

DISCUSSION PAPER

CONSIDERATION OF AN ENVIRONMENTAL MAINTENANCE GROUP

WITHIN ELECTRICAL OPERATIONS

A TASK AND IMPLEMENTATION ANALYSIS

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CONSIDERATION OF AN ENVIRONMENTAL MAINTENANCE GROUP WITHIN ELECTRICAL OPERATIONS

A T A S K A N D I M P L E M E N T A T I O N A N A L Y S I S

ABSTRACT

This report explores the need for a group within Electrical Operations who would have the responsibility of ensuring that the day to day operations of the Authority make the minimum impact on the quality of the total environment. The present circumstances which suggest this need are examined. A total framework within Electrical Operations with the responsibility of Environmental Maintenance is presented for discussion. Possible task responsibilities are catalogued, some new tasks are explained. The necessity for intensive investigation of current resources in both staff and equipment is noted. Two further reports examining work load and long term planning are suggested. Eighteen initial recommendations for discussion form the basis of this report as a task and implementation analysis. A definition glossary of terms used in the report is attached.

INTRODUCTION

This report examines the requirement for an identifiable group in Electrical Operations at both Head Office and in the Regions, with the specific responsibility of reducing the impact of all phases of B. C. Hydro operations on the total environment. For the sake of clarity, this group has been called the Environmental Maintenance Group. Although written primarily for Electrical Operations, all divisions involved in industrial grounds maintenance or construction may have an interest in examining the ideas presented here.

The report is purely conceptual and forms the initial part of a proposed study which will include a Work Load and Equipment Availability Analysis throughout the system and later a Policy and Long Range Planning Study will form the final segment of the overall review. The method of analysis is simple and flexible. This system is no more than a logical progression through the requirements of any action and is applicable to all phases of operation. (See Graphic Display I) Specific recommendations are embodied in the report and provide an organizational framework which can carry out the tasks identified in the analysis.

Three recent factors appear to have influenced the status quo with regard to the current level of environmental awareness within the Authority, the organization has a revised senior management and has embarked on a staff reorganization, the climate of public opinion towards the Utility has restricted some operations and, finally, the Provincial Government is presently undertaking a review and update of current environmental legislation, partly as an outcome of confrontation between some Government agencies as environmental modifiers and conservation groups as concerned protagonists. It can be anticipated that more restrictive legislations and, perhaps, government reorganization of ministerial responsibilities will further restrict or review our operations. Moreover with the trend towards facility beautification, trained staff will be required to maintain the standards of appearance inherent in the original designs.

This report, then, will examine each of the preceeding factors as they relate to a suggested in-house group solely responsible for non-electrical system maintenance within the context of the total environment. As such, the report will be restricted to developing the concept of integrated Environmental Maintenance as a single though not isolated Sub-Function of the principal Elements of utility operation. It was felt particularly important that any new suggestions be presented in a format compatible with and adaptable to the existing framework of operations, supervision and responsibility. The suggestions within have been structured, insofar as it is possible, to make them capable of efficient and effective implementation after adequate discussion of their implications, and modification as a result of individual comment.

DISCUSSION

Reorganization of the senior and medium levels of management within B. C. Hydro to produce a more responsive and co-ordinated group and consolidation of responsibilities through a new regional structure provides an ideal opportunity for examination of current environmental maintenance practices. Although similar in nature at most locations, these practices have been fragmented throughout the organization and have lacked overall standards or implementation guidelines. There have been too few staff with professional expertise in the biological sciences capable of understanding the complex inter-relationship between Utility operations and the total environment. Research and training have been neglected and the Authority has fallen behind the current state of the art as practiced by other utilities in the environmental field.

Notwithstanding the provisions of Section 53 of the British Columbia Hydro and Power Authority Act, wherein it is noted that the Authority is not bound by any statute or statutory provisions of the Province, except as provided under the Act, there is now a growing realization that the organization must, at best, comply with the spirit of Provincial legislation of an environmental nature. Even if the Act is not changed, compliance with some Acts establishes a precedent for compliance with others. For example, it is now tentatively agreed that we will consider ourselves in the future to be complying with the provisions of the Environment and Land Use Act (1971), the Pollution Control Act (1967) and the Pharmacy Act (1969). Other such legislation may follow. New policy considerations, therefore, resulting from statutory obligation and possible compliance with a wider range of existing regulations necessitates examination of an expanded capability with responsibility for maintenance in those segments of the Utility impinging on the total environment (See Graphic Display 2).

Much may be learned from the considerable experience of other organizations involved in industrial grounds maintenance. This Authority, though differing from others in principal generation mode, geographical location, terrain and management practices, is not unique in many maintenance requirements and their effect on the environment. Thus, experience gained with a number of other utilities has been drawn upon to provide an analysis of the requirements for a B. C. Hydro Regional and Head Office capability to supervise, co-ordinate and carry out, in an orderly professional manner, the tasks enounced in this report.

Expertise and interest in a variety of fields related to environmental maintenance has already been developed by individuals within the organization and attention must be given to identification of these skills. Existing job descriptions for a variety of positions embody essential ingredients for many of the positions envisaged for the Environmental Maintenance Group. However, it is anticipated that a number of new personnel with non-engineering backgrounds will be required from outside the organization. It is tentatively envisaged that the growth of the Environmental Maintenance Group to full strength will require a period of some three years during which time recruiting and training will form a fundamental basis for development. Anticipated workload should be carefully considered and staffing made contingent on planned demand. The greatest variation for a time will be in the number of personnel required for the Field Maintenance Teams. It is suggested that the need already exists for the personnel suggested at the regional and Head Office locations. These functions are new and are not at present covered by existing staff responsibilities.

In the regions, however, first line supervision of maintenance work does already exist although at differing levels and under variable job titles. Similarly, crews for tree-trimming in the old Distribution Division and for spraying in the old Production Division already exist and could be welded into a well-trained maintenance staff. Further discussion of framework is given in the section of Recommendations.

RECOMMENDATIONS

If it is assumed that environmental maintenance be regarded as a co-ordinated function throughout the system, there are six fundamental tenants on which the proposed framework is based; one pertains to Head Office and five to the Regional divisions. Since it is a wasteful duplication of manpower to have all expertise duplicated in the Regions, five advisory functions are proposed for Head Office. These five functions would have two principal roles, that of producing overall guidelines for the Authority as a whole, and keeping abreast of legislative changes while, on the other hand, acting in an advisory capacity when called on to so do by the regions. The major responsibilities of these five positions are encapsulated in the job descriptions attached to this report and will not be expounded upon here.

In the regions, a Divisional Environmental Superintendent reporting to the Manager, Systems Operations and Maintenance in a staff capacity is recommended. As may be seen by the job description, it is intended that this position would be a catch all for a wide variety of environmental problems arising in the region. They will require people of broad background with a demonstrated sensitivity to the complex inter-relationships of the total environment and the place of utility operations in that environment. The educational background for these positions is less clearly defined than for the Head Office personnel. These positions are critical to the region's ability to accomplish their own problem-solving of serried non-engineering questions. Special care should be taken in the choice of the candidates for each of these jobs. Further comment is given on the appropriate job description with regard to selection.

It is not envisaged that these positions would have the responsibility of first line supervision. It is suggested that Area Supervisors or Superintendents, depending on the size of area and workload, be appointed to oversee the Environmental Maintenance Teams. These staff would, as is the case now with other Maintenance Superintendents, report to the Manager, System Operations and Maintenance. In turn, these personnel would supervise a newly created

job category of Union tradesmen responsible for Environmental Maintenance. The initial nucleus for these teams would come from the existing resources of equipment and manpower in Production and Distribution, currently responsible for right-of-way spraying and tree trimming respectively. Where necessary these teams would undergo intensive training to improve their skills in Utility Arboriculture, Vegetation Management, Mechanical Equipment Operation and Safety, Grounds Maintenance and Industrial Horticulture. The responsibility for these programs would rest with the Training Co-ordinator in the Environmental Maintenance Resource Group.

It is suggested that the more able field staff be promoted to Foremen category and be exposed immediately to systematic training. Ontario Hydro have offered their training facilities, staff and expertise to assist in our initial steps. It would be soon necessary, however, to locate a suitable building and property which can accommodate residential staff, field equipment, classrooms and demonstration areas so that training and revision may be a continuing process providing progression from trainee status through to fully qualified journeymen.

A number of other recommendations are given in the synopsis following. Each is self-explanatory. The preceeding then, are suggestions for a unified and systematic approach to a problem which has been pressing for some time and which has been considerably aggravated by recent public concern over environmental quality. The recommendations are open to active discussion. Full implementation is not imminent although it may in part be necessary to meet the pressing needs of some areas on an ad-hoc basis. Careful consideration will be given to any constructive suggestions, which we will be actively soliciting from you.

New tasks are given definitive explanation in the attached task analysis while those present day tasks which are self explanatory are listed for information. Suggestions as to new or alternate task methods are also solicited.

A handwritten signature in black ink, appearing to read "M.R. Gardiner". The signature is written in a cursive, flowing style with a large initial "M" and "R".

SYNOPSIS OF RECOMMENDATIONS

1. That environmental maintenance be regarded as a coordinated function throughout the system.
2. A policy regarding task intensity be established in general terms for the major categories of environmental maintenance based on public and statutory demand.
3. A resource capability to be termed the Environmental Maintenance Group be created within Electrical Operations, Vancouver.
4. A Divisional Environmental Superintendent post be made in each regional division reporting to the Manager, System Operations and Maintenance in a broad staff capacity.
5. Area Supervisors or, in some cases, Superintendents, Environmental Maintenance, be appointed at locations determined by workload, existing framework, and geography, with the specific responsibility of overseeing the environmental maintenance teams in the regional divisions.
6. Provision be made for future expansion of these functions at the professional and technical levels.
7. The existing resources of equipment and manpower in Production and Distribution be combined to form a nucleus of field teams capable of executing the work identified in the task analysis. Where no such manpower exists new staffing must be contemplated.
8. The areas of responsibility for the Environmental Maintenance Group and for the field teams be clearly established vis-a-vis other B. C. Hydro Departments.
9. The most able General Tradesmen be screened for suitability as permanent team sub-foremen in the environmental maintenance teams.
10. Consideration be given to a tradesman job category, other than General Tradesmen, for the environmental maintenance field teams.
11. Training programs be instituted to upgrade the general standard of work, anticipate new legislation, and improve field morale.
12. A specific location be designated for trades training.
13. A recruitment review be undertaken to identify sources of adequately trained personnel that will be available for future expansion of the environmental maintenance function.

14. A progression framework be established within the trades category allowing for advancement at stages commensurate with skill (apprenticeship).
15. There be careful selection of personnel able to communicate with the public as the environmental maintenance teams will, in some sensitive tasks, have the closest contact of any utility personnel with the consumer.
16. Careful evaluation of general policy, system work loads, equipment availability, staffing requirements and Divisional Manager inputs be made before any concrete steps are taken on implementation.
17. That an intensive review of system growth, goals, policy, and maintenance alternatives, costs, group flexibility, creativity, and future public and statutory demand trends, form part of a long term planning study for environmental maintenance.
18. That budgeting guidelines be established for existing and new tasks and that accounting procedures be initiated whereby the expenditures required to carry out the respective tasks in each of the elements may be recorded and assessed to provide feedback for future program modification.

Terms

Glossary of Terms

- Total Environment - The actual environment comprised of the public sector, government sector - both civil and political, the company, and the natural environment.
- Natural Environment - Those parts of the environment of natural origin which are required to sustain life namely, air, water and land as modified by man and including present fauna, flora, use and appearance.
- Impingement - The range of effects on the total environment, or the point at which the effect changes environmental quality.
- Effects - The specific consequences resulting from the interaction between functions and the total environment. (impact)
- Elements - Those major segments of electrical utility operations normally described as Generation, Transmission, and Distribution.
- Functions - Those major work categories covering all phases of utility operations in each of the elements.
- Tasks - The specific job requirements involved in each of the functions.
- Task Intensity - The degree to which any task is carried out where the degree is predetermined but flexible for a number of similar tasks it may be termed a guideline where it is not flexible it may be a standard.
- Mode - The specific type of method used to accomplish the requirements of each element.
- Utility Environmental Maintenance - Necessary work required to sustain or improve the quality of the natural environment where affected by utility functions.
- Prescription Maintenance - The choice of maintenance techniques best suited to a particular problem after examination of all influencing factors.
- Vegetation Management - The application of most efficient, safe method to the variety of problems encountered in establishment, maintenance, control, or disposal of plant material.

SIMPLIFIED CORPORATE MODEL

Principal elements - utility operations
Generation - Transmission - Distribution - Admin. facil.

Principal Element Functions

long term planning
and background studies

design

assessment of existing
environment

construction

commissioning

normal operations
and maintenance

expansion or
up-rating

normal operations
and maintenance

de-commissioning
and obsolescence

Head Office
guidance in policy,
management, research
functions
and standards

Information and
work co-ordination.
Two way flow
Regions and H.O.

Data

Regional

policy

and

tasks which

require

Types - civil

mechanical

electrical

environmental

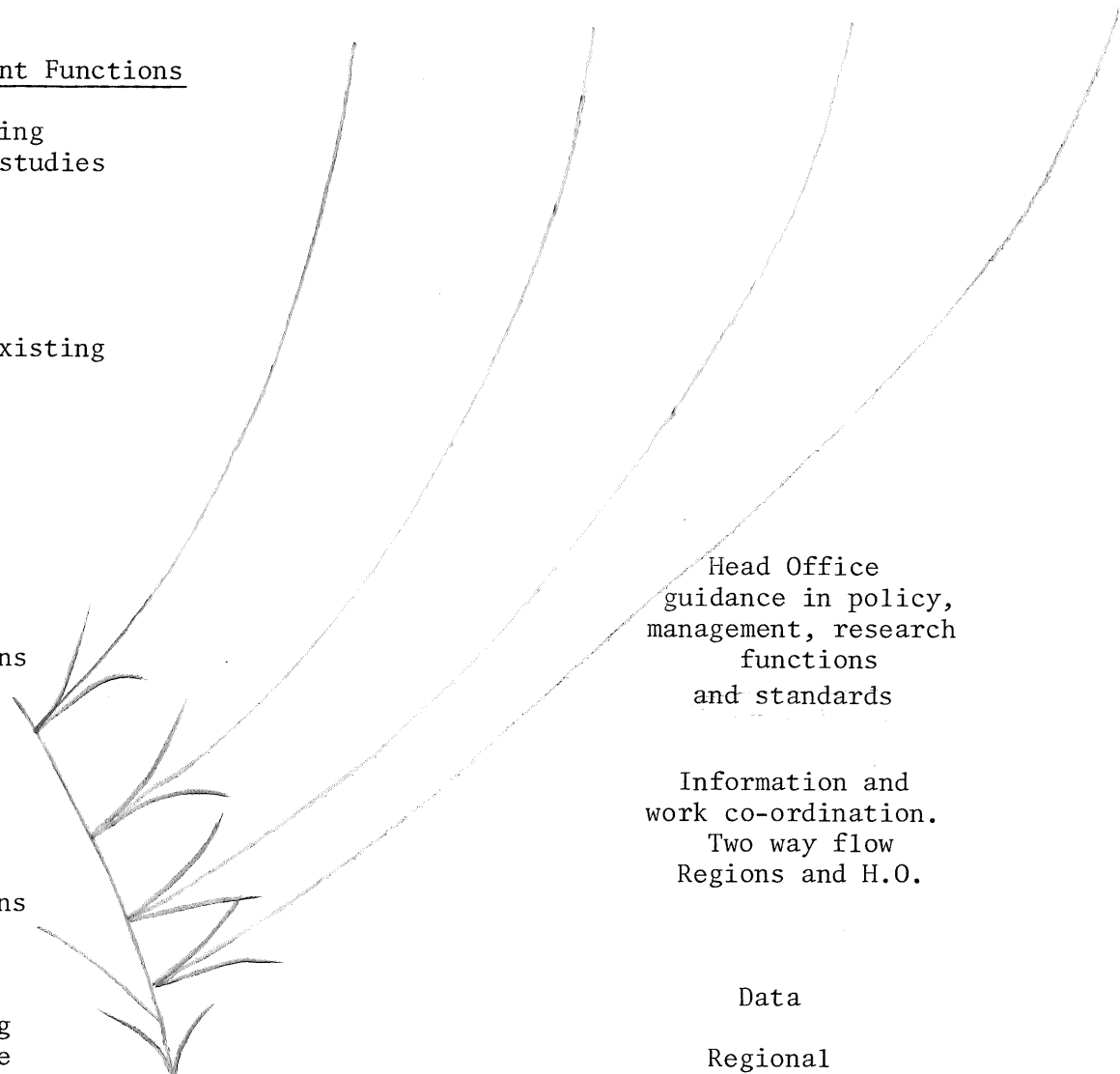
Methods

+
Men

+
Machinery

+
Materials

+
Money



Display II
 Functions and impingement on total environment

Element Function Axis

Total Environment

Environmental
 Maintenance

community

government

company

natural environment

private commercial
 & institutional

civil political

executive
 staff line

air land water
 fauna / flora
 appearance
 use



Tasks

generation

area

of

Tasks

transmission

effects

(impact)

Tasks

distribution

Impingement axis

Legislation Pertaining to Environmental Maintenance

Municipal

City of Vancouver Charter
City of Victoria Charter
Municipal Act

Provincial

Accelerated Park Development Fund Act
Accelerated Reforestation Fund Act
Archaeological and Historic Sites Protection Act
B. C. Hydro and Power Authority Act
Department of Highways Act
Ecological Reserves Act
Environment and Land Use Act
Forest Act
Greenbelt Protection Fund Act
Health Act and Regulations
Highways Act
Highway Development Act
Highways (Scenic Improvement) Act 1968
Land Act
Litter Act
Noxious Weed Act
Pharmacy Act
Pipelines Act
Pollution Control Act
Power and Telephone Line Beautification Fund Act
Public Utilities Act and Regulations
Railway Act
Water Act

Federal

Canada Shipping Act - Section 495A - 495C
Clean Air Act
Fisheries Act - Section 33
Migratory Birds Convention Act - Sections 4, 12 and 51
National Parks Act - Section 7
Navigable Waters Protection Act
Pest Control Products Act
Hazardous Materials Act

The legislation noted above may or may not have implications or advantages of use for environmental maintenance. Each Act is under study by the Legal Division and will be the subject of a future supplement to this report.

Possible Environmental Maintenance Group Inter-communication
in the Total Environment

COMMUNITY

Private

complaints
concerned citizens
property owners

Commercial

consultants
contractors
developers
media
suppliers

Institutional

community services
environmental groups
professional
associations
schools
service clubs
universities

GOVERNMENT

Government -Federal

Federal Members
Dept. of Agriculture
Penitentiary Service
Environment Canada
Dept. of Indian & Northern
Affairs
National Health & Welfare
National Research Council
Fisheries Research Board
Dept. of Public Works

Civil-Provincial

Provincial Members
Dept. of Agriculture
Attorney General Dept. of Corrections
Land Registry
Health Services
Dept. of Highways
Public Works
Lands Forests & Water Resources -
(Land Services, Water, Pollution Dept.)
Provincial Secretary
Public Utilities Commission
Dept. Recreation & Conservation -
(Fish & Wildlife, Parks)
Workmens Compensation Board
Municipal Affairs
Office of the Premier

GOVERNMENT (Cont'd)

Civil - Municipal

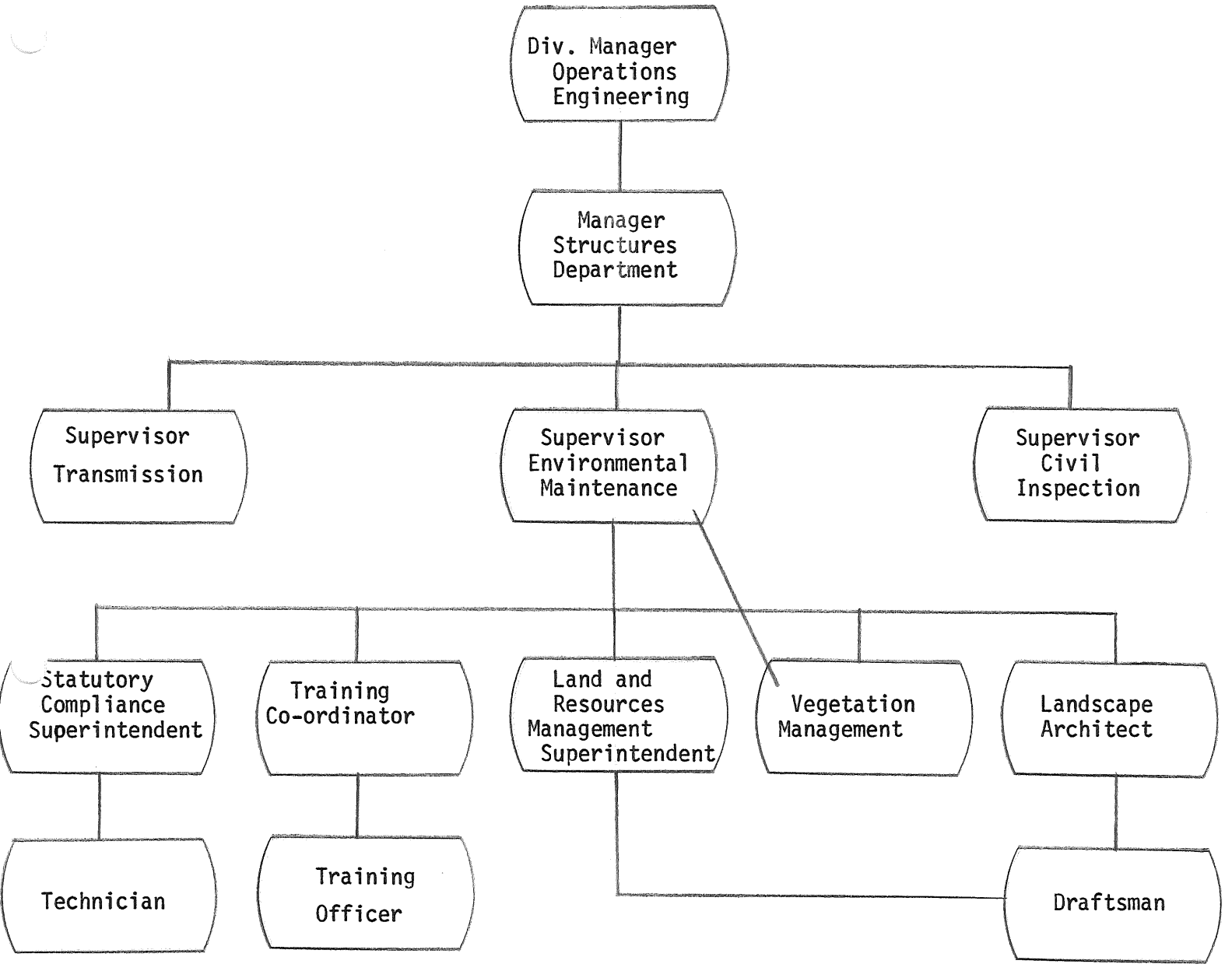
Local Council Members
Community Centres
Conservatory
Elected Officials
Fire Department
Garbage Collection
Golf Courses
Health Department
Land Survey Information
Licences Information
Local Improvements
Parks Board
Planning Branch
Permits Branch
Police
Courts
Voters List Information
Zoning Information
Regional Districts and Technical Planning Committees

COMPANY

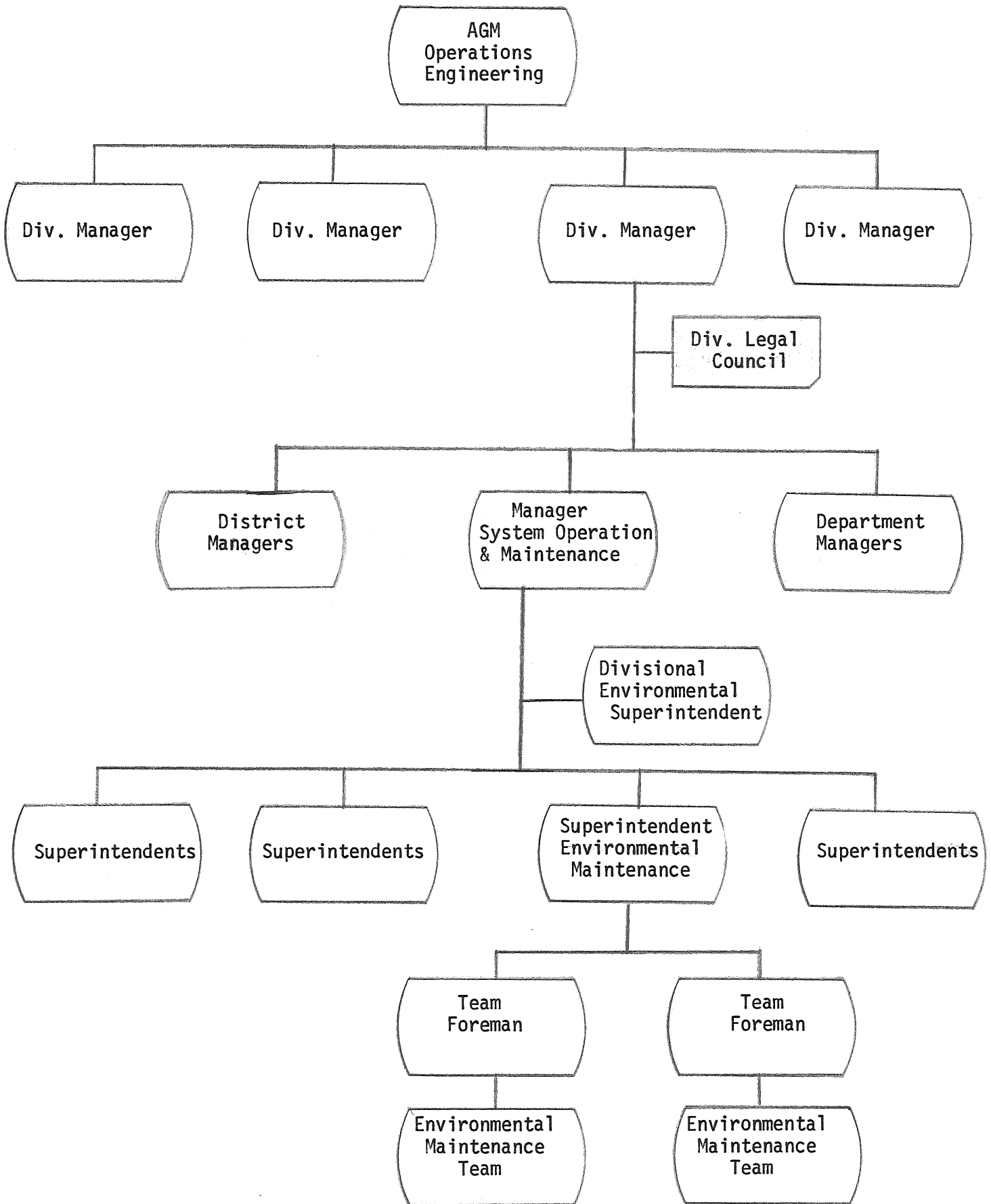
Company - Internal

Executive Branch
Chairman
Accounting
Building Services
Clearing Inspection
Computer Services
Construction
Engineering
Industrial Development
Information Services
Job Evaluation
Land
Legal
Library
Material Research
Material Standards
Manpower Planning
Medical Services
Personnel Services
Purchasing
Safety
Training

- * Committees and Task Forces
- * Head Office resource staff
Head Office administrative staff



ORGANIZATIONAL OUTLINE



Synopsis of Staff Requirements and Functions
Environmental Maintenance Group

Head Office Staff

Manager - Environmental Maintenance Department
Statutory Compliance Superintendent
Land and Resources Management Superintendent
Vegetation Management Superintendent
Training Co-Ordinator - Environmental Maintenance
Landscape Architect - Environmental Maintenance

Regional Staff

Divisional Environmental Superintendent

Area Staff

Area Environmental Maintenance Superintendent
Crew Foreman - Environmental Maintenance
Tradesmen - Environmental Maintenance

The suggested job groupings on the following pages are generally based on existing similar job descriptions and are intended as a relative guide only. To attract suitably qualified people with relevant experience it may be necessary to move away from the common practice of relating job group to supervisory responsibilities.

Head Office Personnel Requirements and Responsibilities

Reporting to: Division Manager, Operations Engineering

DEPARTMENT MANAGER - Environmental Maintenance Group - Suggested Job Group 16

Responsibilities

General

Supervise all aspects of environmental maintenance work required on a continuing basis within Electrical Operations relating to the basic elements of Generation Transmission and Distribution. Maintain close liaison with counterparts in other Authority Divisions engaged in the planning, design or execution of environmental work. Advise and assist in the long range planning of the Authority's development, where such development impinges on the total environment. Participate in the formation of policy for the Authority. Draft internal instructions. Originate suggestions or research and prepare reports on the development and status of the Department. Integrate and co-ordinate ongoing tasks with other system work and maintain constant communication with Regional Divisions engaged in day-to-day work scheduling. Prepare and issue to all interested Departments up to date summaries of all current, committed and planned environmental activities of a maintenance nature. Work closely with Government regulatory bodies, citizens groups, industry and academia to encourage cordial relationships. Participate in inter-divisional or government committees and public meetings engaged in environmental discussion or investigation. Maintain liaison with consultants and professional groups on all matters pertaining to the environment. Keep abreast of new developments in the field by reading appropriate reports, magazines and attending conferences.

Head Office Personnel Requirements and Responsibilities

Reporting to: Department Manager - Environmental Maintenance Group

VEGETATION MANAGEMENT SUPERINTENDENT - Environmental Maintenance Group
Suggested Job Group 15

Responsibilities

General

Supervise a staff required to establish acceptable chemical control techniques and examine all alternatives for vegetation control. Initiate chemical research and equipment design and evaluation. Maintain close Liaison with the Training Co-Ordinator and the appropriate regulatory agencies in this area. Develop compatible tree species for planting in close proximity to overhead conductors and underground facilities in conjunction with the Department Landscape Architect and Engineering. Develop techniques of industrial horticulture to maintain the standard of appearance originated in initial landscape designs. Undertake cost/benefit studies for alternate methods suitable to implement the tasks given in this report. Attend public meetings to explain Authority policy and techniques used for vegetation management. Establish communication with the general public, industry and academia, in such way as to foster a better understanding of the Authority's work. Supervise the development of tendering specifications for contractors engaged in environmental work and advise on the policing of such work. Keep abreast of new developments in vegetation management by reading appropriate journals and attending conferences. Provide technical assistance to the Regional Staff engaged in the day-to-day tasks of the Environmental Maintenance Teams.

Head Office Personnel Requirements and Responsibilities

Reporting to: Department Manager - Environmental Maintenance Group

LAND AND RESOURCES MANAGEMENT SUPERINTENDENT - Environmental Maintenance
Group - Suggested Job Group 14

Responsibilities

General

Supervise a staff required to appraise and identify the property held in public trust by the Authority and recommend forest and use management plans for each location. Oversee the requirements of such plans and provide guidelines and methods for the tasks required to implement such plan. Formulate fire contingency plans for that property supporting forest growth. Maintain close liaison with all levels of Government, the general public, industry and academia on the questions of land use and management. Work in conjunction with other Departments and Staff in all phases of work involving land acquisition and development. Provide technical assistance to the Regional Staff engaged in the day-to-day tasks of the Environmental Maintenance Teams. Assist in the formulation of policy with regard to Authority owned property and initiate investigations required to examine the implications of such policy. Keep abreast of new developments by attending conferences, reading technical journals, etc.

Head Office Personnel Requirements and Responsibilities

Reporting to: Department Manager - Environmental Maintenance Group

STATUTORY COMPLIANCE SUPERINTENDENT - Environmental Maintenance Group
Suggest Job Group 14

Responsibilities

General

Supervise the staff required for Authority compliance under the Pollution Control Act and identify problem areas. Initiate remedial engineering and assess suggestions, impact and success. Provide programs for ongoing monitoring of facilities. Examine all legislation from a technical viewpoint and assess the implications to the Authority. Provide contingency plans, or initiate engineering solutions for specific problem areas. Maintain close liaison with regulatory agencies, all levels of Government and Departments within the Authority, and keep the Department Manager apprised of new developments. Assist in the elucidation of policy for the Organization in relation to existing and future legislation. Identify conflicts between policy and public expectations of the Organization. Examine the implications of consumable energy alternatives and assist in the recommendations for future use patterns. Keep abreast of new developments in equipment and techniques for all aspects of pollution control, read technical journals and attend conferences.

Head Office Personnel Requirements and Responsibilities

Reporting to: Department Manager - Environmental Maintenance Group or
Department Manager - Manpower Development, Personnel Div.

TRAINING CO-ORDINATOR - Environmental Maintenance Group - Suggested
Job Group 13

Responsibilities General

Supervise such staff as may be required and personally engage in training the newly formed Environmental Maintenance Field Teams in the areas of Utility arboriculture, vegetation management, mechanical equipment operation and safety, ground maintenance and industrial horticulture. Co-operate with the Field and Head Office Staff in the production of maintenance guidelines and training manuals. Arrange lectures from outside agencies and co-ordinate the licensing of pesticide applicators. Arrange discussion groups to appraise other Authority Personnel of the work of the Environmental Maintenance Department. Assist in the recruitment of staff for field teams. Provide information on the techniques of interpersonal relations and communications between staff and the general public. Act as liaison officer between the Environmental Department and Information Services.

Head Office Personnel Requirements and Responsibilities

Reporting to: Department Manager - Environmental Maintenance Group

LANDSCAPE ARCHITECT - Suggested Job Group 13

Responsibilities

General

Initiate a review of existing facilities and identify appearance and noise problems. Produce cost estimates for remedial work and formulate technical sections for tendering documents of the creative submission type. Evaluate contractors suggestions for each location and recommend adoption of specific plans. Examine the varieties of plant material growing in British Columbia and recommend particular species for various situations. Establish a list of undesirable plant species and incorporate such information in specifications. Assist in the location of transmission lines and facilities in conjunction with Engineering. Produce upgrading plans for facilities not requiring outside tendering. Provide plans for aftercare of plant material and detailed requirements for long term grounds maintenance at each location improved. Maintain close liaison with the Area and Regional personnel on all questions pertaining to appearance, including assistance in local budget preparation. Supervise additional staff as required. Establish and maintain communication with Local Planning Boards, the general public and Authority personnel, in order to foster a better understanding of Hydro policies and problems.

Field Personnel Requirements and Responsibilities

Reporting to: Manager, System Operations and Maintenance in a
 staff function

DIVISIONAL ENVIRONMENTAL SUPERINTENDENT - Suggested Job Group 14

Responsibilities General

Advise Division Manager and Manager, System Operations and Maintenance on all environmental questions. Assist Superintendents and Supervisors with their individual programs. Recognize potential areas of contention and recommend solutions. Maintain liaison with the public, planning boards and regulatory agencies at a local level. Attend such meetings as may be required to explain Hydro policy, and provide technical explanation of specific programs. Pursue applied research for divisional problems not covered by Head Office staff. Maintain liaison with all Hydro departments that may, through their own functions, affect the quality of the total environment. Provide alternatives which will reduce or modify these effects. Monitor and examine existing system operations, as well as examine planned developments, and contribute feedback to the environmental maintenance staff group. Coordinate and oversee the environmental aspects of new work in his area, be it contract or "in house" and control or suspend such work where deemed necessary for valid environmental reasons.

It will be extremely important to fill these positions with competent personnel. Moreover, they must have a good degree of enthusiasm and personal independence of mind. They should be forward looking, inventive individuals whose interests are, however, tempered with a vian of realism.

Field Personnel Requirements and Responsibilities

Reporting to: Manager, System Operations and Maintenance

AREA ENVIRONMENTAL MAINTENANCE SUPERINTENDENT - Suggested Job Group 13

Responsibilities

General

Supervise teams engaged in the field tasks enunciated in this report and co-ordinate such activities so that they may be integrated with other system requirements. Co-ordinate and ensure adequate stocks of consumable material and specialized equipment. Request and evaluate equipment in conjunction with the Vehicle Section. Prepare procedures for safe and efficient work procedures in conjunction with the Safety Section and assist in the development of training programs with the Training Officer. Program work within the area and prepare budgets for such work. Ensure the economic use of equipment and supervise the maintenance of such equipment. Check time sheets, invoices and expense claims and maintain records. Supervise and direct contractors engaged in environmental maintenance tasks, at or on existing property and oversee such contractors engaged in grounds work on new projects and provide liaison with other divisions to ensure acceptable completion of contracts. Maintain close contact with property owners on private property requiring maintenance and liaise with government departments, local, Provincial and Federal. Keep abreast of new developments in grounds maintenance by reading appropriate journals, attending meetings, etc.

TASK IDENTIFICATION AND
ANALYSIS

TASK ANALYSIS

Display I illustrates the broad functions of the Utility and as they pertain to each of the elements of operation. Each of the functions may be further broken down into tasks, which require methods, men and in some cases, machinery and materials. It is possible then, to follow a progression of the needs of each task through a logical sequence which eventually will form a task outline. This is not a simple job, as there may be an infinite variety of possibilities and to be comprehensive each must be identified, weighted and then ordered in the overall outline. When these outlines are complete it is then possible to translate the information into work practices and, where necessary, lesson material for teaching new tradesmen.

This task study should be a dynamic process constantly evaluating new alternatives vis-a-vis existing methods with modifications of these methods as improved understanding, equipment or materials are determined and validated. Methods should be responsive to the prevailing climate of scientific and public opinion. Personnel performing the tasks must be completely aware of the environmental implications of each task, the value of and reason for the job, and the place that the relative task assumes in the broader picture of utility functions in the total environment.

As it is these personnel who will often have the closest contact with the customer and general public, at a time when the task in question is perhaps one of immediate concern to the individual affected, staff should be able to explain fully the object of each job. Gradually this field rapport helps establish an improved corporate image.

Almost all of the tasks listed are self-explanatory. The work effort and frequency for some will differ widely than that for others. Each will have maintenance techniques best suited to the particular problem for any given location. Where any of the listed tasks are ongoing in the regional districts, a brief sketch of present methodology, different alternatives and the possibilities which have been discarded, would help to form these outlines. Where applicable it would be most helpful if you would catalogue this information for review. In time it will then be possible to assemble the various methods presently used and provide individual task outlines.

Five tasks that I have listed may require brief explanation. 'Woodlot thinning' is applicable to those small areas of property that the Authority may own and wish to keep for sustained appearance rather than production. Selective thinning for health, vigour, and reduction of canopy to encourage second growth is necessary to maintain the timber in perpetuity. 'Road crossing screening' is a method

of reducing the visual impact of transmission lines. With new lines it is possible to retain existing plant material but with lines already cut through bush lots right to the road edge, it is possible to select suitable woody plants and re-establish them as a narrow band of growth, substantially reducing the visibility of the towers and conductor.

'Selective cutting maintenance' applies to maintaining conductor clearance at crossings and those sections of the right-of-way which have not been cleared of all indigenous plant material. The latter is a practice currently used by a number of utilities to mitigate the visual effects of a linear swath cut through dense growth. 'Tree thinning' differs from woodlot thinning in that trees planted for screening and general aesthetics in landscaping around facilities will eventually require selective removal or replacement consistent with the normal requirements of an aftercare management plan. (which should be furnished with each design) 'Tree replacement' refers to the replacement of privately owned undesirable fast growing species along distribution lines with compatible trees with a low crown height at maturity.

The name of the majority of the other tasks explains the objective of each. There may, as yet, be no established method for those which are relatively new, however, tentative guidelines for priority tasks can be compiled soon in conjunction with field suggestions.

Inclusion of a task in the lists following does not mean that environmental maintenance staff should necessarily have that job responsibility. Comments on this point and identification of any omissions will be welcome.

Synopsis of Tasks

1. Field Response

One of the questions contained in the letter circulated to Regional and Division Managers during the course of the work by the Environmental Coordinating Committee read as follows: "Provide a personal assessment of the environmental areas that you feel require further attention". The greatest unanimity of response concerned the aesthetic appearance of our undertakings. Without exception the Regional Managers supported the need for more work in this area. Specific comments included landscaping of substations and office buildings, the appropriate pruning of plant material in close proximity to distribution lines, an improved approach to right-of-way screening and maintenance and lastly, more concerted effort on the problems associated with undergrounding distribution lines.

2. Clearing Contracts

Provisions in the most recent clearing contracts require that significantly more plant material be retained on the rights-of-way in depressions, at road crossings in areas of soil instability. Such plant material will eventually present a hazard to the conductors and therefore in time will necessitate selective removal and sophisticated management. This in turn will require competent personnel with a sound understanding of plant succession as well as the safe and efficient use of expensive and complicated maintenance equipment. Increasing public pressure to mitigate the effects of rights-of-way and our own efforts to enhance the transmission corridor will exert considerable pressure on our maintenance crews in terms of workload and training. The difficulty of these tasks will increase with time.

3. Landscaping

With few exceptions, North American utilities have become increasingly aware of the public pressure to improve the appearance of facilities. In turn, the implementation of landscaping plans will require appropriately trained staff to maintain the inherent quality of the designs. Although simplicity is an integral ingredient of industrial landscape architecture, staff must be skilled in industrial horticulture, grounds maintenance and utility arboriculture.

4. Resource Management

B.C. Hydro has approximately 5,000 miscellaneous land holdings. If we are to manage these under the philosophies of efficiency and multiple land use there must be appropriate management plans for recreational use, fire protection, silviculture maintenance and appearance. These parcels, big or small, will again require appropriately trained and equipped personnel to implement the provisions of each plan.

5. Habitat Management

Mitigation procedures undertaken as a consequence of impact resulting from generation facilities will in some cases require the enhancement of wildlife habitat. Here again appropriately trained staff could integrate this work with other facets of environmental maintenance.

6. Pesticide Use

Public pressure and government department scrutiny of continuing herbicides use requires an increasingly sophisticated understanding of the implications of introducing synthetic compounds into the natural environment. Alternate vegetation manipulating techniques are employed by other utilities and pressure will be exerted on us to adopt these procedures. Reduced use of herbicides by other government agencies, particularly the Dept. of Highways, will result in an increasing workload on the part of this Authority underneath distribution lines. New chemical manipulating substances will be available for use in the future. These will require well-versed personnel in their appropriate application and safe use.

7. Distribution Line Clearing

The basic precepts of plant physiology provide simple guidelines for the pruning and control of large woody plants. Complex equipment specifically designed for working in close proximity to energized conductors is available for distribution line clearing. Inappropriate species with large spreading crowns or aggressive annual growth may be replaced by small aesthetic, compatible tree species. Many North American utilities are deeply involved in urban areas on tree replacements or improvement programs.

8. Public Relations

Other than servicemen, meter-readers, and cashiers, the general public come in closest contact with personnel employed in environmental maintenance, often times in contentious situations. Many utilities have found that corporate image may be significantly enhanced by having well groomed, well versed and well trained maintenance crews.

9. Administration

Administration and supervision of the functions involved in environmental maintenance may be best implemented if there are clear cut though flexible guidelines and terms of responsibility for specific staff groups. Efficient accounting, budgeting and equipment use result from improved training. Where in the past contractors may have benefitted from lower salaries to their men the Public Works Fair Employment Act now makes it appropriate to consider in-house control over environmental maintenance rather than contractual programs.

TASK NEEDS

PROGRESSION EXAMPLE

Element

Transmission

Mode

Lattice Tower

Function

Maintenance

Type

Environmental

Tasks

VARIOUS TASKS

Task Needs

Methods

Men

Machinery

Materials

Considerations

Legality
Admin. complexity
Interperative simplicity
Safety
Efficiency
Flexibility
Alternatives
Guidelines
Standards
Records
Presentation
Communication

Education
Training
Qualifications
Experience
Rank
Job title
Job description
Salary
Mobility
Aspirations
Affiliations
Creative freedom
Working conditions
Morale

Suitability
Proven Reliability
Safety
Cost - capital
Cost - operating
Depreciation
Design
Maintenance
Adaptability
Efficiency
Availability
Utilization

Hazard
Public acceptance
Cost
Form
Dependability
Supply
Packaging
Efficacy
Availability

Money Capital available borrowed cost cost sharing priority of tasks
Budget requirement trends amortization period

Function and Impingement Analysis

Element - GENERATION

Function - Environmental Maintenance

Mode - HYDRAULIC

Impact on Total Environment
(to be elaborated)

Tasks

headpond improvement

debris collection and disposal

silt control

equatic weed control

slime/algae control

fish ladder cleaning

entrainment debris collection and
disposal

rip-rap construction and
maintenance

oil storage dyke inspection

oil spill cleanup

oil contaminated soil disposal

sump cleaning

liquid effluent monitoring

ditchbank maintenance

general housekeeping

impingement axis

Impact on Total Environment
(to be elaborated)

Tasks

fence repair

fence grounding

station appearance painting

security light placement
and maintenance

drain/culvert cleaning

rubbish collection & removal

rodent/bird control

grounds fire watch and
fire fighting

noise abatement

wood lot thinning and maintenance

tree planting/replacement

shrub planting/replacement

grass seeding

grass sodding

turf renovation

tree trimming

tree thinning

tree removal

hedge cutting

flower planting

flower tending

watering

impingement axis

Impact on Total Environment
(to be elaborated)

Tasks

grass cutting

fertilization

insect control

disease control

weed control general

 grass

 gravel

snow removal

parking lot line painting

impingement axis

Function and Impingement Analysis

Element - GENERATION

Function - Environmental Maintenance

Mode - THERMAL

Impact on Total Environment
(to be elaborated)

Tasks

C/W treatment

entrainment debris collection and
disposal c/w systems

tank farm dyke inspection

rip-rap construction and
maintenance

general housekeeping

rubbish collection & removal

sump cleaning

oil spill cleanup

oil contaminated soil disposal

liquid effluent monitoring

drain/culvert cleaning

ditchbank maintenance

fence repair

fence grounding

station appearance painting

security light placement
and maintenance

impingement axis

Impact - Total Environment
(to be elaborated)

Tasks

noise abatement

rodent/bird control

grounds fire watch and
fire fighting

wood lot thinning and maintenance

erosion control

parking lot line painting

shrub planting/replacement

tree planting/replacement

tree trimming

tree thinning

tree removal

hedge cutting

grass seeding

grass sodding

turf renovation

grass cutting

flower planting

flower tending

fertilization

watering

insect control

disease control

impingement axis

Impact on Total Environment
(to be elaborated)

Tasks

weed control general

grass

gravel

monitoring air pollution

snow removal

impingement axis

TASKS

Function and Impingement Analysis

Element - TRANSMISSION

Function - Environmental Maintenance

Mode - WOOD POLE/STEEL STRUCTURES RIGHTS-OF-WAY

Impact - Total Environment
(to be elaborated)

Tasks

re-clearing

bulldozing

scarifying

stump removal

burning

seeding

right-of-way inspection
and policing of easements

multiple land user supervision

erosion observation, control
and maintenance

stream observation, control
and maintenance

water crossing construction
and maintenance

water crossing repair

helicopter landing site clearing
and maintenance

road crossing screening

road crossing tree pruning

selective cutting maintenance

impingement axis

Impact - Total Environment
(to be elaborated)

Tasks

chipping of plant debris

recreational facility servicing

tower inspection

tower painting

insulator washing

rubbish collection & disposal

sign placement and maintenance

fence and building grounding

fence and gate construction
and repair

danger tree determination and
removal - See Example Task Method Breakdown #3

woody brush cutting - machine

woody brush cutting - hand

woody brush spraying - See Example Task Method Breakdown #1

woody brush chemical
treatment - other

noxious weed spraying

noxious weed chemical
treatment -other

grass cutting - machine

grass cutting - hand

grass growth control - chemical

pole treatment

liaison with property owners

impingement axis

Impact - Total Environment
(to be elaborated)

Tasks

public relations

special problem identification

applied research and development

- material
- equipment
- techniques

impingement axis

Function and Impingement Analysis

Element - DISTRIBUTION

Function - Environmental Maintenance

Mode - WOOD POLE/RIGHTS-OF-WAY

Impact on Total Environment
(to be elaborated)

Task

extension line clearing

danger tree determination and
removal

tree trimming or removal

road crossing pruning

tree replacement

pole testing and treatment

joint use liaison highways/telephone

insulator washing

rubbish collection and disposal

fence and gate construction
and repair

selective cutting maintenance

stump removal

chipping

scarifying

erosion control

seeding

chemical brush control - See Example Task Method Breakdown #1

impingement axis

Impact on Total Environment
(to be elaborated)

Tasks

mechanical brush control

chemical weed control

grass cutting

close liaison with property
owners

problem identification

applied research and development

- material
- equipment
- techniques

impingement axis

Function and Impingement Analysis

Element - DISTRIBUTION or TRANSMISSION

Function - Environmental Maintenance

Mode - SUB-STATIONS

Impact - Total Environment
(to be elaborated)

Tasks

general housekeeping

rubbish collection & removal

fence repair

fence grounding

station appearance painting

security light placement
and maintenance

noise control

drain/culvert cleaning

ditchbank maintenance

erosion control

snow removal

grass seeding

grass sodding

turf renovation

ground cover planting/replacement

shrub planting/replacement

tree planting/replacement

impingement axis

Impact - Total Environment
(to be elaborated)

Tasks

hedge cutting
tree trimming
tree thinning
tree removal
flower planting
flower tending
watering
fertilizing
insect control
disease control
grass cutting
weed control general
 grass
 gravel - See Example Task Method Breakdown #2

impingement axis

EXAMPLE-TASK METHOD BREAKDOWN #1

Task - undesirable brush growth control

Location - transmission rights-of-way

Method - selective herbicides

- Herbicide categories -

selective growth regulation non-selective

Task requires - selective woody growth control = Selective Herbicide

Technique used -

dictated by: environmental consideration, safety, public pressure, aesthetics, crop proximity, time of year, density, % and height of undesirable vegetation, accessibility and topography, equipment availability and operator skill, experience, cost

Dormant

Stem Foliage

Pellet

Specific chemical choice -

dictated by: weed species, label recommendations, Provincial recommendations, cost, packaging, toxicity, climate, applicator training, equipment available, chemical characteristics, past research and experience

Type -

dictated by: formulation, active ingredient %, need for additives or carrier, odor, effect of temperature, efficacy, resistance, solubility, experience active ingredient %, size, type of carrier, shape

Rate -

dictated by: label recommendations, Provincial recommendations, own research and experience, cost, density of undesirable species, % of resistant species, % control desired

Application technique used -

dictated by: weed density, size of area, topography, line protection priority, equipment and operator skill

Spot

broadcast or spot

broadcast or spot

Application method -
dictated by: weed density,
availability of equipment,
operator skill, the preceding
criteria

broadcast

broadcast

hydraulic sprayer,
mist blower,
knapsack sprayer

air or ground
thickened hydraulic
or sprayer
microfoil invert
boom emulsion
sprayer

air or ground
centrifical mechanical or hand
venturi centrifical throw
bar spreader
mist blower

spot

spot

mechanical or hand
mist blower backpack
dribble bar
hand sprayer

mechanical or hand
mist blower shaker
measure

EXAMPLE-TASK METHOD BREAKDOWN #2

Task - undesirable plant growth control
Location - substation yard
Method - total growth control herbicides (assuming evaluation of alternatives)

Herbicide categories

selective	growth regulators	nonselective short/long term
-----------	-------------------	---------------------------------

Task requires - total growth control = Non-Selective long term

Specific chemical choice -

dictated by: soil type, weed species, cost, packaging, desired length of control, surrounding vegetation, climate, label recommendations, Provincial recommendations, toxicity, applicator training, characteristics e.g. non corrosive

Form -

dictated by: weed density, equipment available, size of area, safety, applicator training, cost chemical characteristics, type of locations, e.g. topography, solubility, resistance

Forms - Liquid	Pellet	Granular
<u>Type</u> - formulation, active ingredient %, need for additives or carrier	active ingredient % size, type of carrier, shape	active ingredient % coarseness of powder

Rate -

dictated by: label recommendations, Provincial recommendations, cost, length of control desired, weed species and density, soil type, geographical location

liquid	pellet	granular
broadcast or spot	broadcast or spot	broadcast or spot

Technique used -

dictated by: weed density, equipment
operator skill, chemical choice, rate

Application method -

dictated by: availability of equipment,
weed density, operator skill, cost,
chemical, rate, form

mechanical or hand	mechanical or hand	mechanical
hydraulic sprayer mist blower	knapsack sprayer garden dribble bar	Cyclone spreader fertilizer bar
		hand cyclone spreader shaker fertilizer bar

no decision has yet been made on
when to do the job!

amount of growth
safety margin
availability of staff and materials
statutory compliance
public pressure and aesthetics
fire hazard
weather
experience
etc. etc.

EXAMPLE-Task Method Breakdown #3

Task - danger tree removal
Location - Rights-of-Way
Method - as determined by judgement

Intensity -
dictated by: line priority, line type, surrounding
vegetation species, soil type, response, aspect,
rainfall, growth rates, established procedures

Technique -
dictated by - public acceptance, silvicultural,
characteristics of tree species, branching habit,
breakup etc., cost, line priority, time of year,
fire hazard

Types -

Chemical

frill and treat
chemical axe
tree injection

Mechanical

frill
rope and fell
pushover
top and fell
top and leave
girdle

BRIEFING PAPERS
VEGETATION MANAGEMENT IN UTILITY OPERATIONS

" OUTLINES"

VEGETATION MANAGEMENT IN UTILITY OPERATIONS

Statement of the Problem

Scale of the Problem

Trends of the Problem

Philosophies and Methodologies of Problem Management

Administrative Requirements for Problem

Specific Recommendations and Implementation

Research Needs

B.C. HYDRO AND POWER AUTHORITY

ELECTRICAL OPERATIONS GROUP

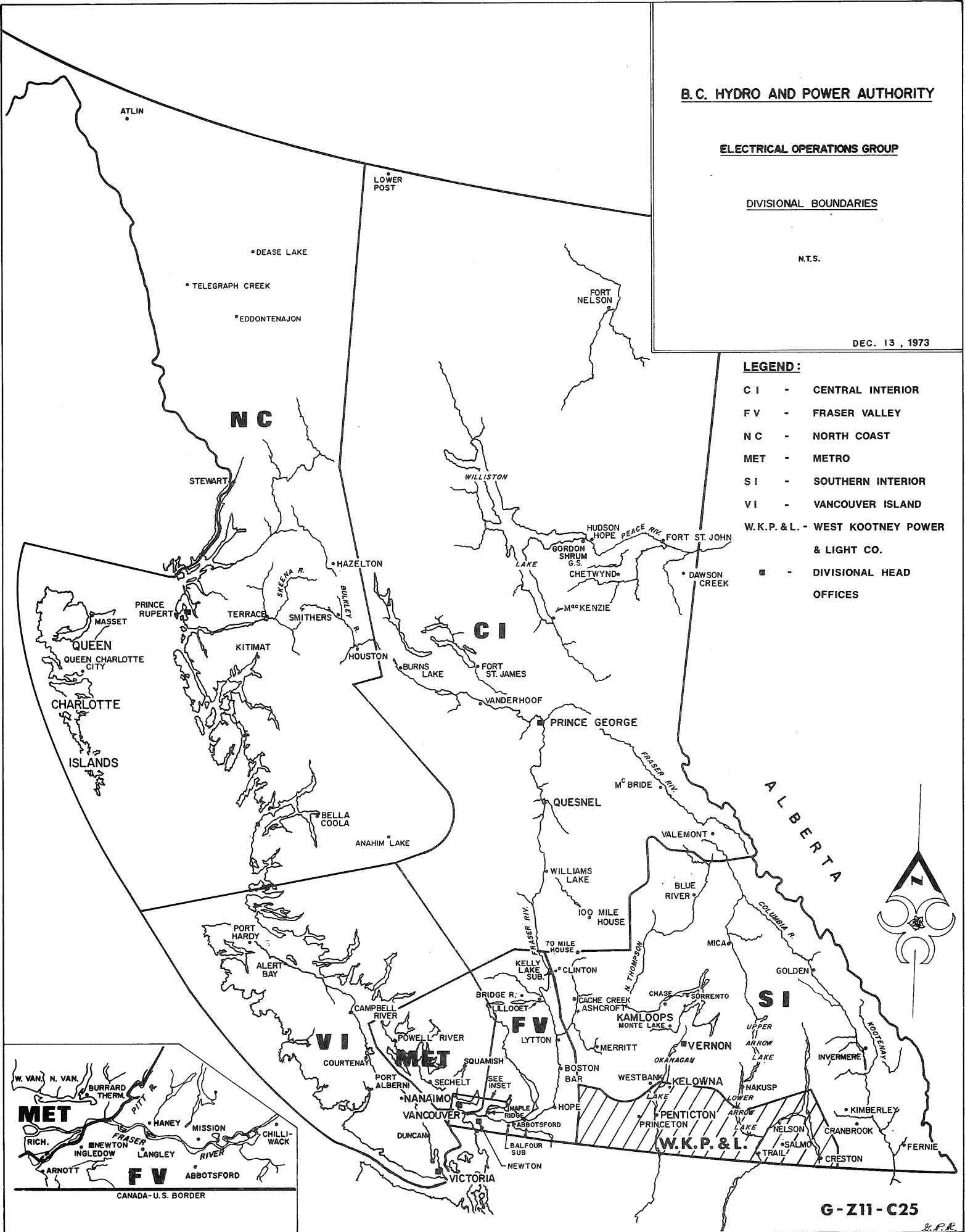
DIVISIONAL BOUNDARIES

N.T.S.

DEC. 13, 1973

LEGEND:

- CI - CENTRAL INTERIOR
- FV - FRASER VALLEY
- NC - NORTH COAST
- MET - METRO
- SI - SOUTHERN INTERIOR
- VI - VANCOUVER ISLAND
- W.K.P. & L. - WEST KOOTNEY POWER & LIGHT CO.
- - DIVISIONAL HEAD OFFICES



STATEMENT OF PROBLEM

Vegetation Management by the Prescription Maintenance Method in Utility Operations

Definition of Vegetation Management

The application of most efficient, safe method to the variety of problems encountered in establishment, maintenance, control, or disposal of plant material.

Definition of Prescription Maintenance

The choice of maintenance techniques best suited to a particular problem after examination of all influencing factors.

Factors Influencing Problem

1. Corporate Goal of Environmental Responsibility
2. Policy of increased attention to Aesthetics
3. Increasing Work Load and Land Holdings
4. Specialization and Expansion of Problem (New Tasks and Task Methods)
5. Increasing Costs
6. Possible reduction in Line Security and subsequent interruption/loss of revenue
7. Growing Public Awareness and Public Relations (complaints)
8. Government Regulation (New Planning Act New Federal Statutes)
9. Government Criticism (Fish and Wildlife)
10. Reorganization and Regionalization (Unclear responsibilities)
11. Increasingly Sophisticated Equipment (Training & Safety)
12. Public Works Fair Employment Act (Equivalent wages internal/external)
13. Administrative complexity
14. New Transmission Clearing Standards (Trees at road crossings, selective clearing)
15. External changes in problem management (Highways not Spraying)
16. Increasing number of Contractors and need for policing

SCALE OF THE PROBLEM

Present Time

ELECTRIC UTILITY:

Buildings	122
Joint Use Buildings	27
Substation Switchyard & Rectifier Stations (Ranging from 1/4 acre to 35 acres)	450

Total Transmission 7,615 miles = 110,000 acres

Total Distribution 19,179 miles = 46,030 acres

Mini Pads on Hydro Property

Generating Stations

Hydro Plants	28
Gas Turbine Plants	2
Conventional Thermal Plants	1
Diesel Plants	23
Mobile Diesel or small Gas Turbines	40

Land

Land holdings other than operational	5,000
Land Interests	30,000

TRANSPORTATION:

Railway

Buildings		5
Miscellaneous Structures		2
Yards (Chilliwack and New Westminster)		2
Miles of Main Track	- Ballast Area) - Right-of-Way Area)	103 miles
Miles of Siding and Yards		80

Bus Division

Buildings	Oakridge Kensington North Vancouver	3
Bus Loops		18
Bus Shelters		UNKNOWN

GAS:

Buildings		2
Regulator Stations		41
Pipe Lines	12 inches	25 miles
	18 inches	37 miles
	20 inches	17 miles
	24 inches	12 miles
	30 inches	35 miles
	36 inches	0 miles
	42 inches	0 miles
	48 inches	0 miles

TRENDS OF THE PROBLEM

Future Time

Additions 10 Years

ELECTRIC UTILITY:

Buildings

31

Joint Use Buildings

Substation Switchyard & Rectifier Stations

25 major in 10 years

Total Transmission 4,200 miles = 90,000 acres

Total Distribution 10,000 miles = 24,000 acres

Generating Stations

Hydro Plants

8

Gas Turbine Plants

Conventional Thermal Plants

1 (perhaps 2)

Diesel Plants

UNKNOWN dependant on
government RE policy

Mobile Diesel or small Gas Turbines

UNKNOWN dependent on
government RE policy

Land

Land holdings other than operational

Land Interests

UNKNOWN

TRANSPORTATION:

Railway

Buildings	5
Miscellaneous Structures	1
Yards	0
Miles of Main Track	UNKNOWN
Miles of Siding and Yards	40

Bus Division

Buildings	3 in 18 months
Understudy	- North Vancouver and Cambie Replacement Within 2 years - Carrall Street Replacement
Bus Loops	2 major

GAS:

Buildings		1
Regulator Stations		9
Pipe Lines	12 inches	0 miles
	18 inches	- 19 miles
	20 inches	0 miles
	24 inches	6 miles
	30 inches	0 miles
	36 inches	8 miles
	42 inches	15 miles
	48 inches	18 miles

ELECTRICAL OPERATIONS GROUP

ANALYSIS OF DISTRIBUTION & TRANSMISSION RIGHT OF WAY VEGETATION MANAGEMENT COSTS

<u>Distribution</u>		<u>1968/69</u>	<u>1969/70</u>	<u>1970/71</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>
Metropolitan Division	- R-of-W Costs	\$132,221	\$247,582	\$195,407	\$239,941	\$226,040	\$303,536
	Pole Line Miles	2,718	2,365	2,435	2,450	2,465	2,489
Fraser Valley Division	- R-of-W Costs	\$ 95,667	\$145,274	\$110,508	\$177,441	\$191,052	\$257,256
	Pole Line Miles	2,186	2,356	2,435	2,426	2,520	2,382
Central Interior Division	- R-of-W Costs	\$ 65,947	\$ 71,978	\$ 46,141	\$ 74,088	\$ 68,570	\$124,650
	Pole Line Miles	3,433	3,643	4,047	4,410	5,057	4,987
North Coast Division	- R-of-W Costs	Not	\$ 16,502	\$ 18,211	\$ 10,299	\$ 3,546	\$ 59,710
	Pole Line Miles	Available	296	339	268	402	915
South Interior Division	- R-of-W Costs	\$ 53,299	\$ 63,748	\$ 67,325	\$ 69,521	\$ 64,700	\$ 88,326
	Pole Line Miles	2,705	3,008	3,035	3,632	3,801	4,206
Vancouver Island Division	- R-of-W Costs	\$208,225	\$211,809	\$242,952	\$300,677	\$311,583	\$381,024
	Pole Line Miles	2,887	3,066	3,277*	3,209	3,290	3,402
Total Distribution	- R-of-W Costs	\$555,378	\$756,866	\$731,923	\$871,908	\$865,491	\$1,214,502
	Pole Line Miles	13,930	14,734	16,666	16,395	17,536	18,381
	Cost/PL Mile	\$ 39.90	\$ 51.40	\$ 43.90	\$ 53.20	\$ 49.40	\$ 66.10
<u>Transmission</u>							
Metropolitan & Fraser Valley Divisions Combined	- R-of-W Costs		\$314,031	\$313,500	\$246,300	\$332,400*	\$496,100
	Circuit Miles		1,930	2,141	2,125	2,004	2,171
South Interior Division	- R-of-W Costs		\$143,593	\$128,345	\$108,995	\$118,334	\$ 79,353
	Circuit Miles		1,404	1,410	1,609	1,667	1,666
Vancouver Island Division	- R-of-W Costs		\$107,559	\$ 80,833	\$ 87,000*	\$ 95,000*	\$102,650
	Circuit Miles		860	966	997	1,036	1,036
Central Interior Division	- R-of-W Costs		\$174,027	\$288,806	\$386,968	\$416,270	\$469,637
	Circuit Miles		2,409	2,499	2,653	2,741	2,678
Total Transmission	- R-of-W Costs		\$739,210	\$811,484	\$829,263	\$962,004	\$1,147,740
	Circuit Miles		6,603	7,016	7,384	7,448	7,551
	Cost/Circuit Mile		\$ 112.00	\$ 115.70	\$ 112.30	\$ 129.20	\$ 152.00

* Estimates only

- NOTES: 1. The South Interior transmission costs for 1969/70 do not include the Kamloops Sub Area transmission costs because they were then included in the Fraser Valley Region costs.
2. The Peace River Transmission costs in the Central Interior Area were estimated for the last four years - 1970/71 to 1973/74.

PHILOSOPHIES AND METHODOLOGIES OF PROBLEM MANAGEMENT

Definition of Corporate Goals

Definition of Corporate Policy

Are the Dynamics of the Problem changing so as to require review

Does Present Organization function in a planned and co-ordinated manner

How clear are the elements of Capacity and Productivity when related to Problem Dimension

Are Future Trends identifiable

Is the Work Force adequate

How should Corporate Policy be translated into fact in the field

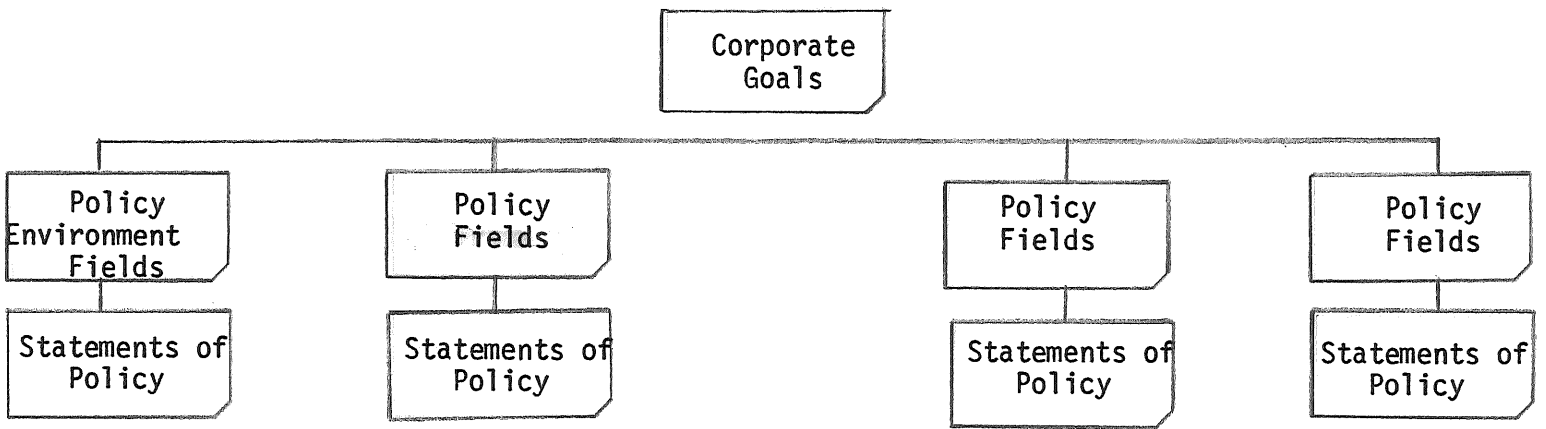
Should the Problem be dealt with Internally, Externally or a Combination of both

How is the General Policy of Regionalization translated into workable arrangements

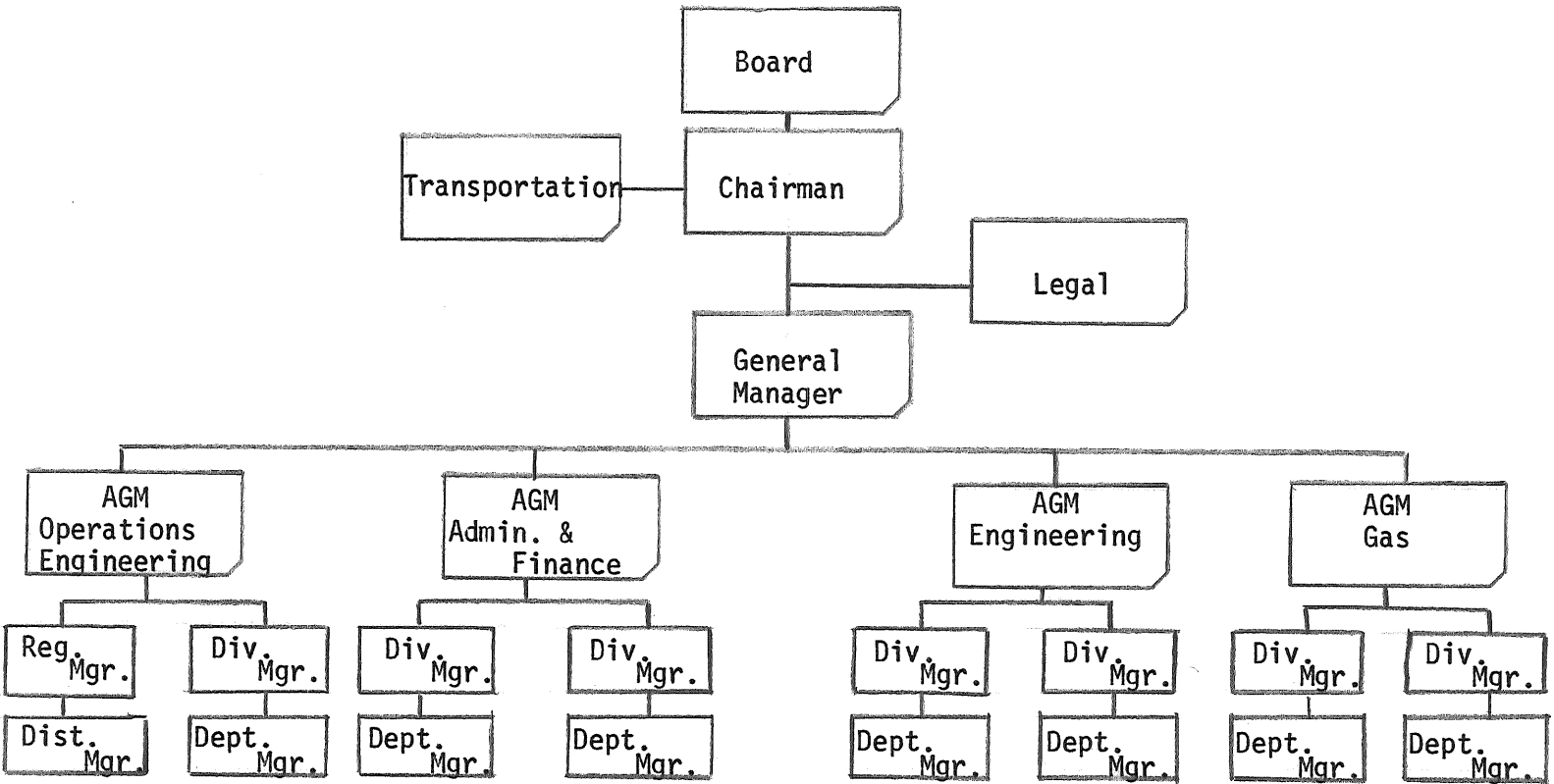
Are the Methods of Problem Analysis adequate

Are the Recommendations appropriate and adequate

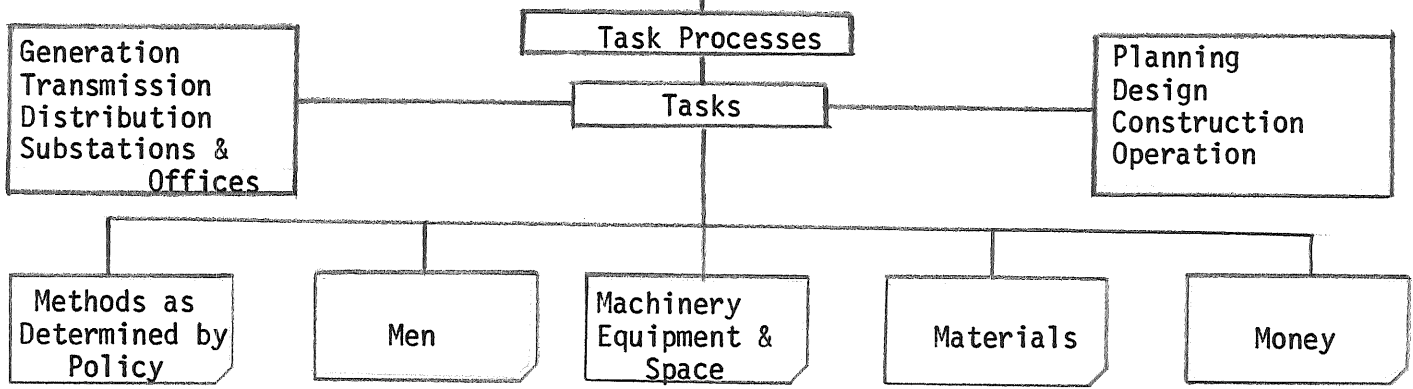
What are the Next Steps and in what Time Frame



Corporate Structure



Responsibilities Required to Carry Out Corporate Goals



Expenditures on Aesthetics

It appears that there is some doubt in the organization as to whether we are expected to pay serious consideration to the aesthetic aspects of our works and structures.

This will let you know that we must be responsible for the appearance of all our works and operations and should take all reasonable steps to ensure that both the design of new facilities and maintenance of existing ones are creditable to us. This does not mean that we can disregard budget constraints in these matters but it does mean that we reject the least-possible-cost philosophy if it means ugliness, and that we should seek to give pleasure and avoid giving offence to the average citizen looking at our works.

When we start working on a formal compilation of objectives and policies, it may be possible to define this particular policy in more specific terms. In the meantime, I hope that this memorandum will enable you and your colleagues to proceed on a freer basis than before.

SUGGESTED

CENTRALIZED FUNCTIONS IN A REGIONALIZED MAINTENANCE PROGRAM

Corporate Objectives

Corporate Policy

Corporate Financial Control

Long-range Planning and Strategy

Assignment of Responsibilities and Accountability

Initiation and Update of Standards and Guidelines

Principal Government Liaison

Supply of Specialty Expertise on a Consulting Basis

Personnel Planning and Training

Arbitration, Mediation and Negotiations, Region and Staff

Interdepartmental Co-ordination

Purchasing and Supply

Research and Development

Principal Accounting and Record Keeping

CONTRACT WORK COMPARISON

Advantages

1. Nil capital investment
2. Few union problems (direct)
3. Low Overhead - Nil benefits holidays (direct)
4. Higher Productivity
5. Fewer administrative hours
6. Structure already set up.
7. Team work
8. Versatility

Disadvantages

1. Dependency
2. Unregulated availability (general and emergency)
3. Loss of flexibility
4. Extras increasing "real" cost
5. Rising costs
6. Price fixing or lack of competition
7. Contracts time (individual jobs)
8. Policing required
9. Quality of training inferior
10. Unsafe practices
11. Insurance (responsibility and liability)
12. Failure to fulfil contractual requirements
13. Nil Public Relations benefits or feedback

SYNOPSIS OF UTILITY VEGETATION MANAGEMENT

Problem Definition and Approaches

Transmission Lines

City and Urban Areas Few problems of plant growth

Underground - some problems with encroachment of roots.

Overhead

- multiple use - car parks
- shoppings centres
- playgrounds
- golf courses
- parks, etc.

Little maintenance required but danger from contacting wires and induction into fences. Plant material will reduce static charges.

- some weed control on open ground against noxious weeds (ragweed, thistles, etc.) grass cutting on some areas.

Agricultural Land Few vegetation problems except hedgerow trees

- farm concern dependent on tower design - lattice-type towers take ground out of production and guyed towers give problems of maneuverability for farm equipment.
- initial clearing standard will dictate suitability for agricultural use on rights-of-way.

Forest Land Rights-of-way through forested ground present problem of suppressing woody growth which would reach the conductors.

Alternative Methods

- groom and seed
- treat reinfestation of woody plants with chemicals or control by mechanical cutting
- selective clearing leaving low growing shrub understory to choke out woody plants. Requires closely controlled maintenance and spot control of woody growth
- selective right-of-way spraying on sparse brush with ground spray of selective herbicide
- aerial application to dense stands of brush or on rough topography with selective herbicides.
- wildlife frequency enhanced by not spraying to edge of right-of-way. Browsing and grazing will reduce re-growth.
- danger tree removal from edges of right-of-way should depend on line priority (voltage, security and customers need) required.

Distribution Lines

May be multi-voltage, single voltage and possibly joint use with telephones and telegraph.

City

- some problems from roadside trees belonging to the city or private landowners.
- park trees and trees on derelict land which may also support brush growth.

Urban

- similar problems plus specimen trees in private gardens and streambank trees.
- those categories above plus trees close to household services require tree trimming.
- possibility of tree removal or replacement with small growing trees and distribution undergrounding of some voltages in some areas.
- also taller poles and stand-off insulators are alternatives.

Rural

- many are along roadside in road allowance which grows brush under the line.
- requires hand or chemical treatment.
- in wooded areas added problem of weak danger trees plus tree trimming categories from first two groups.
- alternatives as before plus use of agriculture ground and judicious routing.

Substations

City

- enclosed SF6, smaller stations in future
- underground or open stations usually integrated with area using residential landscaping effect.
- lawns to maintain.
- annual flowers, shrubs and tree require maintenance.

Urban

- often larger stations
- exposed buswork requires perimeter landscaping for appearance, dust, and noise control.
- problems as before plus treatment of switchyard with soil sterilant for total growth control in interest of safety.

Rural

- often wrongly sited near roads with no opportunity for landscaping
- should, if possible, be sited in low lying or easily screened areas or woods which will be maintained in perpetuity
- may require some landscaping and as before total growth control in switchyards.
- those sited in agriculture ground are often best left stark rather than drawing attention to them with plant material
- good housekeeping here essential

Administration and Operational Facilities

City Public pressure to integrate appearance of facility with appearance of local community either commercial or residential.

- new buildings of advanced design may contain plant material within the structure.
- lawn maintenance necessary, annual flowers, perennial shrubs and trees requiring maintenance.
- total weed control in storage areas on gravel paths around buildings and fences.

Urban Often larger facilities may be less decorative but encompass greater area of ground requiring maintenance of the above noted items.

- new buildings of advanced design may contain plant material within the structure.

Rural

- often on the outskirts of rural communities and suffer from inappropriate siting and poor housekeeping.
- may require simplified design but consistent attention to maintaining standards of appearances.
- often weed control both total and selected in grass plus grass cutting makes up bulk of work

Miscellaneous Vegetation Control

Resource Management

- private property owned by B. C. Hydro and supporting plant material (sometimes to screen facilities) requires fire control plan and forest management plan.
- property held for future development or purchased along with other acquisition and not sold requires general maintenance for appearance and weed control under the Weed Control Act.

Vegetation Control Around Generation Facilities

- control of plant growth around generators, dams, equipment yards, access roads, drains, culverts, dykes and like areas.

Habitat Management

- manipulation of vegetation to mitigate the effects of generation facilities and enhance wildlife or gamebirds on rights-of-way.

Tree Protection

- protection of trees on new construction sites for retention in eventual landscape plan and large tree moving around old or new facilities.

SYNOPSIS OF OPERATIONAL REQUIREMENTS

Appropriate Corporate Policy

Work Load and Equipment Inventory

Staff

Updated Standards and Guidelines

Training Manuals

Appropriate Research Projects

List of Approved Chemicals

Data Collection and Analysis System

Right-of-Way Management Profiles

Individual Property Profiles

Appropriate Tendering Specifications

List of Approved Contractors

SYNOPSIS OF RECOMMENDATIONS

1. That environmental maintenance be regarded as a coordinated internal function throughout the system.
2. A resource capability to be termed the Environmental Maintenance Group be created within Electrical Operations, Vancouver.
3. A Divisional Environmental Superintendent post be made in each regional division reporting to the Manager, System Operations and Maintenance in a broad staff capacity.
4. Area Supervisors or, in some cases, Superintendents, Environmental Maintenance, be appointed at locations determined by workload, existing framework, and geography, with the specific responsibility of overseeing the environmental maintenance teams in the regional divisions.
5. The existing resources of equipment and manpower in Production and Distribution be combined to form a nucleus of field teams capable of executing the work identified in the task analysis. Where no such manpower exists new staffing must be contemplated.
6. The most able General Tradesmen be screened for suitability as permanent team sub-foremen in the environmental maintenance teams.
7. Consideration be given to a tradesman job category, other than General Tradesmen, for the environmental maintenance field teams.
8. Training programs be instituted to upgrade the general standard of work and a progression framework be established within the trades category allowing for advancement at stages commensurate with skill (apprenticeship).
9. Careful evaluation of general policy, system work loads, equipment availability, staffing requirements and Divisional Manager inputs be made before any concrete steps are taken on implementation.
10. That an intensive review of system growth, goals, policy, and maintenance alternatives, costs, group flexibility, creativity, and future public and statutory demand trends, form part of a long term planning study for environmental maintenance.

Synopsis of Staff Requirements and Functions
Environmental Maintenance Group

Head Office Staff

Manager - Environmental Maintenance Department
Statutory Compliance Superintendent
Land and Resources Management Superintendent
Vegetation Management Superintendent
Training Co-Ordinator - Environmental Maintenance
Landscape Architect - Environmental Maintenance

Regional Staff

Divisional Environmental Superintendent

Area Staff

Area Environmental Maintenance Superintendent
Crew Foreman - Environmental Maintenance
Tradesmen - Environmental Maintenance

The suggested job groupings on the following pages are generally based on existing similar job descriptions and are intended as a relative guide only. To attract suitably qualified people with relevant experience it may be necessary to move away from the common practice of relating job group to supervisory responsibilities.

SYNOPSIS OF RESEARCH PROPOSALS

Growth in plants - an ecological study on post-clearing biomass accumulation and successional patterning.

Growth in plants - an examination of tree species with a compact crown at maturity.

Growth control in plants - a comparative evaluation of total growth control chemicals for use on stoned areas.

Growth control in Trees - an examination of techniques and chemicals suitable for control of undesirable growth close to distribution lines.

Growth control in plants - an assessment of the efficacy potential for enhancement, selectivity, migration and degradation of various herbicides.

Growth control in woody plants - an assessment of the productivity of various sites and suitability of various species for multiple use of rights-of-way.

Growth control in plants - a comparative study of selective herbicides for use in landscape areas.

Growth control in plants - a comparison of lawn grass species most suited to industrial grounds.

Growth control in plants - a comparison of plant species and seeding methods for right-of-way enhancement, restoration or maintenance.

Growth in Trees - an examination of danger trees, their stability and control.

SYNOPSIS OF REASEARCH PROPOSALS

Growth in Trees - an examination of danger trees, their stability and control.

Growth in Trees - an examination of tree species with a compact crown at maturity.

Growth in Plants - an ecological study on post-clearing biomass accumulative and successional patterns.

Growth in Plants - a comparison of plant species and seeding methods for right-of-way enhancement, restoration or maintenance.

Growth Control in Trees - an examination of techniques and chemicals suitable for control of undesirable growth close to distribution lines.

Growth Control in Woody Plants - an assessment of the productivity of various sites and suitability of various species for multiple use of rights-of-way.

Growth Control in Plants - a comparison of lawn grass species most suited to industrial grounds.

Growth Control in Plants - an assessment of the efficacy potential for enhancement, selectivity, migration and degradation of various herbicides.

Growth Control in Plants - a comparative evaluation of total growth control chemicals for use on stoned areas.

Growth Control in Plants - a comparative study of selective herbicides for use in landscape areas.

Applied Research Proposal # 1

Vegetation Management

Project Title - Growth in plants - an ecological study on post-clearing biomass accumulative and successional patterning.

Originator - Research Proposal Sub-Committee

Date of Initiation - Proposal

- Research

Date of Completion - Research

- Final Report of Recommendations

Administrative and
Technical Responsibilities

Costs

Location - U.B.C. Research Forest, Haney
Possibly other climatic locations

- Objectives -
1. To identify species, growth forms, growth rates in subsequent growing seasons to initial clearing.
 2. To follow biomass accumulative of undesirable plant species and manipulate regeneration by mechanical or herbicidal methods.
 3. Examine competing forms of vegetative cover in order to predict natural suppression of undesirable woody plants.
 4. Relate natural succession patterns to recommendations for scarification and artificial seeding of grass species, legumes and low growing shrubs.
 5. Prepare recommendations as to clearing techniques and subsequent maintenance practices for inclusion in a Vegetation Management Manual.

Rationale # 1

B. C. Hydro maintains some 110,000 acres of major right-of-way of which the larger proportion may support undesirable plant growth. Control is presently performed with the use of herbicides, some mechanical cutting or by grazing. The theoretical understanding but not the practical experience exists for manipulating successional patterns of plant growth in such a way as to reduce natural regeneration of undesirable woody species. Moreover, the considerable cost presently expended on scarification is predicted on a reduced cost per year over the maintenance cycles through suppression of tree species by contact seeding of grass and legumes. No studies have been completed which determine the most appropriate seeding species for use on rights-of-way in the province.

The Fish and Wildlife Branch of B. C. has chastised this Authority for giving insufficient emphasis to the concept of multiple land use for wildlife enhancement by providing "edge effect" or low growing browse.

The above noted objectives, in a properly designed experiment, would serve to provide data for judging the present cost unknown biological alternatives and answering external criticism.

Applied Research Proposal # 2

Vegetation Management

Project title - Growth in plants - an examination of tree species with a compact crown at maturity.

Originator - Research Proposal Sub-Committee

Date of Initiation - Proposal - 5 May 1974

- Research

Date of Completion - Research

- Final Report of Recommendations

Administrative and
Technical Responsibilities

Costs

Location - Metro Vancouver and
U.B.C. Research Forest, Haney
Possibly other climatic locations

- Objectives -
1. To assess, on various soil types, the survival, annual growth, hardiness, health, vigor and final size at maturity of various species of conifer and deciduous trees suitable for establishment in close proximity to electrical apparatus or distribution lines.
 2. To determine the silvicultural techniques necessary to ensure health and aesthetic appeal of such species at various micro-climatical locations.
 3. To provide a demonstration area suitable for nurserymen, Parks departments, our own staff and members of the general public to examine in-situ the techniques and species most suited to trouble-free use of trees close to electrical facilities.
 4. To compile from the data collected, recommendations as to the suitability of various species for use by municipalities, industry and individual homeowners for planting on property adjacent to or below electrical facilities. Further, to compile a booklet outlining this information in graphic or written form.

Rationale # 2

The Authority maintains some 17,500 miles of distribution lines. This system services some 815 communities in B. C. Some street, boulevard, park, and garden trees endanger security of the system and the safety of the general public if allowed to grow unchecked. Considerable time, equipment and expertise are needed to regulate this problem, much of which is directly related to planting of inappropriate tree species by others. A widely practiced method of containing this problem where undergrounding is not planned is the gradual replacement of undesirable tree species with slow growing compact "compatible" trees.

This basic solution to the root of this problem can, with adequate data, be compiled in an attractive format for distribution to municipalities, garden supply outlets, and the public at large. A practical demonstration area can be established at little cost where ongoing tests of appropriate species may be conducted to evaluate suitability for planting in close proximity overhead or underground conductors.

Applied Research Proposal # 4

Vegetation Management

Project Title - Growth control in Trees - an examination of techniques and chemicals suitable for control of undesirable growth close to distribution lines.

Originator - Research Proposal Sub-Committee

Date of Initiation - Proposal - 5 May 1974

- Research

Date of Completion - Research

- Final Report of Recommendations

Administrative and
Technical Responsibilities

Costs

Location -- U.B.C. Research Forest, Haney
Possibly other climatic locations

- Objectives -
1. To determine if various tree trimming techniques, time of year or chemicals may suppress the growth of adventitious or dormant buds after pruning of fast growing woody plants.
 2. To determine if techniques of injection, soil impregnation or crown spraying could be more effective in prolonging trimming cycles on various tree species than mechanical trimming.
 3. To provide recommendations for adoption of various methods in a Vegetation Management Manual or addition of chemicals to an Approved List of Pesticides for use by the Authority.

Rationale # 4

Chemicals used to manage the growth of plant material fall into 3 major categories:

1. selective herbicides
2. non selective soil sterilants
3. growth regulators.

These latter compounds which mimic or disrupt normal metabolism in growing plants may be used to advantage of the utility arborist. Where many hardwood trees are pruned, the resulting wound produces adventitious and dormant buds which grow to become suckers which in turn require pruning. Some growth regulators will inhibit this growth. The experiment suggests a review of these substances under B. C. conditions.

Applied Research Proposal # 6

Vegetation Management

Project Title - Growth control in woody plants - an assessment of the productivity of various sites and suitability of various species for multiple use of rights-of-way.

Originator - Research Proposal Sub-Committee

Date of Initiation - Proposal - 5 May 1974

- Research

Date of Completion - Research - 1 Oct. 1985 Interim review 1 Oct. 1979

- Final Report of Recommendations - 1 June 1986.

Administrative and
Technical Responsibilities

Costs

Location - U.B.C. Research Forest, Haney
Possibly other climatic locations

- Objectives -
1. To determine if rights-of-way may be used for the production of wood fibre economically and without hazard to the system or staff.
 2. To determine the most appropriate silvicultural techniques to maximize productivity.
 3. To determine the most appropriate harvesting methods for use on rights-of-way.
 4. To examine the economic and silvicultural constraints associated with Christmas Tree farming on rights-of-way.
 5. To prepare recommendations for the management of woody plants as a multiple use resource on rights-of-way.

Rationale # 6

The bludgeoning increase in right-of-way acreage in North America has stirred public concern over appropriate land use in utility corridors. Nature's relentless laws of succession to a climax vegetation of woody plants may be harnessed to the utility manager's benefit. Increasing emphasis on the full utilization of wood fibre may provide an economical climate conducive to hardwood silviculture. The techniques of growing and harvesting timber safely on the linear rights-of-way require further study. Present multiple use of some rights-of-way includes the growing of Christmas Trees. A review of this marginal practical and the adoption of more sophisticated techniques may enhance this land use.

Applied Research Proposal # 8

Vegetation Management

Project Title - Growth control in plants - a comparison of lawn grass species most suited to industrial grounds.

Originator - Research Proposal Sub-Committee

Date of Initiation - Proposal - 5 May 1974

- Research

Date of Completion - Research - 1 Oct. 1978 - review & possible continuation
1 Feb. 1979

- Final Report of Recommendations

Administrative and
Technical Responsibilities

Costs

Location - U.B.C. Research Forest, Haney
Possibly other climatic locations

- Objectives -
1. To compare productivity, health and adaptability of various grass species or mixes of species on three soil types.
 2. To determine the most appropriate maintenance regimes in relation to cost and botanical principles for such grasses.
 3. To determine the efficacy of various growth regulating substances and the factors influencing their use on grass species both to curtail weed growth and suppress grass growth.
 4. To examine the costs associated with establishing various grass combinations in landscape areas and the subsequent costs incurred during maintenance.
 5. To prepare recommendations for incorporation in new Landscape Specifications and adoption on existing high maintenance sites.

Rationale # 8

With the increasing emphasis on the appearance of the facilities, there is a concomitant increase in work load in the summer months. Four to six mowings of grass areas may be necessary to maintain the inherent design appeal of the grounds. Synthetic growth regulators may be used on existing grass areas to suppress leaf blade expansion and seed head development. Savings will accrue from the decreased number of mowings. Some of the more recent slow growing grass species may be suitable for adoption into revised specifications. This proposal suggests examination of these species for use in new works and growth regulators for use on existing grass areas. The latter could be added to the Approved List of Pesticides.

Applied Research Proposal # 9

Vegetation Management

Project Title - Growth control in plants - a comparison of plants species and seeding methods for right-of-way enhancement, restoration or maintenance.

Originator - Research Proposal Sub-Committee

Date of Initiation - Proposal - 5 May 1974

- Research

Date of Completion - Research - 1 Oct. 1978

- Final Report of Recommendations - 1 March 1979

Administrative and
Technical Responsibilities

Costs

Location - U.B.C. Research Forest, Haney
Possibly other climatic locations

- Objectives -
1. To determine the necessity for or degree of ground preparation; appropriate time and method of seeding for various crops and crop combinations on Hydro rights-of-way in relation to soil type and % cover.
 2. To determine if the seeding of grass legumes on low growing shrubs will, by competition, reduce or retard woody plant succession on rights-of-way.
 3. To determine if various crops will curtail or reduce active erosion or consolidate various exposed soil types susceptible to erosion. To determine the effects of such seeding on stream sedimentation in relation to % slope.
 4. To determine if the introduction of various exotic plants species will enhance wildlife, game bird and pollinating insects frequency by providing cover and/or food on the rights-of-way.
 5. To provide quantifiable evidence on which to base future policy and practice in the clearing and maintenance of rights-of-way for incorporation in a Maintenance Practices Manual.

Rationale # 9

B. C. Hydro maintains some 110,000 areas of ground under rights-of-way. The transmission system continues to expand at an ever increasing rate. Initial clearing may vary in cost from \$350.00 dollars per acre for machine clearing to \$3,000.00 dollars for hand clearing. There has been insufficient examination of the justification for spending this added amount for hand clearing on areas which may be rapidly seeded after machine clearing. The ability of such species to provide erosion control would be examined in this study.

In addition, subsequent maintenance cost for vegetation management is largely a function of the initial clearing standard and subsequent regeneration of undesirable woody species. The suppression of undesirable woody plants by a thick bio-mat of grass and shrubs may be possible with the appropriate choice of species. This experiment would study the bio-mass accumulation after clearing.

The Fish and Wildlife Branch of B. C. has been critical of this Authority for doing little to directly enhance rights-of-way for the benefit of wildlife. This experiment suggests examining the silvicultural practice required for the management of brouse potential of the right-of-way and as such is supportive of the study suggested in rationale one.

Applied Research Proposal # 10

Vegetation Management

Project Title - Growth in Trees - an examination of danger trees, their stability and control.

Originator - Research Proposal Sub-Committee

Date of Initiation - Proposal - 5 May 1974

- Research

Date of Completion - Research

- Final Report of Recommendations

Administrative and
Technical Responsibilities

Costs

Location - U.B.C. Research Forest, Haney
Possibly other climatic locations

- Objectives -
1. To examine the post-clearing stability of edge trees in relation to site type, height, climatic factors, species, crown density and % initial danger tree removal.
 2. To examine methods for determining health, growth and stability of danger trees.
 3. To examine methods both mechanical and chemical which may be used throughout the year for control of danger trees in-situ.
 4. To assess the outages throughout the system caused by plant material, establish danger tree removal guidelines dependent on line priority and species composition.

Rationale # 10

With the suggested reduction in back-up capability across the system, greater emphasis must be placed on reducing system hazard from interruptions caused by plant material. Although many lines are cleared to preclude danger tree outages such interruptions do occur. This experiment would attempt to access management criteria for alleviating this problem on both transmission and distribution lines. The information could be incorporated in a Vegetation Management Manual.