Environment Canada and
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des évaluations environnementales

# CONSIDERING ALTERNATIVE MEANS OF CARRYING OUT A PROJECT UNDER THE CANADIAN ENVIRONMENTAL ASSESSMENT ACT

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Canada

**NOTE**

This document was prepared in draft by Paul Rennick, MacViro Consultants and edited by the Environmental Assessment Branch, Environment Canada and the Federal Environmental Assessment and Review office (FEARO).

It is undergoing distribution to transfer the information to people working in the field of environmental assessment. This distribution does not signify publication and if the report is referenced , it should be cited as an unpublished report of Environment Canada and FEARO.

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## 1. INTRODUCTION

This report provides managers with a recommended approach to assessing alternative means of carrying out a project. It focuses on Comprehensive Studies under the Canadian Environmental Assessment Act (CEAA). A comprehensive study is an EA that is more rigorous and intensive than a screening. It must consider all of the same factors as a screening, along with a number of other factors including a consideration of alternative means of carrying out the project. The Act is accompanied by a Comprehensive Study regulation which sets out specific types of projects that will undergo this type of assessment. The overall process is summarized in Figure 1.

### 1.1 What' are Alternatives in EA?

There are two types of alternatives considered in CEAA:

i. Alternatives to the project are functionally different ways of approaching and dealing with a problem or opportunity. If the project is a landfill site, alternatives to the project may include the export of waste outside the study area, incineration with landfilling, or extensive application of reduction, reuse and recycling technology with landfilling. If the project is a road, alternatives to the project may include modal options such as public transit, mixed modes including transit and road scenarios and conservation options such as incentives to reduce vehicular travel. Alternatives to the project are only considered at the discretion of the Responsible Authority (for Screenings), or at the discretion of the Minister (after consulting with the Responsible Authority) for Comprehensive Studies, Mediations or Panel Reviews.

The "no go" or status quo situation is not an alternative to the project. Rather, it provides a benchmark against which to evaluate the alternatives being considered.

ii. Alternative means of carrying out a project are alternatives of a similar technical

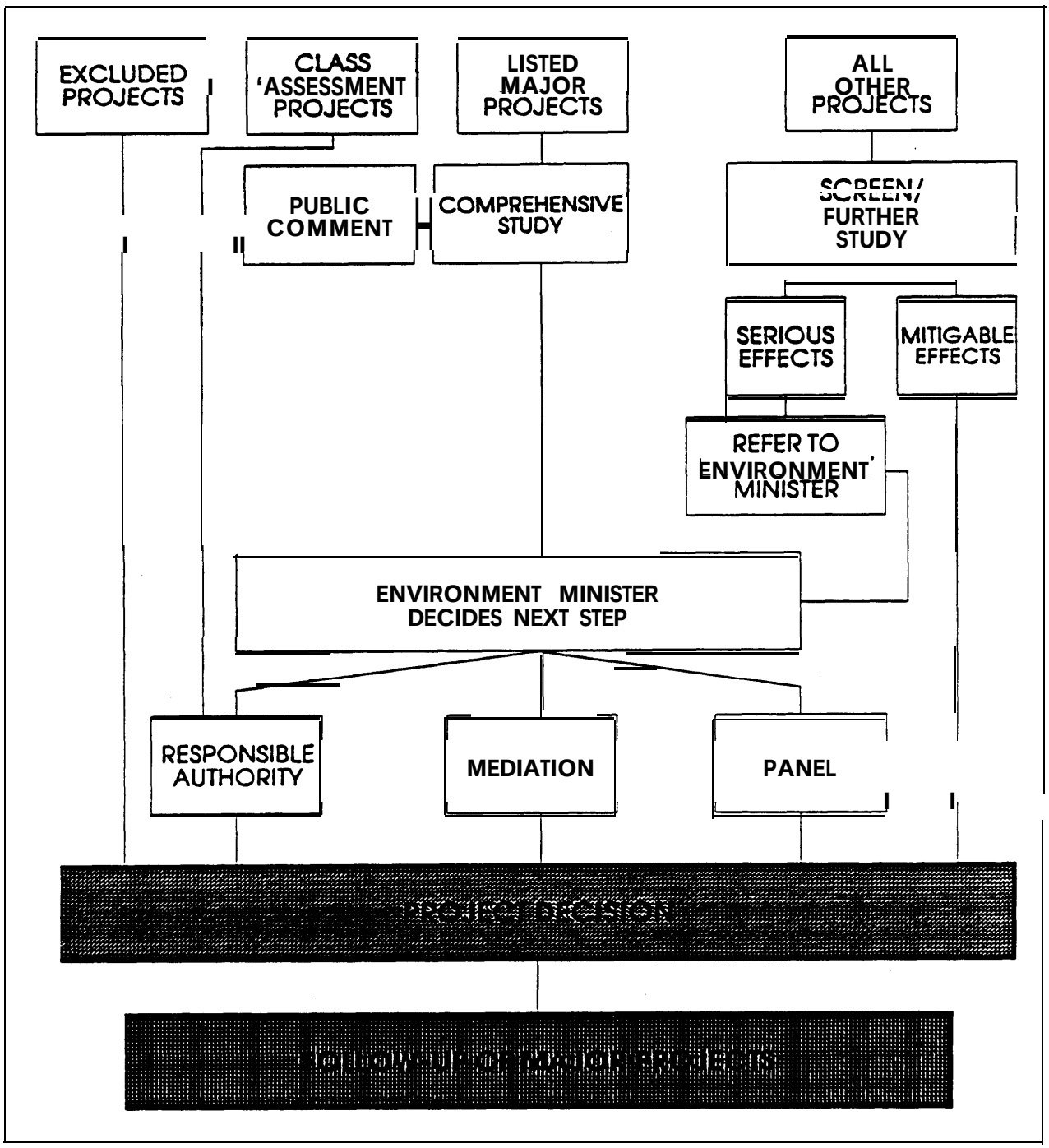



**Figure 1 -** Assessment steps under the Canadian Environmental Assessment Act (CEAA).

character or ones that are functionally the same. For instance, if the project is a landfill, an alternative means may be another site for the landfill. Similarly, if the project is a road, an alternative means may include different corridors and different alignments within the preferred corridor. Once a preferred site or corridor/alignment is chosen, various design alternatives or options come into play. For the landfill example, one alternative to prevent potential leachate from moving off-site would be to use a liner, another would be to avoid the expense of a liner and emphasize contouring, landfill height, etc.

### 1.2 Why consider alternative means in EA?

Many environmental impacts are best prevented before irrevocable location and design decisions have been made. This can only happen if environmental factors are taken into account when making these decisions. If they are, then valued ecosystem components and social and cultural amenities can be avoided and a design can be used that is optimum from a technical, economic and environmental stand-point. It is also more efficient to address certain impacts at an early stage, before final site and design choices have been made. If this is not done, then the proponent may be faced with expensive mitigation., remediation or compensation requirements.

### 13 What are the Legal Requirements?

Section 16(1) of the CEAA stipulates that all environmental assessments must include a consideration of the following factors:

- the environmental effects of the project (including cumulative effects and effects of malfunctions or accidents);
- the significance of the environmental effects;
- public comments;
- feasible measures to mitigate the environmental effects of the project.

In addition, the Responsible Authority may include, at his discretion, a consideration of the need for the project, and reasonable alternatives to the project. Furthermore, if the project to be assessed is on the Comprehensive Study list or is subject to a Mediation or Panel review, the environmental assessment must also include the following factors:

- the purpose of the project;
- alternative means of carrying out the project;
- the need for and requirements of a follow-up program;
- the capacity of renewable resources affected by the project to meet the needs of present and future generations.

The following Sections of this report forego an investigation of how alternative means may be considered at the public review phase of the CEAA process and focus on the Comprehensive Study process.

## 2. ALTERNATIVE MEANS AND THE COMPREHENSIVE STUDY PROCESS

**The consideration of alternative means of** carrying **out a project** is a key component of a **Comprehensive Study, a** Panel Review, or a Mediation exercise. This report uses the Comprehensive Study process to illustrate how this consideration can be integrated into the EA process.

As noted in the Legal Requirements section of this paper, a number of core and additional factors must be considered during the Comprehensive Study process, including alternative means. Before discussing this topic in detail, the following brief commentary is provided on **a few overlying factors.**

### 2.1 Purpose of the Project

There is a clear difference between the purpose of a project and the description of a project. Fundamentally, the purpose of a project is explained at the outset of the EA and the description of the project occurs at the end of the process after project alternatives have been assessed and the preferred location and course of action selected. In other words, the initial thoughts on a particular project location and design may be dramatically altered as a result of a Comprehensive Study, thus one begins with a general statement of purpose and ends with a specific description of the preferred project.

When describing the purpose of a project, it is important to define and legitimize the problem to be solved. This is especially true when route and site selection is feasible. A compelling argument needs to be put forward that the status quo is less than satisfactory (for example, an existing road may be narrow and winding and traffic fatalities may be high) and that changes are needed. Without such **a** rationale, the public will have little reason to support the project.

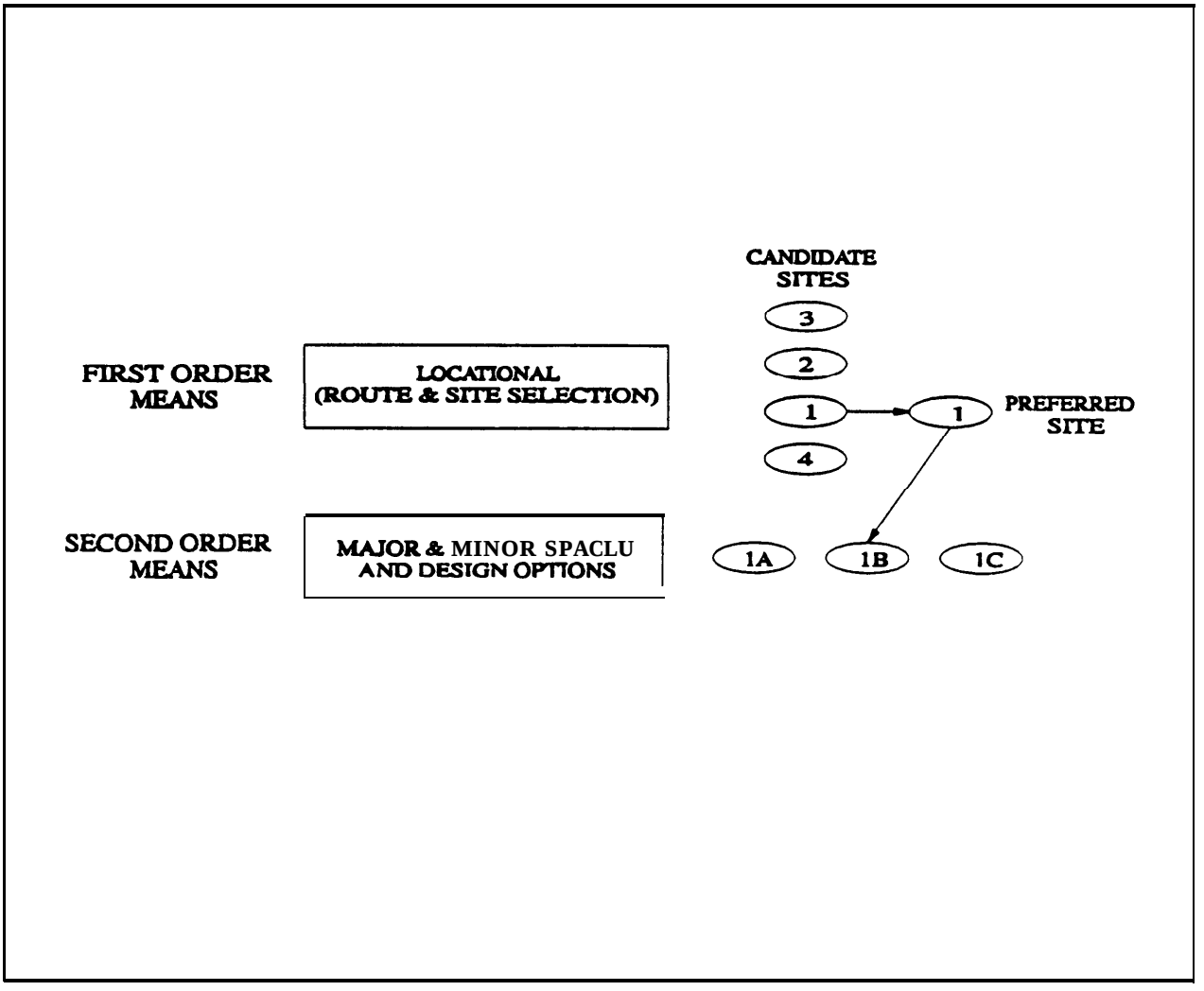
## 2.2 Scoping and the Consideration of Alternatives

Scoping is used to define the study area boundary, thus reducing the number of alternative sites that need to be considered, and to identify environmental issues. Those issues that can be addressed when selecting preferred site and design alternatives would be highlighted for attention in the EA.

Issues that are site dependant (ie, ones that can be mapped, such as high quality agricultural lands, a valued ecosystem component such as a wetland, etc.) would be identified first, then issues that relate to project design would be considered, see figure 2.

As noted above, there is a hierarchial ordering of alternative means involving first order locational alternatives and second order design alternatives. These are discussed in the next sections.

Figure2




## 3. ASSESSING ALTERNATIVE LOCATIONS

This section offers a general discussion on the assessment of alternative locations or sites for a project, including problems with the traditional site selection process, together with some guiding principles or rules on how to make the process more effective. Before proceeding with the guiding principles, an overview of the methodology is provided, as follows: environmental and social effects are assessed for each site that is feasible from a technical, economic, environmental and social standpoint. To determine feasibility, it is

normal practice to conduct an initial elimination of potential routes and sites based on objectives and criteria that define the non-acceptability of a site and that are publicly developed. Once the known, major valued ecosystems and social/cultural amenities are eliminated from consideration, environmental and directly related social effects are assessed for the sites remaining, using publicly derived selection criteria. In the end, a preferred site is identified, one that meets technical, economic, environmental and social requirements.

Now, some basic facility siting "do's and don'ts" will be provided, all based on North American experience over the past decade:

### 3.1 Consider a Cooperative EA Process

Rule number one for identifying and assessing alternative locations for a project is to establish a cooperative, joint planning route/site selection process. Facility siting experience over the past decade indicates that the traditional, technically driven, decide, announce, defend (DAD) approach to facility siting is increasingly unsuccessful. This is especially true for the so-called locally unwanted land uses (LULUs) many of which are on the Comprehensive Study List. These projects are often perceived as a threat to health and safety, may be seen as a stigma by the local community and often cause a change in social cohesion, disrupting traditional life styles.

The technically driven approach to facility siting is problematic for many reasons, the most compelling of which are:

- consultation is too little, too late
- site selection criteria often fail to reflect public values
- citizens want some control over what happens in their own community - now controlled by the proponent and regulator

- there is a lack of trust of government and experts
- lack of participant funding
- inequity exists between those who benefit and those who live near the facility

Left unresolved, these issues lead to confrontation, elevated public concern and opposition to a candidate site that otherwise may be suitable. They may also lead to a Panel Review, when the issues could have been resolved during the comprehensive study.

Typical reactions to the traditional approach to site selection include:

- why us?
- organized confrontation
- us vs. them
- extreme (outrageous) positions
- selective fact finding (misinformation)
- attack mentality

Most of these site selection problems relate to social and political factors and a flawed planning process. Experience strongly suggests that they can all be avoided if time and resources are spent at the front-end of the assessment process, before irrevocable locational and design decisions have been made, within a process that is seen as fair and equitable by all parties.

To establish a fair and equitable process, the Responsible Authority should, at a minimum, consider the following:

i. Establish a Comprehensive Study process that is less confrontational and more cooperative. This can be achieved by publicly establishing a collaborative and partnership approach to planning and decision-making before route and site selection begin.

ii. Recognize that citizens increasingly want control over what happens in the& local community. There is a need to move away from total control by the proponent and the regulator to shared decision-making. Take measures to empower the local community and those with a stake in the stewardship and use of the natural resources by giving them an active role in decisions. This can be achieved by establishing joint planning teams, public liaison committees and by working with local councils.

iii. There is a great lack of trust by citizens of government officials and experts. Flawed planning processes and continued mistakes in delivering the process only fuels this lack of trust. Build trust by joint fact finding so that all parties are playing by the same rules and with the same information For sensitive projects or situations where the Responsible Authority or the proponent is not trusted, consider replacing the proponent with a neutral third party as keeper of the process. In this situation, the proponent would provide the technical input to the Comprehensive Study process carried out by the third party which could be a consultant, an integrated core team or an independent task force skilled in facility siting techniques. The strategy is to institute shared exploration of the issues and joint decision-making based on full information.

iv. Recognize that equity is often an issue. The location for and construction of a project will likely have wide benefits for the whole region, but negative impacts may be narrowly focused on those who live near the corridor or site. Thus, for a Comprehensive Study process to be seen as fair and equitable, careful consideration of the distribution of costs and benefits must be part of the process. Compensation, both impact-related and equity-related, should be considered so that those who own property or live near the facility are at least no worse off by its location and preferably are able to benefit as a result of the project.

v. Traditionally, perceived risks and stigma resulting from a new project have not been addressed in EA studies. But these so-called soft issues must be addressed if project alternatives are to be properly considered and accepted by the public. This is achieved by listening with understanding to community and individual concerns, treating those concerned with integrity, providing factual information and carrying out a cooperative process and shared exploration of issues.

vi. Frequently, public and agency consultation is too little too late. Since the public has standing in the CEAA, it is essential that a carefully planned and executed consultation program be established from the outset of a Comprehensive Study. Public acceptance of the project will be closely linked to the legitimacy of the process. Thus the EA process should be planned and receive general acceptance using the consultation program as a vehicle to achieve such acceptance.

Every effort should be made to avoid the DAD approach to facility siting where the public finds out about locational and design options after the fact. The DAD approach creates confrontation unnecessarily and unwittingly may cause opposition to a location or design which may be otherwise acceptable.

vii. Recognize that the purpose for a project is different than it's description. Avoid the situation where purpose equals undertaking. The purpose for the project must be carefully explained so that alternative means can be examined and boundaries of the study area established accordingly.

viii. The development of criteria to define the environmental and social acceptability of a location alternative need to be jointly developed by responsible agencies and the public for the process to be seen as fair.

ix Each candidate site should be assessed in the same way using a similar level of detail so that comparisons can be made.

x. A predisposition to one alternative is not acceptable in EA. Each locational or design alternative must be fairly and objectively described and compared, thus avoiding the pitfall of entering the process with an obvious favourite. Objectivity and integrity in the EA process is essential if the public is expected to arrive at some level of informed consent.

The above procedures to encourage cooperation and the resolution of conflicts do not replace the need to carry out a thorough approach to route/site selection which includes:

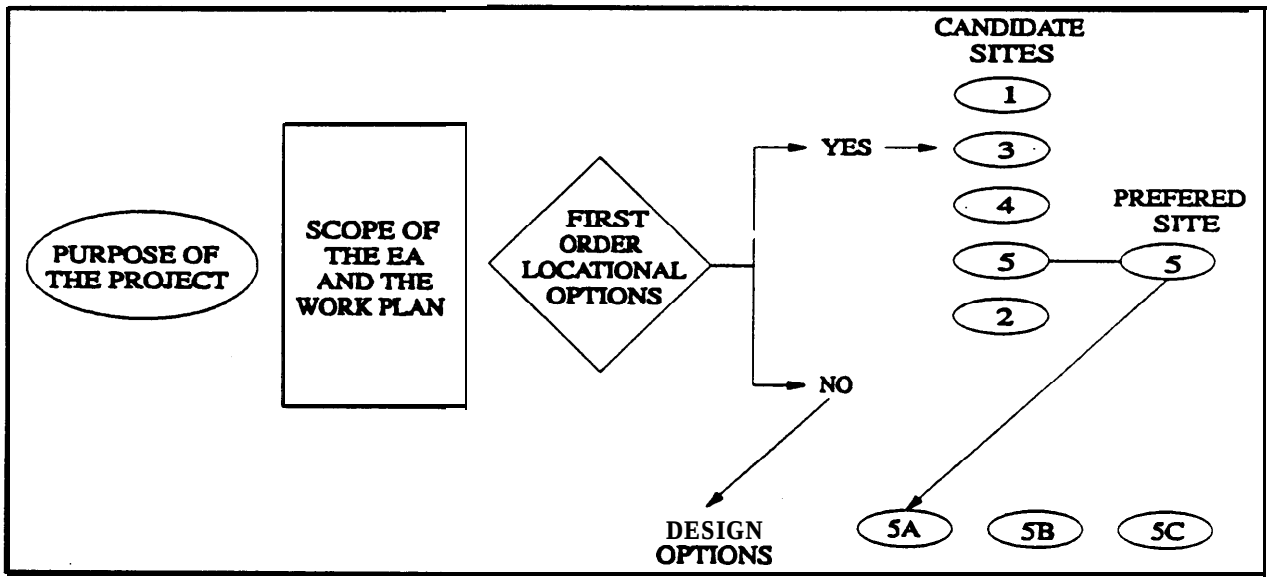
- considering all potential routes/sites that meet the minimum criteria of suitability;
- a systematic, hierarchial process of site elimination and the assessment of those that remain;
- site selection criteria chosen to respond not only to traditional technical and economic issues but also to human health and safety issues, environmental protection issues and the requirements of the Responsible authority;
- a well defined and publicly accountable decision-making process;

Rule number two for locational alternatives is to avoid valued ecosystem components, productive natural resources and social and cultural amenities wherever possible. In other words, the proposed physical project or activity must be located so that it is compatible with the integrity of the natural resources and social or cultural factors.

In Figure 3, the consideration of locational and design alternatives/options is shown in relation to the earlier steps involving issue scoping and a definition of the project purpose.

Most of the projects likely to be included on the Comprehensive Study List Regulation, such as dams, National Park boundaries, oil refineries, major pipelines, electrical transmission lines, facilities for managing used nuclear fuel, a new military base, a new rail line or road and other similar projects will require a consideration of locational

**Figure 3**




alternatives. However, there may be extenuating circumstances where their examination may not appear to be practical. For instance, moving to another corridor or site may cause greater environmental impacts than remaining in the same location, depending on whether the project is a green field situation or an addition/reconstruction of an existing situation_ Even for these circumstances, it may be necessary to compare reasonable locational alternatives to verify that the proposed location is the most environmentally acceptable, socially responsible and technically feasible one.

As another example, reconstructing a two-lane road to four or more lanes to match previously built alignments will require careful consideration of locational alternatives. For some situations, the existing corridor would be preferred. Other circumstances may point towards a new alignment. This would be a judgement call by the Responsible Authority based on: 1) the level of public concern, 2) the presence of valued ecosystems and 3) social or cultural amenities.

Basic technical requirements/criteria that are used to define the acceptability of a site may include certain soil depth, texture and hydrogeological characteristics for a new landfill or proximity to a major water source and transportation facilities for a new

industry. It is essential to clearly and precisely define the minimum technical requirements without which the project could not be built and operated before locational alternatives are considered.

Major environmental constraints/exclusion criteria include components of the natural environment and the social, economic or cultural factors that are known to be especially significant and important to the regional or local area. They are often legally designated by legislation or recognized in approved land use plans, including parks, historic sites, endangered species habitat, areas of scientific interest, burial grounds, proximity to communities, to name a few. These are the areas and features where society has agreed that trade-offs are not acceptable.

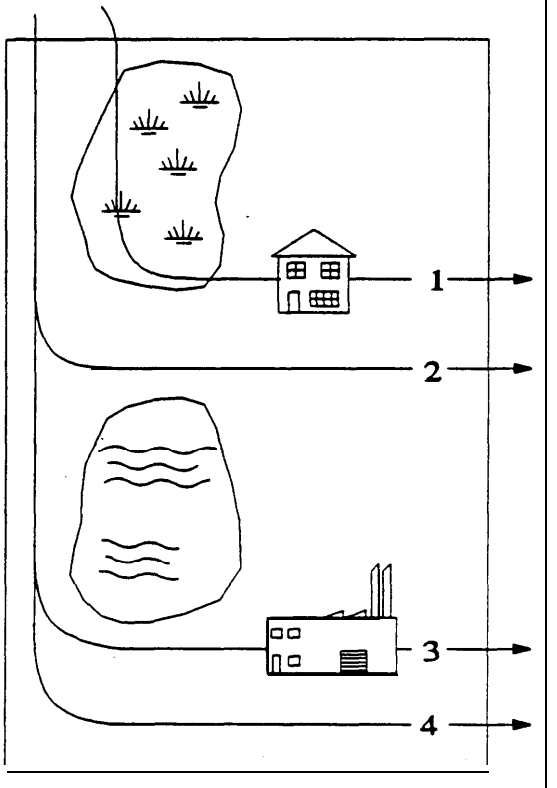
The initial evaluation of site alternatives would use valued ecosystems, social and cultural amenities and unacceptable technical factors to develop objective criteria to eliminate certain sites/areas from further consideration. This is illustrated in Figure 4.

The criteria are clearly and rigorously worded for each environmental issue or technical factor, where trade-offs are not acceptable. A rationale for each criterion is also required. They must be publicly derived, rigorously defined and defensible from the outset and they must also be systematically and consistently applied. Furthermore, where criteria are ranked, the review agencies and the interested public must assist in the assigning of importance to each criterion. To do otherwise simply runs the risk of not meeting an agency mandate or a public preference, resulting in confrontation and increased opposition to the project. Following are three examples of siting criteria. Additional examples are contained in the Environment Canada report entitled: Environment Code of Practice for Steam Electric Power Generation, Siting Phase.

Criterion A - Avoid lands containing flora or fauna, rare or unique to the region; critical wildlife habitat; or designated sensitive natural areas in their regional context.

**Figure 4**

| ROUTES OR LOCATIONS | CRITERIA A B C D ETC. |
|---|---|
| 1<br>2<br>3<br>4 | TO SURVIVE THE INITIAL SCREENING AN ALTERNATIVE MUST RECEIVE "YES" ON ALL CELLS IN THE YES/NO MATRIX |




1 & 3 ARE ELIMINATED

Rationale - Protection of the natural environment is a major concern of the Responsible Authority and an important consideration in the CEAA. The emphasis of this criterion is that components or features of the biophysical environment that are recognized as significant constitute an effective indicator of site sensitivity. In this respect, critical, rare, or unique features have been singled out for screening purposes. Biophysical features that may be lost or subject to negative impact that are not critical, rare, or unique, or are not recognized as particularly sensitive to development will be considered at the post screening, comparative evaluation stage and after a short list of suitable sites have been identified.

Criterion B - Allow for a minimum of 200 ha of a regular dimension of uniform fine textured soils at least 10 m deep.

*Rationale* - A site with a minimum of 200 ha is required to provide for constructing all the required facilities on site, to provide for future expansion based on 40 year projection including the regulatory 100 m buffer.

Criterion C - No site will be located within 1000 m of a recognized residential community including a separated town or village, unincorporated community of 500 person or more including native communities.

*Rationale* - This facility would have impacts on a community including nuisance effects of truck traffic, disruption of social cohesion and perceptions of stigma of such a facility which could potentially affect land values. To avoid these impacts the site should be set well back for existing communities especially sensitive population concentrations such as old age homes, hospitals, schools, etc.

## 4. ASSESSING ALTERNATIVE DESIGNS

Once a preferred project location is selected, design options/alternatives must be considered. They include modifications in site layout and engineering technology that minimize environmental, social and cultural impacts. They also include a consideration of benefits such as regeneration, remedial or economic opportunities as well as minor locational adjustments to avoid or enhance certain site/route features.

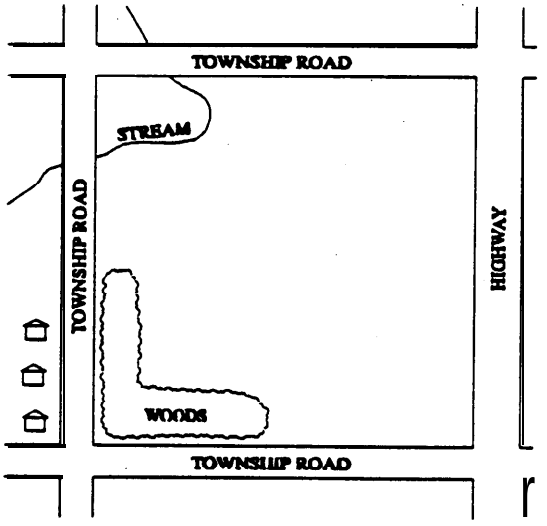
It is assumed that the siting phase would ensure the avoidance of highly valued and ecologically important areas. It now becomes an exercise in project layout and broad design choices, in order to find an alternative that is both technically and environmentally preferred Any remaining ( residual) impacts associated with the preferred design alternative are dealt with via mitigative measures, discussed in Section 5.

There are circumstances, such as new base metal mine, where locational alternatives are not feasible. However, layout alternatives at the site may improve the environmental acceptability of the project. For example, there are choices for the location of the head frame for a mine, whether to put it on the shoreline of a lake causing noise, dust and visual impacts or to locate it away from the lake to reduce nuisance impacts.

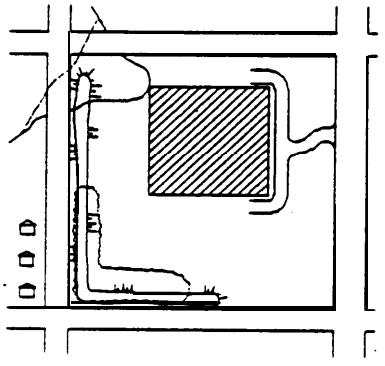
Design options/alternatives are normally compared using similar, but more detailed selection criteria than those used to select a preferred site for the facility. Following are two examples.

4.1 **Facility Example: In this** example, Figure 5, the preferred site has a drainage watercourse running across one comer, a wooded area with remainder generally flat, cleared land. A few residences are located along an adjacent road. The site is serviced by a major highway on the east and surrounded by secondary township roads.

**Figure 5**




**OPTION 1**



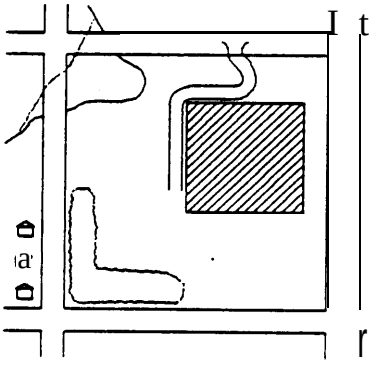
(a) **divert** stream

(b) remove some of woods and build earth berm using excavated soil **from** facility construction to protect residences

0c locate facility in NW sector

(d) bring access in **from** east side of site

OPTION 2



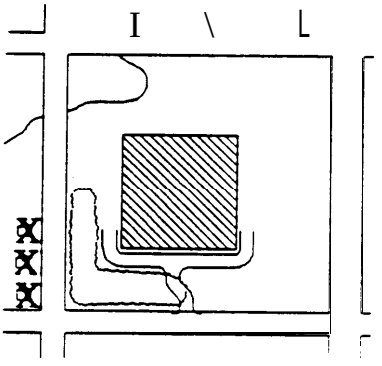
(a) divert stream

(b) protect woods and use as screen to protect residences

0c locate facility in NE sector (furthest away **from** residences

(d) access from north township road

OPTION 3



(a) leave drainage

(b) remove part of woods and purchase residences

0c locate facility in south-central part of site

(d) access from south township road

In this example, the four criteria would be chosen and agreed to by the public and agencies as the ones to use in the comparison of broad design alternatives.

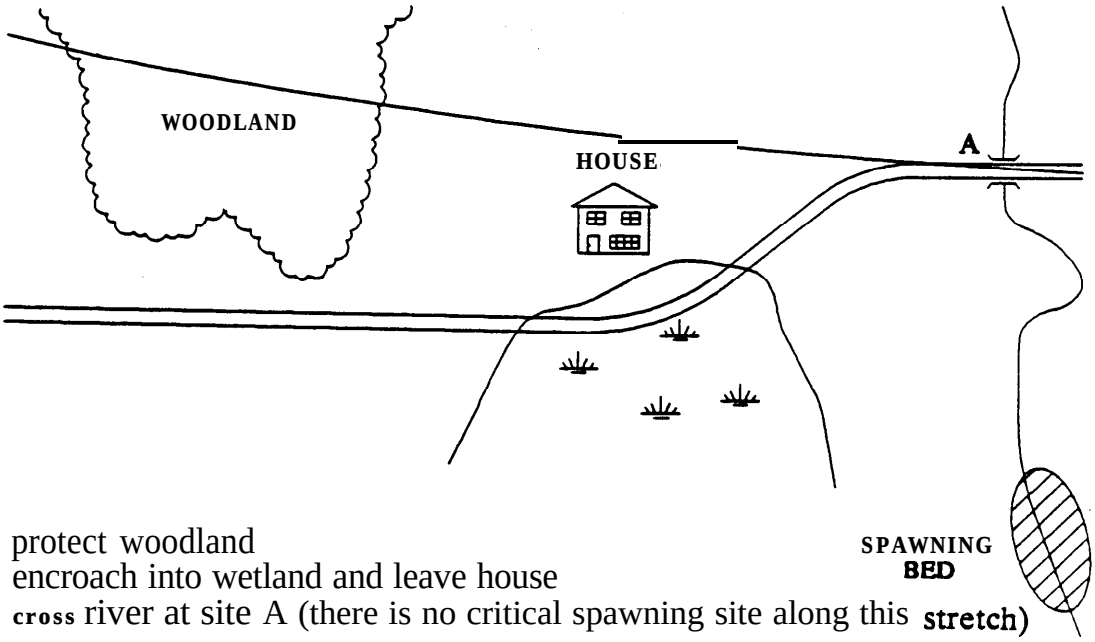
### 4.2 Routing (Road) Example

In the following example, Figure 6, the preferred corridor has a locally valued woodlot (not regionally significant), a class 5 wetland (locally significant) and a navigable river with a sports fish resource requiring bridging.

In this case, alternative means become more complex. First it would be necessary to decide on the best location for the alignment and the major river crossing. (It is assumed that general agreement would be gained during locational screening that a river crossing is required.) Next, a number of major options/alternatives would be considered for the bridge design that minimize erosion potential and keep aquatic and terrestrial habitat and species impacts to a minimum.

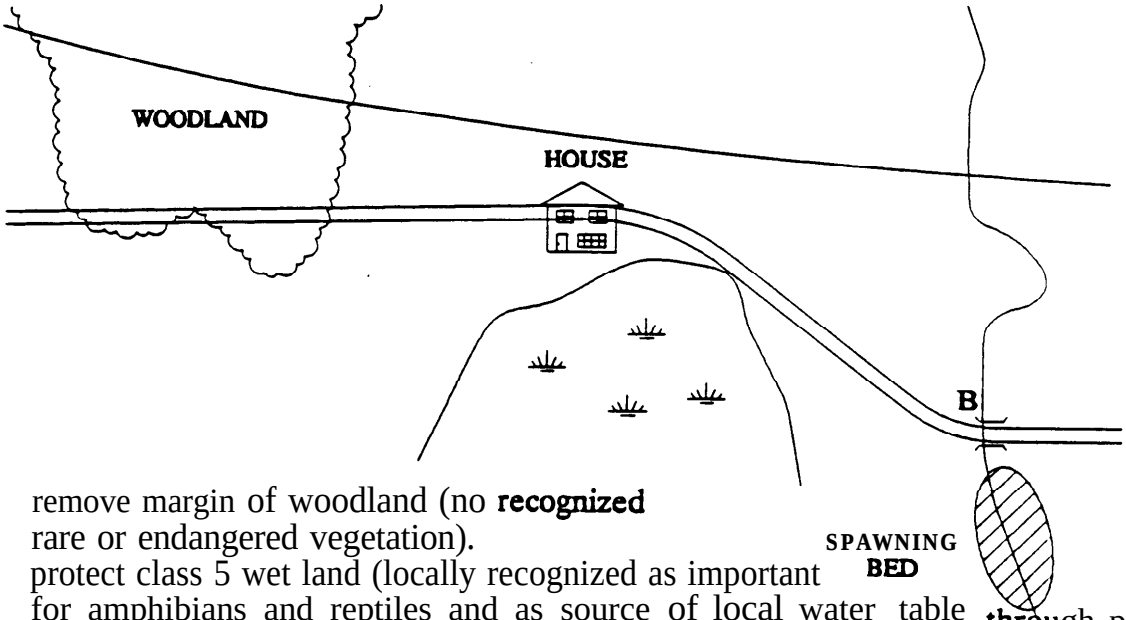
Figure6

**OPTION 1**




(a) protect woodland
(b) encroach into wetland and leave house
0c **cross** river at site A (there is no critical spawning site along this stretch)

**OPTION 2**




(a) remove margin of woodland (no recognized rare or endangered vegetation).
(b) protect class 5 wet land (locally recognized as important for amphibians and reptiles and as source of local water table through public consultation program).
0c remove house (buy at fair market value) and relocate owner as compensation. This was negotiated with owner during EA process.
(d) cross at site B. Marginal impact on spawning area but not considered significant by F & 0 & local residents and can be protected with bridge design. Site B has better geotechnical capabilities for structure required to carry heavy vehicles for resource extraction.

In both these examples, the evaluation of design alternatives would also include an analysis of residual effects after mitigation measures have been applied.

In summary, as the Comprehensive Study EA moves through an evaluation of locational and design alternatives, information requirements change from general to specific, selection criteria become more detailed and some may be dropped from further consideration. Design alternatives are evaluated in terms of layout as well as broad design factors to avoid local amenities and to minimize impacts. Criteria for evaluating design alternatives must be publicly derived, rigorously defined and defensible from the outset.

## 5. MITIGATION

After a preferred project location and design alternative have been chosen, there are still likely to be residual effects requiring attention and mitigation.

At a typical site, the range of mitigation measures available is quite broad and covers construction practices and engineering design, compensation, contingency planning, follow-up (to determine the effectiveness of mitigative measures) and community relations (to resolve any ongoing concerns and issues). This broad approach to mitigation is in keeping with the CEAA definition: "mitigation is the elimination, reduction or control of the adverse environmental effects of the project; it includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means."

**A** more detailed description of some of the mitigation options that are available, after a preferred project site and design have been selected are as follows:

### 5.1 Construction Practices and Engineering Design:

- modifications to facility design such as installing pollution control devices and noise baffles or choose designs in keeping with landscape
- careful site design and layout including landscaping set-back requirements to protect adjoining amenities and noise barriers, etc.

  adoption of environmentally-sound construction and operation practice such as stockpiling excavated soil well away from streams, dust suppression activity and implementing hours of operation consistent with the local situation

  installing improved window glazing to reduce noise levels, planting vegetation to reduce visual impacts or upgrading local roads to improve safety.

## 5.2 Compensation Measures

Compensation falls into two broad categories including impact-related and equity-related compensation Regardless of how well mitigation measures may be applied, there will be residual effects of siting and operating facilities. The aim of impact-related compensation is to leave the community no worse off than it was before the facility was located and includes the following possible measures:

- in-kind compensation to replace what has been lost. The Fisheries Act provides for this type of compensation.
- service subsidies to support expansion of services that may be required to offset the increased demand for these services.
- property tax abatement to offset any potential increase in property tax.
- property value protection in which owners are offered a guarantee of payment of fair market value as protection against decline in property value due to the construction and operation of the facility.
- property buy-out for those residents who are likely to suffer significant and unavoidable impacts for an extended period of time.

The aim of equity-related compensation is to leave the community better off than it was before the facility was sited there including:

local purchasing and hiring policies and training
- tax subsidies for local residents most affected
- a portion of tipping fees earmarked for use by the local community
- co-use of the facility to resolve another local issue
- bonus services such as schools or other amenities that would enhance the community's development potential
- bonus facilities such as research complex on some aspect of project

## 5.3 Contingency Measures and Follow-up

These are designed to answer the "what if" questions if something goes wrong and includes the following measures:

- emergency response planning - provide details of actions to be taken to deal with spills or other unexpected incidents including training of local teams
- financial security and liability coverage to cover incidents arising from normal operations, from accidents or long-term degradation. Both specific funds and conflict resolution procedures may be adopted to address these concerns
- conduct environmental monitoring and evaluate/follow-up on the results to ensure that mitigation measures put in place are working and that any unforeseen problems are detected early so that they can be dealt with before they become significant

## 5.5 Community Relations

These aim to maintain positive relationship with the community and to facilitate the resolution of concerns as they arise. Several kinds of community relations measures can be established including liaison committees, telephone hotlines, complaint procedures and claims resolution process.

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