Environmental Impact Assessment (EIA):

A Guide for Reviewers

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Table of Contents

1.0 Introduction

This paper will outline some key aspects of the Environmental Impact Assessment (EIA) process and what a reviewer should look for when reviewing an EIA. These key aspects include: project description; alternatives; scoping; description of the environment; public participation; biophysical impacts; social impacts; impact significance; cumulative effects assessment; monitoring; and presentation. These aspects have been summarized and listed in Appendix A: EIA Review Sheet for quick reference.

What is an EIA? Some key thinkers on EIA provide the following definitions of an EIA:

• Wood, 1995: "EIA refers to the evaluation of the effects likely to arise from a major project (or other action) significantly affecting the natural and man-made environment."
• Gilpin, 1995: "EIA: the official appraisal of the likely effects of a proposed policy, program or project on the environment; alternatives to the proposal; and measures to be adopted to protect the environment."
• Duinker and Baskerville, 1986: "EIA is a process for informing decision-makers of the potential environmental consequences of development alternatives."

What is an impact? Raymond and Coates (2001) describes an impact as "any change in the physical, natural or cultural environment brought about by development."

According to the Canadian Environmental Assessment Agency (2004), the EIA provides the following benefits: "an opportunity for public participation; increased protection of human health; the sustainable use of natural resources; reduced project costs and delays; minimized risks of environmental disasters; and increased government accountability".

2.0 Project Description

A comprehensive description of all activities is necessary for all EIAs (Gilpin, 1995). A detailed project description assists in determining the significance of impacts arising from a proposed project (Anderson et al., 2003).

The following are criteria for evaluating the merit of an EIA project description:

- ✓ *Clear and concise*

Information presented in an EIA must be clear, understandable, and relevant for decision-making (Sadler, 1996; Anderson et al., 2003). The project description and alternatives should be concise and display a high degree of broad communicability. Appropriate visuals such as maps, figures, tables and graphs are effective ways of communicating technical information (CEP, 1999; Anderson et al., 2003).

- ✓ *Comprehensive*

An EIA project description should include information with respect to the project purpose, technical aspects such as engineering and design, and spatial and temporal requirements (Morris et al., 1995; Anderson et al., 2003).

Changes to project design must be clearly identified and addressed as soon as they are made. If changes occur after the EIA has been completed, an amendment to the EIA may be necessary depending on the significance of the change. It is important that every change and its associated impact be assessed in the same manner as the previously identified impacts (CEP, 1999; Anderson et al., 2003).

3.0 Alternatives

The purpose of including alternatives in the EIA is to identify and evaluate alternate actions that accomplish similar goals and promote sustainable development (Steinemann, 2000; Anderson et al., 2003). EIAs should analyze three to six alternatives (Jain et al., 2002; Anderson et al., 2003).

The following are criteria for evaluating the merit of alternatives in an EIA:

- ✓ *Feasible*

Alternatives should be economically feasible with minimal adverse environmental impacts and time delays (Steinneman, 2000; Anderson et al., 2003).

- ✓ *Diverse*

Diverse alternatives to the proposed action must be included in the EIA. Alternatives may include both design and location options (Steinneman, 2000; Anderson et al., 2003).

- ✓ *Objective and timely presentation and development*

Steinneman (2000) argues that alternatives tend to reflect narrow project objectives, agency agendas, and predilection toward a proposed action. A purpose and need statement should be constructed that would not exclude less damaging alternatives or unduly favour the proposed action.

The EIA process often occurs too late in agency decision-making to consider a full range of alternatives. This can undermine EIA goals to encourage more environmentally sound and publicly acceptable solutions. Allowing new alternatives and objectives to evolve in relation to environmental conditions and public preferences may be a solution (Steinneman, 2000; Anderson et al., 2003).

- ✓ *No-action alternative*

The ‘no-action’ alternative, which serves as a baseline for comparative analysis, must also be included where the environmental impact of taking the proposed action is compared to the impact of not taking the proposed action (Steinneman, 2000; Anderson et al., 2003).

- ✓ Avoids “tokenism” or disingenuous alternatives

Priddle (1977) documented early the presence of ‘tokenism’ in alternatives development, noting a dam project EIA contained such token alternatives as dyking, reforestation, evacuation, and better management of existing structures. Steinemann (2000, p. 11-12) called such alternatives ‘straw men’ stating they “may be constructed, only so they can be torn down, and thereby add to the perceived attractiveness of the preferred alternative. This false representation of activities diminishes the ability to examine tradeoffs among genuine alternatives in an EIA.”

- ✓ *Public participation*

Public involvement is a good practice that can generate new alternatives. Unfortunately, public participation often occurs too late to significantly influence the design of alternatives (Steinneman, 2000; Anderson et al., 2003).

4.0 Scoping

Scoping is an initial stage within the EIA process and serves as an outline for the remainder of the process by outlining the spatial and temporal boundaries of a proposed project and possible affected areas (ESCAP, 1985; Huang et al., 2003).

The following are criteria for evaluating the merit of scoping in an EIA:

- ✓ *Comprehensive and focused*

While it is important that the scoping process capture all potential impacts, it is equally important that scoping does not result in the inclusion of irrelevant information (Ross, 1987a; Huang et al., 2003). If scoping is not adequately focused, the resulting EIA will be unfocused (Marshall, 1986; Huang et al., 2003).

The scoping process should detail the spatial and temporal boundaries for the EIA, the policy framework in which the scoping is being conducted, existing data sources and gaps in information, the schedule of the EIA, and the relationship that the scoping process will have to the decision-making process (UNEP, 2002; Huang et al., 2003). Scoping should set the appropriate boundaries for those impacts that will be further studied. The scoping exercise should include both direct and secondary effects (Westman, 1985; Huang et al., 2003).

- ✓ *Timely*

Scoping should begin early in the EIA process and should also be ongoing throughout the entire process (Ross, 1987b; Huang et al., 2003).

- ✓ *Flexible but systematic*

The scoping process must be flexible. The process must allow for further analysis and provide opportunities to review the initial scope if there are new issues that come about (Ross, 1987b; Huang et al., 2003). However, while it must be flexible, scoping should be done in a systematic manner (UNEP, 2002; Huang et al., 2003). This systematic approach includes firstly forming an extensive list of all concerns that arise from the proposal. The second phase of scoping involves taking the initial list of concerns and reducing it to a list of key issues based on their potential significance (UNEP, 2002; Huang et al., 2003). This process is more subjective since it requires placing values on the concerns (Wolfe, 1987; Huang et al., 2003).

- ✓ *Public participation*

It should be evident, when necessary, that a plan for public involvement in scoping was developed early in the process. This plan should identify all relevant stakeholders and the methods to be used to disseminate and gather information (UNEP, 2002; Huang et al., 2003). The quality of the opportunities for public participation in the scoping process should be evaluated. The public should be provided with

sufficient information about the proposed project and properly understand the project and issues to be able to give informed comments and participate fully in the process (Ross, 1987b; Gilpin, 1995; Huang et al., 2003). It is important that there is evidence that all public comments are considered in the formulation of the list of concerns. All public comments should be recorded without judgment or prioritising in the initial stages of the process (UNEP, 2002; Huang et al., 2003).

- ✓ *Appropriate use of scoping models and methods*

Models assist in identifying cause-effect relationships. These models include map overlays, impact checklists, impact matrices and cause-effect networks. Map overlays show receptors spatially but do not always allow linkages to be made to specific sources. An impact checklist is a standard list of impacts for various types of projects, which allows for the systematic identification of impacts, but it cannot relate impacts to their sources. The impact matrix is a two-dimensional matrix based on the checklist that relates actions to affected environmental elements. Cause-effect networks build on the impact matrix by including both direct and indirect effects. All of these methods provide ways to represent the potential impacts and affected areas as well as allow a more formalized and systematic scoping process (Julien et al., 1991; Huang et al., 2003).

Wolfe (1987) groups available methods to assist in scoping into three categories: EIA methods; public participation methods; and group process methods. EIA methods include examination of similar projects, checklists, matrices, networks, overlays, and environmental modeling. These methods should not be used exclusively but rather in combination to be valuable tools in scoping. Public participation techniques include public meetings and hearings, open houses, networking, hotlines, responsive publications and surveys, advisory councils and content analysis. Group process methods can be used to identify and evaluate potential impacts. These include such techniques as interactive group meetings, brainstorming, the Delphi Method (a structured process for collecting knowledge from experts using a series of questionnaires combined with controlled opinion feedback) (Adler et al., 1996), mediation, and model-building workshops. EIA reviewers must be aware of these methods and models. They should assess whether appropriate models were used and examine the underlying assumptions and data on which the models were based (Huang et al., 2003).

5.0 Environmental Description

Environmental description, also known as baseline studies, is intended to establish the present state of the environment, taking into account changes resulting from natural events and from other human activities (Glasson, 1994; Canning et al., 2003). If an environmental description is flawed, this will reduce the accuracy of subsequent predictions and mitigation measures (Canning et al., 2003).

The following are criteria for evaluating the merit of an EIA environmental description:

- ✓ *Comprehensive*

All relevant components of both the biophysical and socio-economic environment and their interactions should be described in sufficient detail to conduct quality impact prediction (European Commission, 2001; Canning et al., 2003).

The biophysical environmental description should include a description of the topographical and geological features (slope; grade; soil; permeability; mineral content; load bearing capacity; radiological characteristics; significant geological and topographical features (i.e. land quality, erosion); hydrological features (chemical, physical and biological parameters of surface, ground, and

ocean water, sources of water supplies, drainage basins, and quantity of water sources); air, climate, and weather conditions; and flora and fauna (pertinent habitats, endangered species, ecosystems and relationships among species) (European Commission, 2001; Canning et al., 2003).

The socio-economic environmental description should include: quality of life data (income, employment and business/industry trends, recreational opportunities, and public health status); a community profile (resource use, land use, townscape, transportation networks, infrastructure, noise, population density, and demographics); and a description of significant sites (Indigenous, historical, spiritual, archaeological, and cultural) (European Commission, 2001; Canning et al., 2003).

A description of the project-environment interactions should include: changes that will happen in the environment regardless of the project; an environment defined in temporal and spatial terms; a description of the interactions between project effects; a description of the interactions with effects of other projects; and a description of the existing health of the ecosystem (productive, carrying, and assimilative capacity) (European Commission, 2001; Canning et al., 2003).

- ✓ *Inclusive*

Many types of information from a variety of disciplines can be considered. This may include historical records, Traditional Ecological Knowledge (TEK) (TEK is defined in Section 6.0), and new information collected from scientific studies. The information should consider, but is not limited to, traditional and academic sources (European Commission, 2001; Canning et al., 2003).

- ✓ *Scientifically Sound*

The appropriate sampling and analytical methods must be used to gather information. The methods must be applied correctly. Limitations in study conclusions should be identified. Information must be presented in a logical manner (European Commission, 2001; Canning et al., 2003).

6.0 Public Participation

Public participation is a key component of an EIA and is used to integrate citizens into the environmental decision-making process. Traditional decision-making approaches such as closed-door discussions between politicians and experts are no longer appropriate (Vasseur et al., 1997; Duinker, 1998a; Barrington et al., 2003). Public participation, if it is to be democratic, must foster trusting relationships through open and honest negotiations between proponents and the public (Barrington et al., 2003.

The terms ‘participation’ and ‘consultation’ are often used interchangeably but actually differ in “the degree to which those involved in the process are able to influence, share, or control the decision-making” (Marshall et al., 1997, p. 2; Barrington et al., 2003). Public consultation involves “education and information sharing, with the goal being better decision-making by the organization through consulting with the public”, whereas participation “brings the public directly into the decision-making process” (Marshall et al., 1997, p. 2; Barrington et al., 2003).

The following are criteria for evaluating the merit of public participation in an EIA:

- ✓ *Clear statement of the goals of the public participation program*

The goals of the public participation program must be clearly stated (CSA, 1996; Duinker, 1998b; Chess et al., 1999; Shillington, 1999; Barrington et al., 2003).

- ✓ *Early public involvement*

The public must be involved early in the process (Grima, 1997; Duinker 1998b; Chess et al., 1999; Shillington 1999; Barrington et al., 2003). The public must not be placed in a reactive position. Decisions must not be evaluated after they have been made but rather participants must be involved at all stages of the EIA process. The public must be given sufficient time to digest information and prepare its comments, while keeping the whole procedure within a reasonable time frame. The program must be well planned with the help of enlisted experts (CSA, 1996; Grima, 1997; Duinker, 1998b; Shillington, 1999; Barrington et al., 2003).

- ✓ *Use of various mechanisms of public participation*

Various mechanisms of public participation should be used (Duinker, 1998b; Chess et al., 1999; Shillington, 1999; Barrington et al., 2003). When dealing with large numbers of participants, the use of different techniques encourages the widest range of stakeholder participation. When evaluating public participation processes, the rationale behind the selection of techniques, the manner in which problems are dealt with, and the way in which stakeholders and administrators interact should be considered. This will allow the evaluator to determine the level of fairness, objectivity, and openness of the entire process (Morgenstern et al., 1979; Chess et al., 1999; Barrington et al., 2003). It should be evident that the decision-maker has made a stringent effort to incorporate the public's input (Parenteau, 1998; Barrington et al., 2003).

Numerous approaches and techniques are used in public participation such as hearings, meetings, advisory committees, workshops, task forces, and role-playing (Grima, 1977; Parenteau, 1988; Vasseur et al., 1997; Barrington et al., 2003). The methods of choice should depend on various factors including public knowledge and experience, and the volatility of the atmosphere (Marshall et al., 1997; Barrington et al., 2003). New techniques and approaches are continually emerging for public participation. Innes et al. (2000) argued that traditional approaches such as hearings and opinions polls, are bureaucratic and alienating, and do not constitute participation. These methods are being replaced by more collaborative approaches that bring together organized interest groups, citizens, and government agencies, and engage participants with one another and with decision-makers (Barrington et al., 2003).

- ✓ *Public participation techniques modified depending on situation*

The public participation techniques should be modified to suit each situation (Duinker, 1998b; Chess et al., 1999; Shillington, 1999; Barrington et al., 2003). The format of methods, such as public hearings or meetings, may be altered so that they are less formal (CSA, 1996; Grima, 1997; Chess et al., 1999; Barrington et al., 2003). Program scheduling must be flexible, with varied times and places of activities, so that anyone who is interested in participating is given an opportunity (Barrington et al., 2003).

- ✓ *Feedback collected during public participation*

Feedback should be collected while the program is in progress (CSA, 1996; Chess et al., 1999; Barrington et al., 2003). Public participation programs are often more successful when they are evaluated while in progress because it provides an opportunity for the program to be modified during the process (Barrington et al., 2003).

- ✓ *Inclusion of all stakeholders*

Everyone who could possibly be affected by the decision must be included in the process (CSA, 1996; Grima, 1997; Duinker, 1998b; Shillington, 1999; Barrington et al., 2003). Every effort must be made to inform potential stakeholders about the proceedings. If the number of participants able to attend is limited due to financial constraints or other reasons, efforts must be made to ensure that all stakeholders have adequate representation (CSA, 1996; Grima, 1997; Chess et al., 1999; Barrington et al., 2003). When projects affect Indigenous peoples, they must be included in the process. They provide valuable Traditional Ecological Knowledge (TEK). TEK, as defined by Berkes (1999, p. 9), is a "cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationships of living beings (including humans) with one another and with their environment."

- ✓ *Transparency*

The entire process must be transparent. There must be clear notice of what decision or decisions are pending (Parenteau, 1998; Barrington et al., 2003). Participants must be kept well informed of the public participation procedures and decisions being made throughout the process (CSA, 1996; Grima, 1997; Duinker, 1998b; Chess et al., 1999; Barrington et al., 2003). Stakeholders must be given access to technical information regarding the proposal. If required, assistance in understanding this information must be provided so that all are able to formulate informed opinions. The methods for how the results of the participation are to be dealt with must be established and known in advance (Parenteau, 1998; Barrington et al., 2003).

- ✓ *Public contributes to final decision*

The main objective of public participation is for the public to make a meaningful contribution to the final decision. For example, the public may bring forward new information or concerns, thereby influencing project components such as location or size (Chess et al., 1999; Barrington et al., 2003). Not all ideas put forward will be implemented but decision-makers should find a reasonable balance among competing values (Duinker, 1998b; Barrington et al., 2003). When ideas or concerns are not addressed in the final decision, a reasonable explanation must be provided (Grima, 1997; Shillington, 1999; Barrington et al., 2003). The participants should be satisfied with the process and understand the rationale behind decisions (Barrington et al, 2003).

- ✓ *Inclusion of conflict resolution mechanisms and consensus building*

Public participation must include conflict resolution and consensus building mechanisms (Grima, 1997; Barrington et al., 2003). Cooperation, collaboration, and meaningful communication should be emphasized from the beginning (Shepherd et al., 1997; Barrington et al, 2003).

7.0 Biophysical Impact Analysis/Forecasting

A biophysical impact analysis is an attempt to measure the future impact of human activities on the Valued Ecosystem Components (VECs) before a project is implemented (Jones et al., 1985; Côté et al., 2003). VECs are biological or physical entities for which decision-makers need to make forecasts for evaluation purposes (Duinker et al., 1986a; Côté et al., 2003). The selection of the VECs will depend on the EIA. VECs assist in focusing the assessment on key issues that are relevant from an ecological, scientific and social standpoint (Kirk, 2000).

A biophysical impact analysis involves at least two forecasts. One forecast predicts how the biophysical components will change and evolve naturally. The second forecast predicts how the components will respond to the proposed project (Côté et al., 2003).

The following are criteria for evaluating the merit of biophysical analysis/forecasting in an EIA (adapted by Côté et al., 2003 from Duinker, 1985; Environmental Resources Limited, 1985; Raymond et al., 2001):

- ✓ *Clearly identifies methods*

Methods or tools used to analyse and forecast the biophysical impacts should be clearly stated. This allows all concerned to determine whether the appropriate method or model was used in impact forecasting. The forecasting technique chosen should depend on the expected use of the data, the nature of the project and the availability and quality of data. Thus, the biophysical impact analysis should be transparent, explicit and easy to replicate (Côté et al., 2003).

- ✓ *Analysis of all impacts on all VECs*

Biophysical impact analysis should study direct, indirect, interactive, cumulative, temporary, permanent, long-term, and short-term impacts on all identified VECs. Impact, as previously defined by Raymond et al. (2001), is "any change in the physical, natural or cultural environment brought about by development." Impacts are not restricted to the project boundaries determined by humans. For example, water and air pollution, besides affecting areas within the project site, may also affect areas down stream or down wind. Therefore, impacts must be examined beyond the project site. These impacts would have been identified in the scoping process (Côté et al., 2003). Assessing these types of impacts is also known as Cumulative Effects Assessment (see Section 10.0 of this report).

- ✓ *Based on forecasts with and without the project*

The biophysical analysis needs to consider project impacts as well as the proposed area's natural changes. Appropriate emphasis should be given to the most severe, adverse impacts of the project with lesser emphasis provided to less significant impacts. The positive and negative effects of alternative interventions on VECs should be stated explicitly (Côté et al., 2003).

- ✓ *Specification of temporal and spatial impact distribution*

Most impacts are not uniformly distributed so the distribution of the impacts in time and space and their magnitude (high and low) must be specified. Decision-makers are interested in knowing when and where certain magnitudes of the impact are to be expected (Côté et al., 2003).

- ✓ *Uncertainties acknowledged and implications on impact forecasting reported*

Uncertainties in the results caused by either lack of data or any other reasons should be acknowledged and their implication on the impact forecast reported (Côté et al., 2003).

- ✓ *Well communicated*

An impact forecast study must be well communicated. The results should be easy to read. A non-technical summary of the forecast results should be included to enhance readability and understanding (Côté et al., 2003).

- ✓ *Collaborative process*

Biophysical impact analysis and forecasting should be a collaborative process whereby the impact analysis and forecasts are distributed for feedback from peers and the public.

8.0 Social Impact Assessment

The Social Impact Assessment (SIA) is an important component of the EIA process that determines probable social, cultural, economic, heritage, and health impacts, of a proposed project on affected individuals, groups, and communities. Today, SIA has gained wider acceptance since it is now performed by trained social scientists that employ social science methods. To predict the anticipated social impacts of a project, sociologists collect data at different stages of a project using variables. Although using a variable list as a checklist is not advised, because different, yet important variables may be discovered in the SIA process**,** a list can provide a starting point for reviewers (Burdge, 1998; Bigney et al., 2003).

The following are criteria for evaluating the merit of a SIA in an EIA:

- ✓ *Use of qualitative and quantitative data*

Both qualitative and quantitative data should be used. Variables examined should be those that are important to affected communities, not simply those that are easy to quantify (NEPA, 2002; Bigney et al., 2003).

- ✓ *Attention to impact equity*

Special attention should be given to vulnerable segments of the population to determine impact equity (NEPA, 2002). SIAs should evaluate vulnerability, resiliency, and adaptability of communities, and of groups within communities (Endter-Wada et al., 1998; Bigney et al., 2003).

- ✓ *Use of appropriate models*

The approach taken depends on the goals and context of the project and of the SIA. The dominant models are the technical model and the political (or participatory) model. The technical model implies that a SIA is an exercise intended to contribute to a rational analysis, and is founded on rational decisions, information, and science. The political model suggests that an open, participative process leads to better decisions, as decisions are not value neutral and should not attempt to be value neutral (Lang et al., 1981; Bigney et al., 2003).

- ✓ *Public participation*

SIA requires public participation. Efforts must be made to include groups that may have cultural or linguistic barriers to involvement (NEPA, 2002; Bigney et al., 2003). Data derived from public involvement can be used to determine which groups or communities should be interviewed for a SIA (Endter-Wada et al., 1998; Bigney et al., 2003).

9.0 Impact Significance

Determining impact significance is a difficult task limited by an incomplete understanding of the term significance, poor data, value judgments, and complex process interactions that compromise evaluation (Miller et al., 1980; Duinker et al., 1986b; Curran et al., 2003). No uniform definition of significance exists (Haug et al., 1984). Therefore, EIAs are free to include both qualitative and quantitative methods of evaluating impact significance (Fedra, 1991; Curran et al., 2003).

The following are criteria for evaluating the merit of determining impact significance in an EIA:

- ✓ *Clear definition of significance*

The term significance should be clearly defined in the EIA. Significance determination thresholds and criteria must be defined and substantiated (Gibson, 2002; Curran et al., 2003).

- ✓ *Systematic, traceable and reproducible*

The significance determination approach process should be explicitly described and traceable (Gibson, 2002; Curran et al., 2003). A systematic and reproducible approach should be used whether the approach is subjective or objective (Mathews, 1975; Curran et al., 2003).

- ✓ *Justifiable*

Justification of the method for evaluating impact significance should be included since it will reveal if the EIA is acceptable. The method for determining significance should involve use of defensible, logical, analytical, and scientifically sound methods (Thompson, 1988; Curran et al., 2003).

- ✓ *Public participation*

Public participation is key to determining the significance of an impact because it allows the affected and non-affected public an opportunity to highlight areas and impacts that may not have been addressed by traditional forecasting methods (Thompson, 1988; Curran et al., 2003).

- ✓ *Structured group decision making technique for impact significance*

A structured group decision-making technique for impact significance should be considered (Thompson, 1988; Curran et al., 2003).

- ✓ *Presentation of trade-offs between impacts*

Trade-offs between impacts should be clearly presented as well as the development of low-impact alternatives (Thompson, 1988; Curran et al., 2003).

10.0 Cumulative Effects Assessment

Cumulative Effects Assessment (CEA) takes into account the changing nature of an environment over time. Duinker (1994) defined the following four major situations that characterize cumulative effects: multiple causes; multiple effects; nibbling in space; and repeat offences. Multiple causes can be

defined as a set or series of actions occurring on a single VEC. Multiple effects occur when a single action produces multiple effects on a VEC. Nibbling in space occurs when a set of individually minor actions operates at the same time and produces a significant environmental effect. Repeat offences are a result of minor actions happening repetitively in the same place and eventually producing a significant effect (Dollin et al., 2003).

The following are criteria for evaluating the merit of a CEA in an EIA:

- ✓ *Assesses effects over the appropriate area*

CEAs sometimes must go beyond jurisdictional boundaries to consider impacts appropriately since the impacts of a project on ecosystems are not confined by political boundaries (Hegmann et al., 1999). The maximum range of impacts on VECs should be used to determine the spatial scale of the CEA. The spatial scale should be realistic and take into account the point at which the effects become insignificant (Hegmann et al., 1999; Dollin et al., 2003).

- ✓ *Identifies and assesses past, present and future actions and effects*

The identification and assessment of past, existing and future actions must be done. Baseline studies should be completed and compared with observed and/or predicted effects. Impacts can occur incrementally over time and go unnoticed. Without the use of baseline studies as a comparison, it is difficult to determine whether an impact has occurred (MacDonald et al., 2000).

A CEA time scale should also extend into the future to allow for time-lagged effects. These effects should be considered for both existing and proposed projects. If possible, the assumed rates for recovery from predicted impacts should be taken into account and used to gauge the time scale for the CEA (MacDonald et al., 2000; Dollin et al., 2003).

- ✓ *Considers effects on VECs due to interacting projects*

An action may be considered benign by itself but when coupled with another event (past, present or future) may cause changes to VECs that are synergistic or additive (MacDonald et al., 2000; Dollin et al., 2003). These changes may not be necessarily damaging and may result in masking or compensatory interactions that reduce or mitigate the potential effects (Dollin et al., 2003).

- ✓ *Evaluates impact significance in consideration of other effects*

The significance of any one action depends on the intensity of the action and the importance and sensitivity of the VECs being affected. When measurable thresholds exist for a VEC tolerance level, they should be compared to the effects of the proposed project. If the threshold is exceeded, then the impact is considered significant (Hegmann et al., 1999; Dollin et al., 2003). If monitoring and mitigation measures are adequate to deal with a potential impact, the level of significance may decrease (Griffiths et al., 1999). Once cumulative impacts and their significance are considered, project regulators can make a more informed decision (Dollin et al., 2003).

11.0 Biophysical Monitoring

The rationale for biophysical monitoring is that it allows environmental impacts of a project to be compared to predicted effects and mitigation measures. A monitoring program is critical for effective environmental management and protection (Cardinal et al., 2003).

The following are criteria for evaluating the merit of biophysical monitoring in an EIA:

- ✓ *Clearly defines goals, objectives and purpose*

The goals, objectives and purpose for the biophysical monitoring program must be explicitly stated. The monitoring objectives must be directly related to project impacts (Canter et al., 1986; Cardinal et al., 2003). In many cases, the goal is to determine whether, if any, predicted impacts occurred, if they occurred as a result of the project, and the effectiveness of mitigating measures (Rigby, 1982). Monitoring can be used as a warning tool, to alert participants when effects are reaching a critical threshold level (Marcus, 1979; Cardinal et al., 2003). The goals must also describe how the monitoring program will feed back into the project, and in turn how the project could be changed if impacts exceed critical levels as defined by regulations and the EIA (Cardinal et al., 2003).

- ✓ *Identifies components to be monitored*

The VECs should be monitored. VECs with the largest project impacts need to be the priority for monitoring initiatives. Therefore, not all VECs need to be monitored because of their relative unimportance or inappropriateness to the project (Davies et al., 1990; Cardinal et al., 2003). Weighting is one possible technique to determine which VECs are appropriate for monitoring (Canter et al., 1986; Cardinal et al., 2003). A number of VECs will be deemed important because they are considered important in the environment (e.g. keystone species) or carry a high social importance (e.g. beautiful landscapes) (Davies et al., 1990; Cardinal et al., 2003).

- ✓ *Identifies participants*

Participants in the monitoring process and their associated roles must be identified. A good monitoring program will explain the roles and responsibilities of all stakeholders to the project including the proponent, government agencies, and any other relevant parties (such as Indigenous groups). There must be a collaborative effort among the groups to coordinate and communicate. Biophysical monitoring programs should attempt to involve local groups at all stages, from deciding the goals and objectives of monitoring to the field data collection and analysis. Intergovernmental cooperation must occur, where required (Aird, 1982; Cardinal et al., 2003).

- ✓ *Identifies time and spatial scales for monitoring*

The time scale for monitoring needs to be clearly defined at the start of the proposed project. The time scale should last until there is sufficient evidence to conclude that the project is not causing significant impacts. The timeline and spatial scale should outline the stages of the program and its specifics (e.g. time of year, time of day, time requirements) (Canter et al., 1986; Cardinal et al., 2003).

- ✓ *Describes monitoring methods*

The methods used to measure environmental effects should be sufficiently described and scientifically sound (Conover, 1985; Cardinal et al., 2003). The methods should also describe the techniques for monitoring quantifiable and measurable VECs. The monitoring information should be collected in the most efficient way possible. The dissemination of results (e.g. annual summary reports or frequent publications) should be described (Cardinal et al., 2003).

The following considerations need to be taken into account when evaluating monitoring programs: integration into the entire project (e.g. pre- and post-project monitoring); inclusion of previously collected data; monitoring of actual VECs (not literature); a demonstrated commitment to monitoring; clear language and description of the monitoring program (clear indications of how tasks will be

accomplished, who will accomplish them, or what is to be measured) (Beanlands et al., 1983; Cardinal et al., 2003); and inclusion of costs associated with the monitoring program (Cardinal et al., 2003).

- ✓ Public accessibility

The public should have access to monitoring results and reports as they come available.

12.0 Presentation

The presentation of an EIA is important because it conveys to the reader the information collected and analyzed. Therefore, the EIA should be accurate, accessible and complete. The report must be written systematically with features such as indices, page numbers, numbered appendices (Arnold et al., 2003).

The following are criteria for evaluating the merit of the presentation of an EIA:

- ✓ *Clear and concise*

An EIA must be clear so it does not confuse the reader, and lead to inaccurate assumptions and decisions. Technical writing should be used to communicate information efficiently but in such a way that it is understandable by a varied audience (Dorney, 1987; Arnold et al., 2003). In technical writing, words should have an average of 5 to 6 letters each, and sentences an average of 10 to 12 words each (Pauley et al., 1983, Duinker, 2003; Arnold et al., 2003). Paragraphs should be short, and contain one main point in the topic sentence that is expanded and explained in subsequent sentences (Weisman et al., 1998; Arnold et al., 2003). Using the active voice also holds the attention of readers (Pauley et al., 1983: Arnold et al., 2003).

It must be clear in an EIA who is proposing the project, where the project will take place, the duration of the project, how the project will be carried out, and how the impacts of the project will be managed (FEARO, 1987; CEAA 2003a; Arnold et al., 2003). The report should contain sufficient information to enable the reader to identify clearly: the proposed project and alternatives; the present environmental and social state of the proposed site; the predicted environmental impacts of the proposed and alternative projects; and the actions proposed to reduce or eliminate adverse impacts (FEARO, 1987; Freedman, 1995; Arnold et al., 2003). To ensure that all readers understand the information presented in EIA documents, the use of scientific and technical terms, and abbreviations should be kept to a minimum (Ross, 1987a; Arnold et al., 2003). Scientific and technical terms should be defined in a glossary (Arnold et al., 2003).

- ✓ *Executive Summary*

The EIA should start with an Executive Summary. The summary must provide an overview of the proposed project, the possible alternatives, and the environmental, social, and economic impacts of the project. An EIA may not be read beyond the summary so it is important that the summary is brief but comprehensive (Freedman, 1995; Arnold et al., 2003).

- ✓ *Organization*

The reader may easily overlook key components of an EIA if they are not properly organized. Accessibility to information can be increased by cross-referencing information using a table of

contents, list of tables, list of figures, and, if the document is large enough, an index (Markel, 1998; Arnold et al., 2003). Following a summary, the report should be divided into sections. The reader's understanding is elevated if each section starts with a short preview of what is included in that section (Freedman, 1995; Arnold et al., 2003). Headings and subheadings help to organize text and draw interest to particular sections (Pauley et al., 1983; Arnold et al., 2003). Headings and subheadings with a system of hierarchical numbering enhance organization of information and readability of an EIA. The format of titles, headings, subheadings, margins, tables, figures, maps, footnotes, and reference citations must be kept consistent throughout the report (Dorney, 1987; Arnold et al., 2003). Including an abundance of explanatory information can decrease the readability of the report so supplementary information should be placed in appendices and in separate documents and be kept in consistent format with the rest of the EIA (Dorney, 1987; Arnold et al., 2003).

- ✓ *Credibility*

The presentation of the EIA must be credible. Quotations, footnotes, and reference lists must be consistent, correct and properly referenced (Weisman et al., 1998; Arnold et al., 2003).

- ✓ *Graphics*

Page layout and graphics add to the readability of a report by making it attractive and easy to retrieve key information. All graphics, photographs, drawings, maps, tables, and figures should have a consistent layout throughout the document. When several maps of the same area are used in the report, all maps should be generated from the same base map (Dorney, 1987; Arnold et al., 2003). Labels and place names must be consistent with those in the text. A list of abbreviations and definitions should be provided if required. Where graphics are used, reference should be made to them in the text, otherwise they could be overlooked (Pauley et al., 1983; Arnold et al., 2003). All tables and figures must be listed at the front of the report. This list must include the table or figure number, title, and relevant units (Arnold et al., 2003). The addition of colour to a report improves the readers' retention of key concepts and information (Dorney, 1987; Arnold et al., 2003).

- ✓ *Public participation*

EIA documents are intended to be accessible to professionals as well as all members of the public. An interactive website can provide information on the process, as well as an opportunity for the public to provide input electronically. The Internet provides a way to notify the public about assessments that the public can become involved in as well as provide detailed information on how to do so. However, each communication medium must be matched to a particular audience and the Internet may not be accessible for some audiences (Arnold et al., 2003).

Project proponents may produce a video, which can be made available to schools, communities and other interested parties. The proponent may also put highlights of the EIA into a database that can be accessed by third parties on a quarterly or annual basis (CICA, 1994; Arnold et al., 2003). The proponent or coordinating agency can also use press releases to notify the public about a pending EIA, or the status of an ongoing EIA. The use of advertisements in local, regional and national newspapers can also inform the public about the availability of project information (CICA, 1994; Arnold et al., 2003). The availability of EIA documents in public places such as the city hall, community centres and public libraries improves ease of access for the public. The coordinating agency must ensure that any public participation techniques pursued consider the official language(s) of the areas of the proposed project (Arnold et al., 2003).

Appendix A: EIA Review Sheet

Project Title: _____

Reviewer: _____ Date received:_____ Date reviewed: _____

Item	Relevance Y/N	Adequate	Further Info Required
Project Description			
Clear and concise			
Comprehensive			
Notes:			
Alternatives			
Feasible			
Diverse			
Objective and timely presentation and development			
No-action alternative			
Avoids “Tokenism” or Disingenuous Alternatives			
Public participation			
Notes:			
Scoping			
Comprehensive and focused			
Timely			
Flexible but systematic			
Public participation			
Appropriate use of scoping models and methods			
Notes:			

Item	Relevance Y/N	Adequate	Further Info Required
Environmental Description			
Comprehensive			
Inclusive			
Scientifically Sound			
Notes:			
Public Participation			
Clear statement of the goals of the public participation program			
Early public involvement			
Use of various mechanisms of public participation			
Public participation techniques modified depending on situation			
Feedback collected during public participation			
Inclusion of all stakeholders			
Transparency			
Public contributes to final decision			
Inclusion of conflict resolution mechanisms and consensus building			
Notes:			
Biophysical Impact Analysis/Forecasting			
Clearly identifies methods			
Analysis of all impacts on all VECs			
Based on forecasts with and without the project			
Specification of temporal and spatial impact distribution			
Uncertainties and implications on impact forecasting reported			
Well communicated			

Item	Relevance Y/N	Adequate	Further Info Required
Collaborative process			
Notes:			
Social Impact Assessment			
Use of qualitative and quantitative data			
Attention to impact equity			
Use of appropriate models			
Public participation			
Notes:			
Impact Significance			
Clear definition of significance			
Systematic, traceable, and reproducible			
Justifiable			
Public participation			
Structured group decision making technique for impact significance			
Presentation of trade-offs between impacts			
Notes:			
Cumulative Effects Assessment			
Assesses effects over the appropriate area			
Identifies and assesses past, present and future actions and effects			
Considers effects on VECs due to interacting projects			
Evaluates impact significance in consideration of other effects			
Notes:			

Item	Relevance Y/N	Adequate	Further Info Required
Biophysical Monitoring			
Clearly defines goals, objectives and purpose			
Identifies components to be monitored			
Identifies participants			
Identifies time and spatial scales for monitoring			
Describes monitoring methods			
Public accessibility			
Notes:			
Presentation			
Clear and concise			
Executive Summary			
Organization			
Credibility			
Graphics			
Public participation			
Notes:			

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