECCs (particularly wildlife species) unless specific thresholds or limits are known (e.g., regulated levels of sediment in water) and interactions are easily understood;
- treatment of all interactions as simply additive (as opposed to synergistic and other types of interactions that are more difficult to assess) unless the nature of the interaction is well understood;
- greater confidence in results, the closer the effects are to the source — the larger the area examined (and the further ahead in time), the less confident practitioners can be of the results;
- assessment of one project at a time, unless a long-term regional land use planning approach is conducted to address nibbling effects;
- determination of trends as opposed to discrete and quantifiable changes to the distribution or abundance of biological VECCs; and

- effects due to the interaction of *one* project with other projects as opposed to the effects of *many* projects on *many* projects, unless a long-term regional land use planning approach is conducted with appropriate funding for data collection and analysis.

Establishing Minimum Requirements

At minimum, an agency process for the review of projects should (adopted from Hegmann and Yarranton 1995):

- make use of precedent, including assessments and review decisions from earlier projects, to assist in the processing of future similar projects;
- be flexible enough to allow a variety of responses to issues that arise during the review, including the request for further information from the proponent;
- have a mechanism of identifying which other projects may interact with the project under review;
- allow for requests for information at several stages of the inquiry or review process;
- focus on the nature and significance of cause and effect relationships;
- accept uncertainty and handle it through risk management; and
- contain a mechanism to bring a line of inquiry to an end when the decision-maker is satisfied that it has been pursued far enough.

In developing a process for an agency that utilizes a tiered approach to reviews (e.g., screening followed possibly by more in-depth study), the following specific “ingredients” are required in an agency review process for a project application:

- an understanding of surrounding environmental conditions and types of land use, especially any unique conditions that warrant special attention;
- a list of past, existing and reasonably foreseeable projects;
- a means of determining bounds to provide a reasonable limit on obtaining the above information;
- a means of determining if more information, perhaps outside those bounds, may be required;
- a means of efficiently determining if there are any local effects of a project that may also have cumulative effects implications;

- a means of assessing the effects of the project in a regional context;
- a means of focussing the assessment on only the most important VECCs; and
- a step-by-step process for screeners to direct the above information gathering and decision making, including a systematic approach to ranking potential effects on VECCs.

B.4 COMPONENTS OF A CUMULATIVE EFFECTS ASSESSMENT

The assessment of cumulative effects requires completion of the following major steps:

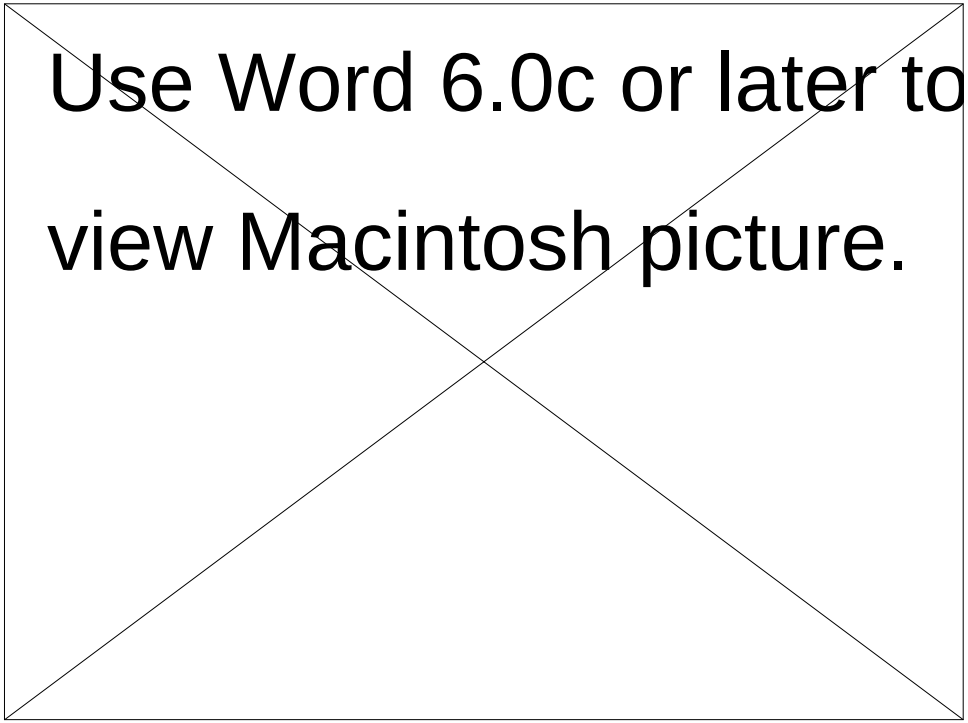
- Identifying issues of concern;
- Identifying VECCs;
- Developing a “project inclusion list”;
- Establishing spatial and temporal bounds;
- Establishing a baseline of environmental and land use conditions;
- Determining regional indicators of change;
- Quantifying impacts;
- Comparing against thresholds;
- Evaluating significance;
- Recommending mitigation; and
- Assessing accidental events.

All of these steps are also required for EIAs — the assessment of cumulative effects differs only by the degree to which effects are pursued beyond the immediate local project area. Due to the far reaching nature of CEAs, some of these steps are explained in more detail below (i.e., bounding, project inclusion list, thresholds and indicators).

Establishing Bounds

Bounding is the process of establishing a limit to the area and period of time examined in an assessment. The results are spatial bounds (i.e., how far?) and temporal bounds (i.e., what duration in time into the past and into the future?). The resulting geographic bounds are often referred to as the "study area" (see Figure B.2 for an example). The challenge is in finding the appropriate compromise between practical constraints and unlimited inquiry. On one hand, limits are imposed by the constraints of time, budget and available data. On the other hand, there is the need to adequately address complex environmental interactions that theoretically could extend for considerable distances and into the future if practitioners pursued effects to their ultimate conclusion.

Figure B.2: An Example of Spatial Scales for a CEA



ref: (Hegmann 1995)

Traditionally, EIA has concerned itself with potential effects within certain more or less arbitrarily defined boundaries around project sites. The process of establishing bounds is often difficult enough in conventional EIA, where bounds often remain fairly local to the effects of a single project. CEA, by definition, implies the need to expand those spatial and temporal horizons. The practitioner must then determine at what point do they stop their pursuit of effects? The dilemma of establishing reasonable bounds is worsened by the perception that practitioners risks CEAs “getting quickly out of hand” to the point of making completion of the assessment practically unattainable — some kind of constraint on information gathering and analysis is necessary if a review is ever to be completed.

In contrast to this are the realities, known and perceived, of the cause-effect relationships incurred due to the proposed project. The implication of too narrow a bound is that important relationships will be not be examined, and the CEA may miss the very point of trying to examine regional and long-term effects (the essence of cumulative effects). The long-range transport of pollutants in airsheds or waterways, the movements of far-ranging wildlife, and the progressive incursion of humans into hinterland areas are all examples that suggest the need to address an ever expanding geographic area.

The use of historical records for the purposes of establishing an environmental baseline for comparison purposes suggests the need to extend the assessment back in time. The possibility or certainty of future developments nearby the influence of the project suggest the need to look ahead into the future.

Arriving at the Limits

As an example of determining a boundary, the project location on a map should be determined and the boundary moved outward until the assessor assumes or knows that the effects of the project have diminished to an acceptable or “trivial” state. Although this approach is conceptually appealing, it is difficult to implement. Ideally, such an approach should be pursued for each environmental component examined (e.g., air, water, vegetation, wildlife, etc.), thus requiring multiple bounds instead of the more typical single “study area”. In essence, bounds become elastic, expanding and contracting as dictated by the ecological relationships that must be addressed by the assessor. For example, in establishing spatial boundaries for water quality, the study area must include the dispersion of a chemical constituent along a river as far as it may still be reactive and cause significant effects. For wildlife, practitioners may “follow” the path of an individual whose movement has been interrupted by a disturbance.

On a less ecological but more pragmatic level, bounds are often assigned based on the limits of an available data set. A well studied watershed, the location of a caribou migration path or the availability of remote sensed imagery may very well determine, at least at the beginning, how far practitioners may go in a CEA. The cost of obtaining more data may be seemingly prohibitive to the practitioner and proponent. However, practical needs must be balanced with ecologically meaningful bounding. The practice of abruptly setting bounds along jurisdictional boundaries is an example of setting bounds for overly practical or political reasons at the expense of the ecological realities that may be occurring. No clear guidelines yet exist that provide actual quantitative distances for bounds. Any such attempt is made difficult by the diverse nature of projects and the unique interactions that may occur (nonetheless, as described in Section 4, such guidelines are being proposed for the NAP process).

Ultimately, bounding relies less on new CEA models as it does on the time-honoured basics of EIA practice; making conservative assumptions about the magnitude and probability of the effect in the face of uncertainty, relying on professional judgement, practicing risk management, and utilizing an adaptive approach to change. In summary, the criteria for terminating a line of inquiry, which then reflects on the extent of bounds, are whether or not the risk to the life, health or vigour of a VECC is known, or whether or not the probable magnitude of an effect is understood.

Guiding Principals

A single prescriptive rule is not available to guide practitioners in determining bounds. However, to aid in the establishment of bounds, three principals should be considered:

1) More than one spatial and temporal bounds are possible and perhaps preferable.

2) Bounds should expand according to the nature of the cause-effect relationship and be modified if demanded by new information.

3) Bounds should end upon reaching the point at which the significance of the effects may be considered trivial.

In carrying out these guidelines, the following items should be considered:

- first establish a local study area to separate the obvious, easily understood and often mitigable effects; then establish a regional study area that includes possible interactions with other projects;
- be prepared to alter the bounds during the assessment process, and be prepared to defend any such changes;
- organize time dependent changes (i.e., temporal scope) in discrete units of time that are easily understood and have relevance to the project under review. For example, use discrete time periods such as “Pre-development”, “Existing conditions”, and “Future projects” with and without the specific project under review;
- recognize the importance of historical perspective regarding appropriate baseline periods of time in which to establish temporal bounds;
- recognize the nature of pathways that describe the cause-effect relationships and the transport and transformation mechanisms of physical constituents;
- consider the number, types, scheduling and location of other projects;
- address the reversibility of the effects (i.e., time to recovery);
- quantify abundance and distribution at a local, regional, national and global scale; and
- identify the interests of other stakeholders.

Development of a Project Inclusion List

A “project inclusion list” is a list of projects that will be examined for any potential interactions with the project under review. The suggestions provided earlier should first be followed to determine a starting point for bounds. However, once a bound is established, a number of projects might have to be considered (see Figure B.3 for an example). The following summarizes further criteria according to the CEAAct by which selection of other projects may be guided.

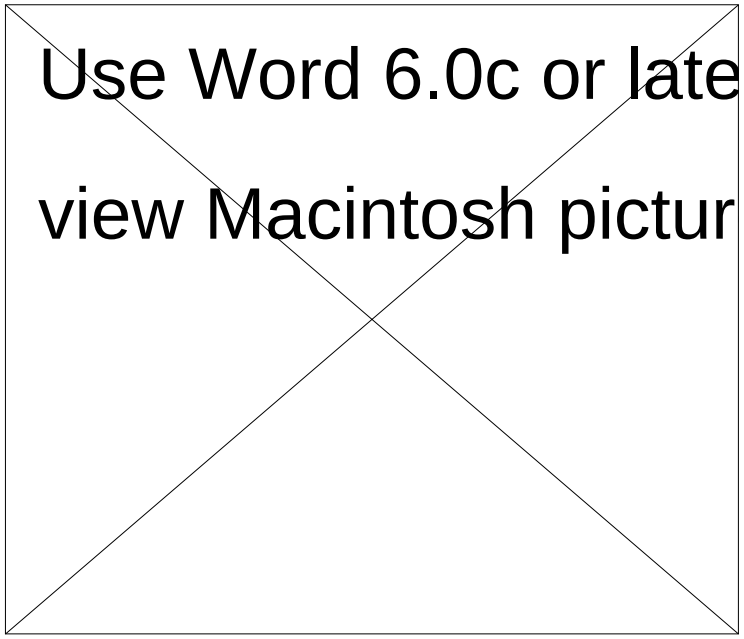
Definition of Project and Activity: The Act states that cumulative effects of a project will be assessed in combination with

“other *projects* or *activities*”. It is, therefore, important to know what a project or activity is. The Act defines a project as “a physical work, any proposed construction, operation, modification, decommissioning, abandonment or other undertaking in relation to that physical work”. The Act does not define “activity”; however, the CEAAgency (1994) suggests that this could include “any human activity relevant to the assessment, for example, fishing or hunting near the project”.

Identifying Future Projects: The Act states that cumulative effects for a project will be considered “with other projects or activities that have been or *will be* carried out”. This can be interpreted to include other past, existing and reasonably foreseeable projects. However, because they have not yet occurred, difficulty remains in identifying future projects. It is usually suggested that such projects currently have their application for approval in progress or that such an application is known to be imminent. Although there may be great temptation to do so because of their potential significant effects, hypothetical projects are not to be included (a practical reason is that assessment effort is not wasted for a project that may never occur). Quasi-legal criteria may be used to assist in the decision, based on potential certainty and magnitude of contributing effects from the project.

CEAAct Regulations: The Act’s Regulations provide an Inclusion List (for Activities), Comprehensive Study List (for Projects), and an Exclusion list (for Projects). Although the original intent was not for this purpose, the fate of a listed project suggests a degree of concern regarding environmental effect, and so may be used to provide some guidance as to inclusion.

Figure B.3: Example of Various Project Stages



ref: (Hegmann and Yarranton 1995)

Comparison Against Thresholds

Thresholds representing acceptable limits of change require knowing what is a desirable state of the environment and allowable change — there is always a certain cumulative level of impact in a region or on a VEC that is sustainable. Unfortunately, thresholds are not readily available, if at all, for many environmental components. The most common are thresholds for water and air contaminants provided in permitting regulations.

The recent amendment to the Fisheries Act in the Yukon and the promulgation of the Yukon Placer Authorization is an example of not only the use of thresholds for a specific environmental component, but of the implementation of such thresholds at a regional level. Maximum acceptable sediment discharge concentrations are specified for five different classes of *streams* as opposed to limits on any given placer mine (limits are based on acceptable effects on fish). Specific streams are classified on a series of mapsheets

covering much of the southern Yukon. The cumulative effects implication of this authorization is that any number of projects (i.e., placer mines) may occur on a single stream until the sedimentation limit is reached. This approach, therefore, provides a regional level threshold that can then assist in future decision making for projects affecting stream sedimentation.

Thresholds ultimately must be determined at a regional level for a variety of VECCs, based on review of environmental conditions and rate of land use change. This must be accomplished by a central advisory or decision making body that has at its disposal a regional database of information to review.

Determination of Regional Indicators of Change

Indicators are specific environmental components that are:

- sensitive to changes as a result of land use or human activities (verses natural changes);
- representative of a wide range of spatial and temporal scales from ecosystem and landscapes to communities and individuals;
- representative of a cross section of ecosystem responses to human disturbances;
- able to address concerns for rare and endangered species;
- easily understood by and reported upon to the public; and
- where possible, cost-effective to monitor reliably in future studies (from Woodley 1993).

Indicators are commonly used in EIAs; however, some indicators may be specifically selected because of their usefulness to indicate changes on broader scales, such as:

- waterborne contaminants that bioaccumulate in fish or benthic organisms, or that may be carried intact in waterbodies for considerable distances;
- airborne contaminants that are known to concentrate in certain vegetation species far removed from the contaminant source;
- far-ranging terrestrial wildlife species that may be affected by obstruction of regional movements; and
- species, such as some songbirds and ungulates, that are susceptible to the degree of habitat fragmentation and edge.

B.5 BIBLIOGRAPHY

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APPENDIX C: SELECTED CUMULATIVE EFFECTS LITERATURE

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