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BIOPHYSICAL TERRAIN SENSITIVITY MAPPING AS AN INPUT TO LINEAR FACILITY ROUTE SELECTION

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ABSTRACT

The development of soil and vegetation sensitivity rating scales is detailed for two industrial projects: a subalpine access road in northwestern British Columbia, and a natural gas pipeline and processing plant in northwestern Alberta. Following extensive field surveys, limiting factors were chosen on the basis of the physical nature of the proposed disturbance, the value of existing biophysical resources and the particular properties of the soil and vegetation types.

The final terrain sensitivity map was used in conjunction with project engineers to assist in route selection and the location of permanent structures. The terrain sensitivity map also became the basis for implementing site-specific construction methods, materials handling techniques and reclamation procedures to mitigate unavoidable impacts.

OBJECTIVES AND CONTEXT

The exact role and scope of any biophysical investigation carried out for the general purposes of impact assessment must be well understood from the outset. For the system of terrain sensitivity mapping discussed in this paper, the applied background is that of corridor development, although modifications could allow its application to other sorts of industrial activities. The specific objectives which this system was designed to meet were the following:

1) To devise a suitable routing for a corridor and suitable siting for auxiliary structures, based on biophysical considerations and given engineering or economic constraints; and
2) To devise suitable methods of mitigation and reclamation for those areas which must be disturbed.

Such objectives arise in the construction of many utility or transportation corridors, such as roads, railroads, pipelines and transmission lines. In fact, the same problems of site selection and mitigative planning are common to most environmental impact assessment processes. To successfully meet these objectives, a great deal of communication and compromise may be required on the part of project engineers and environmental advisors. In outlining a suitable approach to follow, this paper details the technical aspects of the process; final decisions eventually tend to depend on such sociological factors as profit margins, political pressures, philosophical values of the proponent and the personalities of managers. Given these limitations, it remains the task of the professional environmental scientist to provide the most reliable information and recommendations possible.

The role of terrain sensitivity mapping in an overall program of environmental assessment and planning should also be understood. Route selection and reclamation recommendations may be the only objectives, or they may be components of a much larger environmental impact assessment spanning many disciplines and public concerns. In such a case, environmental planning is best approached as a multi-stage process. Regional impacts and land uses should first be documented at a broad scale (as in the classic "E.I.A." document). Terrain sensitivity mapping then follows at a more detailed level with a much narrower scope once the general value and location of the project have been decided. The final level of detail (if required) then takes terrain sensitivity information and uses it to devise precise site-specific procedures kilometre by kilometre, for the mitigation of impacts (as in a "Development and Reclamation Plan" or an "Environmental Protection Plan").

The existence or importance of these three intensities of study and planning vary among projects and governmental jurisdictions. Their hierarchical relationships can be usefully followed in project development and organization. For the purposes of this paper, however, the broader scope of a full-scale impact assessment and the narrower scope of exact methods for devising site-specific mitigative recommendations will only be alluded to. With different scope and objectives, these activities are best dealt with in separate discussions, not included here.

THE APPROACH AND ITS APPLICATION

A practical approach to terrain sensitivity mapping was gradually developed on the basis of the above relevant background and over the course of several corridor route selection projects. The recommended procedures are detailed in the following discussion, with examples drawn from two recent applications. One example is that of a 45 km access road through subalpine-subarctic terrain near the Stikine River in northwestern British Columbia (Monenco Consultants Pacific Ltd. 1981). This job was commissioned by B.C. Hydro to provide access for geotechnical drilling equipment. The second example is a 75 km system of pipelines in the Saddle Hills of northwestern Alberta (Monenco Consultants Limited 1982a), part of the Progress Gas Development being proposed by Shell Canada. Both projects required route selection recommendations and reclamation planning.

The following discussion is presented in a step-by-step manner so that it can serve as a brief manual for someone carrying out the exercise for the first time. Steps 1 to 5 are often done as part of a general E.I.A., while Step 10 represents a detailed environmental protection plan.

Impact Definition

Prior to any data collection or the development of rating schemes, it is imperative that the exact nature of the proposed development activities be clearly identified and understood. Comprehensive checklists should be compiled of the potential mechanisms of impact and needs of the development project. Common features to consider (and their implications) include the following:

- What will be the season of construction and operation? (Winter impacts are often much less than summer impacts.) Are assessments required for all seasons?

- What will be the swath width or area of disturbance? (It is good to understand the absolute area of proposed disturbance, e.g. a 10 m wide right-of-way implies the disruption of one hectare per kilometre.)

- Will soil or vegetation be purposely removed? Will it be stored and replaced? Will it be salvaged for other uses? (This largely defines the magnitude of disturbance at the onset, and determines whether reclamation must deal with the rebuilding of soils and vegetation or whether it can merely augment natural processes of recovery.)

- What engineering and economic restrictions are there on route length, steepness, rock outcrops and bodies of water? (Costs may prohibit the use of any but minor alterations to a straight-line route; bogs and fens may be desirable terrain types for winter construction, but should be avoided during summer construction.)

- What are the characteristics of the machines to be used in construction? What will be the depths of disturbance, and what are the potentials for accidental gouging, compaction and fire?

- What will be the duration of construction activities? After construction, will the corridor be maintained, upgraded, blocked or abandoned?

- What auxiliary features are associated with the project: construction camps, borrow pits, roads, compressor stations, etc.? (These facilities can often have as great an impact as the primary activity, and they should be carefully sited.)

In the case of the Stikine access road, terrain sensitivity assessment was to be carried out for the possibility of both summer and winter activities. Since a prior study had discussed winter impacts (which were largely negligible), terrain mapping was to emphasize summer features in the event that the proposed scenario of "winter in, winter out" access could not be followed. Swath width was limited to that of the actual vehicles, 3 to 4 m. Since most of the area supported no trees, there was no need to remove vegetation for vehicle passage. Large vehicles were to drive over the plant cover in the hope that it would recover itself. Minor excavations would be required at the approaches to creek crossings. Route length was to be kept minimal, with slopes of more than 15% to be avoided if possible. Terrain consisting of large boulders, ragged rock outcrops and waterlogged soils (and bodies of water) were to be avoided in selecting a summer route. The entire industrial activity would be restricted to the double passage (one in, once out) of four to six wheeled and tracked vehicles, with bearing pressures of 18 to 62 kPa (2.6 to 9 p.s.i.). The tracked vehicles (including a D7 Caterpillar tractor) could be expected to contribute significant gouging and soil compaction. Following vehicle passage, the road was to be blocked and abandoned, with reclamation efforts undertaken if necessary. No associated facilities were to be considered, except the location of a temporary bridge across a narrow chasm.

For the Progress Gas Development, winter construction was also proposed, but assessment was to dwell on the most sensitive season, generally summer. The possibility of both winter and summer construction existed. The pipeline system would join 23 well sites (already in existence) with two compressor stations and a sour gas processing plant. Pipeline construction would consist of clearing a right-of-way of 10 m width, excavating a 1.0 m wide trench, 1.5 m deep, and installing the 0.3 m diameter welded and wrapped pipe. Existing cutlines and roadways were to be used for the right-of-way wherever possible, and maintenance roads would share some of the pipeline corridor after construction. In forested areas, the plant cover would first have to be removed by bulldozer (and commercial timber salvaged if possible), so most of the natural vegetation and upper soil would be destroyed in the right-of-way. Trench excavation would have the potential to leave relatively infertile subsoils or glacial tills on the surface. Cover removal, bulldozing and trenching could disrupt local patterns of drainage, notably by creating straight drainage courses where none existed before.

Depending on weather conditions, dusting could arise as a result of soil being bared during construction, or from the surface of associated gravel roads. Route length was to be kept minimal, and although steep slopes were not a severe limitation to construction, they and areas with shallow soil (less than 2.0 m) were to be avoided when more favourable routes were possible. Locations with standing water year round would also be unacceptable. Construction activities would last 10 to 18 months, after which the corridor would be revegetated. Associated facilities requiring site selection would be 23 km of access roads, two gas-powered compressor stations, and the gas-processing plant. The site would require 80 ha of land, and its siting was to be determined by aspects of plume dispersion and anticipated downwind impact (not discussed here) in addition to local terrain sensitivity.

Resource Identification

A review of existing sources of information should be adequate to identify the natural resources and land uses of the proposed project area. Such an inventory provides a regional context within which to consider corridor alternatives and potential conflicts. Use should be made of Canada Land Inventory maps, land disposition maps, published literature (both popular and scientific) and personal communications with local forest rangers, game wardens, municipal representatives and special interest groups. As a result of this process (often carried out as the "preliminary assessment" component of an E.I.A. or prior to a full E.I.A.), all possible sources of conflict should be identified and the relative value of the terrain for alternative uses should become clear.

Categories of resources to consider would include mineral resources, agriculture, forestry, fisheries, wildlife, watershed properties and uses, archaeological finds and preservation considerations (such as parks, recreational uses, wilderness value and the presence of rare or protected species). In addition to examining the present value and use of such features, it is also worth referencing any assessments or plans for future or potential uses. At this time, it is also prudent that all governmental jurisdictions and requirements (by different agencies) of the proposed development be clarified, and that a co-operative (rather than antagonistic) working relationship be established with all concerned.

The Stikine Plateau is located in a very isolated part of northwestern British Columbia. There is very little human use of the area, the nearest settlement being the village of Dease Lake, about 40 km to the north of the proposed trailhead. The climate is cold and terrain mountainous, with any forests being very sparse, slow-growing and non-commercial. Various minerals leases are present in the area, but most have not yet been explored. Agricultural and fisheries land use is non-existent, although the Stikine River (itself out of the project area) is used by spawning salmon. The major resources in the area are those of wildlife, with Dall sheep, caribou and grizzly bear frequenting the area, as well as a large resident moose population. One of the few human land uses of the area has been big game hunting and outfitting, and limited hunting and trapping by local residents. The watershed serves no major populations as a water source. Archaeological potential was considered minimal. Due to the remote, pristine and subarctic/subalpine transitional nature of the area, two ecological preserves had been proposed in the area. The whole area is crown land, under the jurisdiction of the B.C. Ministry of Energy, Mines and Petroleum Resources.

The Progress Gas Development is located in the Saddle Hills, a forested upland 65 km northwest of Grande Prairie, Alberta, surrounded by agricultural lowlands. There are hundreds of oil and gas wells in the area, with exploration and development ongoing. Agricultural land uses included the cultivation of barley, oats, rapeseed and forage crops with cattle grazing occurring both on private land and on crown-owned grazing leases in the forested hill country. Most of the project area is "Green Zone" forest reserve, with Proctor and Gamble Cellulose Co. Ltd. being the major leaseholder, supplying coniferous sawtimber and pulpwood to their mills in Grande Prairie. Recreational use of the area is minor, limited to hunting and off-road vehicle use. Wildlife resources include moose and elk, and several traplines are registered in the project area. Fisheries and aquatic uses are minimal, although the hills serve as a recharge area for streams and aquifers used by several lowland towns. Archaeological potential was moderate, with a few sites having been found previously in the project area. Preservation considerations were minor, the breeding range of trumpeter swans (the nearest being 5 km away) being the only significant factor identified. The local flora and fauna are common throughout much of Alberta. All crown lands are under the jurisdiction of the Alberta Department of Energy and Natural Resources, particularly the Alberta Forest Service.

Air Photo Mapping

The selection of a suitable scale of air photographs to be used (or commissioned if no suitable ones presently exist) is a major consideration. Scales of 1:50,000 to 1:10,000 are generally suitable for terrain sensitivity mapping, the level of detail required depending much on the degree of variability in terrain properties over short distances. It is useful to conduct photo interpretation and subsequent mapping in two stages. Prior to terrain sensitivity mapping per se, it is desirable to have maps prepared at a reconnaissance level (1:25,000 to 1:50,000 scale), showing the regional features at the level of "land system", "soil order" or "forest cover" types. Such maps may already exist for the project area, may be prepared as part of a prior E.I.A., or may be done directly from air-photos prior to terrain sensitivity mapping. Mapping at this level usually depends heavily on topographic features and major differences in canopy structure (such as between marshes, shrubland and forest). These reconnaissance maps are especially useful when done on a photomosaic, providing easy reference from stereo-photos to locations and their regional context.

Following the identification of impact mechanisms, resources and regional features, an appropriate study corridor is defined. Since there were no major obstacles to the use of a shortest route corridor in the examples discussed, alternative corridors were not considered. If conflicts or obstacles did exist, one or more alternative corridors would also be mapped, inventoried and rated. Intensive study is usually confined to such corridors, generally 1 or 2 km wide, with route selection being largely limited to that of alignment within the corridor. Soil and vegetation mapping then proceeds on larger scale (1:40,000 to 1:10,000) individual stereo-pairs on which the approximate boundaries of the preliminary corridor are first drawn. Landscape interpretations may be combined depending on the degree of specialization among team members and the degree of specific emphasis that different biophysical components are to receive. For example, landform mapping is often done in conjunction with soils mapping, while vegetation mapping may include delineation of commercial forest stands.

This level of semi-detailed mapping is used for delineation of areas which are homogeneous in composition (and presumably in functional properties), and which may be expected to require similar degrees of avoidance or mitigation by the proposed project development. Soils mapping, being largely dependent on changes in topography and vegetation, may not be in traditional units such as soil series, but rather in categories pertinent to the project, e.g. based on slope, depth and expected fertility or great soil groups. Vegetation mapping likewise distinguishes plant associations (such as bogs and fens), which would behave differently in response to the impact and although different dominant canopy species may be identified, type boundaries are not necessarily shown unless the dominant growth forms and responses to disturbance are thought to be different.

For the Stikine access road, air-photo interpretation was done at only one scale (1:30,000) using monochromatic stereo-pairs. The corridor of study was one of variable width (0.5 to 4.0 km), basically covering the valley floors which defined the most direct route. Soil divisions were drawn on the basis of breaks in the landscape and parent material, with categories thus described as modified soil orders. Vegetation mapping was largely structural, distinguishing between sedge fens, sphagnum bogs, shrubland, deciduous forest, coniferous forest, and rockland or tundra. Since most of the area was shrubland, divisions within the corridor were few.

Because of the overall impact assessment needed for the Progress gas plant and its associated Saddle Hills gathering system of pipelines, 1:50,000 scale maps were first prepared for the entire region. Using a photomosaic base map, information was transferred from 1:50,000 stereo-pairs, in consultation with a number of pre-existing maps. A soil survey map showing soil series, an ecological land classification map (based on landform units) and a forest cover map all proved useful aids when information was interpreted at a general (rather than detailed) level. Following this small-scale mapping, detailed work was done on 1:15,000 scale air photos, within a 2 km wide corridor centred on the proposed pipeline route. At this level of detail, soils were mapped according to expected depth and steepness phases on different parent materials, which in turn was determined largely from geomorphology. Vegetation interpretation included distinctions among different dominant species (e.g. trembling aspen vs. balsam poplar, white spruce vs. black spruce vs. pine), and noted the degree of canopy closure.

Although understory species could not be identified from air photographs, different degrees of canopy closure would be expected to result in a different understory composition. Mapping was thus done to the level of community type, although full descriptive names could not be assigned at this time.

Field Surveying

With a full understanding of project actions and area resources, and with preliminary soil and vegetation types delineated on air photos, ground truthing and sampling can be efficiently carried out. The layout of the sampling program depends largely on the scale of the project, apparent homogeneity and access. For a small project, walking the entire corridor and doing detailed sampling (at regular intervals or whenever a new terrain type is encountered) is feasible; two or more transects within the corridor may be possible. It is always preferable to walk the whole route, but this can be more easily done when a preliminary alignment is already surveyed and is well marked. If the route is long, terrain rugged or access difficult, inspection of only a relatively few representative locations may be possible. The selection of such sites thus becomes critical, and can be assisted by air photos and by an aerial survey of the corridor by discipline specialists. The intensity of sampling depends on the variability in the study area.

Soil description and sampling procedures can make use of both soil pits and hand auger samples. Soil pits should be dug for each major type in the study area, with the identity of similar sites merely confirmed with auger digging. Soil profiles are described according to the procedures recommended by the Canada Soil Survey Committee (1978). All horizons, to a depth of about 1.0 m (or to bedrock) are to be analyzed or evaluated in the field for depth, colour, pH, effervescence, texture and stoniness. Samples of selected horizons are then collected for more detailed laboratory analysis of physical and chemical characteristics. Depending on the structural and reclamation requirements of soils for the particular project, typical laboratory analysis may include Atterberg limits, saturated moisture percentage, pH, salinity, cation exchange capacity, organic carbon or nutrient content.

Vegetation sampling is most rapidly done using the plotless relevé method, giving a Braun-Blanquet cover-abundance rating for every plant species found in a loosely defined reference area (Mueller-Dombois and Ellenberg 1974). Unknown species are pressed for later identification. If forestry considerations exist, timber volume and productivity determinations should be made, for which the use of wedge prism cruising methods are well suited. Diameter and height should be measured for all trees designated as within the plot, and an increment core of a dominant tree should be taken and the tree's age determined. Timber volumes are then determined from species-specific volume tables (available from provincial forestry offices), and mean annual increment (M.A.I.) is determined by dividing tree volume by tree age. The response of soils and vegetation to any past disturbances (fire, flooding, cutlines, etc.) should be noted.

For the Stikine project, the absence of trees throughout most of the corridor permitted a complete traverse of the route on foot. Following this descriptive reconnaissance, a number of selected sites were sampled intensively with the aid of a helicopter for transportation. A total of 13 sites were intensively sampled. Soils were generally found to be of the Brunisolic and Regosolic orders. The vegetation was dominated by willow (Salix spp.) shrubland, with subtle differences identifiable on the basis of different Salix and understory species.

Access in the Saddle Hills was much more difficult, with most of the route being in steep, dissected terrain with heavy forest cover. Although some segments of the corridor were walked, most sample sites were limited to locations that a four-wheel drive truck could reach from back roads or seismic cut-lines. A total of 96 soil sites and 63 vegetation sites were intensively sampled, including use of data from a previous (Canadian Forestry Service) study for 13 of the sites. Parent materials of soils were predominantly morainal, lacustrine and organic. The majority of soils were Luvisols,with Gleysols and Organics common in poorly drained sites. The vegetation was predominantly deciduous (Populus spp.) forest, with fire and logging obviously having played a major role in the past. Many scrub, deciduous and mixedwood successional communities were common, while mature coniferous stands (those having commercial value) were less common.

Classification

Following the collection of field observations and the compilation of sampling data, it is frequently necessary to recategorize or rename the units previously delineated on air-photos. Using the newly collected field data as an objective information source, individual sample sites (and the broad areas they represent), should be grouped according to their similarity. Criteria for soil groupings may be well defined taxonomically, whereas vegetation classes may need some sort of phytosociological tabular manipulation in order for categories to become apparent. In practice, the different soil and vegetation types can usually be ordinated along factors of moisture and disturbance. Rather than just using general similarity, project-specific criteria (such as soil erodibility or forest productivity) may be used as classification criteria. If field sampling was random and a large number of sites were described, classification can be done mathematically and impartially by means of multivariate statistical techniques (Gauch 1982). Whatever the method of classification, it is usually useful to diagram the hierarchy of classes and the whole scheme should be integrated with existing regional classifications such as maps of ecological regions (e.g. Rowe 1972, Krajina 1965).

Once the interrelationships of sampling units are clear, the degree to which these categories correspond to the preliminary air photo mapping units must be checked. The hierarchical level at which mapping was done should be identified and the mapped units should be reviewed to see that they agree with the more detailed ground level descriptions of such types. Together with general ground observations on the locations of type boundaries and properties, the survey information may indicate that some mapped units should be changed. Furthermore, additional air photo interpretation done at this stage benefits from the experience gained on the ground, so revised interpretations are likely to be better. The result should be the finalized soil and vegetation maps, transferred to a topographic or air photomosaic base. It is also a good idea to prepare tables of the dominant features of each map unit.

Soils of the Stikine Plateau were classified into their traditional Canadian System of Soil Classification soil groups, with the associated criteria for classification (namely parent material, associated landforms, slope and drainage. The vegetation of the region all fell into Rowe's (1972) Stikine Plateau Section of the Boreal Forest Region, and could be broken down further into the forest and shrubland zones of Krajina (1965). Since willow communities dominated many terrain types, it was decided that these could be usefully categorized further. Sites and species were ordinated in a phytosociological table to produce maximum clustering (Mueller-Dombois and Ellenberg 1974). The resulting classification showed the relationship of shrub community types to moisture and produced nine mappable types. The final maps were printed on a 1:25,000 topographic base.

Classification of soils in the Saddle Hills was based primarily on parent material, and secondarily by texture, drainage and slope. Identification with Canadian System of Soil Classification soil groups was also a key classificatory criterion. Soils in the project area have developed on five major parent materials:

- morainal (glacial debris);
- lacustrine (silt and clay deposits);
- fluvial (sandy deltas in glacial meltwater lakes);
- residual (bedrock); and
- organic.

Vegetation of the Saddle Hills was classified according to physiognomic or structural categories (which were mapped on the 1:50,000 regional map), associations of dominant canopy species within each structural category and community types based on dominant subcanopy species within each association. Each community was considered distinguishable on 1:50,000 air photos (although many boundaries and type names were changed from the preliminary air photo mapping) and could exhibit a different response to the proposed impacts. In preparing the final soil and vegetation maps for the Saddle Hills pipeline, a 1:20,000 photomosaic served as the base map.

Development of a Sensitivity Rating Scheme

Once the activities of inventory and mapping are complete, project personnel have a very good impression of the project area's features and how they may be affected by the (previously discussed) mechanisms of impact. Team members are now ready to devise a system of criteria for rating terrain sensitivity in a manner uniquely suited to the proposed project and the area under consideration. Critical ecological factors or sensitivity factors are identified on the basis of those impact mechanisms most likely to damage known resources. These impact mechanisms may not necessarily act only through soils or vegetation, or other resources in the area may be of more value, such that separate categories ought to be allocated for such features as wildlife or recreation. Alternatively, these concerns can be made subcategories or critical factors under a fewer number of categories (e.g. forestry concerns as a subcategory of vegetation). The system of critical factors developed for each project is usually unique, due to the particular unusual resources impact mechanisms and ecological features of a given scenario. Potential soil factors may include those such as erosion, compaction, fertility, drainage and profile reconstruction needs; vegetation factors may include those such as ecological value, timber value, critical wildlife habitat, resilience and revegetation.

Although a set of critical sensitivity factors tends of be unique to any one job, the scale used to rate the importance of these factors can be more universal. A scale of 1 to 5 can be usefully applied to most situations, although the precise meaning of each rating value must be defined for each critical factor. The general criteria for each level can be interpreted as follows:

"1" Negative impact is none or negligible (or undetectable even by scientfic investigation); designates that changes should be reversible in less than 20 years; preferred routes;

"2" Some impact probable, but effects are not major enough to require special mitigative procedures (i.e. other than those applied everywhere) other than in local (sub-unit) situations; negative changes would be apparent through scientific investigation but would generally be reversible over the course of 20 to 40 years;

"3" Significant impact will occur, and will require mitigative procedures and specific reclamation methods across the whole terrain unit; negative changes would be evident even without scientific studies, and would require 40 to 80 years to be reversed;

"4" Severe impact is likely to occur, and it would be preferrable to avoid the terrain unit rather than to implement the major mitigative methods required; negative effects would be apparent even to the untrained eye and would be reversible only over a period of 80 years or more;

"5" Impact would be catastrophic and completely unacceptable. This category is very extreme and refers to geotechnically unstable sites or destruction of legislatively protected species in danger of extinction. Negative effects would be obvious and irreversible.

Soil sensitivity factors chosen for the Stikine-Iskut cat trial route included erosion, compaction, drainage and topography. Soil erosion by water was considered a major danger to be avoided because of its accelerating and cumulative effect on the terrain once started. Once soil material is lost, its ability to support plants is reduced, and with less protective plant cover, erosion will become even worse. Erosion danger was assessed using qualitative assessment of factors in the Universal Soil Loss Equation (Wischmeier and Myer 1973), namely rainfall intensity and length (generally uniform across a project area), slope length and slope gradient, soil type (especially depth, texture and cohesiveness) and vegetative cover and the extent of its probable removal. Compaction was considered a potential problem because of decreased porosity and water infiltration and increased bulk density that could deter root penetration, soil moisture availability and plant growth. In assessing compaction sensitivity, consideration was given to soil bulk density, organic matter content, silt and clay content, coarse fragment content and moisture content. Organic matter helps maintain structure and decreases compactibility, high silt and clay contents indicate greater compactibility, while coarse rock fragments hinder compaction; compaction is greatest when moisture content is slightly below the plastic limit. To account for low bearing strength during summer, poorly drained areas were assessed, generally using the assessments of drainage recommended by the Canadian System of Soil Classification. The literature was consulted to determine the safe bearing strength of different soils under wet and dry conditions. Topographic limitations were also considered under the soil assessment, since no separate geomorphological assessment was done. Slope steepness and complexity were the major components of topographic limitation. The banks of creeks, slopes of eskers and scarp outcrops of bedrock were the major topographic feature limitations not already dealt with under drainage or erosion.

Vegetation sensitivity factors chosen for the Stikine route included ecological value and resilience. Ecological value was rated according to the presence of rare or endangered plant species, plant community associations unusual to the region and (in the absence of a separate wildlife assessment), critical wildlife habitat. Species rarity included range extensions, unusual hybrids and species potentially new to science. Vegetation resilience refers to the ability of the plant community to withstand disturbances in general, and to rapidly regenerate following disturbance. The general criteria for evaluating resilience include canopy compressibility, the potential for vegetative resprouting, the ability of the vegetation type to rapidly reseed itself to some sort of plant cover, and the time anticipated for the community to regenerate to its predisturbance condition.

For the Progress Gas Development, soil factors of erosion, compaction and reclamation requirements were chosen. Criteria for the rating of erodibility were similar to those used for Stikine, with the presence of well developed Ae, Ah or Ap horizons also being indicative of serious fertility losses that would result with the erosion of topsoil. Slope classes were modified from the Canada System of Soil Classification (1978) to provide explicit criteria for erosion sensitivity (Table 1). Compaction ratings were devised to include drainage considerations, because compaction is considered a significant limitation on soils with sub-hydric and hydric moisture regimes (imperfectly to very poorly drained). Compaction may also occur when soil moisture contents are high after periods of heavy rainfall or during thawing. Criteria for compactibility therefore included drainage (primarily), organic matter content, soil texture and coarse fragment content. The final soil sensitivity factor of reclamation potential is related to soil properties which are indicative of soil productivity or the potential to support rapid, successful revegetation. In effect, it relates soil morphology to reclamation procedures (specifically, materials handling) needed to maintain a suitable plant growth medium at the surface.

Factors chosen to assess vegetation sensitivity in the Saddle Hills included ecological value, existing timber value, potential timber value, resilience or susceptibility to adjacent disturbance, and probable revegetation problems. Ecological value considerations included rare species, critical wildlife habitat, and the presence of climax forest types (which represent a relatively unusual community type in the region). Existing and potential timber values received major assessment because of the importance of the resource and of alternative forestry land uses in the area. In terms of existing timber standing crop, ratings were based directly on the proportion of mature, large-stature conifers (suitable for saw timber) found in the district. Potential timber value was given a separate assessment because timber salvage prior to pipeline construction would not prevent loss of the resource. This rating was based on the proportion of juvenile conifers in the stand, and soil and drainage conditions indicative of the ability to support good tree growth. Unlike the Stikine project, pipeline development usually includes complete removal of vegetation in the corridor. The resilience of that vegetation is therefore of little relevance, since it will all be removed except at sites with no trees or shrubs (such as sedge marshes, where development may proceed without vegetation removal). While the re-establishment of vegetation in the corridor was considered under the vegetation assessment, the resilience of the adjacent vegetation should also be considered. The ecological amplitude of the dominant species of a community was considered relative to the expected impacts of adjacent canopy removal or disrupted drainage. Revegetation rating criteria were based on anticipated problems at rocky or steep locations, and in areas with high water tables and organic soils. This revegetation rating is distinct from the soils reclamation factor in that it is based solely on anticipated plant growth and options of revegetation species selection, rather than on the need for selective soil materials handling.

TABLE 1

Fluvial Soil Characteristics
Progress Gas Development

Characteristic		Soil Type		
		FF	FD	FJ
Soil Classification		**Orthic Luvic Gleysol**	**Cumulic Humic Regosol**	**Orthic Eutric Brunisol**
Drainage		Imperfect to poor	Imperfect to poor	Good to moderately good
Slope:	%	0-5	0-5	2-15
	Position	Mid to lower	Mid to lower	Mid
pH Horizon:	A	4.5 to 5.0	5.1 to 6.0	6.1 to 6.5
	B	4.5 to 5.0	5.1 to 7.3	6.1 to 6.5
	C	4.5 to 6.5	5.1 to 7.3	6.1 to 6.5
Texture*	A	SivfS to SiL	LS to L	LS
	B	SL to C	CL to C	SL
Perviousness	B	Moderate	Moderate	Rapid
	C	Moderate	Moderate	Rapid
Depth to C horizon (cm)		18-61	13-35	68

* C = Clay, L = Loam, S = Sand, Si = Silt, vf = very fine

It is important to develop specific and explicit criteria for the application of the rating scale to each soil and vegetation factor. Tables 2 and 3 illustrate the exposition of such criteria for soils and vegetation respectively, as applied to the Progress Gas Development.

Application of Sensitivity Ratings

Once the key sensitivity factors and criteria for their rating have been devised, one can return to the tables summarizing the salient features of each soil and vegetation type, and assess its expected sensitivity to each factor. If the data collected are complete, and if the rating criteria are explicit, this procedure should be easy to carry out. If the characteristics of a particular type are too ambiguous to assign it a sensitivity value, then the rating criteria may have to be changed or additional field information may be needed. Despite clear criteria for rating application, this process involves a degree of subjectivity. Additional sources of information to be drawn upon in assigning sensitivity values include published literature and past experience regarding the behaviour of similar soils and vegetation in response to similar disturbances, the recovery progress evident from earlier disturbance scars observed in the area, and a degree of speculation or extrapolation about the mechanisms of impact at any particular season. The results should be repeatable by other competent environmental scientists, and the accuracy of the assessments improves with experience.

The sensitivity of each map unit to each factor should be tabulated for future reference. The most critical or limiting factors are then noted, and they are then portrayed on the maps as the basis for route selection. A useful notation includes the sensitivity class and the limiting factors, such as "3et" (having Class 3 sensitivity due to ecological and timber values). It would be advantageous to show the rating for each factor shown on the map, but this generally results in overly crowded map symbols. The terrain sensitivity maps must be viewed only as a selective summary of information ratings primarily serving the purpose of route selection. For the purpose of determining site-specific mitigation and reclamation procedures, reference must be made back to the various summary tables that describe the actual features of each map unit.

The only Stikine soils to receive high erodibility ratings were localized sites (creek banks and an esker wall) with very steep slopes, and Orthic Regosols with shallow bedrock. Only two soil types were rated as sensitive to compaction: a sandy south-facing slope and thin Regosol soils overlying bedrock. Three soil types showed definitive characteristics of poor drainage: a Gleyed Humic Regosol and two Typic Mesisols (organics). Topographic limitations (steep slopes and rock outcrops) were limited to a creek bank, esker wall and a large Regosolic area with local rock outcrops. High ecological values were assigned to bogs dominated by feathermoss, and to xeric subalpine shrublands having several species rare in the region. A very high ecological value was also ascribed to a diverse deciduous woodland which contained an unusual range extension, a potentially unknown Gentian species, and rare Populus balsamifera x tremuloides hybrids. Poor resilience was noted for a number of communities, including all those with tree species, steep slopes and

TABLE 2

Soil Sensitivity Classes
Progress Gas Development

Sensitivity Class	Rating Characteristics		
	Erosion Sensitivity (e)	Compaction Sensitivity (c)	Reclamation Sensitivity (s)
1 (least sensitive)	Soil types FD, FF, LA, LG, LB, OD, ML. Slope 0-2%. Level ground, little erosion potential.	Soil types MA, MB, ME, MH, RA, RH, FJ, RE, LA, LG. Well drained soils. Little compaction sensitivity.	All soil types except those below. No expected reclamation problems.
2	Soil types FJ, OC, ME, MH, MJ. Slope 2-15%. Moderate slopes.	Soil types MJ, ML, MM, LB, FD, FF. Poorly drained soils.	Soil types RA, RE, RH, FJ. Shallow profiles with little soil development.
3	Soil types MA, MM. Slope 10-20%. Moderately steep slopes.	Peaty soils. Generally wet, organic veneer.	Soil types LA, LG, LB, MM, OC, OD, peaty phases. Potential salt problems or drainage problems.
4 (highest sensitivity in area)	Soil types MB, RA, RH. Slope 30%. Steep terrain, high erosion potential.	Soil types OC, OD. Very wet areas, fens and bogs. Highly sensitive to compaction.	Not applicable in Progress area.

TABLE 3

Vegetation Sensitivity Criteria
Progress Gas Development

Sensitivity Class	Rating Characteristics			
	Ecological Value (e)	Timber Value (t)	Resilience to Disturbance (d)	Revegetation Potential (r)
1 (least sensitive)	Common species and communities	No suitable timber	Scrub or upland forest with diverse and robust species	No potential problems
2	Uncommon species and communities; valuable wildlife habitat	Scattered conifers or sizes suitable only for posts, roundwood or pulping	Species sensitive to dusting, canopy opening; extensive litter which is susceptible to fire; wetlands sensitive to water level fluctuations	Poorly drained sites requiring higher seeding rates
3	Rare or endangered species and communities; critical wildlife habitat	Merchantable trees of sawlog dimensions	Communities susceptible to water level changes	Organic soils with high water table where revegetation is difficult
4 (highest sensitivity in area)	Species, communities or wildlife habitat requiring special attention	Mature merchantable trees in pure stands	Communities extremely sensitive to adjacent vegetation removal or soil alteration	Severe sites with extreme soil, water or slope characteristics

poor drainage (where churning or rutting would occur).

In the Saddle Hills, the inherent erodibility of most soils ranges from moderate to high. High ratings were assigned for various steep-sloped sites (notably creek banks), some Luvisols with a well developed Ae horizon, and some Mesisols and Luvisols with marked Ah or Ap horizons. Very high compaction was predicted for the organic soils of fens and bogs, with moderate to serious effects expected for other poorly drained soils and peaty phases. Reclamation needs were rated the highest on agricultural lands, where the restoration of topsoil horizons is of special importance to the maintenance of productivity. The most sensitive soils were those in lacustrine lowlands, humic Gleysols on forested land, and organic soils of discharge areas.

Vegetation sensitivity ratings for the Saddle Hills area are summarized in Table 4, and can be assessed relative to the community composition, timber volumes and productivities. No communities received high ecological values, but two communities had a moderate ("2") ecological sensitivity: an Aspen-White Spruce/Rose community because it is the habitat for the round-leaved orchid (Habenaria orbiculata), considered uncommon or rare in Alberta; and White Spruce/Rose stands because such types approximate the regional climax vegetation and such mature stands are infrequent in the area. About half of all community types received Class 1 timber ratings, having no conifers present. Class 2 timber ratings were assigned to black spruce and tamarack communities, and to riparian sites where large trees are widely scattered. Many sites received Class 3 ratings, having dense stands of large white spruce or pine; only the White Spruce/Rose type received a rating of Class 4. In terms of potential timber value, poorly drained sites and those with dense shrub canopies were rated as Class 1. Most of the deciduous, mixedwood and coniferous stands received ratings of Class 2, while various sites with a large component of young white spruce or pine in the understory, or yet to mature, were rated Class 3. Only an Aspen-White Spruce/Rose community, with a subdominant white spruce canopy that could be harvested in about 20 years, received a rating of Class 4. Most community types have some susceptibility to adjacent disturbances, especially through canopy opening and disrupted drainage, and hence were assigned Class 2 ratings. Class 1 ratings were given to scrub, poplar and birch associations, all of which are well known for their wide ecological amplitude and tolerances. Sphagnum bog communities were rated Class 3 because of their close dependence on stable water levels. Revegetation problems may arise on steep sites, such as stream banks occupied by riparian communities. Such sites were rated as Class 2, as were fen communities (sedge-dominated), which have high water tables and organic soils. Class 3 ratings were given to bogs and fens with deep organic layers and where water is always present. The successful revegetation of such sites will depend on selection of water-tolerant species and a certain amount of regrowth or re-invasion by the existing sedges, reedgrasses, birches, willows, and ericaceous shrubs.

Map Overlays

Separate soil and vegetation maps prepared at the same scale (and usually on the basis of the same air photographs) have by this stage been prepared. The sensitivity rating for each map unit has been determined and is portrayed

TABLE 4

Summary of Vegetation Sensitivity Ratings
Progress Gas Development

Plant Community	Sensitivity Factors				
	Ecological Value (e)	Timber Value (t)	Resilience to Disturbance (d)	Revegetation Potential (r)	Limiting Factor
Marsh Reedgrass	1	1	1	1	1
Sedge	1	1	2	2	2 d r
Dwarf Birch/Sedge	1	1	2	2	2 d r
Willow-Birch/Reedgrass	1	1	1	1	1
Willow-Alder/Reedgrass	1	1	1	1	1
Willow/Feathermoss	1	1	1	3	3 r
Poplar-Spruce-Birch/Willow	1	2	2	2	2 tdr
Clearcuts:Willow-Alder/Conifers	1	1	1	1	1
Burns:Willow-Alder/Fireweed	1	1	1	1	1
Paper Birch/Alder-Willow	1	1	1	1	1
Poplar/Sarsparilla	1	1	2	1	2 d
Poplar/Alder-Willow	1	1	1	1	1
Aspen/Rose	1	1	1	1	1
Aspen/Alder-Willow	1	1	1	1	1
Paper Birch-White Spruce/ Horsetail	1	3	2	1	3 t
Poplar-White Spruce/ Bunchberry	1	3	2	1	3 t
Aspen-White Spruce/Rose	2	3	2	1	3 t
Aspen-Pine/Buffaloberry	1	3	2	1	3 t
White Spruce/Alder-Willow	1	3	2	1	3 t
White Spruce/Rose	2	4	3	1	4 t
Pine-White Spruce/Bunchberry	1	3	3	1	3 t d
Pine/Alder	1	3	2	1	3 t
Pine/Cranberry	1	3	3	1	3 t d
Tamarack-Black Spruce/ Labrador Tea	1	2	3	3	3 d r
Black Spruce/Sphagnum	1	2	3	3	3 d r

either on the map or is listed in auxiliary tables which summarize map unit traits. The next step is the combining of soils and vegetation information to create a terrain sensitivity map. This process can be done manually using transparent overlay maps (Wooley and Passey 1980), or automatically if the line drawings (soil and vegetation maps) have been digitized on computer (Newkirk 1979, Rasmussen et al. 1980). Whatever the method of transfer, a certain amount of interpretation and judgement is still required in defining final terrain units. It is useful to have a high quality photomosaic as a base map during this process, to allow some reference back to the original landscape. Many boundaries of soils and vegetation units will coincide, since much undisturbed vegetation has developed in response to soil factors, or in response to the same topographic factors that the soils have. Boundaries which are a few millimeters apart on the map but follow similarly shaped paths were probably devised on the basis of the same feature (which can be confirmed from the photomosaic) and should be denoted by only one line. Other boundaries will be quite independent of each other, and a distinct soil or vegetation border is now traced to delimit a separate terrain unit. Each terrain unit may thus denote only slight differences from its neighbour in terms of either soils or vegetation, but not necessarily both. These "terrain units" therefore should not be confused with the "land systems" or "land types" of ecological land classification schemes (e.g. Lacate 1969), since they do not refer to an area of land on a particular parent material or landform which has a homogeneous combination of soils and chronosequence of vegetation. That is, soils may vary from one terrain unit to the next while vegetation may not, or vice versa. Several vegetation types corresponding to different seral stages (e.g. shrubland, mixedwood forest, coniferous forest) may occur on one soil type because of the local history of disturbances. This is especially true for much of Canada's forest lands, where the existing vegetation is so much a function of the local history of wildfires, insect infestations or logging. The terrain map is thus a summary of the traits of existing features, not potential features. Furthermore, since its primary purpose is that of aiding route selection, map units having identical sensitivities can be combined. An Aspen-White Spruce/Alder community on a Eutric Brunisol may thus be combined on the final map with a Balsam Poplar/Rose community on a Gleyed Luvisol, should they both have identical sensitivity ratings and limitations. The final map units are each denoted by their soil and vegetation sensitivities, with the soils rating over the vegetation rating:

e.g. $\frac{3e}{2dt}$ - soil sensitivity Class 3, limited by erodibility
- vegetation sensitivity Class 2, limited by resilience to disturbance, and by timber value

It is useful to colour-code the map units, based in their highest sensitivity rating. This aids in the route selection process, in that units with the same colour should be avoided to the same degree, although their specific limitations may differ.

Figures 1 to 3 show examples of the computerized overlay process, using maps devised for the Progress Gas Development. Figure 1 is the soils map for a segment of the pipeline corridor, the map units described in terms of landform, parent material, slope, solum thickness, drainage and soil group. Figure 2 is the corresponding vegetation map for the same area, with

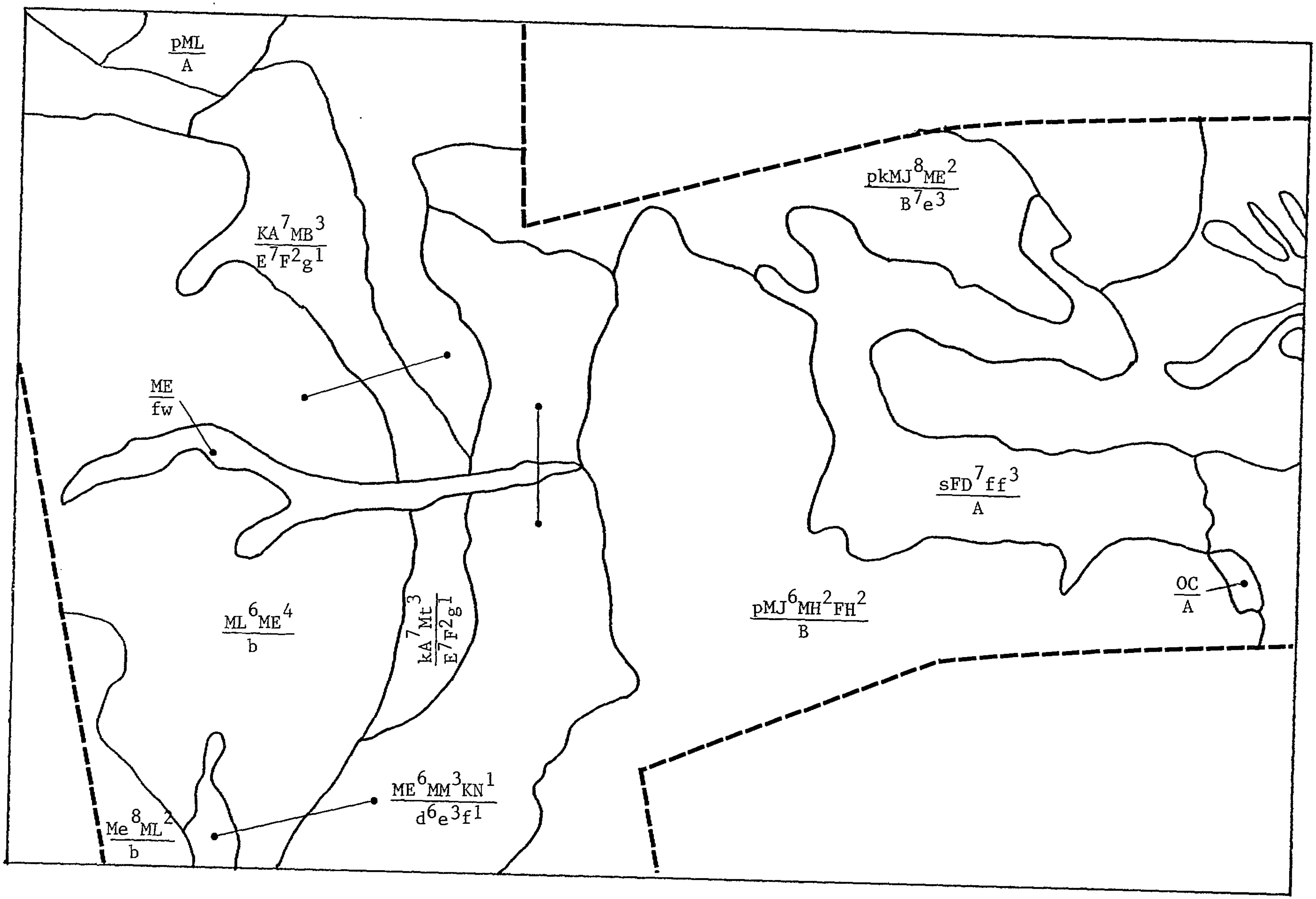

Figure 1. Soils Map for Part of the Progress Gas Pipeline

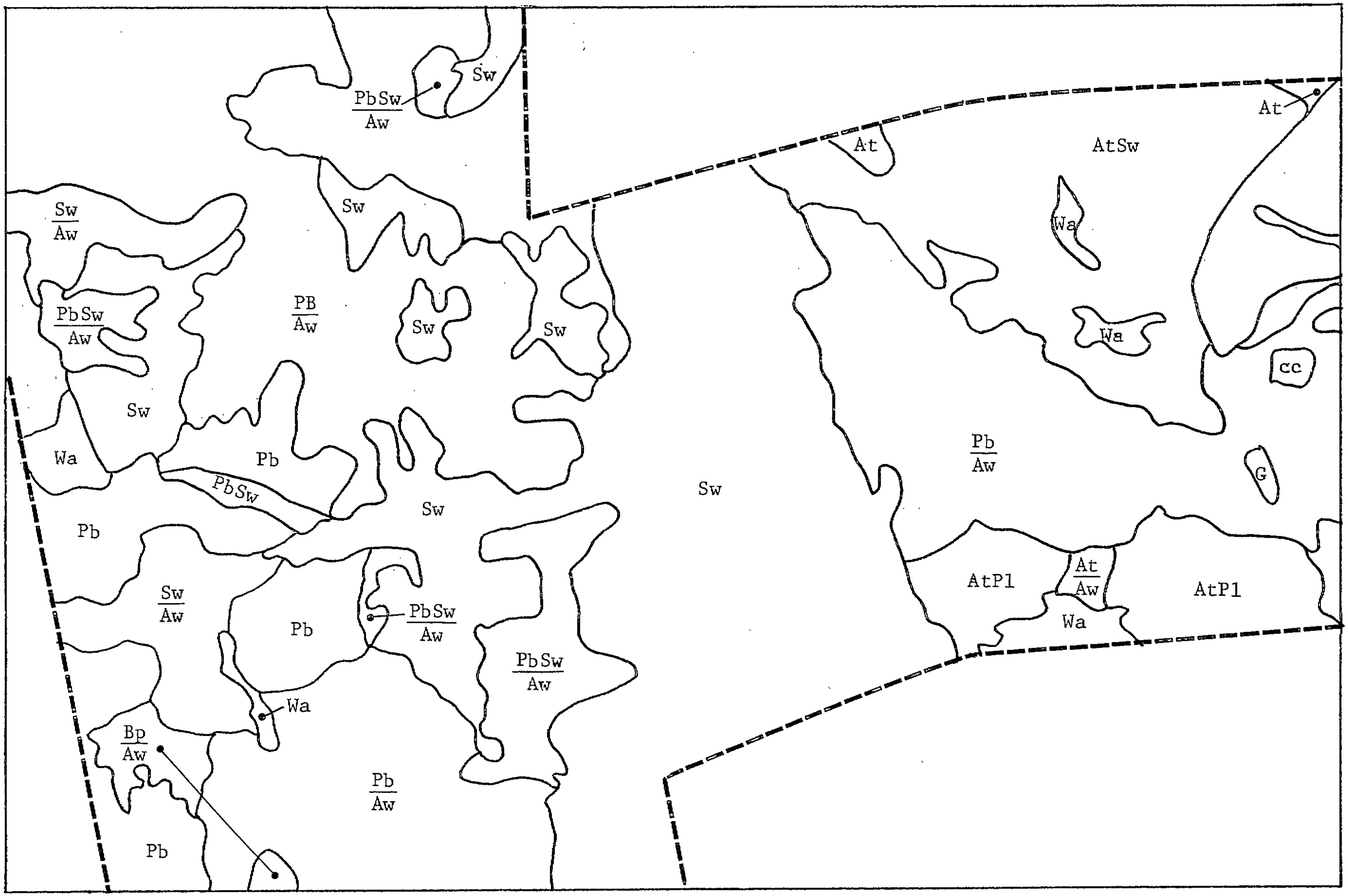

Figure 2. Vegetation Map for Part of the Progress Gas Pipeline

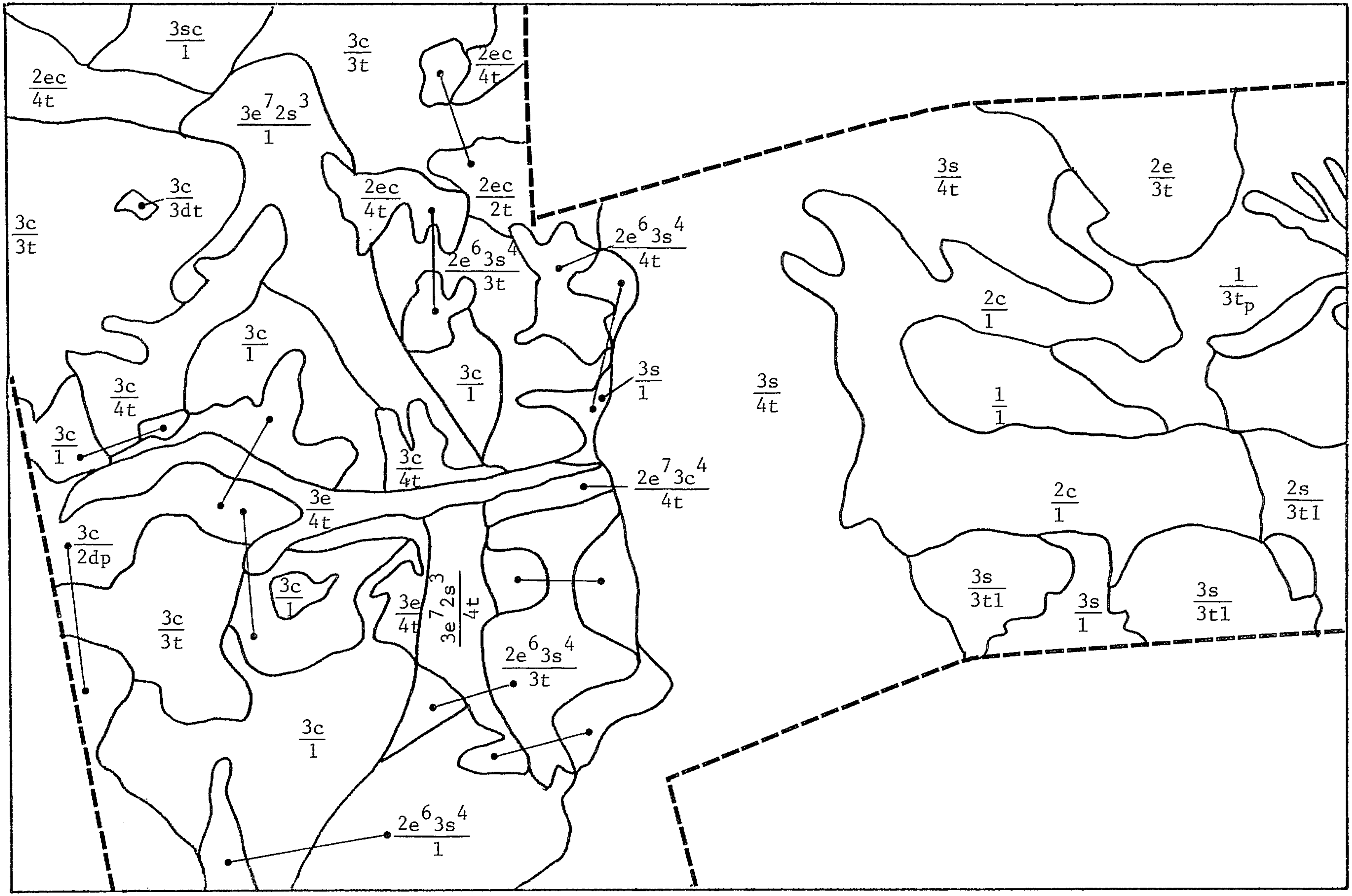

Figure 3. Terrain Sensitivity Map for Part of the Progress Gas Pipeline

descriptions of forest cover, canopy closure and understory structure that correspond to the plant communities sampled and described earlier. Each map was digitized on a Computer Aided Drafting (CAD) station, and a combined ("overlay") map then produced. Final terrain boundaries were confirmed manually, sensitivity ratings were added and the final terrain sensitivity map (Figure 3) was printed on a photomosaic base map. This final map is a summary of differential impact susceptibility and provided the basis for final route (alignment) selection and mitigation planning.

Route Selection

Environmentally sound route selection is one of the reasons for preparing a terrain sensitivity map on the first place. The overall acceptability of a project may have been affirmed already, or this approval may depend on the particular alignment selected. In either case, a credible route selection process must consider a wide enough corridor (or a number of corridors) to provide some reasonable alternatives. The general approach is to follow "the path of least resistance" (shortest distance, most level topography), subject to constraints of geotechnical and ecological stability; other constraints may be imposed according to the construction methods or operational requirements of a particular development.

In practice, therefore, the most straightforward route (generally chosen by project engineers) is followed unless map units having high sensitivity ratings are encountered. Class 5 lands (being exceedingly sensitive and rarely encountered) cannot be crossed at all, while the use of Class 4 lands would require complex mitigation methods that would be better to avoid if at all possible. Class 3 areas are generally passable if the mitigation and reclamation procedures are carefully followed, whereas Class 2 lands can be crossed with only a few localized concerns. Class 1 lands, when they exist, provide the most desirable route, to be used whenever possible. The key is to traverse the terrain between any two fixed points in a manner that provides the best compromise between expediency and environmental concerns. This process of selecting the final route alignment can be a long drawn-out activity involving project engineers and environmental advisors. It can be done solely on the basis of the terrain sensitivity map, but it is best done in conjunction with a final aerial inspection of the corridor to confirm map unit boundaries and interpretations. Thus minor changes in interpretation can be incorporated at the same time that first-hand observation and the portrayal of previously collected data are used together to choose an optimal alignment.

The final route recommended for the Stikine-Iskut cat trail was based primarily on keeping to deep well drained soils that were level and free of forest cover. Deep organic deposits were avoided where possible, given the above constraints; steep slopes have to be negotiated only at stream crossings. Most of the route follows Class 3 lands, indicating that any summer access would require great care and reclamation effort. The only feature to be carefully avoided was an esker with steep sandy slopes and a unique vegetative cover.

The pipeline route decided upon for the Progress Gas development was aligned primarily on the basis of using existing cutlines and clearings, with greater emphasis placed on the mitigation and reclamation procedures needed to permit use of "straight-line" routing wherever possible. Alterations from the shortest possible route were implemented to take advantage of lands previously cleared by agriculture, logging or exploration, and to improve approaches to stream crossings. Most of the terrain traversed was rated Class 2 or 3, with very detailed reclamation procedures developed for agricultural and organic soils, and for steep slopes. Distances through organic soils and valuable timber stands were nevertheless minimized whenever possible. No natural features were deemed non-passable. As a result, the terrain-sensitivity map developed for the Progress Gas Development was used more for the purpose of directing site-specific reclamation planning than for route selection. Although well sites were already fixed, the final site chosen for the gas processing plant was selected to avoid poorly drained soils and mature timber stands.

Mitigation and Reclamation Planning

Terrain sensitivity ratings, derived in the manner described in the previous sections, denote several related properties of a landscape unit: its value as a forestry, agricultural, or ecological resource; its susceptibility to damage of a proposed development action; and its ability to recover following the disturbance. Ultimate interpretation of these ratings is in terms of which landscape units to avoid, and which particular concerns must be addressed in those areas disturbed. For this latter process of mitigative planning, the terrain sensitivity map and its ratings provide only a summary of the most critical factors in each landscape unit and the level of attention that must be paid to them. To prepare a detailed environmental protection plan, reference must be made back to the original biophysical descriptions, and additional field observations may be required to overcome potential problems which are site-specific or were unanticipated. This whole process of preparing a development and reclamation plan can be quite involved and is worthy of being detailed in a separate paper. It results in a document of such a level of detail and quantification that it can be used directly by construction contractors.

In preparing an environmental protection plan, each type of terrain unit (with its distinctive soil and vegetation sensitivity ratings) is assessed for its particular needs to minimize impact. Since the sensitivity classes portrayed on the map only show the most severe or limiting factors, reference must be made back to the complete sensitivity rating summaries (such as Tables 3 and 4). Means of minimizing impact may include the timing of activities, specification of acceptable machinery, materials handling procedures, installation of erosion control and drainage structures, timber salvage, debris disposal, revegetation species mixtures and application rates, and fertilizer blends and application rates. Other protection mechanisms may be implemented if different specific sensitivities had been identified. Some procedures may be devised for broad classes of sites: e.g. drainage sensitivities of 3 or 4 are to be reseeded to a water-tolerant species mixture, erosion sensitivities of 3 or 4 are to be reseeded to a rapid establishing species mixture, while all other ratings are to receive a general purpose mixture. Other procedures require detailed assessment of the biophysical data for each site: e.g. erosion control specifications are devised according to the particular slope steepness, slope length, soil structure, soil depth and parent material of a site, even though sites which vary in these traits may have the same level of erosion sensitivity. Special procedures may be required at particular locations (such as a stream crossing), in which case specifications may be drawn up for one instance rather that for an entire terrain type. The segment of corridor to which each treatment is to be applied must be designated, either by reference to the terrain sensitivity units, or on a separate map.

Mitigative measures recommended for the Stikine-Iskut cat trail concentrated on the desirability of using only winter access. Since the route was selected to avoid forested areas, most of the route would have very low sensitivity and reclamation requirements if equipment were moved only under conditions of frozen soils and a thick snow pack. In the event that access was carried out in the summer, specifications were made for seed and fertilizer mixtures to be used in reclaiming certain terrain units. Individual specifications (regarding approach, excavation, topsoil salvage and replacement, and erosion control) were devised for each stream crossing, and it was suggested that impact on organic terrain would be minimized by multiple trailing. A reconnaisance monitoring program was recommended for a few years after trail abandonment.

Environmental protection specifications for the Progress Gas Development were much more detailed, and concentrated on the segment by segment needs for pipeline installation. Figure 4 is an example of the presentation format used for showing these recommendations and the areas to which they should be applied. The merits of using winter construction for this project were also emphasized, but the recommendations are to be followed no matter what season is used. A general set of procedures was recommended for most areas where soil and vegetation sensitivities were rated as "2" or less. These areas were mostly moderately well drained upland areas supporting deciduous or mixedwood forest. Normal materials handling procedures are to include only the salvage of the thin litter and topsoil layers, to be replaced at the surface after pipeline installation. Erosion control, drainage control and timber salvage are not required for these areas. Forest debris is to be disposed of in windrows by burning. For revegetation, the surface is to be prepared with a breaking disc, and a general purpose seed mixture (alsike clover, timothy, creeping red fescue and crested wheatgrass) is to be seeded with a 57-23-60 fertilizer blend. At other areas with higher sensitivities, specific measures were recommended for dealing with shallow organic soils, deep organic soils, agricultural land, stream crossings, poor drainage, various erosion hazards, and for the salvage of merchantable coniferous timber. Much site-specific planning went into devising these recommendations, often based on quantitative objectives and assessments.

For example, erosion control measures were devised on the basis of disrupting slope length and increasing protective cover so that erosion losses predicted by the Universal Soil Loss Equation (Wischmier and Myer 1973) would be less than 17.8 t/ha. Similarly, site-specific revegetation seed mixtures and rates were devised to provide a given density of plant seedlings (about

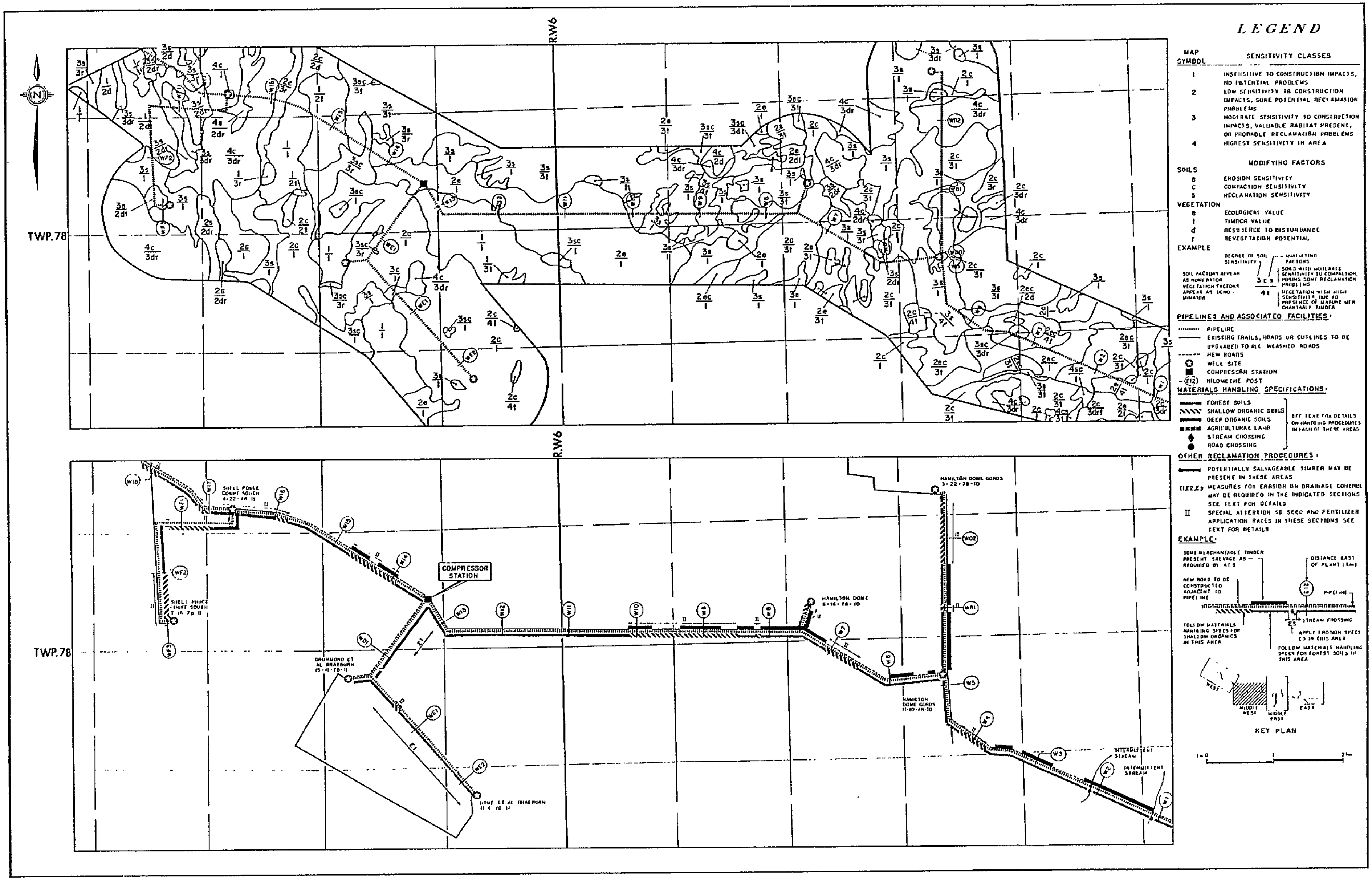

Figure 4. Terrain Sensitivity and Environmental Protection Specifications for Part of the Progress Gas Development.

250 per m^2), based on expected obstacles to germination and broadly known properties of moisture tolerance and rate of cover buildup characteristic of the individual species. These particular procedures are then shown schematically on a map of the pipeline route (Figure 4), with full specifications being indexed in tabular form.

The final component of the environmental protection plan was recommendation of a comprehensive monitoring program to be carried out at regular intervals, especially in those areas which had high sensitivities. Such a program is designed to check for unacceptable erosion, poor revegetation or any deterioration of the associated landscape. In this manner, poorly reclaimed areas can be patched up as needed, and a feedback mechanism is provided for improving future sensitive assessments and protective recommendations. The final result can then be a well vegetated corridor with a uniformly dense plant cover.

CONCLUSIONS

The rating of terrain sensitivity can play a useful and central role in environmental planning. By selective collection of data relevant to the anticipated actions of a proposed development, and by defining map units with similar ecological properties, terrain sensitivity assessment can provide a much more focussed approach to environmental impact assessment and to development and reclamation planning. Although issues such as the reliability of using ecosystem structure to infer specific ecosystems processes and responses remain unresolved, it is clear that any systematic attempt at recognizing the differential impact susceptibility of a landscape can only lead to improve understanding and planning. If these different ecological properties are left unaccounted for, gross oversimplifications will be made regarding anticipated impact and mitigative needs.

Major strengths of the rating approach outlined above are that it is explicit and easily followed, and it can be easily modified (according to disturbance mechanisms and existing environmental concerns) to be project-specific for any number of proposed developments. Furthermore, the results are easily presented in a visual form, and they can be readily appreciated and followed by project engineers. Recommendations for routing and for reclamation procedures are a logical extension of the sensitivity ratings, and are often related to features that a civil or forestry engineer would also consider.

This process will undoubtably be improved with successive applications. Future directions will include enhanced remote sensing interpretations, parametric mapping, and computer database management, mapping and modelling. There are many opportunities for improving the objectivity, quantification and reliability of descriptions, map units and assessments.

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Climate Concerns in Offshore Hydrocarbon-Related Siting and Routing Decisions

1. Introduction

Since the 1960's and the first large rush by private industry to acquire oil and gas leases for promising acreage in the Canadian Arctic offshore, interest in the hydrocarbon potential of both the North and the Atlantic and Pacific offshore areas of Canada has remained high. The lease requirements to spend certain minimum amounts of money to investigate this potential have meant that many millions of dollars have been invested in these areas. Not only have many exploration wells been drilled with a number of oil and gas discoveries resulting, but also high levels of expertise in offshore engineering, knowledge of offshore environmental conditions and understanding of the interaction between the two have been developed. This is certainly true in the area of climate. The learning process has benefited both industry and government - the former in regard to the amount, type and applicability of the offshore climate data that are available (or not, as the case may be), and the latter concerning the specific climate and related needs of the offshore industry.

2. Climatic Elements

2.1 General

The interests of the offshore hydrocarbon industry encompass a wide range of activities: geophysical surveys, design and operation of fixed and dynamically positioned exploration and production platforms, airborne logistic support, sea-bed and overland pipelines, siting and construction of liquifaction plants and port facilities, design and routing of marine transportation, and possible oil-spill movement, containment and clean-up. Such a range of interests means that nearly every element of climate needs to be considered in one phase or another of any offshore operation. Nevertheless, there are certain elements which are of particular concern.

Wind, both direction and speed, is the most important climate element particularly for the roles it plays with other climate and related elements. For example, wind interacts with water currents in the movement of sea ice and oil spills, with sea ice in wave generation, with air temperature in wind chill and air quality, with air and sea surface temperature in structural icing and with cloud and visibility in determining flight limits. In itself, wind has important impacts for the design of exploration platforms in respect to the siting of flaring, cargo handling, the helideck, module access and general deck layout so that optimum relative positioning can be determined. Wind is also important for the redistribution of snow cover which is significant to winter pipeline construction on land. With such a wide range of influences, it is clear that wind impacts on every phase of offshore and related operations.

In addition to its interaction with wind, temperature of the air (and of the sea surface and sea bed) is important for the selection of materials for adequate structural design. Low air temperature is a concern for the development of ice fog near water vapour sources such as pipeline pumping stations. Sea-bed temperatures affect the viscosity of crude oil and low temperatures can precipitate its wave content causing pipelines to clog (Haskins, 1981). Air temperature, of course, is the primary factor in the development and thickness of sea-ice.

The fundamental design criteria for offshore drilling platforms require wave height and period information, particularly the largest wave that may be expected in a 50-100 year period. Increasingly, however, there is interest in smaller waves which may continue over long periods of time and contribute to accelerated structural fatigue problems. The direction of wave patterns is also of concern since savings of 5 percent or more of the quantity of steel used can be made by placing a suitably designed platform in the optimum direction (Gaskell, 1979). Wave generation which is basically a function of wind and its duration, geography and water depth may be further complicated by the presence of sea ice. This tends to reduce the available areas of open water over which waves may be generated (fetches) and in itself acts as a damper on wave actions in the vicinity of ice edges.

Structural icing due to freezing spray which is a function of wind speed, air and sea temperature, and wave activity is a concern for the survey, exploration and marine transportation phases of offshore hydrocarbon activity. Under the right conditions, accumulation of ice on structures can quickly lead to instability. It is, therefore, important to have statistical information on accumulation rates and their maximum duration for use in design. The problem is presumably more acute for vessels which must try to make headway during storm conditions than for fixed platforms (Shellard, 1974). (In such cases, ships' captains may be forced to decide whether or not to lie close to sea ice edges where structural icing rates would be less due to reduced wave activity, but where the possibility of having damaging ice floes driven against their ships is increased.)

Sea ice is an ever-present concern for offshore activity in portions of the Canadian offshore. Even in those areas which may clear of ice only during the July-to-October period of the year, there is frequently a threat of ice floes moving into them due to changing wind conditions. A number of aspects of sea ice must be considered. Thickness is a major concern whether it be due simply to normal growth during the winter or to ridging due to the interaction of adjacent ice masses. Age is also very important because when ice floes survive through several winters, they become increasingly strong as the brine in them is replaced by fresh water which refreezes. Such "old" ice poses the greatest problems for marine transportation. Concentration (percentage of the water surface covered with ice), extent, and the mobility of the ice are concerns as well.

Significant concentrations of icebergs characterize eastern Canadian waters where in many instances, they are embedded in sea-ice cover. Their size and strength make them formidable enemies for any offshore activity. During the open water season, their mobility is increased when they are freed of surrounding sea ice. Scouring tendencies of icebergs (and of heavily ridged sea ice) are important when considering any sea-bed pipelines.

Visibility is a consideration for both marine and airborne activities. While modern detection systems have somewhat reduced the problem for vessels on the high seas, the efficient operation of port facilities and offshore structures subject to the impact of ice features can still be dependent upon good visibility conditions. Logistic support in the form of aircraft, particularly helicopters, is also susceptible to reduced visibility (in addition to other poor flight conditions such as low ceilings and in-cloud icing).

Water currents in association with surface winds play a significant role in the movement of sea ice and icebergs, the importance of which has been discussed above. Knowledge of this combination is particularly vital in modelling the movement of possible oil spills. Bottom currents are of concern for sea-bed pipelines as they can cause sediment washouts resulting in unsupported pipelines which consequently become overstressed.

2.2 Importance by Geographical Area

2.2.1 Arctic

The vast extent of the Canadian Arctic results in important differences in the relative importance of each of the various climatic and related elements, depending upon the particular area of the Arctic under consideration. These differences are superimposed on a general offshore climatic regime which includes sea-ice cover for 9 months of the year with a short navigable season from mid-July to early October. Storm activity is at a maximum in the fall and spring and the temperature pattern features below-freezing temperature for 9 months of the year, extensive periods of -35°C and below readings in winter, and maxima seldom exceeding 10°C in summer (Maxwell, 1980, 1982). Generally, it may be said that wind and ice are the two main issues of concern across the Arctic.

Beaufort Sea

As exploration activity is being carried out in winter, on artificial islands, as well as in summer from drillships, the climatic regime is of concern throughout the year.

During the July to October period, sea ice generally clears from the southern Beaufort Sea with the polar pack retreating to a couple of hundred kilometers offshore. Under such conditions, drilling can proceed continuously except when onshore winds cause intrusions of old ice from the pack or when generally strong winds create high wave conditions or serious structural icing situations. The expected extremes of these conditions dictate design limits both for the drillship itself as well as its positioning. The termination of the drillship operating season is related closely to ice growth both at the drillsite and at the overwintering site.

The use of artificial islands for winter drilling removed the concern for the drilling structure due to impinging sea ice. It is the island itself whose design must conform to expected wind, ice movement and winter current conditions so that likely erosion rates can be countered. Further, the very presence of the island may have important implications in terms of altered spring sea-ice break-up patterns.

Sverdrup Basin-Western Parry Channel

As a result of the extensive amounts of old ice which characterize this area, siting and routing decisions are mainly based on conditions of that ice. For example, proposed tanker routes from Beaufort Sea avoid M'Clure Strait in western Parry Channel because of the old ice that almost continuously chokes the western half of that waterway. Instead, they follow Prince of Wales Strait to the east of Banks Island where first year ice predominates and which frequently clears during the navigation season.

To the northeast of M'Clure Strait, in the Sverdrup Basin, sea-ice clearance during the summer is very limited so that drilling windows are short and very uncertain. For that reason, winter drilling is preferred as it is possible to operate on the sea ice from strengthened ice platforms - the sea ice exhibiting essentially a fast ice condition during the winter.

While wind remains an important factor in this area by virtue of its role in sea-ice movement, particularly in summer, its overall influence is lessened in that the sea ice presence reduces its direct interaction with the sea surface. Thus, the potential for high wave conditions or severe structural icing events is greatly reduced in comparison with the Beaufort Sea or Baffin Bay areas for example. It is important to note, however, that wind chill can be a severe problem for operations in the Sverdrup Basin as temperatures are among the lowest experienced anywhere in the Canadian Arctic.

Lancaster Sound-Northwestern Baffin Bay

As we move eastward, wind once again becomes increasingly important to offshore operations. Sea-ice conditions are typically first year ice often with complete clearing during the July-to-October period. At that time, wind could disrupt drillship activity by advecting old ice floes into this area from the east or the west. During winter, wind contributes to an ice cover which although complete is constantly in motion in most winters thus precluding on-ice drilling such as is possible in the Sverdrup Basin.

The open water season allows a drilling window of several months, but operations are subject to potentially high wave conditions and structural icing possibilities. There are many similarities to the Beaufort Sea in this regard, although higher wave conditions are possible in the Lancaster-Baffin area due to extensive open water fetches to the east and southeast.

Storm activity is increasingly a concern as the major storm trajectory in the Canadian Arctic lies to the east, extending northward from Davis Strait along the eastern side of Baffin Bay. There the combined effects of high winds, high waves, structural icing, extensive cloud and poor visibility must be considered.

In this area, iceberg occurrence begins to be a concern also. Large numbers of icebergs calve from Ellesmere Island and Greenland and pass through northwestern Baffin Bay on their way southward. Some of them enter Lancaster sound typically along its north side and then exit eastward along its south side.

Western Baffin Bay-Davis Strait

This region is completely under the influence of the major storm trajectory mentioned above, along which storms enter the eastern Arctic from the south. As such, the effects of storms combining critical levels of several climatic variables is a significant concern particularly during the latter half of the drilling season when storm activity is most frequent.

Similar to Lancaster Sound-northwestern Baffin Bay, this area presents an ice regime which is characterized by complete sea-ice cover in motion during much of the year. Clearing occurs during July-October and is usually complete although some sea ice can remain in the coastal waters between Cape Dyer and Clyde, remnants of the ice bridge that often extends across Baffin Bay to Melville Bay at the beginning of break-up. More of concern to offshore activities at this time of year is the high concentration of icebergs in these waters. The southward flowing cold Baffin current carries these icebergs continuously through the area and on to the Labrador Sea.

Hudson Bay

In this area, wind again has a very important role. Icebergs are not present and sea ice is of the first year type although some older forms can be found occasionally in Foxe Basin to the north. Sea-ice clearance is total in summer with a navigable season of July-to-October.

Wind's major influences are in the development of high waves as appreciable fetches are possible across Hudson Bay and in the occurrence of high wind chill beginning during the October-November time of the year. Structural icing potential is also high in October.

2.2.2 Atlantic

The Atlantic offshore of Canada can be divided into the areas of the Labrador Sea, Grand Banks and Scotian Shelf. These are considered together in the following paragraphs.

The Labrador Sea and Grand Banks areas are both transportation corridors and potential areas for hydrocarbon reserves. Climatologically, a common characteristic is the presence of moving pack ice during winter and early spring. Icebergs, which are calved from glaciers ending in Baffin Bay to the north, drift southward through the fall and winter to menace shipping and drilling in these waters.

Storms frequently traverse the southern parts of the Labrador Sea, Grand Banks and Scotian Shelf. The wind and wave climate on the Grand Banks is probably the most demanding anywhere in Canadian waters. Juxtaposition of warm/cold air and water currents south of the Maritimes and Newfoundland creates the ingredients necessary for the development of extremely deep and extensive lows with strong winds and high seas.

The near presence of the Gulf Stream as a source for relatively warm moist air results in frequent persisting cloud and fog when the winds are favourable. Along the continental margin on the east coast, the battle between cold and warm air masses gives rise to conditions which make freezing precipitation a frequent occurrence.

It is a bitter irony that one of the most promising areas for oil exploration, the Hibernia area on the Grand Banks, is also one of the most hazardous in terms of climate. 100-year return maximum winds are estimated to be on the order of 110 to 115 knots with a 100-year extreme maximum wave of about 35 metres(among the highest in the world). Strong winds and currents make icebergs a problem for pipelines and sub-sea well facilities because these bergs scour the bottom at times and would tear out anything unprotected or even firmly attached.

In part because of the Ocean Ranger disaster, human safety is becoming a more prominent concern on the east coast. Hydrocarbon fields are very far from bases for resupply and emergency services (search and rescue, and hospitals). Helicopter operations are essential, but can only be carried out when route and destination conditions are favourable. Such things as strong winds and atmospheric icing conditions will also reduce the relative amount of time that it is possible to carry out such operations. As far as marine resupply and construction operations are concerned, high winds, high sea state and reduced visibility are logistics problems.

Clearly, climatic information on multi-dimensional weather windows will likely be a very real constraint on feasible design and construction of offshore facilities in the Atlantic area.

2.2.3 Pacific

The Pacific Ocean areas off Canada's west coast seem at first to be a relatively benign environment for offshore activities. Temperatures are relatively mild, tempered by a fairly long over-sea trajectory. Freezing spray is not frequent and there is no pack ice or icebergs to speak of. The narrow width of the continental shelf means that drilling will be carried out close to shore and supply routes to the mainland could be minimized.

The Pacific, however, is a very large ocean and although the generating potential for strong winds in synoptic scale systems may not appear to be as great as for the Atlantic, the weather systems on the Pacific side are often of a fully-developed nature. This contributes to strong wind and high wave regimes.

The wind regime is complicated by the nearby mountains and their rough topography; thus it is not readily modelled using coarse resolution field data as has been attempted for other offshore areas. Mesoscale modelling may be necessary to produce usable hindcasts of wind. A further problem characteristic of the West Coast is outflow winds or the "squamish". This refers to the streaming of cold arctic air (which has previously invaded the B.C. interior) through fjords along the coast at considerable speed.

Waves in the Pacific have ample opportunity to grow to their full potential. Swells of long period propagate from long distances to mingle with locally generated seas. An extreme wave of on the order of 30 metres was observed during exploratory drilling off Vancouver island before a moritorium on drilling came into effect in the mid-70's so that environmental concerns having to do with risks from spills could be resolved. This has still not been achieved. The coastline is aesthetically pleasing and highly vulnerable to pollution from spills. Winds and currents are such that if spills occur, it is certain that large areas will be at hazard. Risks from and to the environment must be minimized and visibly so.

2.2.4. Design Data Comparison

Table 1 indicates current estimates of 50-year annual return period values for both wind speed and significant wave height for various areas of each of the Arctic, Atlantic and Pacific. While they are drawn from various sources and reflect different methods of analysis, they do give a rough comparison of conditions over the Canadian offshore.

3. Sources of Data

The climatic information necessary for offshore routing and siting decisions is derived from several sources: generally short-term or non-uniform observations from ships and drilling platforms, the observing programs at land-based weather observing stations and at lighthouses, satellite and airborne observing programs, and hindcast data from objectively analyzed data fields and model simulations. None of these sources is completely satisfactory by itself and the necessary climatological guidance must usually be inferred from a combination of them. Figure 1 provides an example of the nature of the AES observing network, ship observations coverage and gridded data points in the Lancaster Sound-northwestern Baffin Bay area.

Ships and drilling platforms obviously offer the most direct data for the offshore areas. Short-term data sets, varying observing locations (e.g. data from ships which are in transit), and non-uniform observing procedures (particularly in terms of types and locations of meteorological instruments) are problems, however. Thus such data are not particularly amenable to time series or extreme value analysis. Usually the data are handled by combining all observations from various locations within defined geographic areas, for example, a 5° x 5° latitude-longitude square. Statistical analyses are then performed on the merged data set. As far as areal coverage is concerned, the Atlantic area has the highest concentrations of observations, followed by the Pacific and Arctic. Referring to the example in Figure 1, there are a total of about 3000 observations available for each of the two areas (labelled 11 and 12) over the entire period of record. This may be contrasted with a coastal observing site such as Resolute where an hourly observing program is in operation, resulting in the accumulation of about 9000 observations in a single year.

The land-based weather stations of the AES observing network offer the advantages, in most cases, of reasonably long, continuous observing programs at fixed locations. The data from these coastal or island locations are suitable for the time series and extreme value analyses that are very important in providing suitable engineering design information. On the other hand, being land-based, the data do not necessarily reflect offshore conditions. Certain critical variables such as wind speed may be underestimated by 30 percent or more if such data are used directly. Additionally, in many areas, particularly the Arctic, coastal stations are sparse so that estimates for many offshore sectors are not even possible using such an approach. Again looking at Figure 1, there appear to be a large number of observing stations along the coasts of or near to Lancaster Sound, for example. Some sites, however, are no longer in operation or have short-term records (Dundas Harbour, Arctic Bay); others (such as Pond Inlet) are influenced by local conditions. Resolute is the only really applicable long-term station and it is considerably to the west.

To supplement the AES land-based data, various non-standard data sets from land-based locations are available. In both the Atlantic and Pacific, the numerous lighthouses have taken observations, in some cases over appreciable periods of time. The quality of these data needs careful assessment as observers have generally minimal training, the type of equipment used and its siting is variable and the observing schedule itself is often not uniform. For the Arctic, supplementary land data are available from the Polar Continental Shelf Project. Data are gathered twice daily at each of the research sites that the Project supports. Observers are given elementary training and efforts are made to ensure uniformity in observing equipment and techniques. The data, however, may only exist at a given site for a week or so and at best, data records may extend over several summers at one site.

Satellite observing programs offer promising possibilities to improve our knowledge of the offshore climate directly. To date, most use has been made of information which can be derived on sea-ice extent and coverage. Increasingly, the possibilities for determining temperature, wind and wave information are being recognized, however. Periods of record are not appreciable as yet in climate terms and digitizing considerations are significant, but this may provide in the long term, the most feasible way to develop a useful, direct offshore climate data archive.

Aerial sea-ice reconnaissance is still the most significant part of the AES ice observing program. Visual, laser profilometer, sideways looking airborne radar (SLAR) and microwave techniques are all integrated to provide areal ice condition charts for the Arctic in summer and the Atlantic in winter. Over 25 years of such data are now available.

In order to fill the gap in direct offshore climate data, hindcast data are now being used extensively to provide design-related information. Gridded surface pressure fields can be used to develop wind climatologies and these in turn may be variously combined with gridded air temperature fields, knowledge of water temperatures and geography to derive such fields as waves, wind chill and structural icing potential. Such analyzed fields offer the advantage of complete coverage in the offshore areas, a continuous record at fixed intervals (6 hours typically) and an appreciable length of record (over 30 years). On the other hand, the smoothing inherent in objective analysis may mean that extreme events are underestimated - an important consideration for design purposes.Figure 1 shows the surface pressure grid point locations in the Lancaster Sound area. Data at each of the points can be used with various interpolation techniques to derive geostrophic winds at any location within the area covered by the data set.

4. Analysis and Presentation of Data

4.1 Types of Analysis

For the climatic elements discussed here, statistical analyses in forms applicable to design purposes are necessary. Thus, the emphasis is on probabilities, percentiles, exceedance values, extremes, return periods, durations and time series trends. Contingency analysis for several climatic elements is also of concern. As critical values often occur in combination during severe storms (e.g. high winds, low visibilities, high waves, rapid structural icing accumulation), the effect on an offshore drilling platform could be disastrous. For this reason, climatologies of storm frequency, intensity and trajectories are vital and case studies of individual extreme situations are necessary to understand fully the interactions and impacts of the various climatic elements.

4.2 Analysis Systems

To access the different sources of data outlined in Section 3 and produce the design type climate information necessary, the AES Canadian Climate Centre has developed several computer based systems capable of providing a full range of area or site specific analyses (Swail et al., 1983).

MAST (Marine Statistics) is a system for accessing ship observations to produce summaries and graphical analyses of winds, waves, air and sea temperature, wind chill, sea spray icing, visibility and cloud. Presentation is in terms of frequency of occurrence, means, medians, exceedances, etc. Several examples of MAST analysis are shown in Figure 2. LAST (Land statistics) and GASP (Gridded Atmospheric Statistics) were developed so that similar analyses would be possible for landbased data and numerical or objectivity analyzed data fields such as the NEDN (Naval Environmental Data Network) data fields obtained from the U.S. Fleet Numerical Oceanographic Center. CONAN (Contour Analysis) was developed to give analysis of the spatial variability of these fields. With CONAN, it is possible to map means, medians, exceedances, percentile values and extremes of environmental data fields. DUST (Duration Statistics) was developed to produce analyses of the duration of critical events and to produce extreme value (Gumbel) analyses of meteorological and oceanographic elements in accessible data bases. Finally, a system which allows analysis of gridded surface pressure data will, when completed, enable pressure centres to be studied in terms of trajectories, frequencies of occurrence, intensities and variability.

Access to the products from these systems is, or will be soon, available through AES regional Scientific Support Divisions, the Canadian Climate Centre or directly on AES' Downsview computer for those users with the capability and need for access. The systems are complex and powerful, yet for most common purposes, easy to use because of their menu-driven nature. They are a new and direct avenue for access to climatic information for decision making on offshore routing and siting.

5. Climatic Change

For exploration activities which at any particular site or area might have a lifetime of perhaps half a dozen years at most, the importance of climatic change and how it might invalidate design information based on the existing data base is not great. For production activity which might be expected to last 20 to 30 years or longer, however, consideration of possible future climatic change is important.

An indication of recent climate conditions is shown in Figure 3. The temperature trends at several eastern arctic locations over the existing periods of record indicate a cooling period beginning in the early 1950's and continuing until the early 1970's. Thereafter a leveling-out and more recently slight warming has occurred. These then represent "existing conditions", if you will, from which design information is currently derived. Any significant deviation of climate in the future from the range of these existing conditions could have important implications for design information. (An important point to note is the fact that the trends in the eastern Arctic are not necessarily similar to those that have occurred in other Canadian offshore regions. Each region must be evaluated separately.)

While both warming and cooling relative to existing conditions is possible future warming (mainly induced by increased atmospheric CO_2 concentration) is considered more likely. Global circulation models based on CO_2 doubling indicate that such a warming trend could amount to an increase of 2 to 3°C in the mean annual temperature of the northern hemisphere by the mid-21st century or soon thereafter. This warming is not expected to be uniform across the whole hemisphere; for example, the Arctic will experience a much greater surface temperature increase (perhaps 10°C) generally than other latitudes. This is related to the general thermal stability of the lower levels of the arctic atmosphere (so that the expected warming will be concentrated close to the surface rather than distributed throughout the troposphere) and to the retreat of the highly reflective ice and snow surfaces. In the Atlantic and Pacific areas between 40 and 55°N, surface warming is expected to be comparable to the hemispheric mean value.

Similarly, there is seasonal variability in the expected warming. In the Arctic, the magnitude of the warming in the summer would be much less than that in the winter. In summer, sea ice is thin or absent in many areas, the surface albedo reduces significantly and net incoming solar radiation increases. The additional solar radiation is used either for melting the sea-ice upper surface or for warming the ice-free mixed layer which has a large heat capacity. Thus the summer warming of the surface air turns out to be relatively small (Manabe and Stouffer, 1979). At the latitudes of the Atlantic and Pacific offshore areas, warming is expected to be fairly uniform throughout the year.

While obviously, over the foreseeable lifetime of offshore production (say 30 years), only a portion of the warming discussed above would occur, it would be enough so that it would need careful consideration during any design work.

A pronounced arctic warming has a number of implications for climatic and related elements which bear on arctic offshore routing and siting decisions. The increased warming relative to equatorial areas will alter the temperature difference between the pole and equator which helps to drive storm systems around the globe. Particularly, it appears there would be a more uniform gradient of air flow between pole and equator so that circulation will slacken in the mid-latitudes but intensify at high latitudes. Thus storm activity embedded in that flow will be more prevalent in the Arctic.

The increased temperature and increased storm activity will lead to increases in such elements as wind speed, wave action and structural icing potential - all of major significance to offshore activity. For example, increased wave action will result in greater wave heights and longer durations and also in increased duration of wave period conditions critical to fatigue problems. Increased structural icing potential would be reflected in both intensity and duration. The season might be shifted and its length overall would increase. The geographical extent of the icing-prone area will also increase. Increased temperature in itself will contribute to lower energy requirements (for compressors) needed to keep oil and gas flowing in pipelines. There would be reduced permafrost extent and attendant frost heave problems.

Due to the importance of sea ice and icebergs for offshore routing and siting, their response to future warming is highlighted in the following section.

5.1 Implications of Warming for Sea Ice and Icebergs

At present, sea ice presence where first-year ridging or multi-year floes and hummocks occur poses major problems for tankers trying to make headway through it and for fixed or dynamically positioned platforms which must either be designed to withstand the ice or be prepared to move off-station to avoid it. There is also some problem due to scour by ridges and hummocks in some of the shallower waters which could affect sea-bed pipelines. In these cases, strict design criteria must be met. This involves large dollar outlays which add significantly to the cost of marketing any future reserves. This is a particular problem for the Arctic, mainly in the Parry Channel, Beaufort Sea and Queen Elizabeth Island areas.

The advent of warmer climate conditions would lead to a decrease both in the overall extent of sea ice and in the thickness of that ice which continues to exist. At the same time, however, the lesser concentrations of ice generally would probably allow more multi-year floes, most of which are presently restricted to the Polar Basin and among the High Arctic Islands, to penetrate into more southerly waterways where Beaufort-related transportation activity is expected to occur. In the long term, such movement of old ice would disappear, but it would likely be a problem at least for the lifetime of any presently foreseen production activity. Another concern might be increased wave/structural icing potential as increased storm activity affects waters that are no longer damped by sea-ice cover.

The threat of icebergs is mainly restricted to the eastern Arctic and the waters east of Labrador and Newfoundland. Problems relate both to collision with platforms or tankers and to seabed scour which could destroy even embedded pipelines used to connect production platforms to coastal markets or collection points.

A future warmer environment would likely result, at least in the short term ,in increased calving from arctic glaciers so that concentrations of icebergs in arctic waters would be greatly increased. On the other hand, melting of the icebergs would probably accelerate so that fewer or at least smaller ones would be likely to survive to affect the southern offshore areas.

6. Discussion

Climate plays a vital role in the siting and routing of offshore hydrocarbon-related activities in Canada. In order to achieve an optimum balance of costs vs. environmental risk, there are a number of specific climatic and related elements which must be taken into account during the design phase; these include wind, waves, structural icing, temperature, wind chill, visibility and cloud, and sea ice and icebergs. Each of these has a varying degree of significance depending upon the particular offshore region being considered and the time of year of interest, and so must be carefully evaluated for each distinct offshore project.

An important point to remember is the fact that expected extremes of individual climatic elements may, for a specific location, not be severe enough to be an important design concern. It is possible, however, that in combination with some other element the resulting impact could be significant. Thus it is vital to recognize that storm situations where significant thresholds of several elements may be reached at the same time must be thoroughly evaluated. This could be the case for severe structural icing or wind chill events, for example.

There is a fairly good understanding of what climatic data are most important for a particular phase of offshore exploration and production, and of the type of analyses that are most needed. Further, powerful tools for processing the data into the required forms have been developed. It is the all-important intermediate step which now requires and is receiving the most attention. That is the acquisition or development of the appropriate climatic data. This problem reflects the very sparse nature of the existing offshore climate data base. Even those data which do exist usually are not amenable to statistical analysis for critical design needs such as extremes and durations. The collection of new data is being encouraged, but in the time frame of present offshore activity, there is insufficient time to build sufficiently long data series from which reliable design statistics can be derived. To circumvent this, the trend has been to develop synthetic climatologies where possible.

A good example is the use of gridded surface pressure data fields which allow geostrophic winds to be calculated. How directly applicable such winds are to design (which generally requires surface wind data) remains an open question. On one hand, they are derived from gridded data which may smooth the most extreme events (which are usually the most important for design); on the other hand, they may not always reflect the frictional component of actual surface wind so that they might be overestimates in that respect. It is clear that there is a complex question of interpretation or adjustment of such data which must be addressed. Generally, it must be done on a site or small areal basis because each geographic area is different in terms of the distribution of land and water surfaces and the relative frequency of cyclonic and anticyclonic activity that occurs there.

Given that the problem of selecting and/or adjusting the most appropriate data is resolved, the question of climate change becomes an important concern. Any statistics which are developed on the basis of existing climate data or gridded fields with the intent of applying them to the design of production expected to have a 30 year lifetime could be put into question by a warming (or cooling) trend in climate during that time. Resulting under-or over-design could mean either significant capital losses and environmental damage or unnecessarily expensive construction and development costs.

The question of climatic change is far from simple. The possibility of warming or cooling must first be resolved, then the manner in which such a change would be reflected on a regional basis such as for the Arctic or Pacific or Atlantic. How further would such change affect other climatic elements and then how would these impact on offshore activities themselves? There is such a chain of connecting assumptions to be made that room for error is large given our current state of knowledge. Nevertheless, qualitative assessments can be usefully attempted now and hopefully refinements in them will be possible in the near future as we are able to study past and present climate patterns and their relationships with offshore activity in more detail. We will then be in a position to make any necessary adjustments to currently derived design values. This is not done now, but it is clearly needed.

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Table 1. Estimates of Wind and Waves for Selected Canadian Offshore Areas

Area	50-Year Annual Return Period Values: Wind Speed (km/h)	50-Year Annual Return Period Values: Significant Wave Height (m)	Source
Arctic			
Beaufort Sea	128*	8.0*	Berry _et al._, 1975
Lancaster Sound-Northern Baffin Bay	142*	11.2*	Lachapelle and Maxwell, 1983
Southern Davis Strait	172	10.0	Unpublished AES data analyses
Atlantic			
Labrador Sea	185	11.8	"
Grand Banks	202	12.5	"
Scotian Shelf	178	12.2	"
Pacific			
Queen Charlotte Islands	165	–	"

* July-October values

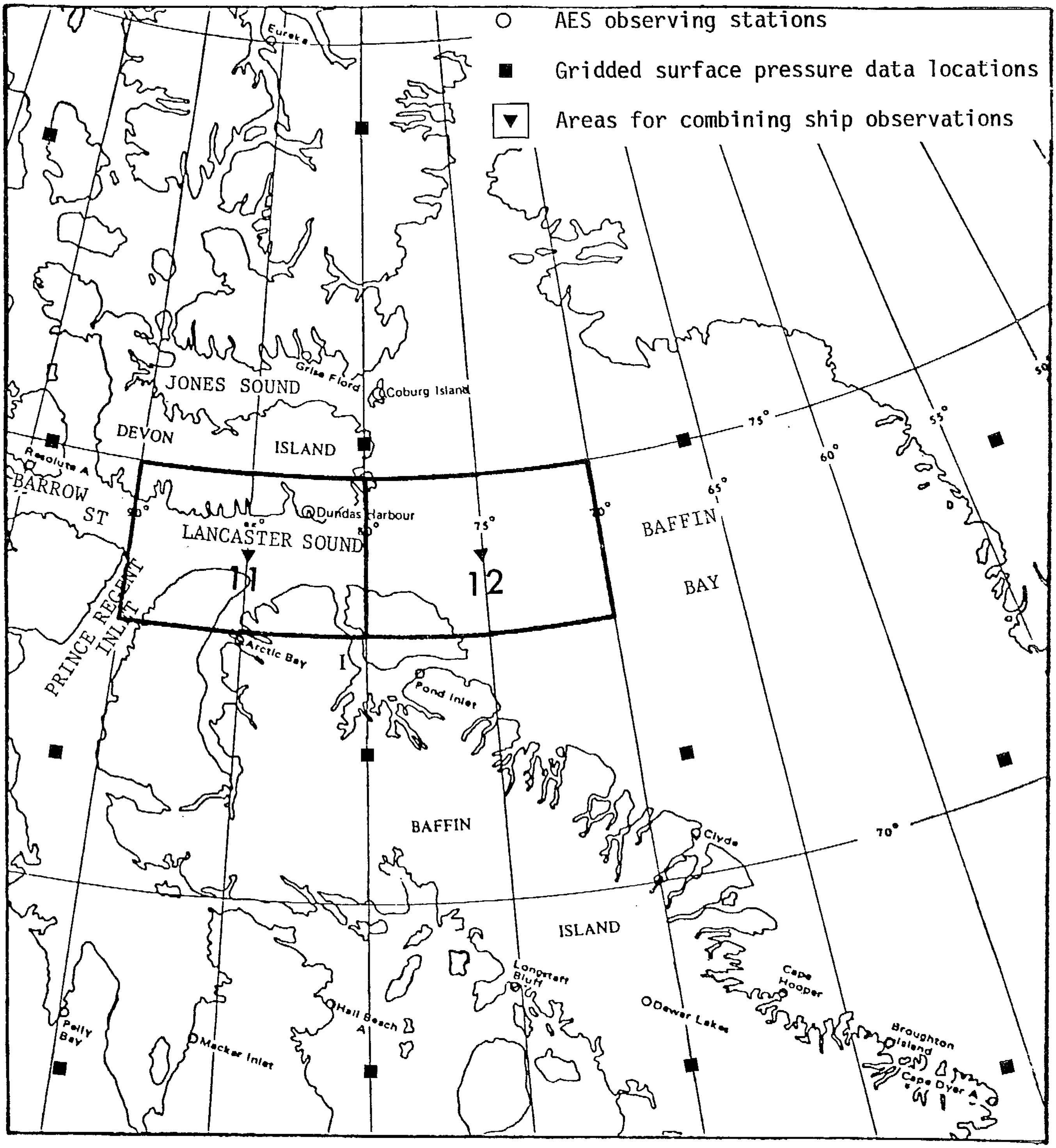


Figure 1. Data Coverage for Lancaster Sound - Northwestern Baffin Bay

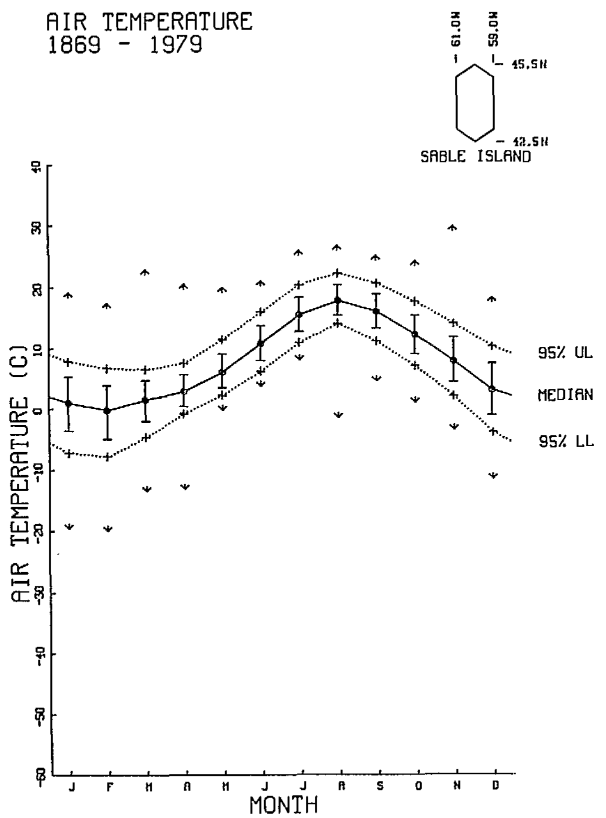


Figure a. Basic statistical tables graph.

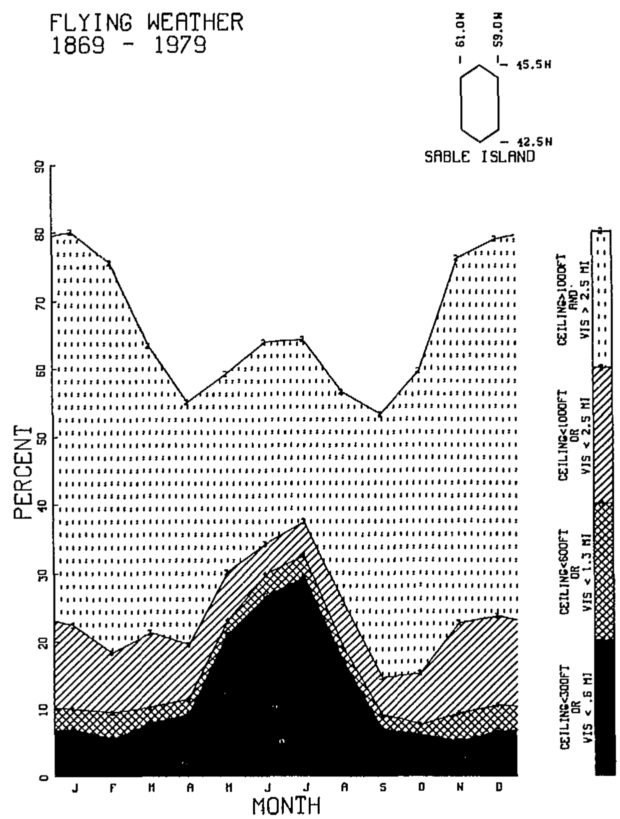


Figure b. Univariate frequency analysis graph.

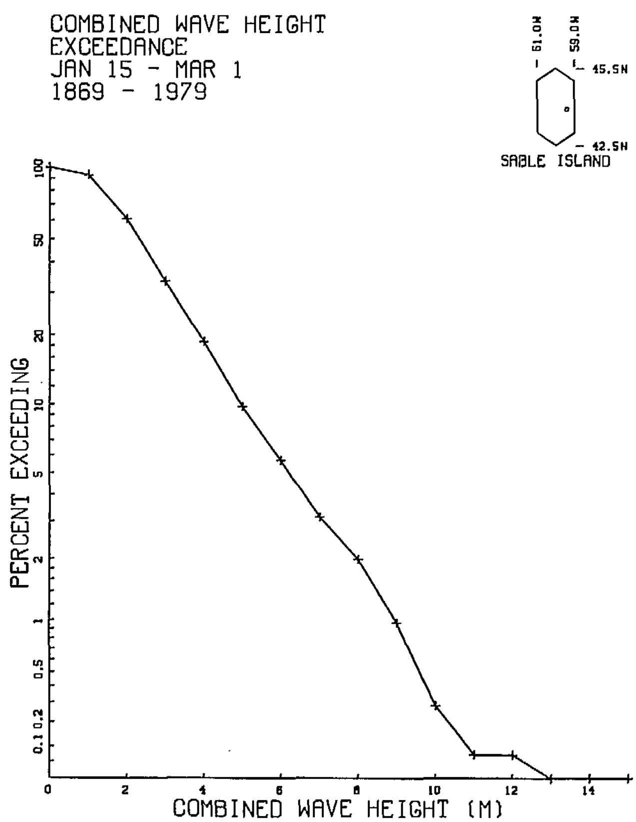


Figure c. Exceedance graph.

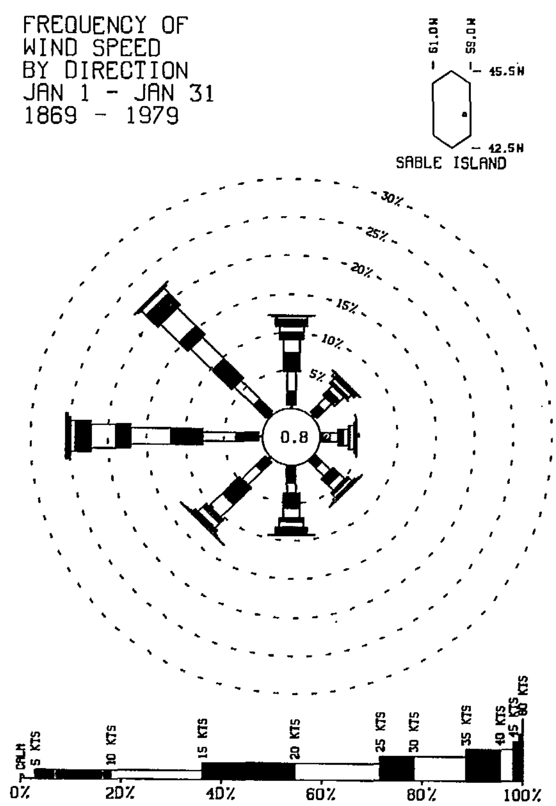


Figure d. Directional plot or roses.

FIGURE 2. SELECTED EXAMPLES OF MAST ANALYSIS FOR AN EAST COAST LOCATION.

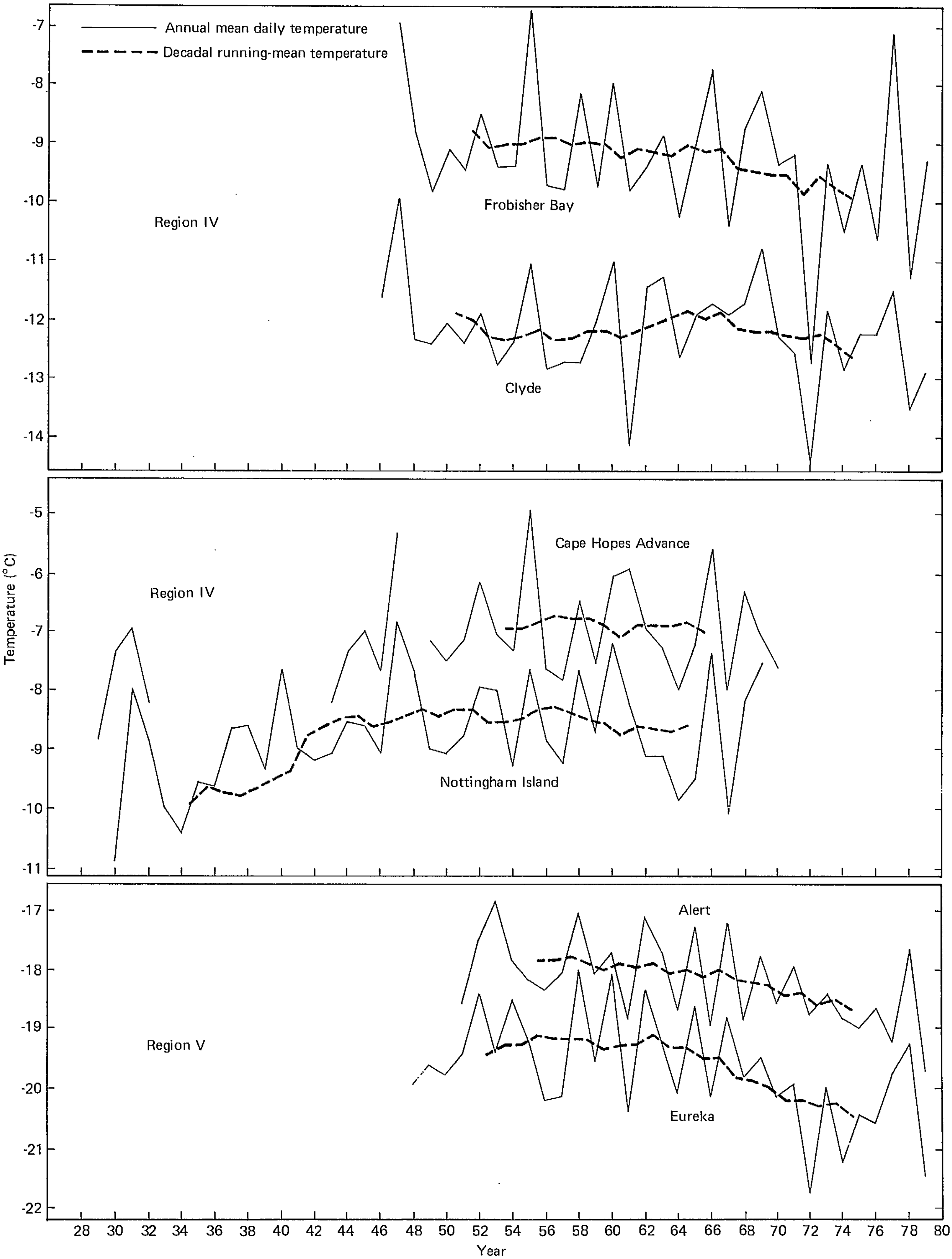


FIGURE 3. RECENT TRENDS IN EASTERN ARCTIC TEMPERATURE.

"A MULTIPLE USE CORRIDOR IN NORTHWEST ALBERTA"

Ian F. H. Scott
Dome Petroleum Limited
P.O. Box 200, Calgary, Alberta

ABSTRACT

This case history highlights Dome Petroleum Limited's experience with the siting of a gas plant, routing of an associated gathering system and construction of both in a somewhat remote, environmentally-sensitive area in Northwest Alberta. Specifically, the paper describes briefly the overall criteria used to site the gas plant and route the gathering system. A major component of this development was the establishment of a multiple use utility corridor involving potentially three different pipelines - a gathering line, a sales line and a liquid hydrocarbon line - to and from the gas plant, and a power line to the gas plant. Dome's role in coordinating the routing and construction of the three pipelines and one power line is discussed. The paper highlights the utility corridor route selection criteria and its compatibility with the requirements of each company and various government agencies. The paper focuses on a number of the potential problems identified during the planning stage which related to the possibility of three or four companies working within the utility corridor at the same time and also those problems which were not identified during planning but did occur during construction. Also, a brief review of potential future problems arising from different right-of-way management methods of each company within the corridor is made. The paper concludes by emphasizing the need for good coordination and communication during both planning and construction and provides recommendations for the development of future multiple use corridors.

INTRODUCTION

Over the last few years Dome Petroleum Limited has been very active in hydrocarbon development in the Deep Basin area, south of Grande Prairie, Alberta. By July 1980, Dome Petroleum had drilled and tested 13 wells, was drilling and testing 12 wells and proposed to drill an additional 20 wells in the Cutbank-Kakwa Rivers area. At that time it was decided that on the basis of the information obtained from the existing wells, the region had good potential for natural gas and gas liquids (C_4+) production. Consequently, Dome decided to build a gas processing plant and a gas gathering system and liquid sales line.

This paper highlights Dome's experience with developing a system in the Cutbank-Kakwa Rivers area of the Deep Basin (Townships 61-64, Ranges 5-10, West of the 6 Meridian). The purpose of this paper is to illustrate the planning process used in developing this system and, in particular, identifying where problems occurred.

To simplify this discussion I will examine primarily the plant and gathering system components of the project then review the entire project. The major components which had to be considered included the location of existing and proposed wells, the gas plant, the gas gathering system, sales gas line, liquids sales line and a power line for the plant. Each of these had a direct influence on the location of each other component. As well, since the project is located in Forest Management Units G6 and G7, consideration had to be given how to minimize interference with the logging operations of Proctor and Gamble.

For each component I will discuss the criteria used to select its location, where it was finally located and any particular problems encountered. I will also briefly review the various data resources that were utilized during the planning process. However before I do, I would like to review the various departments within Dome who had a direct influence on the design of the project.

Project Team

The members of the team involved in development planning are shown in Figure 1. Exploitation identified and evaluated Dome's properties, provided reservoir information and provided overall project management. Drilling designed, organized and operated all drilling and this included the construction of new access roads to wells. Oil and Gas Engineering (OGE) designed all facilities, provided liaison between Dome and other companies involved - NOVA, AN ALBERTA CORPORATION (NOVA), Peace Pipe Lines Ltd. and Alberta Power Limited. OGE worked closely with Environmental Affairs on the site and route selection. Also OGE provided direct project supervision during construction. Environmental Affairs was involved in site and route selection and provided liaison between OGE, government agencies and NOVA. Surface Rights worked closely with all departments to obtain necessary land agreements once the site and route were selected.

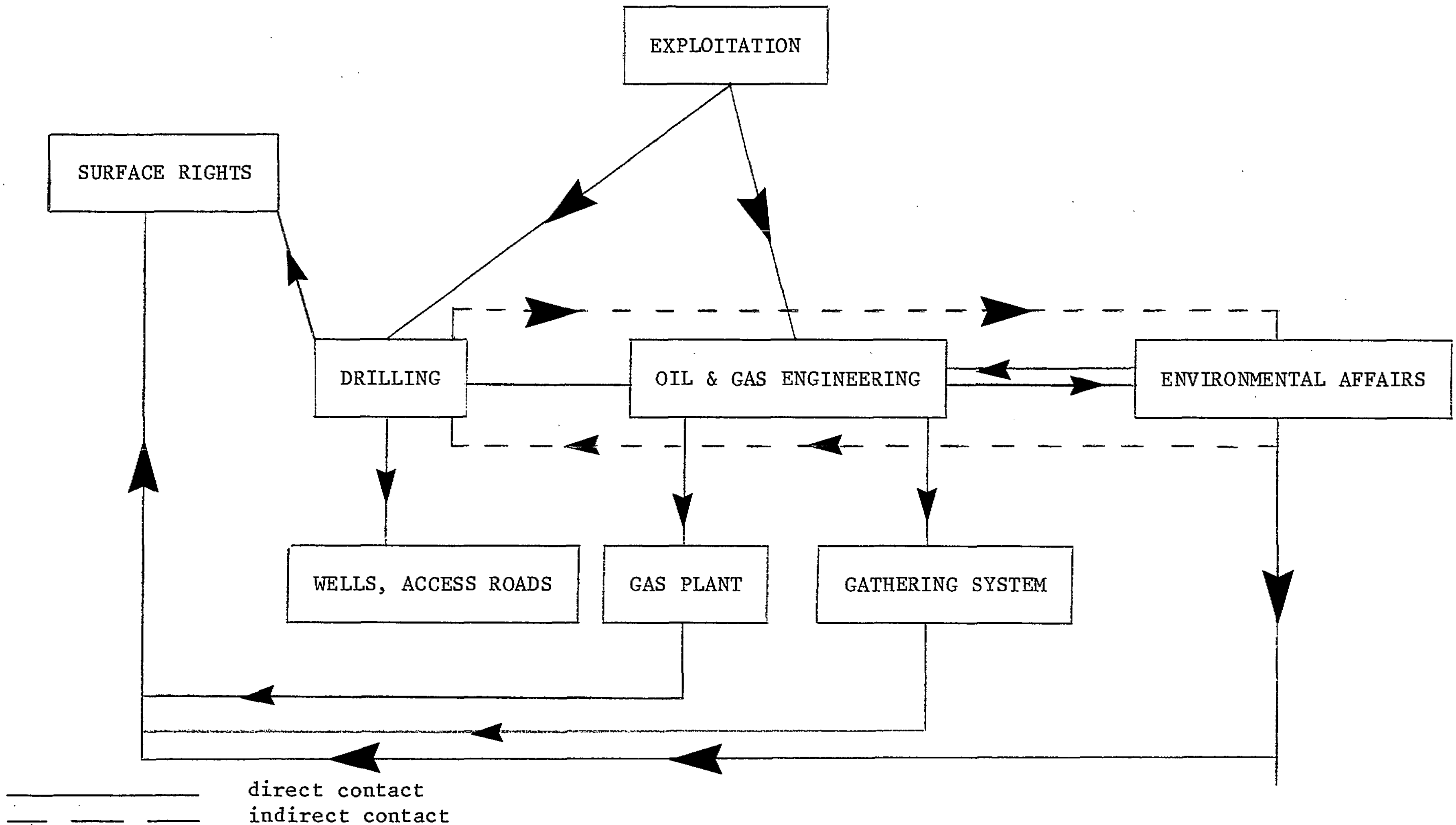
Site and Route Selection Procedures

Initially, the 1:250,000 and 1:50,000 National Topographic Series maps were reviewed to determine suitable potential gas plant sites and a possible gathering system. These were used in conjunction with Alberta Forest 1:50,000 scale maps which provided information about forest cover, existing seismic lines and access roads.

Once the potential sites and possible gathering systems were drawn on the above, a number of aerial reconnaissances were made with a helicopter. During each flight, numerous on-the-ground observations were made to provide better insight about terrain stability and select optimal watercourse crossing locations. Photographs were taken to illustrate unique or specific terrain features for use in the subsequent permit application documentation. Throughout representatives of Alberta Fish and Wildlife and Forest Service were present during these reconnaissance flights to provide input on the various plant sites and gathering system. Following each reconnaissance the site or route were modified on the basis of information provided

FIGURE 1

DEPARTMENTS INVOLVED IN PLANNING PROCESS



by government (i.e., critical wildlife areas, unique or sensitive vegetation, unstable slopes) or information gained during six different sites and gathering systems to each was evaluated by the flight itself. In all more than 10 flights were made to determine the best possible plan, site location and gathering system. In addition, contact was made with a number of other government agencies to determine information which could affect location of either the plant or gathering system. These agencies are listed in Table 1. At this stage, the route selection team had assembled considerable resource inventory data, maps, aerial photography and had a number of meetings with governing agencies.

Following this, applications were prepared, submitted and approvals/permits were obtained. Table 2 lists permits and applications received and responsibility of each department for preparation of the applications. Construction commenced December, 1981 and the plant and pipeline were completed May and April respectively.

Plant Site Selection Criteria

In total, six different potential sites were examined as possible locations for the plant (see Figure 2). All but one were found to be acceptable to Alberta Forest Service and Fish and Wildlife. The one site which was not found acceptable (Site #1) was located too close to Long Lake, a recreation reserve. Both Forestry and Fish and Wildlife felt that the plant would not be compatible with land use around the lake.

In examining each location, the following criteria were used:

- Proximity to wells;
- Accessibility of plant for operations;
- Accessibility to Alberta Power's 250 kV line since compressor drivers are electric;
- Accessibility for NOVA's sales gas line and Peace's liquids line;
- Dry, stable soil suitable for constructing plant;
- Minimizing interference with Proctor and Gamble's logging operation, holder of Forest Management Licence;
- Avoidance of recreational areas;
- Avoidance of critical wildlife area;
- Aesthetics.

Site #6 (see Figure 2) was the site chosen. This site was selected because it was close to the best producing wells, there was a good existing road infrastructure to facilitate accessibility; the plant was not too far from Alberta Power's power line, NOVA's sales gas line and Peace's liquids line; the terrain was stable; the site was well drained; the site was not in any unique or critical wildlife areas and the site did not impact any recreation areas. In general, there were no major problems encountered with the construction of the plant.

TABLE 1

1. DEPARTMENT OF ENVIRONMENT

   - Land Reclamation Division

2. ENERGY AND NATURAL RESOURCES

   - Forest Land Use Branch (Edmonton and Grande Prairie)
   - Fish and Wildlife (Edmonton and Grande Prairie)
   - Land Management and Development Branch Natural Areas Coordinator

3. RECREATION AND PARKS

   - Parks Planning Branch

4. CULTURE

   - Archaeological Survey of Alberta

5. ENERGY AND NATURAL RESOURCES

   - Coal Department

TABLE 2

LIST OF PERMITS/APPROVALS REQUIRED

APPROVAL/PERMIT/LICENCE	AGENCY	RESPONSIBILITY	REQUIRED
Pipeline Permit	ERCB	Engineering, Surface Rights, Environmental Affairs	Construction and operation of pipeline.
Clean Air Act Permit & Licence	Environment	Engineering, Environmental Affairs	Construction and operation of plant.
Development and Reclamation Approval	Environment	Engineering, Environmental Affairs	Construction of regulated pipeline.
Permit to Construct Water Crossing	Environment	Engineering, Environmental Affairs	Water crossings by pipeline.
Licence of Occupation (LO)	Energy & Natural Resources	Engineering, Surface Rights, Drilling	Access Roads.
Miscellaneous Lease (ML)	Energy & Natural Resources	Engineering, Surface Rights	Plant Sites.
Pipeline Agreement	Energy & Natural Resources	Engineering, Surface Rights	Pipeline construction.
Use of Explosives in Fish Sensitive Watercourse	Energy & Natural Resources	Engineering, Environmental Affairs	Blasting in watercourse frequented by fish.
Historical Resources Approval	Energy & Natural Resources	Engineering, Environmental Affairs	Archaeological survey.

Pipeline Route Selection Criteria

The criteria for selecting the gathering system and, in particular, the utility corridors were not much different than those commonly used in selecting any pipeline route:

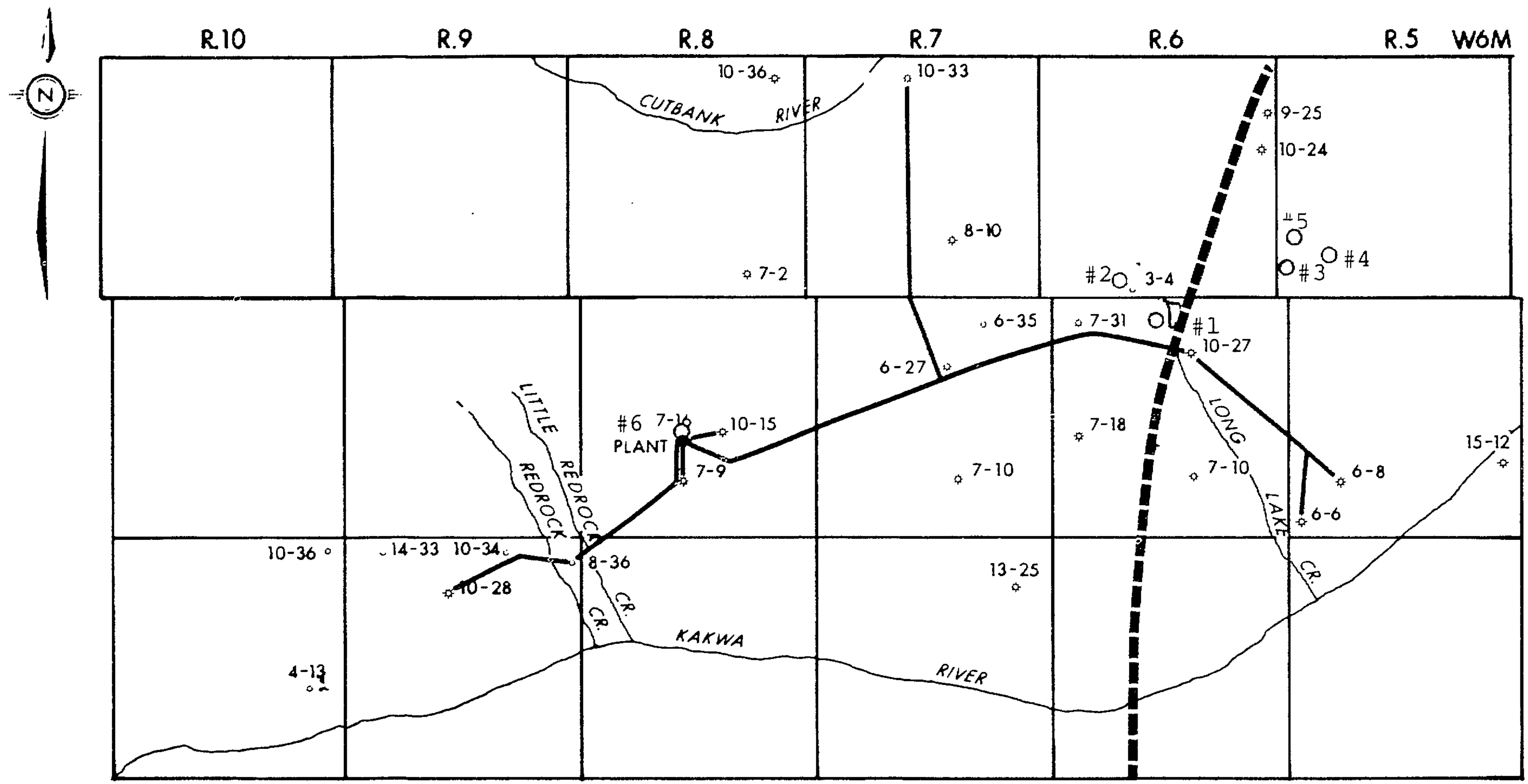
- Termini locations;
- Use of existing seismic lines, roads, rights-of-way, where possible;
- Avoidance of steep or unstable slopes;
- Minimize the number or river crossings;
- Good river crossing locations;
- Avoidance of sensitive or critical wildlife areas;
- Minimize interference with Proctor and Gamble's ongoing and future logging operations;
- Compatibility of Dome's right-of-way with those of NOVA, Alberta Power and Peace Pipe Line;
- Avoidance of recreational areas;
- Avoidance of archaeological sites.

Although at one time there was the potential to tie in 25 or more wells, only 9 wells were tied-in (Figure 3). One of the most difficult aspects of this project was to know which wells would form part of the system. You will recall that initially 13 wells were drilled, 12 were being drilled and tested and 20 more were potential wells. Of the total 9 wells tied in, only 7 were of that original group. Two additional wells were drilled and tested during the planning process. There are other wells which were successful and these may be tied-in later when economic conditions are better. With this change in 16 wells being tied-in modifications were continually being made to the final route up until just before our application for a 70 km regulated pipeline was filed with the ERCB and Alberta Environment.

As part of the overall pipeline route Dome decided to establish a 9.6 km, 42 m wide utility corridor in which all possible services required by the plant could be included within a single right-of-way (Figure 3). The participants in the corridor were NOVA with a 16-inch sales gas line, Peace Pipe with a 3-inch liquids pipeline to their terminal in 15-18-63-5 W6M, Alberta Power with a 25 kV single-pole power transmission line for the plant and Dome Petroleum with an 8-inch gas gathering pipeline to the plant.

Initially Dome was prepared to construct its own liquids sales pipeline to the Peace Terminal but after considerable discussion with Peace Pipe it was decided that Peace Pipe would own the three-inch liquid sales line but Dome would construct the pipeline and lay it within the same trench as Dome's gathering pipeline. It was agreed that Dome and Peace would have joint ownership of the right-of-way.

In addition to the utility corridor, Dome and NOVA established a common corridor alongside Proctor and Gamble's road that runs north to the Cutbank River (Figure 3). Also, Dome and Alberta Power established a corridor east of Range 7 up to where Alberta Power intersects its main line.



ALBERTA POWER LIMITED

○ POTENTIAL PLANT SITES
#6 IS ACTUAL SITE

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DOME PETROLEUM LIMITED
CALGARY ALBERTA CANADA

PROJECT

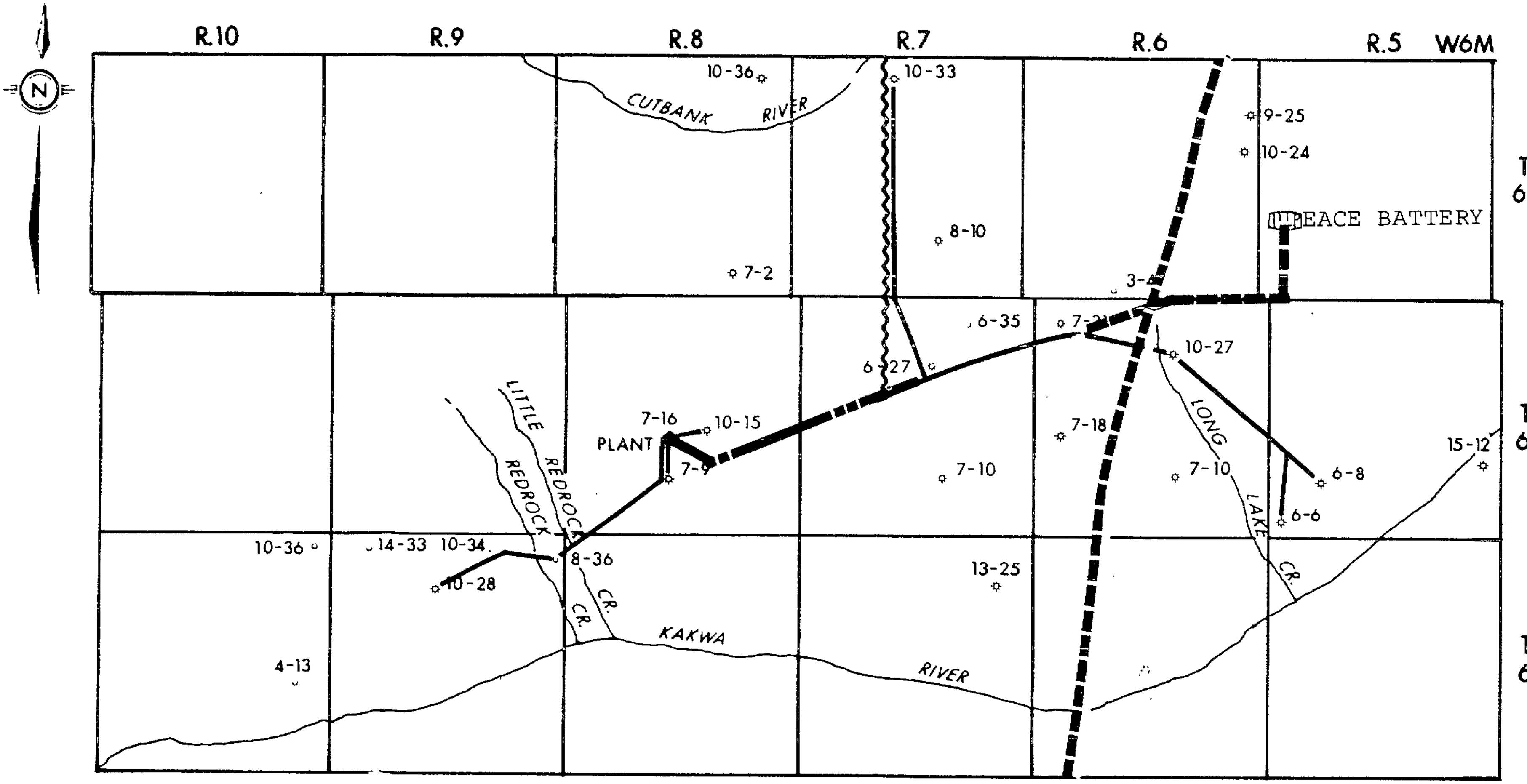
TITLE

FIGURE 2

POTENTIAL PLANT SITES

DRAWN BY	DATE	DRAWING No	REV
B C V W	81-08-24	A-CUT-505-06	1
CHECKED BY	SCALE NOT TO SCALE		

D.P. 184 A D P



UTILITY CORRIDOR
NOVA'S PIPELINE
PEACE'S PIPELINE
ALBERTA POWER LIMITED
DOME PETROLEUM LIMITED

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DOME PETROLEUM LIMITED
CALGARY ALBERTA CANADA

PROJECT

TITLE

FIGURE 3

CUTBANK GATHERING SYSTEM

DRAWN BY	DATE	DRAWING No	REV
B C V W	81.08 24	A-CUT-505-06	1
CHECKED BY	SCALE NOT TO SCALE		

D.P 184 A D P

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This use of the "corridor" concept was to minimize the number of new rights-of-way that would be prepared for this project. The concept was readily endorsed by Alberta Forest Service, Fish and Wildlife and Environment.

Throughout, Dome maintained close liaison with these companies to ensure that the corridor route selected by Dome was compatible with their routing plans. During planning, consideration was given to the width of this corridor. Normally Dome requires a minimum 15 m wide right-of-way to construct a gathering system. NOVA normally requires a minimum of 23 m and Alberta Power 10 m. It was decided that all these widths could be reduced somewhat if each company was able to use the work space on the other rights-of-way.

In the utility corridor (Cutbank River gas plant to SW 1/4 21-67-7 W6M) NOVA's easement was only 18 m but it was agreed they could use 5 m of Alberta Power's right-of-way for work room. Dome's and Peace's right-of-way was 24 m on which Alberta Power had a 9 m easement. In the corridor with Dome, Peace and Alberta Power (SW 1/4 21-72-7 W6M to NW 1/4 32-62-6 W6M), the right-of-way was 35 m wide of which Dome and Peace had an 18 m common right-of-way and Alberta Power had a 10 m right-of-way with the option to acquire 7 m for additional space. In the corridor with Dome and Alberta Power (Alberta Power substation to NW 1/4 33-62-6 W6M), the right-of-way was 25 m of which Dome had a 15 m wide right-of-way and Alberta Power's had a 10 m wide right-of-way. In the corridor with Dome and NOVA (N 1/2 62-7 W6M to 10-33-63-7 W6M), each had a 10 m wide right-of-way.

In general, the route requirements for Dome's and NOVA's pipelines in the utility corridor were similar. Alberta Power's criteria however were somewhat different. The greatest concern was that the number of bends in the corridor be minimized since for every bend they had to brace their line which would increase their costs considerably.

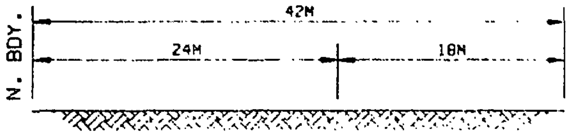
In routing the corridor, existing seismic lines or roads were examined to see if they were suitable. This is now normal practice within Dome and was well received by Forestry and Fish and Wildlife.

Initially, there were no direct roads from the plant west. One road, Nose Mountain Road, runs north of the Plant, then west eventually running south and east back to one of Dome's better wells. Since Drilling was proposing additional wells in the area, it was decided, in conjunction with Forestry and Fish and Wildlife, to construct a road with bridges across the Little Redrock and Redrock Creeks (Figure 3). In doing so OGE and Environmental Affairs worked closely with Drilling and government agencies to select the best location for both the road and the pipeline. When the road was built in late 1982, a 100 m wide right-of-way was cleared and graded for use by both the road and the pipeline. In allowing Dome to construct this road, Dome ensured Forestry that there would be no access on the Nose Mountain Road between November and May.

As well, we avoided any areas known to be critical wildlife areas, steep and unstable slopes and recreational areas. There were no archaeological concerns.

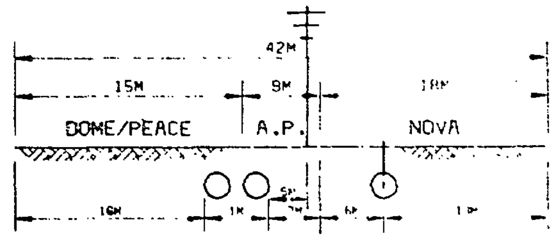
FIGURE 4

CUTBANK PLANT TO S.W.1/4 SEC 21-62-7



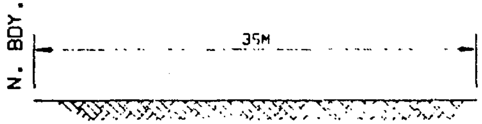
DOME APPLICATION:
24M R.O.W. INCLUDING
15M JOINT OWNERSHIP
PEACE PIPE AND 9M
ALBERTA POWER EASEMENT.

NOVA APPLICATION:
18M R.O.W. + 5M
WORKING SPACE ON
DOME APPLICATION.

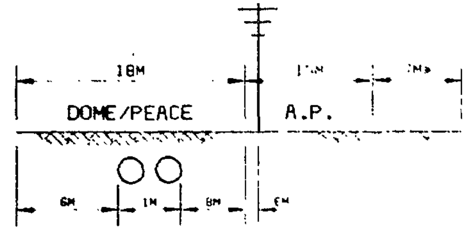


NOTE: POWER POLES MUST BE 5M MIN.
FROM EDGE OF PIPE DITCH.

S.W.1/4 SEC 21-62-7 TO N.W.1/4 SEC 33-62-6



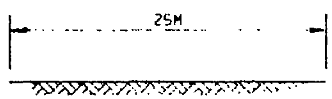
DOME APPLICATION:
35M R.O.W. INCLUDING 10M ALBERTA
POWER EASEMENT AND 15M JOINT OWNERSHIP
WITH PEACE PIPE.



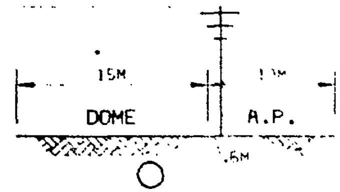
* ADDITIONAL TREE FALL
MAY BE TAKEN IF REQUIRED

- 486 -

A.P. SUB STN. TO N.W.1/4 SEC 33-62-6



DOME APPLICATION:
25M R.O.W. INCLUDING 10M
EASEMENT TO ALBERTA POWER.



* ADDITIONAL TREE FALL
MAY BE TAKEN IF REQUIRED

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DRAWING NO.	REFERENCE DRAWINGS	REV	REVISION DESCRIPTION	BY	DATE	CHKD	APP
		A	ISSUED FOR INFORMATION	RHK	81/10/23		
		B	ISSUED FOR BID	RHK	81/10/29		
		C	ISSUED FOR CONSTRUCTION	RHK	81/12/08		
		D	REVISED PIPE LOCATION	RHK	82/02/01		

ENGINEER'S STAMP

ENGINEERING RECORD
DRAWN BY: R.H.KLASSEN — DATE: 81/10/22
CHKD BY:
ENGINEER: R.JOHNSTON — 81/10/22

DOME PETROLEUM LIMITED
PROJECT: CUTBANK
TITLE: CUTBANK UTILITY CORRIDOR
PROPOSED SPACING
SCALE: NONE
DWG. NO.: B-CUT-192-02

One concern of Fish and Wildlife was that of the impact of construction on fisheries. To assist in our selection of major crossing locations, a geotechnical survey was undertaken. As well, a fish survey was done to determine the fish species present in the watercourse. The main species identified were Arctic Grayling and Dolly Varden. The presence of these two species required considerable discussion with Fish and Wildlife on our crossing procedures and timing. Since there was no evidence of Dolly Varden at any of our crossings and because we were planning winter construction, we were allowed to use the "wet crossing" method for pipe installations. However, because of fisheries concerns, it was agreed by Dome, NOVA and Alberta Power that bridges would be built over in corridors to prevent fording of streams.

Finally, because the area is within Proctor and Gamble's management area, constant liaison was maintained with them concerning our proposed route. One major change in the corridor occurred as a result of Proctor and Gamble's concern that it would be traversing blocks of trees scheduled for cutting. Consequently a realignment of the corridor was made to minimize interference with their operations.

Problems Encountered During Construction

As with any major project, problems are anticipated but hopefully through proper planning can be eliminated or at least minimized. This project was no different. Although problems did occur, some of which were not anticipated, most were resolved and overall construction went well. What follows is a review of the major problems which occurred in the corridor. Some of these were identified during planning, others were not.

1. Scheduling Construction

Perhaps the most difficult aspect of the planning process was determining the logistics of construction in each of the corridors but particularly in the utility corridor. It was not reasonable to consider all three companies constructing in the corridor at once. Consequently, a schedule was established with NOVA commencing construction from the plant east, then Dome would start from the east and work west towards the plant and Alberta Power would follow Dome working east.

This schedule, however, was contingent upon all companies receiving regulatory approvals at the same time. Since each company was submitting its own application, it was difficult to finalize the construction schedule. Originally, NOVA was to have commenced clearing on the utility corridor in December, 1981, but did not begin until January, 1982 because of delays in receiving their approvals. This delay resulted in delays for the other companies and additional problems.

2. Clearing

Alberta Forest Service indicated that they wanted one contractor to clear the utility corridor. Unfortunately, by the time this became known to Dome and NOVA, both had gone out to bid for construction and as part of the bid were requesting a price to clear their portion of the right-of-way. As well, both companies felt the use of one contractor to clear the right-of-way would be difficult to do since it was likely that each would receive approvals at different times. Consequently, Dome and NOVA agreed to use common landing areas but separate clearing contractors. However, minor problems did occur during clearing when one contractor found landing areas unsuitable for him and established new ones. As well, since clearing began at different times and construction was in various stages, some of the decks of salvaged timber were never removed.

3. Construction Techniques

Another problem which occurred was the different construction techniques of each company.

Each company had its own construction specifications which were not necessarily compatible and in some cases sufficiently different that they created problems. For example, NOVA was constructing a 16-inch line and Dome's two lines, 8-inch and 4-inch lines in a common ditch. With the larger line, NOVA requires more grading and had larger berms which often sloughed onto Alberta Power's right-of-way. Since NOVA was delayed in starting construction, this caused problems with Alberta Power's installation of their poles.

4. Contractors

During construction, NOVA used a union contractor and Dome a non-union contractor and both companies perceived the potential problems of each working side by side. Although the schedule was originally set up to minimize both contractors working within the utility corridor at the same time, the change in schedule resulted in the contractors working side by side and minor conflicts did arise.

5. Roads

Although the corridor concept is accepted for linear developments, paralleling an existing road with pipelines may not always be the best route. Another problem identified during planning was that of using Proctor and Gamble's roads. Since winter is the major hauling period, care had to be taken to minimize conflict between logging trucks and pipeline construction vehicles.

The Dome/NOVA corridor running alongside Proctor and Gamble's north road to the Cutbank river was kept to a minimum width at the request of Forestry. Consequently, the road became part of the working area which created a safety hazard for both logging and construction vehicles. As well, if any road upgrading occurs, pipe relocation may be required.

6. Water Crossings

To minimize the impact of pipelining through the streams, Forestry and Fish and Wildlife required that a bridge be built across each stream. Fording was not to be permitted. Problems arose when at least one of the bridges installed by Dome was not suitable for NOVA's needs. The approach to the bridge was too steep for NOVA to get down with its longer lengths of pipe joints. Consequently, an additional bridge had to be constructed. As well, occasionally a bridge became unaccessible due to an open trench on large spoil piles blocking access.

7. Clean-Up

As part of clean-up, erosion control diversion berms were to be placed on steep slopes across the utility corridor. During the planning stage it was agreed that these berms would be located during clean-up. However, a problem arose when Dome was completing clean-up and NOVA was still ditching or backfilling. Dome was only able to build partial berms with the hope that NOVA would continue to run them across the right-of-way.

In the planning stages it was agreed that one company would reseed and fertilize the right-of-way and backcharge the other for its portion. However, with changes in construction schedules, this became impossible since Dome finished its construction before NOVA. Consequently, Dome only seeded and fertilized Alberta Power and its right-of-way and left NOVA to do its own when it completed its construction. Although not a major concern, the mixes used by each company were different.

8. Permits

You will recall that Dome built the liquids sales line for Peace Pipe and laid it in a common ditch with Dome's gathering line. Confusion occurred when during construction another pipeline was hit and damaged. Both companies were unaware of the line and did not have the necessary crossing approvals. Each thought the other had obtained the necessary crossing approvals.

Problems During Operation

To date no serious problems have been encountered on either the utility corridor or the other corridors. Minor erosion and poor revegetation have occurred in localized areas but have been remedied by each company.

Potential problems do exist though; Dome, NOVA and Alberta Power all have different requirements for maintaining their rights-of-way and this could result in a less than uniform looking right-of-way.

Another concern is if either Peace Pipe Line or Dome must do work on their pipeline, considerable care must be taken to ensure that the other company's pipeline, located in the same ditch, will not be damaged.

On the other corridors another potential problem exists since most parallel roads if any road upgrading is required costly pipe replacements may be required.

Recommendations

Overall, all the companies and the government agencies are pleased with the final result of the utility corridor and other corridors. It is obvious that the considerable planning between companies and government agencies was successful in eliminating or at least minimizing the problems. However, the following additional things could have been done to reduce further some of the problems that occurred:

For the most part, communication between all parties involved during the planning stage was good. Unfortunately, communication during construction was not as good. It broke down between companies, sometimes within companies, between contractors and between companies and government. Both Fish and Wildlife and Forestry indicated that at times they had difficulty in knowing who to contact. It could have been improved if a committee had been set up with representatives from each company to deal with specific problems.

In future, it would be preferrable not to have three companies working on the same right-of-way at the same time. This caused considerable delays and problems during construction.

When bridges are to be constructed across creeks, it would be preferrable to have the company using the larger equipment (in this case NOVA) to construct first and build bridges capable of meeting their needs.

Some problems probably could have been eliminated if a common clearing contractor had been used. However, to do so companies need to know government requirements early in the planning stages in order to accommodate such requests.

In future, forestry companies should make their logging plans better known. During route selection, Dome was often requested to change their route to follow roads in order to avoid conflict with Proctor & Gamble's future logging programs. Dome complied only to find the cutblocks cleared the following year.

As well, if companies know they are planning to construct a corridor, they should provide sufficient notice to the logging company so that the logging company could consider doing the clearing.

In all, construction went quite well, considering the complexities of it. The value of a good selection process minimized the number of problems with government and more importantly reduced the environmental impact of construction.

WILDLIFE DATA ISSUES IN THE ROUTING OF ENERGY CORRIDORS

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David T. Brown, Dept. Renewable Resources, Macdonald College, McGill University, Ste-Anne-de-Bellevue, Quebec. H9X 1C0

ABSTRACT

In the past, wildlife was largely ignored by utilities when selecting routes for energy transport facilities. This attitude has changed drastically during the last 20 years and the outcome has been to focus on species with high socioeconomic values in corridor selection studies. The objective of this overview paper is to discuss selected data-related aspects of the wildlife issue in routing energy corridors. The first section of the paper will discuss selected impacts created on wildlife by energy corridors and the role of corridors in shaping animal communities. The second part of the paper will address the wildlife data issue through the following topics: critical habitat, key species, loss of wildlife by small increment and experimental vs descriptive approaches. The third section of the paper will focus on the difficulties of gathering proper data to make predictions concerning wildlife and the role of management in route selection and right-of-way maintenance. Finally, conclusions will be formulated concerning the importance of wildlife issues in relation to other biophysical constraints in selecting routes for energy corridors.

INTRODUCTION

Energy and transportation corridors have affected wildlife since the early settlement of North-America and yet, historically wildlife issues have not played an important role in the planning of these facilities. Matthiessen (1964) gives a vivid account of the role that the construction of the first main transcontinental rail lines played in the demise of the buffalo (*Bison bison*). It is only during the last 20 years that increased attention has been paid to wildlife in corridor and route selection studies and the vast majority of these studies focused on species with high socioeconomic values such as ungulates, furbearers, waterfowl and endangered species.

The integration of wildlife issues in the planning process was difficult for two main reasons. The first was that the scientific literature was not conclusive on the benefits and disadvantages of rights-of-way (ROWs) on wildlife species or animal communities. The second was that wildlife was perceived very differently by various people, public agencies or disciplines and thus wildlife was often arbitrarily given a very different level of importance from one route selection study to another.

The objective of this overview paper is to discuss selected data-related aspects of the wildlife issue in the selection of energy corridors and ultimately the routing of the ROWs themselves. The discussion will address the following issues: 1) repercussions of ROWs on wildlife and animal communities, concepts, methodologies and approaches used to conduct the wildlife analysis in route selection, 2) the role of management, and finally 3) the importance of wildlife issues in the selection of corridors and routes for energy transportation.

REPERCUSSIONS AND CONTRAINTS

Rights-of-way and their associated structures can affect wild animals directly through collisions or indirectly through habitat modification. A priori one would expect that the greatest impacts on wildlife would result from large scale habitat modifications especially those which involve the clearing of ROWs through the forested environment. From a data point of view it is easier to collect and manipulate habitat data than it is animal data therefore it has been more common to analyze the wildlife issue from the habitat standpoint. Direct repercussions on animals on the other hand are more difficult to forecast but they have been shown to be numerous in retrospective studies and thus greater efforts are needed toward collecting the proper data to make valid predictions. The following are a selection of demonstrated impacts which show the difficulty of choosing the suitable data base for the impact assessment of ROWs on wildlife.

Animal aggregations

Dense aggregrations of animals or migrating populations can be extremely vulnerable to serious losses due to traffic or structures. Klein (1971) reported high mortality of reindeer (*Rangifer tarandus*) on roads and railroads, especially in winter. Allen and McCullough (1976) and Puglisi *et al* (1974) respectively reported heavy white-tailed deer (*Odocoileus virginianus*) mortality on Michigan and Pennsylvania highways, while Grenier (1974) estimated the highway moose (*Alces alces*) kill at 15-20 per cent of the adjacent population in a Quebec park. Davis (1940) reported on the highway-related mortality of medium-sized mammals in Texas. Massive roadkills of amphibians on wet warm spring or early fall evenings are difficult to document in the literature (van Gelder 1973; Moore 1954; Carpenter and Delzell 1951), but occasionally anecdotal information can be revealing. For instance Bider (unpub. data) has observed a kill of 500 leopard frogs (*Rana pipiens*) during a 3-hour migration on 1 km of farm road adjacent to a river hibernaculum in southern Quebec. In Switzerland, some mountain roads are temporarily closed during amphibian migration. Under certain conditions (e.g. partial darkness, fog), powerline structures such as towers, conductors and ground wires can inflict appreciable losses to bird populations (Anderson 1978; Blokpoel and Haich 1976; Stout and Cornwell 1976; Boeker and Nickerson 1975; Scott et al 1972; Siegfried 1972; Cornwell and Hochbaum 1971; Ogilvie 1967; Stoddard and Norris 1967).

Rights-of-way structures are sometimes used to advantage by wildlife. Bridges, towers and poles are often used by wildlife for nesting sites (Bridges and McConnon 1981; Gilmer and Wiehe 1977; Stahlecker and Griese 1979; Prevost et al 1978). Some highway interchange overpasses have been shown to harbour densities of woodchucks (Marmota monax) which were several fold higher than those found in adjacent agricultural areas (Doucet et al 1974). Railroad and highway ROWs can be conducive to waterfowl nesting (Voorhees and Cassel 1980; Oetting and Cassel 1971; Page and Cassell 1971).

Animal communities

Changes in the structure of animal communities following the development or maintenance of ROWs have been discussed in some studies. Doucet and Bider (1982) showed that most forest species except amphibians reduced their activity in a newly developed ROW and Bramwell and Bider (1981) reported the same phenomenon following a defoliation experiment in a ROW. As the early stages of vegetation develop in powerline ROWs, pioneer small mammal communities develop (Adams and Geis 1981; Schreiber et al 1976). As the brush community develops, bird species richness increases in ROWs (Bramble and Byrnes 1984; Chasko and Gates 1982; Meyers and Provost 1981).

The increased productivity and higher availability of preys in ROWs could result in greater predation intensity. Ladino (1980) reported higher activity for mammalian and reptilian predators in powerline ROWs. Several studies have reported greater animal activity at the forest edge (Wegner and Merrian 1979; Doucet 1975; Bider 1968). ROWs constitute long double ecotones and Gates and Lyzel (1978) have shown that this concentrates nests, producing an ecological trap where eggs and youngs are extremely vulnerable to predators.

Complete isolation of populations by the implantation of a ROW has never been demonstrated. Doucet et al (1981), Lamothe and Dupuy (1982) and Willey and Marion (1980) have all reported deer crossing powerline ROWs in winter. Doucet and Brown (1983), Adams and Geis (1981) Schreiber and Graves (1977) and Schrieber et al (1976) observed small mammals crossing ROWs in winter and summer. However, Joyal et al (1983) and Doucet et al (1981) have respectively shown that under given conditions, moose and deer crossings were reduced in ROWs during winter. Oxley et al (1974) have shown that white-footed mice (Peromyscus leucopus) and chipmunks (Tamias striatus) failed to cross a 90 m wide roadway. Finally, Doucet and Brown (1983) found marked differences in hare (Lepus americanus) activity, during a population peak, in the adjacent woods on each side of a 30 m wide ROW.

Dispersal

Dispersal of plants and animals have been facilitated by ROWs. Huey (1941) was one of the first to report such a range extension for pocket gopers (Thomonys) in Arizona. Getz et al (1978) showed that field voles (Microtus pennsylvanicus) used roadways as dispersal routes. The presence of field voles in cleared ROWs in forested areas and the presence of grassland bird species (Chasko and Gates, 1983) indicate that animals have the potential to disperse in ROWs. This potential for dispersal brings up two important points. One, the biogeographical concept of saltatorial dispersal from one habitat patch to another could well be a phenomenon taking place in a cleared ROW. The second point was discussed by Schrieber et al (1976) and is related to the spread of diseases by animals such as rodents expanding their range through dispersal in established transport and energy ROWs.

Indirect impacts

The last group of impacts are those that are long termed or resulting indirectly from the implantation of a ROW. The Newfoundland railroad was completed at the turn of the century and it ran through the migration route of the main caribou herd. Hunters quickly adjusted to hunt the caribou as they crossed the ROW and by 1925 this scheme had largely contributed to the demise of the 40 000 caribou herd (Bergerud 1983). Deer and moose declines in Quebec in the 60's have been correlated to excessive hunting in areas where access was facilitated by the development of new highways (Bider and Pimlott 1973). The forecasting of long-term and/or indirectly induced changes in wildlife populations is an issue which deserves serious considerations in route and corridor planning.

CONCEPTS, CRITERIA AND APPROACHES

Critical habitat

Wildlife species need a habitat mosaic which enables them to feed, breed, raise young and rest. It is recognized however that some habitat components are more important than others in time and space. This has facilitated the adoption of the concept of critical habitat in route selection studies. Critical habitat remains an ill-defined concept; it has been variously interpreted as habitat which: 1) harbours a high diversity of life forms (e.g. marshlands), 2) fulfills a specific seasonal need for a given species (e.g. winter yards for white-tailed deer), 3) provides a fragile and/or limited refuge to a rare or endangered species, and 4) fulfills some intermediary function in the biology of a given species (e.g. migration routes of caribou).

Despite some shortcomings, the concept of critical habitat remains valid but it needs clarification and refinement. The central problem is the fact that it is difficult to recognize critical habitat without proper information. Habitat evaluation and mapped results have been lagging at scales appropriate for planners. The maps produced by ARDA for example were often inadequate planning tools because of poor resolution, lack of coverage or incomplete wildlife information. This was demonstrated during the recent routing of high voltage transmission lines in Quebec where several existing deer yards failed to appear on the ARDA maps for ungulate potential. Yet, in some areas, the ARDA analysis remains the best overall mapped information available. The next step is to seek information from the regional level; a slow process under the best circumstances, especially if it requires additional field surveys. There are efforts underway which should improve this situation. For instance the Canadian Committee on Ecological Land Classification has a wildlife working group which is developing appropriate methodologies and format for habitat mapping (Taylor 1979). Hounsell and Risley (1982) have developed a habitat classification system to predict the effects of powerline ROWs on wildlife. In Quebec, the Ministry of Leisure, Fish and Game has been concerned about wildlife habitat and it is striving to give legal status and protection to defined and identified critical habitats (Sarrazin 1983). Results of these efforts should improve the planning process in relation to wildlife habitats because planners will have access to organized information and guidelines (e.g. maps, laws) concerning valued wildlife habitat. However it appears that planners will be left with certain decisions concerning priority critical habitats in conflicting situations.

Key species

In the majority of planning studies, the wildlife analysis is often limited to a few so-called socioeconomically important or key species. This approach raises two important concerns. The first one is that key species means different things to different people. For instance it could be an endangered species or a species that plays a dominant role in the evolution of the structure of the animal community. There is no reason why wolves, beavers, robins or bullfrogs cannot qualify under given circumstances. But the question remains as to who and what criteria should decide which are the key species in a given route selection study. The second concern is that the soundness of determining a priori that some species are more important than others in the ecosystem is a highly questionable practice, whatever the scale of values used. Elton (1927) considered arctic copepods as key industry animals and Pianka (1983) and Paine (1966) defined keystone predators. Although these studies suggested that some species are dominant in shaping the structure of animal communities, in general few ecological studies have supported the concept that some organisms are more important than others in ecosystems. Indeed the holistic approach embraced by most ecologists makes such distinctions of importance highly dubious.

Losses by small increment

By definitions, ROWs are narrow strips and this has promoted the belief that site-specific impacts were of little consequence (with a few exceptions: e.g. pipeline spill risks and caribou migration disruption in the north). Thus the planning process often considers that only a small fraction of a given habitat (e.g. marsh, roost, deer yard) is lost when bisected by a ROW and that most animals can relocate outside the disturbed zone. Although this analysis can withstand regulative and public scrutiny in successive projects, small incremental losses could in the long run jeopardize the resource as a whole through direct or indirect repercussions such as those discussed earlier.

The same concept can be applied to wilderness. Wilderness has several definitions; it can represent vast areas of untouched land or innaccessible areas sometimes in a park or reserve and some wilderness areas are protected by legal status. We often attach the attribute pristine to wilderness and an acceptable definition of pristine is that which is unspoiled by modern tendencies. If we subscribe to the concept that some wilderness should remain free of large scale interventions, it follows that the routing of a ROW through such an area under the assumption that only a small fraction of the unit is lost should be opposed for two reasons. First, it destroys the very concept of a pristine area, if not wilderness itself. The second reason is related to losses by small increment. If a ROW can be routed through a wilderness area under the assumption that only a small fraction of habitat is touched, the same assumption can be carried out to successive route proposals in the same or different wilderness area and thus all wilderness areas could be encroached and jeopardized.

Experimental vs descriptive approach

It is unrealistic to attempt to develop a complete understanding of all ecosystems or animal communities in order to route an energy transport linear facility through the rural or forested environment. However, in order to consider the wildlife issue, it is imperative to have at least a preliminary understanding of the ecological relationships which various wildlife species maintain with each other and with their habitat. To predict the repercussions of ROWs on wildlife a choice usually has to be made between a descriptive approach and an experimental approach. The descriptive approach is often speculative and fails to yield the data required to determine the repercussions concerning reproduction, feeding, behaviour, predation, dispersal and ultimate fate of wildlife populations under consideration. On the other hand, the use of experimentation and scientific methods has been slow and at times inconclusive in producing information helpful to planners. Let us examine this weakness in relation to white-tailed deer, a "hot species" in many ROW planning studies in the northeast. The wildlife literature (Halls 1978; Dasmann 1971 and Hosley 1956) suggests the creation of forest clearings to produce pioneer vegetation and provide winter browse for deer. Bramble and Byrnes (1974, 1982) observed increases in deer browse in powerline ROWs in Pennsylvania. These results, although useful in route selection in deer range at large, become of dubious value in northern deer yards where cover is so critical. A five year study (Doucet et al 1981) in such a yard showed that deer were less active in a 30 m wide powerline ROW than in the adjacent forest in the winter and the authors suggested that deer yards should be avoided by energy transportation ROWs. However, a recent study (Doucet and Brown 1983) conducted in the same yard showed that deer spent considerable time browsing in the ROW during winter. Thus after 10 years of research the results are still inconclusive concerning the trade-off between the loss of cover and the gain in food production in relation to ROWs in northern deer yards. The magnitude of this trade-off is also likely to change for each yard depending upon winter severity and annual population levels within a yard. This one-species scenario shows that there are cases where conclusions based on research data are of limited assistance to the corridor and route selection process.

Several authors (Beanlands and Duinker 1983; Romesberg 1981; Green 1979; and Ward 1978) have deplored the limited use of scientific methods in environmental studies. These authors, however, pointed out the difficulties of conducting control-treatment studies during the preliminary impact assessments of a proposed project. Beanlands and Duinker (1983) have suggested the use of an ecological perspective to the biological components of impact studies. This approach would need to use some unifying ecological processes such as eutrophication, or nutrient cycling as a negotiable currency. In general, studies on whole animal communities are difficult to conduct because of multi-technique sampling problems. Studies by Bramwell and Bider (1981), Ladino (1980) and Doucet and Bider (1982) using sand transects as a technique and animal activity as a currency have shown the short-term effects of cleared powerline ROWs on terrestrial animal communities but the long term effects remain largely unknown.

We firmly believe that experimental research on representative problems would evaluate the legitimacy of several concerns related to wildlife and ROWs and the outcome would increase the efficiency of the planning process. Although the impractibility of conducting many large scale treatment-control studies is recognized, it seems that a potential solution to this difficulty is to implement a few representative long-term studies and to establish monitoring for a number of typical projects (Beanlands and Duinker 1983). This approach would eventually generate a data base from which to make predictions and suggest mitigations.

Another approach is to create experimental reaches of energy and transportation ROWs for the specific purpose of investigating repercussions on wildlife. These special sections could be submitted to treatment-control experiments and could contribute to ecological science and improve the accuracy of predictions for corridor planning.

Results of long-term studies may turn out to be the necessary information for efficient planning in relation to wildlife and ROWs. How long should those studies be is a difficult question to answer but in order to obtain adequate data to make predictions possible concerning wildlife populations and related processes, study specifications should consider for instance the cyclical nature of several wildlife populations and ROW maintenance cycles.

DATA REQUIREMENTS

There are several types of data required in order to integrate wildlife issues in the route selection process. Two specific types of data are: 1) those related to impacts or constraints associated to routing and ROW implantation, and 2) those data required to determine the effects of ROW maintenance activities on wildlife (e.g. timing of work, types of machinery, labour force, phytocides, fire, etc.). The approach has been that baseline data will provide sufficient ecological understanding to permit the formulation of predictions. Although this sounds logical, the problem lies in the fact that the expression baseline data is much too vague in time, space and scope. The interpretation of this concept by environmental specialists in a permit procurement system has been to collect a minimum of data to satisfy the guidelines. Many of these data collections were of limited use in successive route selection studies mainly because very few of these studies included systematic long-term monitoring (Beanlands and Duinker 1983). In addition, very few of these analyses concerned themselves with indirect impacts. Consequently there is a paucity of good representative studies which could serve as backbone in new route selection studies. The post-construction monitoring often presents a non-expansive and practical way of producing before and after type data (Beanlands and Duinker 1983). Certainly this approach should provide pertinent wildlife data and conclusions applicable to future routings of linear energy facilities.

As stated earlier, an improvement in approach would be attained through rigorous experimental studies on specific wildlife problems related to ROW implantation or maintenance. Such studies, using scientific methods, would consider topics like habitat management, edge effect, plant and animal communities, animal activity, predation, competition, dispersal and safety hazards, in order to develop the necessary data to make predictions concerning impacts of ROWs on wildlife. Efforts in that direction have produced useful preliminary results concerning animal activity (Chasko and Gates 1982; Bramwell and Bider 1981; Doucet et al 1981, Ladino 1980), but research must be continued to determine the true impact mosaic of ROWs on wildlife. Finally, at some point in time, research will have to address the complex problem of indirect impacts.

MANAGEMENT

Habitat management

Most wildlife management ventures to date in energy transportation ROWs were directed at habitat modifications. It is quite amazing how management efforts get the go ahead despite flagrant lack of data concerning the wildlife issue. The routing of ROWs creates a spatio-temporal trade-off where some species benefit while others are stressed and unless we understand the magnitude of this trade-off, it remains extremely difficult to make enlighted management decisions concerning wildlife. There is considerable general and somewhat technical information on the management of ROWs for fish and wildlife (e.g. Leedy and Adams 1982; Galvin et al 1979, and Meyers and Provost 1981). Although these reports and several others are more concerned with habitat "grooming" than habitat management they indicate that at times, and through positive management decisions, a certain compatibility can be achieved between wildlife requisites and the routing of ROWs. Certainly, to date, there is available knowledge on some specific wildlife concerns which can be integrated in the planning process in order to address some specific wildlife issues and reduce the impact and sometimes possibly improve the fate of some wildlife species. In the northeast for example, few species arouse public concerns as much as white-tailed deer. These ungulates congregate in traditional winter yards which represent critical habitat for the survival of the deer populations. Under these circumstances, one would consider yards to be major constraints to corridor routing. However a deer yard can be broken into two major components which are cover and food; and while the clearing of coniferous cover to route an energy facility should not be considered, deciduous stands on the other hand can present a viable alternative under specific circumstances. Textbooks on yard management (e.g. Dasmann 1971) suggest to rejuvenate climax deciduous stands to produce deer browse, thus the routing of energy transportation ROWs in such mature deciduous stands within a deer yard appears feasible. Once this concept is accepted it becomes possible to formulate objectively and integrate the details of a management plan into a project (e.g. clearing-by-small-blocks rotation). A successful case has been reported (Lamothe and Dupuy 1982) in Quebec, where a twin 735 kV line was routed through an active deer yard. By locating the elevated towers in clearings practiced in deciduous and mixed stands and raising the conductors to spare coniferous stands, the loss of cover was minimized and deer were provided with quantities of browse from the slash of the original clearing which was carried out in the winter and browse produced by the new growth in successive years. Overall, it is possible that the project may have benefited deer. Unfortunately the long term monitoring of this project was not geared to determine the cover-browse trade-off and it remains difficult to determine the effect of the maintenance schedule on browse production and availability.

It is most important to emphasize that we can only proceed on a case by case basis and that all deer yards are not systematically suited for the routing of an energy transportation ROW. In addition, the routing of a ROW in a deer yard eliminates the wilderness characteristics which are sometimes attached to such habitats. Finally on a comparative scale, deer are certainly much better off to have a linear energy transport facility encroach their yards than a housing development. This kind of choice is not usually left to wildlifers and/or planners alone.

Management: a panacea

Habitat management should not be considered the cure-all for the various problems that ROWs present for wildlife populations. The management of ROWs for wildlife is a complex issue (Meyers and Provost 1981). The be effective, habitat management must be carried according to a set of objectives, otherwise the effects could amount to well- intentioned habitat "grooming". From a wildlife point of view, linear energy transportation facilities present three different sets of problems which are those associated with: 1) planning, 2) construction and, 3) operation and maintenance. The planning phase not only determines the route but it is also responsible for the formulation of guidelines and terms of references for the construction and operation phases. Thus communication is essential between these phases if management is to be successful. Since planning, construction and operation are carried out by different agencies or divisions within an agency, communication breakdowns start during the construction phase and often become complete during the operation and maintenance phase.

Certainly decisions made concerning the routing and construction aspects can be called management decision but the decisions concerning the operation and maintenance of a ROW, in practice, are generally left to the proponent. The planning phase should consider the maintenance aspects of a ROW very seriously in relation to wildlife during a route selection study. This approach requires three important requisites. One, the terms of references for ROW habitat maintenance must remain extremely simple. Secondly, follow-up or monitoring programs must be put in place; such programs could be integrated in the overall ROW inspection program. Finally communications must be assured between the master plan responsibility levels and the field maintenance levels. Breakdowns at this latter stage are as easy to find as bulldozer operators.

ROLE OF WILDLIFE DATA IN CORRIDOR SELECTION

The route selection process must consider wildlife within an array of other biophysical constraints along with social values, costs and technical constraints. The importance of wildlife in such multidisciplinary approaches has been characterized by a roller coaster approach where wildlife issues played a very different role in various studies. Perhaps one reason for this is the willingness of the public to abandon their rights or interest in wildlife (Schoenfeld and Hendee 1978). When there is a conflict with other issues (e.g. forestry, agriculture) in a route selection study, often one can expect wildlife issues to play a secondary role under a lack of sustained public interest. On the other hand, several public groups are often most eager to add weight to other issues such as agriculture, forestry and recreation. Perhaps one reason for these issues gaining momentum during a study is the fact that they lend themselves to dependable predictions and forecast. For example, it is easier to determine that 200 ha versus 600 ha of agricultural land will be lost depending on the outcome of a route selection study where two alternatives are considered. Wildlife issues are usually not as clearly presented and perhaps the lack of adequate data, at times, can contribute to the ultimate demise of wildlife concerns in the corridor and route selection process. There are very few well informed voices which speak for wildlife in route selection studies and unless a species or habitat is legally protected, the level of constraint of the wildlife issue is greatly reduced. If the importance of wildife issues is to be established from social values and national heritage points of view, this can only be achieved through better knowledge of the impacts of ROWs on wildlife communities.

CONCLUSION

Wildlife populations can be affected in many ways by linear energy transport facilities. These impacts can be short- or long-termed, direct or indirect, trivial or of great significance. An essential component of the planning and impact assessment processes is to make predictions. Unless you have a definite idea of: 1) which populations are present and at what time of the year they are most vulnerable to habitat modification, and 2) which ecological processes (e.g. predation) will be affected by a ROW, it becomes extremely difficult to make accurate predictions concerning the fate of these populations, their behaviour, dispersal and community structure, especially in a long-term perspective. The role of energy corridors in shaping animal communities represents a recent interest in the scientific community. It is obvious that some species will benefit while others will be disadvantaged and the trade-off presented by energy ROWs remains difficult to predict from the evidence available. Scientific research in this field is badly needed to provide the proper data to make accurate predictions concerning wildlife and route selection.

Research concerning habitat management in established ROWs could reduce constraints from the route selection process and at the same time improve the fate of wildlife populations occupying habitats which become bisected by energy transport linear facilities. The failure to adopt this course of action will result in a state of stagnation where each route selection will produce various quantities of descriptive wildlife data which will be of limited use to the route selection process and to management efforts.

The role of wildlife issues in corridor selection will be enhanced and simplified through more intensive research in that specific field of wildlife biology. Better overall evaluation and mapping of wildlife habitat (e.g. through improved resolution in remote sensing) will enable planners to recognize problems early in the corridor and route selection process. The maturing of the above considerations can only take place if planners and wildlife specialists maintain an open dialogue to ensure a realistic and favorable inclusion of wildlife issues in the route selection process. In the long run, this will make the route selection process easier, more conflict free and more efficient.

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METHODOLOGY FOR VISUAL RESOURCE EVALUATION IN TRANSMISSION LINE ENVIRONMENTAL IMPACT ASSESSMENT

A paper presented at

Facility Siting and Routing '84
Energy and Environment
Banff, Alberta
April 1984

by

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METHODOLOGY FOR VISUAL RESOURCE EVALUATION IN TRANSMISSION LINE ENVIRONMENTAL IMPACT ASSESSMENT

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ABSTRACT

The major thrust of visual analysis is to evaluate objectively certain aspects of terrain, vegetation and water resources which are perceived by people as having aesthetic value. Those aspects can also determine the degree to which various landscapes can accommodate development or disturbance.

The methodology is based on existing methods which utilize the concept of visual units to determine attractiveness, and employs the more tangible factors of landscape absorptive capability, a function of slope and vegetation/terrain types) and exposure to view to determine the anticipated level of visual impact.

Vertical and oblique photography, topographic maps and ground and aerial reconnaissance were used to map an area in northwestern British Columbia according to four landscape features; exposure to view, attractiveness, slope and vegetation/terrain type. Simple matrices use these features to determine the sensitivity of a mapped unit to visual impacts from linear developments.

1.0 INTRODUCTION

A proposed 500 kV transmission line between Terrace and Prince Rupert, British Columbia provided the opportunity for evaluating the area's visual resources as part of a multidisciplinary environmental assessment of the project.

The Terrace Prince-Rupert area is characterized by the rugged mountains and high precipitation of the Coast Range. The Skeena River is the main feature of the valley between the two cities, flowing among islands and river bars near Terrace, but broadening out toward its estuary near Prince Rupert.

The mountainsides are heavily forested in cedar, hemlock, spruce and fir. River flats are often dominated by black cottonwood, alder and willow. Logging clearcuts are common in the Skeena valley and tributary valleys.

The proposed transmission line would follow the Skeena valley for most of the distance from Terrace to Prince Rupert. Already in the valley are a gas pipeline, provincial highway, railway and a 287 kV transmission line which leaves space at a premium within the narrow valley bottom. The provincial highway is the only road link between Prince Rupert and the rest of British Columbia. It is also important as a scenic tourist route for passengers connecting with the B.C. or Alaska ferry system to or from the central part of the province.

The rugged attractiveness of the landscape and the heavy use of the highway by residents and tourists indicated that any new developments should acknowledge the importance of the visual resource and should minimize disturbance to the valley.

2.0 METHODOLOGY

The methodology employed to evaluate visual resources was based on Visual Resources for the Northeast Coalblock Area (R.M. Tetlow and S.R.J. Sheppard, 1977). It utilized the concept of visual units to determine attractiveness. The methodology was developed specifically for use in varied mountainous terrain. Two other concepts, landscape absorptive capability and exposure to view, are adapted from Cheekye to Dunsmuir 500 kV Transmission Line Route Selection Study (Beak Consultants Limited, 1979). These three concepts or factors were evaluated in attempt to define those aspects of the landscape which are perceived by people as having aesthetic value, as well as those aspects which determine the tolerance of various landscapes to linear development (Fig. 1).

3.0 FACTORS IN INVENTORY DATA ANALYSIS

The following three factors were measured using a combination of field and office methods. All factors were mapped as areas on 1:50 000 scale topographic maps (Map 1). For each area, a rating of high, moderate or low was assigned based on predetermined criteria. Criteria are detailed in Skeena-Rupert 500 kV Transmission Line Environmental and Socio-economic Assessment (B.C. Hydro, 1983) and shown in Tables 1, 2 and 3 of this paper.

(a) Attractiveness

To determine attractiveness, the study area was divided into visual units. Visual units are portions of the landscape enclosed by topographic features which bound an observer's field of view and assist him to form a unified impression of his surroundings. Within each of eight units, 20 factors related to landscape contrast, diversity of water form and landform, etc. were described and rated (Table 1). Visual units were delineated on topographic maps with the help of air photos and verified in the field.

(b) Exposure to View

Exposure to view was determined by both the degree of visibility of a landscape area and assumed expectations of viewers using the study area (Table 2). The visibility factor considered the number and proximity of viewpoints such as roads and residential or recreation areas within subunits of each visual unit. The viewer expectation factor took into account the degree of disturbance or alteration already present in the landscape.

(c) Landscape Absorptive Capability

The natural potential of landscapes to absorb or tolerate visual alteration arising from development can be called landscape absorptive capability. It is a product of the slope and the vegetation/terrain characteristics of an area (Table 3). Steep slopes and uniform vegetation cover will not "absorb" a transmission right-of-way as well as gentle slopes, undulating terrain and discontinuous vegetation patterns. Slopes were determined from topographic maps. Vegetation and terrain characteristics were gleaned from aerial photographs.

4.0 SENSITIVITY OR POTENTIAL IMPACT ANALYSIS

Attractiveness, exposure to view and landscape absorptive capability are all determinants of the sensitivity of a landscape to alteration. Sensitivity is a measure of the potential for alteration of the visual resource from its existing state due to development or disturbance. Where the existing landscape is in a natural undisturbed state, potential for alteration is much higher than if the landscape already harbours such developments as transmission lines, pipelines, logging and so on.

The landscapes with the highest visual sensitivities are those whose landscape absorptive capabilities are low, but whose exposure and attractiveness values are high. Steep forested slopes visible from the main highway, parks, or farms are considered highly sensitive for these reasons. Open water in visual units of high attractiveness and in areas visible from the highway is also considered highly sensitive.

Moderately sensitive areas exhibit various combinations of the factors discussed previously and are widespread throughout the study area.

Low sensitivity areas are usually relatively flat and not visible from roads or other viewpoints. Low attractiveness, highly absorptive discontinuous forest cover or existing development would also be contributing factors.

The study area map units were thus given sensitivity or potential impact ratings of high, moderate or low, dependent on the combination of factors they exhibited (Table 4, Map 1).

5.0 MITIGATION OPPORTUNITIES

The best way to avoid visual impacts is to locate the transmission route through low sensitivity areas. However, due to technical constraints or anticipated impacts on other resources, this is not always feasible.

Even if the transmission route crosses areas of high or moderate sensitivity, there are measures which can be taken to lessen impacts. The mitigative strategy should be to lessen the contrasts between the right-of-way and its surroundings so to reduce visibility of the transmission line.

Most mitigation measures must be site-specific. Those involving vegetation should be incorporated into a comprehensive vegetation management plan which would include clearing and maintenance provisions for fisheries and wildlife as well as visual resources. Some mitigative techniques are as follows:

1. Selective clearing of tall-growing species; feathering right-of-way edges so there is a gradual progression from low-growing vegetation near the centreline to tall growth at the edge.

2. Contouring right-of-way edges where no shrub growth exists to reduce the straight swath appearance. Undulating edges are most successfully used where natural topographic lines can be followed.

3. Retention and encouragement of low-growing vegetation.

4. Retention and establishment of vegetated buffer strips or screens adjacent near road, railroad, or water crossings and other viewpoints. Topping of trees in lieu of removal is a possibility at high visibility crossings.

5. Selective rather than broadcast herbicide applications.

6. Retention of tall-growing vegetation where there is no interference with conductors, e.g., in gullies or at the bases of hills.

7. Conforming access roads to land contours, using grading and drainage procedures which prevent erosion.

8. Use of the common corridor concept where more than one transmission line exists in a valley or visual unit. If lines of different voltage cross a slope, the higher voltage line should be on the low side to minimize clearing width and visibility.

9. Minimizing crossings of large water bodies. Failing that, minimizing span lengths using right angle crossings.

10. When paralleling a road within a valley, location of the transmission route upslope and on the same side as the road.

6.0 IMPACT ASSESSMENT

Criteria were established to determine what level of impacts would be anticipated on sensitive areas when various mitigation measures were applied (Table 5). On areas where no mitigation was possible, the impact rating remains the same as the sensitivity or potential impact rating. Map 1 shows the completed visual analysis for a portion of the proposed transmission route.

7.0 CONCLUSION

This methodology provides a framework for understanding and evaluating some important elements in the visual landscape. Because it requires as well as affords relatively detailed mapping and analysis, it is recommended primarily for assessment of those developments which are expected to cause significant change in areas which are highly valued for their existing natural landscapes.

TABLE 1

ATTRACTIVENESS - SCENIC DISTINCTION SCORES*[1]

Scenic Factor*[2]	Morse	Prudhomme	Rainbow	Green River	Lachmach	Skeena Estuary	Skeena Channels	Lakelse
	Visual Unit							
Spatial Vividness	7	24	8	8	24	24	30	2
Cross-Section Complexity	16	24	4	7	18	24	24	4
Cross-Section Proportion Index	12	12	6	30	30	30	30	30
Cross-Section Contrast	10	16	4	10	21	10	30	6
Linearity and Continuity	6	10	3	5	21	12	18	1
Skyline	10	12	5	7	24	18	12	5
Profile	9	18	8	13	16	16	24	5
Floor	12	16	12	12	16	24	30	5
Lakes: Extent and Character	30	24	12	10	2	0	2	10
Rivers: Extent and Character	0	3	3	8	5	12	12	6
Lakes: Shoreline Form	8	18	24	10	1	0	0	6
River: Shoreline Form	4	6	4	6	5	5	8	3
Water Setting	8	10	8	8	4	16	16	4
Setting Frequency	16	8	10	18	8	5	16	9
Falls and Rapids	2	3	2	3	3	0	4	4
Peaks	10	12	10	10	12	12	12	6
Snow and Ice	0	0	0	3	3	3	8	0
Vegetation Contrasts	2	5	4	8	10	7	24	6
Visual Unit Linkages	10	10	5	9	9	12	24	0
Impacts and Degrading Contrasts	3	7	6	8	4	7	7	0
Total Score	175	238	138	193	236	244	331	112
Adjusted Score*[1]	58	79	46	64	79	81	110	37
Attractiveness Rating*[3]	Mod.	Mod.	Mod.	Mod.	Mod.	High	High	Low
Map Designation	M	M	M	M	M	A	A	L

*[1] Scoring was done independently by three people, so the scores are cumulative. Scoring by each person was on a scale of 0 to 10 as described in Tetlow and Sheppard (1977). The adjusted scores are the total scores divided by three.

*[2] Explanations of these terms may be found in the reference noted above.

*[3] Ratings were given in accordance with Tetlow and Sheppard's (1977) scoring levels:

Low	0 to 39
Moderate	40 to 79
High	80 to 119
Very high	120 to 159
Outstanding	160 to 200

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TABLE 2

EXPOSURE TO VIEW

Exposure Rating*[1]		Criteria
High (R)	-	Areas readily seen from viewpoints such as roads, railroads, recreation or residential areas.
	-	Expectations of viewers do not include development or disturbed landscapes.
Moderate (D)	-	Large areas seen from a long distance or small areas seen from a short distance.
	-	Expectations of viewers may include other than natural landscapes.
Low (O)	-	Areas seen occasionally from viewpoints.
Nil (-)	-	Areas never seen from viewpoints.

*[1] Letters in parantheses refer to map designations.

TABLE 3

LANDSCAPE ABSORPTIVE CAPABILITY

	Slope		
	Steep (S)	Intermediate (I)	Gentle (G)
Terrain/Vegetation Description	>30%	15 to 30%	<15%
Continuous uniform tree cover - either all deciduous, all coniferous or even mixture of both. No conspicuous terrain patterns. Open water. (U)	Low	Low	Moderate
Continuous but irregular tree cover (uneven ages or clumped species distribution). or Discontinuous tree cover with vertical terrain pattern (gullied slopes). (V)	Low	Moderate	Moderate
Discontinuous tree cover, terrain pattern horizontal or irregular. (Burn area, newly logged areas, bogs.) (T)	Moderate	High	High

Note: Letters in parantheses refer to map designations.

TABLE 4

CRITERIA FOR VISUAL SENSITIVITY RATINGS

Sensitivity Rating	Criteria
High	Areas with both high attractiveness and high exposure.
Moderate	Areas not included above with at least two of the following characteristics: moderate or low absorptive capability, moderate or high attractiveness, moderate or high exposure.
Low	All remaining areas.

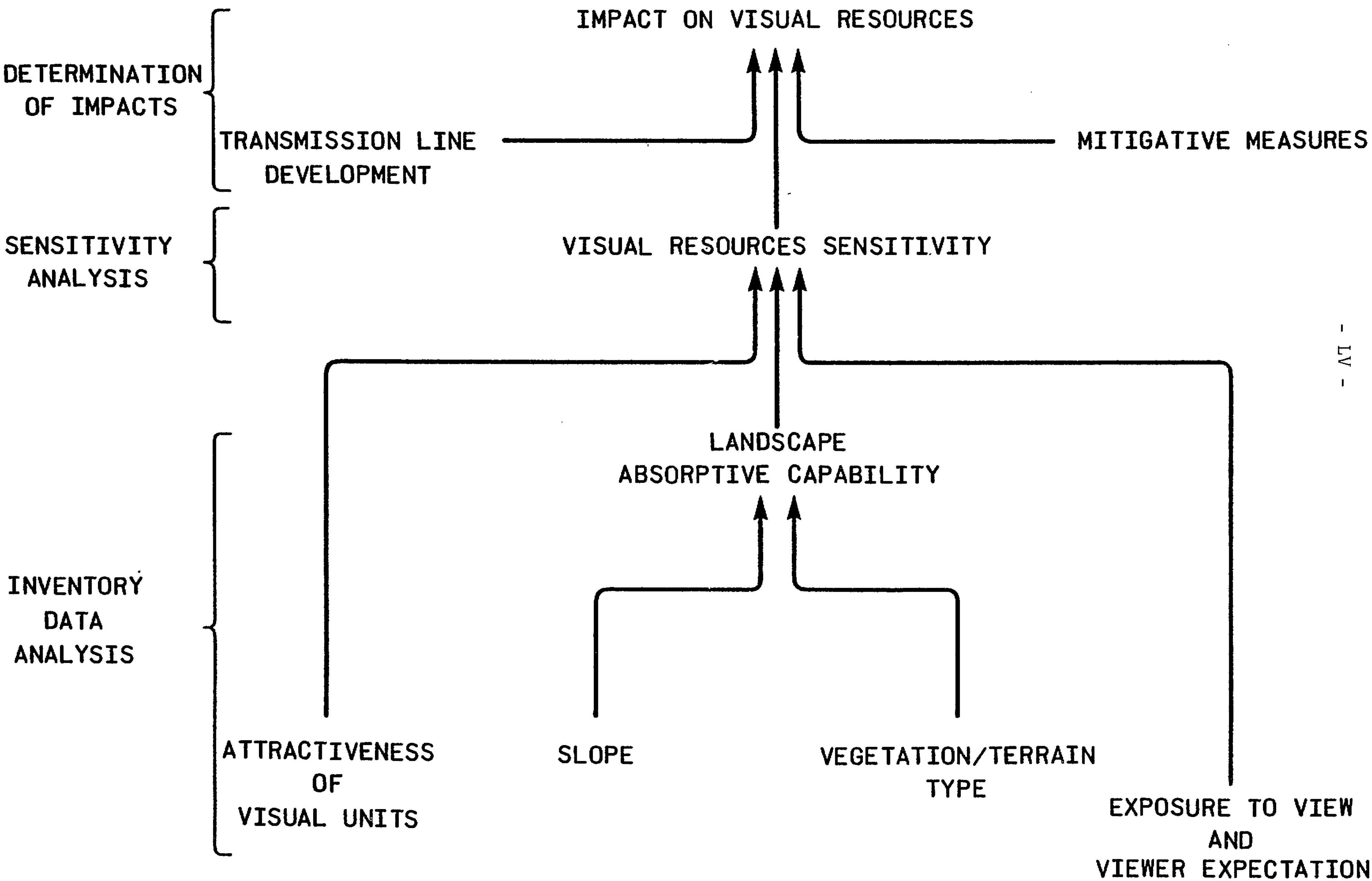
TABLE 5

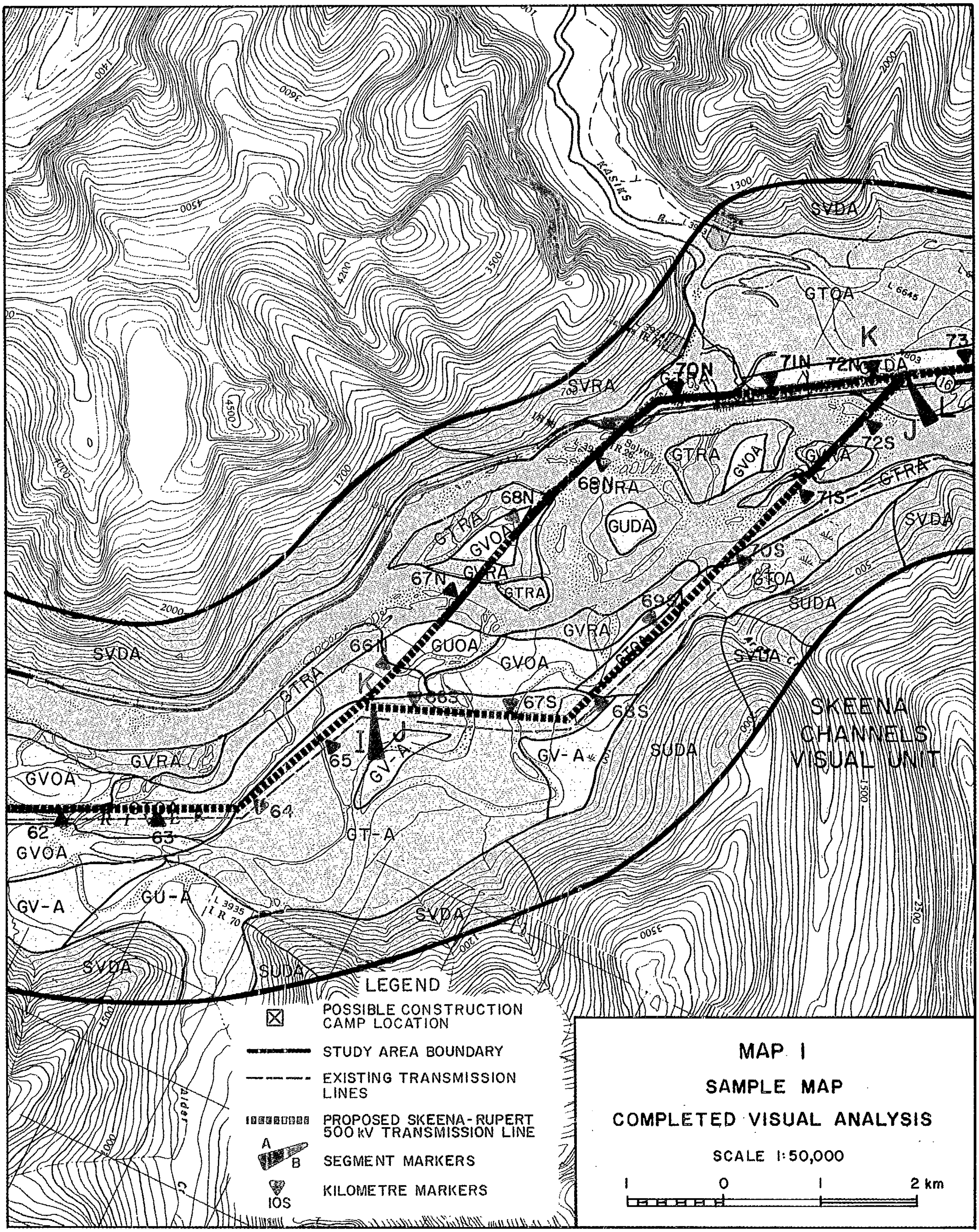
CRITERIA FOR DETERMINING VISUAL IMPACT RATINGS

Impact Rating	Criteria
High	High sensitivity areas where even with mitigation, visibility remains high and high scenic values would be permanently impaired.
Moderate	High sensitivity areas in which mitigation measures like screening, buffer strips and good vegetation management would reduce impacts to a moderate level. Also, areas where an existing transmission line makes the addition of a second one only a moderately disturbing change.
Low	Moderate sensitivity areas in which mitigation measures will reduce impacts or areas in which an additional transmission line will cause only a slight additional impact.

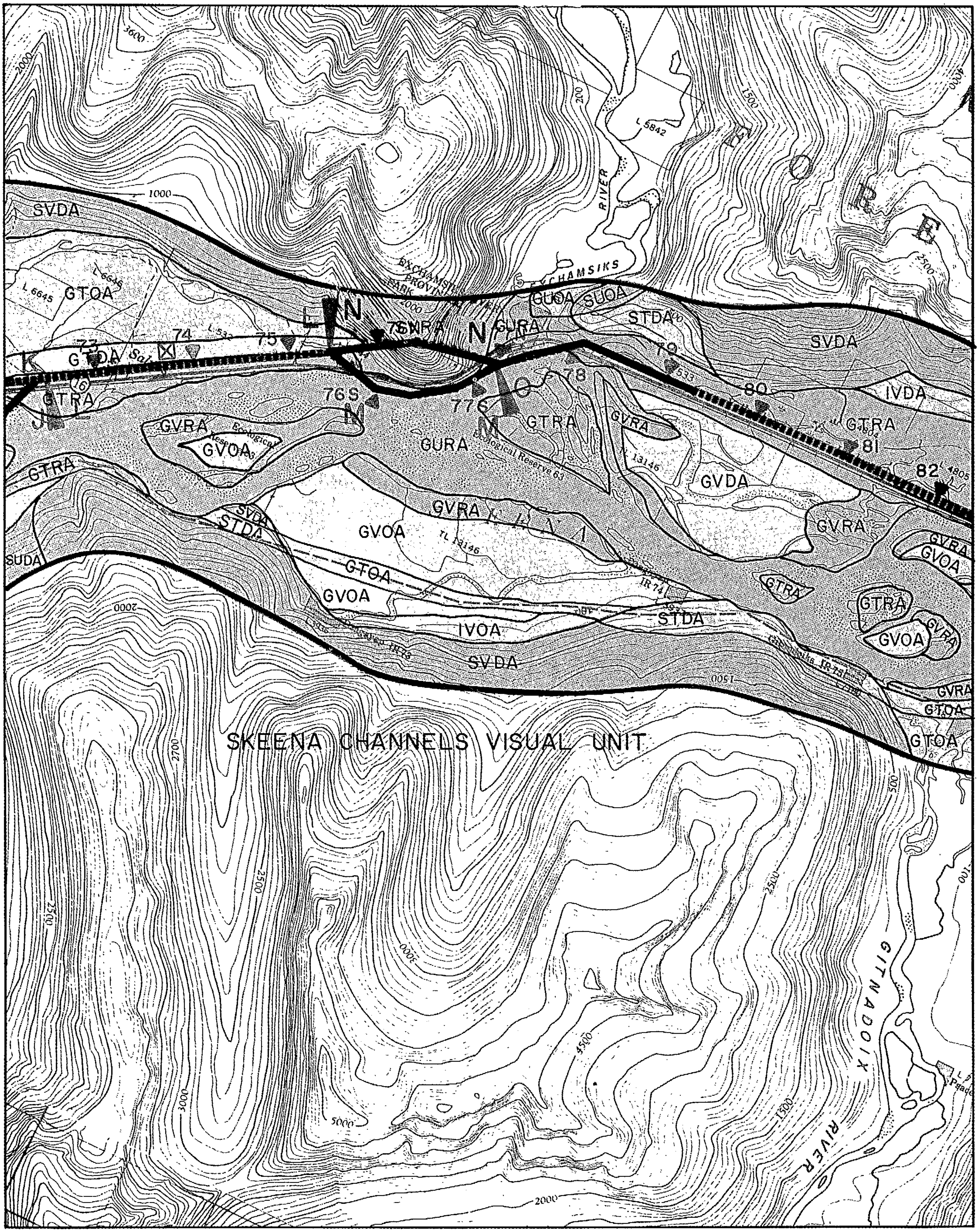
FIGURE I

METHODOLOGY FOR VISUAL ANALYSIS





SVDA
GTOA
K
73
70N
71N
72N
GTRA
SVRA
L
J
72S
GVOA
GUDA
71S
68N
GURA
GTRA
GVOA
67N
GTRA
70S
GTOA
SUDA
69S
GVRA
66N
GUOA
GVOA
SVDA
GTRA
K
66S
67S
68S
SKEENA
CHANNELS
VISUAL UNIT
I
J
65
GV-A
GV-A
SUDA
GVRA
GVOA
64
62
63
GVOA
GT-A
GV-A
GU-A
SVDA
SVDA
SUDA
LEGEND
POSSIBLE CONSTRUCTION CAMP LOCATION
STUDY AREA BOUNDARY
EXISTING TRANSMISSION LINES
PROPOSED SKEENA-RUPERT 500 kV TRANSMISSION LINE
A
B
SEGMENT MARKERS
10S
KILOMETRE MARKERS
MAP I
SAMPLE MAP
COMPLETED VISUAL ANALYSIS
SCALE 1:50,000
1
0
1
2 km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SVDA
STDA
GTRA
GTRA
GVOA
GVRA
GTOA
73
74
75
76S
77S
78
79
80
81
82
RIVER
EXCHAMSIKS
Ecological Reserve 63
IR 74
GITNADOIX RIVER
SKEENA CHANNELS VISUAL UNIT

LEGEND

VISUAL RESOURCES

INVENTORY

SLOPE

S STEEP, >30 PERCENT

I INTERMEDIATE, 15-30 PERCENT

G GENTLE, <15 PERCENT

TERRAIN/VEGETATION

U UNIFORM, CONTINUOUS TREE COVER

V CONTINUOUS BUT IRREGULAR TREE COVER OR DISCONTINUOUS TREE COVER WITH VERTICAL TERRAIN FEATURES

T DISCONTINUOUS TREE COVER OTHER THAN ABOVE

EXPOSURE

R READILY SEEN FROM ROADS OR OTHER VIEWPOINTS

D SEEN FROM MODERATE DISTANCE AWAY

O SEEN OCCASIONALLY

– NOT SEEN

ATTRACTIVITY

A HIGH ATTRACTIVITY

M MODERATE ATTRACTIVITY

L LOW ATTRACTIVITY

— — VISUAL UNIT BOUNDARIES

SENSITIVITY

HIGH

MODERATE

LOW

IMPACT

HIGH

MODERATE

LOW

WORKSHOP SUMMARY

Session II "Elements of the Process"

Summary of Workshop Discussion

G. E. Beanlands

The working groups were asked to address a number of questions which arose from the submitted papers. In total, the groups discussed thirteen questions. The gist of the answers are presented in annotated fashion below:

1. Allocation of Responsibilities

(a) Question: Is more cooperation between governments and industry in route selection and siting desirable and how can it be achieved?

Answers:
- desirable up to a point, mostly in area of study design
- enhances common understanding
- there are potential conflicts of interest
- to some extent cooperation is hindered by adversarial review process
- need clear government policy in this regard

(b) Question: To what extent should government agencies share responsibility for collection of baseline data for route selection and siting?

Answers:
- government should focus on resource <u>management</u> responsibilities
- proponents should focus on specific project environmental <u>impacts</u>
- the distinction between the above two responsibilities is not always clear
- there is a potential for conflict of interest
- the degree of sharing of responsibilities is governed in part by agency mandates

(c) Question: Who should be responsible for deciding on trade-offs associated with alternative routes and sites?

Answers:
- ultimately government must decide (politicians)
- proponent should argue for his preference
- early consultation in public would help both parties
- rigorous selection analysis is an important step
- best we can hope for is an <u>informed</u> judgement call

2. Problems in Decision Making

(a) Question: Is an adversarial-type public review an effective and efficient way to determine the environmental acceptability of alternative routes and sites?

Answers:
- can lead to mistrust and confrontation
- does not promote full disclosure
- government agencies often play "I gotcha"
- allows for public interventions
- promotes decision-making in public
- more likely to make proponents and government agencies accountable
- should only be used as a last resort

(b) Question: Should we de-emphasize the conventional EIS as a decision-making tool in route selection and siting?

Answers:
- it definitely needs improvement
- must specifically compare alternatives
- should clearly identify monitoring requirements
- EIS should be only one step in a process
- it could be part of a three-stage process:
    - consideration of project need
    - study of alternative routes or sites
    - assessment of selected route or site

(c) Question: Is it realistic to attempt to "analyze" public input to determine the extent to which it reflects the overall social good?

Answers:
- not analyzable in a rigorous sense
- some logical inferences can be made
- "general public" is not identifiable
- special interest groups normally prevail
- it is ultimately the responsibility of governments to decide what is the "social good"

(d) Question: What are the alternatives to ever-increasing levels of government regulation with respect to route selection and siting?

Answers:
- more early dialogue to resolve disagreements and misunderstandings
- governments should provide clear statement of requirements
- there should be some mechanism for continuous and joint project review

3. On Matters Technical

(a) Question: Is there an agreed-upon minimum level of information that must be available to properly assess routing and siting alternatives?

Answers:
- there is no generalized agreement
- a good scoping exercise would help
- replace breadth of coverage with depth of information
- data needs are site and project specific
- air photo coverage at various scales is an excellent starting point

(b) Question: Can route selection and siting criteria developed for rural and frontier areas work equally as well in urban areas?

Answers:
- in general, no
- exceptions are in geotechnical and engineering fields
- urban priority concerns include public health and safety, intensive land use competition and aesthetics

(c) Question: Is it necessary to take account of long-term climatic and geological changes in route selection and siting?

Answers:
- yes, but difficult to do
- 500+ years for geological changes
- 40-50 years for climatic changes
- important in radioactive waste disposal
- there are limited data and our predictive capabilities are poor

(d) Question: How can we improve on the timely integration of environmental, social and economic information to reduce project delays and major design changes?

Answers: - more development and use of geographical information systems

- adopt a staged process involving:
    - early project disclosure
    - early identification of key issues
    - good communication networks
    - experienced project managers
    - early public consultation

(e) Question: How should wildlife values be determined and applied to route selection and siting procedures?

Answers: - where habitat is a limiting factor, focus on potential losses

- some species are more sensitive to direct disturbances, i.e., not through habitat loss
- there are always three important perspectives: endangered species (governments), ecosystem impacts (biologists) and human values (public)
- trade-offs will depend upon dominance of roles played by above parties in particular projects

4. Conclusions

(a) We have the technical capability to route and site projects in virtually any conditions, except perhaps in the high arctic and offshore.

(b) The major problem is resolving resource trade-offs and distributing the effects in a fair manner - fair to the public and the proponent. This is primarily a political/administrative problem, not a technical or scientific problem.

(c) There is room for more cooperation between governments and proponents without unduly compromising the positions of regulatory and decision-making bodies.

(d) Decision making in any bureaucracy is a staged process from concept to implementation. EIS as presently conducted does not reflect this reality.

(e) There is a pressing need for early agreement in the EIS process on the allocation of responsibilities among all major parties involved; such an agreement needs to be clearly stated.

(f) To exclude the public is to invite disaster!

5. Recommendation

If a more cooperative approach is to be developed it must be accepted in principle at all levels in government and corporate bureaucracies. Attempts at a cooperative approach at lower levels without the support of senior management will be counterproductive and lead to confusion and frustration. Cooperation at senior levels can be interpreted as early agreement on the allocation of major responsibilities - both individually and collectively.

Therefore, it is recommended that at a very early stage in the decision-making process, senior officials from the proponent and relevant government agencies (say, at the Vice President or Assistant Deputy Minister levels) meet to set "the rules of the game." Such a meeting would:

(i) educate the decision-makers;

(ii) reveal major problem areas;

(iii) enable agreement on allocation of responsibilities;

(iv) demonstrate cooperation by example;

(v) identify individuals with responsibility/accountability;

(vi) clearly define relevant policies and regulations; and

(vii) determine how to effectively involve the public.

REGULATORY HEARING REFORM - LEGAL PRINCIPLES OF "FAIRNESS", TIMELY ACCESS TO INFORMATION and a CONSTITUTIONAL RIGHT TO FUNDING OF PUBLIC PARTICIPATION

By David Estrin, Barrister & Solicitor, Toronto, Ont. and Edmonton, Alta., & Associate Professor, Faculty of Environmental Studies, University of Waterloo; and Harry Dahme, B.Sc., LL.B

ABSTRACT

A fundamental reason for encouraging public participation in decisions regarding large development projects is to allow potentially affected members of the public to understand and comment on the proposal so that, among other things, a "fair" process is achieved. Assuming that fairness is to remain a hallmark of the public hearing process, important procedural assurances must be included. Foremost amongst these are adequate notice of impending hearings, timely access to information as well as adequate funding of those who would participate in the process.

This paper examines from both a Canadian and American perspective the issues of a constitutional right to adequate funding, notice and timely access to information in the environmental and resources regulatory process.

1. Introduction

Regulatory hearings are an integral part of almost every resource development project either in the context of obtaining initial planning approval for the project or in connection with the subsequent developmental aspects, such as siting. Inherent in this generic regulatory process is the application of the concept of fairness, natural justice or "due process" of law. The dictates of these legal and constitutional doctrines may require that all persons potentially affected by the resource development project are entitled to notice of the proceedings before the regulatory tribunal. Furthermore, there is a developing practice and authority which suggest that in addition to notice, funding must be made available to allow meaningful participation in such hearings.

This paper will examine the right to notice and what constitutes adequate notice of a proposed project. It will also focus on the corollary issue of funding for intervenors in the regulatory process, the rationale for funding and, more importantly, the legal and institutional basis for funding.

2. Notice and Access to Information

The development of the concept of adequate notice is tied closely to the formulation of the nature, extent and requirements of the doctrines of natural justice and fairness. The doctrines of natural justice and fairness determine the substantive and procedural aspects of the law as it applies to regulatory agencies. Natural justice or fairness as it has been developed in the case law establishes as a bare minimum a duty on all regulatory agencies to give sufficient notice of the hearing and the scope of that hearing as will allow persons entitled to the benefit of the rule to take full advantage of their right to be heard. This is also said to involve a duty to give persons affected such knowledge of the arguments and evidence presented against their interest as will make their participation in the decision-making process meaningful.[1] What constituties adequate notice may in addition depend on the statute establishing the particular regulatory agency, or the rules developed by the agency to govern procedure before that agency. The key points are that regardless of the source of the duty to give notice, persons potentially affected by the decision-making process are entitled to (a) "sufficient" notice to (b) make their participation "meaningful".

How have these requirements been interpreted by the courts?

To a large extent the notice requirements have been determined by the nature of the proceedings and the nature of the rights affected. "Personal service on all those entitled to appear at the hearing is not an absolute requirement in every case and, indeed, where large numbers of persons are potentially affected by a decision, all that may be demanded is a public notice or advertisement in the press. There may also be differing requirements here as with other aspects of the <u>audi alteram partem</u> rule for differing categories of persons interested in the particular proceedings. Similarly, with respect to the amount of information to be supplied in the notice, requirements vary. Where the proceedings are analogous to a criminal charge, the courts have at times demanded that the notice precisely define the statutory basis for the hearings and in addition clearly set out the possible consequences of a finding against the interest of persons affected. On other occasions, such precision is not demanded on the basis that reasonable persons would, from the amount of information supplied, have realized the nature and implications of the proceedings or at least been put on inquiry."[2]

Where the notice requirements are specified in the enabling statute, such as in the case of the Ontario Planning Act and the Expropriations Act, the courts have interpreted these provisions strictly against municipalities and expropriating authorities.[3] Where the statute provides for only "reasonable notice" and where the form and content are not specified, the rule is that the notice must be sufficiently clear, definite and particularized so as "to enable the person to whom it is directed to know what he must meet."[4]

In practical terms, what all of this suggests is that the legal requirements are more than simply notice of the time, place and character of a hearing. It is suggested that prior to a hearing it is the duty of the proponent to give sufficient notice so that a person may first determine if he is to be affected and, second, to what extent his rights may be affected. In order to be able to formulate an opinion as to the extent that his rights are to be affected, that person should then also be entitled to access to the information gathered by the proponent.[5]

For that right to access to information to be of any effect, it is only a small step to require that there be timely access to information. Information obtained on the eve of a hearing is of very little use to an individual whose rights are being determined. Notice, in order to be meaningful, requires full disclosure of the proponent's case well in advance of the hearing so that the person affected can evaluate the information received, formulate an opinion, and retain experts to verify or contradict the information received from the proponent.[6]

To the extent that the doctrine of notice developed by Canadian courts does not necessarily include requirements as to timely access and particularity, there is a line of reasoning now available as a result of the Canadian Charter of Rights and Freedoms which suggests that these requirements may have to be met in the future.

Section 7 of the Canadian Charter of Rights and Freedoms provides for the constitutional right to "life, liberty and security of the person" and the right "not to be deprived thereof except in accordance with the principles of fundamental justice." The right to "security of the person" not only refers to personal rights, but may be construed as also encompassing property rights which extend to the security of the person.[7] While s.1 of the Charter permits such reasonable limits as can be demonstrably justified in a free and democratic society, this in turn serves to underline the paramount consideration given by the Charter to individual rights as opposed to societal rights.

As a deprivation of personal rights (which may include property rights which affect security of the person) is not permitted under the Charter except in accordance with the principles of fundamental justice, the next step is to determine the scope of this right in the context of a regulatory hearing. To do this, an analogy can be drawn between the Canadian Charter and the constitutional guarantees contained in the U.S. Bill of Rights, Amendments V and XIV. These Amendments guarantee that no person shall be "deprived of life, liberty or property without due process of law." An essential element of due process is notice.

The American courts have said conclusively that notwithstanding compliance with statutory or tribunal-directed provisions for notice, notice must reach the parties affected and must convey the required information. The nature and necessity of these requirements was emphasized in Mullane v. Central Hanover Bank & Trust Co.,[8] a decision of the U.S. Supreme Court. Some quotations from that decision make these points clear.

> "The fundamental requisite of due process of law is the opportunity to be heard. This right to be heard has little reality or worth unless one is informed that the matter is pending and can choose for himself whether to appear or default, acquiesce or contest."
>
> "The notice must be of such nature as reasonably to convey the required information and it must afford a reasonable time for those interested to make their appearance." [9]

The same point was raised again before the U.S. Supreme Court in 1971 in Funtes v. Sheven [10]

> "For more than a century the central meaning of procedural due process has been clear: parties whose rights are to be affected are entitled to be heard; and in order that they may enjoy that right they must first be notified. It is equally fundamental that the right to notice and an opportunity to be heard must be granted at a meaningful time and in a meaningful manner." [11]

What these cases suggest is that notice by publication in accordance with the statutory provisions is simply not always sufficient. Notice is more than a mere gesture; the means employed must be such as can be reasonably expected to inform the affected parties. Publication as a means of notice often operates so that chance alone brings to the attention of a local resident the existence of a hearing which may affect his rights, as well as the nature of the hearing. In Mullane it was suggested that notice should name those whose attention it is supposed to attract, and that within the limits of practicability, notice should be such as is reasonably calculated to reach interested parties.[12] This was not taken to mean that personal service was necessary, but , as was pointed out, where the names and post office addresses of those affected by a proceeding are at hand, the mails would seem to be a reasonable means of giving notice.

The issue of notice was discussed again in the context of the California Environmental Quality Act by the Supreme Court of California in Horn v. County of Ventura[13]

> "...Where, as here, prior notice of a potentially adverse decision is constitutionally required, that notice must, at a minimum, be reasonably calculated to afford affected persons the realistic opportunity to protect their interest.
>
> The notice provided by the County's CEQA regulations fails to meet the foregoing standard. By limiting itself to the posting of environmental documents at central public buildings, and mailings of notice to those persons who specifically request it, the County has manifestly placed the burden of obtaining notice solely on the concerned individuals themselves. While such posting and mailing may well suffice to encourage the generalized public participation in the environmental decision-making contemplated by CEQA, they are inadequate to meet due process standards where fundamental interests are substantially affected. Those persons significantly affected by a proposed subdivision cannot reasonably be expected to place themselves on a mailing list or "haunt" county offices on the off-chance that a pending challenge to those interests will thereby be revealed. Other forms of notice appear better calculated to apprise directly affected persons of a pending decision." (pages 1140-1141)
>
> We do observe, however, that depending on (1) the magnitude of the project and (2) the degree to which a particular landowner's interest may be affected, acceptable techniques might include notice by mail to the owners of record of property situate within a designated radius of the subject property, or by the posting of notice at or near the

> project site, or both. Notice must, of course, occur sufficiently prior to a final decision to permit a "meaningful predeprivation hearing to affected landowners." (page 1141)

The court went on to say that the circulation of environmental assessment documents and the holding of various public information sessions in connection with the preparation of an application is not notice to potentially affected landowners of a subsequent adjudicative hearing that may or may not be held.

These U.S. constitutional principles appear consistent with the requirements of the Canadian Charter of Rights; both constitutions appear to impose on proponents, including proponents of resource projects, fundamental obligations as to the type of notice which must be given to persons likely affected, the manner in which it is to be given, its timing, the information the notice must contain as well as to the information that the proponent must make available to regulatory hearings.

3. Funding

Another issue, and ultimately one which may be of greater significance, is that of funding of intervenors, or citizens affected by a decision of a regulatory body. As a subject area, notice is perhaps less controversial. It is more readily defined by the existing law. But a fundamental question that arises in the context of notice is, of what value is notice, and ultimately the right to be heard, if the person affected is unable to participate in the process through lack of funding. Even if all of the procedural and substantive requirements of notice are met, the party affected may be denied the ability to participate meaningfully in the process as a result of the lack of funding. Some examples will illustrate this point.

To participate in the Canadian (federal) Environmental Assessment and Review Procedure (EARP) concerning resource development in the Canadian Arctic, the Beaufort Sea Alliance, comprising native and public interest groups, estimated that it would spend at least $289,000 in 1983-84. The

Consumers' Association of Canada spent approximately $56,000 to oppose the 1982 Bell Canada rate increase before the Canadian Radio - Television and Telecommunications Commission hearings. The Inuit Tapirisat (Eskimo Brotherhood) spent approximately $350,000 participating in the Arctic Pilot Project hearings before the National Energy Board.[14] These figures illustrate the enormous cost of participation in the hearing process and how participation can frequently be determined by the availability of funding. The result is often that the average person or group is entirely unable to participate in the process. However, a similar rationale to that employed to argue in favour of expanding notice, can also be applied to the matter of funding.

The purpose and goals of notice are to entitle persons who are likely to be affected by a decision the right to take advantage of their right to be heard and to participate meaningfully in the process. Surely this reflects an intrinsic system of values embodied in our legal system which could be used also to argue in favour of the right to adequate funding.

Aside from consistency in promoting an intrinsic set of values, there are other benefits which accrue from public participation in the decision-making process, and which would act so as to justify provision for funding.

First, it has been evident for some time that intervenors bring to the decision-making body information and perspectives not otherwise available. The value of participation on this level has been commented upon time and time again. The CRTC in the case of Challenge Communications,[15] noted that:

> "...in bringing to the attention of the Commission a tariff which was contrary to s.321 of the Railway Act and in making its case, Challenge made a substantial contribution to the effective discharge of the statutory responsibilities of the Commission...." 16

In commenting on the Aishihik hydro-electric development in the Yukon, the Canadian Arctic Resources Committee[17] commented specifically on the effect of the absence of public participation:

> "The most noteworthy aspects of the allocation of responsibilities is that there were no actors external to NCPC [the Northern Canada Power Commission] and its consultants involved in many of the most important decisions that were made during planning and development of the project. The presence of such countervailing influences might have encouraged NCPC to investigate alternatives more thoroughly, to ensure the accuracy of cost estimates, and to schedule the implementation of the project more carefully than it did. The participation of independent organizations in these planning stages might have led to a more satisfactory outcome.
>
> Although there were no particularly strong countervailing influences affecting some of NCPC's actions, the Water Board and intervenors at the Water Board's hearings seem to have had a substantial influence on the course of the history of the project and its final outcome." 18

Another benefit achieved as a result of participation in the hearing and the representation of all viewpoints is that the process itself is clothed with an aura of acceptability. This in turn extends to the decisions of the tribunals, which then become more publicly acceptable. Finally, it has also been said that the other benefits that accrue would be that problems of agency dependance on industry for political support would be alleviated thereby making the agency more autonomous, and that the presentation of alternative points of view would induce the decision maker to weigh the evidence more carefully and be more thorough in evaluating the evidence prior to making his decision.[19] The Law Reform Commission of Canada has acknowledged these grounds for increased public participation and, in keeping with the value accorded these benefits, has recommended that "government funding should continue to be made available for worthwhile public interest intervention activities.".[20]

Having briefly dealt with the rationale for funding, the next step is to examine the legal/institutional basis for funding. There are currently four methods of funding available to intervenors in regulatory proceedings. These are the power to award costs; funding by the applicant; direct grants to intervenors; government funding.[21]

The power to award costs is a power given to the tribunal by the enabling statute. This power may be given explicitly or implicitly.

Examples of the explicit grant of the power to award costs are the Ontario Energy Board,[22] the Ontario Municipal Board,[23] and Ontario Joint Boards under the Consolidated Hearings Act, 1981.[24] Subsections 7(4)-(6) of the Act state:

(4) A joint board may award the costs of a proceeding before the joint board.

(5) A joint board that awards costs may order by whom and to whom they are to be paid.

(6) A joint board that awards costs may fix the amount of the costs or direct that the amount be taxed, the scale according to which they are to be taxed and by whom they are to be taxed

There have also been arguments made to suggest that where a tribunal exercises the powers of a superior court of record, it has inherent jurisdiction to award costs. This line of reasoning has been advanced before the National Energy Board but as yet has been unsuccessful.[25]

Where a regulatory tribunal does have jurisdiction to order costs, it may do so in several ways. A tribunal may award costs in the traditional manner exercised by the courts. The general court rule is that costs follow the event and that a successful party will not be deprived of costs unless he or his counsel have been guilty of some misconduct. Exceptions to the award of costs to the successful party are where the issue is a new one, where a new statute is being interpreted, or if the action is a test case. In these three exceptions, the exercise of the discretion of the tribunal is the paramount feature.[26]

However, as is increasingly the case, it is recognized that the awarding of costs in the traditional method may place great hardship on an intervenor. This is especially true in the case of a resource development project where the intervenors, the persons affected, are individuals. It is in this type of situation that the presumption of economic equality of the parties fails and the potential for unfairness compels a more adequate response. It is in response to this type of situation where we find the law as to costs developing or changing most rapidly.

This can best be seen by briefly listing some recent court decisions and decisions by regulatory tribunals with respect to costs.

In a decision refusing the application by a ratepayers' group for judicial review of a ruling by the Ontario Environmental Assessment Board, the Ontario Supreme Court refused to award costs against the ratepayers' association. The basis for this decision was that the association had acted "responsibly" and "in good faith", and that "the matter [was] one of public importance."[27] Similarly, the Ontario Supreme Court in Re Rosenberg and The Grand River Conservation Authority[28] refused to award costs against the citizens in the area because they performed a public service in bringing the application thereby causing consideration to be given to environmental factors which otherwise would have been completely ignored.

The courts are, however, not always so kind. This can readily be seen by the recent case of Palmer v. Nova Scotia Forest Industries.[29] In this case a group of residents applied for an injunction restraining the defendant company from spraying a herbicide. The application was refused on all of the grounds advanced and costs were awarded against the plaintiffs. The legal fees were enormous and the award of costs spelled potential disaster to the plaintiff applicants.

To the extent that the courts have abrogated the traditional rules with respect to costs, administrative agencies have been quick to adopt a similar approach. The Ontario Municipal Board enunciated a policy similar to that adopted by the courts in public interest matters and has refused to order costs where the resident ratepayers lost the application but the objections had merit and were not frivolous.[30] This, of course, did little to compensate the intervenors with respect to their costs. However, where the ratepayer group has been successful, the OMB has been quick to recognize that "an administrative tribunal, exercising a specific statutory authority is not bound by the principles of the common law on costs." The Board then proceeded to award full costs to the ratepayers, to be paid by the City of Barrie, which although represented at the hearing, was not even party to the hearing.[31]

This approach was also taken by the Ontario Energy Board in the Reference Re Principles of Power Costing and Rate Making for Use by Ontario Hydro. In that case, the Board stated that it felt that "it is important to encourage active, informed and useful participation so that a wide range of views can be examined in detail. Without such interventions the burden upon the Board in a hearing could be overwhelming." The Board then proceeded to award costs to those intervenors "who have actively participated and have put forward intelligent, well-informed and effective interventions."[32]

In effect, the intervenors were funded by the applicants *ex post facto*.

This generosity has not yet however been extended by all tribunals to the awarding of costs prior to the hearing of an application. The Joint Board in Re Ontario Hydro - Southwestern Ontario Transmission System Expansion Program[33] in ruling upon such preliminary motion indicated it was appropriate for intervenors to attempt to raise money for costs on their own initiative, either by fund-raising or obtaining intervenor funding from the government. Interestingly enough, the Board awarded costs to the intervenors after the hearing after noting their contribution and commitment:

> "The Joint Board has taken the approach that the award of costs is to provide full public participation in public hearings of this nature and to enable the participants to bring the kind of evidence and submissions before the Board in order for it to better understand the issues raised." 34

In Alberta the Energy Resources Conservation Board Act clearly provides for costs to be paid by proponents to "local interveners."[35] Costs include both legal fees and expert witness expenses. The allocation of such costs is for the Board. Costs in advance are provided for and are sometimes given.

One of the few cases where the applicant has voluntarily agreed to fund intervenors involves the Ontario Waste Management Corporation ("OWMC"). The OWMC announced in 1982 that it would distribute funds to intervenors in future hearings in accordance with certain criteria established by the panel established to hold public hearings as to the OWMC's proposed hazardous waste facility.[36]

A third type of funding is direct grants to intervenors by the tribunal, commission or inquiry. This practice was instituted by Mr. Justice Berger in the Mackenzie Valley Pipeline Inquiry and was also adopted by the Lysyk Inquiry into the Alaska Highway Pipeline, the Thompson Inquiry into West Coast Oil Ports, the Ontario Royal Commission on the Northern Environment and the Beaufort Sea Environmental Assessment. The rationale employed to justify this source of funding is in keeping with what has already been said about the benefits to be obtained by public participation, ensuring that the evidence is as complete as possible without necessarily being biased in favour of the proponent and that the tribunal thus obtains first-hand knowledge of the concerns of the public.

The criteria for funding vary depending on the inquiry but the criteria established by the Berger Inquiry provide a good set of guidelines. These criteria are:

(1) There had to be a clearly ascertainable interest that ought to be represented at the inquiry.

(2) It should be clear that separate and adequate representation of that interest will make a necessary and substantial contribution to the inquiry.

(3) Those seeking funds should have an established record of concern for and should have demonstrated their own commitment to the interests they seek to represent.

(4) It should be shown that those seeking funds do not have sufficient financial resources to enable them to adequately represent the interests and will require funds to do so.

(5) Those seeking funds should have a clear proposal as to the use they intend to make of the funds and should be sufficiently well organized to account for the funds.[37]

The last source of funding is government programs. This generally is only available to specified groups for specific issues. An example is the funding by the Department of Indian Affairs and Northern Development of the Inuit Tapirisat in the Arctic Pilot Project Hearings.

From this brief examination it can be seen that funding is primarily available as a result of specific legislative enactments coupled with an exercise of the discretion of the tribunals to award costs.

Recently there has been discussion as to whether or not there may be a new argument in favour of funding based on the Canadian Charter of Rights and Freedoms. The argument would be based on s.7 and would flow along the same lines as the arguments advanced on behalf of expanded notice. However, where the arguments on behalf of notice succeeded, or had grounds upon which to succeed based on American jurisprudence, arguments in favour of the constitutional right to funding have no support in American case law.

The "American rule" with respect to costs is that each party is expected to bear its own costs and in the absence of statutory enactment there is no right to indemnification for costs for a successful party or an intervenor representing the public interest. That this is the rule was made quite clear by the U.S. Supreme Court in Alyeska Pipelines Service Co. v. Wilderness Society.[38] The same point was made in Turner v. Federal Communications Commission.[39] wherein the court stated:

> "Congress, and not the Commission, can authorize an exception to the 'American Rule' that litigants bear the expense of their litigation." [40]

This is the case even where the court is prepared to acknowledge the value of the participation of the intervenors. [41]

Put briefly, the constitutional right to due process in the United States does not entitle an intervenor in a regulatory or court hearing to costs. Canadian courts, however, have not ruled on the matter.

However, in 1985, s.15 of the Charter of Rights becomes effective. This provides for equality before and under law and equal protection and benefit of law. A constitutional right to have a truly fair regulatory process may be implicit. Yet until Canadian courts rule affirmatively on this issue, the right to funding for opponents of resource development projects remains one largely defined by statute. Unless there is statutory provision to award costs, an intervenor must seek direct grants from the tribunal, from the government or from the proponent. If there is however statutory authority to award costs, it is well to heed the words of the Joint Board quoted earlier, that a tribunal will not be bound by the traditional rules as to costs and that even if the resource development project is approved, the proponent may well find itself in the position of paying the costs of the intervenors.

NOTES

1. D. J. Mullan. "Administrative Law" (2nd ed.), pp. 3-113

2. Ibid, pp. 3-114

3. Metcalfe Realty Co. Ltd. v. Ottawa-Carleton (1975), 7 L.C.R. 48 (Div. Ct.)

   Re Jurgenson and City of Hamilton [1968] 2 O.R. 659 (C.A.)

   Re Jakovljevic et al v. Town of Oakville (1974) 7 L.C.R. 380 (Div. Ct.)

   Costello et al v. City of Calgary (1983) 143 D.L.R. (3d) 385, (S.C.C.)

   Wiswell et al v. Metropolitan Corporation of Greater Winnipeg (1965) 51 D.L.R. (2d), 754 (S.C.C.)

4. Reid and David, Administrative Law and Procedure (2d), pp. 65-66

   Wilson et al v. Secretary of State for the Environment et al [1973] 1 W.L.R. 1083, per Browne, J. at 1092

5. Denton v. Auckland City [1969] N.Z.L.R. 256

   Evaskow v. International Brotherhood of Boilermakers (1969) 9 D.L.R. (3d) 715 (Man. C.A.)

6. This position corresponds to that advocated by the Law Reform Commission of Canada, Independent Administrative Agencies, Working Paper 25 (1982) pp. 101-103

7. The Queen v. Fisherman's Wharf Ltd. (1982) 135 D.L.R. (3d) 307 at 315-316 (N.B.Q.B) affmd in the result, 144 D.L.R. (3d) 21

   Melvin v. The Queen (1982) 1 C.R.R. 307 at 315 (N.B.Q.B.)

8. (1950) 70 S.Ct. 652

9. Ibid, pp. 656-657

10. (1971) 407 U.S. 67 (U.S. Supt. Ct.)

11. Ibid, p. 80 [emphasis added]

12. Supra, note 8, pp. 659-660

13. (1979) 596, P. 2d, 1134 (Sup. Ct. of Calif.)

14. Ian A. Blue "The Allocation of Costs of Participation: Costs and Intervenor Funding - The National Energy Board" (1983)

15. Challenge Communications v. Bell Canada, CRTC Telecom Decision 77-16

16. Ibid, p. 39

17. W. G. Nicholls, "Aishihik: The Politics of Hydro Planning in the Yukon" (1981), Canadian Arctic Resources Committee

18. Ibid, pp. 89-90

19. R. Anand, I. G. Scott "Financing Public Participation in Environmental Decision Making" (1982) 60 Can. Bar Review 81

20. Supra, note 6, p. 106

21. Supra, note 14

22. The Ontario Energy Board Act, R.S.O. 1980, c. 332, s.28

23. The Ontario Municipal Board Act, R.S.O. 1980, c. 347, s. 41(2)

24. S.O. 1981, c.20

25. The argument was advanced by counsel for the Inuit Tapirisat in the Arctic Pilot Project hearings but was rejected.

26. Opcit, note 19

27. Re Nanticoke Ratepayers' Association and Environmental Assessment Board (1973) 19 O.R. (2d) 7, at pp. 17-18

28. (1976) 9 O.R. (2d) 771

29. (1983) 60 N.S.R. (2d) 271

30. Re Central Wellington Planning Area Official Plan Amendment (1978) 8 O.M.B.R. 263 at p. 284

31. Re Township of Innisfil Restricted Area By-law 78-80 (No. 2) (1981) 11 C.E.L.R. 49

32. (1977) 6 C.E.L.N. 171

33. (1982) 11 C.E.L.R. 53

34. Re Ontario Hydro-Southwestern Ontario Transmission System Expansion Program (1982) 12 C.E.L.R. 62 at p.63

35. R.S.A. 1980, c. E-11, s.31. See also Interveners' Costs Regulation, Alta. Reg. 435/78

36. OWMC Regional Meeting, Chatam, Ont. Sept. 29, 1982: Statement by the OWMC Chairman. See also S.O. 1981, c.21, s.16.

37. Berger, Report of the Mackenzie Valley Pipeline Inquiry (1977) Vol. 2 pp. 225-226.

38. (1975) 95 S.St. 1612, 421 U.S. 240

39. (1975) 514 F. (2d) 1354

40. Ibid, p. 1356

41. <u>Green County Planning Board v. Federal Power Commission</u> (1976) 559 F. (2d) 1227, cert. denied 98 S. Ct. 1280

THE MATRICES OF POWER: REBALANCING THE PROPOSERS AND THE PUBLIC

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ABSTRACT

Those who propose energy projects possess power in the form of knowledge, purpose, group support, and, in some cases, legal rights as well. The citizen possesses fewer advantages, and so feels less powerful. His consequent anxiety or anger leads him to seek reinforcement or to frustrate the goal. The proposers--whether government agency or private utility--can do much to redress this inequity. In fostering a balance, they will enhance present communications and provide a solid foundation for public involvement in future projects within their service area.

INTRODUCTION

Utilities and power agencies seek through their proposals to provide power (energy) to small and large groups of people so that they may run their machines and their lives in greater security and with greater efficiency and pleasure. The provision of power, like everything else, is more difficult than that simple definition would suggest. The benefits of having energy readily available are not obtained without a certain price: energy facilities cost money, take up space, and often are not readily compatible with the landscapes they occupy.

To provide power with maximum efficiency and yet with a minimum of these costs is a difficult and contradictory task. It is further complicated by the need and commitment to involve and communicate effectively with those whom the facilities would affect. This brings us to a second kind of power: the complex matrix of relative powers held by each side of any communication.

Communication works best among peers. Between those of equivalent training and experience, the exchange of information is most straightforward, and the potential for misunderstanding is diminished. Fear of the other is minimized. Opportunities to subvert the communication are less often seized.

Communications between unequals may also succeed, where the relationship is benign and where the role of each participant is both clearly defined and willingly accepted by each. Teaching, for instance, proceeds best with the mutual agreement that the teacher, who possesses more authority by position, knowledge, and perhaps age, regards benignly the student who, with less power, less knowledge, and less wisdom, occupies an "inferior" position. The relationship is unequal, but parallels the superior/inferior relationship of parent and child.

Unequal situations less readily identified as benign, however, make communication more difficult. The person occupying the lesser position in power, knowledge, and/or wisdom may be uneasy. He may see himself as being at a disadvantage. Consequently, he or she may take steps to rise to peer status, to participate as an equal, or to gain the advantage in the exchange. Where this is not possible, he may seek to develop a bargaining or a threatening position or, worse, work to subvert the communication and the goal.

This sequence of feelings and actions by proposers and the public is a familiar one to utilities and power agencies. However, an understanding of the forces at work in a communication between those who propose energy projects and those who may be affected by them may enable the proposers to ask the right questions of themselves and of the public. The proposers may also then aim to establish a balance of powers that will increase the efficiency of a project, reduce the potential for misunderstanding, and enable both "sides" to feel that a fair exchange and fair treatment have played successful parts in a project.

The following discussion maps out the strategies and sources of power in communication, and suggests effective and worthwhile ways to redress an imbalance which works against successful communication and resolution when the proposers encounter the public.

COMMUNICATION STRATEGIES AND CONSEQUENCES

Language makes up for our inability to read minds:

"Just what is this line going to look like when it comes over into our valley?" 1/

With a common agreement as to what each word means, we "decode" it to follow an argument, to arrive at a point, to understand a question and prepare a response.

Language is imperfect, however. One word may mean several different things:

"You said 'closer to.' What does that mean? How much closer?"

We must see the word in context: how it appears in each sentence, who is saying it, what information and motivation the speaker possesses, and what his or her feelings are. For this reason, communication is difficult and imperfect, subject to accidental or intentional misunderstanding and to misinterpretation. This powerful tool is subject to abuse. It is equally capable of clearing the way for a positive working relationship.

1/ These and other "public comments" are representative, not actual, quotes.

Sources of Power in Communication

A primary source of power in communication is control of information. The more control one has over information, the greater the power. Consider, for instance, the following opportunities for control in any exchange:

- Release of information: Either party may choose to make some or all facts available; but what does all mean? Does available mean simply leaving the facts in a convenient place for discovery, or can it mean actively seeking out the other party?

- Timing of information: Information received too late leaves the receiver feeling abused or deceived; information received too early may be discarded without recognition of its significance.

- Sharing of information: The two "sides" or parties to a communication may exchange information; but how much and of what quality?

- Decision to receive information: Either party may choose to proceed without widening the information base to include the contributions of the other.

- Decision on what information to receive, to refuse, to ignore: Either party may decide to receive some but not all information as valid, may receive information from one source but not another, may set limits on the extent of information or on its relevance.

- Decision to interpret information: Either party may receive information from a limited or particularized point of view.

- Decision to categorize information: Either party may decide to organize the information according to pre-set categories, or according to categories derived from the total sum of information received.

- Decision to spotlight information: Either party may decide to "highlight" or give greater value to some information received, based on such values as knowledgeability or importance of the source, trust in the source, frequency with which the information appears in a set of surveys, compatibility with the party's objectives, or other criteria.

- Decision to downgrade the validity of the information: Conversely, either party may diminish or devalue information, based on reliability of the source, infrequency of appearance, or lack of compatibility with its ideas or goals.

These powers may individually be held by either or both parties in an exchange. These powers may also be abused by either or both parties. Regardless of the speaker's primary purpose in communicating, however, secondary decisions or purposes usually involve maintaining enough control of the communication (and therefore of the relationship) to enable the speaker's goal to be reached. Where goals differ, communications most often break down.

Consequences of Ignorance

Suppose, moreover, that the knowledge and training of one party exceeds that of the other, and that they address each other not as peers, but as a superior and an inferior in knowledge. The complexity increases, and the balance of power shifts.

The master/pupil relationship, while unequal, is positive within the learning environment. The assumed object of each participant is to increase the knowledge of one of them so that he or she, in turn, can independently understand and use the knowledge. In other words, the student learns enough information to be able to ask intelligent questions about the subject and to detect gaps of knowledge without the aid of the teacher.

This unequal but benevolent and protected exchange is defined by the common goals of the participants. However, when the extent of necessary knowledge is unequal <u>and</u> the goals of communications differ, the balance of powers is disturbed. Communication is hampered. The right questions cannot be asked until it is too late. If the less informed or disadvantaged person is unable to acquire sufficient knowledge and is therefore unable to participate in the exchange of information as an equal, he or she may become more fearful or anxious. These feelings may produce embarrassment, resentment, anger, despair, hostility--a guarantee for misunderstanding and a likely failure of communication. The exchange degenerates to a situation in which one party must "win" and the other "lose."

FACILITY SITING: COMMUNICATIONS BETWEEN THE PROPOSERS AND THE PUBLIC

Both conditions--inequality of knowledge and differing goals--often apply in communications between the proposers of an energy project and the public, those whom it would affect.

Differing Goals

First, the goals of each group frequently differ. The proposer's primary focus is to provide energy for the use of a small or large group of people, often through new construction (and energization). Subsidiary goals may be to achieve this purpose economically, without controversy, and in a timely and efficient manner. The proposers also want to achieve their goal within the legal framework specified for them and, finally, to achieve the goal with maximum benefit to the involved parties--however they may be defined.

The goals of those affected by the energy facility will vary more widely, depending on whether they perceive a direct benefit from its construction. Photographs attest to the fact that, years ago, construction crews were greeted with open arms and actual assistance in first bringing electricity to rural areas. Even today, if the affected public perceives tangible and desired benefits in the building of a facility (such as initial or needed extra energy; employment; financial or other benefits; or an increased capacity to compete in the world), their approach to the proposer's goal may be positive, and their attitudes receptive. The goals are mutually reinforcing.

But where they see no tangible or desired benefits for themselves, or benefits only to others, the reaction changes:

> "It seems to me that our community has been chosen as a national sacrifice area for the good of those energy-wasting folks back in the big cities."

If the public perceives only negative outcomes such as noise and dust, potential intrusions on their property, increased burdens on the community, and esthetic drawbacks, other goals emerge for any communication. These goals may be to preserve an established lifestyle which the facility might change; to maintain individual control in a world where the ability to do so is increasingly limited; to resist change. If these goals prove to be impossible, "lesser" goals may be added or substituted: to profit from any changes, or to be adequately compensated for these changes.

Differing Sources of Power

Differing goals alone will not necessarily unbalance any exchange of information. Where the sources of authority differ in both kind and degree, however, the chances for successful communication and resolution plummet.

The Public's Innate Powers. The public possesses firsthand information which may benefit the proposers and even shorten the planning process:

> "I've watched those eagles circle for eighteen years now, and I know building through that patch of trees is going to scare them off."

As an individual, the landowner possesses certain information the proposers may not: unstable soil conditions caused by flooding, or the yearly elk calving on a nearby mountain. Multiply his number by the count of the private parcels of land crossed, and it becomes evident that the public does possess valuable information: the local detail of natural and social life which the proposers need to enter into their estimates of the level and kind of impacts and the best location for the facility.

The public also possesses some innate resources and powers that limit the proposer's jurisdiction. They may see the utility as a service provider, with certain obligations to the public. An interaction between the public and a government power agency should theoretically reflect the principle that the government serves the people. This fact is often pointed out indignantly by those objecting to an agency proposal:

> "The government is to serve the people, isn't it? Well, we're the people, and we say put it somewhere else."

The people of a particular region may argue that the proposers should respond to the wishes of this group of citizens: put it where they suggest, not build it at all if they see no need for it, and so on. Are they not undeniably "the people," and should government not reflect their wishes?

The Proposer's Innate Powers. However, the proposers--private utility or public agency--more easily occupy a superior position by virtue of their collective knowledge and authority. The proposers are "bigger" than individual landowners in a given region. Proposers generally have experts who know more about the consequences and potential effects of their actions. And proposers have more clout: that is, more resources available to present a case and to maintain control of the relationship as well.

Despite the philosophic idea that government exists to serve the people, this notion is limited. A government represents the people as a nation before it serves the people of a particular region. The United States' Federal right of eminent domain assigns the proposing agency some other legal rights as well: if a landowner will not willingly sell his or her property or the easement rights to it, it may be condemned and taken for a "just compensation" determined by the courts. Private proposers have no right of eminent domain, but neither are they identified so strongly with public service. And they, like the governmental agency, may call to their aid the enormous resources of education and research not readily available to the individual citizen to provide power to their arguments.

Consequences of the Disparity

This inequality provides the conditions for a host of psychological consequences--anxiety, fear, and then anger--which further interfere with communication:

> "You think you can come in here with your numbers and your charts

and bamboozle us! Well, we're not just country hicks in this town, and we know what's right. You don't frighten us! And you'll be sorry you ever thought of coming through here!"

The farmer mentioned earlier may fear, for instance, the potential for unseen and therefore more frightening electrical or biological effects of a facility--a fear often compounded of rumor and misinformation, but very real to him nonetheless. He may perceive his or his family's health threatened; he may fear that buyers of his livestock may hesitate. He may fear the potential for "weed highways" which may infest his crops, or casual intrusions by the proposers on his land. He may fear that he will not be strong enough to get the proposer to agree on where to put the line. He may fear the anger of his neighbors if he agrees to a location that will affect them; or he may fear their scorn if he settles for too little compensation. He may fear that he will appear ignorant or stupid, because he does not have enough information to be able to ask the right questions, or to know when he's gotten an accurate answer. And fear is a breeder of anger. Seeing himself as more vulnerable and less powerful, the individual landowner may therefore be more suspicious, more resistant, and more angry. The prospects for effective communication diminish.

The Search for Reinforcement

The public, then, defined from the beginning of this exchange as the lesser partner in knowledge and resources, may look for reinforcement. In seeking other authorities to extend their powers and make them more "equal" to the proposers, they look for moral support, for leaders or champions, and for knowledge.

A variety of options is open to them. They may seek as individuals to invest time (and therefore money) into research: reading, asking questions, sending for information, and so on. But "spare time" is seldom enough, and few can afford the luxury of stopping work to take on a new and time-consuming project.

They may seek to increase their power through numbers, joining with other neighbors, increasing the pool of knowledge, dividing the tasks of research, and increasing the potential for discovering effective speakers or representatives. They may also choose to join with established interest groups at a national or regional level, groups with an ecological or environmental bent, groups with greater power and knowledge by virtue of their broad base and their reputation for questioning the assumptions of the proposers, as well as with greater financial support.

They may also extend their connections to professional askers of questions. The media--newspapers, television, radio--may be enlisted in a cause, particularly where the chance exists for the expression of opinion as well as of fact. The media enable a modest group of landowners to increase their appeal and their information, as they reach those less directly involved, but with similar problems or sympathies. This is particularly true in smaller communities where any news is important to the media. They may even seek to extend their power by calling upon elected officials, from the local to the Federal level. Since it is in the self-interest of those elected to demonstrate responsiveness to their constituents, they may act as intervenors on behalf of the public.

Finally, they may seek out comparable resources--time and/or money--which will enable them to become equivalent to proposers in knowledge and therefore in power. But sources are few or non-existent. By seeking out a variety of means to enhance their powers, the public seeks to attain at least equivalent status with the proposers, in hopes of having their interests adequately represented in what began as an unequal encounter.

The Need for Balance

This scenario is incomplete, because it ignores the work of the proposers themselves to begin redressing this imbalance. However, if the original premise is re-examined, one may ask whether attempting to redress this imbalance is necessary or good, or whether it is even in the proposer's interests. Perhaps the best situation is where the proposers have the best chance of "winning," and where inertia or pressing matters of family or business prevent individuals from effectively augmenting their own power.

But redress is necessary. It is good. And it is efficient in the long run. First, if the disproportion of power outlined above were to be preserved, the assumption is made that one side must "win" and the other "lose." Aside from the fact that winning is no championship when one competes against an ill-equipped opponent, such competition may be seen as inappropriate in a business of service, whether public or private. It is particularly inappropriate when it may be possible instead to arrive at a situation where the parties may speak as equals and from which each emerges with agreement, a "win."

Second, the consequences of "winning" at another's expense may well foster increased resistance when the proposers try later to provide service through the same area--a situation which recurs often, as populations and expectations increase and as more power is needed. Bitter memories live the longest. Each successive "contest" will prove more difficult to "win." Each easement or property right will be more costly, in time, money, and anger. Any present expense of improved communications will more than offset the future expenses of bitterness.

Existing Measures of Balance

Both legal and voluntary efforts have begun to redress this disproportion of power between the proposers and the public. In the United States, government power agencies are legally bound to communicate with those they may affect or whose interests they may affect. The Council on Environmental Quality has specified procedures for involving and informing citizens through "scoping": finding out what concerns the agencies and citizens of any given area may have about a proposal before and during its investigation. These regulations are designed in part to redress the unequal balance of power by insisting that the proposers discover what information is important to the public and that, at the same time, they impart information to that public. Information meetings, newsletters, "hot lines," and local offices established in communities for the duration of a project have added a variety of ways to draw the public into a common circle of knowledge and understanding. Agency environmental studies are published in draft so that the public and agencies may review the findings and comment on them and on how they were derived. Procedures for counting, studying, and responding to those comments have been developed.

QUESTIONS TO CONSIDER

Successful scoping and successful public involvement, however, rest entirely upon successful communication. The model of the teacher-pupil relationship may not be the ideal for agencies or utilities and the public. However, it does offer some benefits. The proposers can educate the public; agencies and utilities can even educate themselves to establish more overtly benign relationships with those whom their facilities affect. By paying attention to the assumptions behind and the structure of their relationships, the proposers can reduce the negative reactions to their work.

The following series of questions offer considerations which the proposers ought to address in establishing a public involvement or public relations program that will foster communication freer from the struggle between unequals. These are basic questions of policy that ought to be systematically addressed by everyone in the business of transferring power.

(1) Opportunities for Control. Since the proposers have more ways to control information, they should re-examine for each project the list offered earlier, to locate opportunities to minimize disparities:

How do we release information, and how much do we release?
How can we best reach people with a variety of educations and understandings?
When is the best time to share information?
How much do we need to teach a defined public before they can appreciate the implications of what we propose?
How do we sort through the wide variety of comments to arrive at a true representation of people's concerns?

How will we "weight" one opinion against another?
How do we show ourselves to be responsive to the public?

(2) Conduits of Information. We must also consider how information flows both to and especially from the public. Any individuals acting as conduits should have a broad-based understanding not only of the principles and problems of building a facility, but also of the psychological consequences of what will always be a disparity in power. The best conduit will not necessarily be a long-time company or agency employee, for those who labor long and well in the service of a company or agency may find it increasingly difficult to remember not only what the average citizen knows but also what he doesn't know. Power agencies and companies should seek out within their ranks a natural "devil's advocate" who can understand and address these factors, or should find means to hire a power ombudsman: an individual who may act as go-between for the proposers and the public. This may require going outside the organization in order to achieve both the appearance as well as the reality of evenhandedness. This person needs training in communications and facilitation, and must be able to represent the misunderstandings of each side to the other. His or her independence is a crucial element in establishing trust from each party. The conduit becomes a translator of concern, one who can define the necessary information and procedures to convey information to a public.

(3) Training. Other agency or utility representatives with frequent and ongoing contact with the public should receive training and practice in conflict management and communication techniques, including assessment of non-verbal communications. Ability to communicate successfully and helpfully with the public should be part of their performance appraisals.

(4) Internal Communications between the Field and Office. Energy projects are often fluid, as load growth estimates, political realities, funding, and other considerations change. If these changes affect the nature of the project, a system should be established to communicate those changes from the office (where they may be made) to the field. Field changes in siting or other location work should likewise be transmitted to the home office as rapidly as possible. If a plan is developed with some "soft spots," which are likely to change in the future, the potential for change should also be specified. Having the "rug pulled out from under you" is a surefire method to stimulate suspicion.

(5) Scoping. The seeking out of public concerns, whether in a general sense before the project is firmly developed, or later, when alternatives are

defined by narrower corridors or even by centerlines, should be done by persons trained in communications. Where written comments form an important part of the public involvement in a project, careful attention should be paid to the training of analysts who will be able to pick out not only the overt, but also the underlying message. Where more than one reader is involved, frequent cross-checking should be done to ensure that comments are identified in a consistent manner. This is particularly important in the context of public meetings, where speakers do not have the organization of or control over their expression available to those who write.

(6) Content of Comments. A systematic means of defining a comment is also crucial, for the definition must be broad enough to include marginal comments or comments on related topics. The comment analyst must also be able to distinguish which comments require a response, and which are expressions of feeling or "votes" on a route or plan. A good working definition might be: "A comment is an observation or an expression of opinion which possesses a clear subject and which suggests, assigns a value, makes a judgment, identifies a concern, or corrects an error."

This definition enables one not only to recognize an obvious comment ("Plan A is better than Plan B, because it affects fewer residences."), but also includes comments offered as facts ("My employees won't work under the line."), and comments offered as questions ("How many more lines are really going to come through here?"). The ostensible content of that last comment, for instance, is a mere tally of lines. The comment, however, conveys a clear message of suspicion and mistrust; the commenter is really asking "how much can I trust you?" It is important that, whenever possible, people's feelings be addressed as well as the statements which convey them. Those identifying comments, as well as those responding to them, must be trained to assess both.

(7) Delineating Public Involvement. Finally, every company or agency involved in the business of power and public involvement should establish a standard list of questions to enable them to define a public involvement plan which particularly suits the needs of each project. Such questions should include some or all of the following:

What information do we share with the public? How accurate and ambitious is that information? What is the best format for an exchange of views and information?

What do we know technically about the project?

How "hard" is the information?
What don't we know?
Are we willing to share that lack of information with our public in clear and unambiguous terms?
How can we accurately explain the fluidity of forecasts to the public?
How much do we want them to know?
What formats for exchanging information can we devise that will minimize fear and confrontation?

<u>What do we know about the nature of the audience?</u>

What are the priorities and values of the people in a given area?
What are their values without regard to the project?
What is their level of education or knowledge?
What is their level of sophistication?
What attitudes might be encountered?
What community support systems exist which might lend themselves to bolstering the knowledge and self-assuredness of individuals?
How can we work with those support systems?

<u>How can we explain the way we make decisions to a community? How can we assure them that we take their views seriously?</u>

Can we identify the decisionmakers?
Can we give a community or representative individuals within it access to such decisionmakers?
Can we assure them of the roles their opinions and information play?
Is there a means to insure that all public comment and opinion on a project reach the evaluators or decisionmakers?
Is there an adequate means to convey intensity of concern?
Is there a means to ensure that simple numbers of commenters are not overvalued by contrast with a smaller interest group with equally valid concerns?
How shall we respond to questions and comments?
How shall we respond to their feelings as well as to their questions?

<u>And finally</u>:
How much do they need to know?
How much do they get to know?

To meet the goals common to our utilities and agencies--to construct with efficiency and economy, in a timely and non-controversial manner, to interact positively and cooperatively with those members of the public on whom our facility will have an impact--we must be prepared to transfer power in our communications. We must make the public and the public servant (or the private provider of service) more nearly equal in information; we must formulate policy that minimizes chances for misunderstanding; and, above all, we must focus on removing the element of fear from the interchange. The complicated matrix of power must be designed for each project so as to reduce the inequalities of each interchange and make possible communication and resolution in which both parties may win.

SESSION III A - REGULATION AND ADMINISTRATION

NEW APPROVAL PROCESS IN ONTARIO - CASE STUDY OF APPLICATION FOR MAJOR ELECTRIC TRANSMISSION FACILITIES

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ABSTRACT

This case history examines Ontario Hydro's Southwestern Ontario Transmission application and the progress to date of that application through the public hearings and approval process. An overview of the Consolidated Hearings Act, 1981 is provided along with the considerations which led Ontario Hydro to adopt a two stage approval process under the new legislation.

Two successive Environmental Assessments have been submitted and the second stage of hearings is now scheduled to begin in March 1984.

Initial experience by Ontario Hydro on two major undertakings provides a basis for preliminary commentary on the operation of the new legislation.

INTRODUCTION

Ontario Hydro is a public corporation, which was created in 1906 by a law passed by the legislature of the Province of Ontario. The mandate of the Corporation is to provide electric service to the people of the province and the power, responsibilities and regulatory controls on the Corporation flow from the current form of the legislation entitled "The Power Corporation Act". In physical terms, this means we own and operate the generation and transmission facilities to supply electricity to over 330 municipal utilities who in turn service over 2,000,000 customers; and through our own distribution network to over 780,000 direct customers.

Between the end of the second World War and the early 1970's, the development and expansion of the power system kept pace with a steady 7% growth in load. However, in the early 1970's, Hydro began to experience serious delays in acquiring new facilities as the public demanded a greater say in the planning. Two special government appointed enquiries and a Royal Commission on Electric Power Planning were held over the next eleven years and in addition, two significant pieces of legislation were passed, namely The Environmental Assessment Act, 1975, and The Consolidated Hearings Act, 1981.

These events dramatically altered the approval process for major transmission projects in Ontario. This paper examines the new approval process with particular emphasis on the incorporation of The Consoldiated Hearings Act and its current application to the planning of new 500 kV transmission facilities in Southwestern Ontario.

PLANNING DIFFICULTIES DURING THE 1970's

Up to 1970, Ontario Hydro had followed time honoured methods for selecting transmission routes, consulting with government authorities, acquiring the property rights and constructing the facilities. Problems were minimal, expropriations were rare and the facilities were generally brought into service on time. It was in such a comfortable environment that we began to plan and locate an extensive 500 kV bulk power grid to overlay the existing 230 kV bulk power grid throughout the province. As the initial elements of this plan were unveiled and municipal and provincial route approvals sought, public opposition began to rise sharply. This opposition became so intense that in 1972 the provincial government appointed the Solandt Commission to enquire into the routing of the initial phase of the 500 kV network which we had hoped to have in-service by 1975.

During the Solandt Commission, Hydro became painfully aware that earlier government blessing of our system plan and routes was rather meaningless as powerful environmental and agricultural groups intervened in the planning and acquisition process. These groups claimed that Hydro's plans lacked public involvement, adequate analysis of alternatives and consideration of environmental factors.

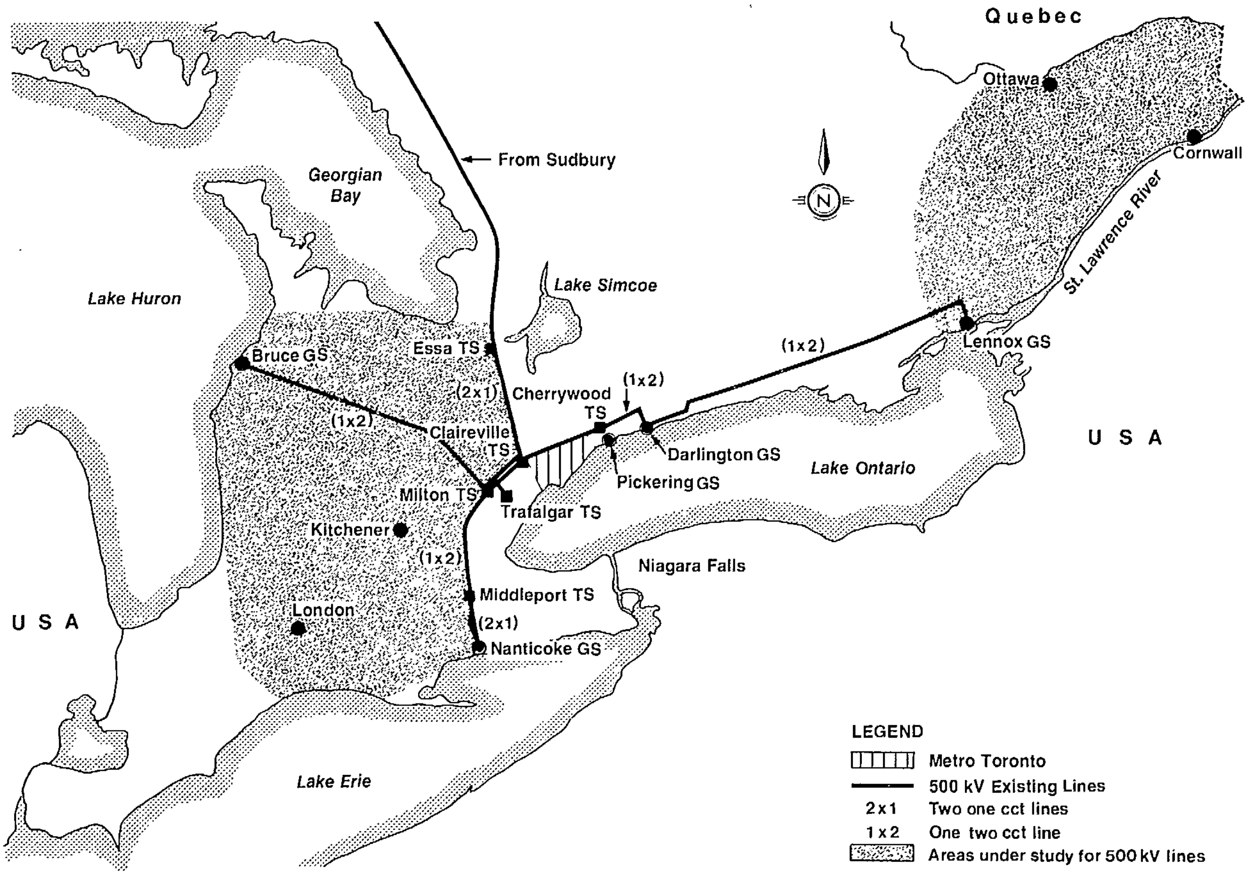
Following extensive hearings, government approvals were received and the initial major links of the grid were eventually placed in service at 500 kV as follows:

Nanticoke GS to Claireville TS	- 1979
Bruce NPD to Milton TS	- 1980
Lennox GS to Cherrywood TS	- 1980
Claireville TS to Cherrywood TS	- 1982

The 500 kV system in southern Ontario as it stands today is shown in Figure 1.

The delay of several years in placing these initial lines in service has resulted in large cost penalties. To date, the lack of adequate transmission out of the Bruce Nuclear Power Development (Bruce NPD) has cost approximately $52 million due to the need to burn coal to replace the cheaper "bottled up" nuclear generation. Significant capital costs have been incurred to install a load and generation rejection (LGR) scheme so that maximum use can be made of the nuclear units as they come on stream during the 1980's at Bruce NPD. Even with the LCR scheme in place, when the final nuclear unit comes into service (January 1987), the "bottled" generation problem will recur at an expected cost penalty of between $50 to $100 million per year until the next 500 kV line is placed in service.

In connection with the government approval, in 1974, of the Bruce NPD to Milton TS 500 kV line, they announced the appointment of the Royal Commission on Electric Power Planning (RCEPP). One of its priority tasks was to investigate and report on Ontario Hydro's claims that there was an urgent need to extend the 500 kV system into the Ottawa area and into Southwestern Ontario. This effectively halted Hydro's planning on these projects during the RCEPP hearings. In 1980, RCEPP delivered its final report and the government endorsed its findings that more transmission was indeed needed in these areas.



500kV TRANSMISSION SYSTEM
SOUTHERN ONTARIO
1984

FIGURE 1

Meanwhile, in 1976, the government passed the Environmental Assessment Act (EA Act). Although it was considered the first piece of legislation to go through in the planning and approval process, there was no assurance that matters decided under the EA Act would not be reassessed by subsequent tribunals under other Acts. This long standing weakness had, of course, evolved over the years as new Acts came into being creating new hearing requirements, and overlapping jurisdictions and terms of reference.

RCEPP identified these fundamental problems with the approval process as did Municipalities and other proponents having to face hearings under the EA Act in addition to other Acts.

The government response was the passage of the Consolidated Hearings Act in July 1981.

The first program registered under this new Act was Ontario Hydro's Eastern Ontario Transmission Program followed closely by the Southwestern Ontario Transmission Program.

CONSOLIDATED HEARINGS ACT - 1981

The primary purpose of the Consolidated Hearings Act is to provide a streamlined approval process for municipal, private and provincial projects and programs which require hearings by more than one tribunal under more than one Act.

Twelve specific Acts, passed over many years, which have to do with Municipal and special area planning, protection of the environment and the expropriation of property are encompassed by the Consolidated Hearings Act (C.H. Act). When a proponent chooses to place an undertaking under the C.H. Act, written notice is given to the Hearings Registrar. Members are then selected from the appropriate tribunals to form a "Joint Board". This Joint Board is then seized for the duration of that case; that is until all decisions under all relevant Acts are obtained or the undertaking is withdrawn.

The decisions of the Joint Board may be appealed to the Cabinet of the Province of Ontario.

A useful feature is the ability of the Joint Board to defer unto itself future decisions pending the submission of further submissions as planning proceeds.

Since the C.H. Act was proclaimed in July 1981, fifteen (15) applications have been made up to January 1984. Most of the applications are from Municipalities for sewer, water and roads projects as well as landfill sites. Three private undertakings were initiated but are already withdrawn or expected to be withdrawn. The two largest undertakings are the transmission programs of Ontario Hydro.

Excluding the two Ontario Hydro undertakings, the present status of the applications under the C.H. Act may be summarized as follows:

- . 2 projects have been withdrawn;
- . 3 projects are awaiting hearings;
- . 2 projects were settled without requiring a joint board decision;
- . 6 projects have received final decisions by a joint board
  - 3 approved (1 appeal pending, 1 appeal rejected by Cabinet)
  - 3 not approved (Cabinet overturned these 3 decisions but 1 is under Judicial Review at the Supreme Court level).

Costs have generally been awarded where the parties have made a significant contribution and the hearings have been lengthy. Hearings have ranged up to about 50 days.

The style of hearings conducted to date may be characterized as follows:

- . Hearings are open to the public and a level of informality is set to encourage participation by the public.
- . Notice provisions go beyond legislative requirements in an attempt to satisfy natural justice and practical considerations.
- . Two kinds of interested persons are permitted - parties and participants. Parties, whose rights are addressed in the legislation, are expected to be involved in cross-examining witnesses while participants are less involved, although equal weight is given to their concerns.
- . Witness statements are generally prepared and exchanged as well as interrogatories which are encouraged to reduce hearing duration.
- . Prior to a hearing, notice of motions may be brought before the Board.
- . The hearing itself follows traditional routines regarding introduction of evidence, cross-examination, and argument.
- . Media may be admitted and record proceedings with prior approval.

The Joint Board has the power to summon witnesses and the witness cannot refuse to answer a question on the grounds that it may tend to incriminate or establish liability in a civil proceeding. The witness may, of course, request the protection of Section 5 of the Canada Evidence Act.

THE TWO STAGE APPROVAL PROCESS

With the passage of the C.H. Act, the legal mechanism was now available to plan and develop major projects in stages; initially addressing the broader issues and obtaining some general decisions then moving successively to more specific analysis and decisions. This more ideal match of the planning process with the legislative decision making process would hopefully lead to more orderly and timely project development and yield more predictable results, greater public acceptance and fewer surprises for the political decision makers and proponents.

It was clear from the language of the EA Act and the wholistic approach of staff of the Ministry of the Environment that broad scale issues would have to be addressed in a comprehensive manner and thoroughly documented in the Environmental Assessment. The key question was whether to take the risk of moving directly from the broad decisions to the detail route selection studies without pausing to obtain regulatory approval; or to stop and obtain such on external endorsement before committing resources to the next level of planning.

In considering the potential of the new legislation together with the status of planning on the 500 kV transmission projects, Ontario Hydro decided to place these major projects under the C.H. Act and split the planning and approval process into two successive stages.

The first stage, called the Plan Stage, would have the objective of obtaining approval for an electric power system plan. This plan would be established by deciding on the following elements:

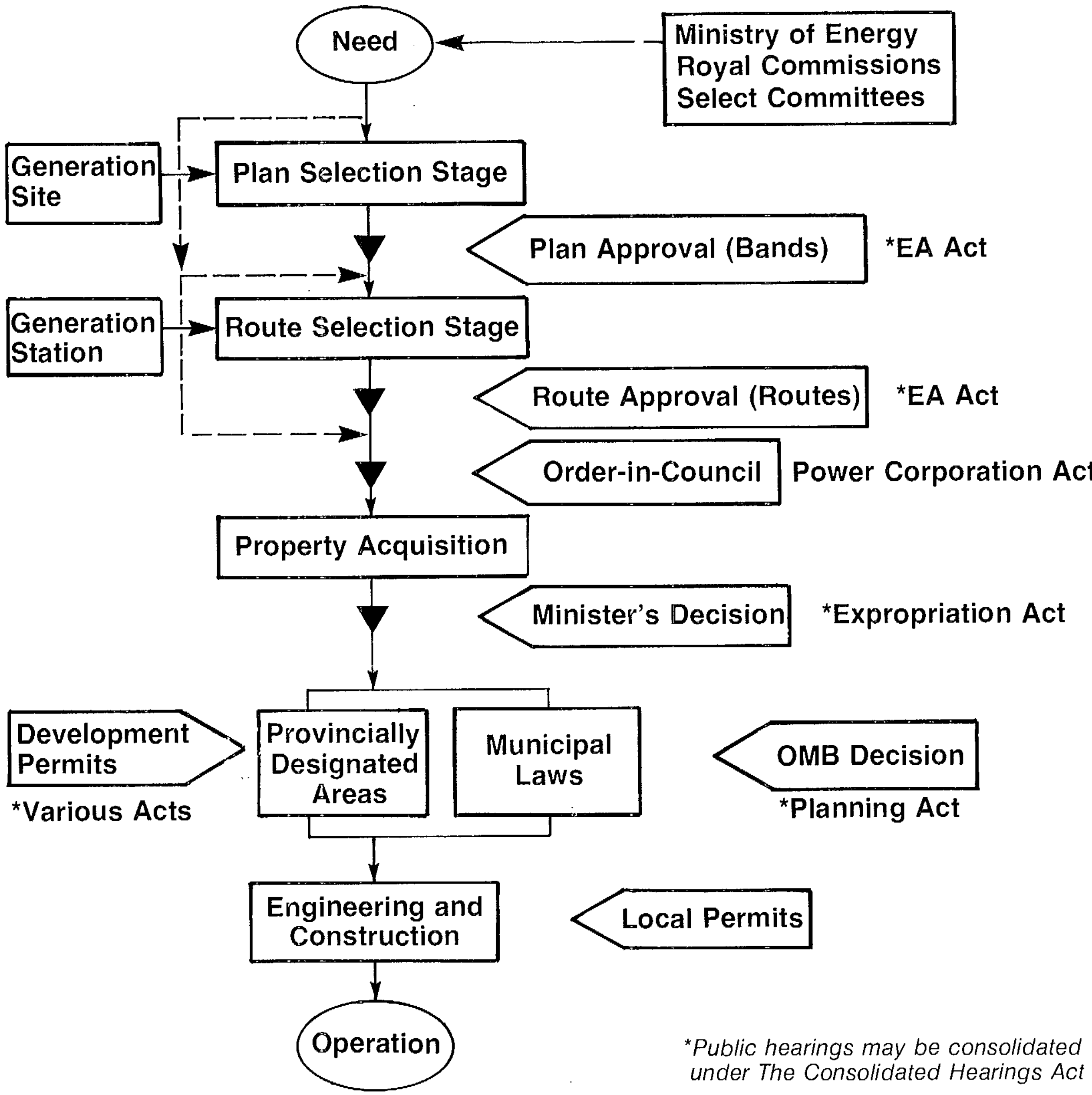
- the voltage and number of circuits of the transmission line;
- the terminal points to be connected by the transmission line;
- the general geographic area within which route selection studies would be conducted (Route Stage Study Area).

In order to reach these decisions pursuant to the EA Act, it is necessary to prepare an EA and submit it to the government for review. The matters which must be addressed and the factors considered and documented in the Plan Stage EA are discussed later in the paper.

Following Plan Stage hearings and decisions, the planning would move into the Route Stage. The objective of this stage would be to obtain an approval for the routes of the transmission lines and the sites for the transformer or switching stations. In order to reach this objective, it is necessary to prepare a second EA and submit it to the government for review.

This two stage approval process adopted by Ontario Hydro in 1981 is illustrated in Figure 2.

Some site specific and property owner matters traditionally dealt with under the Expropriations Act are not provided in the Route Stage EA. These matters cannot be fully addressed until access is gained to private property and engineering information obtained and discussions held with each property owner. Tower locations and right of way boundaries will then be determined. It has yet to be determined how the Joint Board will deal with these specific landowner locational issues. It is hoped that a formal third stage of hearings, traditionally referred to as the "enquiry" hearings, will not be necessary, but rather brief local mediation by a designate of the Joint Board could handle the expected few cases where Ontario Hydro and the landowners cannot reach agreement on location. Thus, the C.H. Act addresses the process up to, and including, the registration of the necessary property rights to construct and operate the facilities. The matter of compensation is not included in the terms of the C.H. Act, but will continue to be handled in the traditional way.



GENERALIZED TRANSMISSION ROUTE PLANNING AND APPROVAL PROCESS

FIGURE 2

PLAN STAGE EA - SOUTHWESTERN ONTARIO

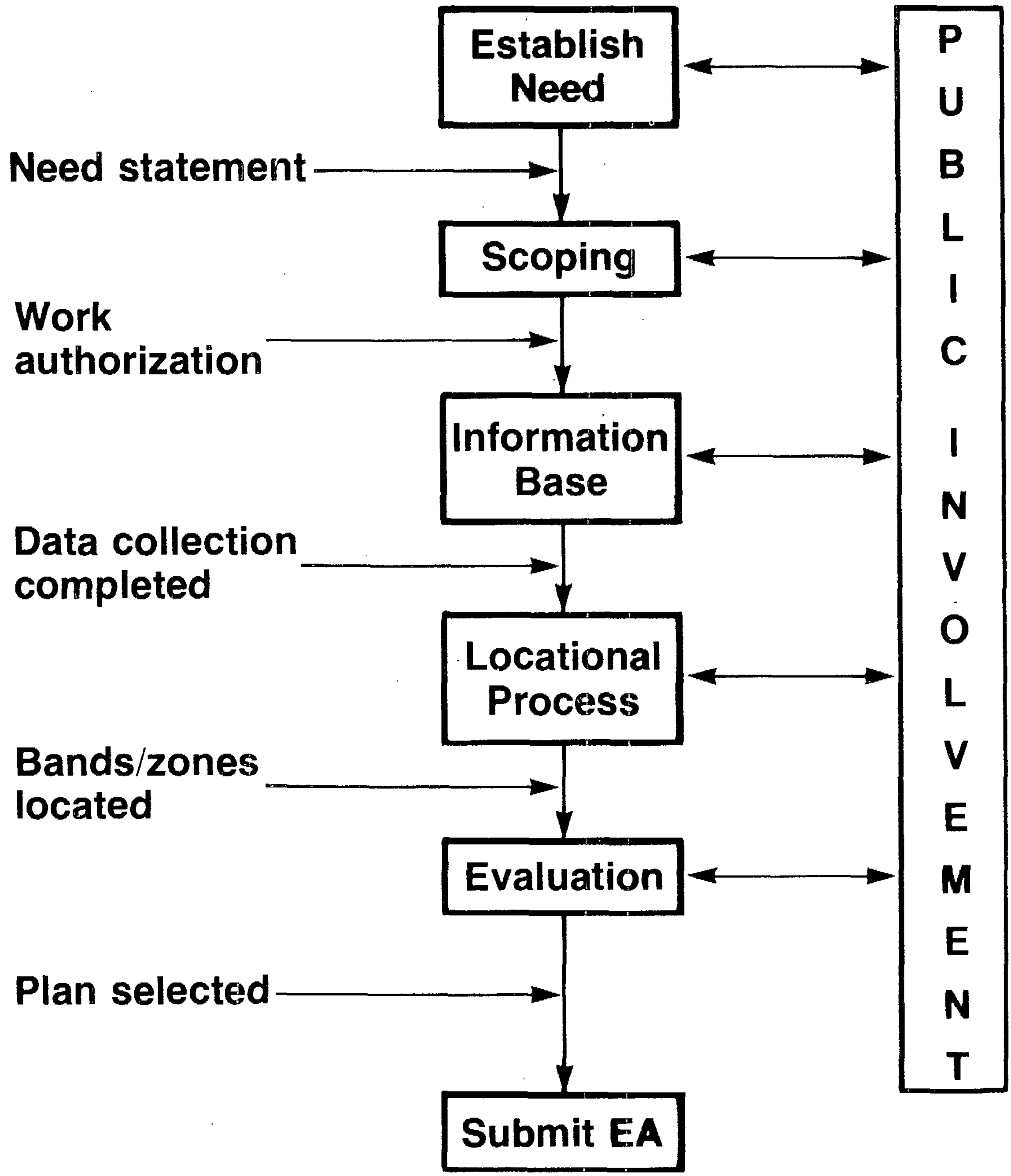
The generalized process[1] used by Ontario Hydro to carry out an environmental assessment of provincial/regional power planning schemes is shown in Figure 3.

RCEPP had dealt extensively with the subject of "need" during its hearings and concluded that additional transmission was the appropriate way to solve the forecasted power supply problems. However, Section 5(3) of the EA Act requires that "alternatives to" the undertaking be assessed as well as "alternative methods" of carrying out the undertaking. Therefore, the Plan Stage EA first addressed the broad scale alternative solutions such as wind and solar generation, co-generation, no project and traditional forms of new generation (hydraulic, fossil, nuclear) to demonstrate that new bulk transmission was preferred both economically and environmentally. Then, six alternative transmission arrangements were developed which were technically acceptable based on electric power system criteria. A geographic area was selected to encompass all the alternative terminal points and feasible routing alternatives (Figure 1).

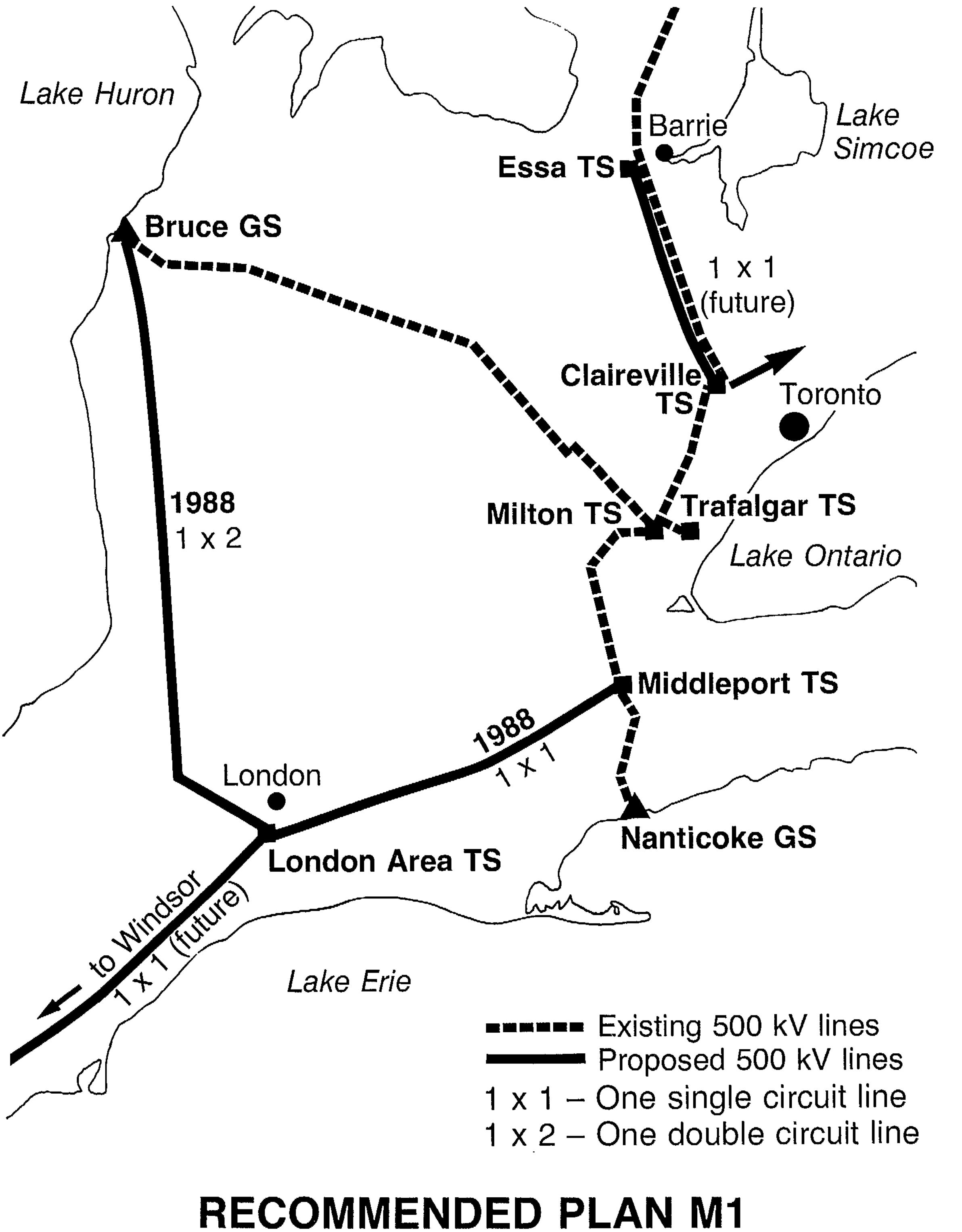
Environmental information was gathered and mapped at a scale of 1:250,000 and given a value system which was derived through a public involvement program. Alternative transmission bands were located in the low constraint areas, where possible, to meet the six alternative system arrangements. Engineering, economic and environmental comparisons were then done and Plan M1 was selected as the recommended system plan (Figure 4). These studies were documented in the Southwestern Ontario Transmission - Plan Stage EA[2] which was submitted to the government in October 1981.

The Ministry of Environment co-ordinated the comments of all government ministries and agencies and issued the EA Review[3] in December, 1981.

In the Review, all Ministries generally supported the undertaking and the EA submitted by Ontario Hydro. Many ministries felt that the general level of environmental information associated with the Plan Stage EA limited their ability to give detail comments but they planned to participate to a much greater extent in the Route Stage EA. Most of the concerns raised in the Review came from the Ministry of Environment review co-ordinator who dealt extensively with the manner in which the EA addressed the requirements of Section 5(3) of the EA Act. These concerns related mainly to the conceptual aspects of the scope and purpose of the undertaking and the extent of study devoted to alternatives to the undertaking and alternative methods of carrying out the undertaking. The Review did not make recommendations with respect to acceptance of the EA or approval of the undertaking, but deferred these matters to the Joint Board whose Plan Stage hearings were to begin shortly thereafter.



SYSTEM PLAN STAGE
STUDY PROCESS
FIGURE 3



RECOMMENDED PLAN M1
FIGURE 4

PLAN STAGE HEARINGS

Ontario Hydro made application to the Hearings Registrar to have the Southwestern Ontario Transmission program placed under the C.H. Act. The Joint Board formed for this case consisted of 2 members of the Ontario Municipal Board and 1 member of the Environmental Assessment Board who was appointed Chairman.

Shortly after the release of the government's EA Review, the Joint Board began the main hearings. These hearings, which lasted for 35 days and finished in April 1982 were held at one central location in the study area. Although about 10 parties and 39 participants are listed in the proceedings, only about a dozen were involved extensively at the hearings with the greatest participation coming from agricultural groups.

The style of the hearings was generally as described earlier in the section on the Consolidated Hearings Act.

Ontario Hydro used witnesses quite extensively to give the evidence-in-chief rather than resting on the EA documents and other written submissions. This was done because of the magnitude and complexity of the case and to make the investment for the subsequent stage of hearings under the same Board.

In addition to the 11 Ontario Hydro witnesses, 46 other witnesses participated in the hearings and 181 exhibits were filed.

The main issues which surfaced at the Plan Stage Hearings included the following:

- the definition of the "undertaking" in the EA, particularly as it related to the statements on the "purpose of the undertaking", "alternatives to the undertaking" and "alternative methods of carrying out the undertaking".
- the range of alternatives considered in the EA and the amount of study devoted to each before discarding them from further study.
- electric load forecasting methods and results.
- currency and scale of the agricultural data used.
- certain aspects of the environmental methodology, for example: weightings, comparison technique and scale.
- impacts on the Niagara Escarpment.

One provincial government ministry, Agriculture and Food, presented a case quite critical of Ontario Hydro's methodology even though they had not done so in the EA Review document.

In June 1982, the Joint Board issued its "Reasons for Decision" report. In summary, they found Ontario Hydro's EA to be acceptable, the range of alternatives reasonable and the medium load growth scenario valid. They placed prime importance on minimizing agriculture impact from the proposed transmission facilities. They also used the opportunity to express their views on the somewhat controversial point of the role of the environmental review co-ordinator, from the Ministry of the Environment, in carrying out a government review of a proponent's EA.

In July 1982, the Joint Board decision was issued selecting a modified Plan M3 (Figure 5) rather than the recommended Plan M1. The significant modification to Plan M3 required Ontario Hydro to study routings along Hwy. 401, a major expressway between London and Toronto, and present evidence on the matter at the next stage of hearings. This modification had been suggested by some agricultural interests at the hearings as a possible way to reduce the higher agricultural impact of Plan M3.

The Board was careful to note that its decision was "without constraint" to any decisions to be made subsequently by it in respect to any matter deferred by Order of the Board made Dec. 16, 1981 and confirmed Feb. 24, 1982. The Board's own explanation of this condition is that "the Joint Board may find it necessary to modify, alter or resolve conclusions which have been reached at an earlier phase of the hearing. The Joint Board renders a decision which takes into account the current findings and conclusions. The net result of this approach is the issuance of a decision on each phase of the hearing, and each decision is a cumulative determination of all facts and issues previously presented. The decision on the undertaking, therefore, is the final determination which is made following the last phase of the hearing".

The Route Stage Study Areas within which route selection studies were to take place are shown in Figure 6.

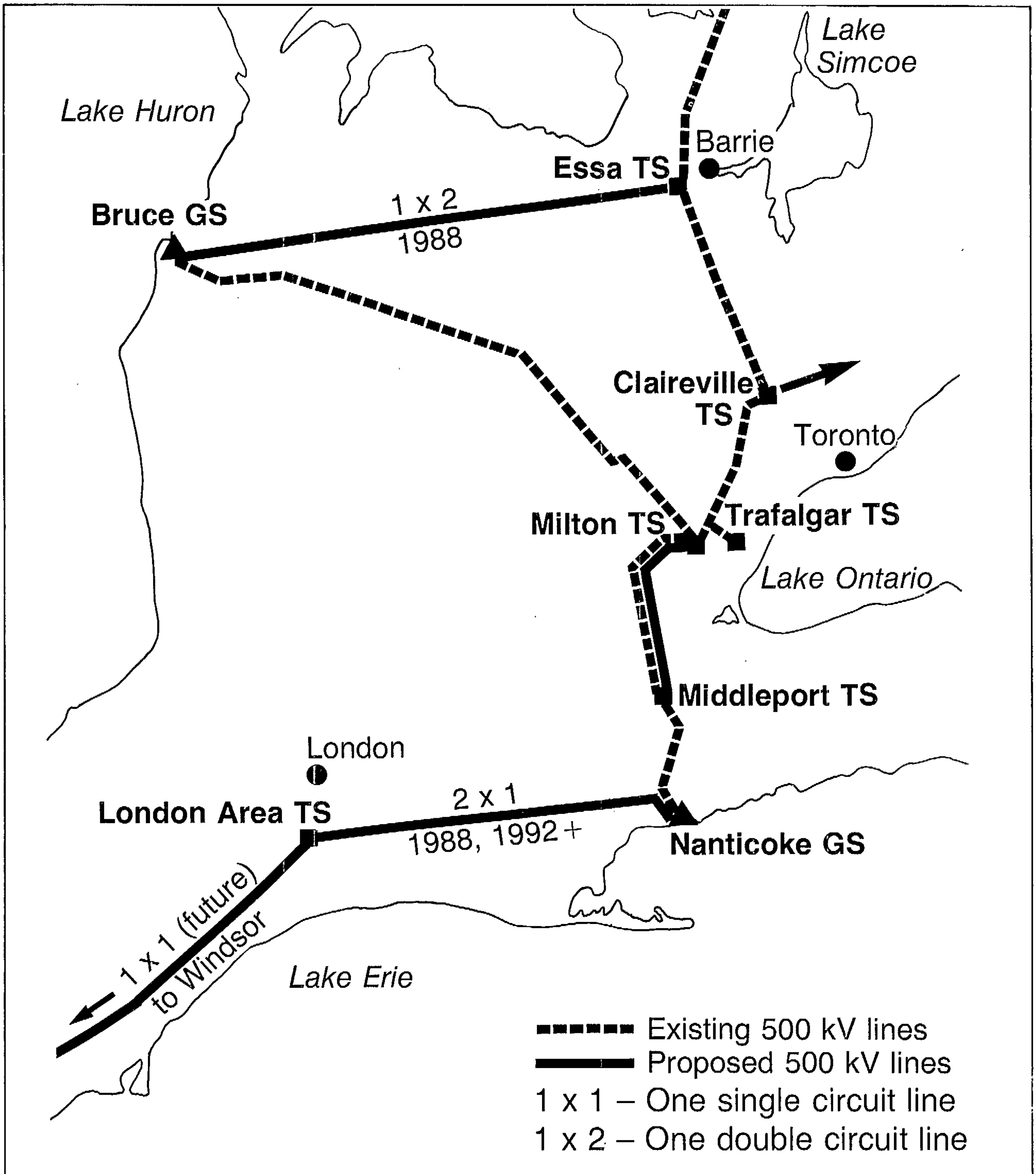
The Joint Board decision was appealed to the Cabinet by over 40 parties. The main grounds for these appeals were that the Notice of Hearings given by the Joint Board was inadequate and misleading and that the hearings were at one location only. However, in September 1982, the Cabinet rejected all the appeals and upheld the decision of the Joint Board.

ROUTE STAGE EA

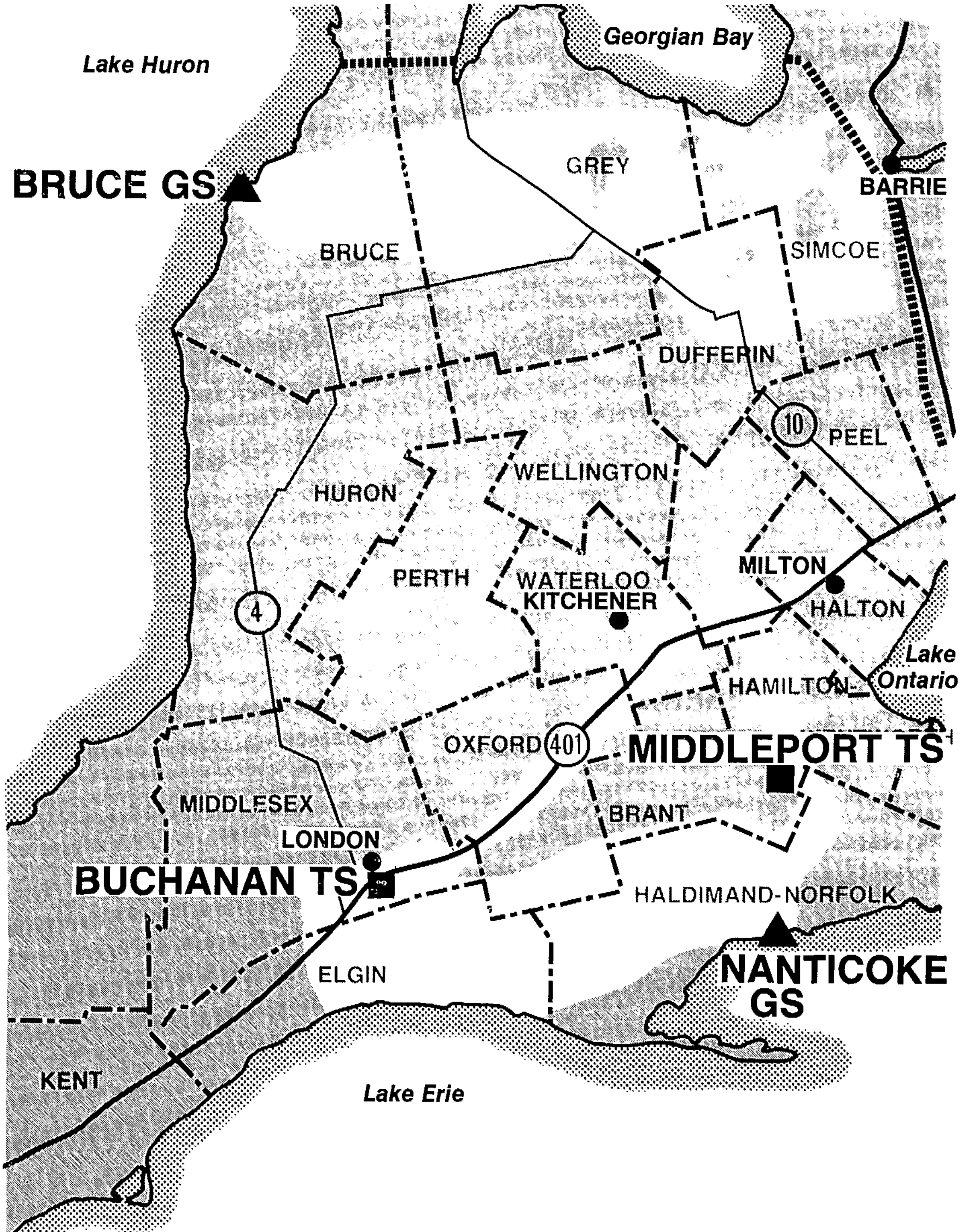
Route selection studies were conducted generally within the geographic areas, called "Route Stage Study Areas" set out in the Joint Board decision, and the study process used was conceptually similar to the Plan Stage, but applied at increasing levels of detail.

As Ontario Hydro moved out into the community to begin these studies and form public working groups to assist us, it soon became apparent that those affected negatively by the Plan Stage decision were mainly interested in questioning the Joint Board's decision and the adequacy of notification and involvement in the Plan Stage hearings. However, during the educational phase and information gathering phases from the summer of 1982 to the spring of 1983, the groups met regularly and developed a public ranking for the environmental information.

Based on the environmental constraint maps (scale 1:50,000) and economic and engineering factors, alternative corridors (1-4 km wide) and zones (1 km square) were located with the assistance of the working groups. At the same time, property make-up was mapped and a name and address search done for all alternatives. This information was used to notify over 35,000 people of public information centres where they could review the alternative corridors and zones.



PLAN M3
FIGURE 5



ROUTE STAGE STUDY AREA
MODIFIED PLAN M3
FIGURE 6

As planning progressed towards more specific locations for the transmission lines, the general public became increasingly involved and the Chairmen of the working groups began to experience difficulty in controlling meetings and maintaining schedule. Newly formed citizens' groups were attending in large numbers and disrupting their meetings. One working group disbanded while another halted work for the summer, then disbanded in the fall.

Within the corridors and zones, further more detailed data was gathered and mapped at a scale of 1:15,000. Alternative transmission routes and station sites were then identified. Engineering, economic and environmental evaluations were then conducted leading to the selection of the recommended routes and station site (Figure 7) which was announced in November 1983.

In the north part of the study, a 158 km route was selected for the 500 kV 2 circuit transmission line from the Bruce Nuclear Power Development on Lake Huron to the Essa Transformer Station near Barrie, Ontario.

In the south part of the study, a 113 km route was selected for the first 500 kV single circuit transmission line generally parallel to Hwy. 401, a major expressway from London to Toronto. A route was also selected (122 km) for the second 500 kV single circuit line generally utilizing existing rights of way from London to the coal fired Nanticoke generating station on Lake Erie. These two new routes terminated at the proposed site of a new Transformer and Switching station in the London area. The plan also includes twinning an existing 500 kV line from the Nanticoke area to Toronto (65 km).

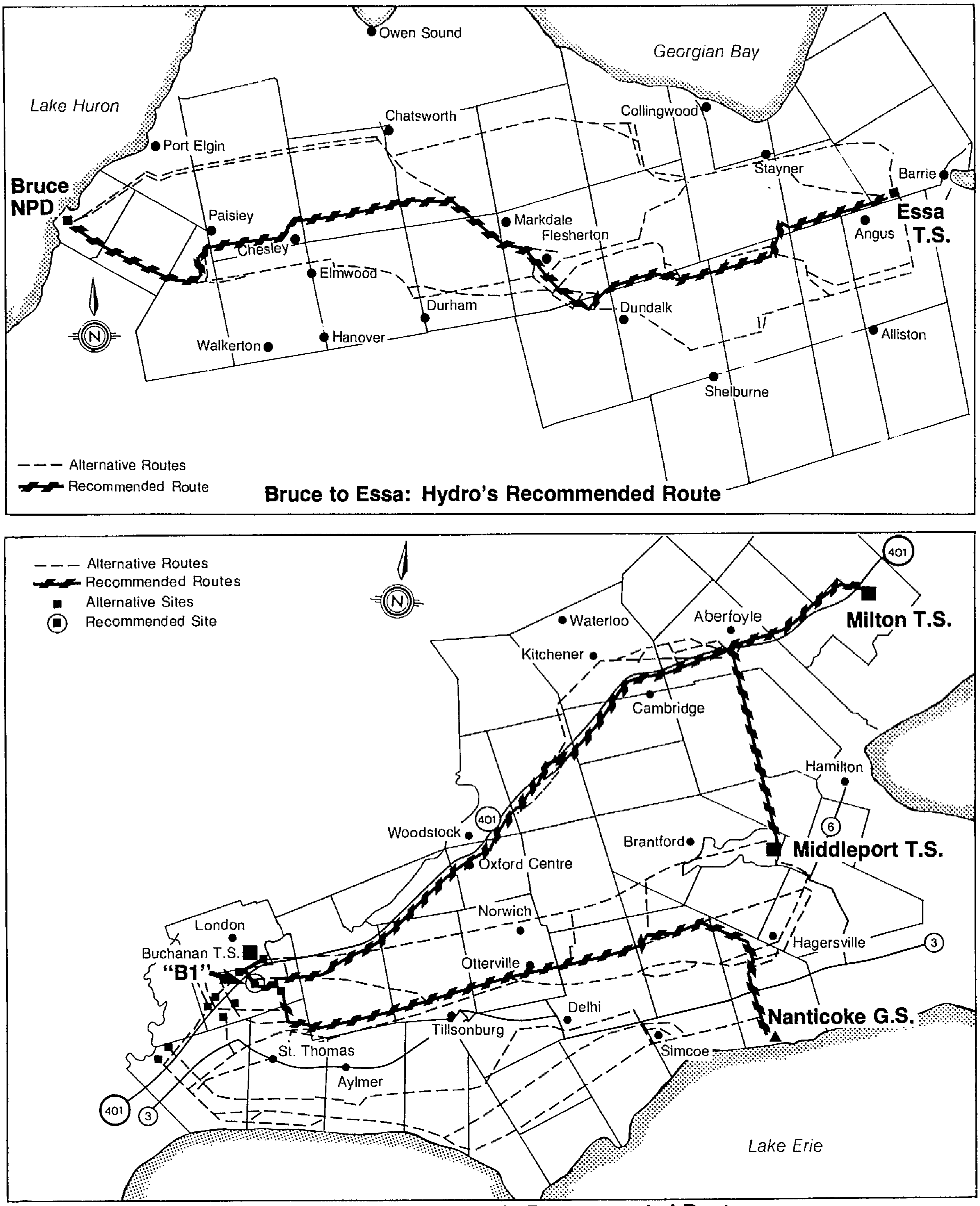
The EA documents for the Southwestern Ontario Transmission - Route Stage were completed and delivered to the government on December 1, 1983[5].

The government review of the EA was issued by the Minister of the Environment on February 3, 1984[6].

Reviewers focussed their comments on how well the EA addressed their programs and policies and the soundness of the scientific basis of the data, analysis and conclusions in the EA from the point of view of their mandate area. All reviewers thought the range of alternatives was adequate. A few disagreed with the weight given their interests and the alternative selected. Most reviewers agreed with the general methodology used, but some expressed concerns with specific parts of the data, analysis and conclusions. With regard to the requirements of Section 5 (3) of the EA Act, the Ministry of the Environment concluded that the EA considered all of them, but some concern was expressed on the manner in which they were met. No recommendations were made regarding acceptance of the EA or approval of the undertaking.

ROUTE STAGE HEARINGS

The notification procedure ordered by the Joint Board with respect to the Route Stage hearings was much more extensive than for the plan stage hearings. Three Notices were sent to all parties and participants to the Plan Stage hearings, all landowners (about 35,000) affected by all the alternative routes,



Bruce to Essa: Hydro's Recommended Route

Supply to London: Hydro's Recommended Routes

FIGURE 7

municipalities, special interest groups and many others. These notices mailed in August 1983, November 1983 and January 1984, contained progressively more detail information with the final notice showing the recommended location to the facilities and attaching the summary of the Route Stage EA. In these notices, a February 1984 date was set for the preliminary Route Stage hearings to commence.

In late 1983, several parties approached the Joint Board to request permission to review the Plan Stage decision. The Board adopted the procedure that "leave" was required to tender evidence only relevant to the completed plan stage hearings. The party was required to bring forward a notice of motion supported by an Affidavit which sets out the complete grounds for requesting such leave. This procedure was followed and hearings on this matter are taking place during February 1984. It is anticipated that the Joint Board will grant leave to hear new plan stage evidence at the upcoming Route Stage hearings.

Meanwhile, several parties, unsatisfied with the Joint Board's procedures and decisions, made application to the Divisional Court of the Supreme Court of Ontario to have the decisions of the Joint Board overturned and a new Board appointed to rehear the case. A Judicial Review was granted and 7 days of hearings before three Supreme Court judges were held during January.

The applicants' main grounds were that the Joint Board provided inadequate notice of hearings and selected a Plan (M3 modified) which was not an alternative presented and analyzed at the hearings and which directly involved people previously not affected by the six basic system alternatives. The Judicial Review panel announced on the final day of hearings that it was deferring its decision on the matter, but saw no reason to stay the preliminary hearings scheduled by the Joint Board in February 1984.

At the time of writing of this paper, it is difficult to predict the extent of new plan stage evidence which may be brought by the new parties to the hearings. It is possible this next set of hearings could extend into the fall of 1984. This would seriously extend the urgent in-service date of July 1988 for the second 500 kV line out of the Bruce Nuclear Power Development with the associated large cost penalties.

COMMENTS ON THE NEW APPROVAL PROCESS

The two key elements which make this approval process "new" are:

- The Consolidated Hearings Act 1981.
- Two stage environmental assessment.

The first element was an act of the legislature of Ontario while the second element was a decision taken by Ontario Hydro, made feasible by the first element. To date, no other proponent has chosen to use the C.H. Act in this two stage format. We understand that no other provincial agencies are currently planning projects based on the two stage EA process. As Ontario Hydro is only part way through the process on its two largest transmission projects and the same Joint Board is assigned to both projects, our experience is indeed limited.

With respect to the Act itself, no changes have occurred since its passage in 1981 and we have not proposed changes to date. The announced plan to eventually make the use of the Act compulsory rather than at the option of the proponent has not been implemented. It continues to be administered by the Minister of the Environment.

The only projects to pass completely through the C.H. Act process to date are one stage municipal public works projects. Based on the small number of cases to date, where the Joint Boards have refused approval, the Cabinet has tended to overrule the decision and authorize the project to proceed; and where the Joint Boards have approved projects, Cabinet has supported their decision.

With respect to the operations of the Joint Board on the transmission projects, it has, in the view of Ontario Hydro, conducted the hearings in an orderly and fair manner and has issued timely decisions. The "without constraint" condition has introduced an element of uncertainty in our planning which we had hoped to reduce by the two stage format. The matters currently under appeal before the courts regarding notification and natural justice could, if unfavourable decisions are rendered, have serious implications on Joint Board procedures and indeed on the two stage format. The determination of appropriate notice for protracted, progressive and large geographic undertakings such as the location process for a transmission line has always been elusive. Most people suffer from the NIMBY (not in my back yard) syndrome and will not react to notices or enter the planning process until the recommended route directly affects their property.

Three features of the C.H. Act have increased its effectiveness. Firstly, the power to defer unto itself any matters for future hearings has enabled the Boards to better organize hearings.

Secondly, the requirement for the same Board to make all the decisions through to the end has expedited the approval process by reducing the requirement to present background evidence to a new Board each time.

Thirdly, the power of the Board to make decisions rather than recommendations has helped to get matters settled faster.

In summary, some problems have surfaced and some advantages are indicated, but experience is too limited to draw an overall conclusion. The C.H. Act has an exciting potential to streamline the approval process but it needs to be given a chance to see if it will live up to this potential.

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PERSPECTIVES ON SITING ADVISORY COUNCILS IN PUBLIC PARTICIPATION UTILITY PLANNING

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ABSTRACT

Public participation in the electric utility industry, notably in the form of an independent siting advisory council (SAC), is widespread and can work to minimize conflict. The enlistment of regulators, local officials, business groups and other interested parties early on in the process of siting controversial facilities has become common practice. This has come about in part due to the awareness on the part of industry that the public has a proper role. Such public participation programs can be extremely useful as an educational process, in identifying public values, and in developing an understanding of, and trust in, a common cause. However, open planning is not a panacea that eliminates all potential conflict from a utility's dealings with the public and with the various regulators.

Siting advisory council programs can be costly--in terms of dollars, time and aggravation. Once a utility commits to using a SAC, it sacrifices part of its own decision-making power. In addition, the firm, assumes an obligation to consider diverse opinions, often resulting in slowing the process of reaching decisions to a snail's pace. On the other hand, the SAC members must make a commitment to such programs and, in doing so, may take on peculiar liabilities. This is particularly true of members affiliated with regulatory agencies when conflict of interest is but one potential liability.

Mutual understanding of, and belief in, the purpose of an independent advisory council is perhaps the most important factor in laying the groundwork for a successful program. The concept of public participation has undeniable merit; however this merit alone does not guarantee success. The key to a successful public program is the establishment and maintenance of credibility through trust-building.

This paper presents the rational for using independent siting advisory councils on controversial projects, and also, as illustrated through the experiences of the authors, some pitfalls that may be encountered.

INTRODUCTION

Anyone who reads a newspaper knows there is tremendous difficulty in developing new large scale projects. Human health and environmental concerns, regulations, and public opposition have made the process difficult. As a nation we face an increasing dilemma -how to handle the vast array of development projects that are regionally or nationally needed or desired, but which are objectionable to many of the people who must live near them. Facilities associated with electricity generation such as power stations, waste disposal sites, transmission and railroad corridors and the like, are all considered Locally Unacceptable Land Uses or LULUs. While there are those individuals who will always say "not in my backyard", the difficulty of more thoughtful people comes in trying to balance the need for the facility with a wide variety of environmental, social, and economic issues.

The public hearing process has been adopted by most planning, development and regulatory agencies as the mechanism for assuring that competing interests and viewpoints are adequately addressed in any new development proposal. However, the hearing process generally occurs long after site decisions have been made, therefore the hearing is one of carefully prepared written statements and there is little or no interaction between groups. As a result, polarization between interest groups can be, and often is, reinforced through the hearing process. There is seldom a feeling of mutual concern for achieving the best solution in the highly charged atmosphere of the hearing process.

Public participation in the form of an independent advisory council in the electric utility industry is becoming widely recognized as a helpful precursor to the hearing process to minimize conflict. It can be extremely useful as an educational process, in identifying public values, and in developing an understanding of, and trust in, a common purpose. However, open planning is not a panacea that eliminates all potential conflict from a utility's dealings with the public and with the various regulators.

This paper discusses the use of public participation and specifically the use of independent siting advisory councils on controversial projects, and also, as illustrated through the experiences of the authors, takes note of some limitations that may be encountered.

PUBLIC PARTICIPATION AND SITING ADVISORY COUNCILS

A good public participation program typically has three primary goals. These are:

Credibility - By creating a visible decision-making process to which everyone has access, public involvement provides a means of making the decision-making process credible to groups with highly divergent viewpoints

Identifying Public Concerns and Values - Because the various groups have fundamentally different points of view, they will evaluate any proposed action from different perspectives. Public involvement provides a mechanism by which a utility can understand the problems, issues, and possible solutions from the perspectives of the various interests.

Developing a Consensus - One implication of the highly divergent public viewpoints is that there is no single philosophy on which there is a consensus that can guide all utility actions. Rather, consensus must be formed on an issue-by-issue basis. Public involvement provides a process by which such a consensus can evolve around specific utility actions.

There is no concensus definition as to what constitutes a public participation program. To be classified as truly "participatory", such programs should include an element of sharing in a decision to be reached. Existing and earlier utility programs range from public opinion polls, informational meetings, and citizen action phone lines, to interactive discussions with Boards of Directors and high-ranking corporate officers. The "participatory" power of each of these programs varies.

In the last few years, a number of useful social science techniques which have the potential for facilitating group interaction in achivement of the goals - developing credibility, eliciting values and concerns, and arriving at a concensus, have become available. The use of such techniques can permit the utility planner to obtain public participation at an early design stage, thereby helping to reduce or even eliminate the conflict which has become so characteristic of the later stages of modern large-scale development.

The use of siting advisory councils (SACs) in the siting process has gained increasing attention as a useful forum for inclusion of diverse viewpoints in a complex decision process. Participants act as jurors in the process of developing selection criteria and possibly in assigning values or levels of importance from one criterion to the next.

LIMITATIONS

The benefits of using siting advisory councils in site selection have been documented numerous times by numerous authors. While these benefits are supported by the authors of this papers, experience has shown that there are limitations to the use of such groups in the planning process. Once such limitations are recognized, this knowledge can greatly smooth the efforts of all involved.

The limitations are of two principal natures; timing and task. Timing is concerned with when the outside group is integrated into the decision making process. In this context, "time" is defined by the number of decisions remaining in the process, and not by calendar time.

The proper timing of involvement is to a large extent, determined by the task. The task limitations are set by the only two available choices - should the group be sharing opinions or making decisions? If it is sharing opinions, the earlier the better; if it is making decisions, they should be brought in at the time of the decision, which is often late in a site selection program.

Affected by both timing and task is another question which also has imposed limitations - "who should be involved in the process?" These limitations are discussed below.

Tasks - Decision-Making or Opinion Sharing?

In terms of the goals or tasks of any public participation program on which a utility may embark, there are only two real options: opinion-sharing and decision-making. Only one can be assigned to a council. As the name may imply, in most cases a utility will seek the opinion or advise of an "advisory council." In such circumstances, there is no promise that the advice or recommendations will be followed. Of course, serious consideration must be given to the opinion offered, however the advisory council is not given or, as some may perceive it, is not saddled with the responsibility of making the decisions for the Company. If it is only opinions that are sought, and the council is truely an "advisory" council, this must be clearly announced. The structure of the council will generally be much more casual, and expectations less imposing. These opinions, however, are of importance to the utility because they offer viewpoints based on experience unique from that of the utility.

Decision-making, on the other hand, is just that-the group is taking on the problem of making, what are in some cases, hard choices, and the Company, by asking for decisions, is making a committment to abide by those decisions.

Which decisions can be made is also an important question - but is not as great a problem as determining the need for opinions vs. decisions. In general, they will be the softer decisions; the trade-offs that have no right answer and do not transfer utility resources to special interests. They may be the gross sifting of many sites to a few, or sifting many issues to the important ones.

When a SAC is asked to have input to a final site decision there is an increased potential for credibility problems to arise. The group may be suspect of the Company's willingness to yield this decision. Because of this, it is critical that both the sponsoring utility <u>and</u> the advisory council clearly understand exactly what authority is being delegated. The Company may delegate the authority to make a particular decision to the council, but it cannot delegate the responsibility for this decision. Clearly, it will always remain the Company's responsibiltiy to defend this decision, whether it be made internally by a Board of Directors or externally by an advisory council.

It is worthwhile reemphasizing that the task of the advisory council must be made clear at the outset of the program. This will help to avoid confrontation and disappointment during later phases of the council's deliberations. In addition, it will help to establish the data and information requirements for the program. In short, if only opinions are being solicited, the council members may not require detailed data and information: opinions do not need to be based in fact, and personal perferences or perceptions may suffice or actually override any factual data. However, if the task is to reach a decision, then most council members (as well as the utility) will want a substantial amount of factual data, information, and documentation.

<u>Timing of the Process</u>

The timing of when the advisory council becomes involved with the utility is as important as the task assigned to the group. In reality, task and timing must be considered as being interrelated and as having a synergistic effect on the planning of the program.

A site selection study for an electric generating station is usually conducted in phases that include elements such as defining eligible areas, identifying candidate areas, selecting potential sites and selecting a proposed site from among primary candidate sites. The advisory council can be brought into the site selection process either very early or very late.

If the council becomes involved early in the process then their task is that of providing opinions. These opinions can be used to guide the direction of the subsequent phases of the site selection study. At such an early phase the task of opinion-sharing is preferred to decision-making inasmuch as there is very little factual data and information available on which to base a decision.

When the site selection study reaches the phase of performing detailed studies on a small number of candidate sites, then decisions must be made. The option of giving the task of decision-making to a SAC becomes a plausible alternative. The data and information needed to make "hard choices" will then be available.

An interesting aspect of the timing consideration is that as the number of candidate sites decrease, the depth of the analysis should increase. This is reasonable in that both the company and the advisory council have a lot at stake, particularly if the council is to provide a decision rather than opinion. As a result, the company needs to provide much more data and information than at earlier phases of the site selection study. This also means that the council member must devote more time and effort to understanding the material presented.

There arises, however, a delicate balance between length of time devoted by a SAC and the completeness of understanding that is required. If the council is to make a decision, they should be convened for the shortest possible time, ending at the arrival of that decision. If a utility insists that a SAC meet over a length of time that the utility feels is required, rather than that with which the council feels comfortable, then this influence can destroy the unique perspective that the SAC was to originally bring to the process.

Who Should Participate

The choice of participants depends on the task assigned to the advisory council, the timing of their participation in the site selection program, and the overall objectives of the Advisory Council Program. The new variable here is program objective.

In addition to either soliciting opinions or making decisions (again, these are the council's task), the Company may want to establish an early dialogue with regulatory agencies and interest groups. Obviously, if this is an objective then the choice of participants becomes clear.

If involvement is early in the site selection process then the most appropriate task becomes that of soliciting opinions. Inasmuch as one man's opinion is probably no better or no worse than another's, then the composition of the council may not be as important compared to other program elements. Group dynamics necessitates a certain level of awareness of the composition of the group, inasmuch as the members must feel that the council is comprised of individuals whose opinions or decisions are trustworthy and valuable enough to share. However, a careful "balancing of viewpoints" may not be critical. There should be no question of whether or not the group will adequately represent the public. As there is no guarantee that they will, it is a safer assumption that they won't. They are certainly not a statistical sampling of a population, and there is no public charter empowering any such group. The most important factor is that they are not subject to the influence of the utility. Interest in participating on an advisory council may be reflected by an individual's related pursuits, but expertise is not a requirement during opinion-sharing programs.

The composition of the council becomes very important where there are few alternative sites to choose between and the council has been delegated decision-making authority. The Company has a lot at stake at this point and should want the decision to be made by individuals having expertise in the issues to be considered and resolved. Here it is not only important to choose the "right" individuals but it is also important attempt to achieve a balance among potentially competing or opposite viewpoints. As a practical matter, a group of individuals knowledgeable of the siting issues will be easier to work with in that they will need little, if any, education.

If it is desirable to involve regulatory agency staff and members of environmental or public advocacy groups, then the question must be asked whether these council members are expressing their views or the views of the agencies and organizations with which they are affiliated? In soliciting participation from these individuals it might be best to do so in a manner that does not have them represent agencies or organizations. Rather, they would express their own viewpoints (which are probably tempered by their vocational affiliation) and not have to "clear" their positions on issues with these organizations.

When regulatory agency staff participate on a siting advisory council there is always the potential for conflict of interest. Sensitivity to this concern will vary between both agencies and individuals, and with the task and timing of SAC involvement. Even where an agency or individual has no permit review responsibilities for the project under consideration the potential for conflict of interest can still cause some individuals to withdraw from the program. This occurs when individuals have difficulty in distancing themselves from their affiliation.

The potential for conflict of interest problems for requlators also increases the closer the council comes to making a final decision. If the SAC only expresses opinions on major issues for example, very little conflict will probably arise. However, the inclusion of site specific data may raise questions of conflict. It has been the experience of the authors that it is best to avoid announcement of alternative site locations if regulators are to be involved.

A final concern on the selection of participants is whether the council should include local representation. When the council becomes involved very early in the site selection process local participation is impractical inasmuch as there would be too many potential site areas and therefore too many participants. However, when there are only four or five alternative sites being studied local representation is facilitated. This creates a unique problem in that including local participants on the council results in an announcement as to where the candidate sites are located. Extreme bias can also enter into the decision-making process. Some individuals may attempt to sway the process due to "NIMBY" desires - "not in my backyard." Maintenance of objective decision-making from such individuals becomes a tricky task for the utility's program designer.

How Open Should Open Planning Be?

This question gets right to the heart of the entire concept of public participation. No matter how well a utility company conducts a site selection study its announcement of the results (the proposed site) will catch people by surprise, create anxiety, and possibly create instant hostility. Public participation is an alternative to the "decide, announce, defend" manner of doing business. The more the public knows about the alternatives available to the company, the less hostile they are likely to become when the final choice is announced.

It was noted above that including local representation on the council amounts to disclosure of the locations of the remaining alternative sites. Superficially this would appear to present problems, particularly if the Company does not own all the sites. In reality, and on balance, it is probably a benefit in that it lets the general public know in advance that their municipality is being considered as a future location of an electric generating station. This "eases" the shock of the final announcement and probably minimizes the anxiety local residents may experience.

There are risks associated with public disclosure of alternative sites, particularly where the sites are not all owned by the Company. The most evident risk is that of land speculation. A less obvious risk is that of introducing a geographic bias into the deliberations of the advisory council. Some council members may attempt to influence the proceedings based on their perceptions of the suitability of specific sites, rather than objectively considering the criteria by which all sites should be evaluated.

On the other hand, disclosing the locations of the remaining alternative sites also presents an opportunity for the Company to go out to these communities and explain why it needs the facility and how the final choice of site will be made. It is surely better to have the Company talk directly to the public than to let the media attempt to inform the public absent all the facts.

CONCLUSION

The Siting Advisory Council is a very useful tool which, if properly structured, can help utilities in moving projects toward implementation much more effectively than the standard hearing approach. The use of a SAC must be well thought out. The trade-offs of tasks, timing and who will be involved should be clearly understood, explained to the SAC as soon as the program begins, and strictly followed.

Probably the most important benefit that can result is the collective sense of involvement generated by the process and the attitude which participants share as a result of the cross-educational process. It allows participants to transcend individual limitations and produce a group output superior to individual efforts.

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BIOGRAPHIES

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DUPLICATION IN CANADIAN FEDERAL ENVIRONMENTAL REVIEWS

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ABSTRACT

Within the Canadian regulatory regime, major federal energy development projects are subjected to two sets of environmental reviews with associated public hearings. Examination of two case studies has shown that the same impacts are being addressed through both sets of independent review. Inherently, considerable time and resources are being wasted. Four alternatives to the current system of independent reviews were evaluated; two have potential for considerably improving the efficiency of environmental reviews. These include sole review by one agency and a co-ordinated approach to dual environmental reviews.

BACKGROUND

With increasing public concern over the environmental implications of resource development and the public's desire to play a role in decision-making regarding such developments, the Canadian federal government reacted accordingly. The federal Environmental Assessment and Review Process (EARP) was established in 1973 to ensure that environmental concerns were considered for all federal projects and activities. In the late 1970s the National Energy Board (NEB), which regulates Canada's energy sector, began to require environmental impact assessments as part of applications under its review. Proponents are now faced with having their projects subjected to two independent environmental reviews, each with public hearings.

The Federal Environmental Assessment and Review Office (FEARO) administers EARP. When a project is referred to FEARO for review an Environment Assessment (EA) Panel (usually consisting of four to six members) is established to conduct a review of the project. Based on an Environmental Impact Statement (EIS) prepared by the proponent, public hearings are held to provide government departments and the public with an opportunity to comment on the project, question the proponent and to relay their concerns to the EA Panel. After the EIS has been reviewed and the public hearings have been held, the EA Panel prepares a report with recommendations covering project design and implementation. The recommendations may be specific or provide general direction. They are based on whatever information the EA Panel considers relevant. The EA Panel serves as an advisory body to the Minister of Environment. The recommendations are usually passed on to Cabinet, by the Minister, where final decisions regarding the project are made. Cabinet decisions regarding a project are not made on the basis of EARP alone; completion of EARP does not release the proponent from complying with other regulations and reviews.

The National Energy Board has both regulatory and advisory responsibilities on all aspects of energy ranging from production through to utilization. When an application is made to the NEB, it is first reviewed internally by the Board. Hearings are then held which are chaired by three NEB representatives. Unlike EA Panel hearings which are informal, NEB proceedings follow a court-like procedure. Witnesses are sworn in and legal counsel is usually required to make successful interventions. If approval for the project is granted, terms and conditions are issued which proponents are legally bound to comply with during construction and operation. The NEB is principally concerned with the technical regulation of oil and gas development, utilization and conservation but it also considers environmental protection related to these activities.

The projects that FEARO reviews and those that the NEB reviews are not always mutually exclusive. FEARO and the NEB have different mandates in terms of the types, and components, of projects that they review. However, both agencies review the biophysical and socio-economic impacts associated with energy development project activities. Despite this similiar role, the reviews are not interrelated; the two sets of reviews are not co-ordinated and information is not apparently exchanged between the two reviewing bodies. Not surprisingly, this has lead to skepticism over the government's management of regulatory requirements. Furthermore , it may be questionable that the government is really acting in the public interest. Completion of the reviews and public hearings can be quite lengthy and therefore, could quite conceivably be affecting the investment climate and in turn reducing potential economic benefits. There is a need for government to critically examine the efficiency and effectiveness of holding two environmental reviews for the same project.

The Norman Wells Project (NWP) was a proposal by Esso Resources to expand production of its existing oilfield at Norman Wells, N.W.T. and bring the oil down the Mackenzie Valley to Zama Lake in northern Alberta. The Arctic Pilot Project (APP) involved shipping liquified natural gas from Melville Island in the High Arctic to the Canadian East Coast via icebreaking tanker. Both of these projects, the APP and NWP, were subjected to the dual reviews of NEB and FEARO. It appeared to the proponents, and other observers, that FEARO and the NEB were duplicating efforts - not only their own but all of the participants' involved in dual review. In a presentation to the Special Committee of the Senate on the Northern Pipeline, Mr. Bezaire, Manager, Esso Resources Canada lead the following discussion:

> Mr. Bezaire: We also have observed that there is significant overlap between some of the public reviews, hearings and meetings that take place. There are a number of different agencies and groups that hold hearings in the Northwest Territories. There seems to have been a fair amount of confusion among the residents when different bodies move through and hold hearings on different subjects. Therefore, we think that there is a substantial opportunity to combine some of these hearings and reduce the overlap.
>
> The Chairman: Can you give me an example of two or three hearings?
>
> Mr. Bezaire: For example, on Norman Wells there was an environmental assessment hearing, a National Energy Board hearing and hearings by the water board. To some extent they all looked at similar issues.
>
> Senator Lucier: They would often have the same people making the same presentation.
>
> Mr. Bezaire: That is correct (Senate of Canada 1982, p. 17:35-36).

During a speech to the Canadian Institute of Energy Don Wolcott, Chairman of the APP

> '...condemned bureaucratic reviews, conditions and roadblocks put upon Canadian projects... "Why should (the LNG buyers) deal with Canada when they know that regulatory procedures could involve delays of up to two years and still not permit delivery of any resources"... Wolcott noted that for much of the seven months that the hearing did take place, the NEB was simply going over again the evidence which had already been heard by other regulatory agencies... Wolcott said that as well as being time-consuming, regulatory hearings are also costly.' (Hatter 1982)

Reactions to dual NEB/EARP review, such as the above, lead to a study by the Environmental Protection Service examining the necessity and effectiveness of holding these two sets of reviews. The purpose was to determine whether extensive overlap was occurring, examine the participants at the hearings, compare the roles of NEB and EARP' determine who was participating in the hearings, and examine different means by which the government could improve the efficiency of environmental review.

DUAL REVIEW

Overlap

Examination of the NEB and EA Panel hearing transcripts for Arctic Pilot Project and the Norman Wells Project revealed that the same impacts and issues were being discussed in the two different forums. The differences in the information covered were minimal. Neither process was more effective than the other in terms of identifying impacts. The main difference in the hearings was the level of detail to which the issues were addressed before each reviewing body. The treatment of impacts was more rigorous at the NEB hearings. Although the same impacts were addressed at the EARP hearings, the study results indicated that projects are examined from a more detailed perspective at the NEB hearings than at the EA Panel hearings.

Although basically the same information is reviewed by the NEB and EA Panels it may be used for different purposes. Therefore the EPS study also included an examination of the final conclusions and recommendations which were made by each reviewing agency. (The NEB hearings for the APP were suspended before they were complete. Thus, the following discussion is based only on the NWP.) The results of the NEB's and EA Panel's public reviews, in terms of the ensuing conclusions and recommendations made, were similiar. None of the conclusions, terms, conditions or recommendations made by the EA Panel and the NEB were conflicting. On the contrary they reached the same conclusions and dealt with the same impacts. However, the EA Panel recommendations were conceptual or strategic whereas NEB's were more operational. On the whole, EARP recommendations centred on what environmental protection measures should be carried out, whereas NEB's terms and conditions focused on how they should be done. The NEB took its recommendations one step further - it wanted to know how environmental protection was going to be managed. Despite the varying nature of the recommendations, if they were implemented independently of each other, then the results (in terms of environmental quality) would be the same.

Interveners

The hearings associated with environmental reviews serve a number of purposes, one of which is to provide an opportunity for concerned individuals to express their concerns to the appropriate decision-makers. This opportunity may vary between hearings, in part depending on how they are run. While considering the redundancy between the hearings consideration should be given to the above factor - are the same interveners appearing before the NEB and EA Panels? The critical difference in the two review processes lies in the participants who intervene at the hearings. When the transcripts were reviewed, each participant who made an intervention was noted. The interveners were broken down into four main categories: private citizens; government personnel; technical witnesses; and interest groups. It became readily apparent that private citizens were far more inclined to participate in the EA Panel hearings and that interest groups played a stronger role in the NEB hearings. FEARO goes to great lengths to facilitate public

participation. EA Panels place emphasis on gaining comments from the public - not necessarily technical or scientific comments. "What the Panel wants is a representative feedback from local residents - their opinions, in their own words, about the project in general" (FEARO 1980b, p. 6). Both technical and community hearings are held by EA Panels. "In remote or small communities that may be affected by a project, a different type of meeting, termed a "community hearing" is conducted so that the EA Panel can get the views of local residents. For such community meetings, the proponent is asked to provide only one representative. The full EA Panel may not be present" (ibid, p. 9). On the other hand, while the NEB may hold hearings in these communities, it only does so if a request is made. "The NEB, if going out, is going out because there is a firm request for that and witnesses are ready to appear and have asked the Board to go there" (Madame Thur, NEB in NEB 1982a, p. 3940). A 'consultation' as opposed to 'confrontation' approach is taken at EA Panel hearings. "Public meetings are kept as informal as possible. The aim is to establish face-to-face contact between the Panel and the people, with a minimum of go-betweens" (FEARO 1980b, p. 6).

While the NEB does not discourage participation by private citizens their hearings may be intimidating and this apparently prevents individuals from intervening. Because of its regulating responsibilities the NEB holds quasi-judicial hearings. In such a setting, the purpose of cross-examination is to find holes in the defense's arguments - leading to an atmosphere of confrontation and intimidation. The following statement, made by a private citizen, exemplifies this. "It is also kind of, perhaps insulting today, watching some of my colleagues being cross-examined "(NEB 1980, p. 8, Vol. XII A). Further, in such quasi-judicial hearings there is importance in having legal counsel representing interveners. "The NEB's procedure has not seemed to cause problems for parties as long as all parties are represented by counsel and the majority have some familiarity with the agency and its proceedings. Difficulties have arisen only when unrepresented intervenors have appeared and attempted to participate fully" (Lucas and Bell 1977, p. 61). Although it is not imperative, legal counsel is beneficial and all those who may want to participate cannot affort it. The intimidation and expense associated with intervening at the NEB hearings, along with the necessity to travel to major centres to participate, inhibits public participation as evidenced by the findings of this study.

Roles of NEB and EARP

The environmental review processes conducted by the National Energy Board and Environmental Assessment Panels fill similar roles. For the most part they examine the same environmental impacts, are both involved in the pre-construction stage of approving energy development projects, and both provide a forum for members of the public to voice their concerns. There are also fundamental differences in the roles of NEB and FEARO which are not always apparent. Differences in the purpose of each review is an important factor when considering alternatives to current dual review.

The NEB is a regulatory agency whereas an EA Panel is an advisory body (in that there is no legal backing to Panel recommendations). This underlies the major difference in the two reviews and the responsibilities they have. EARP is an investigative process whereas the NEB is adjudicative. EARP was established "to ensure that potential environmental impacts of federal projects, programs, and activities were determined in advance, so that environmental implications would be considered in the planning process." (FEARO 1980c, p. 1). While the NEB also insures that environmental impacts are given consideration in the planning of projects they are further responsible for specifying how environmental impacts are to be managed in the construction, operation and abandonment of energy developments. While the NEB review and EARP are both part of the same approval system, their environmental reviews were established for different purposes. "The results of the EARP should be a definition of the state of the environment desired (i.e. as reflected by Minister/Cabinet acceptance of recommendations) if the project proceeds. Regulatory agencies such as NEB, on the other hand, should be directed at achieving, amongst other things, the state of the environment defined by accepted Panel recommendations. This would be reflected in the terms, conditions, requirements and enforcement of licenses and permits. It is here that detailed design of projects must be subjected to detailed scrutiny" (Frith 1983).

This subtle, yet basic difference is further illustrated by the following statements made at the APP (EARP) hearings.

> "Perception of the purpose of EARP hearings has been that they are of an overview nature to determine the attraction or drawbacks of a particular project. It has always seemed to me that the concerns over details of drilling procedures, permafrost stability, sumps, etc. are the responsibility of the regulatory branches of the federal government" (FEARO 1980a, p. 389).

> "...we (the EA Panel) are not in a position to decide whether twelve inches of stream bed excavation is better than the blasting of a few kilometers of quarry. We would like to know, whichever method is proposed is generally and environmentally satisfactory and if there is a regulating method to make sure that it is carried out and it is within the state of the art and the economic capabilities of the company so that they would accept the method" (FEARO 1980a, p. 406).

Although the difference in purposes is apparent when reviewing the transcripts, the Boards' 'Reasons for Decision' and the EA Panel Reports, it is not evident that all of the participants are aware of the different roles. Confusion over differences and similarities in the purposes of the two reviews may, in part, be attributed to the fact that the two reviewing bodies request that the same type of information be submitted. "They ask for exactly the same information; it is just put into different covers" (Stan McKay, 1982).

As was illustrated earlier, the different roles of the NEB and EARP are reflected in the manner in which impacts are discussed at the two hearings and in the nature of the final recommendations, terms and conditions issued by the EA Panels and the NEB. By following the hearing proceedings it becomes evident that NEB's review is of a more detailed and comprehensive nature. This in turn is followed by terms and conditions which go beyond the environmental framework outlined by the EA Panel recommendations by requiring the submission of specific plans for the incorporation and management of mitigative measures ensuring environmental protection. The important point is that EARP is not regulatory like NEB reviews, it was designed to be used as a planning device.

ALTERNATIVES TO DUAL REVIEW

The last phase of the study looked at different alternatives to the present system of dual review. Because extensive (almost total) overlap is occurring there is a critical need for government to alter the present practice and improve the efficiency of identifying and dealing with environmental impacts associated with energy developments.

The status quo has minimal advantages. Although it does offer added insurance that significant environmental impacts will be identified, there are too many disadvantages and costs which plague the system. Holding two reviews does not appear to be contributing to environmental quality; information flows between the two agencies is illogically restricted as the conclusions and recommendations developed at one hearing are not used to inform and guide deliberations at the next; participants are continually confused and frustrated by dual review; federal monies and time are wasted; the economic viability of projects may be jeopardized; and the efforts of all parties are being duplicated. There is room to improve efficiency while maintaining the objective of ensuring environmental protection.

Single Window

Having a 'single window' approach to NEB/EA Panel reviews is not a feasible alternative to the current system. A single window approach would involve the co-ordinated review of environmental impacts by the National Energy Board and FEARO via joint reviews and hearings. The EA Panel and the NEB would conduct joint hearings and co-ordinate efforts in the background reviews under a co-chairmanship arrangement. This of course would only apply to areas dealing with environmental impact assessment. The EA Panel would not deal with other components of projects (e.g. tolls, tarriffs, economics) which fall under NEB jurisdiction. In effect, proponents would only have to deal with one agency as they would only have to prepare one EIS/application and deal with one set of hearings (reduced time and costs). A single window approach to environmental review would ensure that each agency would be able to concentrate on its particular areas of concern while minimizing duplication

The logistics of implementing a single window approach would be numerous and detailed: hearing format (formal vs. informal); location and timing of hearings; EA Panel/NEB composition; handling of interveners; division of decision-making powers (will NEB and FEARO each provide their own recommendations and conclusions after the hearings are held or will they combine efforts? If they do, will it lead to problems of conflict?); funding of interveners; form of EIS/application; NEB and FEARO sharing of hearing costs; etcetera. Unless there is open and strong support for this option within government and particularly, within the NEB and FEARO, then the likelihood of successfully implementing this approach will be slim. Presently, representatives from NEB and FEARO oppose consideration of this approach. Facilitating a single window approach would require quite a substantial transformation in the management of environmental reviews and this restricts the feasibility of implementing this alternative.

Split Reviews

Possibly, one agency could review the biophysical impacts associated with a project and the other agency could review socio-economic impacts. Concerns relating to engineering or technical feasibility would become the responsibility of the agency reviewing the biophysical impacts. Because of the manner in which the two hearings are held (formal vs. informal) it seems logical that under such a scheme NEB review biophysical impacts and EA Panels review socio-economic impacts. Although it may appear, in principle, that this option would reduce overlap it is doubtful that in practice this goal could be attained.

There are a number of disadvantages to this option which restrict its viability. The most notable difficulty is the fact that biophysical and socio-economic concerns are closely interrelated and it is often difficult to separate the two. "No matter how the terms are used, it is important to recognize that impacts on ecosystems, biogeochemical cycles, and the like are intimately related through complex feedback mechanisms to social impacts and economic considerations" (Munn 1972, p. 8). Because of the linkage between these two types of impacts and because of the problem of defining a division between the two, even for the sake of discussion, operational difficulties in running and coordinating the two sets of hearings would be considerable. Proponents would still have to prepare for, and finance, involvement at two sets of hearings and the time involved in gaining project approval would not be substantially reduced. Furthermore, participants who had both socio-economic and biophysical concerns would still have to attend two sets of hearings. As with the single window alternative and the status quo, 'split reviews' are deemed to be an unsatisfactory approach to reviewing energy developments in light of environmental implications.

The EPS study identified two alternatives which would reduce overlap and which could be implemented within the existing regulatory and administrative regime without significant changes. The first involves review by only one agency and the second entails a co-ordinated approach to EARP/NEB reviews.

Sole Review

Under the first option there are two possible variations - either the sole responsibility lies with the National Energy Board or it is the responsibility of the Federal Environmental Assessment and Review Office. The argument can be made for retaining either one. However, the case supporting the NEB is somewhat stronger.

The participants involved in the NEB's public hearings pursue greater detail in their examination of environmental issues than do those people involved in EARP. The NEB evaluates projects from a wider perspective than does EARP. Not only does the NEB consider environmental impacts, but it also focuses attention on supply, markets, financial matters, cost-benefit analysis, tarriffs and public interest. The result is that the NEB reviews the same information that is reviewed through EARP, and more. This fact, considered in light of the evidence that substantial overlap is occurring, provides a strong basis for advocating that the NEB conduct the environmental reviews when a project falls under the mandates of both agencies.

The advantages of having the NEB conducting the only review are many fold. Overlap and redundancy would be totally eliminated. This implies savings in cost to all interveners who appear before both reviewing bodies; government savings as one reviewing body is relieved of its responsibilities; reduced time spent in the preparation for, and participation in, hearings; and (probably) less time involved from project conception to approval or rejection. A number of representatives from the petroleum industry, who had been involved in both sets of reviews, were interviewed. The most common response was that there should only be one environmental review. Dual review is frustrating to those involved and hence, they felt a considerable amount of time and money was being misused. Reducing review to one agency would satisfy these concerns. In June 1983, a Task Force headed by V.L. Horte studied pipeline construction costs in Canada and recommended that the "EARP process should not be invoked in respect of pipeline facilities over which the NEB has certification and regulatory jurisdiction... Use of the EARP process on NEB regulated projects is an unnecessary duplication which leads to unnecessary costs" (Horte 1983, p. 52). This recommendation has not been acted upon and there is debate within government as to whether it should be. In a letter to J. Chrétien (Minister of Energy, Mines and Resources), C. Caccia (Minister of Environment) stated that while the Department agreed that overlap and redundancy should be reduced, environmental review should not be limited to the NEB's. Rather than adopting the recommendation in Horte's report, he felt that efforts should be made to co-ordinate the two reviews.

The major shortcoming associated with having the NEB holding the only environmental review, and hence the only set of hearings, is the limited participation of private citizens. Although it is likely that in instances of sole review the NEB would make greater efforts to facilitate public participation (such as holding hearings in small communities) it is unlikely that involvement of private citizens in NEB reviews would equal that in EARP.

Co-ordinated Reviews

The next option considered to be a feasible alternative to independent, dual reviews is co-ordinated EARP/NEB reviews. The two reviews would be conducted in much the same way as they presently are but with a few important strategic changes. By abandoning the practice of independent review and treating the two hearings as part of a single system with information flows between them, the identification and resolution of environmental impacts could be enhanced and the overlap problem significantly reduced.

Resource development begins with the initial concept of a project. From there, the proponent begins general planning, including the examination of alternative means of development. Assuming that the total benefits of the project outweight the costs, detailed plans are drawn up. Next is the approval process. If the project receives the go-ahead, then final designs are completed to comply with the conditions of approval and the project is constructed and put into operation. Each of these stages represents a decision point and therefore, an opportunity for government to get involved and the public to participate. As it is, EARP is being applied anywhere between general planning and up to the 'approval' stage, depending on the project. NEB reviews at the approval stage but detailed plans are not always worked out. In order to meet the widespread concerns of government and the public, involvement should begin during general planning.

The Environmental Assessment and Review Process and the environmental reviews of the National Energy Board could prove to be complementary to each other. Looking at the project continuum, it seems logical that the formal review under EARP should be applied after the general plans have been completed but before detailed planning has begun. Detailed planning needs to be completed before NEB public reviews are commenced. The goal of more efficient environmental review can be secured by holding EARP after general planning and the NEB review after detailed project planning, in conjunction with the establishment of a mechanism to facilitate flows of information between the two agencies.

Under this scheme EA Panel reviews could be used as a screening and scoping mechanism. This would not require any alternations in the way EARP is presently administered. The major change would lie in the environmental issues discussed at the NEB hearings. Rather than going over the same general concerns again, the NEB could utilize the information gained at the EARP hearings. This would give the NEB the benefit of a comprehensive review and allow its hearings to focus more narrowly on specific impacts and to determine how impacts are to be addressed in the construction, operation and abandonment of the project. This implies that the EARP hearings would have to be held early in the planning stages of a project, before the NEB hearings. The NEB would conduct its review after detailed planning had been completed allowing sufficient time to pass from the EARP hearings so that the information derived from the first review could be used for the second. This would be in keeping with the respective roles of the two agencies. As was mentioned, EARP is more of a planning tool while NEB environmental reviews are a regulatory mechanism. The specific approach and mechanisms for co-ordinated review will have to be worked out by the NEB and FEARO if the government decides upon this approach. There needs to be a clear interdepartmental understanding of what the end result of each review should be and how they should be interrelated.

If the scheme for environmental review is adopted many benefits would stand to be gained. There would be: the insurance offered by dual review that all major environmental impacts are identified; the EA Panel would serve as a screening mechanism for the NEB hearings, saving time; the NEB hearings would serve as a 'follow-up' mechanism for those who wish to pursue recommendations provided by the EA Panel; the first hearings would provide a learning opportunity for participants; two types of meetings (informal and quasi-judicial) would be held allowing participants to intervene in the setting they preferred; hearings would be held in the vicinity of the project as well as in major decision-making centres. Overlap and the time involved in hearings would be reduced; uncertainty surrounding the review processes should diminish; and frustrations stemming from uncontrolled repetitive discussions and debates during dual review would subside. Most significantly, this option could enhance the identification and treatment of environmental impacts. It is for these reasons that the Department of Environment has taken the position that in the future EARP and NEB reviews should be synchronized.

ADVANTAGES AND DISADVANTAGES OF FINAL OPTIONS

STATUS QUO

Advantages

- existing mechanism

Disadvantages

- public dissatisfaction
- relatively time-consuming and costly
- extensive overlap

SPLIT REVIEW

Advantages

Disadvantages

- public dissatisfaction
- relatively time-consuming and costly
- overlap
- difficult to implement

SINGLE WINDOW

Advantages

- overlap eliminated
- public satisfaction
- savings in time and cost

Disadvantages

- very difficult to implement

REVIEW BY ONE AGENCY

Advantages

- overlap eliminated
- public satisfaction
- savings in time and cost

Disadvantages

- potentially difficult to implement because of bureaucratic resistance

COORDINATED REVIEW

Advantages

- overlap reduced
- savings in time and cost
- enhances identification and treatment of environmental impacts

Disadvantages

- potential for initial public dissatisfaction

CONCLUSIONS

There is a great deal of public dissatisfaction, particularly within industry, stemming from the dual environmental reviews of the NEB and EA Panels. The dissatisfaction is well founded as it is based upon the duplication of efforts at the public hearings. A large percentage of the environmental issues are being repeatedly discussed from one hearing to the next. If the federal government adheres to its present practice of independent and inherently duplicative hearings, it will continue to be a source of frustration and vexation for many of those who are involved. Greater efficiency at identifying the environmental consequences of energy developments can be realized by abandoning the status quo. Although there is clearly room for improvement, there is no clear-cut, obvious route to an improved system. There is, and will continue to be, debate as to what should be done. Two options have been identified, 1) sole review by the NEB and 2) co-ordinated reviews, both of which would improve the efficiency by which government identifies and addresses environmental impacts.

Do the differences in the two reviews warrant the application of both to the same project? The NEB's and EA Panels' reviews are equally effective at identifying the environmental impacts associated with energy development projects. The NEB and EA Panels are also addressing the same impacts in their final recommendations and conclusions, but the focus of the EA Panels' recommendations and the NEB's terms and conditions are different; the EA Panels' results are advisory and the NEB's are prescriptive. Despite these differences, the application of either the NEB's or the EA Panels' recommendations to the design and operation of a project would have the same bearing on the project and the environment.

The NEB and EARP have very similar mandates and roles in environmental review. Yet again, there are differences though they are not always recognized, even by those who are involved in the reviews. This lack of apparency may be attributed to a number of factors: government has failed to clearly define the differing roles of the NEB reviews and, particularly, EA Panel reviews; EARP hearings are not always held far in advance of the NEB hearings (for the Norman Wells Project, the EARP hearings were held only three months before the NEB hearings); and much of the same information is reviewed by each agency.

The NEB is a regulatory agency while FEARO, the administrator of EARP, is an advisory agency. EARP was designed more to be a planning tool than a regulating procedure. As a result, the discussions before the NEB are more detailed (yet centring largely on the same issues), and the recommendations and conclusions made by EA Panels and the NEB differ in focus. Because differences in the roles and mandates of the NEB and EARP do not presently have any influence on the impacts which are discussed at the hearings (the discussions are the same), the variances cannot be used to justify maintaining both sets of hearings. However, if EARP was applied more as it was intended, the two reviews would have obviously different purposes.

The key difference in the two reviews is the extent to which they identify the concerns of private citizens. FEARO facilitates public participation to a greater extent than does the NEB and therefore, EARP is more effective at identifying the concerns of interested individuals. If it is decided by government decision-makers that the opportunities for public participation provided by EARP are not necessary, then it can be justified having a single agency (the NEB) review the project. However, it could be argued that public participation is an important and essential element of environmental review processes and that private citizens are entitled to adequate access to government decision-making on projects which may affect their communities and lifestyles. The elimination of the opportunities for public participation (by having sole NEB review) could result in public opposition and disquiet as a major link to the decision-making process would be removed. Further, government and the proponent may fail to benefit from the information provided by private citizens - information which may not be obtainable from technicial or scientific experts.

The question of what can be done to improve the efficiency of the identification of environmental impacts by government appears to come down to the issue of public participation. It may be viewed that public input is necessary for decision-making and that the NEB does not provide sufficient opportunity for the public to intervene. Presently, a great deal of resources, time and money are being wasted by dual review. The government must decide on the value of public participation and what trade-offs can be made between that input and improved process efficiency.

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THE MARYLAND SITE ACQUISITION PROGRAM

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ABSTRACT

The statute currently requires that the Maryland Power Plant Siting Program acquire a minimum of 1 site suitable for each of the three largest utilities in Maryland. One site has been purchased, an impasse has been reached over the purchase of one site from the Federal government, and a regional study to select the third site is nearing completion. A discussion of the history of the site acquisition program provides perspective on the capabilities and constraints on state governments in such an endeavor.

INTRODUCTION

The Maryland Power Plant Siting Program was established in 1971 to insure adequate power on reasonable schedules at reasonable costs while also protecting the quality of the state's environment. Major program elements include impact assessment for existing facilities, a research program, detailed evaluation of proposed new sites, and acquisition of sites in a state land bank. Numerous planning and technical activities support these broad functions.

LEGISLATIVE REQUIREMENTS FOR SITE ACQUISITION

Legislation initially required the acquisition of at least four and no more than eight sites, with at least one site available at any time for each of the two largest utilities in the state. The law was later revised to prevent the acquisition of sites for any utility whose peak demand is less than 1000 MWe within the state unless approved by the Public Service Commission. The acquisition schedule was also revised (in 1978) to require purchase "within a reasonable time" of at least one site for each of the three companies with a peak demand in the state of more than 1000 MWe. The actual number of sites (between 3 and 8) is required to be based on a biennal study of growth projections and site requirements. Site selection must be based on studies showing the suitability of the site. Once a site has been identified, it must be purchased or removed from consideration within two years. After acquisition of a site, the state and affected counties are to jointly identify a transmission line corridor, which should then be incorporated in the county's land use plans. It should be emphasized that utilities retain the ability to purchase sites on their own and are not required to use the State-purchased sites.

Funds for site acquisition comes from an Environmental Trust Fund, which supports the entire Power Plant Siting Program through an environmental surcharge on electric utility bills. The average surcharge during FY 1984 is 0.175 mills per kilowatt hour and should provide revenues of approximately $5.5 million in FY 1984. Sites may be acquired through negotiation or condemnation. Interim uses of a site which will not affect its availability as a power plant site are allowed and encouraged. Half of any revenues from interim use are paid to the county in which a site is located, and, at a minimum, the county must be paid an amount equal to the property taxes that were paid on the site at the time of acquisition. An electric utility may purchase a site upon request, at "fair market value". If a site is not used by a utility within 15 years from its date of purchase, the original owner or heirs may repurchase the site at a price not to exceed the original price plus 6 percent annual appreciation. No sites have been purchased from the state by a utility to date.

RATIONALE FOR SITE ACQUISITION

There are several related reasons for establishing a state site acquisition program. The first is that it promotes an early orderly development of power plant sites while allowing a systematic incorporation of public interest considerations, including public and local government participation, environmental impacts and economic development. Consideration of such factors is not precluded for utility-selected sites, but input usually occurs at a much later stage, usually at the Public Service Commission certification hearing on a specific application. Effective participation at that stage requires standing as a party, and participants are to some extent forced into a "take it or leave it" situation. The state site acquisition process in principle avoids many of these difficulties.

A second reason for site acquisition is that it provides the state with a set of alternative sites. When a utility proposes construction at a particular site, the state has some basis for judging the utility's proposal by comparing it to the sites in the land bank and by using the information developed in the studies that led to acquisition of state sites. The exercise of site acquisition also helps to educate policymakers to the idea that there are no perfect sites and forces them to acknowledge the trade-offs required to find actual sites.

A third reason for state site acquisition is that it helps utilities to eventually obtain sites which might otherwise be difficult to acquire.

A final state reason for site acquisition is that it reduces the potential for delay or bad decisions in a utility licensing procedure. In the absence of an available and evaluated alternative site, it is very difficult to oppose a proposed utility site because the delay caused by starting over would be disruptive and expensive and might even adversely affect reserve margins. The ready availability of an alternative site provides for a broader spectrum of policy options regarding power plants.

There are also disadvantages associated with State site acquisition, and the situations described above have been oversimplified. These limitations are discussed in later sections of this paper.

BRIEF HISTORY OF MARYLAND SITE ACQUISITION

There have been two fundamentally different types of site acquisition activities: In the early years of the program, acquisition activities were focussed on seemingly good sites as the opportunities presented themselves. The Program has evolved to the point where regional screening studies are currently utilized.

The targets of opportunity include Bainbridge, Elms and Stillpond Neck. In each case a preliminary study was conducted before a decision was made to proceed with an acquisition attempt, and more detailed studies were performed in parallel with or subsequent to the acquisition process.

At Bainbridge the former Bainbridge Naval Training Center was determined to be surplus and the state attempted to acquire it for a power plant as well as for various county development projects. However, several major complications arose, related to encumbrances to the title of the site due to agreements made by the Navy with a neighboring municipality at the time of purchase, federal uses of the land proposed during the protracted negotiation period, and two federal Job Corps Centers with a population of 1800 becoming tenants on part of the site. After ten years of study and effort the state has reached an apparent impasse in its efforts to acquire the site because of federal procrastination, developing incompatible land uses at and adjacent to the site and other changed circumstances.

The Elms site was acquired in 1975 in a straightforward and uncontroversial transaction, although condemnation was utilized to establish the sale price. Efforts have continued to acquire several inholdings. The state has allowed several interim uses, including tenants in rental housing, forest management, an ecological study area, hunting and a waterfront recreation area. There are no current plans for utilization of the site by a utility.

Acquisition of the Stillpond Neck site was studied and then deferred due primarily to public opposition. The site was eventually dropped from further consideration because of a lawsuit regarding the two year limit for evaluation of a site after its identification.

Two large scale siting studies have been conducted. The Eastern Shore Siting Study resulted in the eventual selection of four finalist candidates. Because of the substantial controversy occasioned by this study, the General Assembly enacted legislation which prohibited State acquisition of a power plant site for a utility with a peak demand in Maryland of less than 1000 MW (which is the case for the utility which serves the Eastern Shore). No further action was taken on the sites.

The other large scale siting study is currently underway in Western Maryland.

WESTERN MARYLAND POWER PLANT SITING STUDY

Our current practice is reflected in this study, which has as its goal the selection and purchase of a site for a coal-fired power plant suitable for the Potomac Edison Company, a subsidiary of the Allegheny Power System which serves the western portion of Maryland.

The overall objective of the study was first to define large regions in Western Maryland where a coal fired power plant would be compatible with existing resources and at the same time be consistent with the environmental, economic and other objectives of the State. Once defined, these regions were analyzed using successively more detailed information. Successive screening of smaller and smaller areas resulted in selection of specific candidate areas that could be analyzed in terms of their capability to support development of a power plant. As part of this siting process, the Power Plant Siting Program has conducted an extensive public involvement program which included the convening of a select group of community leaders who formed the Western Maryland Power Plant Siting Study Advisory Group.

The Advisory Group is made up of representatives of a number of interests, including citizens representatives from the counties, representatives of the county governments, and representatives of State agencies, utility companies, and the Federal government. The main purpose of this group was to provide the Power Plant Siting Program with information about the public and private concerns of people from each county in the study area. These concerns focussed on the kinds of factors that should be considered in selecting a site and how those factors should be used. At the same time, the Advisory Group provided us with a formal channel for receiving and disseminating information about the entire siting process to the community at large.

Each of the four stages of screening identified increasingly more specific locations for power plant sites. The four stages of the screening process included the following activities:

- Exclusionary Screening - a procedure to identify areas where power plant sites are legally or practically excluded from development;

- Discretionary Screening - A process to identify large areas (several hundred to several thousand acres in size) using available data and numerically weighted siting factors developed by the Advisory Group;

- Suitability Screening - An evaluation designed to locate and map possible candidate areas and subject these areas to a preliminary suitability analysis for site development; and

- Candidate Area Comparisons - A detailed analysis of favorable power plant areas building on previous analyses and input from technical experts and informed citizens.

In the first stage of screening 110 candidate areas were selected. After more detailed technical reviews of these areas and public workshops in each of the five counties, a second stage of screening narrowed down to about two dozen candidate areas.

In the final stage of screening, criteria were developed that would provide for between-site comparisons of the two dozen highly favorable Candidate Areas. This comparison was augmented by an even more detailed information-base and included input from the Advisory Group, public workshops, field visits, county planning offices, utility groups, and the technical consulting team. The result of applying this information to the screening process, together with preliminary engineering/economics studies, was the selection of six candidate areas targeted for more detailed candidate site analyses.

A detailed air quality analysis of the six candidates demonstrated that under present design and operation assumptions and regulatory requirements, three of the sites had to be excluded from further analysis. Additionally, an engineering and economics evaluation on tranmission line, coal delivery, and solid waste disposal systems supported the elimination of these three areas from further consideration.

We have designed the remainder of the Western Maryland Study such that the final three candidate areas will each be evaluated under the equivalent of a National Environmental Policy Act (NEPA) review. The remaining evaluation tasks involve developing a conceptual power plant design for each area, evaluating environmental and engineering-related limitations and impacts, analyzing the environmental licensing constraints and issues, and performing a full-scale socio-economic evaluation of the potential impact of the construction and operation of a power plant on each surrounding community. We expect to complete the study by Summer 1984 and to proceed with selection of one of the sites for purchase.

In order to solicit the opinions of, and to inform local residents in and around the remaining candidate areas, we have formed local groups to serve in an advisory group capacity in the local level.

FACTORS AFFECTING THE SITE ACQUISITION PROCESS

The site acquisition program has been affected by many factors discussed below, the foremost of which is that many circumstances have changed since 1971.

Annual demand growth in Maryland has decreased from approximately 8% to 3% over the last decade. The immediate consequences of this decrease are that no new major power plant construction has commenced since the early

1970's, several planned plants have been canceled, and licensing activity for new plants has almost ceased. The indirect consequences are that utilities currently do not appear to have a pressing need for new sites. In the face of a lack of perceived need for new power plants, there is little governmental or public interest in site acquisition but there is still an awareness of possible impacts when potential sites are under consideration. The result is that the problems with site acquisition are as prevalent as ever, but the sense of need which tended to counterbalance some of these problems has disappeared.

A second major change is in technology. First of all, Nuclear power is not being considered as a realistic option for new plants in Maryland at present. Mitigation techniques such as cooling towers, waste fixation and containment, intake screening, waste water recycling and dust suppression have substantially affected the impacts and acreage requirements for sites, generally reducing the impacts but, in some cases, increasing the area requirements.

A third element of change involves environmental impacts and concerns. Many issues which were previously important as real or potential impacts have been mitigated; e.g. "thermal pollution", or studied to the extent that speculation has been replaced by hard information. At the same time new environmental concerns in areas such as waste disposal have arisen, and the regulatory situation has become more formalized and stringent.

A fourth area of change is in the economics of power generation and in the perception of the importance of economics. In Maryland the early focus was on finding sites suitable for both nuclear and fossil fuel generation. Factors related to nuclear plants led to an emphasis on sites far from population centers and a lesser emphasis on differential site costs, since there was no standard for quantifying and trading off safety versus cost. Escalating energy costs and the resurgence of coal costs have led to a major change in the factors affect power system costs and an emphasis on the importance of cost in siting new power plants.

LESSONS FROM HINDSIGHT

Based on our experience and evaluation of our previous results, we have identified a number of shortcomings in our previous procedures. For example, efforts to select sites suitable for both nuclear and fossil plants can result in the selection of sites which are optimum for neither. In addition, by focussing on sites suitable for ultimate expansion up to approximately 2000 MW, we have passed over smaller but potentially desirable sites.

Another fact that has come to light is that some utility-owned sites that we have evaluated in detail and have found to be acceptable would not have survived the first level of screening of the past state study process. The reason is that in the past we have been too simplistic in our application of screening criteria. For example, the Eastern Shore Siting Study placed great emphasis on finding sites with a zero impact on important aquatic species because of the importance of Chesapeake Bay aquatic resources. The problem with such an approach is that for many specific sites it is possible through detailed design and mitigation to reduce impacts to insubstantial levels at costs that may be high by direct cost/benefit standards but which are more than offset by lower site-related engineering costs that are the traditional concern of utilities, such as transmission and coal shipment costs. This has highlighted the fact that valid site comparisons are difficult to make unless detailed study has been devoted to the alternative sites.

The state built on its accumulated experience for the current Western Maryland study by focussing solely on a site for a coal-fired power plant, by specifically screening for smaller sites as well as larger ones, and by performing progressively more detailed studies of the remaining areas as we narrowed down to fewer and fewer candidate areas at each stage of the screening process. A special effort was made to ensure that sites which would prove to be suitable, on the basis of detailed studies, were not removed from consideration prematurely due to inappropriate application of of broad-brush screening criteria.

POLITICAL CONSIDERATIONS

Ensuring that adequate electricity is available is a primary purpose of the Power Plant Siting Program in general and of the site acquisition activities in particular. Nonetheless, the site acquisition program has been a major political liability for the Power Plant Siting Program. That is not much of a surprise, given the controversial nature of the job and the public participation requirements, which guarantee an aroused public. One consequence is that the funding and mission of the entire Power Plant Siting Program, of which the site acquisition activities have comprised less than 10% of expenditures, is subject to attack as retaliation for disagreements engendered by the site acquisition program.

Another quasi-political consideration is the question of where in the site acquisition process to inform and involve the public. Early involvement allows maximum opportunity to affect the outcome, but it unnecessarily aggravates many people by offering the spectre of a power plant in their backyard whereas most of the alternatives considered early on will ultimately be removed from consideration before narrowing down to several "finalist" sites. There are valid questions regarding the fairness of causing widespread distress and/or uncertainty about the ultimate fate of property and neighborhoods. There are also direct political consequences of such distress. At the other extreme, late public participation presents the public with most decisions already made. Our practice in the Western Maryland Study has been to bend over backward to involve citizens and local officials during the entire course of the study. It is too early to draw firm conclusions, but this appears to have been painful but beneficial to the ultimate success of the project.

CONCLUSIONS

Many of the reasons in favor of a State site acquisition program remain valid. Experience has pointed the way to a number of improvements in our program which should address previous shortcomings. However, the decrease in the need for additional sites raises 2 issues. One is a a practical problem: without a perceived need it is difficult to justify a site purchase which has aroused substantial local opposition. The second is a policy issue; ie., is there a sufficient need for new sites to justify the State's involvement in site purchase? We have concluded that it is important to ensure that at least two sites, a prime site and an alternate, are available for each of the major utilities, but that it does not appear warranted for the state to have a substantial involvement in site purchase beyond that point. Therefore we recommended legislation to our General Assembly, enacted eight days ago, which provides that if a utility already owns at least two suitable sites, including existing sites suitable for expansion, then we are not required to purchase a site for that utility. The new legislation also allows us to purchase land necessary for the expansion of an existing utility-owned site, including land necessary for ancillary facilities such as solid waste disposal and access for cooling water, transportation, and transmission lines.

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SESSION III B - PUBLIC INTEREST

THE KELLY LAKE - CHEEKYE TRANSMISSION LINE

- Anatomy of the Public Consultation Process

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THE KELLY LAKE - CHEEKYE TRANSMISSION LINE
- Anatomy of the Public Consultation Process

1. Introduction

This paper reviews the public consultation component of B. C. Hydro's planning for a 500 kilovolt transmission line in southwestern British Columbia. While the information/consultation program was effective for much of the project, in some areas misunderstandings and differences in perspective between Hydro and the public stretched the communications process to the breaking point. In these instances, however, rather than resolving differences the consultation process served a useful purpose by providing a vehicle for problem definition for subsequent resolution by regulatory or political means.

2. The Project

The project being planned is a 500 kV transmission line required for reinforcement of B. C. Hydro's transmission system in southwestern British Columbia. It would become an integral component of a grid comprised of a number of existing 230 kV, 360 kV, and 500 kV transmission lines connecting generating plants in B. C.'s interior with major load centres on the southwest coast. (See figures 1 and 2)

The transmission line would be approximately 200 kilometres in length. It was originally planned as a double-circuit line, but substantial reductions in expected long term load growth caused it to be changed to a single circuit line during the planning process. The route would traverse rugged and spectacular mountainous terrain, beginning at Kelly Lake Substation in B. C.'s southern Interior region near the village of Clinton, and travelling southwest to Cheekye Substation near Squamish on the Pacific coast, about 50 kilometres north of Vancouver. The 500 kV line would replace about 135 kilometres of existing 230 kV line, using as much of the established right of way as possible.

The mountainous terrain and deep cut valleys caused the range of suitable routes to be severely restricted. While populations along the route are relatively sparse, the limited usable land is congested with roads, rail, several existing transmission lines, homesteads, Indian reserves, villages, and ski resorts.

3. The Project Planning Process

(i) Legislative

Route selection and construction approval for major transmission lines in British Columbia must comply with certain provincial government requirements. Specifically, since 1980 major energy generation, transmission, and storage facilities became regulated under the Utilities Commission Act, which requires that an Energy Project Certificate be issued prior to construction. The B. C. Utilities Commission was also established under the Act as the agency responsible for utility regulation.

Under this Act the provincial government, in early 1982, issued a "Guide to the Energy Project Review Process". In addition to requirements for information on the project description, project justification, and environmental impacts, the guide included the provision that:

> "An Application (for an Energy Project Certificate) must contain a description of the applicant's public information and consultation program. This should include a report on public notices, meetings and workshops, and other public consultation. It should contain a summary of information dissemination, public responses, major issues and concerns, and potential resolution of such issues and concerns."

Prior to publication of the above Energy Project Review Process guide, linear projects such as transmission lines, pipelines, railways, etc., were planned in accordance with the government's "Guidelines to Linear Developments", issued in 1977 under the authority of its Environment and Land Use Committee. These guidelines were also explicit in their requirement for public information and consultation as a component of the planning process.

It should be noted that while provincial regulations call for public information/consultation as part of the planning process, they do not specify what the particulars of the program should be. The objectives, extent, and content of the public information/consultation process are up to the individual proponents to decide.

In this respect B. C. Hydro was somewhat ahead of the game, having on its own initiative in the early 1970's decided that more project information and public dialogue was essential to an effective planning process, and established the Community Relations Department with this responsibility. In fact that project planning steps eventually stipulated by the government followed closely the model developed by B. C. Hydro, thus conformity with the guidelines presented little difficulty.

Planning for the Kelly Lake - Cheekye transmission line was begun in 1979 under the Linear Guidelines, and continued in 1982 under the Energy Project Review Process. While this required some changes in terminology, the basic procedures were similar.

(ii) Corporate

When B. C. Hydro's system planning indicates that a major transmission project will be necessary at some future date, the first step is the preparation of a Prospectus, as required under the Energy Project Review Process. The prospectus provides information to the government (and the public) on the project being planned, its characteristics, rationale, and the scope of the proposed study program to be undertaken - including public consultation.

The second step is to proceed with preliminary route location and impact studies. These are done in two basic parts: (a) technical and economic; and (b) environmental and social.

The information from these studies comes together in a single Preliminary Planning Report, which evaluates the alternative basic corridor options in terms of both their technical and environmental feasibility, and identifies a preferred basic corridor, along which the final route - or right of way - would be located.

The Preliminary Planning Report then becomes the basic discussion document for public information and dialogue, as well as for preliminary review by appropriate government resource management ministries. This report also contains terms of reference for detailed environmental studies that will be required for subsequent project application. Following comment received from both the public and government ministries, a final corridor is selected for detailed route location studies, preparatory to making application for the Energy Project Certificate.

For the Kelly Lake - Cheekye project, which was being planned prior to the Energy Project Review Process, a Stage I Summary Report was published in 1981 under the provisions of the former "guidelines", and this became the basic document for public discussion.

Upon receipt of the Application for an Energy Project Certificate, the government then decides whether the project can be either: (i) approved for construction without further process, or (ii) referred to the B. C. Utilities Commission for public hearings and further review, with a recommendation sent back to government for final decision. The Kelly Lake - Cheekye project has not yet reached the application stage.

4. The Public Consultation Process

(i) Policy Context

As outlined above, while major project planning procedures preparatory to an application for an Energy Project Certificate require that there be a public information/consultation program, they do not specify its objectives or content. These are up to each individual project proponent. In this respect B. C. Hydro has developed its program with the following purpose and objectives:

Purpose - to ensure that any group or individual who is affected by, interested in, or concerned about major generating plants or transmission lines being planned is:

(a) informed about plans at an early stage;

(b) aware of the planning and decision-making process;

(c) provided with information on the project and its potential impacts;

(d) provided with opportunities to consult with members of the project planning team before final decisions are made.

The objectives of the program are:

(a) to enable Hydro to make more informed and responsive decisions;

(b) to arrive at the end of the planning process with no "surprises" for either Hydro or the public; and

(c) to identify and resolve as many problems as possible prior to formal Utility Commission hearings for project approval.

In other words, its aim is to incorporate public concerns in the planning process alongside the usual planning inputs such as engineering, environmental, financial, legal, land use, etc.

It should be noted that, contrary to the expectations of some members of the public, neither consensus nor shared decision-making are specifically sought as objectives of the program. Consensus is pursued as a highly desireable result of the program, but in some cases it will not be achieved - nor is it essential for informed decision-making. Similarly shared decision-making may be a desireable ideal, but it does not recognize that responsibility for the results of decisions usually can not be shared, and Hydro alone must be accountable to the government and its customers for its decisions. Thus Hydro's planning objectives are primarily openness, accessibility, and "no surprises" so that both sides can be fully informed preparatory to whatever decisions or actions they may take.

(ii) Procedures and Methods

The basic steps in conducting the program are as follows:

- Develop a program strategy, and a plan;
- Identify the participants (e.g. provincial political representatives, regional and local governments, Indian bands, citizen interest groups, media, schools and colleges, etc.);
- Establish contact with participants;
- Provide information on project and planning process;
- Establish procedures and clarify expectations;
- Develop dialogue on impacts and issues;
- Document public concerns and comments, and follow them through to decisions;
- Respond to public;
- Summarize and report.

In conducting its program one of Hydro's basic principles is to seek a relatively large number of small informal meetings rather than a smaller number of large meetings. While the numbers of participants may be similar in each case, the smaller meetings usually enable much more effective dialogue.

(iii) Participants

B. C. Hydro participants in the Kelly Lake - Cheekye planning process included members of the project planning team representing transmission planning, engineering design, properties, electrical operations and environmental consultants.

Externally, participants included provincial government elected representatives, officials of resource management ministries, regional and local governments (both elected and administrative), property owners, Indian bands, and private citizens.

While the actual numbers of participants was not large - possibly not exceeding a total of 300 - the social spectrum was broad, and all key interests were represented.

(iv) Information Provided

Information provided as the basis for dialogue and consultation was in three basic categories:

(a) Project-specific. This included a project Prospectus, Stage I Summary Report (e.g. Preliminary Planning Report), engineering feasibility report on route alternatives, environmental impact studies, and a supplementary report on additional route alternatives (five publications).

(b) General. This included reports on corporate system planning, general perspectives on energy planning, land acquisition policies and procedures, transmission planning criteria, biological and electrical effects of high-voltage transmission lines, vegetation management, and safety precautions re transmission lines (12 publications).

(c) Government. Guide to the Energy Review Process, Guidelines for Linear Developments (two publications).

(v) Consultation Process

During the period October 1980 to March 1983 a total of 61 meetings were held with various public groups and government officials. In addition to verbal comments and letters, nine briefs and submissions were received.

During the process 29 issues or concerns were identified and documented. These ranged all the way from corporate objectives and project justification to specific impacts of the transmission line, such as biological field effects, herbicides, visual impacts, water supplies, and right of way location.

5. The Course of Events

(i) Background

Route location for major transmission lines can be expected to cause friction between those who are planning them and those who may be affected by them. While problems may not always be resolved to the satisfaction of all concerned, the issues can usually be well defined and each side will have a clear idea of the other's viewpoint, whether they agree with it or not.

In this respect the Kelly Lake - Cheekye project public consultation process took some unusual turns. Through misconceptions, legitimate misunderstandings, and some stubborness on both sides the communication problems in some respects seemed to grow larger and more complex with increased efforts to resolve them, rather than smaller and better defined.

For the record it should be noted that this was not the case with the entire project. On the northern (Kelly Lake) segment, and the southern (Cheekye) segment communications were more effective. Following thorough discussion, community representatives appeared to be prepared to live with the transmission line so long as certain conditions regarding specific right of way locations were met.

Difficulties arose primarily in the central part of the study area, in the Pemberton-Anderson Lake segment. There were a number of reasons for this, principally arising from: Hydro's legacy of previous transmission projects in the area; the project's changing characteristics; differences in perception between Hydro and the local public on the justification for the project; and different interpretations of the role of the government in the planning process.

(ii) B. C. Hydro's Legacy in the Project Area

The study region is already heavily impacted by existing transmission lines. With the first transmission line in the 1940's, followed by new lines in the 1950's and 1960's, there are now, in one short section of the Gates - Birken Valley area north of Pemberton, four existing transmission lines: two at 230 kV, one at 360 kV, and one at 500 kV. Further south in the Whistler - Cheekye area this reduces to three lines: two at 230 kV and one at 500 kV. The valley is also impacted by a highway, a railway, and a network of logging roads. (These latter do, however, provide direct local benefit in the way of services and revenue).

The region is characterized by spectacular mountain scenery but limited usable valley land. The residents are independent by nature, and very protective of their region; particularly when decisions affecting it are being made by "outsiders".

High voltage transmission lines often intrude on the landscape with no direct benefits to local residents in terms of services or revenues, and in many instances the original lines in this region traversed properties where local power supply was unavailable. In this respect the historical existence of several transmission lines, and the somewhat heavy handed negotiations that are reported to have sometimes accompanied them, left a well of local resentment that put Hydro's planning team for the Kelly Lake - Cheekye project in a hole to start with. Despite the fact that the new line would not be an addition, but would replace an existing lower voltage line, long time residents received the news of yet another transmission line with the response "Not again! Why us? We have paid our dues! Go elsewhere and take your existing lines with you!"

As a result of public discussion a number of modifications to the right of way were proposed that would ease some of the problems of proximity and visible impact caused by the existing 230 kV line. However many residents were not interested in such "cosmetic" solutions. Not only did they reject the idea of a new 500 kV line - regardless of its location - but they also wanted the existing 230 kV line removed as well.

(iii) Changing Project Characteristics

As public discussion proceeded the ground under the planning team kept shifting.

The Kelly Lake - Cheekye project was introduced to the public in early 1980 as a double circuit 500 kV transmission line with a completion date of 1988. It was described as a system expansion project required to strengthen B. C. Hydro's transmission grid by linking two major substations - Kelly Lake in the southern Interior and Cheekye on the south coast.

In some respects justification was difficult to explain publicly because the project was not required simply to connect a specific generation project to the system, or to serve any specific load centre. B. C. Hydro's system plan at the time required that a number of potential generation projects be studied as alternatives to meet future load growth. These included both hydroelectric (Site C, Homathko) and thermal (Hat Creek, Quesnel) projects in B. C.'s interior. Kelly Lake substation was the focal point for transmitting energy from any or all of these to southern B. C. and Vancouver Island load centres. Further, the project as planned would replace one of the older 230 kV lines already in place, and it was deemed practical to re-use the existing right of way for much of the new line's length rather than create a new right of way that would be costly and difficult to acquire.

However a double circuit 500 kV line is an imposing structure at the best of times (equivalent in height to a 15 storey building) and local public reaction to this new potential intrusion on their valley was strong, regardless of its justification, or the merits of using an existing right of way.

Meanwhile, during the heat of public discussion, the circumstances that determined the size and timing of the project were changing. Shrinking load growth caused the planners to re-think the need for a double circuit line and about mid-1982 it was established that only a single circuit line could be justified. Also the timing of the project was becoming less certain as the need for new generating plants diminished. None of this, however, could be officially communicated to the public because it was part of a system plan that did not, at the time, have final corporate approval. Thus, while corporate Hydro held firm officially, it became necessary to "informally" advise the local public of changes in the size and timing of the project. The long delay in formal corporate announcement in the face of obviously changing project justification only increased public skepticism about Hydro's openness and flexibility, and undermined the credibility of the project planning team in public.

(iv) Perceptions of the Problem

Hydro and local residents viewed the problem from different ends of the telescope.

In addition to studies of near term generation and transmission proposals that were directly related to the need for the Kelly Lake - Cheekye project, Hydro was studying two gigantic potential hydroelectric developments in northern B. C. on the Stikine and Liard Rivers. Either, or both, could well require a separate transmission system to reach the southern B. C. load centres that would by-pass the Kelly Lake substation and possibly avoid much of the Kelly Lake - Cheekye study area. Hydro had published preliminary information on the northern projects that indicated a possible need for a new substation somewhere in the vicinity of Pemberton (called Creekside Substation) as a focal point for northern transmission lines if they were eventually needed. In addition Hydro was investigating the potential for geothermal energy at Meager Creek, west of Pemberton.

These projects were long term alternatives that presented Hydro with different route location problems at another - more distant - time. Their presence on the horizon did, however, introduce future possibilities that alarmed local residents (more transmission lines?) but also offered a potential solution to their problem - that is, why not plan the Kelly Lake - Cheekye route in a way that would be integrated with the northern transmission lines or the geothermal site in the long term? This could not only remove the threat of a new twin circuit 500 kV line from their valley, but also enable one of the existing 230 kV lines to be removed, as planned.

This proposal made theoretical sense in the long term but would entail additional up front capital expenditures of $150 to $300 million for the Kelly Lake - Cheekye line based upon uncertain possibilities. These were costs for which Hydro could find no justification. Nor could Hydro find justification for spending money on for impact studies for such speculative and costly route options for the Kelly Lake - Cheekye project.

Thus while Hydro viewed the Kelly Lake - Cheekye transmission line as a stand-alone, straight forward solution to a specific transmission problem (e.g. connect two substations), the local residents viewed it as a small and flexible component of a large and changing system. Hydro wanted to discuss a specific project, the public wanted to discuss systems.

Thus Hydro's project staff were reluctantly "backed up" into attempting to de-mystify the complexities of electrical systems under changing future scenarios in the pressure cooker of public meetings. What appeared on the surface to be simple questions required complex answers, and any hesitations or qualifications in responding were viewed as evasions or bafflegab. Attempts by Hydro staff to restrict discussion to "the problem at hand" resulted in somewhat unfair accusations of tunnel vision or unwillingness to disclose information about some mysterious "master plan". Communications on this issue gave rise to a good deal of exasperation on both sides as each sought to relate the general to the specific, or the specific to the general.

Hydro eventually took the view that while it would be fully prepared to discuss the complex matter of total system planning and project justification in complete detail, with all the necessary technical data and professional judgements, for the B. C. Utilities Commission, it could not do so for every questioner along the way. In other words, a full performance with full supporting cast, but in one place at one time.

Local residents were asked to wait in good faith, and in the meantime get on with discussing specific project impacts and available location options within the context of the study parameters established by Hydro.

The local residents' view was that the regulatory hearing came too late in the game - that justification should be established at the beginning of the process, not the end. They were concerned that any cooperative discussions with Hydro on "how" the project should be done would put them at a disadvantage during later hearings on "whether" the project should be done.

(v) Citizens and Governments

Dissatisfaction with the planning process led local residents to seek a referee well in advance of the involvement of the B. C. Utilities Commission.

Soon after public discussion began the combination of: (a) local concerns about the project; (b) public dissatisfaction with the project rationale; and (c) Hydro's unwillingness to seriously consider costly route alternatives that would avoid Pemberton and the Birkenhead and Gates Valleys, led to the formation of a citizens' coalition call PERC (Public Energy Review Coalition) as the focus for local residents' opposition to the project. This group was adept at obtaining publicity directed at discrediting Hydro for its seemingly narrow view of the situation, and its apparent lack of responsiveness to their concerns and proposals.

Eventually the PERC group, in seeking more information and different solutions, formed a "public advisory committee" - comprised primarily of PERC members - to represent local residents. The objectives of this group were to have more in-depth meetings with Hydro on a regular basis, ostensibly to obtain more detailed information, improve communications, and act as a link between Hydro and the community.

While Hydro staff were prepared to meet with this group at any time to continue project discussions, they were reluctant to recognize its special status as a "public advisory committee" in the role to which it had laid claim. This stance put Hydro in a somewhat awkward position because it has publicly supported the concept of public advisory committees as having a positive role in the consultation process, but only under certain conditions. These conditions are that advisory committees:

1. Should not by-pass elected officials, but be appointed by them.

2. Should represent a broad cross-section of the community.

3. Should be non-adversarial.

4. Should not necessarily require proof of project need to perform their function - which is to advise on "how", not "whether", a project should be planned.

5. Should be advisory only, and not expect to share in decision-making.

6. Should not necessarily have access to special information that is not also available to the public at large.

7. Should not expect Hydro to meet with them mutually exclusive of other interest groups in the community.

8. Are more useful in dense urban areas with large populations than for linear developments where small populations live in separate pockets within a large study area. Committee members from separate communities would have to travel long distances for meetings and would have difficulty advising on specific impacts in other areas.

Because the Kelly Lake - Cheekye advisory committee appeared to Hydro to be a self-appointed committee (independent of an elected body), unrepresentative of the "community at large", with adversarial origins, concerned primarily with whether (not how) the project should be planned, it did not fit Hydro's perception of an advisory committee. Hydro did, however, agree to meet with the committee at any time on the same basis as any other public group in the project area.

Hydro's reluctance to grant special advisory committee status was interpreted by the Committee as a refusal by Hydro to meet with them, and the resultant publicity exacerbated the widening communications gulf.

It was about this time that the PERC group sought and obtained a meeting with provincial government officials responsible for administering the energy project review process on the grounds that Hydro was not planning its project in accordance with government requirements. The meeting was held in Victoria in mid 1982 and included government staff and PERC representatives, the PERC group with legal counsel as its spokesman. Hydro project staff attended also, ostensibly as "observers". The meeting quickly focussed on the public consultation program, it being inferred that Hydro was not meeting its obligations as required by the Energy Project Review Process.

Because the meeting was billed as a review of the planning process only, Hydro staff responsible for the public consultation program were not in attendance. Thus one opportunity was lost to clarify that despite lack of consensus the program's primary objectives (full disclosure of relevant information, full public access to the planning staff, no "surprises" at the end of the planning process) were, despite disagreements, being met. The result was that government officials encouraged Hydro to recognize the advisory committee as a useful bridging mechanism to achieve "consensus". Hydro reiterated its willingness to meet with the committee, but under the circumstances of its structure and origins continued to resist granting special status.

Events by this time had reached a mutual stand-off between Hydro and the PERC group.

In the fall of 1982, again with legal counsel as spokesman, the PERC group succeeded in obtaining an audience with the provincial governments' Environment and Land Use Committee - a senior cabinet committee consisting of nine cabinet ministers. Hydro representatives were not in attendance. However the outcome seemed to be that the PERC group was advised to go back and work through elected regional officials. The net result was a more broadly based group, established as a committee of the Regional District - an elected body - without legal counsel.

This outcome effectively removed Hydro's concerns about the structure and accountability of the committee, and a meeting was subsequently arranged at which mutually acceptable terms of reference were developed.

It was also about this time (early 1983) that the need for the project was deferred by several more years owing to reduced load growth forecasts, and planning activity was suspended.

6. Conclusions

The foregoing outline appears to dwell more upon the difficulties associated with public dialogue than it does with solutions. In fact, many of the problems with public acceptance, right of way location, and project impacts were on their way to resolution through constructive public dialogue and responsive planning by

Hydro's project staff and consultants. However as with most events in day to day living, only the proportion that produced sparks "made the news".

This relatively small proportion is, however, relevant for analysis because it is the part that creates difficulties for both sides in a dialogue. Also small things can have significant consequences, and frequently signal larger problems ahead - or provide opportunities for doing things better.

With regard to the Kelly Lake - Cheekye project, three conclusions can be reached.

First, better bridging mechanisms are needed at an early stage in planning. On future projects, Hydro Community Relations staff should be alert to circumstances requiring special forums for dialogue (such as Advisory Committees) and initiate steps with local elected officials to establish a mutually acceptable format before positions become entrenched.

Second, the tendency to attempt to limit detailed discussion to specific stand-alone projects sometimes creates more problems than it resolves. In this respect more corporate effort should be directed towards providing clear written explanations, in layman's terms, of how the electric system planning process works, the kinds of judgements that must be made, and how specific projects fit within a total system.

Third, project planning staff can not always be expected to publicly explain and defend total system planning decisions and policies for which they are not responsible. Senior planning staff therefore have a stronger role to play in support of project staff, subject to the condition that effective forums (e.g. not large public meetings) can be developed in which this can be done.

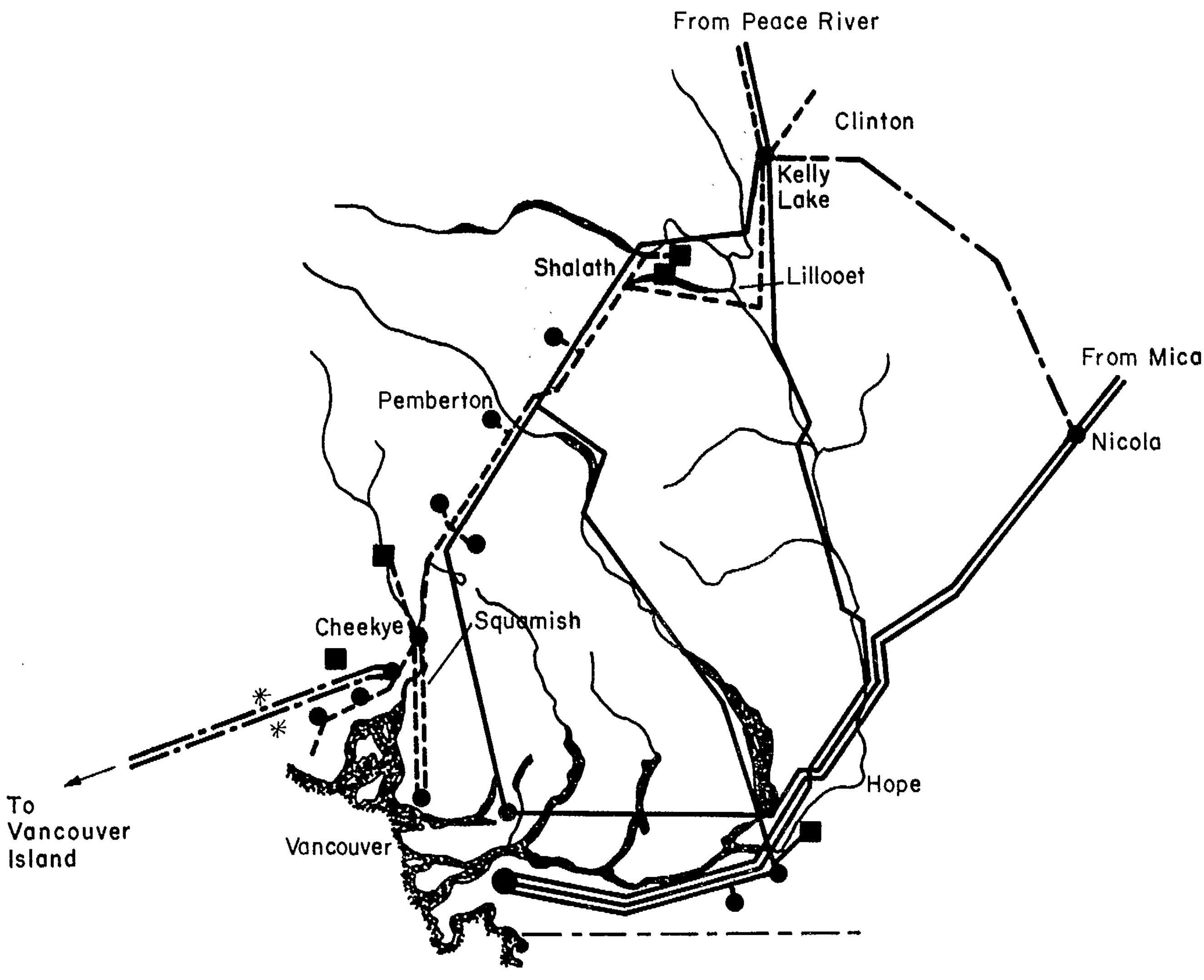
In general, it is clear that there is no way to tiptoe past the graveyard. Controversial projects cannot escape close scrutiny by the public. The only question is when the scrutiny will occur - early in the process when feathers are relatively unruffled, or late when positions are entrenched and further studies, delays, or design changes can be costly and embarrassing.

FIGURE 1

KELLY LAKE — CHEEKYE TRANSMISSION LINE STUDY AREA

FIGURE 2

B.C. HYDRO
LOWER MAINLAND TRANSMISSION GRID
INCLUDING LINES UNDER CONSTRUCTION



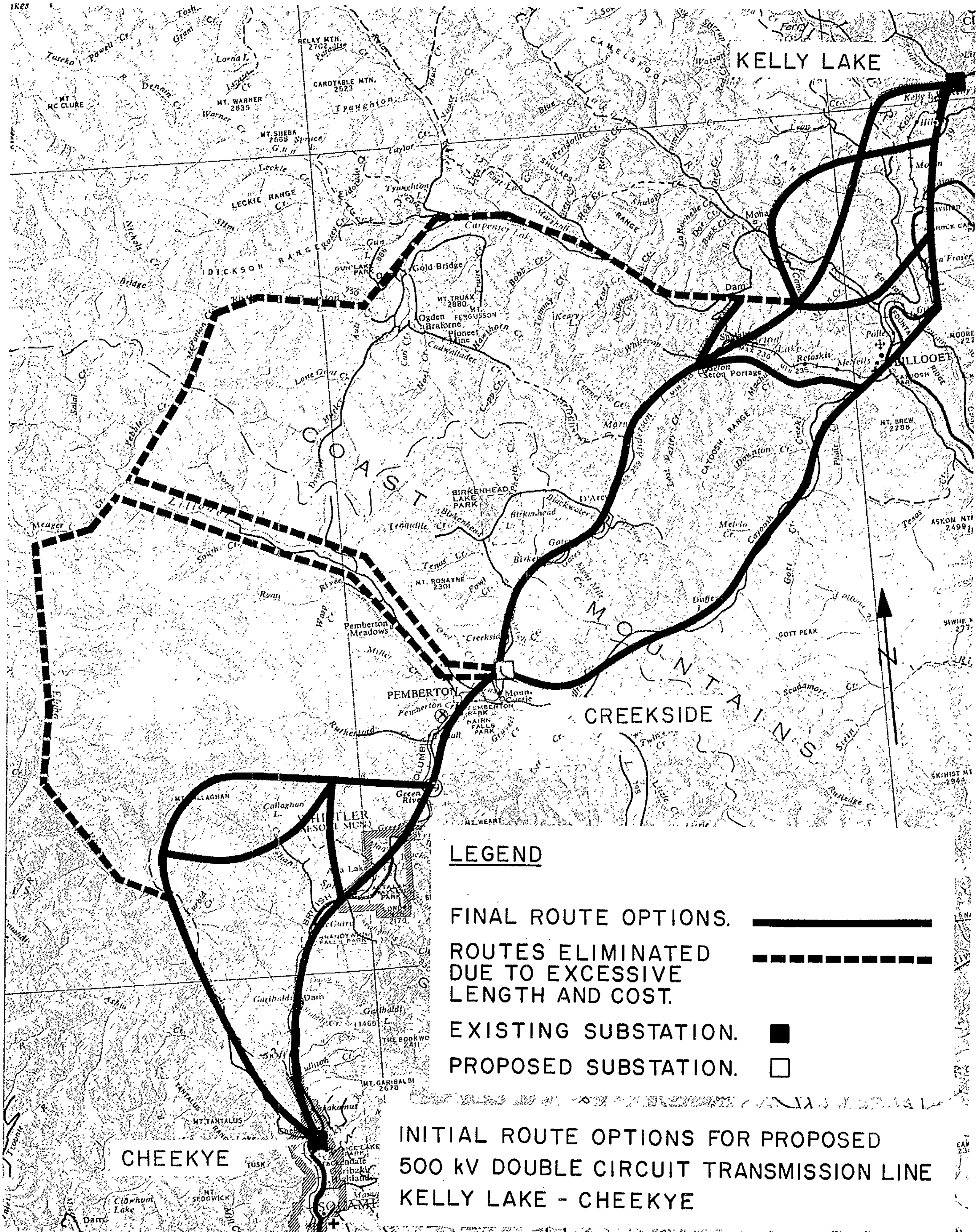
* UNDER CONSTRUCTION

LEGEND

- - - - - 230 & 287kV CIRCUITS
——— 360 & 500kV CIRCUITS
—·— FUTURE 500kV CIRCUITS
● SUBSTATIONS
■ HYDROELECTRIC GENERATION

DJC/KR
3JUN81

FIGURE 3


KELLY LAKE
CREEKSIDE
CHEEKYE
PEMBERTON
LEGEND
FINAL ROUTE OPTIONS.
ROUTES ELIMINATED DUE TO EXCESSIVE LENGTH AND COST.
EXISTING SUBSTATION.
PROPOSED SUBSTATION.
INITIAL ROUTE OPTIONS FOR PROPOSED 500 kV DOUBLE CIRCUIT TRANSMISSION LINE KELLY LAKE - CHEEKYE

A QUESTION OF BALANCE: PUBLIC PARTICIPATION IN ENVIRONMENTAL ASSESSMENT

Dale Ferns
Ontario Federation of Agriculture

ABSTRACT

Since the mid-seventies, various frameworks have existed at both the Federal and Provincial levels, requiring environmental approval for specific class projects. Our failure to develop a systematic approach to public participation and resolve the outstanding issues of public notice, form of involvement as well as funding, continues to comprise the entire environmental assessment process.

This paper reviews the approaches adopted and their inherent weaknesses. An appraisal is made of three case examples involving Ontario Hydro, TransCanada Pipelines Limited and the Ontario Ministry of Transportation and Communications.

It is suggested that Ontario Hydro's approach to public participation makes this Crown Corporation a clear leader.

INTRODUCTION

The seventies ushered in major changes to our traditional decision-making process. Our traditional way that served corporate and private interests so well in the preceding decades could not, when confronted with public demands for involvement, adjust.

Too often, development decisions were made exclusively on the grounds of favourable economic analysis, engineering or technical studies and just as often did not address the legitimate concerns of the public involved. Examples were numerous, but included utility and transportation projects where proponents utilized the best in Federal and Provincial expropriation legislation to push ahead projects regardless of local impact and concerns. It was a period that left its mark on society.

The public grew cynical that neither government nor corporate interests had the capacity to incorporate their concerns into the decision-making process. As a result of constant public pressure and the continual need to appoint special commissions and hearings, it became evident that a new process was needed. It was accepted that the traditional way was too inflexible, too narrow in scope, and based too much on in-house exercises to provide the public with a significant role in the decision-making process.

As an alternative decision-making process, environmental impact assessment (E.I.A.) was embraced. The process offered opportunities to both the proponent and the general public to assess alternatives, address the concerns of society and choose the best course of action. Although the process itself did not explicitly incorporate public participation as a fundamental and required step, it did clearly encourage the public's involvement.

ENVIRONMENTAL ASSESSMENT: A GENERAL OVERVIEW

It is necessary to review briefly the various approaches that have been adopted to undertake environmental assessment, if the role of public participation in this process is to be defined clearly.

Essentially, there are two general approaches to environmental impact assessment. The first approach encompasses policy statements and guidelines, while the more preferred approach from the perspective of public interest groups relies on legislation.

In the case of guidelines and statements, a number of examples may be cited, including the Federal Government's Environmental Assessment Review Process (E.A.R.P.) which has been in effect since 1973. The legislative approach is exemplified by Ontario's Environmental Assessment Act passed in 1975 and still felt by many to be a major and comprehensive piece of environmental legislation.

In addition, environmental impact statements E.I.S., which in our view, should not be confused with E.I.A., may be required by regulatory authorities such as the National Energy Board or the Ontario Energy Board. Proponents are required to undertake and file comprehensive inventories on the impact of their proposals and mitigating measures to be undertaken.

In each case, the intention of the approach whether guidelines, an order, regulation or rules of procedure and practice of the approval authority or legislation is to ensure that the decision-maker is provided with the widest possible information base, that all options have been considered, their impacts determined and addressed.

Clearly, the ultimate goal of this entire process is the selection of the best possible option which addresses in balance the economic, social and environmental needs of the public, as well as the legitimate development goals of the proponent. It is also clear that the public has an important and fundamental role to play, if the process is to work to the benefit of all parties.

The Federal Approach

As noted earlier, the Federal Government adopted a systematic approach to environmental assessment as early as 1973. Prior to the adoption of E.A.R.P. such reviews were sporadic.

The Federal approach ensures that the following three goals are achieved:

(1) That environmental effects are taken into account early in the planning of new Federal projects, programs and activities.

(2) That an environmental assessment is carried out for all projects which may have an adverse affect on the environment before commitments or irrevocable decisions are made. Projects with potentially significant environmental effects are submitted to the Department of Environment for review.

(3) That the results of these assessments are used in planning, decision-making and implementation.

Unfortunately, the process restricts the role of the public to the hearings stage. In fact, the Federal agency initiating or sponsoring the projects may as an in-house decision, by-pass the public by declaring the project has no significant environmental affects. The public's role during this crucial phase of the process is very limited.

Amendments are continually being made, however, it is unlikely the process will be incorporated into legislation in the forseeable future.

Clearly, the Federal process is narrow in application and far too limited to provide a meaningful vehicle for public involvement. Fundamental changes would be required to the process to meet the minimum standards essential for public participation.

The Provincial Approach

In 1975, the Ontario Provincial Government recognized the opportunities inherent in the environmental assessment decision-making process and passed a comprehensive form of environmental legislation incorporating this process.

The purpose of Ontario's Environmental Assessment Act, as stated in Section 2 of the legislation is, "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment."

Unlike Federal E.A.R.P., this legislative approach requires public notice to be made following the Ministry of Environment's review. The actual timing of this notice is not clear, but public notice is mandatory which is an important improvement over the Federal approach.

Following public notice, submissions from interested parties may be made to the Minister. If a request is made for a hearing or the Minister feels a hearing should be conducted, the proposal is then referred to the Environmental Assessment Board for a public hearing.

In the event additional approvals are required as a result of other legislation, then the proposal is referred to the Consolidated Hearings Board for one hearing. This includes approvals required by; Environmental Assessment Act, Environmental Protection Act, Expropriations Act, Municipal Act, Municipality of Metropolitan Toronto Act, Niagara Escarpment Planning and Development Act, Ontario Municipal Board Act, Ontario Water Resources Act, Parkway Belt Planning and Development Act, Planning Act, Regional Municipality of Ottawa-Carleton Act, Regional Municipality of York Act. This legislated process eliminates the need for multiple hearings under various Acts and as a result, reduces expense and time delays for all parties associated with multiple hearings. However, it also makes the involvement of the public in the early stages of the development process even more crucial. Failure to participate by the public leaves them with no other forum to debate the proposals.

The Environmental Assessment Act also provides for a streamlined approval process for minor projects termed class projects. Class projects are characterized by the following conditions; (1) occur frequently and apply to existing facilities or minor new developments, (2) result in predictable and minor environmental impacts, (3) result from common and identified needs and deficiencies and (4) the process of construction and implementation is the same.

The stated purpose of class environmental assessments is to specify a planning process which will ensure that environmental effects are taken into account and approval gained without the necessity of undergoing public examination and an E.A.B. hearing. In effect, this procedure allows for full environmental assessment without public involvement on specific projects. However, proponents using this process generally incorporate public notice to add a measure of fairness.

The Class Environmental Assessment Process also involves provisions to permit the project to be bumped up to full environmental assessment requiring a public hearing. This may be accomplished by the general public requesting individual environmental assessment, by the proponent, in the event unexpected environmental impacts were identified during the initial E.A., or by the Minister.

The major problems associated with class assessments are; (1) the limited involvement of the public in the process, particularly in determining whether the project should undergo individual E.A., (2) the reliance on the proponent and the Ministry of Environment to decide what is severe environmental impact, and (3) the problem of adequate public notice.

Unfortunately, the role of the public under Ontario's Environmental Assessment legislation is poorly defined. The Act makes no provision for and does not explicitly require public involvement for individual or class environmental assessments. The public is afforded only the opportunity to participate at the approvals hearings, if one is required.

Other Approaches

Unlike public undertakings at either the Federal or Provincial level, private development projects are exempt from the E.I.A. process. However, in the case of national or provincial utility companies, regulatory authorities do require detailed environmental information to be filed.

In the case of national utility companies such as TransCanada Pipelines Limited, the National Energy Board (N.E.B.) requires under Part VI of the Board's Rules of Practice and Procedure, that proponents file detailed environmental information on the proposed route as well as the alternative routes considered. Information required includes physical data on soil, plant, wildlife and water resources, as well as information on current land use, planned use, settlement patterns, and land capability. In addition, the proponent is required to file information on the measures to be taken to mitigate impacts and their assessment on the residual impacts.

The N.E.B. does not require the applicant to involve the public in the development process, but does require that the applicant provide notice of the application to the public. The manner of such notice is left up to the applicant, but is closely reviewed by the Board in order to ensure fairness.

Unfortunately, by not requiring public involvement, the proponent is left in the position of determining the scope and support of such involvement. In the event of an in-house decision, the proponent's objectives will likely determine the form of public participation. This is a crucial point because it leaves the proponent in a difficult and extremely vulnerable position if the program selected is viewed as inadequate by the public.

In Ontario, Provincial utilities, except Ontario Hydro, are regulated by the Ontario Energy Board (O.E.B.). In these cases, the Board requires that all applicants adhere to Board environmental guidelines.

The guidelines specify the data to be collected and filed, provides basic routing guidelines, as well as construction practices to the applicant. In addition, the Board appoints an inspector to ensure the applicant complies with Board terms and conditions.

As a direct result of O.E.B. guidelines and in recognition of the need to reassess environmental practices, most utility companies in Ontario have undertaken extensive programs involving the public to identify construction problem areas and their correction, in addition to contacting the public before proceeding to the approvals stage. These initiatives are still in their infancy, but they do represent positive responses to the demands being made by the public.

The O.E.B., however, does not require that the public participate during the development or approval stage, nor does the Board provide financial support for public intervenors either directly or by awarding costs.

Summary

Although public involvement in the environmental assessment process is not required, it is apparent that it is to the benefit of all parties that public participation play a major role in the decision-making process. The general goodwill of all proponents to address the question of public involvement and its level must be recognized as positive support for such undertakings. However, by failing to address the key remaining issues of proper notice and funding, we risk compromising public participation as a meaningful exercise and with it, the environmental assessment decision-making process itself.

Public Participation Issues

There are four major issues that compromise public participation and with it, the environmental assessment process.

The first problem concerns providing adequate public notice, the second, access to information, the third, financial support for public involvement and the last, the issue of confidentiality.

Public Notice

The issue of providing proper public notice to all parties is considered essential. Generally guidelines, or if legislation applies, require that the proponent or in some cases the government ministry reviewing the environmental assessment document undertake to provide public notice. In such cases, the notice provides thirty days of lead time before a decision is made on accepting the E.A. with or without a hearing.

Notice formally provides the public with the right to respond to proponent proposals. It is therefore essential that public notification be in such a manner as to notify as many members of the public as can reasonably be expected.

Compliance to legislative or regulatory agency requirements for public notice often places the proponent in a difficult position. For example, legal requirements are for the most part considered inadequate by the public. The inadequate thirty day time period often leaves intervenors in the position of requesting additional time when the application appears before the hearings board, or may result in the proponent being severely criticized for lack of early public involvement by the media. Such actions affect the proponent's ability to complete any approved project within the time schedule desired and translate into financial losses which could have been avoided if proper attention and care to detail had been made.

A prime example of compliance to legal requirements not being sufficient, can be found in Ontario Hydro's Bruce to Milton plans for new high voltage transmission facilities in the mid-seventies. Here the utility complied with all legal requirements, but faced costly construction delays as a result of public opposition along the entire route. In fact, construction was delayed to the point that the utility company was forced to reassess its planning procedures and practices. Unfortunately, damage had been done to the reputation of this Crown Crorporation and it still persists.

Problems of inadequate public notice can be addressed by the involvement of the public at the early proposal development stages. In fact, by actively supporting public participation programs well before legal notice is required blunts public and media criticism during later stages of the process, particularly if the proponent uses public participation as a method to determine the form and timing of advanced general public notice. Such practices not only build commitment between the proponent and the public groups involved, but act as a screening mechanism for the proponent.

Access To Information

The problems associated with full disclosure of information also pose difficult hurdles for effective public involvement. Inadequate disclosure, including withholding information vital to the proposal or releasing highly technical and voluminous reports compromise the entire activity.

It is fundamental to the public participation process that studies, background data and reports be available for inspection. It is the proponent's responsibility to ensure such documents are free of technical jargon and are available in such a manner as to expedite public review. By involving the public as early as possible in the planning process, the proponent can avoid the pitfalls associated with complex proposals by permitting careful and informed review over a suitable period of time.

Public Funding

Few issues cause more debate than requests from the public for proponent funding of their review activities. The common view remains that the public acting out of their own self-interest on a volunteer basis should be prepared to accept the cost of public participation in order to influence the decision-making process. Let's examine this view in light of the objectives of public participation.

As volunteers, the public is dependent upon the proponent's goodwill to conduct their review. By restricting support, the proponent can effectively reduce public involvement and yet claim public participation was a major component of their planning process. The predictable result of this scenario is the public continues to criticize the proponent for failing to involve them at an early stage and opposes project plans. Once again, the proponent is vulnerable to such criticism.

A few proponents such as Ontario Hydro have to a limited degree experimented with private funding of Provincial working committees for non-development activities. For the most part, this approach has been positively received by those involved and would, if incorporated into the general public participation program for major projects, produce superior results for the efforts presently being made. It would also answer definitively any criticism of a proponent's commitment to the principles of public participation.

Confidentiality

For the proponent, questions regarding trade secrets, contracts, financial sources are considered to be off-limits in any public participation program. However, from the stand point of public participation, the question is one of necessity. The test should be if the data is absolutely essential to arriving at a particular conclusion or option supported by the proponent, then it should be made available to the public working committees.

The proponent should address the issue early in the public participation process through its working groups or Provincial Committee. A suitable method should be possible on how such information should be released, its format, as well as its detail.

Summary

The issues of notice, confidentiality, access to information and funding must be addressed by the proponent in the early stages of public participation. By employing Provincial as well as local public committees, it is possible for the proponent to identify the issues early in the planning process.

THE ROLE OF PUBLIC PARTICIPATION

Public participation is a mechanism to permit individuals, special interest groups, and the community at large, the opportunity to express their views and influence the decision-making process. Its principles are:

(1) To provide a forum for public interest groups and individuals to consider and comment on the need for the project and options that could address the identified need.
(2) To provide a mechanism for local groups to contribute their own concerns and specific details.
(3) To provide the proponent a forum to present proposals to the general public and the planning process and time frame being considered.

The Royal Commission on Electric Power Planning in Ontario noted, "public participation is a complex issue that requires careful analysis to determine its uses, limits and appropriate forms. In many cases, it also requires a significant change in attitude, an acceptance that valuable contributions can come from the non-expert and a willingness to allow such contributions to form a significant input to the decision process". The Commission also noted and rightly so, that "there is no single, monolithic public interest in our society, and it's therefore wrong to expect any one group to represent the public".

The evolution of public participation programs and techniques continually attempt to address the issues noted by the Commission, mainly the involvement of the widest possible public interest base and the need for the proponent to rely on and incorporate public input into the decision-making process.

Public participation can be categorized into four general types or classes; educational, informational, consultative, and shared or joint planning. Each form has specific limits and depending upon the objectives of the proponent may be selected on that basis.

(a) Educational Approach. Perhaps the most basic approach, educational public participation programs are designed to inform and convince the public of the proponents proposal. The underlying assumption of the approach assumes the public's understanding of the issues and complexities of the proposal is very limited. Activities include holding public information meetings, public speaking engagements and media campaigns. The approach is not intended for incorporation of public input into the decision processes.

This approach is so basic that few, if any, proponents use the approach exclusively.

(b) Informational Approach. The informational or feedback approach represents the first approach to involve the public in decision-making. Under this form the public is asked to comment on planning information, alternatives and proposals. The objective is to gather information and feedback into the decision-making process. In addition to the educational media and public involvement activities, the approach uses field trips and citizen committees as techniques for involvement.

Unfortunately, the public is skeptical of such approaches because crucial areas of the proposals such as need studies are not open for discussion. In addition, the technique fails to incorporate legitimate public comments into the proposals and reduces the activities to a mere public relations function.

(c) Consultative Approach. A more advanced form of public participation addresses the need of the public to play a meaningful role in the decision-making process. Under the consultative approach, the public is encouraged through citizen groups and Provincial working committees to express their local concerns, review study areas, alternatives and proposals. Public comments are documented in the environmental assessment report and are usually noted by the proponent if not incorporated into the proposals. Some areas of concern, namely on questions of project need are not considered and this continues to be a major drawback to this form of public participation.

(d) Joint Or Shared Planning Approach. If the public is to informed on the proposals and is to be encouraged to participate, then it is essential that they feel that their involvement is regarded by the proponent to be essential to the decision-making process. One technique to achieve this objective is for the proponent to make full disclosure of information leading to the developments of their initial proposals. Obviously, such an approach places the public in a decision-making capacity.

By means of small workshops, citizen and Provincial Committees, all issues regarding a specific project are examined including questions on need. By working in close association with the proponent, it is conceivable that a proposal supported by the bulk of participants can be developed and offered for approval. However, co-sponsorship is a very difficult goal.

Provincial Advisory Groups

Provincial interest groups or associations such as the Ontario Federation of Agriculture, play a key role in resolving macro-planning and public participation issues that face a prospective proponent.

These groups, representing many interests and members, can assist the proponent in determining the general planning principles that should be addressed in the proposal, in determining the process for involving the public to best solicit local public involvement and what public participation activities should be undertaken. Additionally, the proponent can involve such groups in assessing their general planning methodology and practices and system principles.

An example of how such involvement can produce benefits to the proponent is again illustrated by Ontario Hydro. In the mid-seventies, Provincial agricultural groups and government ministries were solicited by Ontario Hydro to assist in the development of an environmental methodology for transmission route planning. The formation of an agricultural working group fully supported by Ontario Hydro, produced basic guidelines for the utility in routing and siting generation and transmission facilities. Their first report An Approach To Classifying And Ranking Ontario Foodlands (1976), identified a methodology which could be applied to agricultural lands in order to determine their relative importance. A later report, Provincial Overview of Generation

Siting, The Agricultural Report (1979), addressed the issues associated with siting generation stations in agricultural areas. For example, the effects of emissions on pollutant-sensitive crops and the effect of hydro development on agricultural communities were examined and base maps developed to guide planners. These activities were fully supported by the utility and resources made available to the working groups in order to carry out their objectives. Both reports continue to be used in the planning and review process.

Ontario Hydro also undertook in 1981 a review of their public participation programs by involving Provincial associations and organizations. The findings of the sixty organizations involved representing agriculture, business, environment, municipal government, recreation and resource interests, confirmed that Ontario Hydro's public participation program was not only comprehensive, but clearly the most advanced approach adopted to-date.

Ontario Hydro's attitude to include Provincial advisory groups in the pre-planning stages is essential. It allows the utility to identify issues early and permits their early resolution with public input.

Local Organizations/General Public

Due to the very nature of planning large scale projects, it is impossible for most Provincial associations including O.F.A., to advise the proponent on specifics. On that basis it is essential that the proponent not rely exclusively on Provincial advisory committees, but develop local public participation programs that will solicit local input.

Three major difficulties face the proponent. First, the proponent is likely an unknown commodity; second, any local involvement is usually on a volunteer basis which limits involvement; and third, scheduling requirements may be unrealistic.

The problem of visibility is not new nor is it likely to be resolved without a great deal of effort on the part of prospective proponents. Unfortunately, proponents who rely on Provincial level organizations fail to understand that such organizations rarely can transfer goodwill that may have developed during Provincial reviews. In fact, Provincial associations are limited unusually to making local organizations aware that a project is being proposed, the approvals process to be followed in determining whether the proposal is acceptable, specific information on compensation and construction practices of the proponents and in encouraging their local organizations to be involved.

In achieving local involvement, the proponent usually will rely on small public workshops, citizen committees and public information meetings. Such programs require the proponent to provide resource staff, support materials, and at a minimum, expenses for such items as meeting halls. Again, the key to a successful program at the local level is lead time. It is absolutely essential that the public be provided enough time to review and comment on proposals. The results of such a program should provide beneficial feedback, in fact, an effective local public participation program not only provides the proponent with specific details and local concerns, but if employed properly provides a measure of local acceptability of the proposal before the hearings stage.

Case Illustrations

Throughout this paper, the role of public participation has been highlighted, the problems associated with public involvement as well as the benefits that such an activity can produce. Given that the form of public involvement is left to the discretion of the proponent, it is important to review very briefly the techniques employed.

(A) Ontario Hydro

Operating as the second largest utility in North America and employing over 20,000, the development activities of this utility includes large numbers of class, as well as individual environmental assessment projects. Since 1975, the utility has slowly developed with the assistance of public input, a well formulated public participation plan to address planning issues associated with both types of projects.

One area of excellence has been Ontario Hydro's public participation program directed towards addressing the needs of Provincial organizations. As noted earlier, Provincial agricultural organizations have been involved in advising Ontario Hydro on macro-planning issues.

Ontario Hydro's current program involves two major activities; media and public involvement activities,on an impressive scale. The former activity includes all forms of media to advise local residents that the utility is proposing specific developments in their area. The latter involves the formation of citizen working committees, liaison committees, workshops and Provincial working groups.

Each activity has been developed to make the citizen aware of the proposals, their opportunities to become involved, the need for the projects and as well, the opportunities that exist to discuss options. In effect, the utility has attempted to open up the planning process in order to satisfy the objectives noted earlier for good public participation programs.

The utility's program involves several exceptional aspects, including the staff and financial resources committed to the programs, the lead time provided to conduct program activities, and the multifaceted approach of the program and the extensive involvement of many interested groups. The areas of weakness include the lack of financial support for public participants and local associations in reviewing proposals, the lack of public involvement during the need study stage, the reluctance of the utility to call on or rely on working groups to substantiate their positions during the hearings stage and finally, a general reliance on Provincial associations and organizations to convey to their local organizations the goodwill of the utility rather than develop long-term programs to develop local understanding and familarity.

Overall, the public participation program of Ontario Hydro ranks as well above average.

(B) TransCanada Pipelines Limited

Although a major inter-provincial pipeline company, the development activities of this utility are much less extensive than Ontario Hydro's. For the most part, development consists of line upgrading and looping of existing facilities. As a result, the extent of T.C.P.L. public participation program reflect these conditions.

Recently, T.C.P.L. undertook a major project to supply natural gas to the Montreal area. Existing facilities were judged to be insignificant, necessitating the construction of a major line through agricultural areas. Recognizing the need to involve Provincial as well as local agricultural groups, T.C.P.L. undertook a limited public participation program in order to familiarize affected parties with their proposal and gain their comments.

The program consisted of a series of meetings between T.C.P.L. staff and O.F.A. on the proposals and reasons for the proposed route. In addition, local organizations of O.F.A. in the agricultural regions to be impacted arranged large scale public meetings for the utility and thereby provided a forum for T.C.P.L. to present their proposals and hear the concerns of local residents. The public meetings also facilitated the exchange of information which in some cases lead T.C.P.L. to modify the proposed route in order to avoid prime agricultural land and systematic tile drainage.

T.C.P.L. actively supported local agricultural working committees that reviewed the specifics of the route and their impact. In addition, T.C.P.L. accepted agricultural proposals to retain agricultural drainage experts nominated and/or approved by the local agricultural working committees. Finally, T.C.P.L. developed an effective landowner's guide to inform all affected landowners of the proposal, approvals process, construction practises and compensation policies.

The positive aspects of the program included the reliance on local agricultural organizations to comment on the route, the early contact with Provincial organizations, the professional staff and financial resources provided for public meetings and local committees in their review, and the production of effective printed material to be distributed to all landowners at the time of filing of the application. The problem areas included the narrow scope of the program itself limiting discussion to the proposed route, the inadequate lead time provided to inform the public and conduct independent studies, the lack of financial support for intervenors.

The program initiated by T.C.P.L. relied heavily on Provincial and agricultural organizations to provide a forum for public meetings and although, generally effective, it did lead to charges of inadequate notice by some individuals. The program was considered to be generally effective, given the implied objectives of the utility.

(C) Ontario Ministry Of Transportation And Communications (M.T.C.)

Since the passage of the Environmental Assessment Act in 1975, the Ministry of Transportation and Communications has slowly altered their planning process in order to take into account public concerns. Unfortunately, their program of public participation continues to lag behind the efforts of private and Crown Corporations.

In Ontario, the last decade has seen a marked decline in new highway construction with expansion limited to extending existing highways for the most part. However, the Ministry is heavily involved in highway realignment, and some expansion of existing roads within current right-of-ways. A large percentage of these projects, like in the case of Ontario Hydro and T.C.P.L., occur in rural agricultural settings.

Individual and class environmental assessment procedures adhered to by the ministry require at a minimum, public notice of the proposals planned. As a result the ministry does conduct limited public participation programs.

Unlike Ontario Hydro or TransCanada Pipelines Limited, ministry programs are generally characterized by a lack of O.F.A. provincial level involvement. The relationship has been characterized by a lack of involvement in the preliminary stages, plans for public participation, plans for printed material to be circulated to affected landowners, compensation policies or construction practices. Such areas from a Provincial perspective continue to be very much in-house exercises.

Public participation programs of M.T.C. also rely heavily on the initiative of interested parties to comment on circulated proposals. This approach is again significantly different from the approaches pursued by Ontario Hydro and TransCanada Pipelines Limited. Provision is made for routine public participation activities such as general public meetings and information centres, but special interest groups such as agriculture are generally in the position of having to request special meetings to discuss their concerns. Again, this approach is unlike the other approaches reviewed in this paper.

In our view, current Ministry programs are extremely limited in scope, face severe time restraints, rely too heavily on individual initiatives, lack the necessary involvement of Provincial organizations, and generally convey the attitude that the Ministry views public participation as a secondary or minor activity in the planning process.

In considering the approaches of Ontario Hydro and T.C.P.L., the program is judged to be poor overall.

SUMMARY/RECOMMENDATIONS

In O.F.A.'s view, an effective public participation program achieves the following objectives:

(1) provides a forum to present and discuss information,
(2) enables interested parties to comment on proposals at each stage of the approvals process,
(3) provides the public with an opportunity to consider need, alternatives and options, and
(4) allows interested groups and individuals to contribute a local perspective.

Various approaches and techniques exist to solicit and encourage public involvement during the development, planning and approval stages of the environmental assessment process in order to achieve the noted objectives of such a program. Techniques may include citizen committees, workshops, information centres, and Provincial study committees. However, the failure of current guidelines and legislation to recognize the essential role that public participation can and should play in the decision-making process has resulted in a variety of ad hoc approaches largely dependent upon the proponent. Clearly, Ontario Hydro has developed an impressive public participation program and currently provides the best case example of how effective public programs can influence the decision-making process.

The Following Recommendations Are Offered

1. That Provincial and Federal approaches, whether guidelines or legislation, be amended to require public participation as a mandatory condition for undertaking individual environmental assessment. In the case of Ontario class environmental assessments, it is recommended that an environmental advisory committee be established to review requests to submit proposals for individual environmental assessment. The findings of the advisory committee to be reported to the responsible Minister.

2. That legislation or guidelines be amended to encourage proponents

to financially assist public involvement in the approvals process.

3. That proponents view Provincial advisory committees as an essential component of their public participation program.

4. That proponents include the filing of a minority report in any environmental assessment document.

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ASSESSING SOCIAL IMPACTS IN AN ENERGY-FROM-WASTE PROJECT

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ABSTRACT

This paper describes a survey-based approach that was used to assess the social impacts of an energy-from-waste plant in London, Ontario. It compares the impacts perceived to be most important by local residents with quantitative predictions made by the proponent and identifies existing levels of knowledge and concern about the proposed project. The implications, for the approval process, of a discrepancy between public perceptions and "scientific" predictions are discussed and the usefulness of social survey methods in general is evaluated.

INTRODUCTION

Social impact assessment is a young and rapidly evolving field. One of the neglected tools of social impact assessment is the social survey. For this paper, we discuss the need for social surveys in facility siting and illustrate the usefulness of the survey approach with a case study of an environmental assessment of an Energy-from-waste (EFW) facility in London, Ontario. A questionnaire was distributed to a stratified random sample of 120 households in the immediate area of the proposed facility. The survey generated an enormous amount of information, but we have chosen, in this paper, to examine only selected aspects of the results. Specifically, we investigaged:

(a) descrepancies between the Environmental Assessment (EA) document and the survey results on predicted impacts of the three alternatives;

(b) the level of knowledge about impacts, as reflected in the proportion of residents unable to make predictions about possible impacts; and

(c) the values placed by the local community on a number of environmental and economic concerns.

In all cases, we also test the extent of spatial variation in the responses.

THE NEED FOR SOCIAL SURVEYS IN FACILITY SITING

While most agencies would agree that there is a need for a public participation programme during the siting study and planning phase of a project, few recognize the value of more formal opinion surveys. In fact of the nine projects that have gone before an environmental hearing board in Ontario, none has included the results of a scientifically conducted opinion survey in its submissions.

While there are many reasons why such surveys are not conducted (Jaakson, 1984), it is our belief that they constitute an important supplement to any public participation programme based on public meetings, content analysis of newspapers, or submissions by experts and local interest groups, since they permit valid inferences to be made about the opinion of the whole population. Such surveys or mini-surveys as Finsterbusch (1977) calls them, can be carried out in a cost-effective manner and are particularly useful for generating descriptive information, rough estimations of univariate distributions and some simple two-variable relationships.

Planners and decision-makers are often ambivalent about the perceptions and attitudes revealed by traditional public participation programmes: some pay too much attention to the "activists" in the well-organized and vocal interest groups because of the perceived power that they wield; others discount the opinions of such groups because they reflect the attitudes of small, self-interested segments of society and not those, it is supposed, of the general public (Willeke, 1977).

In our view, any decision based on either type of perception is equally erroneous since, without a survey, it is impossible to know whether, and to what degree, these special interest groups do or do not reflect the opinions of the "silent majority".

A properly conducted random-sample survey can provide the following types of information:

1) the existing levels of knowledge about a proposed project and its alternatives;
2) the nature and magnitude of the perceived impacts of the alternatives, both positive and negative;
3) the relative importance attached by the community to each component of the impacted environment, and
4) the degree of apathy, opposition or support for each of the alternatives.

Existing Levels of Knowledge

Unless the public has basic information about the proposed project and its alternatives, it is impossible for its members to make informed judgements about possible impacts and what their effect will be. Lack of such information will often result in groundless fears and, as our study shows, opposition to all alternatives.

A survey will reveal both the type and the spatial distribution within the community of deficient knowledge and suggest appropriate efforts that can be made to remedy the situation. If it is a large community, the location of the most uninformed public will be known and these areas can be specially "targetted".

The Nature and Magnitude of the Perceived Impacts

Even where there is a basic knowledge about the project being proposed, there may still be fears expressed about the impacts that are real, groundless, or appear groundless to the proponent. Where the fears are justified, the survey will provide the proponent and regulatory agency with better information as to where the fears are most strongly felt and appropriate mitigation measures can be proposed to allay them. Where the concerns are groundless, or appear to be groundless, correct information about the predicted impacts and the probability of their occurrence can be supplied, especially to those locations where there are the highest levels of unjustified concerns. It may also happen that the survey will reveal to the proponent and regulatory agencies concerns about project impacts that the latter were unaware of and which can then be addressed.

The Relative Importance of Environmental Components

If a properly conducted EIA is being carried out, the proponents and the regulatory agency should want information not only about the actual and perceived impacts, both positive and negative, but also the importance that different publics attach to the various components of the environment impacted. The "weights" obtained from the publics and from the various agencies concerned could then be used, together with the magnitude of impacts, to arrive at the "best" alternative.

This type of information is most useful to have, because many studies have shown (Whyte, 1977) that there are significant differences of opinion among experts and publics about the importance of different components of the environment. Serious planning errors can arise, and powerful opposition can be generated when the hierarchy of concerns about components of local environments is perceived differently by experts and public. For example, a great deal of effort may be devoted to reducing noise levels when the real concern is about traffic safety.

The Degree of Support for the Project

A survey provides objective information about the levels of opposition, apathy or support for a project which cannot be obtained through the normal public participation channels; it will indicate to what degree those levels are common to both the activist public and the silent majority and to what degree they differ. Hence, it will also indicate whether vocal groups are really voicing widely held concerns or just promoting their own limited interests.

It is very important that proponents and regulatory agencies are aware of the concerns of the silent majority during the hearing and planning phases of a project. A carefully designed survey can distinguish among the various sub-groups of the "silent majority". There are those who are concerned about the general environmental and social issues, but who, have not made their voice heard. Another sub-group belongs to the "not-in my-backyard" category. Their concerns are site specific and evaporate if another location is proposed. A third sub-group are the apathetic - who neither know nor care to know, about the issues involved.

A knowledge of both the size and the spatial distribution of each of these sub-groups is useful in a number of ways. Once the distribution of the concerned but "non-activist" components of the public have been identified, they can be encouraged to contribute to the decision-making process through specailly designed programmes. It may also be useful to know the location of the "apathetic" sub-group, particularly in cases where several candidate sites have been selected, so that those with the lowest "opposition", or most apathy, can be identified (Sherman, 1978).

It is important that these sub-groups of the silent majority be determined by surveys at an early stage of project design and site selection to avoid serious opposition and greater delays at some later stage.

A classical exmaple of the failure to do this has been the recent courtcase to overturn a hearing board selection of a specific hydro corridor because it had neglected to make provision for opposition to that route being voiced (Toronto Globe and Mail, 1984).

In addition to the benefits described above, surveys have an important legitimizing function in the public participation process. Opinion surveys are now accepted by the public as a legitimate basis for decisions, ranging from product marketing strategies to the formulation of complex governmental policies. Thus, if a survey is added to the other public participation programmes in the environmental assessment process, it will not only provide additional information, but will serve to legitimize the process as a whole. To achieve this legitimacy, of course, it is desirable that such surveys be carried out by an organization that is independent of the proponent.

THE CASE STUDY

A Brief History

In 1982 Victoria Hospital submitted an Environmental Assessment document (Victoria Hospital Corporation, 1982) to the Ontario Ministry of Environment for a proposed EFW facility on the Hospital's Westminster Campus in London, Ontario.

Victoria Hospital is presently served by an outdated energy plant which draws electricity from the public utility and generates heat from natural gas. The electrical installation needs to be upgraded and the boilers replaced in order to maintain present service and supply energy to planned future developments.

The facilities of the Hospital lie on 325 acres of land in south London. A 250-bed psychiatric hospital already exists on the site and two additional buildings, a 340-bed general hospital and a 450-bed chronic care hospital are now under construction. An extensive portion of the south and east sections of the property remains undeveloped. This area is heavily wooded and contains three small bodies of water known as Westminster Ponds. The proposed location for the EFW plant is in the north east corner of the property on abandoned agricultural land. This site is roughly in the centre of a large area of residential land use, that lies within 400 to 2500 metres of the proposed plant.

The feasibility study for an EFW facility, using either solid waste or solid waste and sewage sludge, was conducted by the Hospital in 1980 and 1981 (ECE Group, 1981). The Hospital presented the results of this study at public meetings held in the spring and summer of 1981. In November, 1981, a number of ratepayers' groups joined together to form the Citizen's Coalition to Maintain the Environment. As a result of the public meetings and communications between the Hospital and the Coalition, the City of London, and the Ontario Ministry of Environment , the Hospital decided to ask the Ministry of Environment to make the proposed plant subject to the Ontario Environmental Assessment Act. Since the Hospital is privately rather than publicly owned, it would not have been subject to the Act unless it specifically requested that it be so applied. Victoria Hospital was the first private environmental assessment in the history of the Ontario Environmental Assessment Act, the first assessment of an EFW facility, and only the second assessment to be heard by a Joint Board under the 1981 Consolidated Hearings Act. Thus, in many ways, it was a landmark case for environmental assessment in Ontario.

The Hospital held an additional public meeting in February 1982, and then filed its Environmental Assessment document in July, 1982. The Hospital was given the opportunity to reply to the Ministry's review of the EA document before it was submitted to the Environmental Assessment Board (ECE Group, 1982). The Environmental hearings began in February and concluded in June 1983.

The following alternatives evaluated in the EA document were considered at the hearing:

A. Conventional Plant. This plant would use electricity from the municipal public utility and generate steam from natural gas with a fuel oil standby.

B. Energy from Waste Plant (Solid Waste). This plant would generate steam by incinerating municipal solid waste and would co-generate electricity. The plant would be equipped with a backup fossil fuel boiler plant and would process 300 tons of garbage per day. Burning solid waste at the plant will extend the lifetime of the City of London's landfill site by four years.

C. Energy from Waste Plant (Solid Waste and Sewage Sludge). This plant would be similar to the EFW Solid Waste plant, but it would also extract energy from incineration of sewage sludge cake. The partially dried sludge would be transported by truck to the EFW plant from the Greenway waste management facility three and a half miles away. The Ministry of Environment has issued a control order for the replacement of the sewage sludge incineration unit at Greenway. The EFW Solid Waste/Sewage Sludge plant will remove the need for the City of London to construct a new incinerator at Greenway.

There were five parties represented at the hearings. The Hospital, the City of London, and the Ontario Ministry of Energy all supported an EFW facility with solid waste and sewage sludge. The Ministry of Environment also supported the Solid Waste/Sewage Sludge facility, but expressed concern about a number of environmental factors. Their primary concern was that they were not convinced that the plant would meet all of the criteria, standards, guidelines and provisional guidelines for air emissions.

The Citizen's Coalition neither opposed nor favoured any of the alternatives. They felt that their primary role was to ensure that a thorough critique of all the alternatives was presented to the Board and that neighbourhood interests were protected. Since the proponent, namely the Hospital, favoured either type of EFW facility over a conventional plant, these facilities were the main focus of the Coalition's criticism. The coalition felt that the EA document had not addressed the following concerns adequately (Citizen's Coalition for a Safe Environment, 1982).

(a) noise levels
(b) traffic flows
(c) property values
(d) economic feasibility
(e) ownership of the plant
(f) dioxin and furon emissions
(g) other pollutants, such as NO_{x1}, SO_2
(h) ecological sensitivity of the Westminster ponds area.

(i) effect on plants and animals
(j) health effects
(k) use of an unproven technology for the EFW plant
(l) odours

After 50 days of hearings, the Environmental Assessment Board decided to accept the EA document; subject to 17 conditions (Joint Consolidated Hearings Board, 1983). Ten of these conditions were related to air quality controls and monitoring, the remainder were related to ownership, complaint and performance review procedures, pathological wastes, and odour controls.

Structure of the Survey

The survey was conducted by students from the University of Toronto as part of a joint graduate/undergraduate course in environmental impact assessment and distributed in March, 1983, during the Environmental Assessment Board Hearings. There were 24 questions in the questionnaire, covering six main topics: (a) respondent's perceptions about predicted impacts of the three alternatives on different aspects of the environment; (b) value placed by the respondent on a number of economic and environmental costs and benefits likely to be generated by the project; (c) extent and type of public participation to date; (d) a direct question about which alternative the respondent preferred; (e) plant management; (f) location of the respondent's place of residence in the survey area.

The questions were prepared in consultation with the Citizen's Coalition and the Ontario Ministry of Environment. The format of the questionnaire was pretested on students at the University of Toronto.

The first set of questions on predicted impacts asked the respondents to indicate the degree of impact they felt each of the three alternatives might have in their neighbourhood on, among others: air pollution, odours, water pollution in Westminister Ponds, loose litter, destruction of plants and animals, cost of London's waste management programme, dust and ash problems, local tax rate, and property values. The degree of impact was measured on a seven point scale, ranging from "large increase" to "no change" to "large decrease". The questions also included a "don't know" category.

The second set of questions asked respondents to allocate an amount of money, from $0 to $100, to each of 12 environmental and economic criteria according to their desire to see a reduction in the relative levels of those criteria. An allocation of $100 to any criterion indicated the highest level of concern possible for that criteron and an allocation of $1 is the lowest level possible.

Further details on the two sets of questions described above, and the remaining questions is provided by a copy of selected questions from the questionnaire in the Appendix.

The sample taken was a stratified random sample of 120 household in the target area indicated by figure 1. Approximately equal proportions of households were drawn from each neighbourhood surrounding the proposed plant. Five groups of two people each distributed the questionnaire during a two-hour period on a weekday morning and collected them that evening. If the questionnaire had not been completed by that time, the householder was asked to return it as soon as possible in a stamped, pre-addressed envelope. Before receiving the questionnaire, the household was asked whether he or she had heard of the EFW project. If the householder had not heard of the project, then the household was excluded from the survey. Sixty-three questionnaires were returned altogether, of which about 10% were mail-backs.

Survey Results

Prediction Discrepancies Between the EA Document and the Survey Results. In this section, we examine the predicted impact discrepancies found between the Hospital's EA document and the survey results for 10 environmental and economic criteria. As noted in the previous sections, the existence of prediction discrepances can have important implications for the proponent. Tables 1 to 3 describe the discrepancies for each of the three alternatives. We have chosen the median response category for each question as a summary measure of the local community's views, and have attempted to place the Hospital's EA impact predictions for each of the alternatives onto the same scale. In most cases, applying the seven-point scale to the Hospital predictions was fairly straight forward, but, in two cases, more than one interpretation of the appropriate category assignment was possible.

The Hospital's predictions for traffic flow impacts were a 26% increase in truck flows for the solid waste EFW facility and a 30% increase for the solid waste/sewage sludge EFW facility. We consider both of these to be "moderate" increases. Interpreting the air pollution impact was more difficult. In comparing the two EFW facilities to the conventional plant, the Hospital EA predicted that maximum ground level concentrations of NO_2 would be 10 and 11 times higher than a conventional plant, for the solid waste and solid waste/sewage sludge facility, respectively; 12 and 13 times higher for ACl; and 9 times higher for SO_2 at both facilities. None of the concentrations will exceed provincial standards. We therefore consider increases in air pollution levels attributable to both facilities to be "moderate" increases.

It is immediately apparent from Table 1 that there are few prediction discrepancies between the Hospital and the survey about impacts from the conventional plant. The median response in the survey was one category higher than the Hospital's prediction only for air pollution and local tax rates. Table 2 displays a wider range of discrepancies. The median response in the survey is one category higher than the Hospital's for waste management

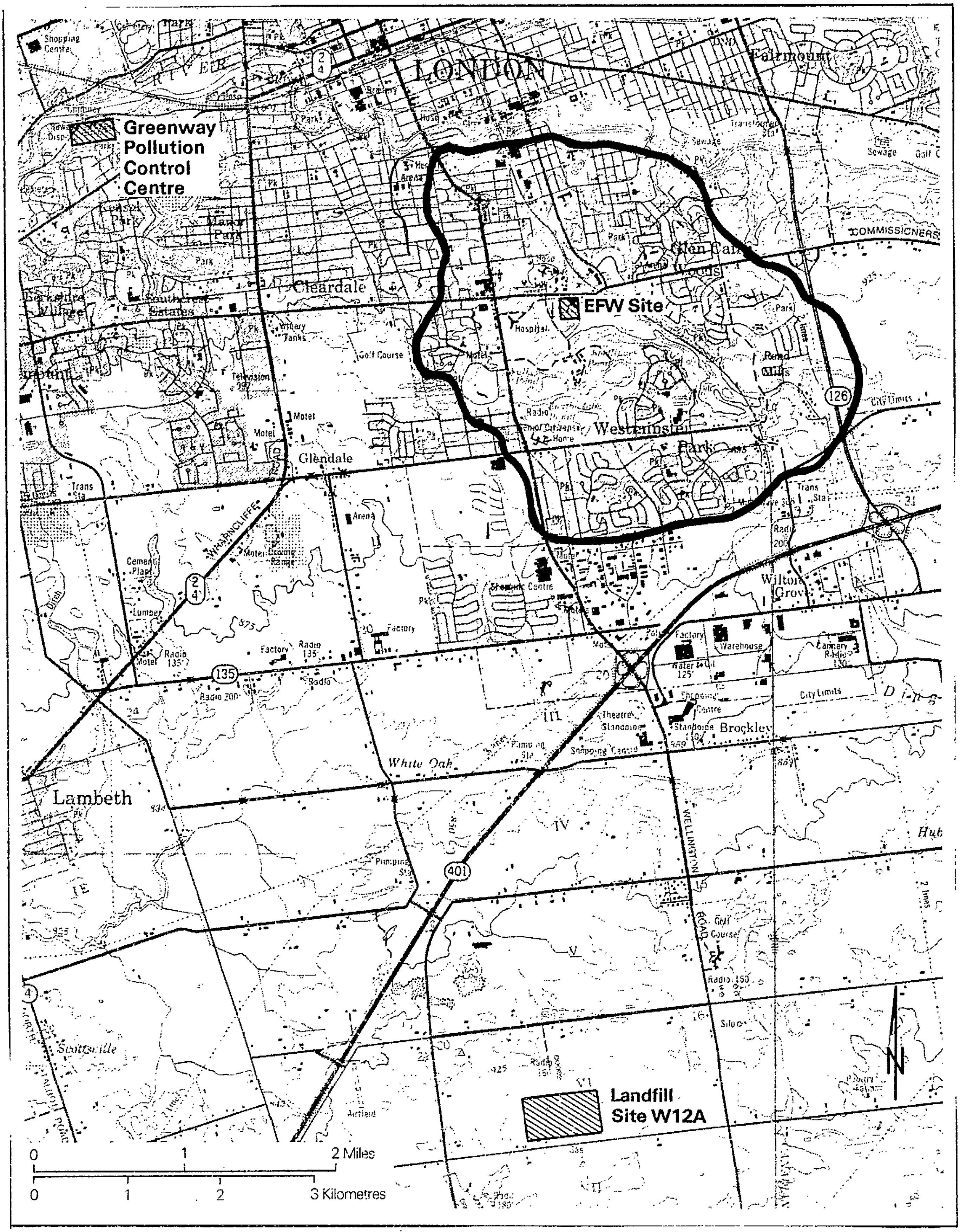

Figure 1: Victoria Hospital energy-from-waste site and sample-survey area.

Table 1* Comparison of Survey Responses and Hospital Predictions for Conventional Plant Impacts

	Large Increase	Moderate Increase	Slight Increase	No Change	Slight Decrease	Moderate Decrease	Large Decrease	Don't Know†
(a) waste management costs				S/H				35%
(b) traffic volume				S/H				24%
(c) property values				S/H				21%
(d) pollution in ponds				S/H				44%
(e) loose litter				S/H				46%
(f) odours				S/H				44%
(g) air pollution			S	H				17%
(h) dust and ash				S/H				21%
(i) tax rate			S	H				30%
(j) plants and animals				S/H				24%

* S = median response category in Survey
H = Hospital's predictions

† % of survey respondents answering 'don't know' to that question

Table 2 Comparison of Survey Responses and Hospital Predictions for Solid Waste Plant Impacts

		Large Increase	Moderate Increase	Slight Increase	No Change	Slight Decrease	Moderate Decrease	Large Decrease	Don't Know†
(a)	waste management costs			S	H				32%
(b)	traffic volume		S/H						20%
(c)	property values				H	S			22%
(d)	pollution in ponds			S	H				46%
(e)	loose litter				S/H				43%
(f)	odours		S		H				40%
(g)	air pollution		S/H						22%
(h)	dust and ash		S		H				21%
(i)	tax rate			S	H				32%
(j)	plants and animals			S	H				22%

Table 3 Comparison of Survey Responses and Hospital Predictions for Solid Waste/Sewage Sludge Plant Impacts

	Large Increase	Moderate Increase	Slight Increase	No Change	Slight Decrease	Moderate Decrease	Large Decrease	Don't Know
(a) waste management costs			S	H				32%
(b) traffic volume		S/H						20%
(c) property values				H		S		22%
(d) pollution in ponds		S		H				46%
(e) loose litter				S/H				46%
(f) odours	S			H				40%
(g) air pollution	S	H						19%
(h) dust and ash		S		H				20%
(i) tax rate			S	H				32%
(j) plants and animals			S	H				21%

costs, property values, pollution in Westminster Ponds, local tax rate, and destruction of plants and animals. There is a more serious discrepancy for odours and dust and ash problems, where the survey median response is two categories higher than the Hospital's prediction.

As indicated by Table 3, the solid waste/sewage sludge EFW facility generates the most and largest prediction discrepancies of the three alternatives. The median response in the survey is one category higher than the Hospital's predictions for waste management costs, local tax rate, destruction of plants and animals, and air pollution. It is two categories higher for property values, pollution in Westminster Ponds, and dust and ash problems, and three categories higher for odours. Obviously, the community's fear about an increase in odours from the solid waste/sewage sludge facility is the most important impact that the Hospital should address when attempting to reconcile the above discrepancies. These is a distinct trend in the severity of the prediction discrepancies from slight to most severe as the technology of the proposed plant moves along the scale of conventional to innovative. This is not surprising, given that less is generally known by the public and, frequently by the proponent, about innovative technologies than conventional ones.

None of the discrepancies discussed above displayed any spatial variation. A Kolmogrov-Smirnov test of the North and West areas of the sample against the South and East areas found that there were no significant differences (α = .05) in response distributions to each question between the two area.

The "Don't Know" Category. In order to evaluate a respondent's perceived level of knowledge about predicted impacts, each respondent was assigned a score from zero to 36, reflecting the number of times he or she had responded "don't know" to the 36 questions on predicted impacts of the three alternatives. Fifteen respondents, or 24% of the samples received a score of zero, indicating that they never responded in the "don't know" category for a question. Seven respondents or 11% of the sample, received a score of 36, meaning that they answered "don't know" to every single question. Just over 3/4 of the respondents were uncertain about the potential impacts of one or more alternatives on one or more aspects of the environment.

Table 1 to 3 also present the response distribution of "don't knows" for each of the impact questions about the three alternatives. A Cochran Q test (α = .05) indicated that the proportion of those replying "don't know" to each question did not vary significantly across the three alternatives. In other words, if a respondent did not know what the potential impact of one alternative would be, then it was unlikely that he or she would be knowledgeable about that particular impact for any other alternative. This suggests that attempts to increase the level of knowledge about potential impacts in the community should focus on all alternatives, not just one or two.

Finally, Table 4 describes the distribution of responses to a question that asked respondents to indicate whether they favoured one or more of the three alternatives. Three missing responses are not included in the table. The table also presents the average level of knowledge about impacts for those favouring one of the three alternatives or no alternative at all. An analysis of variance ($\alpha = 0.05$) indicated that those opposed to all of the alternatives (i.e. those choosing the 'none' category) had a significantly lower average level of knowledge about impacts than those favouring one of the alternatives. Additionally, there was no significant difference in average level of knowledge among those favouring one of the three alternatives. The implications of this result are that increasing community knowledge about the types of potential environmental impacts of the alternatives through, for example, information programmes, will tend to increase the number of people favouring at least one of the three alternatives. The analysis does not lead to predictions about which alternatives will receive more support but does suggest that high knowledge levels will reduce negative attitudes towards the construction of any plant on the site.

	Conventional	Solid waste	Sewage sludge	None
Number of respondents	30	9	15	6
Average knowledge score *	10.7	13.7	10.3	24.7

Table 4: Average level of knowledge of respondents favouring one or more of the alternatives.

Valuation of Criteria. Table 5 presents summary data on responses to questions about valuation of environmental and economic concerns. The table is broken down into eight categories, according to direction of the Hospital from the respondent's place of residence. Recall that larger dollar values allocated to any criterion indicate greater concern about that criterion. Respondents value air pollution more than any other criterion and value development costs for the hospital least. Respondents in the South and East quadrants of the sample (identified in table 5 as 'North", 'Northwest' and 'West') generally valued all criteria at a higher level than did other respondents. However, a one-way analysis of variance performed on all of the Criteria indicated that only the valuation of air pollution was significantly ($\alpha = .05$) higher in the South East quadrants.

* Note that higher scores indicate increasing lack of knowledge.

Direction of the Hospital from Respondent's Place of Residence

Concern	North (m=10)	Northwest (m=4)	West (m=3)	Southwest (m=1)	South (m=11)	Southeast (m-9)	East (m=8)	Northeast (m-8)	Question Average (m=54)
Air pollution	85.4	96.3	100.0	100.0	77.7	67.1	55.6	86.5	78.1
Odours	78.8	85.0	93.3	80.0	78.2	51.0	78.6	61.4	72.8
Plants and Animals	80.5	70.0	91.7	90.0	68.6	59.4	65.6	63.6	70.0
Ponds	81.5	61.3	90.0	90.0	65.0	54.4	66.8	63.1	67.9
Dust and Ash	73.3	88.6	73.3	90.0	75.5	59.9	46.9	70.8	68.5
Property values	67.2	43.8	70.0	99.0	59.6	51.1	50.5	49.3	56.8
Litter	64.3	72.5	63.3	90.0	63.1	32.7	53.1	51.4	56.2
Noise levels	65.2	37.5	53.3	90.0	60.9	44.5	45.0	52.1	53.7
Energy Efficiency	68.0	44.0	75.0	90.0	29.1	51.2	43.1	56.9	50.5
Traffic Flows	42.3	55.0	63.3	90.0	46.8	46.7	48.3	25.1	45.7
City Costs	44.4	32.5	62.5	0.0	21.4	28.3	39.4	43.8	34.8
Hospital Costs	35.1	28.7	12.5	0.0	24.1	23.2	33.7	15.7	25.7
Direction Average	65.5	59.6	70.7	75.8	55.8	47.5	52.2	52.0	

Table 5: Average Dollar Value Assigned by Respondents to Different Concerns.

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

Surveys can be a valuable tool in the assessment of the social impacts of a project. They can be used to discover the views of the "silent majority" and determine whether those views differ significantly from those of the "activists" and the proponent. The Victoria Hospital case study provided several examples of discrepancies in impact predictions between those made by the proponent and those perceived by the local community. It also revealed that level of knowledge about impacts had a significant effect on an individual's decision to favour one of the given alternatives.

Finally, the case demonstrated how surveys can be useful in evaluating a community's environmental concerns.

For large and controversial projects, where the hearing process extends over a long period of time and where opinions, attitudes, and concerns may change, future research is required in the use of continuous opinion monitoring systems. For example, a sub-sample of the various groups already identified in a preliminary survey could be retained during the hearing, planning, construction and operation phases to monitor the community's changing concerns about the project. This will allow proponents and regulatory agencies to make appropriate respones at an early stage before widespread opposition develops.

Additional research is required into the timing of surveys; the role of surveys in providing as well as gathering information about projects (Jaakson, 1984) and the design of survey instruments and techniques to elucidate the most pertinent information on the magnitude and the importance of the perceived impacts.

Research must also be conducted on how to make the most effective use of information gathered in surveys in the hearing and decision-making process.

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APPENDIX

EFW Questionnaire

The following three alternatives are being considered to supply energy for Victoria Hospital:

Alternative A: Conventional energy plant using natural gas oil and electricity;

Alternative B: An energy-from-waste plant using municipal solid waste.

Alternative C: An energy-from-waste plant using municipal waste and sewage sludge.

1. We would like to know what you think will be the positive and/or negative effects of each of the above alternatives. Please check the appropriate boxes and add any comments in the spaces provided below for each alternative A, B, and C.

(a) Change in the cost of London's waste management programme

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't Know
A. conventional	______	______	______	______	______	______	______	______
B. solid waste	______	______	______	______	______	______	______	______
C. solid/sludge	______	______	______	______	______	______	______	______

(b) Change in traffic volume in your neighbourhood

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional	______	______	______	______	______	______	______	______
B. solid waste	______	______	______	______	______	______	______	______
C. solid/sludge	______	______	______	______	______	______	______	______

(c) Change in property values in your neighbourhood

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional	______	______	______	______	______	______	______	______
B. solid waste	______	______	______	______	______	______	______	______
C. solid/sludge	______	______	______	______	______	______	______	______

(d) Pollution in ponds near the hospital site

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional								
B. solid waste								
C. solid/sludge								

(e) Loose litter in your neighbourhood

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional								
B. solid waste								
C. solid/sludge								

(f) Odours in your neighbourhood

	Large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional								
B. solid waste								
C. solid/sludge								

(g) Change in air pollution in your neighbourhood

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional								
B. solid waste								
C. solid/sludge								

(h) Dust and ash in your neighbourhood

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional								
B. solid waste								
C. solid/sludge								

(i) Effect on your local tax rate

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional	____	____	____	____	____	____	____	____
B. solid waste	____	____	____	____	____	____	____	____
C. solid/sludge	____	____	____	____	____	____	____	____

(j) Destruction of plants and animals

	large increase	moderate increase	slight increase	no change	slight decrease	moderate decrease	large decrease	don't know
A. conventional	____	____	____	____	____	____	____	____
B. solid waste	____	____	____	____	____	____	____	____
C. solid/sludge	____	____	____	____	____	____	____	____

2. How far do you live from the hospital? (walking distance)

____ less than 5 minutes

____ 5-10 minutes

____ more than 10 minutes

3. Please indicate the direction of the hospital from your home.

____ North ____ South

____ North-east ____ South-east

____ North-west ____ South-west

____ East ____ West

4. (a) Which of the three projects would you favour?

____ conventional

____ solid waste

____ solid waste/sewage sludge

____ None.

(b) If NONE, could you suggest any other alternative that you would favour?

____

____

5. (a) Have you expressed your opinion publicly about any of the proposed projects?

____ yes

____ no

(b) If YES, how was this done? (letter to newspaper, attendance at meetings, etc.)

____

____

6. We would now like to ask you some questions about your attitude towards different aspects of possible energy supply schemes. Suppose that the Ontario Government is prepared to give you money to help promote those aspects of the Victoria Hospital energy scheme that are of greatest concern to you. Please study the list of concerns below and decide how much money you would request from the government to support each of the alternative schemes. This should be applied to the alternative that is of greatest concern to you. You would request $0 for the scheme(s) that you have no interest or concern about. Amounts ranging from $1 to $100 should be requested for all other schemes below according to your degree of concern about them.

		$
(a)	The scheme that will have the least negative effect on local ponds and streams.	____
(b)	The scheme that will have least negative effect on property values.	____
(c)	The scheme that will have most effect on reducing odours.	____
(d)	The scheme that will cost the least to the hospital.	____
(e)	The scheme that will lower the costs to the City of London for solid waste	____
(f)	The scheme that will be most energy efficient	____
(g)	The scheme that will cause least litter	____
(h)	The scheme that will result in the least increase in noise levels.	____
(i)	The scheme that will result in the least increase of air pollution	____
(j)	The scheme that will most reduce dust and ash problems.	____
(k)	The scheme that will result in the least increase of traffic volume	____
(l)	The scheme that will cause the least destruction to plants and animals.	____

A PUBLIC INVOLVEMENT STRATEGY FOR SITING TRANSMISSION LINES: TWO CASE STUDIES

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ABSTRACT

This paper outlines two case studies of public involvement strategies for major transmission lines. It reviews the procedures and techniques used by the Bonneville Power Administration to involve the public in the decisionmaking process and how they were accepted. The experiences on these projects have contributed significantly to overall public involvement planning and have resulted in practical ideas and steps for a successful public involvement program.

Since the enactment of the United States National Environmental Policy Act (NEPA) in 1970, and the U.S. Council on Environmental Quality (CEQ) Regulations in 1979, Bonneville Power Administration (BPA) and other Federal agencies have tried different ways to involve the public in the decisionmaking process for large Federal projects. The process outlined by this act calls for Federal agencies to gather potential issues and concerns of the public, focus on these issues in their environmental analysis, and make decisions based as much on environmental factors as on economic and technical criteria. This paper looks at two of BPA's large transmission projects required by law to meet the spirit and intent of NEPA. It reviews the processes used by BPA for citizen participation, the successful techniques used and a new strategy for future projects.

THE GARRISON-SPOKANE TRANSMISSION PROJECT CASE STUDY

In 1977, Bonneville Power Administration proposed building a 500-kv transmission line from western Montana to Spokane, Washington. The Federal agencies responsible for writing the Environmental Impact Statement for the transmission line decided to jointly evaluate key Federal decisions on a corridor for the line. Because of Federal agencies' NEPA requirements, the public would participate in the analysis and also the decisionmaking process.

As the Federal team began the process of studying and managing this new transmission line section, strategies for involving the public were incorporated into the work plan for the project. Objectives outlined for the public involvement process were:

1. To inform
2. To invite participation
3. To provide convenient opportunities for people to be involved early and often 1/

To meet these objectives, general responsibilities of each agency for different components of the public involvement plan were assigned. To begin the process, meetings were set up with local land use planners and officials for an information exchange. Methods for informing the public were developed and included an issue newsletter; establishing a local office in Missoula, Montana, to better serve local people and groups by giving them one key contact point; identifying objectives and expected results of public involvement for each phase of the project; using local media; and holding scoping meetings to identify important topics for consideration. An extensive mailing list was also started of individuals and groups that might want information about the project, and for sending out summaries of the scoping meetings to participants. In addition to scoping meetings, informal meetings were planned as needed, and included open houses and workshops. Time periods were set aside during the process to solve common concerns through different project coordinators of Federal and other agencies. A content analysis was completed to provide an objective survey of public comment and this summary of public concerns was used for making decisions.

To begin the scoping process for the line, meetings were held to define issues and concerns and to seek comments on centerline location. These meetings were designed to be informal and participatory, with individuals looking over resource maps. Because this project was controversial, most meetings were lively with much discussion. The format of being able to work one-on-one with people created a receptive atmosphere at most of the meetings. The results of these meetings and an updated schedule were sent to participants in a mailer after the meetings.

As environmental studies continued, workshops were held throughout the study area to meet the objectives specifically designed for this phase:

1. Seek review of issues, alternative plans of service, and routes.

1/ Garrison-Spokane 500-kV Transmission Project, Plan for Environmental Studies, Bonneville Power Administration, November 1979, amended June 1981.

2. Identify evaluation criteria.

3. Use public participation to verify or revise the important topics and evaluation criteria and refine routes. 1/

Following the workshops, newsletters were sent to the participants.

As the environmental documents were completed and possible routes were refined, news releases, newsletters, a special phone number for comments, and additional one-on-one and larger meetings were used to keep the public informed and able to comment on the process. Although public input was used in all decisions, there were inevitably some areas of unresovled conflict with landowners and some interest groups unhappy with routing choices.

To defuse this conflict, smaller meetings were held one-on-one with individuals and groups. A facilitator with expertise in conflict resolution was hired by BPA to work out compromises on site specific questions with some groups. This happened in the Maxville, Montana, area of the project. The facilitator was able to work with the people of the Maxville area in formulating an alternative route. A variation of this alternative was ultimately implemented by BPA.

As a result of the public involvement efforts on this project, several things happened. A list of issues was developed for concentrating environmental studies. From comments received, evaluation criteria for ranking route alternatives were evolved. New alternatives were proposed by the public and then evaluated by BPA. Some of BPA's proposed routes were eliminated because of public concerns. In addition, route changes, special designs for structures, and other mitigation measures were incorporated into the final project.

THE BOUNDARY-SPOKANE/COLVILLE VALLEY SUPPORT PROJECT CASE STUDY

This project, located in northeastern Washington state, consists of replacing an existing 100-mile BPA 115-kv line from just north of Spokane to the U.S.-Canadian border with a new double-circuit 230-kv line. The line would, for the most part, be on existing right-of-way. The line is needed to reinforce the electric power system in the Colville Valley area and to provide additional capacity for 40 MW of new generation at Boundary Dam and a new wood residue generation plant at Kettle Falls, Washington.

1/ Garrison-Spokane 500-kV Transmission Project, Plan for Environmental Studies, Bonneville Power Administration, November 1979, amended June 1981.

This project, because it is mainly a rebuild, was not thought to be controversial. However, a public involvement plan was developed to provide for public participation.

The public involvement plan developed for this project was similar in many ways to the one prepared for the Colstrip project. It was designed by two key project team members, the environmental coordinator for the project and the local Area Engineer, and was reviewed by other interested members of the BPA organization. The plan stated the objectives for public involvement, and stressed BPA's commitment to encouraging participation by different publics. It also emphasized BPA's commitment to making a decision that took into account the comments of the public. The objectives were:

1. To inform the public, including affected landowners, utilities, and Federal, state, and local agencies of BPA's proposed project and its status.

2. To invite the public, affected landowners, utilities, and cooperating agencies to participate in the environmental and decisionmaking processes of the project.

3. To provide the public with opportunities to identify alternatives, resources, and issues of concern to the project.

4. To gather information from cooperating agencies and others for use in the analysis process.

5. To provide the public, affected landowners, utilities and agencies with opportunities to review and comment on the project environmental analysis.

6. To make a decision on the project which reflects the input of all interested public and cooperating agencies. 1/

The public involvement plan also outlined lead organizational responsibilities for the program as well as public involvement tasks to be completed over the life of the project, including the land acquisition and construction phases.

The atmosphere to be created on this project was one of informality and consistency. The project area is mostly rural or rural residential.

1/ January 19, 1984 Bonneville Power Administration Memorandum, from Timothy J. Murray (EVH), to Paul E. Eichin (OKE), Subject: Boundary-Spokane/Colville Valley Support Project--Public Involement Plan.

The main industries are farming, mining, and logging, with some tourist trade. Too often in the past, BPA has been thought of as a large, impersonal institution. Consequently, the intent of the plan was to try to change that image by doing things informally. In a large organization, with responsibility for public contact spread out across many parts of the agency, it is often very hard to coordinate contacts with individuals. This had come up on past projects--that is, people complained about having to deal with a different person every time they talked to someone or received material from BPA. To change this, all material sent out to the public was to have the same person's name on it. Meetings or workshops were designed to be informal, but controlled enough to allow everyone an opportunity to speak.

Briefing sessions were scheduled with agencies and local officials before anything was sent to the public. These allowed the team to get an idea of who would be interested in the project, and to identify local interest groups and the concerns they might have, before any public meetings were held. The sessions also assured that local politicians were aware of the project before their constituents called them for action or opinions; it was hoped that the politicians and their publics would both look more favorably on BPA as a result.

Generally, the initial scoping meetings were successful. The format of each meeting included a brief description of the project (15 minutes), followed by a listing from the audience of issues and concerns, and then by a period of questions and answers. This format was adhered to and no one disrupted the meetings or took over control. About 50 people attended the Colville meeting. At first, the reaction of the public was negative. However, by allowing their concerns to be voiced and noted, and by answering questions when possible, this negative feeling was turned around. One individual said, "I came here kind of negative tonight, but right now I feel a little more positive about this. I see a need for the increased size of the lines." 1/

At the meeting in Metaline Falls, one woman brought a prepared statement on electical effects and asked permission to deliver it. She was given the opportunity. Afterwards, she continued talking until both the audience and the BPA personnel were anxious for someone else to take the floor. Allowing her to voice her concerns enhanced BPA's credibility, but did not appear to persuade any other people to her position.

Some months later, after a summary of issues and concerns was sent to scoping meeting participants and the environmental work was almost complete, open houses were held. These were designed to give people a

1/ Bonneville Power Administration, Transcript of Proceedings, Re: Public Meeting on Proposed Colville Valley Support Transmission Line Rebuild Project.

chance to review the environmental work done to date, to check it for accuracy, and to ask more questions about the project. The open houses were held in the afternoon and evening with no formal presentation. They were attended by environmental specialists, a location engineer, and an engineer representing the local BPA office. This allowed BPA staff to discuss issues one-on-one with people and begin the development of mitigation measures with landowners. The open houses were not designed to be stages for open confrontation. The key was to establish a nonthreatening environment, especially for individuals who might be afraid to speak in a large group. Attendance at the open houses was small compared to the scoping meetings.

In addition to the open houses and briefings with local government officials, there were many one-on-one contacts with individual landowners. Although no formal newsletter was developed for the project, periodic letters kept individuals informed about the project's status. This may be the reason for the low attendance at the open house sessions.

ISSUES IDENTIFIED

From the experience on these two projects, and from the many transmission projects that BPA has been involved in since NEPA, certain patterns and issues have emerged. An understanding of these should increase the effectiveness of the public involvement program. Knowing the kinds of concerns that may develop will help an agency or utility prepare for events and hence come across to the public in a better light. It can also speed the process of mitigation by incorporating typical concerns into the planning and design processes early. As a result, compromise and consensus with the public is much easier to achieve.

The following items of public concern can be expected to surface on a major project:

1. Visual impacts to scenic and other areas.
2. Biological effects from transmission lines on people and animals.
3. The need for the project and its direct benefit to affected publics.
4. Conservation, and how it could postpone or cancel the project.
5. Impacts to historic and archeological sites.
6. Effects on natural resources, including wildlife, soil, and vegetation.
7. Establishing a precedent for future corridors.
8. Weighing the effects on people equally with cost and engineering criteria.

9. Economic impacts to people, including devaluation of property, crop damage, loss of farm and forest land, and the impact of construction workers on the community.
10. Use of public instead of private land.
11. Recreational impacts.
12. TV and radio interference.
13. Safety.
14. Public involvement in decision.

LESSONS LEARNED FROM THESE PROJECTS

Based on our experiences on these two projects and others of differing sizes, the following lessons and questions can be used when planning strategies for future projects.

Timing

Get all publics involved early in the process, particularly the potentially affected landowners.

Techniques should be used which include people in the decisionmaking process before the line comes on their property. Having a list of landowners available at the start of the project will help get information out early. However, before staff is sent to get that information from the county records, local leaders should be informed of what the agency has in mind. The question that arises is, should an agency get the public involved in the decision on the need for the project?

Audience

Use past experience and local contacts to define your publics.

In the early stages of planning, ask questions such as: "Who are your publics? Have all interests been identified? Who are the local leaders to contact for information? Who do we want to develop support from?" to make sure you have involved all the people in the process. This information should direct the techniques you use, your scoping process, and your plan.

Format

How you present your information, your representatives, your project, and the process to the public can determine whether your strategy is a success.

BPA did the following to insure a successful program:

1. Outlined the objectives of public involvement.

   Different parts of any organization will have different public involvement objectives or goals. For example, designing a meeting to do environmental scoping will be different than setting up a one-on-one contact to purchase land. Before anything happens, however, what is hoped to be accomplished must be communicated to all parties, including the public.

2. Realized that internal communication is as important as external communication.

   In any large organization with specialized functions, communication between players involved in a project is crucial. Any credibility built up with the public can be lost when different answers are coming from different parts of the same organization. Therefore, before any outside contacts are made, it is essential that all internal organizations know current aspects of the project and the public involvement strategy.

3. Informed political leaders about the project and the process for public involvement before general information was circulated. Keeping them up to date as the project develops makes them able to answer questions from their constituents.

4. Established cooperative agreements with agencies and local governments before the public involvement process began.

5. Found that different techniques work better than others. Used many techniques to reach each public.

   Often, when thinking of initial steps for planning a public involvement program, one technique, that is holding a meeting, comes quickly to mind. In some circumstances, to meet objectives or to meet a certain part of your public, this is appropriate. Too often, however, other less threatening techniques or meeting formats are forgotten.

   If you must have a meeting, make it as informal as possible while still retaining control. To do this, trained people are necessary. Individuals must practice and anticipate persons trying to disrupt the format of the meeting.

Sometimes it may be necessary to hire a specialist from outside the organization to resolve conflicts.

In most cases, one-on-one contacts are most effective, either through an open house, where people drop in just to talk about the project, or through personal visits. This insures that all voices are heard.

Defining the objectives for of each phase of a public involvement project can help sort out the kinds of activities required. Perhaps a joint meeting with another agency is appropriate, or making a presentation as part of a board's or commission's agenda. Maybe briefing sessions with political leaders is all that is necessary at the early stage. Sometimes a newsletter will accomplish more than an open house. The point here is to carefully think through and explore the various means for communicating, considering the audience.

The public should also see the same faces throughout the process.

6. Established a toll-free telephone line to a local office, staffed with skilled people, to be the main contacts for individuals, groups, and the media.

Effects on Decisionmaking

When designing a public involvement program, the requirements for public involvement and the benefits and risks involved must be clearly understood by both the program manager responsible for the project and the public. The following suggestions will help you develop your program, make it worth the time and effort of your staff, and insure that the public knows it is a sincere process:

1. Establish criteria for working public concerns into the decisionmaking process. Before the public participation program begins, there must be a clear understanding by members of the agency of just how the process will work and how the input of the public will be used.

2. Although an agency may be hesitant to bring sensitive issues out in the open, it usually is better to be the one bringing the subject up than to wait for the public to make it an issue.

3. Remember that all issues identified by the public are real issues, even though they may seem insignificant.

4. Follow through on all commitments made at meetings, during field work, or in any contact with the public. Be sure to document all these commitments.

5. Be prepared for the possibility that your time schedule may not always be the same as the public's.

6. Be patient and explain your technical restraints to the public.

7. Have decisionmakers meet with the public so that the public knows their concerns are being taken seriously by the "right" people.

8. Meld public involvement into the planning and decisionmaking processes so that it is just another part of doing business.

9. Schedule a follow-up evaluation of your Public Involvement Plan to see if the process can be improved and if the concerns of the public were used in the final decision.

NEW MODEL FOR FUTURE PROJECTS

Based upon the successful techniques developed during these projects, a new model for structuring public involvement in construction projects is being suggested by BPA staff. This model is going to be used in three test projects with the assistance of engineers, program managers, project managers, environmental staff, public involvement specialists, and others involved with the projects. The plan consists of the following elements:

1. Project description

   This will include a map of study area as well as a schedule of study phases, decision points, and other background information.

2. Establishment of a Public Involvement Coordination Team

   The Public Involvement Coordination Team will consist of a systems planner, environmental coordinator, design engineer, public involvement specialist, land specialist, construction specialist, and a local BPA office representative. The team will meet at major decision points to develop the overall public involvement strategy, decide on public involvement activities, define publics and problem areas, and evaluate public involvement.

3. Definition of publics and preparation of mailing lists

   This includes how the list is developed and maintained.

4. Public involvement needs analysis

   The analysis of public involvement needs will involve a history of past issues, information from old transmission line files, the characteristics of the study area and its publics, the publics information and participation needs, types of issues, and potential conflicts.

5. Selection of public participation objectives

   This includes involvement methods and activities, schedule, task descriptions, and assignment of lead responsibility for each task.

6. Documentation and evaluation of public comments

7. Follow-up evaluation of public involvement plan

Following this plan will assure that the need and purpose of the project are clearly defined and widely supported. By working as a team, the agency can insure that all relevant issues and concerns are identified and addressed. Reaching all publics will assure that only a feasible option is considered in the development of alternatives and mitigation measures. Areas of conflict or problems which are identified during the public involvement process can be dealt with efficiently by the team well in advance of land acquisition and construction.

CONCLUSION

Integrating the public into the planning and decisionmaking processes of a public agency or utility can be beneficial to the planning process. Early and frequent contact and information exchange can lead to better and more publically acceptable projects and programs and a better understanding by the public of engineering restraints and an agency's mission. Public perceptions of an agency, as a whole, can be made more favorable and can, in the long term, smooth the way for future projects.

The suggestions outlined in this paper and the questions that they raise can help program managers plan and implement successful public involvement experiences.

PUBLIC INVOLVEMENT
IN THE ROUTE STAGE OF ONTARIO HYDRO'S
SOUTHWESTERN ONTARIO 500 KV TRANSMISSION EXPANSION PROGRAM

A Poster Paper presented to:

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ABSTRACT

The most intensive public involvement program ever undertaken by Ontario Hydro took place in southwestern Ontario throughout 1983.

A bulk transmission regional study to determine routes for four 500 kV transmission lines (totalling over 400 km) and a site for a 500/230 kV transformer station began in the fall of 1982 and concluded with the submission of an Environmental Assessment in December 1983. Public Hearings on the undertaking are expected in 1984.

The poster display and the following summary describe the scope of the activities designed to involve the public and point to the key results of the public programs.

I. Southwestern Ontario Route Stage Study

Task:

- Involve the public in the preparation of an Environmental Assessment for a major 500 kV transmission expansion program in southwestern Ontario.

Dimension:

- Routes required for four 500 kV transmission lines (over 400 km).
- Site required for a 500/230 kV transformer station.
- Total study area of 3,500 square miles.
- 13 counties and 63 townships affected.
- Do it all in 14 months.

Section II describes the scope of the public program implemented on this study. Section III points to the key results of the public involvement program.

II. The Public Involvement Program

General Description

A public involvement program for the study was initiated by Ontario Hydro. The program was designed to involve the public in all phases of the Route Stage study. While the contributions of the public are reflected throughout the study, the selection of recommended routes and a site was the responsibility of Ontario Hydro.

In a joint planning component of the program, representatives of the public on working groups and liaison committees met with the Ontario Hydro planning team on a regular basis throughout the route selection study, offering information, and contributing community preferences.

In addition, detailed project information was taken to the general public at key stages of the study for their review and comments. This was achieved principally through information centres, presentations, advertising and mailings.

The program commenced in November 1982 and concluded with the submission of the Environmental Assessment in December 1983. The program components are described in the following sections.

An overview of the involvement of the public in the key steps of the study is set out in Figure 1.

Working Groups

The working groups were formed from a broad range of interests including elected and appointed municipal officials, provincial ministries, conservation authorities, county federations of agriculture, local federated nature clubs and local groups representing agricultural, community/cultural, environmental, recreational, resource and electrical/energy interests. In addition to plenary sessions, subgroup meetings were held as required to discuss areas of specific interest and concern. A chairman was elected from amongst the delegates. All meetings were open to the media and general public.

The study areas and geographical boundaries of each group are shown in Figures 2 and 3.

The working groups were formed on the following basis:

(i) Prospective participants represented organized local land use, environmental or community groups with interests related to the siting of facilities within the study area;

(ii) Counties, regional municipalities and townships in the study area were invited to appoint delegates. Cities and towns that incorporate significant rural areas within their boundaries were also invited to participate;

FIGURE 1

Public Involvement Program - Ontario Hydro and Publics

Ontario Hydro	Citizens' Committees	General Public
Scale 1:50,000		
Collect environmental data and illustrate, establish citizens' committees, initiate technical studies	Identify environmental concerns and rank in order of importance to avoid	Introductory Status Report, Advertising and Information Centres, Nov. '82
Prepare constraint maps Identify and review alternative corridors/zones	Identify and review alternative corridors/ zones with Ontario Hydro	
Define corridors/zones on mosaics		Status Report #2, Advertising and Information Centres, May '83
Scale 1:15,000		
Collect environmental data and illustrate, prepare technical and cost information, identify preliminary routes/sites	Develop location criteria, and review alternative routes/sites	
Prepare maps showing alternative routes/sites		Status Report #3, Advertising and Information Centres, Aug. '83
Evaluate and compare alternatives	Review	
Discuss with ministries, municipalities, interest groups	State preferences	
Recommendations and complete Environmental Assessment		Status Report #4, Advertising and Information Centres, Dec. '83

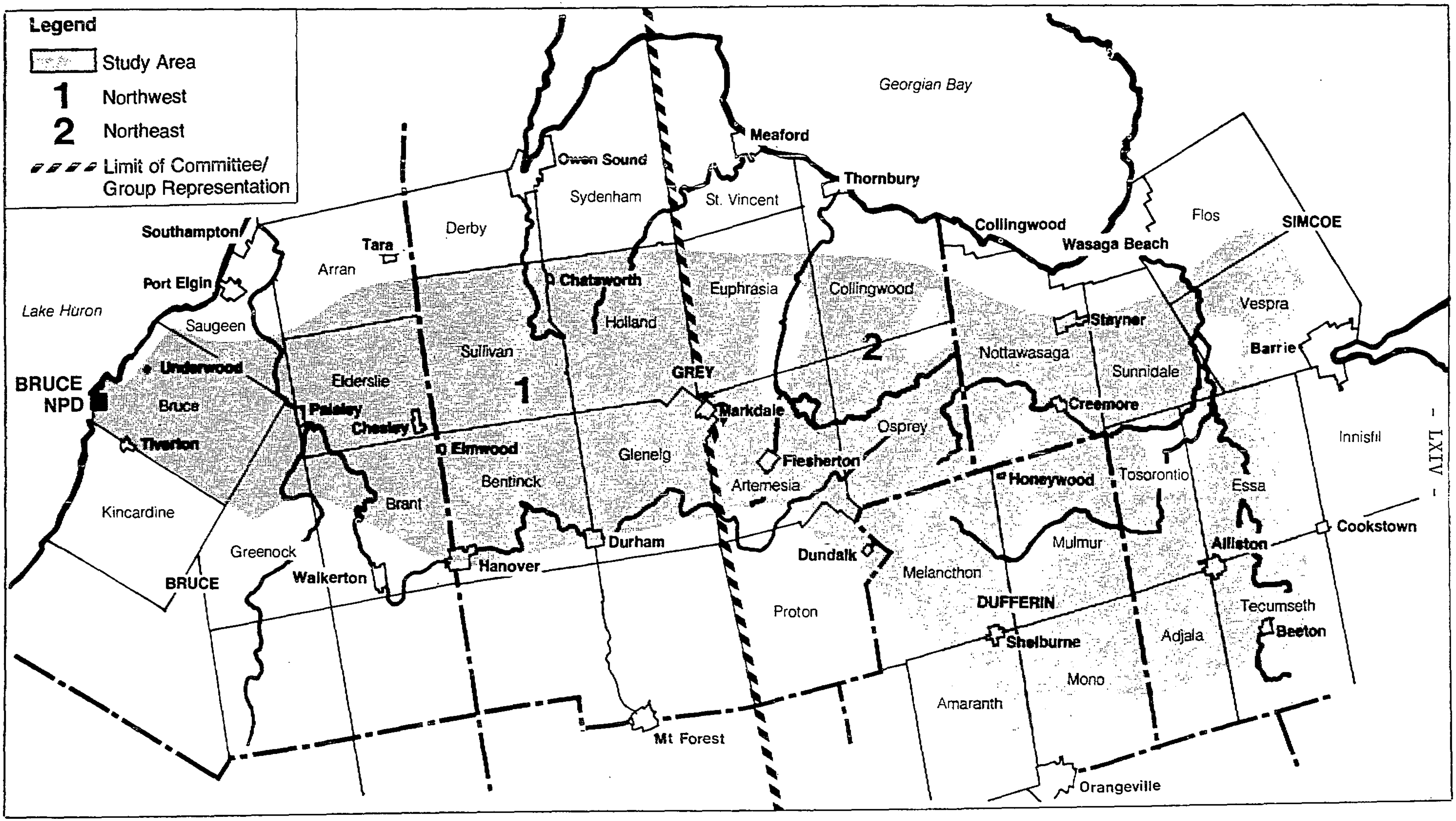

Figure 2
Bruce to Essa Study Area – Working Groups

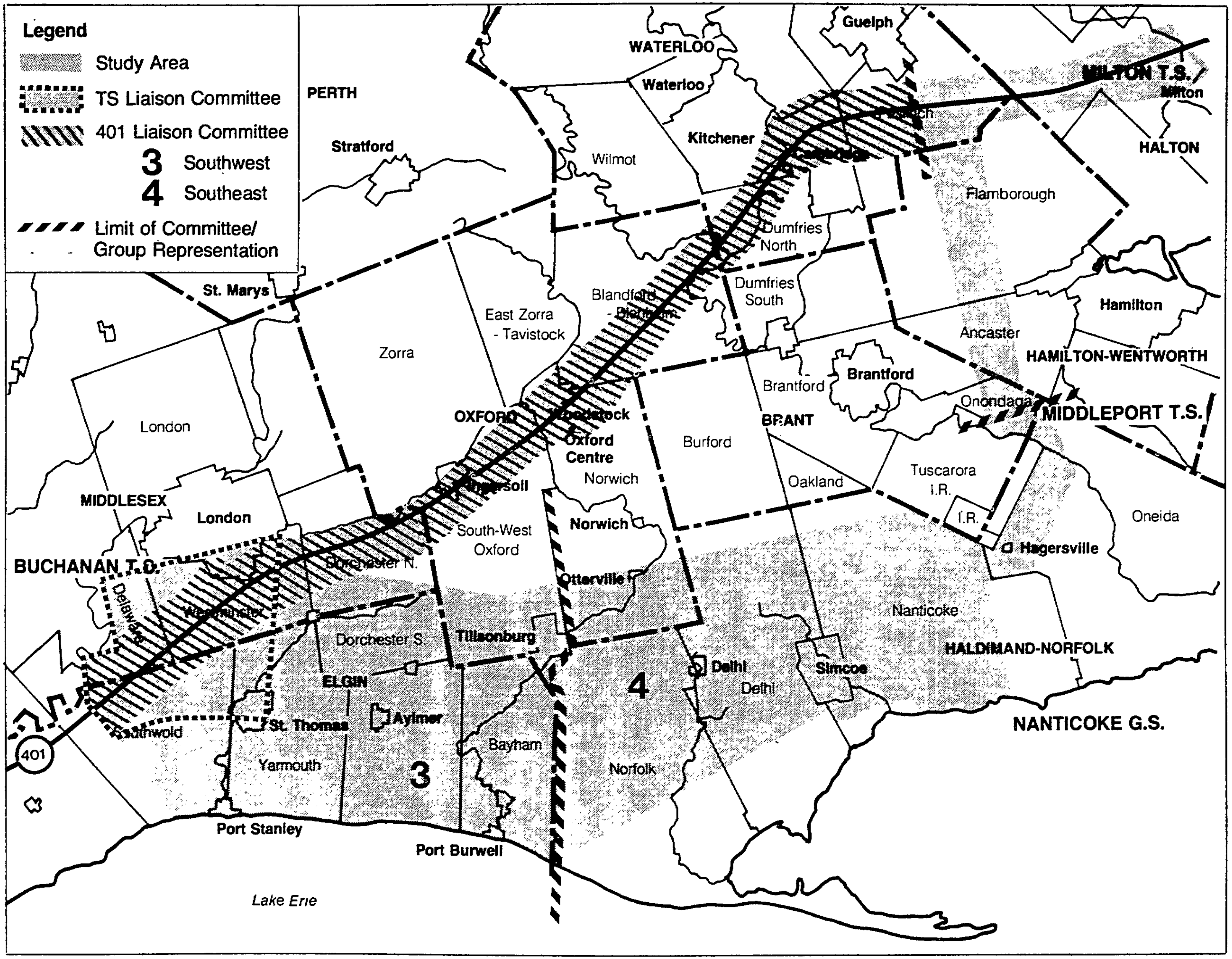

Figure 3

Supply to London Study Area – Working Group/Committees

(iii) Provincial Ministries with an interest in the study were invited to appoint local representatives to each of the working groups.

(iv) Individuals or organizations who expressed an interest in joining a working group were invited to attend the meetings as observers, and could only become an official member if approved by the working group itself.

(v) Members of the public and media were welcome to attend working group meetings as observers.

The notes of the working group meetings were recorded by independent notetakers, and were included in the reference material filed with the Environmental Assessment.

A summary of working group representation is provided in Figure 4.

Liaison Committees

In addition to the working groups, two geographically based liaison committees were established. One committee assisted in the study to find suitable alternative routes along the Highway 401 corridor. The other committee assisted in the study to find the most suitable site for the 500 kV/230 kV transformer station and met in London. Figure 3 shows the geographic boundaries of the two liaison committees.

These committees were made up of representatives of the municipalities within the respective committee boundaries, regional municipalities, counties, townships and major cities. Also on the committees were potentially affected County Federations of Agriculture, representatives from the ministries of Industry and Trade, Transportation and Communications, Natural Resources, and Agriculture and Food. The committees were more oriented towards the planning discipline and performed a review and advisory function during the study as compared to the developmental approach of the working groups.

Communication with the General Public

Communication with the general public focussed on the major phases of the study:

- introduction;
- identification of corridors/zones;
- identification of alternative routes/sites; and
- identification of preferred route(s) and site.

The public was contacted by way of status reports, advertising, information centres and presentations.

Status Reports

Information regarding the status of the project was mailed at key stages in the study to potentially affected individuals and groups within the

FIGURE 4

Southwestern Ontario Route Stage Study

Summary of Working Groups Representation

Organization	NW	NE	SW	SE
Municipal Governments	15	20	12	13
Conservation Authorities	2	2	3	2
Agricultural Organizations	8	12	13	13
Community/Cultural Organizations	2	1	1	1
Electrical Industry	1	1	1	1
Environmental Organizations	2	4	2	3
Recreational Organizations	2	4	2	2
Resource Organizations	0	1	2	1
Local Citizens' Groups	0	0	1	1
Ministries	3	3	4	3
Former Working Group Members	—	1	1	1
Total Appointed	35	49	42	41

3766M

following categories:

Cabinet Ministers	Mayors and Reeves
Conservation Authorities	MPs
County Federations of Agriculture	MPPs
Deputy Ministers	Media
Direct Industrial Customers	Opposition Leaders
Directors of Planning	Municipal Clerks
Federated Nature Clubs	Property Owners
Government Ministry Reviewers	Provincial and Local Organizations
Interested Publics	Regional and Local Ministry
Libraries	Electric Utilities
Working Group Members (Route Stage)	

The initial mailing list of about 5,000 persons in November 1982 grew to over 35,000 by the completion of the study.

Advertising

In addition to the distribution of status reports, paid advertisements were placed in newspapers and aired on radio stations throughout the study area. The objectives of the advertisements were to notify the general public as to the progress of the study at key stages, to announce the location of information centres, and to advise where more information could be obtained.

Information Centres

At the four stages of the study, project information was taken to the community by way of one day information centres in local halls throughout the study area. Project staff attending the centres presented the current study information, received information and views of the visiting public and answered questions. The number of locations for the centres at each stage is shown below:

Date	Subject	No. of Centres
November 1982	project introduction	16
May 1983	corridors and zones	25
August 1983	alternative routes and sites	26
December 1983	recommended routes and sites	25

Presentations

Presentations were made, upon request, to municipal councils, government ministries, public utilities, direct industrial customers and other interested groups or organizations. The purpose of these presentations was to inform the audiences of the study process and to receive their comments.

In addition, public officials were invited to preview information centres prior to their opening to the general public. MPs, MPPs and municipal officials, as well as the media, attended these previews. Project staff were available to review the progress of the study with these officials.

Media Program

In view of the scale of study activities in such a large portion of the heavily populated southwestern Ontario area, a media specialist was assigned full time to the study. The specialist continually travelled throughout the study area to ensure that the community press and electronic news media was well served with the current study information and with the utility's views on issues or matters under public discussion.

Distribution of Environmental Assessment

Copies of the three volume environmental assessment were mailed to all affected municipalities and many other affected or interested groups.

A forty-one page summary of the document was also prepared for more general distribution and it was forwarded to all on the 35,000 name mailing list.

III. Results

In the course of this 14 month study, Ontario Hydro:

- participated at 90 citizens' committee meetings to jointly plan for the selection of routes and a site.
- held 92 one day information centres in the affected communities.
- made over 50 presentations to municipal councils, government ministries and other interested groups.
- mailed over 100,000 pieces of project related information, including project newsletters, responses to enquiries and notices for the public hearings.
- monitored some 2,000 study related newspaper clippings, the majority of which were either balanced or favourable to the utility's views on the study issues.

As a result of these public involvement activities significant benefits have accrued to Ontario Hydro, to the government and approval authorities and to the affected public:

- public representatives made significant contributions to the planning studies for the facilities.
- the public reviewed and confirmed, corrected or added to the environmental data.
- the environmental assessment documents public views, especially those of the citizens' committees and affected municipalities.
- issues in the public forum were identified very early in the study. These issues were addressed throughout the study by members of the project team and are documented in the study.
- information sent to potentially affected property owners alerted the public to the progress of the study. While this resulted in court action questioning the validity of earlier approval authority decisions, the judicial review was initiated early, thereby keeping delay to the route stage approvals to a minimum.
- property owners, municipal contacts, and interest group representatives were all well known to the study team and this results in full knowledge and consideration of their concerns by Ontario Hydro, government review ministries and by the approval authority.

In its review of the Environmental Assessment for the study, the Ontario Government commended Ontario Hydro for its public involvement efforts.

As a result of the public program, Ontario Hydro has incorporated public views into its planning decisions and is now preparing for public hearings with full knowledge of the public affected by the proposal and the public concerns.

All of this helps to ensure the speediest possible approvals for the facilities.

SESSION III C - DECISION-MAKING

SAN FRANCISCO'S SEARCH FOR A LONG-TERM LANDFILL SOLUTION

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BACKGROUND I : The Rationality of the process

San Francisco, whose population density and city charter preclude a landfill within its boundaries, must look elsewhere to resolve a solid waste disposal crisis. State law now prohibits the traditional practice of filling in San Francisco Bay Wetlands in adjacent communities. Several investigations have been undertaken by the private garbage companies, which have the franchise to collect and dispose of San Francisco's refuse, and by the public administrators of the City and County of San Francisco, to identify alternatives which can reduce San Francisco's dependence on landfilling. Further studies have been conducted to identify potential sites, using as site selection criteria, identifiable environmental, economic, and political constraints. Some five years ago, an alternative disposal method was finally chosen, it included: modification of the wastestream to produce a relatively energy efficient fuel, burning of this fuel, and landfill disposal of the non-burnable segment of the wastestream and the residual burned ash. Critical to this plan was the selection and development of a landfill. Several sites were identified which meet San Francisco's criteria. Short term decisions as to the location of the new landfill were made in the interim, while the process for a more permanent solution continued. This process continues to this day.

In hindsight, San Francisco's search for a long-term landfill can be seen as a simple straightforward unfolding of events in which patterns are easily discernible, providing guidelines for other large-scale facility site selections. This description of the process of selecting a landfill site and of obtaining its permits, however, is misleading and leaves out much of the critical detail of the real process San Francisco has gone through to solve its landfill problem. The implication that the process is no more than the unfolding of a series of identifiable logical steps is wrong; the reality is that the path to selection of a site to solve a long-term need for a garbage disposal landfill for San Francisco has been tortuous, non-linear, and frequently irrational. All aspects of this process, identification of critical needs, the selection of disposal methods, the defining of criteria for site selection, the choice of actual sites and the obtaining of permits, have been interrelated and dynamic. Eventually, a site will be chosen and a pattern by which the site was selected and obtained will be apparent. This hindsight determination of the site selection process, however, should not be construed as programmed. To point out the pattern of what happened after the fact is rationalization. The real challenge for the actors in the site selection process is to derive from this, and other real life discussions of facility and route site selection, guidelines for accomplishing the site selection goal in the dynamic and fluid context in which such decisions actually occur.

BACKGROUND II : The Setting For The Story

The 1980 U.S. Census estimates that 674,073 persons reside within the 45 square miles of the City and County of San Francisco. San Francisco is the financial capital of the Western United States, as well as the administrative center for many leading U.S. corporations. The city does not have a large heavy industrial base; it is primarily a white collar town. It is also a major center of North American tourism.

San Francisco also has an extremely high population density of 14,000 persons per square mile. Approximately two-thirds of San Francisco's population reside in multi-family buildings, with about one-third of the population living in apartment buildings of ten or more dwelling units. This high population density is a primary reason for San Francisco's inability to provide a landfill disposal site within its own corporate boundaries.

Since the famous 1906 earthquake which devastated much of the city, city ordinances have barred refuse disposal in San Francisco. For most of the Twentieth Century, however, this restriction has not been much of a hardship. Up to 1964, San Francisco's solid waste was brought to its southern border where it was used to fill in a portion of the San Francisco Bay in the town of Brisbane in the adjacent county of San Mateo. Brisbane, a small town of 1000 to 2000 people, welcomed San Francisco garbage as a means for reclaiming unused marsh lands. In the early 1960's, however, press articles revealing that San Francisco Bay had shrunk by two-thirds in a century because of unregulated filling in of the Bay wetlands, spawned a strong Bay preservation movement. This movement culminated in the passage of State legislation severly restricting Bay filling. The days of unfettered disposal of San Francisco garbage were numbered. San Francisco had to abandon its traditional Brisbane landfill by 1964, and could only use an adjacent area called Sierra Park, the location for a planned future office park and marina, for an additional five years.

Since 1969, the solution to San Francisco's landfill disposal problem has been a series of short-term negotiated agreements to use landfill space in nearby landfills. The first proposed site for San Francisco solid waste was a landfill in Lassen County, a remote site over 200 miles from San Francisco, where refuse would have had to be hauled by rail. This project had reached the stage of active negotiations when a much closer site became available in the city of Mountain View, only 32 miles from San Francisco. Mountain View wished to develop a regional park on a part of its land which was unusable for development because excess groundwater pumping to irrigate fruit orchards had caused the land elevation to subside below sea level. The cost to San Francisco of disposal of its garbage at Mountain View was far less than Lassen County because of the much closer location of this site. San Francisco negotiated an agreement with Mountain View which was extended twice and which ended in late 1983. The story of San Francisco's search for a solution to its landfill problems for the post-1983 period is the subject of this paper.

This process for selecting a landfill site for San Francisco, however, cannot be understood without first discussing two other background elements, first, the regulatory climate in present-day California and its effects on solid waste management and second, the several institutions both private and public sector, involved in this decision.

As with many major site selection decisions in both the U.S. and Canada, the process of selecting a landfill site in California is not a simple matter of generating technical studies which allow one to chose the site most compatible with environmental and economic constraints. There is a long and cumbersome regulatory process requiring at least nine major and minor permits, and lasting from three to five years. For landfills in California, the first major hurdle is the Environmental Impact Report (EIR), a document required by the state law for all major development projects, showing potential adverse environmental impacts of the project, and the ways in which the impacts can be mitigated. The EIR report rarely takes less than a year. Following this, the project must obtain a county use permit which sets out the terms and conditions under which the project can be allowed to proceed. Finally, the last major regulatory hurdle is satisfying the concerns of the regional water quality control district which issues waste discharge requirements defining the technical engineering constraints under which the project must operate, and the procedures for monitoring landfill operations. In addition, there are less rigorous permits which it is usually necessary to obtain from county and state roads departments, regional air quality agencies, the state department of fish and game, and the county health department.

An even more critical factor, however, is the changing regulatory climate. New requirements and permits may be added to the regulatory process which radically change the balance of calculations in determining appropriate sites, and occasionally an offsetting concern or priority can arise to ease the path of site selection, as when in the mid-1970's, the energy crisis fostered a great interest in "waste-to-energy" garbage burning plants, and incentive schemes to encourage their development were fostered by the state government. Finally, even if there are no changes in the regulatory requirements, unforseen opponents can appear to attack the site selection though a host of governmental instruments, such as the referendum and intiative process for overturning unpopular political decisions, or court litigation. None of these elements can be predicted before the fact in landfill site selection, but one or more is almost certain to occur in as volatile an issue as selecting a landfill site.

Finally, one must also consider the entities included in this site selection process, the private scavenger companies which collect and dispose of San Francisco solid waste, and the city government which sets collection rates. San Francisco's garbage collection system is unique among American cities. Although the collection of city refuse is carried out by two private companies, GOLDEN GATE DISPOSAL COMPANY and SUNSET SCAVENGERS, they are closely regulated by city government. The city charter defines the boundaries of the collection districts and authorizes the city to set collection rates. A public-private partnership thus exists for this city's garbage collection systems, with GOLDEN GATE DISPOSAL COMPANY'S collection area serving mostly the downtown commercial area, and SUNSET SCAVENGER's area serving the bulk of San Francisco's residences. The companies themselves are also unique in American industry. They evolved from protective associations of the primarily Genoese Northern Italian immigrants who dominated the city's garbage collection system to ultimately become two major workers cooperatives. The companies are entirely self-owned by the workers who collect and dispose of the city's garbage. Finally, within city government, there has also been a shift in the agencies overseeing solid waste management. Traditionally, the city's end of the public-private partnership of garbage collection was handled by the city's Department of Public Works, reflecting the general attitude that solid waste management was a function akin to other municipal infrastructure services such as street sweeping or sewage treatment. In 1978, San Francisco's Chief Administrative Officer (CAO) shifted the jurisdiction of the

Solid Waste Program from the Public Works Department to the Office of Special Projects, directly under his personal control. The special project which necessitated this shift in agency jurisdiction was the search for a long-term landfill solution.

EVENTS

The first phase of San Francisco's landfill search process was an attempt to develop a waste-to-energy facility. Although the negotiations to allow disposal of San Francisco's refuse at the Mountain View Landfill eased the immediate disposal crisis, both the city and its scavengers desired a more long-term resolution of this problem. Initially, the solution seemed to be a waste-to-energy plant that would significantly reduce the volume of waste requiring landfill disposal. The mid-70's, when most of the waste-to-energy facility investigations took place, was the highlight of the alternative energy enthusiasm, an attempt to reduce dependence on imported foreign oil by developing alternate sources of energy such as garbage burning plants.

This focus on developing a technology to create energy from burning garbage, however, obscured several issues which needed to be addressed before a waste-to-energy facility could become a reality. First, it needed to be known whether such a facility would actually work. In the "hey-day" of engineering enthusiasm for garbage burning plants, at least three major technologies were suggested for accomplishing the task of creating energy from burning garbage. Few, however, had been tested to the point of being assured of operational success, and none had been tested in the California environment of strict air pollution control requirements. Second, there needed to be economic analysis to establish that the costs of constructing, and operating a garbage burning facility could be kept down to the point where the additional energy benefits would offset the increase in cost of disposal, so that there would be a net economic benefit to the scavengers and to the city residents from developing a garbage burning plant. Finally, and most important, there was a need to continue to address the problem of landfill disposal. Burning garbage would only reduce the volume of the San Francisco wastestream by about two-thirds, and would only delay the time when San Francisco would have to find a landfill which could take the unburned segment of the refuse stream, and the ash residue from burned garbage.

None of these issues were seriously considered in the initial consideration of a waste-to-energy plant. The impetus for developing such a plant, at first, came from SUNSET SCAVENGERS who owned the land in Brisbane where San Francisco garbage had traditionally been dumped. A waste-to-energy plant seemed a way to dramatically increase the value of the completed landfill, and to increase the revenues of both scavenger companies, since the construction and operation of the garbage burning plant would be carried out as a SUNSET/GOLDEN GATE joint venture company called SANITARY FILL COMPANY. Similarly, San Francisco was also taken with the enthusiasm of developing a milestone technology to burn garbage, and in this way put itself in the forefrount of progressive North American cities.

As a consequence, several technical analyses were undertaken which showed that a garbage burning facility was indeed the answer to San Franciso's waste disposal problem, and that the best site for such a facility was the completed Brisbane landfill adjacent to an existing transfer station, owned and operated by the SANITARY FILL COMPANY.

Before such a development could actually be carried out, however, several events occured which considerably slowed, and at times halted the development of the waste-to-energy plant. In the first place, it became apparent that garbage burning technology was in fact quite shaky. Several small and large American cities moved more quickly than San Francisco, and built state-of-the-art facilities which turned out to be white elephants. Bridgeport Conneticut built a prototype of the technology that San Francisco was considering, the burning of refuse derived fuel (RDF), that operated only sporadically, and was eventually abandoned. Baltimore Maryland constructed a plant of even more exotic technology, gas pyrolysis, that never worked at all. Fairly quickly, as a consequence, the bond houses who were to provide the financing for waste-to-energy facilities, became cautious in their approval of garbage burning schemes, and began to demand assurance of long-term back-up commitments for landfill availability to accomodate the entire wastestream if the waste-to-energy projects were unsuccessful, or only partially successful, and the reduced wastestream of ash residue and unburned garbage if the plant worked as envisioned.

San Francisco's CAO also reacted to the failure of early garbage burning plants by taking a much more direct role on the development of the waste-to-energy facility. He assumed direct control of all solid waste operations in the city, demanded control of the negotiations with prospective vendors or garbage burning technologies, and insisted that the engineering firms designing the San Francisco waste-to-energy plants assume liability for the operations of the untested technology once construction was complete.

These actions slowed considerably the progress of the waste-to-energy project. Other events also contributed to this lengthening out of the process of developing a garbage burning facility. Environmental analyses revealed that it was very unlikely that such a plant could be operated without significantly increasing emissions of air pollutants. Such a situation would require costly control equipment, and an agreement to take actions that would offset the increases in emissions by paying for other compensating air pollution reduction activities.

Finally, a shift in political attitude occured in Brisbane that eliminated the availability of the former landfill as a site for the garbage burning factory. Fostered by the concern of a large real estate developer who proposed to build homes in the vicinity of the proposed waste-to-energy plant, a movement was begun in Brisbane to oppose this facility. The movement succeeded in overcoming initial city council support for the facility, and eventually an initiative was placed before the city voters to prevent the use of the proposed site for a garbage burning plant. Thus, Brisbane, which had accepted San Francisco's garbage for 50 years, decided that it could not allow this same garbage to be brought to the city and burned.

Despite the defeat of the proposal to build the garbage burning plant in Brisbane, there was still an effort underway in San Francisco to construct such a facility. This effort, though, was minimal. The scavenger companies had no involvement in this project, having been entirely preempted by the city's CAO, and although he selected a vendor for design of the facility, and continues today to investigate potential sites, the waste-to-energy project is mostly simmering on the back burner.

The major emphasis of the search for a solution to San Francisco waste problem became, instead, the effort to find a landfill that would accept San Francisco's garbage. This problem, in turn, was defined as a two-part task--the immediate need to locate a landfill to take San Francisco garbage for a limited five year period after the 1983 deadline for getting out of Mountain View, and secondly, the need to find a landfill that could make an extended commitment to receive San Francisco waste.

Both the City of San Francisco and the private scavenger companies participated fully in the landfill search. The focus of each participant's involvement, however, was quite different. The scavengers felt that control of landfill disposal was becoming the major factor in determining the success of their solid waste business. Whereas traditionally, the private garbage companies have made their profits mostly from efficient garbage collection operations, in recent years, the growing scarcity of available landfill space has made the disposal side of scavenger business the most profitable aspect of the solid waste management. The scavengers, therefore, sought to secure a commitment from San Francisco to take its garbage to a medium-sized landfill owned by GOLDEN GATE as the solution to the immediate crisis, and to develop a new major landfill as the site for long-term disposal of San Francisco refuse.

San Francisco, however, has been ruled by several different, not always consistent motives. The city's main interest was probably "peace of mind", both in the short and long run. Secondary motives, however, particularly the feeling of the CAO that he had to control the selection process as much as possible, also figured significantly in the search for a landfill. The principal means by which the CAO has attempted to control this process has been his insistence that the landfill search should be a competitive process with the city dictating the terms of the competition. For the first phase of the landfill search, the attempt to find short-term landfill space for San Francisco's garbage, the terms of the competition were that the city would send its garbage to the first landfill which could provide all of the necessary permits to allow disposal of San Francisco's refuse. For the second phase, the search for long-term landfill availability, the terms of the competition have supposedly been that the long-term contract for San Francisco's garbage would go the the landfill which would offer the cheapest price to dispose of the city's solid waste.

In the search for a five-year site to receive San Francisco refuse after the 1983 closure of the Mountain View Landfill, GOLDEN GATE attempted to get San Francisco to come to a site about 75 miles from the city, the B&J Landfill in Solano County. GOLDEN GATE was at a disadvantage, however, on several counts. All other sites under consideration were closer than B&J to San Francisco, so that it was presumed to be more expensive to haul San Francisco garbage to this site than to any other. In addition, the scavengers disagreed among themselves on the B&J site. GOLDEN GATE favored it because it owned the site; SUNSET, however, which wouldn't receive any of the increased revenues from garbage going to B&J, favored an extension of the Mountain View contract and several other alternatives. Finally, and most important, one of the competitors to GOLDEN GATE, the OAKLAND SCAVENGER's Altamont Landfill, (55 miles from San Francisco), had almost all of the required permits, and a willing county government, to allow disposal of San Francisco garbage, whereas the permitting activity necessary to allow B&J in Solano County to receive San Francisco garbage would take at least one and a half years.

Since San Francisco's CAO insisted that the terms of the competition would be that "the first one in the door with all necessary permits gets the contract", this difference in length of time required for obtaining landfill permits was a disadvantage that GOLDEN GATE could not overcome. Despite the pretense of a careful consideration of economic, environmental, and political factors, once it became apparent that the Altamont site would be permitted and ready to receive San Francisco garbage sooner than any other site, no other site was in serious contention for the short-term contract. Moreover, because the OAKLAND SCAVENGERS had no competition, they were able to negotiate a very high price with San Francisco

The search for a long-term landfill site for San Francisco's garbage has pitted many of the same competitors against each other, as in the earlier contest for the five-year contract. The landfills under consideration are generally those that the city considered earlier, and as before, despite its seemingly uncompetitive fee structures, the OAKLAND SCAVENGER's Altamont site is in top contention to become the chosen site. As mentioned earlier, San Francisco's CAO is also conducting a similar search process, competition between privately owned landfills. The terms of the competition have now shifted; the selection of a long-term landfill is now to be based on cost rather than expedience of delivering a permitted site.

There have been significant changes, however, among the San Francisco scavengers. GOLDEN GATE and SUNSET have agreed to support a joint venture project to develop a major new site, the Lynch Canyon Landfill, whereas before each had supported a seperate landfill option. Lynch Canyon, like the B&J site GOLDEN GATE had proposed for the short-term contract, is located in Solano County. It is huge and could, if developed, take San Francisco's garbage as well as the refuse from nearby Solano and Napa County communities for 80 years. There is also, however, a substantial amount of political opposition to Lynch Canyon, so that it is by no means certain that the site will be permitted as a landfill. At present, the homeowners association of a development 3 miles away, which is spearheading this opposition has qualified a referendum and an intitiative for the November 1984 ballot in Solano County. If the referendum and initiative get voters approval, Lynch Canyon will not be able to be developed as a landfill, and there will be strict limitations on the volume of garbage that can be disposed of from communities outside of Solano County.

Before these Lynch Canyon developments occured, however, the San Francisco scavengers were able to get approval for a permit to take San Francisco garbage to B&J for the five year period from 1988 to 1993. San Francisco's CAO agreed to a contract with B&J for this period because it was thought that this might ease the way for approvals of Lynch Canyon.

Thus, San Francisco today is in essentially the same position it was in 1964, when it first became apparent that the city's traditional disposal site would have to be closed. The city has negotiated a series of short-term contracts with local landfills, while the major problem remains. Although the city and its scavengers have hired experts, conducted numerous studies, and held countless numbers of high-level negotiations with landfill owners and community politicians, San Franciso has been unable to work out a long-term landfill solution to its waste disposal problem.

As a consequense, both the city and its scavengers have suffered loss. Without a landfill of their own to take San Francisco's garbage, the scavengers have seen their prospects for future business growth diminish. If they are not successful in being able to control the disposal side of their business, there is a real possibility that they may ultimately be bought out by one of the major solid waste agglomerates. WASTE MANAGEMENT, BROWNING FERRIS, or SCA. These are three companies who, during the 1970's, through skillful buyouts of companies like GOLDEN GATE and SUNSET, acquired control of much of the previously small-scale garbage industry in North America. Thus, for the scavengers, their industrial survival is at stake.

San Francisco has also lost by continually being on the short leash of her temporary land disposal contracts. No city would willingly make itself so beholden to other communities for major services such as solid waste disposal. Even where a city is forced to seek outside its boundaries for the means of providing services, it always seeks the stability of long-term renewable contracts. Certainly, the cities who purchase water from San Francisco's own Hetch-Hetchy water project do this, or even San Francisco's sister city of Oakland in its negotiations with the private OAKLAND SCAVENGERS over garbage disposal at the Altamont Landfill. The cost in municipal flexibility and actual revenues from always being in an unfavorable bargaining position is incalculable. San Francisco may yet achieve a resolution of this garbage crisis, but until it does so, its solid waste management future is shaky and unenviable.

A MODEL FOR ENVIRONMENTAL NEGOTIATION:
ITS ROLE IN SITING AND ROUTING OF ENERGY FACILITIES

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The views presented in this paper are those of the authors and do not necessarily represent the views of the Department of the Environment.

A MODEL FOR ENVIRONMENTAL NEGOTIATION: ITS ROLE IN SITING AND ROUTING OF ENERGY FACILITIES

INTRODUCTION

Environmental regulatory decision-making surrounding energy facility siting has given rise to situations of conflict reflecting the inconsistencies inherent in achieving society's objectives for sustained economic growth on the one hand and the protection of environmental quality on the other. In fact, the process has been well described as a 'balancing act' involving technical, economic, environmental, social and political considerations. This paper is an attempt to propose certain changes to existing environmental regulatory decision-making processes to improve their capacity to anticipate and more constructively manage these conflicts. Specifically, it explores the possibility of identifying opportunities in federal regulatory processes where, at certain points, inclusion of planning and decision-making mechanisms would allow more meaningful representation and consideration of a wider range of public interests thereby minimizing actual or potential environmental disputes. The idea here is that, if environmental regulatory processes are to serve the public interest, there must be greater opportunity for those persons representing the public interest to be involved in the decision-making process. Implicit in a proposal for change is the premise that the cause of sound environmental decision-making is not served if significant[1] social and political conflicts are not resolved in the process, regardless of how right the decision may be from a technical standpoint. This view further assumes that 'environment' includes all aspects of human environment, including social, political, cultural and economic phenomena[2].

The incentive to explore this concept arose out of one of the newest conflict resolution mechanisms in the environmental field, 'environmental mediation'. An examination of this concept led to the conclusion that certain of its 'innovative' characteristics and inherent principles might be utilized to achieve our objectives for improving existing environmental regulatory decision-making processes.

The paper begins with an examination of the concept of environmental mediation focusing particularly on its innovative characteristics and its potential application for resolving environmental conflicts.

Part two briefly summarizes two federal regulatory processes, the National Energy Board Act and the Atomic Energy Control Act, identifying specifically those provisions in the statutes which could provide opportunity for early conflict resolution.

the Canadian context.[5] Principal among these differences is the ready access to courts available to U.S. private citizens and public interest groups for litigating class actions in environmental matters. The highly litigious system of environmental regulation in the U.S. has resulted in excessive delays and has provided the various parties to an environmental dispute with the motivation to enter into voluntary negotiations in an effort to achieve consensual resolution of the problem. Hence environmental mediation is perceived to be an effective dispute resolution mechanism.

By contrast, individuals and groups in Canada are traditionally less litigious, and as well, are severely restricted in civil actions by the many procedural hurdles, not the least of which is the definition of what constitutes a class action. As a result, non-governmental parties without a specific direct interest in environmental decisions are limited to political lobbying and public pressure tactics to influence environmental decision-making processes.

In addition to these factors, Canadian environmental regulatory decision-making processes are substantially controlled by government through administrative procedures. For environmental mediation to be useful in Canada therefore existing environmental regulatory processes and non-regulatory environmental decision-making processes such as the Federal Environmental Assessment and Review Process require refinement to facilitate a wide acceptance of the principles underlying the concept as well as its use as a conflict resolution mechanism. In other words, the refinements as proposed, embodying many of the principles of mediation, if introduced into existing regulatory environmental decision-making processes, could begin to put administrators, industry, and the public at greater ease with the concept of negotiation and consensual decision-making for resolving disputes in facility siting and routing.

1. MEDIATION: A DEFINITION AND FIRST PRINCIPLES

The most frequently cited definition of mediation has been advanced by Gerald Cormick, a leading practitioner from the United States; he describes it as:

> A voluntary process in which those involved in a dispute jointly explore and reconcile their differences. The mediator has no authority to impose a settlement. His or her strength lies in the ability to assist the parties in resolving their own differences. The mediated dispute is settled when the parties themselves reach what they consider to be a workable solution.[6]

Put simply, the features of the process are negotiation among the parties with the assistance of a neutral third party to achieve consensus. Inherent in Cormick's expanded definition are the several essential principles of the process:

(1) The process is voluntary. The parties must be willing to enter into negotiation and are not compelled to do so at the recommendation of a mediator. One report has pointed out that voluntary participation in the process does not preclude resort to any other remedy available to a party;[7]

(2) The parties are brought face-to-face to negotiate the issues they have identified;

(3) The mediator facilitates the process particularly by improving communication among the parties;

(4) Agreement is reached by consensus; the mediator has no authority to impose a settlement; and

(5) The proceedings are kept confidential by the mediator in order to gain and maintain the trust of the concerned parties.

Given that inter-party negotiation is the essential feature of mediation, the process becomes an alternative to the more adversarial forms of dispute resolution, provides disputing parties with a forum to communicate their concerns, to exchange and challenge each other's information, to clarify the issues and to identify alternative approaches for reaching agreement.

But what are the limitations to the wide use of environmental mediation as a conflict resolution mechanism? First, mediation comes into play when conflict reaches a point where direct, face-to-face negotiations have reached an impasse and one or more of the parties feel that progress towards settlement has ceased. In other words, environmental mediation may be described as a crisis intervention technique.

Secondly, not all environmental conflicts can be mediated. One author has concluded that the mediability of any dispute is inversely proportional to the breadth and complexity of the issues involved.[8] He goes on to opine that disputes which pertain to activities or undertakings which are confined geographically but involve various government agencies, levels of government, and broadly based industrial and environmental interest groups, are usually very difficult to resolve because of the number of affected constituencies and the very diverse nature of their respective interests. He does conclude, however, that the resolution of these disputes is possible when innovative approaches are developed for rationalizing the costs and benefits associated with the activities. Included in this category would be energy facility-siting disputes.

If it is the case that environmental mediation has limitations for its wide use for resolving environmental conflict, what are the possibilities for refining exisiting environmental decision-making processes:

(1) to provide meaningful representations in the decision-making process of a wide range of public interests to respond to complex issues with far-reaching environmental implications;

(2) to facilitate the development of a single, adequate and widely accepted information base useful to all parties in negotiations with full access to the information to allow for effective presentation of all interest;

(3) to provide sufficient funding to allow all identified parties to a cause to present their concerns;

(4) to expedite the process; and

(5) to ensure sound environmental decision-making?

It is suggested that existing environmental decision-making processes could be improved by including in the administrative procedures dispute management processes which in most respects conform to the criteria identified in the definition of mediation, and which could serve to resolve conflict before stalemate occurs. While several environmental mediation practitioners from the United States have stated that such processes have little likelihood of success, they are speaking from the American experience where litigation is a frequent remedy whereas 'facilitation' and 'conflict anticipation' are less decisive mechanisms. Canadian environmental decision-making processes on the other hand, favour informal consultation with interest groups rather than public adversary hearings and have set a climate more amenable to increasing the scope of participation to include all the affected parties in order to take fully into account "the public interest". The concept of environmental mediation has considerable potential to achieve goals of this nature. However, there also exists the need to design processes for inclusion in existing regulatory processes to provide opportunities where negotiation could be conducted among all the affected parties, facilitated by a neutral third party, to achieve more consensual decision-making.

that in the Board's opinion may be affected by the granting or the refusing of the application". The Board has inserted many different conditions in certificates issued for projects; some of these have required the applicant to undertake further studies and tests and to furnish these to the Board or to undertake environmental protection requirements.

The National Energy Board Act and Regulations provide only a basic framework for hearing procedures, and much is left to the discretion of the Board. The Act directs that hearings regarding the issue, revocation or suspension of certificates or licenses for export or import of gas, or leave to abandon a pipeline or international power line shall be public. The Board may hold public meetings on other matters if it considers it advisable to do so.[20] (emphasis added)

The Act provides that the Board has exclusive jurisdiction to determine standing and to date the Board has never denied standing to any intervenor[21].

Board hearings for major frontier projects are usually held in Ottawa; when sociological and environmental issues are to be considered, it is the Board's practice to move to the regions affected by the proposed facility siting. Some observers have opined that the regional meetings tend to be of secondary importance thereby leading to feelings of alienation on the part of those who come in 'cold' to the regional meetings.[22] Finally, Section 29.6 provides that the Board may fix an amount for actual costs incurred by any person making representations to the Board.

The National Energy Board Act has incorporated into its scheme provision for the appointment, by the Minister, of a negotiator or an Arbitration Committee to settle compensation claims related to the acquisition of lands or for legislative damages suffered from company operations[23]. Section 9 provides that the Governor-in-Council may appoint and fix the renumerations of experts or persons having technical or special knowledge to assist the Board in any matter in an advisory capacity.

2. THE ATOMIC ENERGY CONTROL BOARD

The British North America Act of 1867, through a 1930 amendment, conferred the ownership and control of resources on the provinces. Uranium and nuclear matters became the exception to this division of powers, with the passage of the Atomic Energy Control Act in 1946.[24] The Act was based on Section 92-10(c) of the BNA Act which allows the Parliament of Canada to declare a "local work and undertaking" to be "for the general advantage of Canada".[25] Thus formal regulatory authority resides with the federal Atomic Energy Control Board.

The primary role of the Atomic Energy Control Board is set out in the Atomic Energy Control Act[26] which authorizes the Board, inter alia, to control atomic energy materials and equipment in the interest of national and international security. The Act confers on the Atomic Energy Control Board and on Cabinet a great array of control powers. By virtue of Section 3 of the Atomic Energy Control Act, the Board is the agent of the Federal Crown and is subject to any general or specific directions by the Minister under Section 7.

Many of the Atomic Energy Control Board's powers are exercised through the agency's Atomic Energy Control Regulations[27]. These establish a comprehensive licensing system. Briefly, there are two formal licensing stages, construction approval and approval to commence operation. Preceeding these stages is the site approval stage. The Board does not consider this phase part of its licensing process yet site selection obviously has implications for health and safety and hence early public debate is important. In addition, the agency's inevitable involvement in site selection is impossible to sever from the steps that culminate in agency decisions on the construction and operation stages.

3. FEDERAL ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS (EARP)

This federal environmental assessment process is a non-statutory requirement, based on a Cabinet decision of December 20, 1973 as amended by Cabinet on February 15, 1977[28].

Under the Cabinet Minute the Minister of the Environment was authorized to establish a process to ensure that:

(a) environmental effects are taken into account early in the planning of new federal projects, programs and activities;

(b) an environmental assessment is carried out for all projects which may have an adverse effect on the environment before commitments or irrevocable decisions are made; projects with potentially significant environmental effects are submitted to the Department of the Environment for review;

(c) the results of these assessments are used in planning, decision-making and implementation".[29]

This authority has been clarified by a 1979 amendment to The Government Organization Act[30] which makes it clear that the assessment powers and responsibilities are vested in the Department of the Environment. Federal projects are those initiated by federal departments or agencies, and projects proposed by agencies outside the federal government that involve federal funds or federal property. Federal regulatory agencies and proprietary crown corporations are not specifically bound by the process. They have been 'invited' but not directed to participate.

The detailed procedures are as follow: As early as possible in the project planning process the initiating department or agency ('the initiator') must screen projects for potential adverse environmental effects. The "initiator" is the government department or agency either proposing the project, or charged with administration of federal funds or property involved in a project proposed by a private developer ('the proponent'). Screening guidelines in matrix form for various categories of projects have been developed by the Department of the Environment.[31] The Department has also suggested the following criteria for making screening decisions: magnitude, prevalence, duration and frequency, risks, importance, and mitigation.

As a result of initial screening one of three decisions must be made by the "initiator":

1. There are no potential adverse environmental effects, or adverse environmental effects are not considered significant;
2. The nature and magnitude of potential environmental effects cannot be determined by preliminary screening; or
3. Anticipated adverse environmental effects are considered to be signficant.

It is important to note that the Screening Guide specifies that environmental effects are judged to be significant if they create or have the potential to create controversy in the public or in professional communities.

If decision 1 is made, no further reference to the process is required. Decision 2 requires that the "initiator" prepare an Initial Environmental Evaluation (IEE). In this latter case the IEE will permit the "initiator" to make a decision as to whether alternative 1 or 3 should be followed. If decision 3 is made either initially or following preparation of an IEE, then the Executive Chairman, Federal Environmental Assessment Review Chairman, Federal Environmental Assessment Review Office (FEARO), Department of the Environment, will establish a Panel to review the project.

The roles of each of the parties to the process may be summarized as follows:

1. <u>Proponent Agency</u>
   - interprets Department of Environment guidelines and conducts initial screening and/or environmental evaluation to determine whether potential

environmental impacts of project are significant;

- interprets review panel guidelines and prepares E.I.S. accordingly; may seek clarification of guidelines from panel;
- proceeds with project if judged to have no significant residual detrimental environmental effects or if approved by Minister upon receiving EARP report.

2. FEARO
   - recruits members of federal Public Service to review panels;
   - administers EARP;

3. Review Panel
   - prepares guidelines for preparation of the environmental impact statement (EIS);
   - may consult with public interest groups in preparing guidelines;
   - conducts public meeting to review E.I.S.;
   - may issue statement of deficiencies requiring further information or analysis be provided in the E.I.S., and hold subsequent public meeting to complete review of E.I.S. upon receipt of supplementary information;
   - makes a report with recommendations to the Minister of the Environment.

4. Affected Persons and Public Interest Groups
   - may be consulted re guidelines for the E.I.S. at discretion of review panel;
   - may be consulted by proponent in preparation of E.I.S. at proponent's discretion;
   - participate in public meetings for review of E.I.S.

5. Minister of the Environment
   - appoints members to review panels who are from outside the federal Public Service;
   - in conjunction with the Minister responsible for the initiating agency, makes final decision on projects which have gone through EARP;

In terms of relative power of the parties to the process, the proponent or initiating department has greater control over the process than the affected public. For example, the proponent can potentially decide that there are no significant impacts and not proceed to a review process.

III

A MODEL FOR ENVIRONMENTAL NEGOTIATION

The development of a model for environmental negotiation arose out of two basic tenets. The first was the belief in the concept of environmental mediation as a more effective dispute resolution mechanism to better reflect the interests of all affected parties, but acknowledging its limitations for the Canadian regulatory context. The second premise was that the public hearing process should not be the only technique used to resolve environmental disputes; that many of the issues which are left to the public hearing could be dealt with earlier, could be more effectively resolved to the satisfaction of all the affected parties through a process of negotiation, facilitated by a neutral third party, thereby narrowing the issues before a hearing starts. Because techniques which assist negotiation have been developed in other fields, their application to environmental disputes is tenable more importantly the public hearing process as it presently functions, where all the issues are left for decision to the one forum, fails to provide opportunity for truly consensual decision-making in the public interest.

With the features of environmental mediation in mind as well as the concept of preliminary or pre-trial hearings, a model for the use of environmental negotiation was developed for use at specific decision-making points in environmental regulatory processes. The model had to address how to deal with procedural and substantive issues, matters related to the gathering and sharing of all relevant and necessary information, funding of the affected parties, and fair, competent neutral leadership for conducting the negotiations. These and other issues are fully discussed in Part III.

A. <u>THE NATIONAL ENERGY BOARD:</u>

Pursuant to the <u>National Energy Board Act</u>, the National Energy Board has full and exclusive jurisdiction to make any order or give any direction in 'the public interest'. The Board therefore could direct that an environmental negotiation process be conducted to resolve specific issues such as facility siting and route selection[32]. Because the National Energy Board shall recommend to the Minister such measures as it considers necessary or advisable in the public interest for the control and supervision of the development of energy[33], the Board could, in this advising role, establish a precedent of directing early environmental negotiation among the parties affected by proposed development, in order to identify potential issues for negotiated resolution. In order to facilitate this process the Board has the mandate to utilize, wherever appropriate, agencies of the Government to facilitate an order or direction for environmental negotiation.[34]

With this broad mandate the National Energy Board could facilitate the inclusion of environmental negotiation processes at three different stages in the regulatory process under the Act:

(1) The site planning stage: when a company makes an application to construct a pipeline, it must accompany the application with a plan, profile and book of reference about the proposed site. Construction may not begin without a certificate from the Board granting it leave to begin. The use of an environmental negotiation process at this stage could benefit all parties having an interest in the proposed facility site. The process could facilitate an identification of the environmental issues which would likely arise, their complexity and the possible mitigative measures which would be necessary if development proceeded. The process could facilitate communication between industry and the parties likely to be adversely affected by the development. Early consultation could facilitate agreement about some of the issues provided all the parties adversely affected had been consulted and negotiation techniques utilized. Lines of communication among the parties could be established making further negotiation possible throughout the progress of the development.

(2) The application stage: Once industry has decided on a facility site, it must make an application for a certificate to proceed with the construction phase. In accordance with the Board's Rule of Practice, the application must be accompanied by detailed environmental information[35]. The Board could direct that environmental negotiation be conducted among the affected parties for the preparation of this report. Such a process would encourage the identification of mutually agreed upon, anticipated environmental problems and problem areas. Attention could also be given to detailing mitigative measures and follow-up processes for ensuring their satisfactory completion. Certain issues would undoubtedly remain contentious but identification at this stage would both provide early warning to allow preparation for their consideration at later stages.

(3) Upon the calling of a public hearing: The Board must hold a public hearing where a person adversely affected by a proposed construction has filed a written statement opposing such development[36].

Since the parties adversely affected by the development would be identified through the filing of their objection statements, an environmental negotiation carried out at this stage could facilitate the identification of the issues for conflict anticipation purposes. Negotiation conducted at this stage could be used to resolve some of the identified disputes; those issues which remain unresolved could be dealt with at the public hearing stage. This would serve to focus the public hearing process on the more contentious issues.

If the National Energy Board directed that environmental negotiation was to be utilized as an integral part of its administrative procedures to assist it in its deliberations concerning the public interest, presumably the agreements arising out of the environmental negotiation process would be given due weight by the Board in its final deliberations. At the same time, however, it would be essential that the use of environmental negotiation would not preclude the parties adversely affected by the proposed development from utilizing other approaches to bring their concerns to the attention of the developer and the Board, if environmental negotiation processes failed. Approaches such as political lobbying and use of the media come to mind especially if the environmental negotiation process failed to achieve stated objectives.

The choice of a facilitator for the environmental negotiation process would be critical to its success. Clearly the person would have to be acceptable to all the parties involved. Critics of this proposed process will identify this aspect as a problem area. They will argue that a facilitator appointed by the National Energy Board could not be a neutral third party . In response, it is argued that the process will likely be successful if all the parties strive to ensure that it does work to everyone's satisfaction. It is suggested that the issue at this stage is to attempt to facilitate more negotiation to achieve consensual agreement among the parties to a proposed development early in the process to identify and resolve, so far as possible, conflicts arising out of perceived environmental impacts.

B. THE ATOMIC ENERGY CONTROL BOARD:

It is recommended that an environmental negotiation process should be instituted by the Atomic Energy Control Board in accordance with its mandate under The

Atomic Energy Control Act[37] for the pre-site approval stage. Site selection obviously has implications for health and safety and to ensure early public debate and agreement, where possible, the Board could require as a condition of being licensed that a proponent announce publicly its intention to seek site approval and satisfy the Board that adequate public debate had taken place including the use of environmental negotiation among the affected parties.

This would achieve two ends. It would enable debate on general issues to take place at the provincial level at an early stage. Second, it would bring environmental questions to the fore when they should be raised.

The Atomic Energy Control Board[38] is instructed to act in the national interest in the control, development and use of nuclear energy. Its task involves health and safety measures. But, the flexibility of its mandate gives the Board ample scope for structuring its licensing tool to nudge the proponents in the direction of a environmental consultation process. This would benefit not only the public at large but also its perception of the Board as an effective regulator truly acting in the public interest.

C. INCENTIVES FOR IMPLEMENTING A MODEL OF ENVIRONMENTAL NEGOTIATION IN EXISTING ENVIRONMENTAL REGULATORY PROCESSES

It is all very well to argue for improving existing federal regulatory processes to achieve more balanced environmental decision-making, but without clear policy directions being provided to regulatory or administrative tribunals such reforms are not likely to take place. There are initiatives which could provide the necessary impetus and these are discussed in this section.

1. Promotion by Government

Parliament has given the National Energy Board full and exclusive jurisdiction to inquire into, hear and dètermine any matter where it appears to the Board that circumstances may require it to act in 'the public interest'[39]. Yet nowhere in its enabling legislation is the 'public interest' defined. Because environmental impact assessments must accompany applications for facility siting and development, environmental matters must be in the public interest. As to the definition of 'environment' a review of the environmental information which must be filed suggests it includes social, economic, political and cultural impacts. Yet the role of the public in the Board's deliberations about the 'public interest' fails to meet the objectives for sound environmental decision-making. If the 'public interest' is to be determinative of the Board's decision-making then the process should include more meaningful consultation to include the negotiation among mutually-identified areas of dispute.

The model of environmental negotiation process proposed in this paper could create new access points through which the public could participate in the resolution of environmental disputes related to energy facility siting. The implementation of these proposals would be facilitated if there was public committment by the federal government to encourage the use of environmental negotiation as a dispute resolution mechanism.

The first most important stage would be the full development of this model by the Department of the Environment, including full and adequate discussion with all those persons and groups likely to be affected by the inclusion of such a process in existing regulatory and administrative proceedings. Thereafter, and presuming that full Cabinet endorsement was obtained, encouragement could be given in the form of an Environmental Policy Direction in the Speech from the Throne. Policy guidelines could be issued from the Minister of the Environment to direct bureaucratic decision-making in the selection of facilitators for environmental negotiation processes.

The National Energy Board Act and the Atomic Energy Control Act would require amendment to include preambles directing that the Boards shall, in exercising their mandates, consider 'the public interest as it relates to the protection of the environment.'

Finally the development of policies and strategies for funding to environmental interest groups would be needed.

2. Funding of Environmental Interest Groups

The inclusion of environmental negotiation processes in existing administrative procedures would increase consultation and negotiation between industry and the public adversely affected in facility site selection. In order to implement these processes successfully funding would have to be provided to the parties. There are three approaches for providing funds which could be considered:

(i) Environmental Protection Grant Programme: The federal government could create such a programme as part of an implementation strategy for a new Environmental Priority Policy. Upon the application by an environmental group direct grants could be made to it to obtain quality legal and scientific expertise. Grants for this purpose would indicate the strength of government support for meaningful participation in environmental decision-making processes.

(ii) Award of Costs by Regulatory Tribunals Under the National Energy Board Act: The Board may fix such amount as it deems reasonable in respect of actual costs reasonably incurred by any person who made representations to the Board at a 'public hearing'[40]. If environmental negotiation processes were included in the process at the points described earlier, it would be essential to broaden this provision to cover these situations too. The suggestion has been made that administrative tribunals should be given jurisdiction to award costs against a regulated industry where it is demonstrated that an environmental intervenor has demonstrated a legitimate interest in the outcome of the process and has participated in a responsible manner. This is analogous to a negative tax; presumably the intervenor has contributed valuable information and insight to the process and should therefore be rewarded. It is the opinion of the authors that such awards could only antagonize industry and to what end?

One problem with an award of costs to environmental interest groups is that it is after the fact and does not address the need for funds to prepare in advance of a presentation. In addition, groups cannot be assured that costs will be awarded in their favour, nor what the amount of the award will be. It is arguable therefore that the most effective strategy is one which would provide funds to environmental interest groups to assist with development of their presentation. Clear criteria for eligibility to such funds would be essential.

On the issue of funding for environmental interest groups, little attention has been directed to the use of legal aid plans to facilitate increased representation at public hearings in environmental disputes. In Ontario, it is within the discretion of local legal aid committees to consider applications for legal aid related to environmental hearings.

It can be argued that environmental groups have a right to legal aid assistance before a regulartory tribunal. Where a person has the right to appear at a judicial or quasi-judicial inquiry, that person is entitled to be represented by counsel[41]. Section 20 of the National Energy Board Act has been intrepreted by the Federal Court of Canada as giving every member of the public who has a demonstrable interest in the subject matter before the Board over and above the public generally the right to participate in a hearing.

While not yet proclaimed in force but as a matter of argument, Section 15 of the Canadian Charter of Rights and Freedoms states that "Every individual is equal before and under the law and has the right to the equal protection and equal benefit of the law without discrimination and, in particular, without discrimination based on mental or physical disability"[42]. Most environmental groups when pitted against industry are at a disadvantage in both 'mental' and 'physical' ability. They have inadequate resources to be entitled to the 'equal benefit of the law' because they suffer from 'discrimination' by virtue of inadequate funding mechanisms. Section 15 comes into force on April 17, 1985, it is possible that an argument along these lines will be used to obtain more adequate funding for groups with statutory rights to participate.

3. Full Disclosure of Information

In order for parties to a dispute to argue their positions effectively, they must have an adequate information base and full access to information on all the matters in issue.

The National Energy Board, in considering applications before it for certificates to construct, pipelines takes into account staff reports prior to reaching its decision. These reports are considered confidential and not available to the parties.

> "While the Board is authorized by statute to obtain information otherwise than under sanction of an oath or affirmation . . . this does not authorize it to depart from the rules of natural justice. It is clearly contrary to those rules to rely on information obtained after the hearing was completed without disclosing it to the parties and giving them an opportunity to meet it"[43].

The applicable principle in law is that each party to a hearing is entitled to be informed of, and to make representations with respect to evidence which could effect the disposition of the case[44]. While the National Energy Board argues that staff reports are confidential this has been held not to be grounds to exclude evidence from the record. Even where a statute has a provision to prevent confidential information from being made public, the parties to a statutory hearing must have a fair opportunity to answer anything contrary to their interest and a right to make submissions with respect to the material on which the tribunal proposes to base its decision. This may necessitate some editing of the material by the tribunal to protect confidentiality, but disclosure is required. This is the case unless there is something in the statute clearly pointing to the contrary[45].

Section 23 of the National Energy Board Act provides that studies and reports of the Board may be made public with the approval of the Minister. Staff reports could be disclosed pursuant to this section and would provide important and relevant information to the parties.

Under The Atomic Energy Control Act the Board receives reports from the Reactor Safety Advisory Committee. If an environmental negotiation processes were conducted at the pre-site selection stage and such reports were completed, it would be essential that they be made public as soon as possible.

Finally, there is the issue related to which parties are entitled to participate in environmental negotiation processes. All parties that are "directly" affected by a proposed development, and are seen to be in conflict, must be involved in the negotiation process. A group which has been overlooked may have recourse to undermine any negotiated settlement. It is the responsibility of the facilitator to insure that all 'affected' interests are adequately represented at the negotiating table. This issue may itself have to be a subject of negotiation and agreement early in the process.

In addition, negotiations are more likely to succeed and the agreements concluded out of them acceptable, if government representatives are parties to the negotiation process. The issues surrounding who participates are complex and require explicit consideration if an environmental negotiation process is be successful.

IV
CONCLUSIONS

The purpose of this paper has been to propose refinements to existing environmental regulatory processes to accord interest and environmental groups greater opportunity to influence the course of environmentally significant events related to energy facility siting. The proposal for a model of environmental negotiation draws upon the innovative characteristics of environmental mediation, a dispute resolution mechanism which features voluntariness, inter-party negotiation, information sharing and consensual agreement. The major features which had to be included in this proposed model were the means to facilitate consultation and negotiation among the proponents, government and the persons adversely affected by proposed facility siting, financial resources to adequately prepare and full access for all the parties to the process to all necessary information. The objectives to be achieved in presenting a model for an environmental negotiation process were the opportunity for greater equality in the bargaining positions of interest and environmental groups, the enhancement of the status of public interest intervenors, and the introduction of a process of negotiation among the parties into existing federal regulatory bodies involved in environmental decision-making processes.

Given that only a few types of environmental disputes are amenable to environmental mediation, given that most environmental decision-making in Canada is made within the context of regulatory and administrative processes, usually legalistic and adversarial in form, and recognizing that the concept of environmental mediation would introduce a voluntary, negotiated, consensual element into existing processes which currently fail to provide adequate opportunity for negotiation among the affected parties, thereby leaving many conflicts unresolved or often times creating conflict, the objective was to propose refinements which would introduce certain of the features of environmental mediation into existing regulatory and administrative processes to facilitate increased negotiation and consensual decision-making in facility siting. The authors also argued that use of the proposed model of environmental negotiation could act as a catalyst for wider acknowledgment of the value and utility of environmental mediation as a dispute resolution mechanism in environmental decision-making.

The issue which remains to be considered is can the existing regulatory and administrative processes contemplate a process of negotiation among the parties having an interest in a proposed development? In the case of the Federal Environmental Assessment and Review Process, the Minister of the Environment is responsible for final decisions about projects which have gone through the review process. Panels conduct the 'assessments' of projects which have been referred by proponents and provide recommendations to the Minister. Thus only those projects which have been referred to FEARO and then enter the assessment phase could incorporate negotiation. Because identification of the issues is a critical aspect of environmental impact assessment, the proposed model of environmental negotiation could be utilized to both identify the issues, and depending on the will of the parties, even narrow some of the issues through early negotiation. The subsequent public hearing could then address the outstanding unresolved matters.

The National Energy Board Act grants the National Energy Board full and exclusive jurisdiction to inquire into, hear and determine any matter related to disposal of energy and sources of energy within Canada and to report to the Minister of Energy Mines and Resources therein. While the Act does not contain direction to the Board to 'negotiate' any of the matters over which it has jurisdiction, clearly the powers of the

Board are sufficiently broad that the model of environmental negotiation could be incorporated as a decision-making process in the existing provisions of the Act. It would, however, require Board direction based upon its belief in the utility of negotiation to assist in its decision-making as it relates to 'the public interest'. As proposed, policy direction in the Speech from the Throne could provide the necessary impetus to the Board to include environmental negotiation at the facility siting stage.

Further section 22 of the Act provides that the Board shall recommend to the Minister "such measures ... as it considers necessary or advisable in the public interest ..." (emphasis added). The Board, itself, could initiate negotiation processes at specific decision-making points to aid in its decision-making as it relates to the 'public interest' provided it was persuaded to the value of environmental negotiation as a tool to more precisely identify the key issues, expedite the process and minimize potential environmental disputes.

The National Energy Board Act includes the concept of negotiation as it relates to the acquisition of lands. Where there is disagreement about the compensation, either party may request negotiation proceedings. Pursuant to Section 75.1, a negotiator shall be appointed by the Minister and within sixty days of the commencement of the negotiation proceedings shall report back to the Minister about the success or failure of such efforts. Clearly, the Act intends that the results of such negotiation should be taken into account in the decision-making as it relates to compensation for the acquisition of lands. It is not unreasonable therefore, to suggest that the model for environmental negotiation could be incorporated into the Board's practices for facility siting.

In the case of the Atomic Energy Control Act, the enabling legislation does not currently contemplate negotiation. Practices and procedures which have been implemented since 1977 however do indicate a trend towards greater openness. It is suggested that the decision-point at which negotiation could have considerable impact is the pre-site facility selection stage as discussed earlier.

The purpose of this paper was twofold: (1) to examine the concept of environmental mediation as a model dispute resolution mechanism and to identify those features in the process which would facilitate inter-party negotiation for environmental devision-making, and (2) to propose a process which could be integrated into exisitng federal environmental regulatory and administrative processes to facilitate negotiation among proponents, government and persons affected by energy facility siting and routing. A model for an environmental negotiation has been described to achieve this objective together with strategies for its implementation.

ENDNOTES

1. While a definition of significant will be inevitably arbitrary the following characteristics are generally included:

   - the involvement of substantial, actual or potential economic costs and benefits,
   - The inequitable distribution of costs and benefits creating a win-lose situation
   - frequent philosophical or cultural polarization paralleling the proponent, opponent views,
   - highly politicized debate at regional or national levels.

2. This definition is taken from The Environmental Assessment Act, S.O. 1980, as amended, which is the most comprehensive detailed in Canadian statutes.

3. See for example The Northern Manitoba Flood Agreement; Darlington G.S., Whitechurch; Stouffville Sanitary Landfill Site - all of which situations have been fully studied and documented by The Canadian Environmental Law Association, Toronto, Ontario.

4. Steven Shrybman, Canadian Environmental Law Association, Toronto, Ontario who has conducted considerable, in-depth research on the concept of environmental mediation and prepared a report titled "Environmental Mediation, from Theory to Practice", May, 1984.

5. F. Christof Haussmann, "Environmental Mediation. A Canadian Perspective," a report prepared for Environment Canada, March, 1982.

6. See, Cormick, Gerald, The Theory and Practice of Environmental Mediation. The Environmental Professional, 1980. Volumes I and II.

7. Shrybman, supra, f.n.4.

8. ibid.

9. Canada Royal Commission on Canada's Economic Prospects, Final Report, November, 1957. The Gordon Royal Commission appointed by the Liberal Government and the Borden Royal Commission on Energy, First Report, October 1958, Second Report, July 1959.

10. With the passage of The National Energy Board Act, the Pipe Lines Act and the Exportation of Power and Fluids and Importation of Gas Act were repealed. Gas, oil and electrical power, insofar as it was exported, were to be regulated by the new Board.

11. S.C. 1959, c. 46 as amended; consolidated as R.S.C. 1970, c. N-6.

12. Section 11(b).

13. Vanvervort, Lucinda, "Political Control of Independent Administrative Agencies", Ottawa Law Reform Commission of Canada, 1977 at p. 44.

14. In practice, decisions requiring Cabinet approval are not released until Cabinet approval is actually received. As to this relationship see, Gale, "The National Energy Board", November 1982 at pp. 16, 33-34.

15. The National Energy Board Act, supra f.n. 9 and sec. 44.

16. ibid., sec. 44 (e).

17. Gas Pipeline Regulations, C.R.C. 1978, c. 1052, as amended.

18. National Energy Board, NEB Rules of Practice and Procedure, C.R.C. 1978, c. 1057, which schedule contains provision for the filing of social impact information.

19. In considering export licenses under Section 83, the Board is given a wide discretion to "have regard to all considerations that appear to it to be relevant". However it is specifically directed to satisfy itself as to the needs of Canadians and the justness and reasonableness of the proposed export price.

20. National Energy Board Act, R.S.C. 1970, c. N-6 as amended, Section 20. The present policy of the Board is to set all "major applications" for hearing. It was held in A-G. Manitoba v. NEB, (1974) 2 F.C. (F.C.T.D.), that if a hearing is held it must be procedurally similar to that in a court of law. See Section 10 in this regard.

21. ibid., sec. 45. It has however rejected some intervenors' evidence as irrelevant. Applications for judicial review of such rejections have not met with success.

22. Gale, W., and Wolpert, M., "The National Energy Board," Paper prepared for Advanced Administrative Law, Faculty of Law, University of Ottawa, November, 1982. p. 15.

23. Sections 75.1 and 75.13.

24. S.C. 1946, c. 37 and amended R.S.C. 1952, c. 11 as amended.

25. Department of Energy, Mines and Resources, "A Brief Submitted to the Cluff Lake of Board of Inquiry", Regina, Saskatchewan April, 1977, pp. 6-7.

26. R.S.C. 1970, c. A-19.

27. P.C. 1974-1195 (May 30, 1974)

28. See "Revised Guide to the Federal Environmental Assessment Review Process" No. En 105-4/1979 (Ottawa: Supply and Services Canada, May 1979). The following description of EARP is based on R. Franson and A. Lucas, 1 Canadian Environmental Law 996-2 to 996-9 (Toronto: Butterworths, 1976 and regular service issues). See also, P. Emond, Environmental Assessment Law in Canada (Toronto: Emond-Montgomery Limited, 1978), c.5.

29. Canada, Federal Environmental Assessment Review Office, "Detailed Outline of Contents of Cabinet Memoranda Establishing the Federal Environmental Assessment and Review Process" (Ottawa: April 1, 1978).

30. The Government Organization Act, 1979, S.C. 1978-79, c. 13, s. 14.

31. Canada, Federal Environmental Assessment and Review Office, "A Guide for Environmental Screening" (Ottawa: 1978).

32. National Energy Board Rules of Practice and Procedure, C.R.C., C. 1057, ss. 6, 15, 17.

33. R.S.C. 1970, C. N-6, S.22

34. ibid, S.22(3)

35. Rules of Practice, supra, f.n. 30, S. 5.

36. The National Energy Board Act, supra, fn. 31, S. 29.2.

37. R.S.C. 1970, c. A-19

38. ibid, S.3.

39. ibid., fn. s.22.

40. ibid., s.29.6.

41. Guay v. Lafleur, (1965) S.C.R. 12.

42. The Constitution Act, 1982, Schedule B Part I s.c. 1982, c.11.

43. Pfizer Company Ltd. v Deputy Minister of National Revenue for Customs and Excise, (1977) 1 S.C.R. 456, at 463.

44. Kane v. University of British Columbia, (1980) 1 S.C.R. 1105.

45. Magnasonic Canada Ltd., v. Anti-Dumping Tribunal, (1972) F.C. 1239.

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COMPENSATION OF POWERLINE IMPACTS AS A COST-EFFECTIVE ALTERNATIVE TO RELOCATION[1]

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Abstract.--Compensation for powerline impacts may, in some cases, be a more cost-effective means of reducing net overall environmental impact than rerouting or other mitigative measures. At Lake Broadview in southern Montana, waterfowl losses due to wire strikes could have been fully offset by a recommended mitigation and compensation program costing only about 25 percent as much as line relocation. Only a partial compensation program was approved and funded; this program resulted in a partial reduction of net losses at a cost equal to 7 percent of the anticipated cost of relocation. At Rock Creek in western Montana, compensation of losses to a nationally significant recreation area was found to cost less than 41 percent of the anticipated cost of relocation. Compensation of off-right-of-way impacts may offer a cheaper and more effective solution to certain other siting conflicts than line relocation.

INTRODUCTION

One important goal of regulatory agencies in reviewing plans for proposed transmission facilities is to minimize overall environmental impact. Another important goal is to minimize project costs. Meeting both objectives simultaneously is often very difficult, and requires that all feasible solutions be seriously considered in the planning process.

Although rerouting is only one of several ways in which the overall impact of linear facilities (such as transmission lines and pipelines) can be reduced, it is the option that commonly receives the most attention in environmental assessments. Other means of reducing net impacts, including compensation for unmitigable impacts, are seldom considered, even though they may prove to be far more cost-effective than rerouting. In fact, although compensation for impacts to private property within the right-of-way (ROW) is standard practice, compensation for impacts to private individuals off the ROW--or for any impacts to public resources, whether on- or off-ROW--is often dismissed out of hand in reviewing solutions to linear siting conflicts.

This paper describes two recent cases, each involving a double-circuit 500 kV powerline crossing Montana, where compensation offered a more cost-effective

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means of dealing with powerline impacts than rerouting. The first case is an example of how powerline-caused losses to a "fungible" public resource (in this case, ducks) can be offset by in-kind compensation: ducks for ducks. The second case describes how powerline-caused damage to a unique public resource was offset by out-of-kind compensation: losses were offset by providing for the acquisition of adjacent areas offering substitute opportunities for public recreation. Some topics for future research are suggested in the concluding section.

DEFINITIONS

Mitigation

In this paper, mitigation is defined as any action that reduces or ameliorates the severity of a potential impact. In some cases, it may be possible to fully mitigate an impact so that there is no change in resource quality or quantity as a result of the facility (Thompson 1979). This may be accomplished by rerouting to avoid the impact altogether, or by not building the facility at all.

Unfortunately, the costs of fully mitigating an impact are often excessive, especially at the margin: it may cost as much to reduce an impact from 10% to 0% as it does to reduce an impact from 100% to 10%. Therefore, reliance on mitigation alone can result both in excessive costs and in unacceptable "residual" or unmitigable impacts--external project costs that are passed on to the public at large.

Rerouting can be considered a form of mitigation. Many types of powerline impacts can be reduced by moving the facility away from the problem. Unfortunately, this often means moving the line closer to another problem. Therefore, full mitigation of powerline impacts by rerouting is seldom possible.

Compensation

Compensation may be defined as any action that provides substitute resources or environments to replace those lost due to a project. This definition is similar to that adopted by the Council of Environmental Quality (40 CFR 1508.20), although the CEQ defines compensation as a subset of mitigation. The reasons for making a distinction between mitigation and compensation are discussed by Thompson (1979).

It is important to realize that, while it may eliminate the net impact, compensation does not prevent impact altogether: the impact at one location is accepted, but it is offset by enhancement in another area. The situation over time has been changed, although the net losses over the long term have been eliminated.

Compensation works best with fungible resources--that is, commodities (such as grain, timber, electricity, or money) of the type in which one unit is equivalent to every other unit. Compensation does not work as well for unique resources--although, as we will see in Case 2 below, it is possible in certain cases to compensate for losses to more or less unique resources. Also, in-kind compensation (substitution of like resources) is easier to deal with conceptually than out-of-kind compensation (substitution of unlike resources, e.g. fishing access sites for wildlife losses).

Compensation of unmitigated impacts is routinely used as a tool to correct losses caused by hydroelectric development, power plant construction, and other developments for which impacts are easily quantified in terms of acreages inundated or destroyed. Indeed, compensation of such impacts has become a standard means of reducing net impacts and is supported by ample precedent and a substantial body of literature (Schwiebert 1977; Swanson 1979; Northwest Power Planning Council 1983).

Strangely enough, the concept of compensation has rarely been applied to powerline siting problems. Part of this is probably due to the fact that powerline impacts are extremely difficult to quantify--they are spread in a linear fashion over a very large area and are often experienced as a sum of small, difficult-to-measure impacts rather than a large, localized, easily quantified impact. Also, the public resources most severly affected by transmission lines--visual, recreational, and wildlife resources--are those which are by their very nature difficult to quantify. Therefore, severe transmission line related losses to these public resources are very frequently written off as unmitigable because they are unquantifiable, and the general public is left to bear the burden of their cost.

An important feature of both mitigation and compensation is this: if their costs are borne by the utility, they are no longer passed on to the general public but to that subset of the public that benefits from the construction of the facility. In economic jargon, one may say that mitigation and compensation are ways to "internalize" external costs.

Public vs. Private Resources

A fundamental distinction can be made between compensation of losses to public values, such as wildlife and recreation, and compensation of losses to private property, such as land, crops, and fences. Another important distinction can be drawn between compensation of losses occurring on the right-of-way (ROW), where just compensation for damage is clearly required by law, and that of losses occurring off the ROW. The various possibilities are shown in figure 1.

	ON-ROW	OFF-ROW
Losses to Public Resources	CASE I	CASE II
Losses to Private Resources	STANDARD PRACTISE	SEE DISCUSSION

Figure 1. Types of compensation discussed in this paper.

Compensation of damage to private resources within the ROW (figure 1) is standard practice. If private property is crossed by a ROW and the use of the land is impaired or its market value is reduced, the landowner is compensated monetarily (out-of-kind compensation) as a fair settlement for his losses. Private property that is inadvertently damaged during powerline construction--grainfields compacted by vehicles, gates or fences destroyed by construction machinery, irrigation systems disrupted--is likewise routinely compensated for to make the property owner "whole."

The other situations shown in figure 1 have not yet gained wide acceptance, although as acceptable solutions they appear no less justified, as I hope to demonstrate in the following discussion. Case I, described below, is an example of compensation for on-ROW losses to wildlife, a public resource (figure 1). Case II is an example of compensation for off-ROW losses to public recreational opportunity. In the discussion that follows I hope to demonstrate the desirability of a mechanism to compensate for off-ROW impacts to private property and amenities. In all cases, compensation of unmitigable impacts may not only be cheaper than partial mitigation or line relocation, but may also be more effective in reducing external costs to the general public.

CASE HISTORY I: WIRE STRIKES AT LAKE BROADVIEW

History

In 1973, the Montana Power Company (MPC) and the Puget Sound Power and Light Company filed an application with the Montana Department of Natural Resources and Conservation (DNRC) for permission to construct a 230 kV transmission line from a power plant at Colstrip to a substation site at Broadview, Montana. This line was intended to transport power produced by Colstrip Units 1 and 2 to the applicants' electrical grid system.

During its environmental review, DNRC found that the applicant's preferred route crossed a closed basin called Comanche Basin in which extensive intermittent wetlands are generated during wet years and that is used by large numbers of waterfowl when flooded. The EIS discussed the possibility of wire strikes by waterfowl and summarized the available literature. In its draft EIS, DNRC identified an alternative route that passed south of the applicant's preferred route and avoided the Comanche Basin.

During public hearings on the EIS, strong local opposition was voiced concerning the DNRC route, which passed near some residential areas on the outskirts of Billings. The Board of Natural Resources and Conservation (BNRC) eventually approved the applicant's preferred route in response to this strong public opposition.

Since it was possible that the 230 kV line would eventually become part of a twin 500 kV system, BNRC granted the applicant permission to build the 230 kV line on 500 kV steel lattice towers and to string two 230 kV circuits on the towers. The conductors could later be rebundled to allow transmission at 500 kV. Most of the line was to be constructed using guyed towers. The line between Colstrip and Broadview was constructed in 1975 and 1976, a time when Comanche Basin was completely dry—as it had been for many years.

In 1976 the Colstrip-Hot Springs twin 500 kV transmission lines were approved by BNRC along the Applicants' preferred route, a two-mile-wide corridor that followed the Colstrip-Broadview 230 kV line as far west as Broadview. A centerline closely paralleling that of the Colstrip-Broadview 230 kV line was approved by BNRC in February 1978. At that time the basin was still dry. The existing conductors for the 230 kV line were to be rebundled to create the 500 kV "A" line, and a new "B" line was to be constructed immediately to the north of the existing towers.

The winter of 1977-78 was severe, with heavy snow accumulation in the basin. This severe winter was followed by an unusually wet spring, with rainfall amounts much higher than normal. As a result, the Comanche Basin filled with water in 1978, creating a lake with a surface area of about 10,000 acres and containing about 20,500 acre-feet of water. This lake was called Lake Broadview. Water remained in the basin through 1978. Winter and spring conditions in 1978-79 were similar to those of the previous winter, and in spring of 1979 the surface area of the lake was again about 10,000 acres (see figure 2).

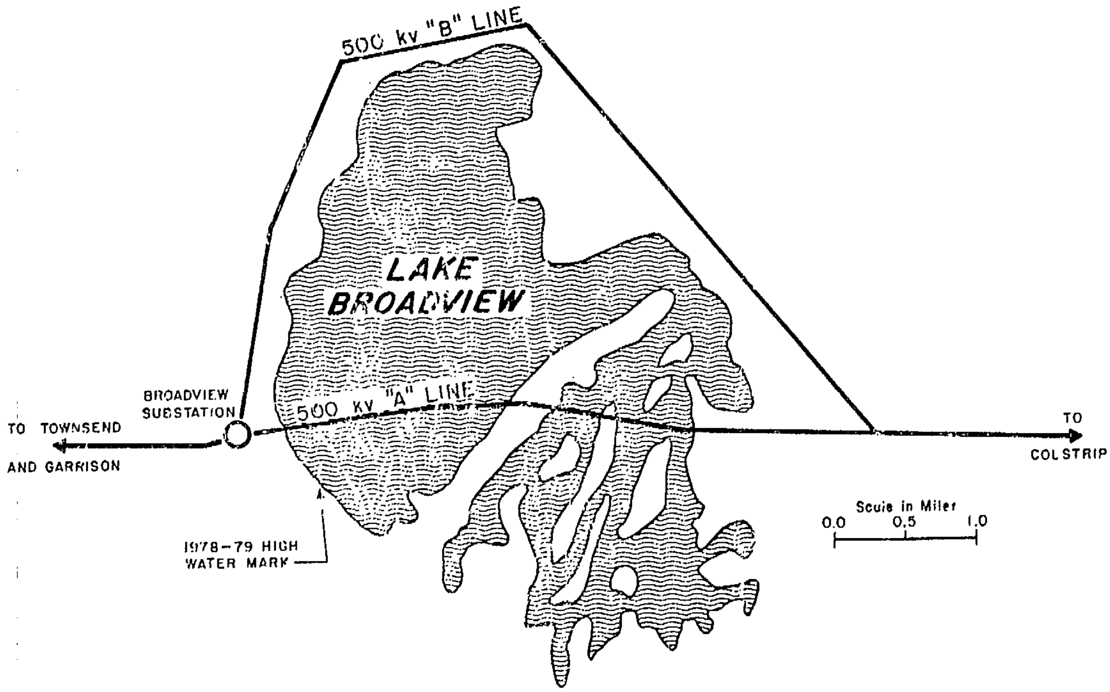

Figure 2. Location of 500 kV "A" and "B" lines in relation to Lake Broadview.

The abnormally high water levels in the Comanche Basin created a number of problems. In April 1978, large ice rafts, propelled by wind across the lake, destroyed three towers surrounded by the water. To prevent such damage from reoccurring, protective wooden pilings were installed around the towers. Also, waterfowl and other water birds—probably as many as 60,000 per year—used the newly-flooded lake habitats. Large numbers of these birds were killed by naturally-occurring outbreaks of avian botulism in 1978 and 1979, and the U.S. Fish and Wildlife Service (USFWS) responded with an intensive effort to clean up the dead birds. During the cleanup, examination of carcasses with obvious external injuries revealed that many birds were being killed by colliding with the wires of the 230 kV line.

In the spring of 1980 the surface area of Lake Broadview decreased to about 3,500 acres (5,250 acre-feet), but the area was still used by large numbers of water birds. Because of the large waterfowl losses during the summers of 1978 and 1979, USFWS began a monitoring program in the spring of 1980 to document bird mortality resulting from wire strikes. Costs of the USFWS cleanup and monitoring studies were $29,000 in 1979 and about $30,000 in 1980. DNRC was informed of USFWS concerns about these problems in August of 1980.

In August 1980, the applicants applied to BNRC for an amended certificate allowing relocation of the centerline of the 500 kV "B" line to avoid Lake Broadview (figure 2). That amendment was approved by the BNRC in September 1980 with the condition that the applicants establish an ad hoc committee, including representatives of the Montana Power Company, USFWS, DNRC, and Montana Department of Fish, Wildlife, and Parks (MDFWP), to "determine the most appropriate means of correcting or compensating for damage, if any, to waterfowl populations caused by the project in the vicinity of Lake Broadview. This committee is to present to the Board by January 1, 1981, its findings and recommended corrective or compensating measures, including a timetable and complete budget, if any, for Board approval, rejection, implementation or other necessary and appropriate action."

The Lake Broadview Mitigation Committee was thus created, and began a detailed study of the wire strike problem and possible solutions, including moving the "A" line, other mitigative measures, and compensation. In its reports to BNRC, the committee presented the findings and recommendations summarized below.

Estimates of Wire Strike Losses

Based on the USFWS cleanup data, the Committee estimated that 4,970 birds (half of which, or 2,485, were ducks) were killed each year during 1978-79 by colliding with the conductors, static wires, guy wires, or towers of the "A" line at Lake Broadview. In 1980 losses were estimated as 3,072 birds (1,536 ducks). These losses represent a bird collision rate of 4.8 birds per kilometer-day, by far the highest collision rate ever reported. The projected collision rate for the yet-to-be-constructed "B" line, which was to be located on dry land but adjacent to Lake Broadview, was estimated at 0.03 to 0.30 ducks/km-day, based on literature and other available sources.

To derive an estimate of long-term losses at Lake Broadview, the Committee had to estimate the frequency of flooding of Comanche Basin. The USFWS estimated, based on interviews with local landowners and on 1909 through 1979 precipitation data, that there has been substantial water in the basin an average of three years out of ten since 1909. Of the three problem years, one would likely be a "worst-case" year with losses comparable to those incurred during 1978 and 1979. One would be an "intermediate-loss" year similar to 1980, and one would be a "low-loss" year.

The majority of the committee eventually arrived at an estimate of long-term wire strike losses at Lake Broadview of 1,150 birds (575 ducks) per year (MPC did not agree with this estimate). This estimate was based on the estimated wire strike rates for the "A" and "B" lines and on the USFWS flooding frequency estimates, and was obtained by dividing the total estimated losses over the 37-year cost-accounting life of the project by 37 years. This is the largest wire strike loss reported to date.

Botulism Losses

The wire strike losses at Lake Broadview were small in comparison to losses caused by a related problem: avian botulism. The losses due to botulism at Lake Broadview were estimated by USFWS to be 35,000 birds in 1978 and 28,000 birds in 1979 (Malcolm 1982). These losses are greater than the annual waterfowl production at any of the national wildlife refuges in Montana.

The Committee's review of the problem revealed that the wire strikes caused by the project were exacerbating the existing botulism problem at Lake Broadview. The presence of bird carcasses in the shallow, warm water throughout the spring and summer caused botulism outbreaks to occur earlier in the year than they otherwise would and to occur with increased severity. The presence of the transmission line was, therefore, contributing to a secondary bird mortality problem possibly far greater than the mortality due to the collisions themselves.

In 1978 and 1979, when botulism losses were the most severe, the USFWS cleanup program did not begin until after the botulism outbreak was well under way. In 1980 the USFWS conducted dead bird cleanup prior to the botulism outbreak. As a result, losses were reduced to an estimated 5,200 birds (Malcom 1982). This suggested that cleanup of dead birds could be effective in mitigating the project-caused increase in severity of botulism outbreaks at Lake Broadview.

Possible Solutions

The Committee examined a number of potential solutions to the wire strike problem at Lake Broadview. One obvious solution--rerouting the "A" line above the Lake Broadview high water mark--would probably be very effective in reducing both the wire strike problem and the associated botulism problem. However, the cost of relocating the line was estimated to be $2.6 million. The committee, therefore, investigated other possible solutions to see if any were equally effective and less costly.

The committee investigated possible mitigation of the wire strike problem by engineering design, including marking wires, installing strobes, or ground wire removal. None of these options seemed very promising. They were either very costly, unfeasible, or of limited effectiveness. Water management solutions, including draining or diking of the marsh, also were considered. These options, however, were prohibitively expensive and also were likely to result in a net degradation of existing waterfowl habitat.

In the end, compensation for the bird losses by improvement of habitat off-site was found to be the most cost-effective solution to the problem of bird losses due directly to collisions. These losses could be compensated by improving waterfowl production habitat elsewhere, so that each year an additional number of ducks (equal to the average annual number lost to wire strikes) would be produced. (The committee's approach dealt only with duck losses; the committee was willing to assume that improvement of duck habitat also would benefit other bird species.) Utility-funded cleanup of dead birds was felt to be a cost-effective means of mitigating the increase in botulism mortality caused by the wire strikes.

Committee Recommendations

The committee initially recommended: (1) that the applicants be required to compensate for wire strike losses incurred during the life of the project (including known losses from 1978 through 1981, as well as projected future losses) by implementing a habitat acquisition and improvement program capable of recruiting 575 additional ducks per year into the Central Montana breeding population; and (2) that the applicant fund cleanup of dead birds during years when there is water in the basin. The total costs of this strategy would be about $270,000 for habitat acquisition, enhancement, protection, and maintenance, plus about $360,000 for cleanup of dead birds ($30,000/yr for each of the estimated 12 years there would be water in the basin), for a total of about $630,000. This figure amounts to about 25 percent of the $2.6 million it would cost to relocate the line away from Lake Broadview. Therefore, this option was felt to be the most cost-effective solution.

At the request of the BNRC, the committee eventually revised part 1 of the recommendation to separate known losses incurred through 1981 from projected future losses. The committee then presented a revised recommendation calling for: (1) a compensation program capable of recruiting 200 additional ducks per year (this target figure was obtained by dividing the total waterfowl losses incurred through the period—7,400 ducks—by the 37-year cost-accounting life of the project); (2) a long-term monitoring program based on the cleanup results; and (3) additional future compensation based on the results of the monitoring studies. That is, in the event that additional wire strike losses were documented after 1981, the applicant would be required to pay for improvement of enough additional habitat to compensate for these losses.

The committee stressed the importance of compensation based on the target number of ducks rather than on a dollar amount. In no case did the Committee consider a cost or value for each individual duck.

Board Action

In August 1981, the BNRC arrived at a decision that was a compromise between the recommendations of a majority of the committee and those of the applicants. The applicants were required to create two separate funds, each in the amount of $87,000. (The figure $87,000 was derived from a preliminary estimate of the approximate costs of acquiring and improving habitat to produce an additional 200 ducks per year.) The first $87,000 fund was to be used to acquire and manage habitat to compensate for wire strike losses incurred through 1981. The second $87,000 was to be used to implement an effective mitigation program or, if no such program could be developed, to compensate for future wire strike losses at Lake Broadview. The total costs were therefore $174,000, or only 7 percent of the $2.6 million it would cost to relocate the line.

The BNRC decision did not require the applicant to pay for cleaning up dead birds at Lake Broadview, as recommended by the majority of the Committee. This means that the USFWS, a public agency, may continue to absorb the costs of cleanup during years when there is water in the lake, and the impacts of the line will be only partially offset. The effect of the line on botulism mortality will not be corrected by the applicant. There is also the possibility that USFWS may not volunteer to fund the cleanup of dead birds the next time the lake fills. As a result, there could be serious future losses to botulism exacerbated by line strikes.

Recent Developments

Since creation of the Lake Broadview Mitigation Funds, the committee has continued to function in identifying and acquiring suitable compensation lands. Compensation activities have centered on Big Lake, another closed basin about 20 miles southwest of Lake Broadview. Much of the Big Lake basin is already in public ownership, and the committee has used part of the mitigation fund to acquire additional land to be used for waterfowl enhancement. One 350-acre parcel has been acquired, and another parcel is being negotiated. Ducks Unlimited has recently identified the Big Lake area as its No. 1 priority for waterfowl habitat management in Montana. The presence of public lands brought about by the Lake Broadview fund will allow increased flexibility in management of the entire basin by DU for waterfowl production.

Lake Broadview dried completely in July 1983 for the first time since 1976. Table 1 summarizes wire strike losses through 1983.

Year	Bird Use Days (millions)	Exposure to Collision Hazard			Estimated Collision Rate (Birds/ km-Day)	Number of Documented Wire Strikes	Estimated Total No. Birds Killed	Estimated Total No. Ducks Killed
		Ave. km.	Days	km-Days				
1978	-	4.5	230	1,035	4.8	0	4,970	2,485
1979	-	4.5	230	1,035	4.8	0	4,970	2,485
1980	7.7[1]	3.2	200	640	4.8	1,861	3,072	1,536
1981	5.0[1]	3.2	200	640	4.8	1,357	3,072	1,536
1982	-	2.8	200	560	3.0	310[2]	1,680	840
1983	-	1.5	75	112	3.0	10[3]	336	168

[1] Source: Malcolm 1982
[2] June 22 - September 3 only
[3] June 13 cleanup only

Table 1. Summary of wire strike losses at Lake Broadview through July 1983.

CASE HISTORY II:
CROSSING OF ROCK CREEK BY THE BPA 500 kV GARRISON WEST LINE

History

In January 1982, Federal District Judge James Battin ruled that federal energy marketing agencies, including the Bonneville Power Administration (BPA), must comply with the substantive standards of state law. At that time, BPA was in the process of completing an environmental impact statement on a major 500 kV transmission project, which would consist of a double-circuit 500 kV line on 165- to 175-foot steel lattice towers connecting the Garrison substation site in western Montana with the Spokane area. This line will be needed to carry power from Colstrip Unit four (a coal-fired generation plant in eastern Montana) when that plant comes on line in late 1985.

DNRC subsequently began a review of the project to determine whether it was in compliance with the substantive standards of Montana's Major Facility Siting Act. A number of alternative routes were studied during the state and federal review process.

The Problem

During DNRC's review of the project, a number of siting conflicts became evident. One of the most serious of these concerned the crossing of Rock Creek, about 20 miles southeast of Missoula, by the route that was jointly identified by the state and federal teams as the preferred route for the facility (figure 3). As site-specific centerline-level study of this area progressed, a number of seemingly irreconcilable siting conflicts became apparent.

Rock Creek is a nationally-acclaimed trout stream that provides a high-quality recreational setting for Montanans and out-of-state visitors alike. Rock Creek was the first stream in Montana to be designated as a "Blue Ribbon" stream (stream of highest recreational and biological value), and today it is one of the few "Class I" (the highest value in the new classification system) streams west of the Continental Divide in Montana.

Part of the high recreational attractiveness of Rock Creek is its relatively pristine setting within a few miles of a major city. For the past two decades, state agencies and conservation groups have actively worked to preserve the stream's aesthetic, recreational, and biological quality. A former ranch called the "Valley of the Moon," which is near the proposed powerline crossing, was acquired by the U. S. Forest Service in order to preserve the natural setting and opportunities for dispersed public recreation (mainly fishing, picnicking, and enjoyment of natural surroundings).

Conservation groups felt that any powerline crossing of Rock Creek was totally unacceptable in light of the area's aesthetic importance, high recreational use, and uniqueness. This was not merely due to the potential impacts the powerline crossing would have on visual and recreational quality at the Valley of the Moon and adjacent settings--although these impacts alone were felt to be significant enough to render a powerline crossing unacceptable. It was also felt that the presence of the line at the point where most visitors leave the heavily-developed Clark Fork River Valley, with its four-lane interstate highway and commercial development, and enter the relatively pristine Rock Creek drainage would affect the recreational experience of all visitors entering via this route.

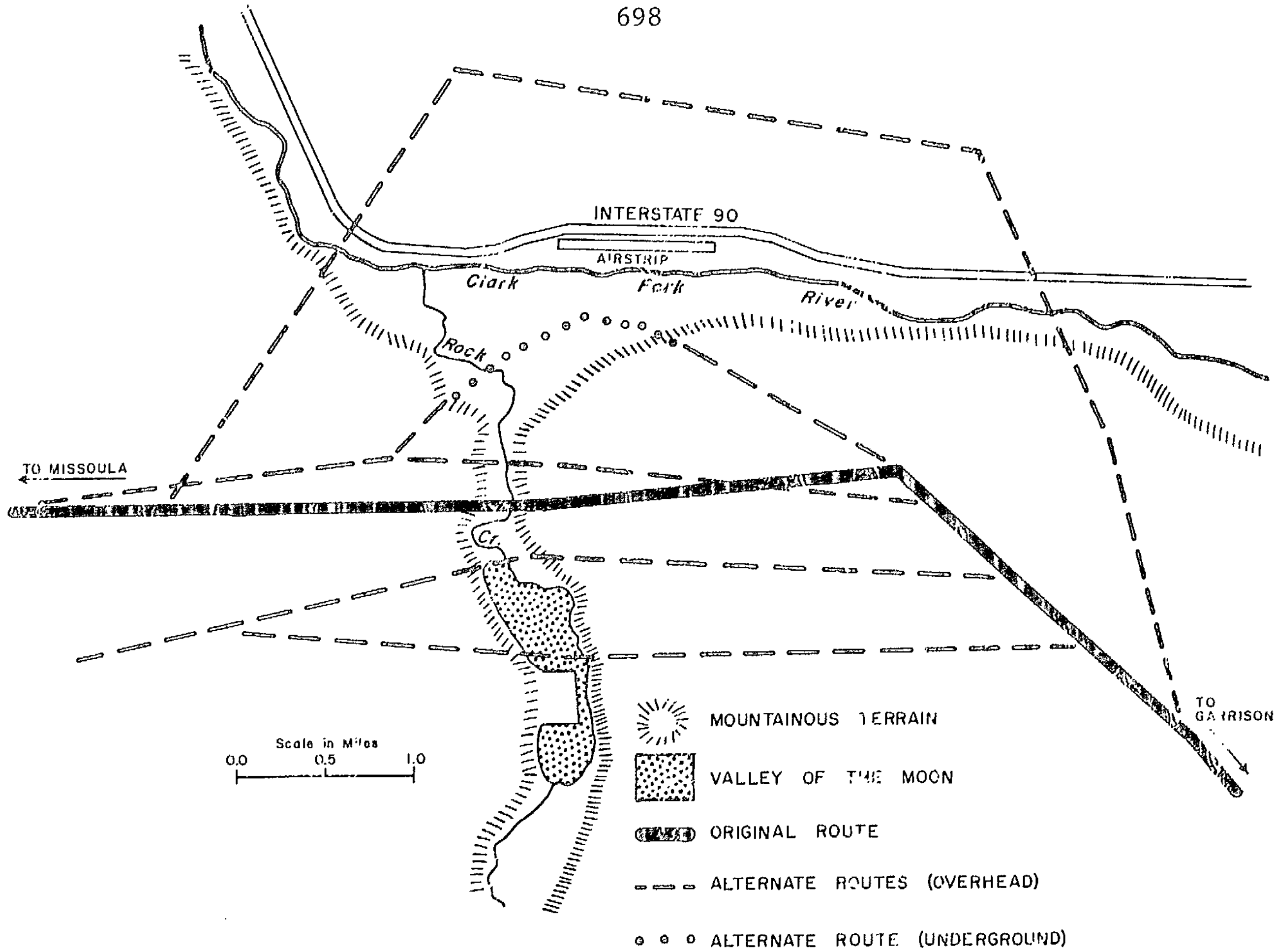

Figure 3. Original and proposed alternative routes for the 500 kV powerline crossing of Rock Creek.

According to the Montana Department of Fish, Wildlife, and Parks (MDFWP), a more significant effect of the line was the violation of the decades-old preservation agenda for the Rock Creek drainage by the powerline. It was felt that the presence of the line would erode support for any future preservation or enhancement measures in the drainage and would render any possible future protective classification of the drainage highly unlikely. Therefore, the presence of the powerline crossing near the mouth of Rock Creek could have a very real negative effect over the long term on the future management and recreational quality of the entire drainage.

A further complicating factor was the concern of the Montana Division of Aeronautics that the high Rock Creek Crossing (660 feet above the canyon floor) would pose a hazard during inclement weather to aircraft flying down the narrow Rock Creek canyon to reach an emergency airstrip along the Clark Fork River near the mouth of Rock Creek. The Division of Aeronautics took a strong position in saying that the proposed high crossing posed an unacceptable threat to pilot safety. Conservation groups took an equally strong position in saying that a lower span would be even more unacceptable than the original high span because it would require the location of a tower near the valley bottom. It seemed that there was no solution to the problem that would be even minimally acceptable to any of the parties concerned.

The RARE II issue

A separate issue concerned the crossing of several RARE (Roadless Area Review and Evaluation) II areas by the preferred route of the powerline. A 1982 decision by the U. S. Court of Appeals for the 9th Circuit prohibited any activities incompatible with wilderness in 46 California RARE II areas from taking place until the U.S. Forest Service (USFS) could prepare adequate environmental impact statements for each area. Although this decision applied only to the 46 California areas, it could set a precedent for all RARE II areas under the jurisdiction of the 9th Circuit (which includes Montana). In July 1983, three conservation groups—the West Slope Chapter of Trout Unlimited, the National Wildlife Federation, and the Montana Wildlife Federation—filed an appeal on the federal Record of Decision for the project with the chief of the U. S. Forest Service. This appeal called for a complete evaluation of the RARE II areas crossed by the BPA line before construction on the line could begin. The conservation groups also argued that BPA did not adequately consider all available alternatives. The Forest Service granted a stay for the appeals, which meant that construction of the line could have been delayed long beyond its scheduled completion date of October 1985. Any delay of the transmission project after the scheduled start-up date for Colstrip Unit four would result in cost increases to the applicants of up to $19 million per month (DNRC 1982, p. 55).

Alternatives to the Rock Creek crossing

DNRC, in its study of the Rock Creek siting problem, looked at a number of possible alternatives to the controversial high and low spans (figure 3). These included underground construction of the lines across the mouth of Rock Creek, routes which would cross Rock Creek farther upstream, and a route which would avoid crossing of Rock Creek by crossing the Clark Fork River twice (via either underground or overhead construction). All of these options would have increased the costs of the project greatly (by amounts ranging from $4 million to $13 million), but would not have substantially reduced the overall impacts of the project. Those options that would have avoided crossing Rock Creek or that would have reduced the hazard to aircraft would have created severe land use or visual impacts in the Clark Fork Valley. Such impacts would have proven unacceptable to other groups. The underground options would have done little to reduce overall visual impacts and would have created a host of new problems, including severe engineering and geotechnical problems.

DNRC, therefore, attempted to identify other solutions that could reduce net evironmental impacts to an acceptable level at a lower cost than the options mentioned above. In all, fifteen separate options were studied.

The solution which seemed to have the most merit was the compensation option. This would involve crossing Rock Creek along BPA's originally proposed alignment, but then compensating for the primary unmitigable impacts of the crossing. These impacts include visual and recreational damage to the Valley of the Moon and to the entrance to the Rock Creek canyon, a decreased likelihood that protection of the valley could be achieved in the future by special designation or classification, and the broader impact of negating the decades-old conservation agenda. It was felt that these impacts could be compensated for by acquiring protective easements on private inholdings farther upstream in the Rock Creek drainage.

Although a cost for this option could not be calculated, DNRC staff felt that adequate compensation could probably be achieved at a much lower cost than would have to be paid for any of the other options. The U. S. Forest Service and a private consultant had already been actively seeking options on selected parcels in the area (none were purchased because funds were cut off), so prime parcels for recreation enhancement were readily available.

Still, some mechanism was needed to determine the amount of compensation that would be needed. In this regard two major possibilities were discussed. First, an extensive study of Rock Creek could be conducted after the line was built to determine quantitatively the extent of recreational and visual impacts due to the project. The results of this study could be used as the basis for formulating a compensation package. This approach was not favored because of the difficulty of quantifying recreational and aesthetic impacts, the likelihood of delay in any settlement until years after the project is built, and the fact that the results of any such studies could be argued indefinitely without resolution—possibly with the result that no compensation would ever actually be achieved. Second, a dollar settlement could be negotiated. A problem with this latter approach is that it is not quantitatively linked to actual documented impacts. O'Hare et al. (1983), however, suggest that "compensation is best determined through negotiation among the parties to a dispute."

In the end, DNRC recommended the compensation option to the BNRC as the most cost-effective solution to the problem, and the only solution that would be even marginally acceptable to all parties involved. In spite of its drawbacks, negotiation of a compensation package without quantitative documentation of impacts seemed to be the only feasible way of arriving at an equitable settlement. It was felt that aeronautical hazards could be adequately mitigated by pilot education, posting of warnings at nearby airports, and marking of towers and wires with strobes or marker balls.

Unfortunately, BPA was unwilling to consider the possibility of off-site compensation. BPA officials indicated that even if the BNRC approved DNRC's recommended compensation option, BPA would likely not carry it out. It seemed unlikely that negotiations for a compensation package could even be initiated with BPA. Nevertheless, DNRC carried through its recommendation to BNRC, maintaining throughout that it was the most cost-effective and reasonable solution to this siting conflict.

Meanwhile, the conservation groups which had appealed the Record of Decision for the project had independently arrived at the idea of compensation for the powerline's impact to Rock Creek as a solution. Acting independently from the DNRC and BNRC process, they began negotiating a compensation settlement with MPC, the utility that was depending on timely construction of the powerlines to carry the power of Colstrip Unit No. 4. The conservation groups stated that they would be willing to drop their appeal of the Record of Decision if the impacts at Rock Creek could be satisfactorily compensated.

The Compensation Settlement

During the final days before the scheduled meeting at which BNRC was to make its decision on the issue, the conservation groups, BPA, Montana Power Company, DNRC, and the USFS met to negotiate a compensation package. At first, BPA was not willing to even discuss the option of compensation, although the conservation groups had decided that it would be an acceptable, if imperfect, solution. BPA agreed to negotiate a settlement only after the builders of the Colstrip project had agreed to fund the program and after the conservation groups agreed to withdraw their appeal on the RARE II issue.

By the time of the BNRC meeting, a $1.65 million compensation package had been agreed to by all parties. The funds would be paid to a public agency for the purpose of securing conservation easements and/or implementing monitoring programs in the Rock Creek drainage. The conservation easements would provide long-term protection of the area from further visual degradation, and would provide for public access to additional high-quality recreation lands in the drainage. The conservation groups had agreed to withdraw their appeal of the federal Record of Decision.

BNRC arrived at a decision on the Rock Creek powerline on August 19, 1983. In this decision, the BNRC adopted DNRC's recommendation for the compensation option. In its conclusions and final determination, BNRC determined that the project would comply with the substantive standards of the Montana Major Facility Siting Act if the line were built along the original crossing and the compensation package were implemented. Since the conservation groups had already negotiated a compensation settlement, BNRC was able to specify a dollar amount for the DNRC's recommended solution: "The mitigation measures include the payment of $1.65 million to a public agency for mitigation of adverse impacts at the time the...line is substantially completed and available for transmission of power."

It is important to realize that the BNRC decision and the negotiated settlement between the conservation groups and MPC were entirely separate processes. Had the conservation groups never filed the appeal on the federal Record of Decision, BNRC could still have adopted DNRC's recommended compensation program (although a dollar amount for the compensation settlement would probably not have been specified, and BPA might have refused to comply with the BNRC requirement). The fact that the appeal was filed, however, provided impetus to the utilities to negotiate a settlement which they might otherwise have refused to consider. This contributed in no small measure to a strong public reaction to the final settlement.

Public Reaction to the Settlement

Public reaction to the compensation settlement focused on one aspect of the process: the negotiations between the utilities and the conservation groups. The fact that a parallel process--that of the DNRC and BNRC--was leading independently to the same solution seems to have been ignored. The meetings were making headlines in local newspapers during the final days of the negotiations. After the agreement was signed, a number of strongly-worded editorials appeared in the press. Opposition to the settlement seemed to be equally strong on the part of both industry and environmental interests. Some members of conservation groups called the settlement a "sellout"; some utility representatives called it "blackmail" and "extortion".

However, once the issues behind the settlement were made clear, most groups came closer to a general acceptance of the concept. Some of those who attacked the settlement realized later that DNRC independently recommended a compensation settlement, and that the BNRC could have made the same determination even without the complications of the RARE II issue and the appeal of the federal Record of Decision. The utilities involved considered the settlement " a good business decision." An editorial in "Transmission and Distribution," a major utility industry journal, went so far as to praise the solution as evidence that "environmentalists and utilities can work together," and to suggest that "utilities would be well advised to foster this attitude and approach." (Lewis 1983). A spokesperson for one of the environmental groups said, "Some people say we were totally wrong and that we gave up too early. But we didn't give up. We won. We got the best we possibly could have wanted. I don't feel we traded principles for pragmatics." (Helena Independent Record, August 23, 1983, p. 3B). A representative of Defenders of Wildlife wrote, "...the RARE II issue never offered any hope of stopping the powerlines; at best, all the conservation groups hoped to achieve was...more mitigation for key resource features. When it became clear the groups might save time and money by negotiating a settlement..., an agreement was reached. Although the powerlines will cross Rock Creek, they'll do so on the conservation groups' terms." (Missoulian, Sept. 4, 1983, p. 10)

CONCLUSIONS

Summary of Case Studies

Each of the case histories described above incorporates unique features and is far from an ideal example. Nevertheless, these case histories do, as a group, offer real examples of situations where compensation for powerline impacts has provided a more cost-effective alternative than line relocation. One case involved compensation of losses to a public resource within the ROW; the other involved compensation of off-ROW losses to public resources. As demonstrated by these case studies, compensation appears to be a valid alternative to line relocation and, in some instances, the only equitable and satisfactory solution. Based on the beneficial aspects of the compensation option, it is difficult to understand why compensation is not standard practice in powerline siting as it is with hydroelectric development.

Needs for Future Research

The case studies described above are two instances where compensation of impacts to public resources offered a more cost-effective solution to siting conflicts than rerouting. Compensation for off-ROW impacts to private property and resources (figure 1) might also provide an alternative solution to certain siting conflicts, and seems to be a promising field for further research.

Michael O'Hare of the Kennedy School of Government at Harvard University has written that "An important failing of current practice in siting an ugly or dangerous facility is the strategic problem that results from failure to pay compensation to neighbors who suffer costs (losses in property values or less measurable amenity costs) not found to be a taking under law. Unless such compensation is paid, a socially beneficial project can be stalled or blocked permanently on each possible site." (O'Hare 1977). He proposes to "compensate victims of localized [off-site] nuisance costs, just as we already compensate those who suffer tangible costs when their property is physically invaded or taken by eminent domain."

Siting of large, unsightly transmission lines is an example of the larger problem discussed by O'Hare, namely the inequity of current means of settling off-site damages for a "locally noxious facility...that seem(s) to threaten a few for the good of many..." In current practice, "...costs imposed on the few unfortunate neighbors of a major new facility, except as they were reflected in acquisition costs through condemnation, [are] for the most part ignored." O'Hare suggests that "compensation for local sufferers is not only an equitable desideratum, as has long been recognized, but a strategic necessity for aligning critical actors' interests with the public interest."

In the case of large transmission facilities, it is standard practice to compensate only those landowners whose property is actually crossed by the ROW and which is "taken" either through negotiation or through condemnation. Landowners owning property or homes immediately adjacent to a ROW, but whose property is not actually crossed by the ROW, may also suffer real damages (such as lowering of property values, despoiled views from living-room windows, degradation of locally prized scenic views, or damage to other amenities). Such people stand to lose a lot if a proposed project is built in their back yard. Yet they receive nothing in return. They do not have the opportunity to sit down and negotiate a settlement, while their neighbors whose property happens to be crossed by the project may receive a sizable monetary settlement. Also, as they may perceive the situation, the distant users at the load center receive all the benefits of the project yet bear none of the external costs. Such is the inequity.

This fundamental inequity leads to one of the primary problems of siting large transmission facilities. The only option available to off-ROW people who would be adversely affected by a proposed project is to strongly oppose the project--and to do anything in their power to stop it, delay it, or at least move it to "somebody else's block," whatever the cost. To accomplish this, these people often elevate whatever local concerns they can find--life-styles, center pivots, wildlife areas, ranching operations--to exaggerated importance in an attempt to stop the project or to move it into somebody else's back yard. Commonly, the issues raised most strongly are those that are emotive or which can be argued indefinitely without resolution--e.g., health effects. If one group succeeds in moving the line to somebody else's back yard, the "somebody else" thus affected is likely to react similarly. The outcome of such public opposition commonly falls among one of the following possibilities:

(1) local opposition will be so strong that a socially beneficial facility is stopped or delayed;

(2) the project is built through somebody's backyard, affecting them severely yet offering them no compensation whatsoever, while their peers over the ridge get off scot-free; or

(3) the project is relocated into the mountainous wilds where there are no vocal, angry residents. This, in turn, often results in increased length and construction costs, decreased reliability of service, and increased natural resource impacts. It also merely shifts the impact burden from one segment of the populace--the local landowners and residents--to another, namely those who value and use unspoiled settings, wildlife, and dispersed recreational opportunities. The costs, however, remain external, and are still borne by one or another segment of society <u>other than that which receives the benefits of the project</u>. Whatever the outcome, someone ends up unhappy: the process has resulted in increased costs, increased impacts, or both.

O'Hare et al. (1983) suggest that compensation offers people who suffer off-ROW impacts an alternative other than to fight the project. If this group of people could be offered compensation for the real impacts they suffer--as are their neighbors who happen to own land on the ROW--chances are they would be more willing to accept the project in their area. The costs of compensation would be diffused over a large population of electricity users and would probably not even be noticed by them. At any rate, failure to compensate for these impacts can result in increased costs far higher than those that would have resulted from even a very liberal compensation program.

In a recent siting decision involving BPA's double-circuit 500 kV transmission lines across Montana, substantial line relocations were made in response to strong public opposition. This opposition was largely based on visual impacts and impacts to residences and agricultural land. As a result of the relocations, the length of the line was increased by 8.2 miles, certain environmental impacts were increased significantly, the costs were increased by $14.7 million (not including line losses), and many of the concerns which prompted the relocation were not fully mitigated by the new alignment (DNRC 1982, 1983 a&b).

Had there existed some mechanism to compensate the communities and individuals for real losses in amenities (and for other impacts) at a cost less than $14.7 million, the outcome might have been quite different. It is likely that a compensation settlement much smaller than the costs of relocation could have been negotiated, since the combined annual budgets of the three counties crossed by the segment of line in question total only $5.5 million (Mont. Dept. Commerce, pers. comm.)

If compensation continues to be discounted as a possible alternative to relocation, similar problems can be expected to recur time and time again when needed major projects are proposed through residential areas. Compensation of local residents and/or amenity users for off-ROW impacts would seem to offer an equitable—and cheaper--solution to the problem for all concerned. The desirability of a mechanism to compensate for off-ROW impacts can be expected to increase as UHV transmission becomes more common. In fact, one study has suggested (Sforzini 1980) that UHV may never become viable unless such a mechanism is developed.

The utility industry has much to gain by developing and implementing a mechanism allowing consideration of compensation as an alternative to relocation in facility siting. Project costs could be reduced by millions and the likelihood of delay or stopping needed projects would be greatly reduced. It seems that industry, and not regulatory agencies, should take the lead in developing standards for compensatation of powerline impacts, particularly off-ROW impacts to private parties. A viable approach might be the development of industry standards and guidelines for determining when off-ROW compensation of landowners is justified and how large the settlement should be. The settlement could be based on a decreasing stepped function, since impacts generally decrease with distance from the ROW. Such a method has been proposed by O'Hare (1977), as shown in figure 4. Sforzini's "penalty factor" method is also a promising approach (Sforzini 1980). To ensure equitable settlement, the system should be designed such that the most outspoken landowners would not get favored treatment. Development of industry-wide standards would help prevent this. At present, it seems such standards are most badly needed for UHV projects (Sforzini 1980).

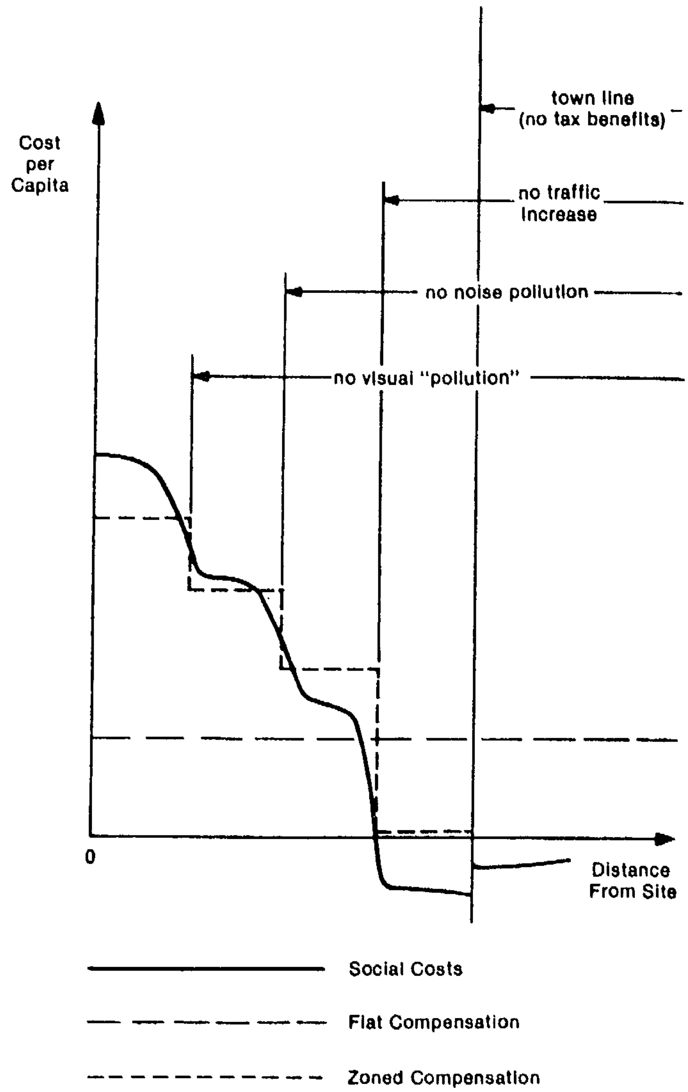

Figure 4. "Zoned compensation," or compensation based on a stepped function decreasing with distance from the ROW (reproduced with permission from O'Hare 1977).

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MEASUREMENT OF PERFORMANCE OF ROUTE/SITE SELECTION STUDIES

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ABSTRACT

With increasing pressure for economy, and "value-for-money" in government agencies, there is a consequent need to document effectiveness and efficiency in route/site studies and other environmental and land use planning projects. Based on analysis of more than thirty such studies and borrowing from other industries, a performance measurement system has been developed in terms of concept, procedures, documentation, and a computer system for storage/retrieval of information. This system can probably be adapted to most related studies, and includes guidelines on cost and methods of measurement of effectiveness and quality.

INTRODUCTION

With the present state of the economy, public demands for government accountability, and new concepts such as operational (value for money) auditing, many organizations in the fields of route and site selection, land use planning, natural resources, and environmental assessment are under growing pressure to improve and report on performance and productivity. A common reaction is that it is not feasible to systematically monitor and report on performance of a planning office, since the nature of the work is much less tangible than that of say a car assembly line. However, by borrowing concepts from industry, and adapting them to processes common to many planning and scientific research projects, a performance measurement system has been developed and implemented in a large planning office. This approach could likely be applied in other planning offices and related disciplines with minor modifications.

The key requirements of a performance monitoring system are:

Informativeness: It should be comprehensive enough to reflect all aspects of the work, and all types of work. Information that truly indicates performance is obviously essential, yet often considerable thought has to be given to ensure that this is actually achieved.

Cost Effectiveness: Since a major motive for performance monitoring is concern about costs and productivity, the monitoring system itself needs to be seen to be setting an example. Clearly, measurements and reports that are not very revealing about performance and those that are time-consuming should be carefully evaluated. To save costs, some measures can be devised to give insights to several aspects of the work that are not worth separating, or else that can be separated by inference. Overall, the system must show a positive benefit/cost ratio, with relatively little incremental cost.

Appropriateness: The system must fit the type of work being done in the office, and if necessary, must be flexible enough to adjust to related but somewhat different work as functions change over the years.

Compatibility: Unless current work control methods are chaotic, it would be counter-productive to disrupt them and introduce totally new management concepts. The system should preferably be one that can be grafted onto existing supervisory and management procedures, or perhaps even streamline them. The format needs to be adaptable to existing organization structure (teams, sections, departments, etc), the different types of work going on, and any existing recording and reporting systems.

Confidentiality: Although there should be good information flow between a subordinate and his superior, privacy between peers can be very important, especially in a competitive career situation. Generally, this tends to be controlled by the superior for work done by his/her immediate subordinates, and this should be a conscious responsibility for his/her office. The system itself should provide full confidentiality. Also, lack of confidentiality arouses serious antagonism to the introduction of a system. In addition to internal confidentiality, the company as a whole may wish to keep its detailed records private and publish overall reports (often for fear of misinterpretation of raw data rather than a desire to 'cover up').

Acceptability: The philosophy, manner of implementation, and practical techniques must be designed so as to find acceptance from the people involved.

DESIGN CONCEPT

A large number of performance measurement concepts and systems have been available for several decades at least, mostly in sales and manufacturing-oriented companies. All are based primarily on the concept of setting a target (objective) and checking up on how well it is achieved. The problem is to adapt the idea to a planning office in such a way that the philosophy and practice meet the key requirements suggested above.

A major difference between a planning office and sales or manufacturing organizations is the nature of the work and the products. Sales offices and factories are usually involved in repetitive work that is simple in concept (though techniques and individual cases can be very complex and challenging) and has easily measurable results (e.g. total dollar sales or number of widgets per day). Performance monitoring systems for the latter can thus be devised with relatively few, and fully quantitative, measures. Some common systems developed originally for those situations, MBO (Management by Objectives) and MAR (Management by Achievement of Results) do not adapt well to a planning office, where much of the work is of a 'one-off' nature more closely akin to research and development, where many important aspects are qualitative, and where the professional mentality is different and people tend to resent a mechanistic type of control.

A voluntary response survey of planners in Ontario Hydro showed that most of them consider themselves to be highly personally motivated, and they cited the main causes of poor performance to be either uncertainty over the nature of the product required, unreasonable demands on them without negotiation, and external unforeseen circumstances (e.g. public opposition). This is consistent with the findings of other studies and companies (e.g. (1)). In effect, it means that much of perceived poor performance is really the lack of a well defined scope of study and mutual agreement on terms of reference. Further, if these can be simply and tightly defined, the residual poor performance of a person or organizational unit will become very clear, and can be dealt with. Therefore, the basic approach recommended for a route/site planning office may be described as 'Management by Integration of Expectations'. Under this approach, a series of topics (measures) are established to describe the nature of the work, and then the producing unit and the client communicate their expectations and neogtiate an agreement on each one. This terminology and philosophy was found to be much more acceptable to planners than hardline approaches such as MBO and MAR.

The next step is to identify what measures should be discussed and defined to fully represent route/site planning work. These generally fall into two categories: effectiveness, which expresses whether or not and how well the product is achieved; and efficiency, which expresses various forms of cost and effort involved in production. Based on debate and refinement over two years among some 30 planners, the measures shown in Figure 1 are recommended. These are considered appropriate for offices engaged in route/site selection, environmental impact assessment, natural resource survey or planning, and regional or town planning. They could likely be adapted to related fields with minor modifications.

One important point to note is that it is necessary to use all of these measures in order to gain a full and fair picture of expectations and performance in planning. For example, one study may be more costly than historic average because the quality was designed to be higher than usual, or because conscious effort was made to 'overdo' the quantity of work to help restore credibility. Unless each of the topics underlined is reported on, it becomes difficult to explain performance. A second point is that Figure 1 deliberately avoids weighting the various measures, since each company or office would naturally have different weights, and should make them clear in advance to its staff.

To be definitive both when setting expectations and recording achievements, these measures need to be applied to some entity. That entity should be as tangible as possible, sharply defined, and readily identifiable to all concerned. For example, it is possible to define each route/site planning task as an individual project, and regard the plan or report as the tangible product and the date of its completion can be readily identified.

The next thought is that it is highly desirable when monitoring and managing improvement of performance to have progress reports, and to provide opportunity to improve performance before completion of a project. This leads to the idea of breaking up each planning project into smaller yet still discrete steps, each of which is clearly completed at a specific point in time with a tangible product or milestone event. Identification of steps and milestones can be unique to each planning project, and probably would be for innovative or development studies. However, by extensive literature review of route/site studies, land use planning, and scientific research methods, we have found sufficient consistency to adopt some standard steps that are generally applicable to most of our planning work (Figure 2). Using standardized steps does not seem to intrude on planners' choices of methods and techniques, and has a great advantage in allowing cross-referencing of performance by steps (e.g. to identify costs of environmental mapping).

The final conceptual consideration is that of a recording system. As explained to this point, that comprises a separate file for each planning project or task. Each project is broken down into a useful number of steps (often about 8), and a list of measures is applied to each step. This yields a matrix, as shown in Figure 3, of steps and measures for each project. For each matrix box (Step/Measure) it is necessary to record the expectation and the achievement. The expectation may be set at the beginning of the project, or at the beginning of the step, and the achievement is recorded at completion of the step. It is also desirable to record explanations of variance (good or bad) from the expectation. If misused these become merely excuses, but properly used they are extremely helpful in identifying consistent or persistent problems affecting the organization.

MEASURES

The measures shown in Figure 1 cover a wide range from fully quantifiable to purely qualitative, and at first there could be considerable scepticism about measuring and recording quality in a field such as route/site selection. There are of course plenty of procedures developed in the field of quality engineering for doing so, even in older basic text books (2), let alone more advanced or modern ones (3). So it is generally possible to develop meaningful measures of quality.

For the purpose of performance reporting, comparison with previous products or peer groups is most important, and this is much easier than absolute measurement. Some examples of measures, covering a wide range of types are given below:

Cost

This could be measured in terms of dollars, however, it is recommended that manhours are better measurement units. Manhours are more universally comparable, since dollar costs vary in time and among organizations. The disadvantage with manhours is that cash expenditures cannot be included (e.g. purchase of services, supplies, expenses), but our experience has been that these are a small and usually consistent percentage of salary costs in a route/site planning office.

Timeliness

This reflects ability to meet schedules, so the measurement units are in terms of calendar time, not manhours. A recommended way of doing this is to fix the expected date of completion, then count back to the start date to record the number of workable days ("calendar working days"), and likewise count forwards from start to actual finish date to measure the achievement.

Work Quantity
This is harder than cost and timeliness to quantify, however with positive intent it can be done. Different steps may lend themselves to very different measurement units. For example, environmental mapping effort tends to correlate with the number of map sheets involved and the variable being mapped, i.e. regardless of scale, and for a given quality of mapping.

It is best to subdivide mapping into 'level of effort' categories such as 1) soil or ecosystem mapping (high fieldwork content), 2) forest inventory (complex air photo interpretation), 3) land use mapping (simple air photo interpretation). As another example, one can record the number of alternative plans or sites evaluated. Often, measurement units will be crude, however it is stressed that even rough estimates can be very valuable information. We feel our project management has been greatly improved even where we cannot do better than estimate into one of three levels of effort 'high, medium, and low', provided these levels are defined and documented to help consistency.

Work Quality
Measurement 'units' for quality are likely to vary greatly among different types of work and steps. The easiest basis for quality estimating is by comparison with class examples. In the case of report writing, a panel of experienced staff can be asked to select example reports that are considered to be of appropriate quality, plus some representing qualities distinctly above and below that level (perhaps even five classes total). A particular product can then be rated according to which of these it most closely resembles. In the case of environmental mapping, there is a growing trend towards quantification of quality considerations such as accuracy (4).

Two important considerations when establishing measurement units are 1) to ensure that the measure is a meaningful expression of performance and 2) to take advantage of existing recording systems as much as possible (e.g. accounting systems for costs). In some cases, there may be no suitable measurement unit for a particular measure/step, or it may not be worthwhile, in which case the record can be left blank without upsetting the system.

STANDARD TARGETS

Each recorded expectation is in effect a target or objective to be achieved, and performance is measured by the degree of variance that is attributed to the staff unit (team, section, etc) rather than to circumstances beyond their control. Where work is at least somewhat repetitive, it seems reasonable to expect that in time the skills in setting expectations and in meeting them would improve until achievements were consistently close to (100% of) expectations. However, some new staff units may need to evolve up to that level, or else a manager may raise the expectations so as to raise productivity, quality, etc. Under any of these circumstances, it is possible to create a class of targets that are consistent expectations among various staff units and over time. These can be referred to as standard targets, and are a very valuable management tool.

It is particularly valuable in the present economic climate to be able to compare performance between peer groups, whether within the organization or in other companies. This is not often possible in terms of a complete project. The advantage of a step/measure approach is that it is often more feasible to find reasonable comparisons at the 'step' level of detail. The comparison may well be only in 'ball park' terms, but that can be valuable enough. For example, although few companies in the world have to follow the same process for environmental assessment that we do, many different companies and agencies do the same kinds of environmental mapping, so we are able to compare performance at least on that element of the work.

COMPUTER SYSTEM

It is evident from Figure 3, which shows only some of the information required for one project, that considerable quantities of performance information will be generated in a large office. Many of the data are numerical, and all of the other information can be reduced to code letters or acronyms. This suggests that a computer can be very useful to store and retrieve data. The main benefit of having computer assistance, however, is its speed and its capability for cross-referencing within a complex matrix such as Figure 3. It is often desirable for managers to analyze historic trends, compare staff units, or trace single measures and projects across a number of staff units. Raw data may need to be reproduced in graphical form as well.

Based on these considerations, and given that the planning office involved has some 120 people in some 20 different work units, a computer system was developed to handle the storage, retrieval, and analysis. Initially, there was considerable fear and antagonism from supervisors towards the idea of storing sensitive performance information on the company's mainframe despite assurances about confidential access codes and passwords. This problem was overcome by agreeing to use a desk top computer with removeable floppy discs. Records of a particular staff unit's performance can thus be physically held by the supervisor and his immediate manager. Other people who have a right to access the records would have to let the supervisor know when they wanted to do so. This idea of physical possession of a tangible record seems to eliminate most of the concern about the use of a computer system.

Most medium-priced desk top computers ($5,000-$7,000) with spreadsheet software have sufficient capacity to handle the system.

CONCLUSIONS, BENEFITS, AND COSTS

Introduction of a systematic approach to performance monitoring and reporting, especially the concept of milestone events, has proven acceptable and very beneficial. Responses indicate that the 'management by integration of expectations' concept is just as valuable for the planning of work (e.g. budget estimating) as it is for performance control. It is also now distinctly easier to explain to senior management why certain costs vary from normal, and to demonstrate increasing external pressures for higher quality and credibility. One spin-off benefit has been to improve the familiarity of some planners with computers.

The total cost of developing the concept and designing the system to date is approximately $85,000 (1983 dollars) plus about $5,000 for the computer and accessories. It is estimated that a further $25,000 will be needed to finalize implementation. Operating costs are estimated to be one-third of the time of a technical supervisor to maintain interest in the system and solve problems, one-half the time of a data entry clerk, and a few hundred dollars per year for forms and computer supplies (i.e. about 0.7% of total office budget). The principal problems experienced to date are in maintaining interest and use until the system 'becomes a habit' and in checking to ensure that correct codes are used until these are memorized. Supervisors could potentially spend a lot of time inputting and retrieving information, however this is not recorded as a cost on the grounds that it is replacing the previous less systematic supervisory activities, i.e. there is no cause for incremental cost for supervisors or managers apart from some minor familiarization.

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SUGGESTED FURTHER READING

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PERFORMANCE

EFFECTIVENESS	EFFICIENCY
APPROVAL INDEX	EXPENDITURE
TIMELINESS	QUANTITY OF WORK
QUALITY	QUANTITY OF RESULTS
CREDIBILITY	EXPERTISE
CORRECTNESS OF ASSUMPTIONS	STAFF NUMBERS
ORGANIZATION EFFECTIVENESS	DATABASE
SPINOFFS	MORALE/HEALTH
	ORGANIZATION EFFICIENCY

FIGURE 1

EXAMPLES OF MEASUREMENT TOPICS

A. ROUTE/SITE SELECTION, ENVIRONMENTAL ASSESSMENT OR NATURAL RESOURCE PLANNING

1. Scope/Study Design
* 2. Analysis of significant issues/impacts/resources
* 3. Mapping of significant impacts/resources
* 4. Identification of alternative plans/sites/methods
5. Evaluation of alternatives
6. Comparison/selection
* 7. Report preparation
8. Approval/publication/public hearings
9. Follow-up/monitoring

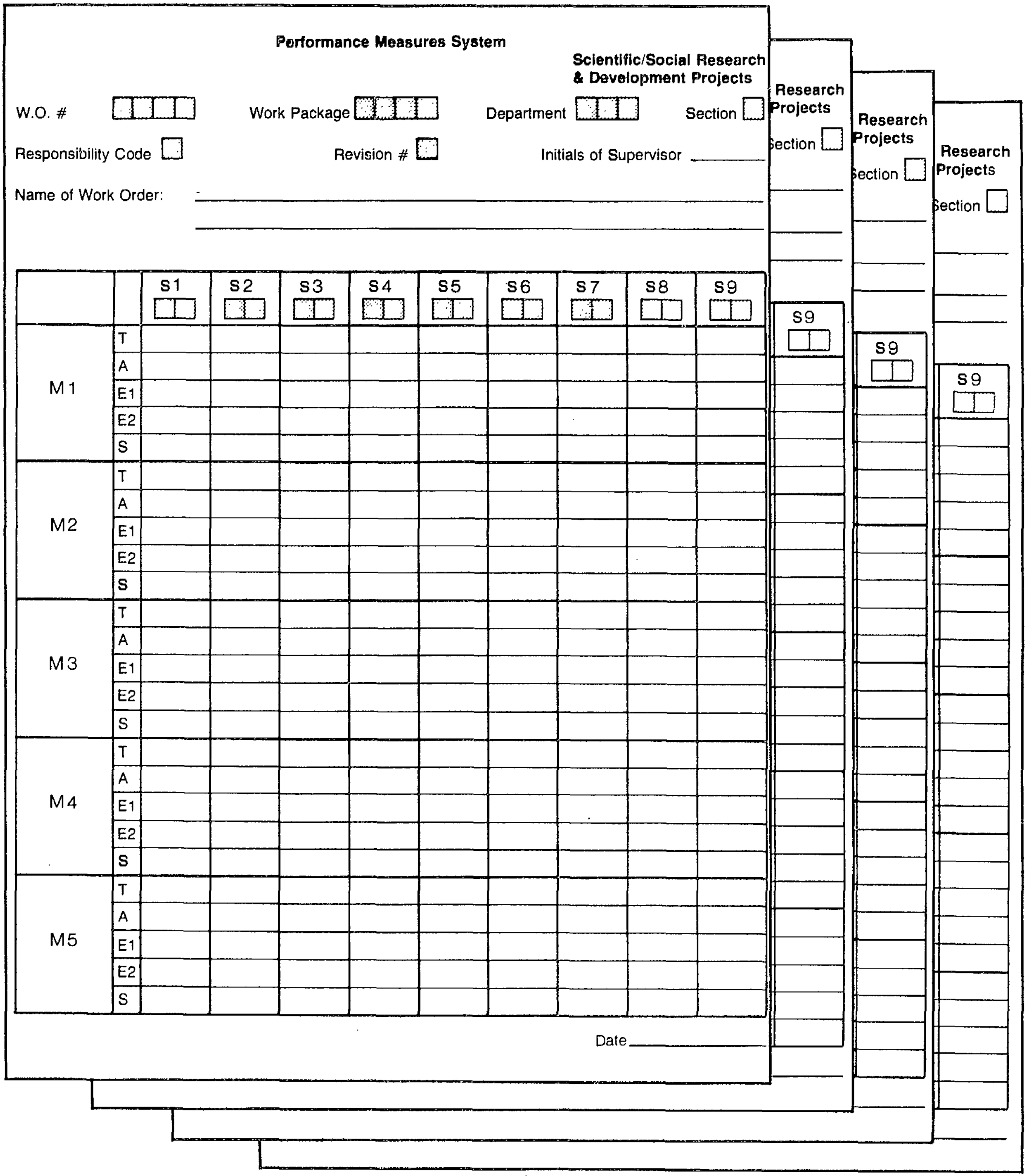
B. SCIENTIFIC/SOCIAL RESEARCH, DEVELOPMENT STUDIES

1. Scope/Study Design
* 2. Literature review/published data review
* 3. Original observations/new data collection
* 4. Development of alternative hypotheses/solutions
5. Evaluation of alternatives
6. Comparison of alternatives/selection
* 7. Report preparation
8. Approval/publication
9. Monitoring/feedback/follow-up

* Work on each step is discrete but may occur simultaneously with other steps.

FIGURE 2

SUGGESTED STEPS FOR PLANNING OFFICES



Performance Measures System

Scientific/Social Research & Development Projects

W.O. # ☐☐☐☐ Work Package ☐☐☐☐ Department ☐☐☐ Section ☐

Responsibility Code ☐ Revision # ☐ Initials of Supervisor ______

Name of Work Order: ______

		S1	S2	S3	S4	S5	S6	S7	S8	S9
M1	T									
	A									
	E1									
	E2									
	S									
M2	T									
	A									
	E1									
	E2									
	S									
M3	T									
	A									
	E1									
	E2									
	S									
M4	T									
	A									
	E1									
	E2									
	S									
M5	T									
	A									
	E1									
	E2									
	S									

Date ______

Figure 3 Raw Data Record Format

Using Mediation To Resolve Energy-Environment Conflicts

Poster Session: Facility and Routing '84
Energy and Environment

April 15-18, 1984
Banff, Alberta

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Abstract

Using Mediation to Resolve Energy-Environment Conflicts

New techniques were developed in the United States in the early 70's that sought to help resolve complex environmental conflicts. One such technique that was adapted from the Labour-Management arena, is mediation. Mediation is a voluntary process where parties agree to jointly explore their differences with the help of a neutral third party. The paper describes the process of mediation and its use in both a Canadian and American environmental dispute, involving energy related activities. Brief comments are provided on mediation and its potential use in regulatory proceedings and an account of research initiatives on environmental mediation in the Canadian context is included.

Using Mediation to Resolve Energy-Environment Conflicts

Introduction

One of the most wide spread and pressing problems facing many countries today is that of energy security. As conventional and assured reserves of hydrocarbons are depleted, increased pressure is exerted to find and exploit existing energy stores and to develope new and varied methods to utilize renewable and non-renewable energy sources. As Gladwin (1980) points out, this action gives rise to a variety of disputes that can be catagorized into several broader issues of contention: job creation vs. clean air, growth vs. no-growth, risks vs. costs, technocracy vs. democracy, national vs. local interests, hypotheses vs. facts, politics vs. science, equity vs. efficiency, exploitation vs. preservation, short term vs. long term, life vs. death, and so on.[1]

Canada is no exception to countries experiencing disputes over energy development. Canada's reaction to price increases of foreign oil supplies in the early 1970's prompted a flurry of activity designed to promote energy conservation and at the same time to make better and more extensive use of indegenous natural resources. The National Energy Board provided data which showed to what extent energy use in Canada can be attributed to particular sectors of society and what increases might be expected in energy demand over the next two decades. NEB data indicate that virtually all sectors will anticipate some increase in energy demand to the year 2000, with an overall growth rate of 2.3% per year.[2] As modest as this increase seems, conflicts can and have developed in response to energy demands, and they seem to be centred on the routing and siting of energy facilities.

Mr. E. Kupchanko, Alberta's Assistant Deputy Minister of the Environment, once pointed out that, " the economic and social benefits of resource development must be weighed against the environmental and social costs of such development".[3] It is percisely for this reason that certain individuals and groups feel that they are adversely affected by resource development and actively voice their opposition. These parties are often not willing to accept the benefits of development, since at the same time they may have to bear many of the social and environmental costs.

Although energy development, including routing and siting, is only one part of overall resource development in Canada, it may well be associated with the greatest number of conflicts. A small study that sought to catagorize dispute activity in Canada, indicates that energy development accounted for more than half of 47 disputes identified over a seven month period,(Figure 1.). A further breakdown indicated that hydro-electric and petro-chemical activities comprised the majority of disputes associated with energy development, (Figure 2.).[4] While this study is neither conclusive or comprehensive, it serves to illustrate the degree to which conflicts arise from resource developments, particularily energy related activities.

Presently, most energy-environment disputes are dealt with through regulatory agencies or government departments. Socio-economic and environmental impact assessments and variations of public participation are used to reach decisions on whether to approve a project, where the activity will be located and what mitigating measures may be employed. While the use of submissions from the public at regulatory hearings can offer valuable input, it is viewed by some as an ineffective way to judge the merits of a particular project. While the project proponent may spend vast amounts of money and employ experts to attest to the need and desirability of the project, private as well as public interest groups and individuals often do not possess the financial or material resources to adequately respond before hearings.[5] In addition, regulatory hearings and tribunals can often be very formal and lengthy. Individuals with little experience in formal proceedings are often caught up in situations where acrimony and animus are exacerbated and where win-lose outcomes can be the end result. On rare occasions, environmental and public interest groups will argue their case in a court of law, but the same formal standards apply and the financial risks can be far greater. The search for new methods of resolving natural resource disputes has led to the formulation of an emerging field called, Environmental Conflict Management. Developed in the United States in the early 1970's, labour-management dispute resolution techniques have been successfully applied to natural resource conflicts, including energy-environment disputes.

New Techniques for Resolving Energy-Environment Disputes

When the words " conflict " or " dispute " are mentioned, many of us consider the words in the negative context. However, conflicts can be positive forces in bringing about productive change. One has only to examine the civil rights movement in the 60's and 70's to observe that great social changes and gains were born from conflict situations. Environmental disputes on the other hand are very complicated and therefore it is difficult to engage in productive problem solving involving many competing interests.[6] It is difficult, but not impossible, as case studies in the United States have shown. Given the diversity of environmental disputes, a number of procedures have developed which attempt to resolve conflicts in a variety of ways. It is important to point out that these procedures are intended to:[7]

1. Make productive use of conflict.
2. Create an opportunity for parties to exchange information.
3. Create an opportunity for parties to develope creative new alternatives that increase the choices available.
4. Reach mutually agreed upon decisions.

These procedures are not intended to:

1. Suppress or avoid conflict.
2. Co-opt the opposition.
3. Convince people to change their values or principles.
4. Get people to like each other.

Gail Bingham, of the Conservation Foundation (Washington, D.C.), has outlined several different methods of dispute resolution which have been adapted and are outlined below:[8]

Negotiation: Broadly defined, it is a process where parties with conflicting interests deal directly with each other in order to reach a mutually agreed upon decision. When parties negotiate in good faith, it is implied that they have the intention and ability to implement their agreements and that the representatives are able to speak for their constituents.

Mediation: Is the assistance of a neutral, " third party ", in a negotiation process. This process is used most often when a dispute is fully developed, i.e., when the parties can be clearly identified, the issues have been defined, the parties have fairly well formulated positions on the issues, and there is a general recognition that no single group or organization can achieve its objectives unilaterally without high costs. The mediator has no stake in the outcome and has no authority to impose a settlement.

Conciliation: Is a process where a neutral third party attempts to reduce the tension and hostility among disputants, in order to open or reopen channels of communication and to establish a dispute resolution process.

Joint Problem Solving: Is used frequently after a dispute has emerged, but before groups have formed strongly opposing positions. It is most effective when used by groups that have similar objectives and/or that have an interdependent relationship. Joint problem solving draws more upon planning processes and group dynamics than upon negotiation. The objectives of a joint problem solving process are to define the issues, reach agreement on a definition of the problem, analyze the problem, generate alternative solutions, evaluate these solutions, and reach a decision. In contrast with negotiation, participants are not encouraged to develope seperate positions from which to bargain, but are assisted as a group to build consensus at each step in the process. Participants usually represent their own views rather than their organization's; and agreements are informal, depending for their implementation on the breadth of their acceptability.

Facilitation: Is the assistance of a netural third party to a joint problem solving process. There are many styles of facilitation, but generally facilitators design and conduct meetings in order to help participants through a joint problem solving process.

Policy Dialogue: Is the application of negotiation and joint problem solving techniques to issues of national environmental policy. It is a small group process where traditional adversaries on public policy issues meet to reason together, seeking areas of agreement and clarification of their differences.

Regulatory Negotiation: Is an extension of policy dialogue and negotiation to the official rulemaking process of regulatory agencies. Representatives of the major interests in a proposed new regulation or change in regulations are invited to participate in the negotiation process and the regulatory agency designates a senior official as negotiator for the agency. The product of the negotiation, if successful, is published in the federal register as a proposed rule, which then goes through normal notice and comment rulemaking.

Environmental Mediation

The dispute resolution process of mediation is selected for further discussion because of its wide use in the U.S. and its use once in a Canadian environmental conflict.

The Institute for Environmental Mediation, based in Seattle, Washington, defines the mediation process as:[9] " a voluntary process in which those involved in a dispute jointly explore and reconcile their differences. The mediator has no authority to impose a settlement. His or her strength lies in the ability to assist the parties in settling their own differences. The mediated dispute is settled when the parties themselves reach what they consider to be a workable solution. "

An MIT study identified nine steps toward dispute resolution that a mediator might employ:[10]

1. Identify all the parties that have a stake in the outcome.
2. Ensure that each interest group is adequately represented.
3. Identify the key issues and narrow the agenda to points of conflict.
4. Generate a sufficent number of alternatives.
5. Agree on boundary and time horizons.
6. Weigh, scale and amalgamate judgements about impacts.
7. Identify possible compensatory action.
8. Implement the bargains that are made.
9. Hold the parties to their agreement.

The Institute for Environmental Mediation identifies four seperate phases involved in environmental mediation and describe the possible action that the mediator or parties may take at each phase:[11]

Phases	Possible Action Taken
Exploration:	
-mediator is approached by interested third party or by the parties in dispute. -informal exploration of the situation; who are the relevant actors, current situation, relevant issues. -determine the history of the dispute. -contact made of organizations and agencies outside the present dispute. -informal discussions with parties about possible negotiation procedures.	-a disengagement by the mediator or parties, or both, if either considers mediation inappropriate. -agreement from the parties for further discussions on how mediation may be of assistance.
Process Design:	
-parties are informed about the specific manner in which mediation can be used. -procedural points are discussed. -a public announcement of " good faith " negotiation is made.	-disengagement by the mediator or parties. -decision by parties to resolve the dispute without mediation. -commitment by parties to engage in face to face negotiation.
Negotiation/Mediation:	
-skills employed, i.e. communication, interpretation, data gathering, idea generation, educator, realist, confidant, secretary. -coordinates actions of organizations and agencies. -formation of " caucuses ", to explore alternatives to data sources, etc.	-disengagement of the mediator and/or the mediation process. -unanimous agreement on the resolution of the dispute.
Implementation:	
-mediator facilitates continuing party interaction. -ensures that all agreements are binding. -plans for the unforeseen problems that may interrupt the agreement.	-withdrawal by the mediator from the dispute.

There are a number of organizations in the United States that offer mediation services in cases of environmental disputes. The procedures they use vary according to the nature of the dispute and the degree to which the parties are willing to negotiate on key issues.[12] Perhaps the two most important aspects of a successful environmental mediation are the inclusion of all the affected parties (since parties that are excluded from the negotiation may resort to legal action to prevent the implementation of an agreement), and the inclusion of regulatory and government agencies, (either as parties to the negotiation or as sanctioners' of the mediation attempt), since any negotiated agreement will probably have to have government approval for its implementation.

Case Studies

There are few cases of environmental mediation in Canada that can be used to describe how the process worked. Currently, there is an environmental mediation attempt being undertaken near Lake Simcoe involving the siting of a landfill. The only other mediation attempt took place in 1976 in Northern Manitoba and involved compensation paid to Indian Bands due to flooding from hydro-electric dams.

The Northern Flood Agreement - Manitoba

During the 1960's the Federal Government of Canada and the Provincial Government of Manitoba agreed to allow Manitoba Hydro to divert the waters of the Churchill River into the Nelson River. This action allowed for the possible construction of up to 10 hydro-electric generating stations in order to meet the electrical needs of Manitobans and to provide power exports to other Provinces and the United States.[13] The project caused the flooding of over 100,000 square miles of land, rivers and lakes the majority of which were on land used by Indian communities for traditional hunting, trapping and gathering activities. Faced with the erosin of their traditional lifestyle and major means of subsistence, five Indian communities joined forces and formed an organization known as the Northern Flood Committee. The NFC was not in total opposition to the project, but wished to ensure that benefits from the project would take place and that adequate compensation was forthcoming.[14] Attempts to gain agreement on the use of a neutral arbitrator failed because the NFC were not prepared to give a third party the power to decide for them their rights to use of land and resources, and the extent and nature of compensation to be paid. On the advice of legal counsel for the NFC , a mediator, Mr. Leon Mitchell, was retained to explore with the parties the option of mediation.

On February 13, 1976 the parties to the dispute entered into a mediation agreement which contained the following points:[15]

1. A broad statement that adverse effects to the Indians may result from the diversion and the rise and fall of water levels for the purpose of developing hydro-electric generating facilities.

2. A mediator was appointed to mediate the issues.

3. The mediator was empowered to:

    a. convene meetings after a minimum 48 hours notice;
    b. propose further studies and possible solutions to the issues;
    c. meet separately with any one or more of the parties to discuss their positions;
    d. adjourn or postpone meetings for a mazimum of one week.

4. The parties undertook at the request of the mediator:

    a. to make available to one another or the mediator their experts.
    b. to make available to one another or the mediator documents but not confidential information.

5. The issues to be negotiated were defined as: compensation for damages, monetary or other forms and remedial measures arising out of or attributable to the hydro project.

6. The parties undertook to negotiate in good faith and conclude an agreement in 2 months or such later date as may be agreed to by the parties.

7. The mediator was permitted at his discretion to make public a report presenting his analysis of the outstanding issues and the reasons for failing to reach a settlement.

8. The participation in these negotiations was agreed to be without prejudice to any of the rights at law by any party.

In 1977 the parties reached agreement on the issues of dispute which included: compensation from land flooded in the form of other land rather than money, granting the Indians the right to select land for development to broaden their economic resource basin opportunity and provided for Indian participation in a wildlife resource advisory council to manage the resources.[16]

Although problems developed in the implementation of the agreement, all parties generally recognized the utility of the mediation process in obtaining an agreement and supported the process as an alternative to possibly costly and lenthy litigation.[17]

Homestake Pitch Mine Dispute - Colorado

In 1981 the Institute for Environmental Mediation, based in Seattle, was approached by the Homestake Mining Company and a coalition of environmental organizations from Colorado to help resolve a dispute over the proposed construction of an open-pit uranium mine and mill near Gunnison. The mining company and the environmental coalition were the principal parties, but also involved were the Colorado Department of Natural Resources, the Colorado Department of Health and the U.S. Forest Service. The parties came to the conclusion that neither wanted to persue a course of litigation, where the outcome was uncertain and where delays to the project through appeals might be costly.

The substantive aspects of the dispute centred on reclamation of the open-pit mine with emphasis on maintenance of water quality during and after the mining operations, backfilling, revegetation and mitigation of wildlife and fishery impacts. It was the position of the coalition that these issues were not properly addressed in the EIS and were the reason for their opposition to the project. The uranium mill was not dealt with in the mediation because the coalition felt that the technical issues were too complex and the environmental impacts could not be mitigated and therefore negotiations on the licencing of the mill was deferred.[18]

Involved in the mediation were four joint meetings with experts to exchange information and consider data. In addition there were at least three negotiation sessions, briefings of interested Federal and State agencies on the terms of the settlement and a joint press conference. The form of the agreement was in three parts:[19]

1. A <u>Statement of Understanding</u> stipulated that permit revisions regarding water quality maintenance and revegetation be jointly presented to the State.

2. A <u>Mediation Agreement</u> which established cooperative programs and company efforts in dealing with water quality, revegetation, wildlife and fisheries.

3. A <u>Covenant Not to Sue</u> that was formally ratified by Company headquarters and the Board of environmental organizations.

4. A <u>Joint Press Release</u> that was negotiated by the parties.

Although the mediation took approximately 16 months to complete, the parties generally felt that the time taken to reach agreement was much less than what might have been expected if they had chosen litigation. One of the problems encountered during the mediation was the withdrawl of one of the coalition's constituents. An anti-nuclear group felt that they could not support the actions of the uranium mine on ethical grounds. This action could have placed any agreement into jeopardy, since the disaffected party might have resorted to litigation. So far the anti-nuclear group has not done so.

One organization, based in Canada and the United States, has identified a number of energy projects that have the potential to cause transboundary environmental disputes, (Figure 3.). Environmental Mediation International Inc. has investigated these projects to determine if mediation could be used and if the parties are willing to explore alternative approaches to dispute resolution.[20]

Environmental Mediation and the Regulatory Process

At a recent workshop in Banff, (Conflict Resolution in Resource Management), the question was posed of how dispute resolution techniques such as mediation might be used in the Canadian context. The majority of the participants were representatives of various Provincial and Federal government departments and it was felt that mediation might be most appropriate at the regulatory level of environmental decision making.[21] Since many agencies already engage in ad hoc negotiations with various parties on the implementation of a rule or regulation, the move to using some of the methods described in this paper does not seem to be insurmountable. What is lacking is the expertise and familiarity with these alternative processes in order to assure all parties that mediation might be an effective alternative.

The National Energy Board of Canada is an agency that has come under a great deal of scrutiny since many of the projects it reviews involves large amounts of capital expenditure and the proposed energy projects may have significant and widespread social and environmental consequences. The hearings into the Arctic Pilot Project (now shelved), to ship liquid natural gas from the arctic to Eastern Canada, involved lengthy and probably costly arguments between the lawyers for the project's proponents and those of the Inuit associations opposing the project. If alternative dispute resolution mechanisms had been in place, it might have been possible for the parties to explore and reconcile some or all of their differences prior to attending the hearings.

Along with the general increase in environmental awareness of the late 60's and early 70's, it became apparent to the National Energy Board that environmental groups could potentially disrupt or delay the Board's regulatory proceedings.[22] Inclusion of public interest and environmental groups at the hearings certainly gave a more balanced consideration of the issues, but many intervenors found that the formality of the proceedings, the necessity of using legal representatives and technical experts, as well as cost incurred in obtaining transcripts of the hearing became prohibitive.[23] Specific techniques that would address the issue of involving the public in a more direct and fair manner have been discussed, but to date none have been developed.

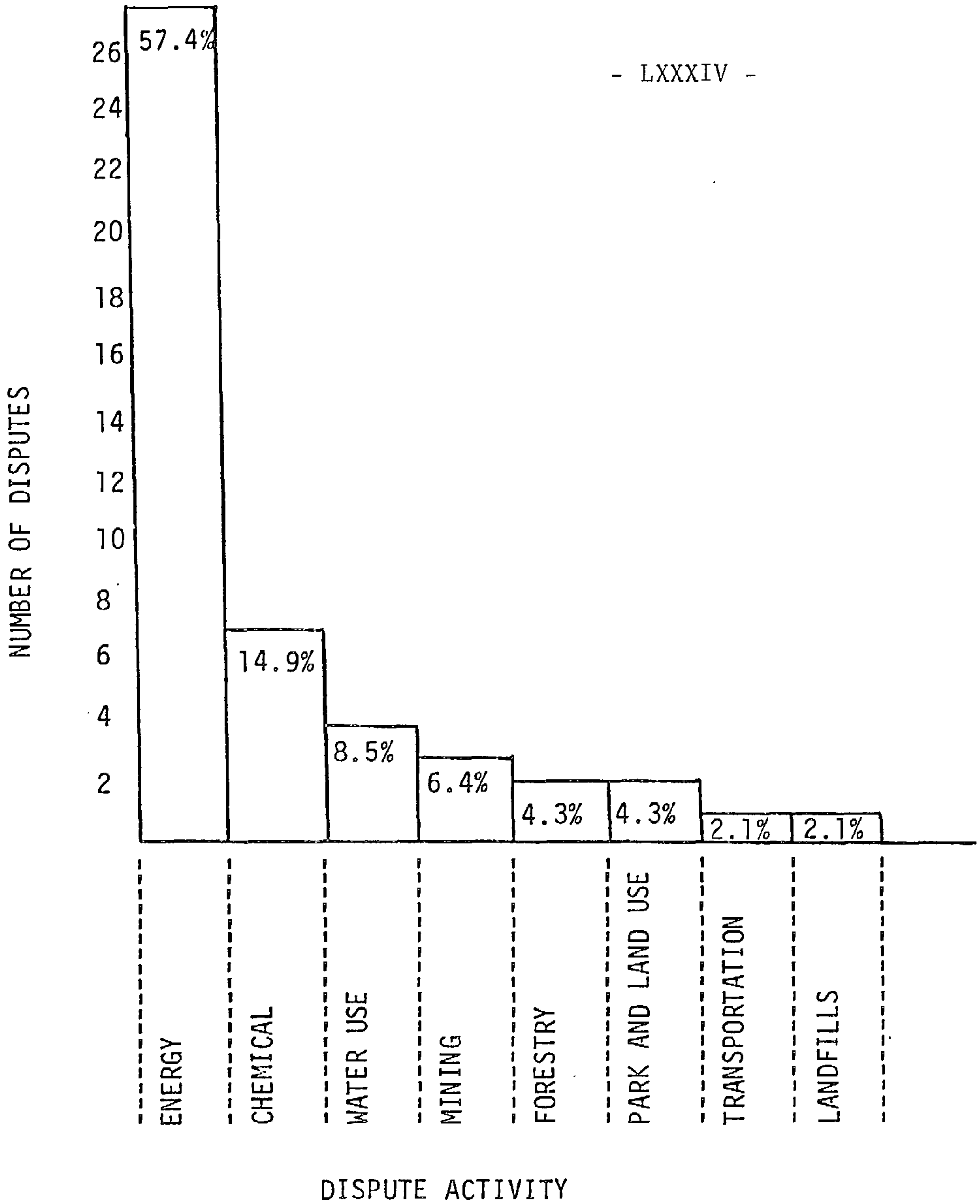
It would appear that even energy related industries would like to see a better defined process involving the public in environmental regulation of the oil and gas development activities.[24] As it stands now, many energy industries feel uncertain about the legal basis and the role the public plays in approval of energy projects. It may be that Industry would welcome the opportunity to negotiate directly with affected parties prior to, or in conjunction with, various environmental regulatory hearings.

Conclusion

Axelrod (1981), points out that," There need not be conflict between energy usage and the environment if a new conception of the future emerges." He notes that the lack of comprehensiveness in policy making, that is found in energy-environment problems, is characteristic of a political system that indulges in crisis decision making while postponing problem solving.[25] Smil (1974), goes one step further in suggesting that, " Bargaining, mediation and conciliation are tedious processes, but until we have at our disposal cheap and nonpolluting energy production technologies, these actions are absolutely necessary both to prevent detrimental environmental changes and to secure the necessary flow of energy. "[26]

There have been initiatives in Canada which offer hope that environmental mediation and other conflict management techniques will be used. Two very good reports, one by Haussmann in 1982, and another to be released soon by the Canadian Environmental Law Association, provide information that prospective parties to a mediation might find helpful. In addition, there have been two conferences in Canada, (in Ottawa and in Nanaimo), that have provided the opportunity for dialogue between environmental, industrial and government representatives on the merits of environmental mediation. Perhaps the most recent discussion of environmental mediation is the most interesting; The March 1984 Ontario Speech From the Throne concedes that, " in some cases mediation may be a more sensible means of resolving disputes than existing administrative or judicial processes. Consequently, experimental mediation procedures will be initiated with the Environmental Assessment Board. "[27]

This paper does not intend to offer environmental mediation as a panacea for all environmental disputes. Administrative and judicial processes as well as existing public participatory mechanisms will continue to be used in sound environmental decision making. However, new techniques that seek to resolve conflicts should be considered when siting and routing energy facilities.

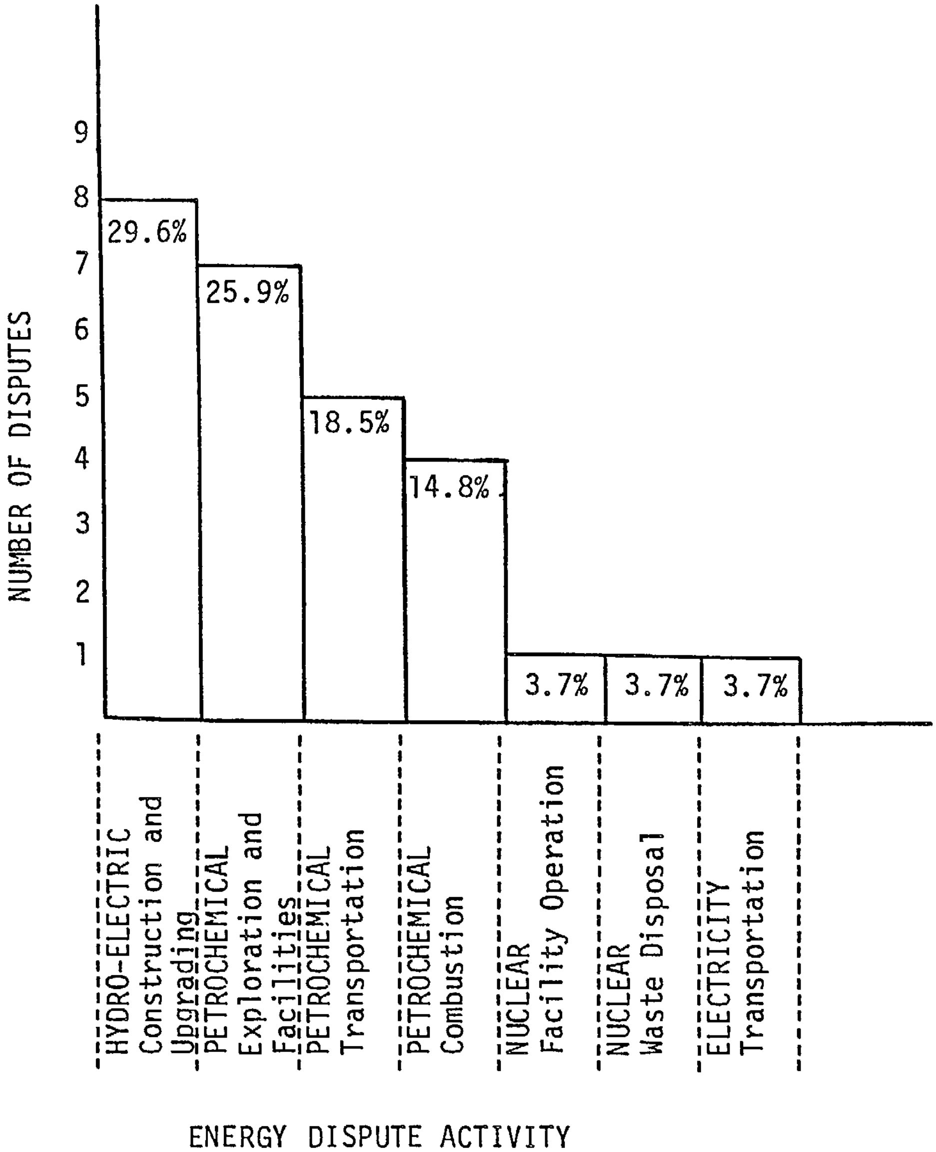


ENVIRONMENTAL DISPUTES

Disputes listed are categorized by type of activity which led to dispute.
Data was obtained by analysis of news articles and press releases distributed by Environment Canada's Media Monitoring Service.
Data was compiled over a 7 month period, from November 1981 to May 1982.
Criteria for selection of dispute:

1) clearly defined issue
2) clearly identified - proponents and opponents
3) action oriented
   - legal proceedings
   - regulatory hearings
   - referrendum
   - public protest - media
   - appeal to elected representatives and government

Figure 1.



ENERGY RELATED ENVIRONMENTAL DISPUTES

Disputes listed are categorized by type of activity which led to dispute.
Data was obtained by analysis of news articles and press releases distributed by Environment Canada's Media Monitoring Service.
Data was compiled over a 7 month period, from November 1981 to May 1982.
Criteria for selection of dispute:

1) clearly defined issue
2) clearly identified - proponents and opponents
3) action oriented
   - legal proceedings
   - regulatory hearings
   - referrendum
   - public protest - media
   - appeal to elected representatives and government

Figure 2.

EMI ENERGY PROJECT: POTENTIAL TRANS-BOUNDARY ENERGY-ENVIRONMENT DISPUTES

Figure 3.

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4. The author recognizes that these data may not be conclusive and that additional information sources may be necessary to verify the results.

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WORKSHOP SUMMARY

Session III "Regulation, Public Interest and Decision-Making"

Summary of Workshop Discussion

C. Hunt

"Regulation, Public Interest and Decision-Making"

I. Issues of Public Participation and Interest

A. Principles of Public Participation

There was general consensus that while public involvement in site/route selection may not be strictly necessary in all cases, it is desirable, since it can help improve a project and its public acceptability.

Approaches to public involvement in any proposed project should be addressed by the proponent in an organized fashion very early in the planning stages, and should take into account both the internal objectives of the proponent and the external needs of the public.

There was also general consensus on the need to involve the public at an early stage. Exactly when to do so is problematic, however. With apologies to the story of Goldilocks and The Three Bears, it should be not too early, and not too late, when it is "just right". One way to deal with the complicated question of timing is to approach the project in "stages". The public should at least be informed at the feasibility study stage, and the information flow should continue as planning proceeds.

One matter that proved somewhat contentious was whether or not there is a need to legislate a minimum standard for public participation in the approvals process. The general view seems to be that while the principle of public participation might usefully be legislated, the content should not because there is a need for flexibility in the content depending upon a host of factors. Such factors include: the size, nature, location and expected impact of the project; the size and level of interest of the affected publics; the previous record and past experience of the proponent; and the stage of the proponent's plans (to mention just a few). The principle of public participation should be supplemented by policy statements and guidelines that set out expectations in more detail.

One group suggested the following model concerning public participation for inclusion in legislation:

> The affected public(s) shall be afforded the opportunity to enter their concerns and opinions (which shall be documented) into the project process preceding each major decision point such as:
>
> - need vs. no action
> - design of study
> - development of environmental criteria
> - development of alternatives
> - identification of preferred routes or sites

- selection of mitigative measures
- identification of centreline.

B. Methods of Public Participation

While the appropriate method will depend on a range of project-specific factors (such as those outlined above), the groups outlined a wide variety of possible methods, including:

- newsletters, reports, notice, flyers
- phone "hot" lines
- opinion surveys
- public advisory/citizen committees
- information centres, such as libraries and open houses
- public meetings in local areas
- regular community contacts - networking

There was considerable discussion of the concept of mediation. It was generally felt that this method was of limited usefulness, because it could only be employed in those cases where a small number of parties are affected. Moreover, there is not usually a common party to represent the public interest. Finally, it could tend to extend the time frame for project approvals, and thus may be counterproductive.

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C. Means of Promoting the Public Interest

Two impediments to the public interest were identified in the discussions.

The first is the fact that there is often considerable overlap/duplication in both regulations and review processes. These can occur as between the provincial and federal governments and also within both levels of government. Overlap and duplication are wasteful because they result in excessive costs, in ordinate study requirements and delays in decision-making.

Three main solutions to this problem were identified. The first is the "single window" approach examples of which can be found in Alberta's Energy Resources Conservation Board and Ontario's Consolidated Hearings Process. Another alternative is co-ordination of review processes, at the interjurisdictional level. One example is the federal - Nova Scotia review of the Venture Gas Project. A third approach would be to have agreement that a decision made by one tribunal would be binding on all the others.

Another potential impediment to promoting the public interest is industry's reluctance to share "confidential" information with the public. This can occur when such information could impair a company's competitive position, or when policies have been arrived at and/or based upon internal corporate strategy.

Requirements to disclose such information should depend in part upon the particular stage of the project, and there should be overall equality of treatment as between different companies. However, there was apparent consensus that information relating to compliance (both the raw data and resulting analyses) should be made available to the public.

There was discussion of the extent to which and circumstances in which compensation might reasonably be considered an alternative to mitigation. Generally, compensation should be considered only as a last resort, and not when a unique or scarce resource is at issue. Compensation to an individual, it was pointed out, does not necessarily solve environmental problems; moreover, economics should not be the sole criteria for determining when compensation is appropriate, as there are other values that may be more important.

With these limitations, compensation may be appropriate for residual problems, following mitigation. Compensation works best when losses are quantifiable, or when losses can be repaid in kind.

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II. Appropriate Roles and Responsibilities for Proponents and Regulators

A. Proponents

The proponent bears the main responsibility for facilitating public involvement in a project, particularly in the earlier stages. It also has an overall obligation to demonstrate that a broad range of alternatives have been considered in the planning stage (public involvement early in this process can help to avoid subsequent conflict). Industry needs to consider alternative techniques of implementing a particular project.

Industry also has major responsibility in the area of monitoring, especially to ensure compliance with government requirements. When impacts are uncertain, both industry and government ought to share monitoring obligations. But regardless of the industry/government division of labour in relation to monitoring, there is also a role for the public to play. The public's reaction to a project after the construction phase could usefully be monitored, and the public itself may also play a useful part in monitoring activities. In any event, as indicated earlier, the public should always have access to the results of monitoring.

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B. Government/Regulators

Although the role of government and regulators is not necessarily greater than that of the proponent, it may take a little longer to describe.

Just as the proponent has a responsibility to promote and facilitate public involvement at an early stage of its project, regulators need to be sure that the public is well-informed as to the nature and timing of public review processes, methods of intervention, etc. Regulators also have a watch-dog role in relation to overseeing the definition of the affected "publics", and the nature and adequacy of the public - involvement mechanisms being employed by the proponent. They should have the responsibility to determine the content, nature and timing of the notice given by the proponent to the public, particularly in the later, post-feasibility stages. In relation to the feasibility stage, however, government has another role, namely to ensure that the proponent takes a broad overview.

Although no clear consensus emerged from the Workshops on the question of who should bear the cost of public participation exercises, there was a measure of agreement that a key part must be played by an independent third party, notably the regulator. At times, it may be appropriate for costs to be shared between the regulator and the proponent.

But in any event clear criteria and limits should be established and applied by the regulating agency. If funding is provided prior to public participation in a review process, however, the proponent should not be required to contribute until such time as the regulator has made a determination as to the effectiveness of the public's intervention.

Finally, government has a major role to play in monitoring. Monitoring should not be open-ended; but where it is intended to evaluate impact prediction, the task should fall primarily to government. It is also government's main obligation when monitoring is required to produce or improve standards. In any case, it is up to government to see that the public is involved in monitoring.

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