

# Cumulative Effects Assessment: Current Practices and Future Options

## 1.0 Introduction

### 1.1 Terms of Reference

Alberta Environmental Protection (AEP) retained the Macleod Institute for Environmental Analysis (the Institute) and Axys Environmental Consulting Ltd. (Axys) to review current cumulative effects assessment (CEA) practices and to identify and evaluate practices which could be adopted in future assessments and management of cumulative effects. The Institute/Axys was asked to provide the following:

- A summary of the overall approach to the assessment and management of cumulative effects in Alberta for projects requiring an Environmental Impact Assessment (EIA) under the Alberta *Environmental Protection and Enhancement Act* (EPEA);
- A summary of environmental assessment approaches related to cumulative effects used by the federal government and the other provinces and territories;
- Identification of the major challenges facing successful implementation of cumulative effects assessment in Alberta;
- Practical, effective options for future Alberta assessment of cumulative effects; and
- Implications of the options described.

### 1.2 Context

The concept that environmental impacts are caused by numerous activities over time is not a new one. However, little consensus on the meaning of the term “cumulative effects assessment” has emerged, and many continue to debate the questions of who is responsible for performing CEAs and what role they play in decision making. Recent practices in Alberta have moved towards a more consistent approach to CEA, but some challenges remain.

To put this report in perspective, it is useful to remember that environmental management is a process that occurs over a period of years. Nothing remains static in time. Ecosystems themselves are dynamic. Other changes such as innovations in technology, information and policy are introduced by humans. From time to time, humans also initiate new industrial, commercial or residential developments which have an impact in terms of managing environmental consequences.

When innovations are introduced or new developments are initiated, some form of planning process is typically put in motion as stakeholders prepare to make decisions on the future management of one or more projects. The planning process may be private, in which case the stakeholders probably include only the project owner and its shareholders, or it may be subject to public review and approval, in which case the stakeholders likely include owners, government officials and communities, as well as others who have a direct interest. It is in the context of public planning and decision making processes that the subject of cumulative effects assessments is discussed in this report.

**Figure 1: Environmental Management Over Time**

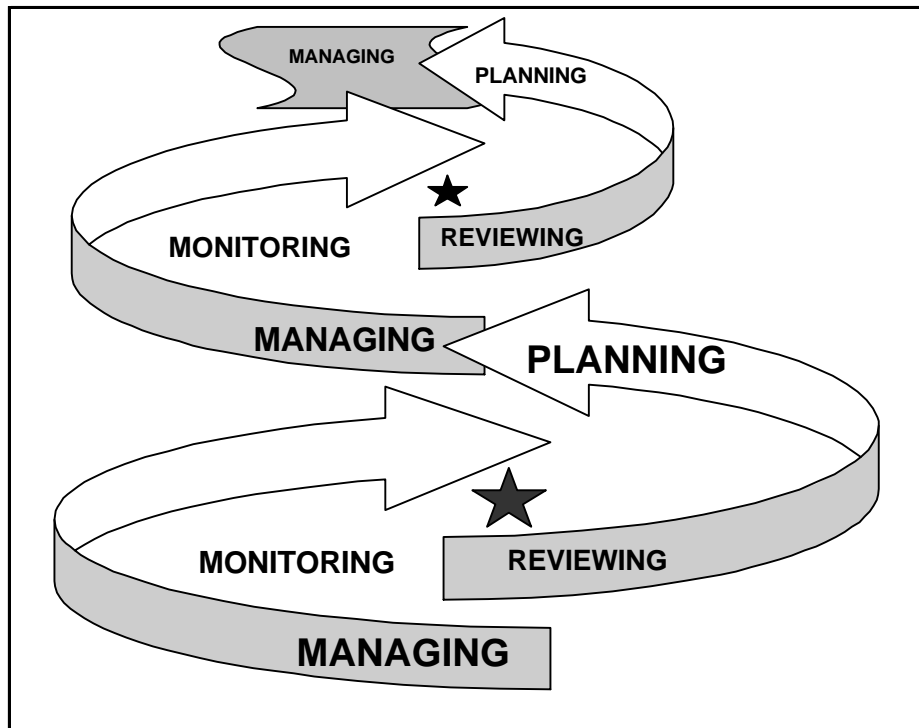
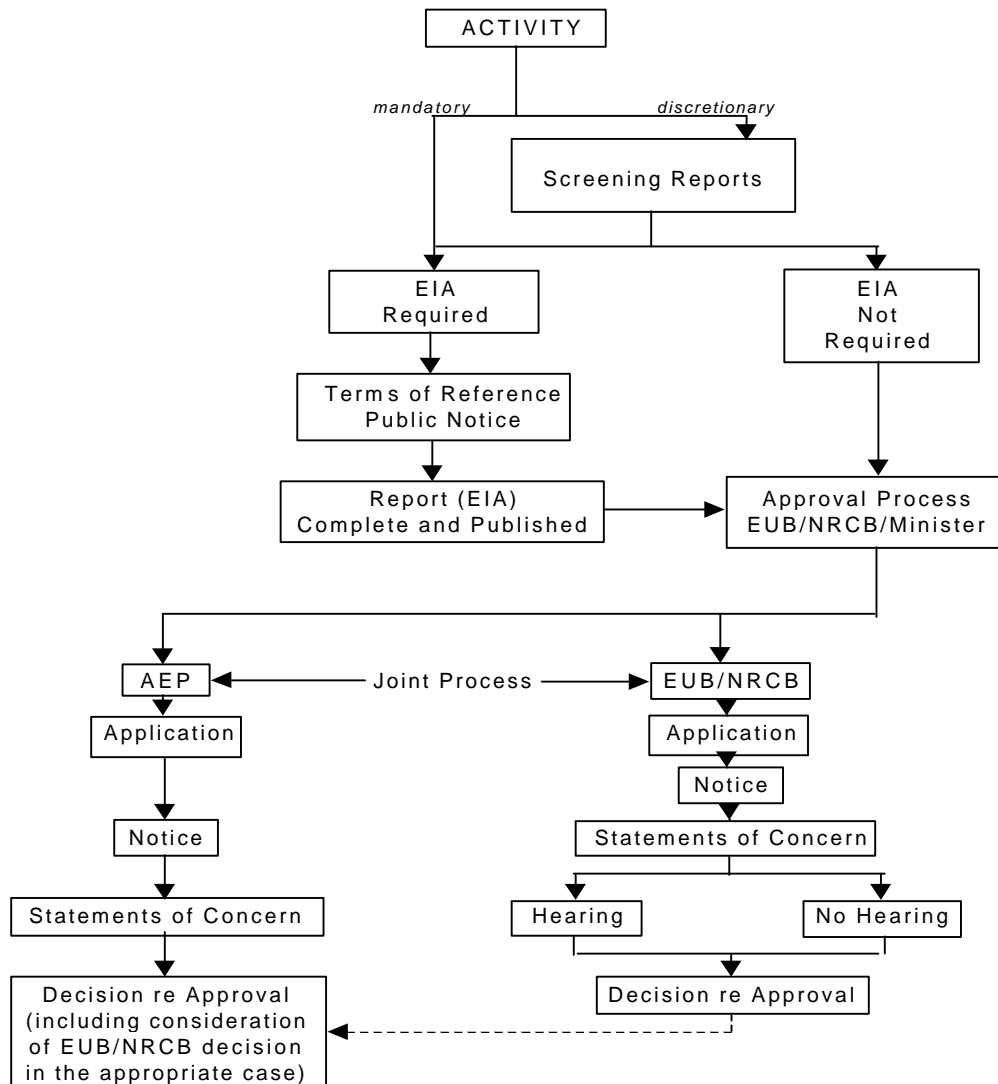


Figure 1 illustrates the general process of managing industrial, commercial and residential developments over time. It portrays the fact that, while managing environmental effects associated with an activity is continuous, planning and decision making processes intercede from time to time. As examples, the planning process may be triggered by periodic reviews or by an evaluation of data collected from monitoring emissions or ambient conditions. The planning process could be either private (as would happen in the case of an owner applying a formal environmental management system), or public (if monitoring data demonstrated non-compliance with licencing conditions, for example, and regulators enforced corrective action on the operator). A public planning process is also triggered whenever a new project (as defined by regulations) is proposed, and may be initiated when responsible authorities are prompted to respond to innovations in technology, information or policy. The star (★) signifies how cumulative effects assessments can be employed during the course of planning and preparing for future management practices.

With respect to a public planning and decision making process triggered pursuant to legislation in Alberta, cumulative effects must be taken into account if an environmental impact assessment (EIA) is required. Some activities are specifically exempt; otherwise all mandatory activities and some discretionary activities require an EIA (Figure 2). Under Alberta's EPEA, the Department of Environmental Protection is responsible for managing the EIA process. AEP first determines if an EIA is mandatory. If the activity involved is discretionary, AEP decides whether an EIA is required. In either case, AEP works with the proponent to develop Terms of Reference for the assessment. The proponent is responsible for conducting the EIA and any associated CEA. AEP then determines if the assessment is complete and ready for regulatory review, or if additional information is required. A regulatory review is carried out by the EUB or the NRCB to determine if the project is in the public interest. With some exceptions such as pipelines, their findings are sent to Cabinet which makes the final decision. The government then implements the decision through approvals, licences, monitoring and other regulatory measures.

**Figure 2: Alberta Regulatory Process**



## 1.3 Overview of Report

The Institute/Axys began its review of current practices by examining 19 projects in which CEA techniques had been either explicitly or implicitly applied in evaluating environmental impacts of projects under consideration. A synopsis of the projects is presented in Section 1.4. Summaries for each project are attached as appendices. Section 1.5 introduces current definitions of CEA, and describes competing views as to the responsibilities of participants and the role CEA plays in decision making. Nine key CEA components used by the Institute/Axys to structure its review of the projects are also presented in the section.

Section 2.0 briefly describes legislation governing cumulative effects across Canada, as well as the mandate of the four regulatory authorities relevant to Alberta projects (AEP, the Energy and Utilities Board, the Natural Resources Conservation Board and the National Energy Board). The role of the “public interest component” is discussed.

Section 3.0 describes how key CEA components, such as issues identification and impact characterization, have been completed in past assessments. The report, based largely on a review of 19 projects, summarizes current CEA practices in Alberta and other Canadian jurisdictions. It does not attempt to provide a comprehensive review of cumulative effects assessment practices or a history of cumulative effects assessment, although older precedents are cited from time to time. Highlights of current practice are presented for each of nine components. The highlights represent a compendium of practices generally accepted by current practitioners, regulators and the public in Alberta and considered by the Institute/Axys to be the best of practices revealed in the 19 projects. In particular, practices were identified as highlights based on the following criteria:

Expert Consensus:	the practice has been generally accepted in the literature, conferences and workshop proceedings;
Public Acceptance:	the practice has been generally accepted in formal regulatory proceedings;
Accepted Practice:	the practice is generally accepted by practitioners in the field and industry;
Historical Progression:	the practice reflects an advancement of the science and availability of data;
Opinion:	the practice is considered to be a highlight in the opinion of the Institute/Axys, based on knowledge and experience in the field.

In Section 4.0, major challenges facing successful implementation in Alberta are identified and discussed. Section 5.0 presents future options. Section 6.0 provides a brief conclusion.

## 1.4 Projects Reviewed

The Institute/Axys and AEP chose 19 projects for detailed review (Tables 1 and 2). The projects were chosen to represent a cross-section of different types of industrial developments and of different cumulative effects on various resource groups such as air quality, groundwater, vegetation and wildlife. Table 1 lists 13 Alberta projects, 11 of which were subject to the *Environmental Protection and Enhancement Act* (EPEA) or its predecessors. Table 2 lists four projects not located in Alberta and two Alberta projects for which federal agencies carried principal regulatory responsibility.

Given that the Terms of Reference focus on current CEA practices in Alberta, emphasis was placed on contemporary examples subject to EPEA. Only three projects antedate the 1990s. The Mercoal (Manalta Coal Ltd.), Athabasca Pulp Mill (Alberta Pacific Forest Industries Inc.) and Caroline (Shell Canada Ltd.) projects were included for detailed review as examples of CEA practice and regulatory process in Alberta before legislative requirements for CEA were introduced in 1992.

**Table 1: Alberta Projects Reviewed**

Type of Project	Proponent	Project	Year Submitted
Forestry	Alberta Pacific Forest Industries Inc.	Athabasca Pulp Mill	1989 *
Petrochemical Plant	Union Carbide Canada Inc.	Prentiss Expansion	1997
	Amoco Canada Petroleum Company Ltd.	Prairie Rose: Linear Alpha Olefins Plant	1997
	Shell Canada Ltd.	Ethylene Glycol	1997
Sour Gas Processing	Shell Canada Ltd.	Caroline Expansion	1989
Heavy Oil	Imperial Oil Resources Ltd.	Cold Lake Expansion	1997
Oil Sands	Suncor Inc. Oil Sands Group	Steepbank Mine	1996
	Syncrude Canada Ltd.	Aurora Mine	1997
	Shell Canada Ltd.	Muskeg River Mine	1997
Mining	Cardinal River Coals Ltd.	Cheviot Coal Mine	1996
	Manalta Coal Ltd.	Mercoal Project	1982
Recreation and Urban Development	Eagle Terrace Inc.	Eagle Terrace Sub-division	1996 *
	Three Sisters Golf Resorts Inc.	Three Sisters Resort	1991

\*project was not subject to Alberta EPEA or its predecessors

**Table 2: Other Canadian Projects Reviewed**

Type of Project	Proponent	Project	Year Submitted
Pipeline	Express Pipeline Ltd. (Alberta Energy Company & TransCanada PipeLines)	Express Pipeline	1995 *
Off-Shore Oil and Gas	Mobil Oil Canada and Shell Canada Limited	Sable Island Offshore Energy Project	1996 *
Mining	Cogema Resources Inc.	Midwest Uranium Mines (Sask.)	1995 *
Oil and Gas	Amoco Canada Petroleum Ltd., et al.	Monkman / Grizzly Valley Oil and Gas Field (BC)	1994 *
National Parks	Parks Canada	Trans-Canada Highway	1994 *
Power Plant and Dam	Columbia Basin Trust and Columbia Power Corp.	Keenleyside Dam and Power Project (BC)	1997 *

*\* project was not subject to Alberta EPEA or its predecessors*

For each project, the Institute/Axys reviewed portions of the Environmental Impact Assessment (EIA) dealing with cumulative effects and, when it was available, corresponding sections of the regulatory decision. Time and resource constraints prevented a detailed review of the entire regulatory record for each project, which in some cases extended to more than 20 volumes of material. Project Summaries are attached as appendices.

Current practices in Alberta were highlighted for each component and are presented in Section 3.3. The highlights identify what Alberta does well and the strengths on which to build, as well as good practices from elsewhere. The highlights represent a compendium of practices generally accepted by current practitioners, regulators and the public in Alberta and considered by the Institute/Axys to be the best of practices revealed in the 19 Project Summaries.

## 1.5 Cumulative Effects Assessment Described

The Canadian Environmental Assessment Agency defines cumulative effects as follows:

... changes to the environment that are caused by an action in combination with other past, present and future human actions (CEAWG, 1997, page 3).

The US Council on Environmental Quality uses a similar but slightly more comprehensive definition:

... the impact on the environment which results from the incremental impact of the action when added to their past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (CEQ, 1997, page 1).

Both Alberta and Canadian federal legislation requiring proponents to consider cumulative effects first came into effect in 1992. Then, as now, practitioners, regulators and environmental managers around the world were engaged in considerable debate over what role a cumulative effects assessment should play in the regulatory decision making process.

Two main positions developed, characterizing discussions in Alberta, as elsewhere:

- 1) CEA is, essentially, an environmental impact assessment done well (Duinker, 1994), and
- 2) CEA is a regional planning assessment tool.

Those who took the first position ascribed responsibility for conducting the assessment to individual project proponents. Those who took the second position ascribed responsibility to government. They argued that regional planning falls within the public domain and extends beyond the scope of a single project or the reasonable capacity of a single proponent to assemble regional databases on environmental conditions and past, present and reasonably foreseeable projects.

In reality, the two positions are not exclusive; rather, they build on each other. CEA is a useful set of assessment tools which can be applied in a number of different circumstances. Regulators in Alberta and other Canadian jurisdictions, for example, have consistently held that CEA is an integral part of an environmental impact assessment (EIA) and have placed the onus on individual project proponents to conduct cumulative effects assessments. Environmental non-governmental organizations and other interested parties supported this view, particularly during interventions in such cases as AIPac, Three Sisters and Express Pipeline. Fundamentally, regulators and others sharing their view have subscribed to a variation of the “polluter pays” principle. Responsibility is assigned to any organization which introduces an environmental hazard to demonstrate that its proposed development will not cause irreparable damage.

By the same token, CEA can provide valuable information in the course of a regional planning exercise. Examples include the Beaufort Environmental Monitoring Program (LGL et al. 1984) and the Mackenzie Environmental Monitoring Program (Bernard et al., 1994; DIAND, 1987) in which government, industry and community members worked cooperatively to assess project-specific and regional impacts that might occur as a result of large-scale oil and gas development in the western Canadian arctic. More recent examples include the Banff Bow Valley Study and the Monkman/Grizzly Valley Study in British Columbia. These two cases help to highlight the fact that CEA is a set of tools, useful for assessing either specific projects in their environmental context, or the overall situation itself, and useful to proponents, regulators and resource managers alike.

The Banff Bow Valley and Monkman studies exhibit similarities in that both were initiated by governments charged with the responsibility of protecting and conserving natural resources. However, the two governments exercised their responsibilities in different ways. The Banff Bow Valley Study was directed by an advisory panel appointed by the government responsible for managing the Banff National Park. Extensive and diverse stakeholder participation was encouraged and the assessment was funded from the public purse. The Monkman study, on the other hand, was conducted by a consortium of private interests directed by government to undertake the study. No external stakeholders participated and, as far as is known, the assessment was funded by the consortium.

It is apparent, then, that there is no single answer to the question of who should be responsible for conducting cumulative effects assessments. In each case, circumstances must be examined and a number of variables considered. Answers will depend on several factors other than the CEA itself or the tools used to conduct it. Such factors include the following:

- **Scope of inquiry** - Does the planning and decision making process focus on identifying and mitigating environmental effects of a specific project? Or does it focus primarily on maintaining a chosen level of environmental quality throughout a region containing many activities and interests? Is the assessment designed in response to a specific, proposed project? Or is it to be used to create a strategic framework against which impacts and benefits can be measured at some unspecified future date?
- **Scale of private economic activity** - How many proponents or resource managers are involved? Does one project or sector predominate in the region under study? Will the decision making process focus on specific proposals to derive private economic benefits from exploiting natural resources? Or is it more concerned with the overall economy and environment of a region?
- **Span of competing interests** - Is the inquiry primarily focussed on one or two private economic competitors? Do competing interests arise from one or more than one industrial sector or interest group? Are all competing interests sufficiently well represented?

These factors can easily become blurred in the context of a public planning and decision making process because so many stakeholders have legitimate roles to play. Moreover, it is sometimes the case that the government (represented by different officials) plays more than one role. Figure 2 (page 1-3) illustrates five separate roles in the Alberta regulatory process, for example. A Director determines whether a discretionary activity warrants further environmental assessment and, if so, whether a full EIA is required. If it is, then the Director (usually acting on the advice of his or her staff) must make an administrative decision as to whether the EIA is complete. Once an EIA is deemed complete, it is routed to the appropriate approvals authority or authorities which include the Minister of Environmental Protection, the Energy and Utilities Board and the Natural Resources Conservation Board.

In addition to regulatory and administrative roles such as these, government occasionally has responsibility for managing the daily operations of specific activities or resources. In any event, government has overall responsibility for managing the state of the environment and economy for the public good. Distinguishing between its operational, regulatory and management roles can help clarify when government should itself conduct a CEA.

In the case of reviewing a single project, clearly, the proponent should be responsible for conducting the cumulative effects assessment. This answer would also apply when more than one project is being contemplated for roughly the same area and time, or when one industrial sector is looking at the implications of its overall activity in a region. In such cases, it may be most effective for the proponents and existing operators to cooperate on a single, more comprehensive, assessment. Collaborative efforts would also be an appropriate response in situations involving a broad span of competing interests. When focussing on the overall economy and environment of a region that has experienced some level of development, government and private sector resource managers could form constructive partnerships to share the responsibility for conducting different aspects of a CEA. On the broadest scales, particularly when potential interests are not yet well represented by individual corporate or non-governmental organizations, it is government's responsibility to assess the capacity of the landscape in anticipation of ongoing societal and economic growth. It may then be to government's advantage to conduct a CEA as a strategic initiative and to establish a framework against which specific, but as yet undefined, future proposals can be assessed.

The concept of CEA as a set of tools also expedites understanding some of the variations in the way assessments are defined. The circumstances in which a CEA is applied have coloured the way in which it is described. Again, the distinction lies not in the toolbox, but rather in the use for which the tools are being employed. The Canadian Environmental Assessment Agency, for instance, identifies a CEA's purpose as follows:

Cumulative effects assessment is done to ensure that the incremental effects resulting from the combined influences of various projects are assessed. These incremental effects may be significant even though effects due to each project, when independently assessed, are considered insignificant (CEAWG, 1997; page 1).

The US Council on Environmental Quality (CEQ), however, identifies a CEA's purpose somewhat differently, possibly because government agencies themselves conduct the environmental impact assessment when deciding whether development permits should be granted to private sector proponents. CEQ emphasizes a broad planning view of CEA when it states that:

To a large extent, the goal of cumulative effects analysis, like that of NEPA itself, is to inject environmental considerations into the planning process as early as is needed to improve decisions (CEQ, 1997; page 3).

The *CEAA Practitioners Guide*, being addressed to an audience of practitioners, gets more specific. It comments that, as an extension to EIAs, cumulative effects assessments are generally expected to (page 3):

- Assess impacts on a regional area that goes beyond the project foot print;
- Use a longer temporal scale running from before project start up, into the future;
- Consider effects on Valued Ecosystem Components (VECs) resulting from other activities in the area, in addition to the proposed project;
- Include other past, existing and proposed projects in identifying and assessing effects; and
- Evaluate the significance of effects.

As the three examples of CEA role descriptions illustrate, focussing attention on how the tools of CEA will be applied can shift the emphasis when attempting a definition of cumulative effects assessment. It is also true that the objective of a particular planning or decision making process can determine which tools in the CEA set will be used in different situations.

Regardless of the circumstances in which it is applied, cumulative effects involves multiple causes and effects, larger regional boundaries, longer time frames, interactions among projects and activities in different ecosystems, and the expectation that although individual effects may be insignificant, cumulative effects may not be (Lawrence, 1994).

More recent CEAs are beginning to focus on functional aspects of the assessments rather than continuing the debate as to who should take responsibility for conducting them. Shell (Muskeg River), for example, specifically identified several criteria to determine the need for assessing cumulative effects, reflecting the National Energy Board's decision in the Express Pipeline case:

- There must be an environmental effect related to the Muskeg River mine project;
- The environmental effect must be demonstrated to operate cumulatively with the environmental effect from other developments or activities; and
- Other developments or activities either have been or will be carried out and are not hypothetical.

Although approaches vary considerably from proponent to proponent, and depending on how the assessment tool is being used, CEAs generally include the following nine components:

- Issue identification;
- Valued Ecosystem Components (VECs) and associated indicators;
- Spatial bounding;
- Temporal bounding;
- Included projects;

- Assessment methods;
- Impact characterization;
- Significance of cumulative effects; and
- Future management options.

These components were used to structure Section 3.0 of each Project Summary (Approaches to CEA - see Appendices). Current practices were then summarized, and highlights cataloged for each component. Challenges and future options to improve practice were also identified.

All nine components are essential for effective CEA (Beanlands and Duinker, 1983; CEAWG, 1997; Hegmann and Yarranton, 1995; Smit and Spaling, 1994). However, each must be addressed in the context of the specific project in question, taking relevant cause-effect environmental relationships and the current or baseline state of the environment into account. The current state of the environment is particularly important when predicting future impacts and attributing significance to those impacts. Impacts on an already disturbed system may be much more significant than those on a system which has seen little disturbance. In any event, baseline information is fundamental to managing future environmental impacts.

The components are presented in the order in which they are addressed when completing a CEA, although the process is somewhat iterative. The choice of VECs or indicators will influence the choice of spatial and temporal boundaries, and vice versa, for example.

The component "Assessment Methods" has been used in the report to summarize methods chosen by proponents in each project. The Institute/Axys has not included a detailed description of the technical aspects of various assessment methods. Both the Canadian Environmental Assessment Agency's *CEAA Practitioners Guide* (December, 1997: currently in draft form) and the US Council on Environmental Quality's *Considering Cumulative Effects Under the National Environmental Policy Act* (January, 1997) provide technical information regarding assessment techniques.

CEAs typically evaluate the significance of residual impacts after taking mitigation and monitoring activities into account. The term "Future Management Options" has been used to highlight impact management programs or recommendations which extend beyond the scope of a single project, individual proponent or local area. Many proponents focus solely on monitoring programs but it is rapidly becoming more usual for proponents or regulators to recommend collaborative regional impact management measures in addition to monitoring.

In the Cheviot project, for example, the proponent, Canadian River Coal (CRC), outlined a program to manage anticipated impacts on elk. The program would have required government and other corporations in the region to participate both during and after the proposed project's operational phase in managing resources to ameliorate anticipated cumulative effects on elk, as follows:

- Monitor response of the elk population in the study area (CRC);
- Initiate progressive reclamation directed to wildlife as a primary end use (CRC);
- Monitor and manage human recreation in the Cadomin area to minimize disturbance of elk (government, CRC and others);
- Identify nodes of high quality habitat and restrict access and other development in these areas (government and others);
- Coordinate logging and other future development to prevent additive loss of quality elk habitat (government and others); and
- Plan the reintroduction of people onto the reclaimed landscape after mining (government, CRC and others).