URBAN RECLAMATION PLAN FOR THE B.C. SKYTRAIN

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ABSTRACT

The first phase of B.C. Transit's SkyTrain is a 19 kilometer long concrete guideway that shuttles passenger loaded automated trains from Vancouver's waterfront, through Burnaby, to downtown New Westminster, B.C. The SkyTrain is a heavily used system, having a daily passenger use of over 30,000.

Because of it's high visability, both from the SkyTrain and of the guideway from below, reclamation of the disturbed landscape was a high priority. All phases of construction of the pylons, guideway and stations required continuous access for heavy construction equipment. This created a 20 - 30 meter wide swath of disturbed and compacted earth passing through a mix of sensitive urban landscapes. Initial plans for restoration called for a "natural systems" approach to revegetation based on variables such as slope, aspect, soils, surface condition, location, and anticipated management of the final landscape. The result of this phase of reclamation was to be a cost-effective method of successfully revegetating the disturbed SkyTrain corridor. The first stage of hydroseeding was tendered and implemented in the fall of 1984.

In the spring of 1985, the site reclamation package changed to include extensive landscaping plus construction of jogging and cycling pathways. Lead by the Honorable Grace McCarthy, Minister Responsible for SkyTrain, the Provincial Government spearheaded an ambitious campaign in partnership with the Federal Government to obtain private and corporate donations to create the B.C. Parkway. A Master Plan designated a pair of linear pathways that linked the Parkway with existing parks within Vancouver, Burnaby, and New Westminster. Design Guidelines and Standards specified details and conformed to municipal standards for design and construction including clearances, utilities, grading and drainage, path layout, landscape standards, lighting and irrigation. As increased funding for the project became available, the scope of reclamation changed from the hydroseeding and rooted cutting program originally planned to an extensive urban landscape installation. Work began in the spring of 1985. B.C. Parkway was officially opened in July, 1986.

INTRODUCTION

The construction of B.C. Transit's Advanced Light Rapid Transit system, now called SkyTrain, created a 20 - 30 meter wide swath of disturbed and compacted earth 19 kilometers long passing through three municipalities and a series of urban, suburban, industrial, and residential landscapes. Because of its impact upon the cities, and its high visibility, sensitive land reclamation was a high priority.

Limited funding for site restoration required that an economic "Natural Systems" approach to site revegetation was developed. This method was carefully researched and documented for construction. The methods and prescriptions for revegetation will be further described herein.

By the spring of 1985, after 90% of the guideway construction was completed, the Honorable Grace McCarthy, Provincial Minister responsible for Rapid Transit, spearheaded a campaign to use the SkyTrain construction as a springboard for developing a linear park system. Supported by the Federal Government, and a massive campaign to solicit and obtain private and corporate donations, B.C. Parkway was realized. Funding became available to construct the parkway using traditional landscape techniques.

SITE DESCRIPTION

Location

The first phase of The SkyTrain is a nineteen kilometer long link between the waterfront of Vancouver, B.C. with downtown New Westminster, passing through Burnaby, B.C. (Figure 1)

Site Conditions

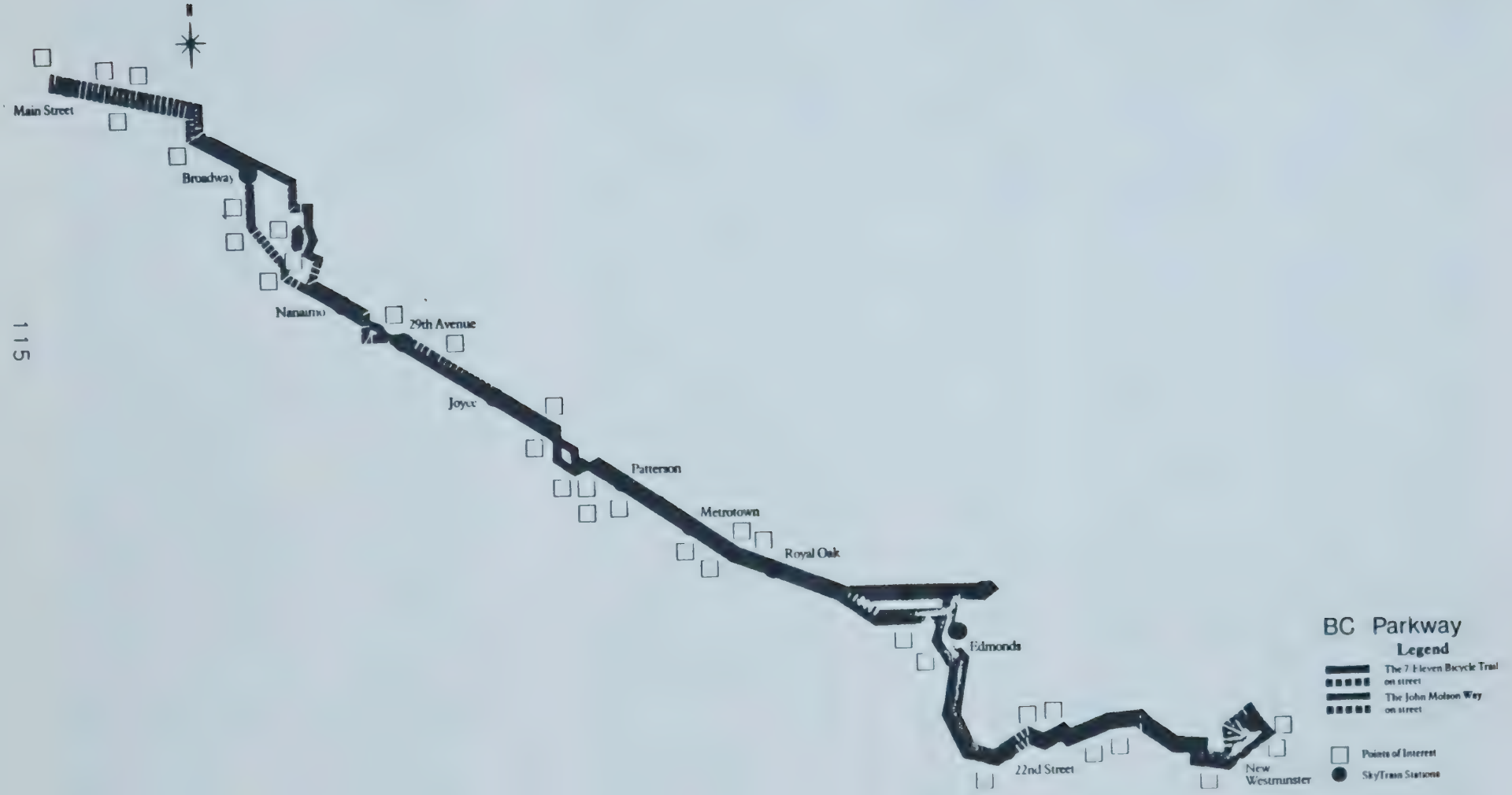
Consultation did not begin until after construction of the guideway was well under way. Construction had resulted in severe disturbance of the vegetation and native soils along the route. The soils along the guideway were not assessed for their suitability as topsoil prior to the commencement of construction. Suitable topsoil materials had generally been mixed with the subsoil, removed from the site or buried. As well, very gravelly sandy subsoil material and dredge sands had been imported and used for foundation and backfill material around the columns.

Soils

The native soils were developed on fine textured glaciomarine and moderately coarse and very coarse textured glacial till and fluvioglacial deposits. The dominant soils were derived from the moderately coarse and very coarse textured glacial deposits.

The remaining surface materials along the guideway were very infertile as a result of the construction activities. The organically enriched surface horizon of a major portion of native soils had been destroyed as a result of removal, burial or mixing

Figure 1


Main Street
Broadway
Nanaimo
29th Avenue
Joyce
Patterson
Metrotown
Royal Oak
Edmonds
22nd Street
New Westminster
BC Parkway
Legend
The 7-Eleven Bicycle Trail on street
The John Molson Way on street
Points of Interest
SkyTrain Stations

with the subsoil. Fill materials and subsoils were then exposed. They had generally less than 2% organic matter as opposed to 10%, an amount more typical of native topsoils. The available soil nitrogen was also very low, averaging 0.04% in comparison to the desirable level of 0.4%. The soils also had low amounts of potassium, phosphorus and magnesium. Generally, the soils were slightly acid (pH 6.1-6.5) and would not require liming with the exception of some areas east of Central Park in Burnaby, which were alkaline having a pH of 7.0-8.8.

The physical properties of the soils had been severely disturbed. The use of heavy equipment had frequently resulted in compaction, deep rutting and loss of soil structure around the columns and along the guideway where it was used as a temporary road during construction of the rail system. As well, excavation had resulted in the exposure of naturally compacted subsoils on cutbanks.

Although there was some variability in the texture, the materials occurring along the guideway could be divided into three major groups: The moderately coarse textured glacial deposits, the very coarse textured glacial deposits and dredge sands brought in as fill.

Slopes

Construction had resulted not only in burial or degradation of the more fertile components of the native soils, but also in the exposure of natural, steep slopes which were sensitive to erosion and which were devoid of vegetation. As well, steep slopes were created and often consisted of material which had a low suitability for plant establishment. Many of the slopes were engineered to a 1 1/2:1 to 2:1 slope and by the time of the study were showing signs of surface erosion. Because a majority of the on-grade guideway was on either a cut or fill situation, on an east-west axis, aspects of the slopes were generally north or south facing.

Vegetation

Much of the natural vegetation had been destroyed during construction. However, there were many areas where remnant native vegetation existed, and would eventually encroach onto low maintenance areas. The common vegetation types included: trailing blackberry, broom, horsetail, alder, salmonberry, salal, and buttercup.

RECLAMATION

The SkyTrain passes through a geography rich with a variety of land uses, ranging from downtown urban centres to outlying parks and forested areas. The natural systems approach to reclamation could not easily address the wide range of cultural, political and financial attitudes towards the landscape, except by altering seed mixes or changing the type of plant material used. However, with the final implementation of the B.C. Parkway, significant and sophisticated landscape designs were installed to

address these items. In outlying areas, away from residential or urban properties, simpler hydroseeding techniques were implemented, especially for slope stabilization and erosion control.

The intent of the natural systems program was to assess the disturbed site with respect to the exposed surface condition, slope, aspect, and future management techniques, and assign a specific site treatment to the site. The three site treatments were:

(1) Surface treatment
   a. scarify surface 5 cm of soil
   b. cultivate upper 15 cm of soil
   c. deep plough upper 30 cm of soil
   d. straw mulching, tacked to the surface

(2) Soil amendment
   a. incorporate 5-7 cm of peat or manure
   b. cover surface with 7+ cm topsoil

(3) Revegetation treatment
   a. hydroseed - mixture contains seed, fertilizer, 500 kg/ha woodfiber mulch
   b. hydroseed - mixture contains seed, fertilizer, 1000 kg/ha woodfiber mulch, soil binder
   c. hydroseed - mixture contains seed, fertilizer, 1500 kg/ha woodfiber mulch
   d. surface cultivation - dry seeding

The resulting Prescriptions for Revegetation which assigned either one or a combination of the three site treatments to a particular site condition were used to prepare a master plan for reclamation for the entire site. Specific site treatments were assigned based upon cost for installation, anticipated success of ground cover, both immediate and long term, and aesthetics, or the look and function of the finished product.

Hydroseeding

In the fall of 1984, the first hydroseeding contract was tendered. The entire guideway route was seeded with the intent being to provide a quick vegetative cover to protect the slopes from the winter rains. The following mix design was implemented:

Seed Mixture A: used for all slopes, industrial sites, and sites where little maintenance would occur.

25 % Orchard Grass	*Dactylis glomerata*
20 % Italian Ryegrass	*Lolium multiflorum*
20 % White Dutch Clover	*Trifolium repens*
10 % Timothy Grass	*Phleum pratense*
10 % Canadian Bluegrass	*Poa compressa*
10 % Creeping Red Fescue	*Festuca rubra*
5 % Lupine	*Lupinus polyphyllus*

Seed Mixture B: used in park settings where regular maintenance

practices would be used, i.e. mowing, watering, and fertilizing.

35 % Canadian Bluegrass	*Poa compressa*
25 % Creeping Red Fescue	*Festuca rubra*
20 % White Dutch Clover	*Trifolium repens*
15 % Italian Ryegrass	*Lolium multiflorum*
5 % Perennial Ryegrass	*Lolium perenne*

Seed Mixture C: used on slopes and sites with high visibility. This red, white, yellow and blue wildflower mix was added to mix A at a 70% of mix A to 30% mix C ratio.

20 % Alaska Daisy	*Chrysanthemum maximum* "Alaska"
20 % Blackeyed Susan	*Coreopsis grandiflora* "Sunburst"
20 % Blue flax	*Linum perenne*
20 % Lupine	*Lupinus polyphyllus*
10 % Iceland poppy	*Papaver nudicaule*
10 % Allegro poppy	*Papaver* "Allegro"

In all cases, seed mix was applied at 140 kg/ha; a 19-19-19 fertilizer having 50% s.c.u. was applied at 215 kg/ha; epsom salts applied at 145 kg/ha; wood cellulose fibre was applied at 1500 kg/ha; an erosion control agent "J-Tac" by Rectamare Company was used at 28 kg/ha on all slopes between 3:1 and 2:1; slopes steeper than 2:1 had an application of Deci 162 by Denca Construction Specialties Ltd. The Deci 162 was also spot applied on specific disturbed areas where the extra soil stabilization benefits were required.

B.C. PARKWAY

B.C. Parkway developed from the desire to do more with the SkyTrain right-of-way than simply restore it to its original conditions. The unique situation of a twenty to thirty meter wide continuous corridor bisecting the Greater Vancouver area from False Creek in Vancouver, to the Fraser River in New Westminster offered a great potential for recreational development.

Twin systems of pedestrian/jogging paths and bicycling trails were planned parallel and adjacent to the SkyTrain, sharing the right-of-way with B.C. Hydro rail tracks, high pressure gas lines, water mains and underground electrical transmission lines. Landscaping was designed to complement these recreational paths, varying in character depending upon surrounding conditions. Urban neighbourhoods dictated a formal and elaborate landscaping treatment while rural or suburban areas needed a more naturalistic response. Varied settings included industrial areas, residential districts, city parks, arterial boulevards, sanitary landfill sites, and forested areas.

Nineteen kilometers of the two paths stretched through three municipalities. To facilitate this development beyond the original two million dollar restoration budget, a Canada Manpower program was set in place to provide labourers for each municipal sector within the Parkway, and engineering supervisory staff was provided by the municipalities to implement designs for the B.C. Parkway. In addition to this federal grant of 1.5 million dollars

for labour, corporate sponsors, private individuals, cultural communities and service groups donated approximately 2 million dollars to provide the total of 5.5 million dollars to complete the project. Major donors were designated on site by signs or plaques and special mention was given to Molsons for donating the funds for the John Molsons' jogging path, and 7-11 for donating funds for the 7-11 bicycle trail.

The construction of paths was based on local municipal standards with layout and design for bicycle trails conforming to B.C. Bicycling Association requests and American Association of State Highway and Transportation Official standards. To define separate functions and discourage bicyclists from using the jogging/pedestrian paths, compacted limestone screenings to a depth of 50 mm were installed over a compacted road base and edged with double, pressure-treated 12 mm x 100 mm wooden edgers. The fine screenings provided a good resilient surface for running and walking. Bicycle trails were constructed of 50 mm hot rolled asphalt 3 meters wide over a compacted road base. Street intersections and special areas were marked with coloured, interlocking pavers and white traffic barrier posts. Signs designate path uses and flag areas of interest or potential hazard.

Standards for landscape restoration varied with the B.C. Parkway context. In general, urban and suburban area's standards required scarification and importation of 75 mm topsoil for lawns and 300 mm for shrub beds. Wilder areas and steep slopes were cleaned, raked and hydroseeded as previously described. Some areas received a mixture of 80% low growing white clover and 20% wild flower seed mix and met with great public acceptance.

Plant materials were generally specified in standard nursery sizes and supplied by local growers. Varieties were selected based on site conditions and microclimate as well as appearance. Trees were selected in both nursery sizes and larger, specimen sizes, and all were supplied locally. Mature trees required heavy equipment as well as extensive labour for installation but provided instant visual impact and greater resistance to vandalism and adverse site conditions.

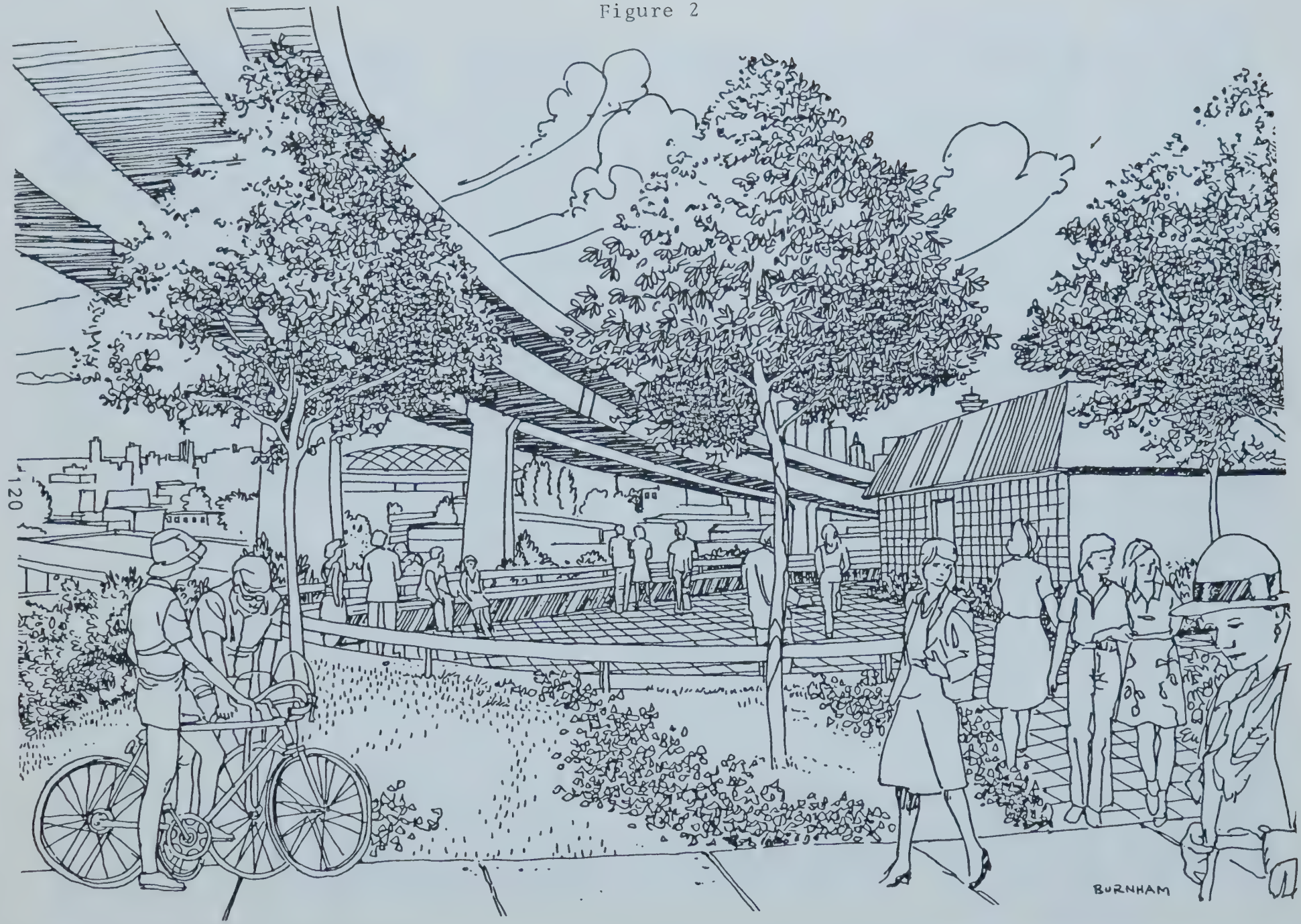
As a finishing touch, over two hundred thousand tulip bulbs were planted in the fall of 1985 to bloom for the spring opening. These were followed by the planting of fifty thousand annuals to provide summer colour and interest in key locations.

The B.C. Parkway Committee, a thirty person board of volunteers representing municipalities and local leaders of industry and commerce, approached sponsors for designated special projects within the context of the B.C. Parkway. As a result, plazas, seating areas, playgrounds, drinking fountains, special planting and other features completed the linear park system (Figure 2).

CONCLUSION

The evolution of the B.C. SkyTrain corridor from a simply restored right-of-way to a linear park complete with jogging and

Figure 2



cycling paths, special features and landscaping has fulfilled the potential for a successful urban reclamation project. By using the informed direction of consultants, the resultant B.C. Parkway is a celebration of what community efforts can achieve.

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LAND REHABILITATION:
Policy, Planning Systems and Operational Programs

June 3 - 6, 1986

University of British Columbia
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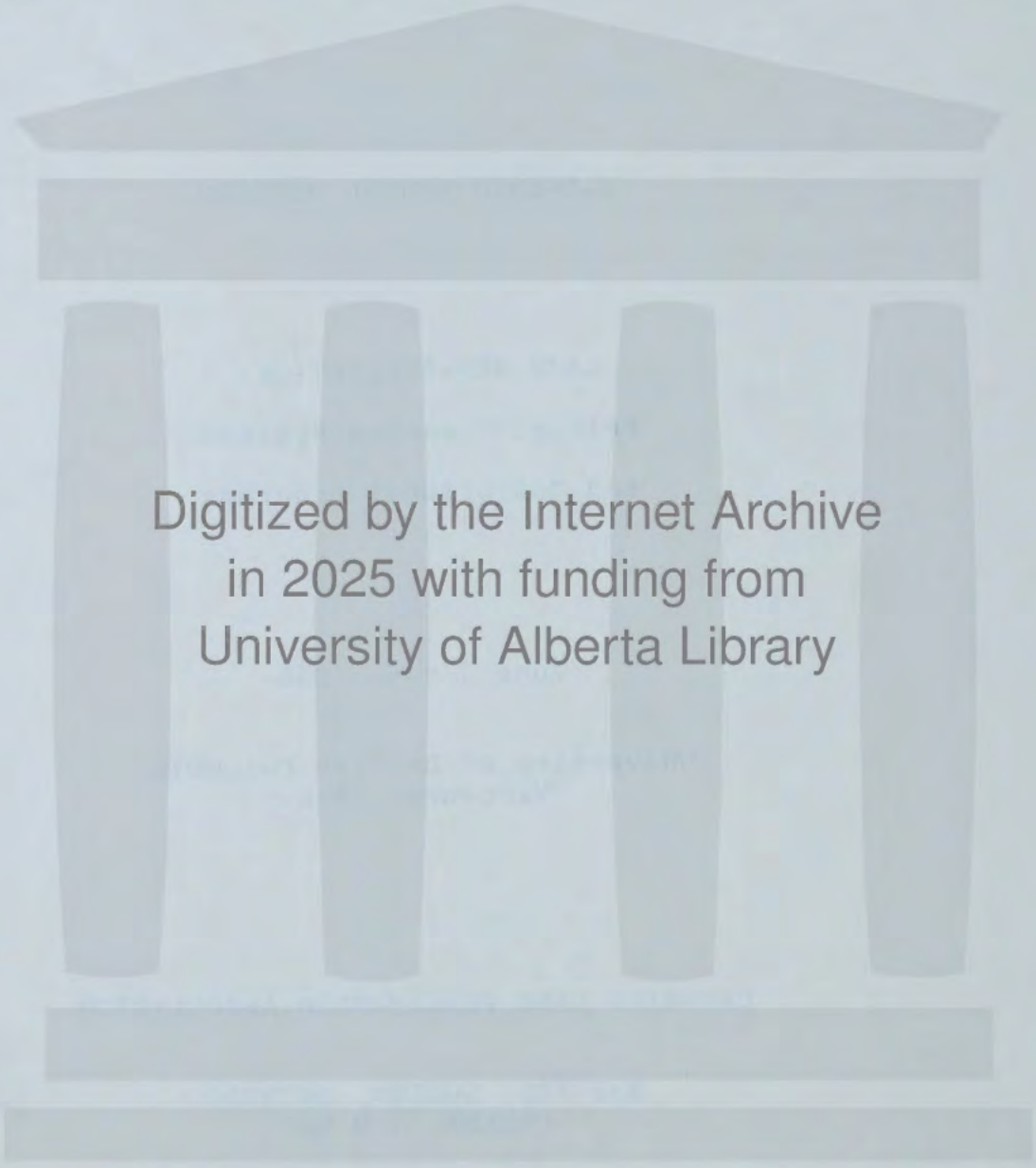

TABLE OF CONTENTS

FOREWORD

The British Columbia Chapter of the Canadian Land Reclamation Association was formed in 1985 to provide a local public forum for the exchange of information and experience in land rehabilitation. Comprised of professionals from a wide range of backgrounds and interests, this organization pulled together quickly to host the 1986 Annual Meeting. The diverse membership in the B.C. Chapter was realized in a program that expanded the scope of the conference to include many fields that have not been represented in past programs. The quality of presentations and range of topics kept audience participation at a spirited level. It is our hope that we have initiated a trend to widen the scope of the annual meetings so as to not focus on traditional mining or energy development issues.

I wish to thank all speakers and attendees for making this first formal function of the B.C. Chapter a success. The enthusiastic support of chapter members in the planning and administration of the conference demonstrated a strong desire for a quality meeting. This drive bodes well for the future of our chapter.

A great deal of effort went into the publication of the proceedings of the 1986 Annual Meeting. Care was taken to accurately reproducce all papers, however minor errors may have escaped the review process. We hope that this will not detract from the information presented by the authors.

May the CLRA and all local chapters continue to grow and function as a focal point for land rehabilitation.