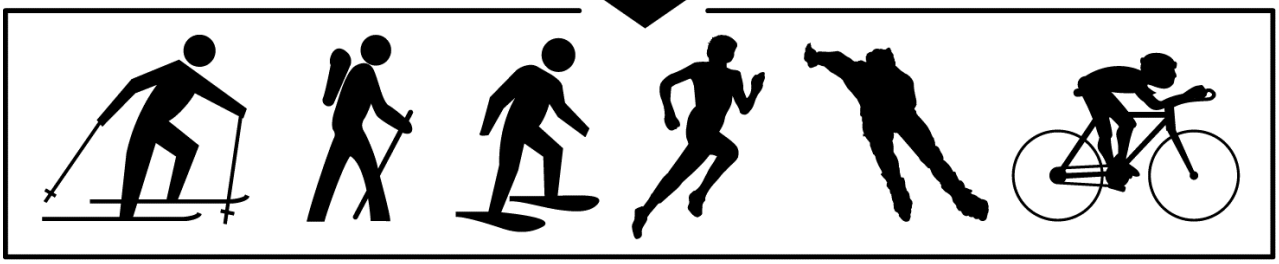
RECREATION TRAILS MASTER PLAN



Prepared by:

HENDERSON & ASSOCIATES
Community & Development Planning Consultants

and

The Kimberley Advisory Trail Planning Committee

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1.0 Project Description

The purpose of this plan is to define a strategy for providing a community wide trail network which links neighbourhoods, parks, schools, commercial areas, adjacent communities and open spaces. The plan is intended to provide comprehensive guidance for achieving this goal by identifying existing and desired trail routes, trail construction standards, trail signage guidelines, proposed phasing with cost estimates and an implementation plan.

2.0 Goals

The goals for the Kimberley Trail Master Plan are:

- To promote community support for a trail network.
- To provide a trail network, that is both a recreational and alternative transportation amenity.
- To create a trail network with a high degree of connectivity while recognizing the uniqueness of trail areas within the overall network such as the Kimberley Nature Park, Lois Creek, and the Kimberley Nordic Club.
- To educate trail users about ways to reduce user conflicts and environmental impacts.
- To develop a framework for trail upgrades, construction and maintenance.
- To develop trail construction standards.
- To encourage community partnerships for building trails.
- To develop policies for Council and the Approving Officer to secure the provision of trails in new developments during the development approval process.
- To identify potential trail connections to neighbouring communities and the Trans Canada Trail.
- To ensure public safety.
- To reduce liability by developing a framework for maintenance and risk management.

3.0 Planning Principles

These principles illustrate the fundamental directions for the study and identify the limits and opportunities for the trail system. The planning principles include:

- Accommodating all non-motorized multiple compatible uses.
- Optimizing existing trails and developing links to provide a continuous network.
- Developing a unified network through signing, mapping and marketing.
- Establishing a trail classification system.
- Securing land tenure for all trails in the Trail Master Plan.
- Developing trails to reasonable standards for the intended uses.
- Recognizing trail uses (including hiking, walking, cycling, inline skating, cross-country skiing, snowshoeing, and possibly horseback riding in limited areas).
- Matching trail standards to uses.
- Using trails for transportation, recreation and tourism.
- Offering some trails with barrier free access.
- Seeking to establish partnerships wherever possible.

4.0 Master Planning Process

Master planning is a very important element of trail development. Trail planning – as with the planning of all activities – must be done within the context of a broad scale plan. Other existing or potential uses must be considered when developing the plan. By using this approach conflicts between uses will be avoided and the best overall use will be made of resources. Each trail should fit with and contribute to the overall context of the trail network as well as broader City planning goals.

Another important consideration at the master planning stage is how much trail development will occur, e.g. how many paved trails, interpretive trails, new trails, signs, etc. Often, the basic controlling factors are the availability of both trail and financial resources. In Kimberley's case the existing trail resources are plentiful and the financial resources will be a limiting factor. Beyond the limiting factors it is also important to assess the levels of present and future demand.

4.1 Public Participation

A Kimberley Trail Planning Advisory Committee was formed by inviting representatives from user groups, land-owners, government agencies and the general community. The group comprised of 19 members plus 10 additional contacts that were advised of meetings and the planning process. A list of the Trail Planning Advisory Committee members is attached to this report as Appendix A. There were several meetings with the committee between November 2001 and March 2003. The meetings covered brainstorming and mapping exercises pertaining to trail opportunities, route options, multiple trail uses, interpretive features and implementation priorities. The committee was broken up into various sub-committees to review certain sections or topics related to the Master Plan such as legal and land tenure issues, trail signage, and construction standards.

4.2 Public Consultation

Contact was made with several stakeholder groups and government agencies as an effort to encourage open communication and coordinate planning initiatives. A public open house and several group presentations were held to review and discuss the draft Master Plan and trail network information. These meetings were also used to encourage community involvement in the Adopt-A-Trail Program as well as volunteer trail construction projects.

5.0 Benefits of Trails

Health Benefits
The majority of Canadians view environmental quality and fitness as the most important factors influencing their personal health.[1]

Walking has consistently been the most popular physical activity of Canadians over the last decade. Eighty-five percent of Canadians walk for leisure and recreational reasons. More than eighty percent of Canadians confirmed that they would like to walk more often than they currently do.[2] Trails can provide Canadians of all ages with this opportunity.

Just over one-third of Canadian children and youth meet the guidelines for optimal growth and healthy development.[3]

In 1994, the World Health Organization, in a landmark position statement, announced that physical inactivity as one of the four major risk factors of coronary heart disease.[4] Physical inactivity is also a contributing factor for type II diabetes, colon cancer, hypertension, obesity, osteoporosis, anxiety and stress.[5]

There is evidence that improved cycling and walking facilities mean greater participation. The percentage of commuters who cycle is three times greater in cities with substantial bicycle lanes.[6]

Active leisure pastimes, that are and will continue to be popular, are those that are unobstructed and can be enjoyed close to home, work or a secondary residence. Trails are affordable, accessible and unscheduled opportunities.

Tourism and Social Benefits
Tourists have an increased interest in the outdoors and nature-based activities and they travel to pursue special interests and fulfilling experiences.[7] Trails offer an ideal means of satisfying these interests. The experience of walking and bicycling help us connect people to places. Walkers move at slower speeds and have more time to perceive and comprehend the details of the environment and the community. Interpretive signage along trails can complement tourists' desire to learn more about the history and natural heritage of the places they visit.

Trails located close to one's home are accessible to all income groups. Trails can be used as a route to the corner store, or to commute to work or school, and will rapidly become

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[1] Environonics, 1998. *National Survey on Active Transportation.*
[2] Ibid.
[3] CFLRI (Canadian Fitness and Lifestyle Research Institute), 1997. Physical *Activity Benchmarks Report.*
[4] WHO (World Health Organization), 1994. *Physical Inactivity as a Risk Factor for Coronary Heart Disease. A WHO and International Society and Federation of Cardiology Position Statement.* Bulletin of the WHO.
[5] U.S. Department of Health and Human Services, 1996. *Physical Activity and Health. A Report of the Surgeon General.* Atlanta, GA.
[6] Active Living – Go For Green, 1995. *Linkages: Built Environment, Wellbeing and Active Living.*
[7] Warren, N.M., 1998. *Nova Scotia Hiking Trails Study*. Nova Scotia Trail Federation.

part of community life. Trails are utilized by a broad cross-section of the community, unlike many sport specific facilities such as ball fields.

Economic Benefits
There is ample evidence that trails not only enable Canadians to live actively in a healthier environment but also that trails most often benefit both adjacent landowners and the local business community.

- Numerous studies demonstrate that trails can increase nearby property values, which can in turn increase local property tax values. For instance, an U.S. National Parks Service study, that cites examples from across the United States, claims that close proximity to trails increase property values by 5 to 32 percent.
- Spending by residents and visitors on trail-related activities helps support recreation orientated business and employment, as well as other businesses that are patronized by trail users. [8]
- Trail networks often provide new business opportunities for commercial activities such as outdoor apparel outfitters and bike and in-line skate rental shops.
- Trail networks are often major tourist attractions, which generate expenditures on lodging, food and recreation oriented services.
- A trail network can be a key part of a tourist destination marketing strategy. Having a trail network contributes to the image of a healthy, active and vibrant community.
- A high quality trail network can attract high profile events such as mountain bike races and cross-country running and walking events.
- The attractions that greenways offer can be effective in encouraging tourist to stay an extra night.

Cost Effectiveness
Trails are cost effective in comparison to many other recreation amenities because they are easy to maintain. Surfacing costs increase as the number of users increase, and the more expensive the surface, the lower the maintenance cost.[9] Compared with the lawns, play structures, and ball fields of traditional parks, trails require very little maintenance.

Utilizing volunteer labour of individuals and groups can also reduce the cost of developing and maintaining trails. Involving the community in trail construction and maintenance also gives a sense of accomplishment and pride to those involved.

6.0 Trail Resources

Assuming that all built trails are pretty much alike is as dangerous as making generalizations about trail users.

Urban Trail Network
Three main concepts have expanded the concept of urban trails:

- The increased number of uses of trails in addition to traditional walking.

[8] Royal Commission on the Future of the Toronto Waterfront, 1992. *Toronto's Waterfront and the Sustainable City: Final Report.* Ontario Queen's Printer.
[9] Colorado State Parks, 1992. *Statewide Parks Study.*

- The interest in making connections between parks and neighbourhoods and building trail networks.
- The desire to rehabilitate urban stream corridors.

Urban trails are often paved, while often adjoining natural surface trails along creek corridors or trail spurs. The use of finely crushed rock to harden a natural surface trail is being used increasingly in urban trail settings.

Front Country Trails
As a response to the urban sprawl that has occurred in North America in the last 50 years, there has a emerged a great deal of support in preserving open space in the form of a nature park or even a community forest. Since the idea is to save natural areas, these areas receive few developed park amenities but typically have a system of trails. Two examples in Kimberley are the Nature Park and the Lois Creek area. An important trend is making connections from urban areas or greenway corridors to these front country areas.

Backcountry Trails
What most people think of as a hiking trail fall into this category, encompassing trails in national and provincial parks and remote crown land. Many of the backcountry trails in the Kimberley area are used only during the summer season due to the climate. However, many trails do receive considerable use for snowmobiling, cross-country skiing and ski touring when snowfall is sufficient. Hikers, equestrians and mountain bikers share many of the trails. Some backcountry trails are open to motor cycles and ATVs as well.

The scope of this plan is to perhaps provide some connection to backcountry trails; however, the majority of these trails are outside of the City of Kimberley's jurisdiction.

Roads
A surprising amount of trail activities take place on roads. Road cyclists, as users of the highway system, are often urging the construction of wider highway shoulders. Mountain bikers, cross-country skiers, and to some degree walkers, have discovered a wealth of dirt roads across public lands. Off-road vehicles typically make use of forestry, mining or abandoned roads and typically refer to them as trails.

Rail Line
In recent years there has been numerous trail developments on abandoned rail lines and there will continue to be more "rails-to-trails" conversions in the near future, as C.P. Rail donated 1216 kilometres of abandoned rail corridors across Canada to the Trans Canada Trail Foundation in 1999. The first rail to trail conversion in Canada was the Galloping Goose Trail, which is built upon a 60-kilometre rail line, which stretches from downtown Victoria to Leechtown. The Galloping Goose Trail was opened for recreational use in 1989.

Galloping Goose Trail

The linear nature and grade of rails-to-trails offer excellent opportunities for people of almost any age to pursue physical activity in a nature setting. Rails-to-trails may also offer opportunities for barrier free access to trails.

The rail line from Kimberley to Cranbrook was recently semi-abandoned by the closure of the Sullivan Mine. There is interest from both communities and the Regional District of East Kootenay to see the rail line converted to a trail. The City of Kimberley has requested that the rail line be preserved for the time being as it may be advantageous to attract a new industry into Kimberley.

7.0 Planning Issues

7.1 Land Tenure

Most of the existing trails in Kimberley are located on Crown Land with existing use agreements; however, some existing and numerous proposed trails are located on lands owned by Teck Cominco. Teck Cominco has agreed to grant the City a License of Occupation for existing recreational trails over its lands, as illustrated in Schedule B- License of Occupation Map. Teck Cominco has reviewed the proposed trails of the Trails Master Plan that cross Teck Cominco's property and do not object to revising the license of occupation to accommodate the proposed trails at the time of their construction.

Right-of-Way agreements for public trails have and will continue to be secured over private lands as development proceeds at the Kimberley Alpine Resort and other development areas such as the Forest Crowne Development. The City also has the option of securing trail corridors as linear parks during the subdivision approval process.

The Forests Practices Code requires individuals or groups to obtain the consent of the District Manager of the local Forest District prior to the construction, rehabilitation or maintenance of a trail on lands managed by the Ministry of Forests (for more information refer to Section 102 of the Forest Practices Code).

7.2 Liability and Risk Management

One of the more complicated issues concerning trail development is that of liability. Publicity of huge settlements in lawsuits over virtually every aspect of daily life has made the threat of litigation very real and has led to a perception that personal responsibility is a vanishing concept. While these trends are of great concern to trail providers, the public still demands and supports new trails. And while no legislation has emerged to reform this aspect of the legal system, trails do get built and continue to be managed with very few lawsuits. To put the matter in perspective there are hundreds of thousands of kilometres of trail in Canada, which provide an enormous amount of recreation with very low rates of injuries, litigation and risk.

Creating trails will involve a greater degree of public liability than for unidentified natural areas. In particular, built facilities such as trails, bridges and similar structures are likely to attract more public use and therefore more liability. The trail design and construction standards outlined in this document recognize the responsibility for public safety and ensure that care is taken to incorporate protective measures.

The City of Kimberley's solicitors, Murdy & McAllister, have summarized a number of steps that they recommend the City take to avoid liability:

- Post clear signs at appropriate locations indicating that the trail is a "recreational trail" and that a person is entering for recreational purposes use it at their own risk.

- Consider the categories (e.g. adults, children, elderly, disabled, non-english speaking/reading tourists, etc.) and skill levels (e.g. beginner, intermediate, advanced, etc.) of persons who may use the trails and the types of activities they might engage in while there (e.g. walking, cross-country skiing, biking, dog walking, etc.).

- Consider the kinds of accidents that might be "reasonably foreseeable" under a variety of conditions that may occur.

- If an unusual, hidden, or unexpected danger arises as a result of human activity or weather or earth conditions, post clear warnings of such dangers at appropriate locations in a way that can be easily seen and understood by all persons entering. Note that what is not dangerous in the daylight may become dangerous at night, and that postings should allow sufficient time for the people to avoid the hazard.

- If dangerous conditions exist of which the occupier is aware but cannot be remedied quickly, reasonable steps should be taken to prevent persons from entering the area.

- Where entry by the public is prohibited clear signs should be posted at points of entry (e.g. "Do Not Enter", "Trail Closed to the Public", Private – No Trespassing").

If children or youth are likely to use the trails, physical precautions such as adequate guardrails, fences or placing of obstructions to prevent entry may be necessary in addition to warning signs.

Recent changes to *Occupiers' Liability Act, R.S.B.C. 1996,c.337* expressly provide that in respect of recreational users of recreational trails who do not pay the occupier for their use, the responsibility of the occupier to ensure that the area is reasonably safe for use is somewhat relaxed. As well the amendments have clarified that trespassers, as well as recreational users, are now only entitled to a duty of care by the occupier to avoid intentional harm and reckless disregard for personal safety or property damage.

In order to obtain the protection of the new provisions, recreational trails must be reasonably marked as such.

In addition, although the *Occupiers' Liability Act* does not expressly require it, Murdy & McAllister recommend that occupiers should take some measures to protect against dangers known to the occupier but that may be unusual, hidden or otherwise unexpected by trail users. At a minimum, warning signs should be appropriately placed. If trails become unusually dangerous due to slides, weather conditions, or excavations, some attempt should be made to prohibit access, by sign or barrier, until the problem is remedied.

7.3 Use Analysis

One way of referring to this issue is to call it "user conflict," but a more positive expression is "multiple use." Trails are a way for people with varied interests to share a common love of being active in the outdoors. The focus of this trail master plan is on non-motorized trail uses; however, the City should consider identifying potential routes for motorized uses and equestrians to connect from designated areas within the City of Kimberley to trails outside of the City boundaries that permit these types of uses. The City also wishes to work with provincial agencies to ensure appropriate access to recreational areas and protection of environmental values outside of the City boundaries.

The majority of trail users in Kimberley consist of pedestrians and cyclists in the summer months and cross-country skiers, snowshoers and pedestrians in the winter months. The construction of paved trails is expected to broaden this group to wheelchairs (motorized and non-motorized) and in-line skaters. Our inventive society is continually producing new recreational activities and equipment. New activities illustrate the versatility of trails in providing the most opportunities for the largest amount of people, but they also provide for new challenges to trail designers and managers. Coming years will no doubt bring new activities while demographic changes in society will change participation rates in the different trail pursuits.

The challenge is to figure out ways to accommodate a wide variety of trail users. We need to look for solutions rather than give up at the first sign of controversy. Sharing information and open discussions is the first step to resolving conflict issues.

If trail damage is caused by a certain use, determine the reason it is occurring and take measures to correct the situation. Consider hardening trails, installing water bars, using seasonal closures, re-locating the trail or recommending alternate routes. Inform trail users of the problem and suggest measures they can take to correct the situation.

7.4 Trail Etiquette

Over the last decade numerous jurisdictions across North America have proven that conflicts on multiple use trails can be minimized by establishing codes of trail etiquette and advertising them on signs, trail guides and at special events. Examples of trail etiquette to consider include:

General Trail Etiquette
- Keep right. Move off the trail wherever possible for less mobile trail users.
- Groups of users should not span more than half the width of an urban or busy rural trail.
- Stay on the trail.
- Don't litter.
- Avoid using the trails alone. Tell someone where you are going and when to expect you back.
- Bring food, water and extra clothes on long hikes.
- Bring a cell phone for emergency use.

Walkers and Snowshoers
- Avoid ski tracks when walking or snowshoeing.

In-line Skaters
- Stay in control. Always be prepared to stop.
- Use caution where visibility is limited.

Mountain Bikers
- Ride in control. Travel at safe speed considering the terrain and your ability.
- Use caution on blind corners and unfamiliar trails.
- Announce your presence with a bell or greeting and pass slowly.
- Practice erosion free cycling. Avoid harsh skids and any action that destroys trail tread.
- Avoid riding in wet conditions.
- Wear a helmet.

Cross-country Skiers
- Ski on the right side. Yield to faster skiers and those coming downhill.
- To get out of the track, lift skis parallel and off without disturbing the track.
- When breaking trail, keep skis wider apart than normal. The trails narrow with use.
- Make tracks near the edge of the trail so other trail users can avoid it.
- Fill and smooth the trail when you fall.

Dog Owners
- Scoop your dogs poop.
- Restrain dogs near wildlife.
- Keep dogs out of streams.
- Leash dogs on designated "leash only" trails.
- Obey trail restrictions for dogs.

7.5 Trail Difficulty Levels

The following are generalized levels of trail difficulty as they apply to mountain bikes[10] and have been modified to apply to hiking as well. Some of the other uses expected on the trails will often be limited due to trail surface and trail width. The difficulty levels outlined below will be used to assist in determining difficulty levels for each trail or portion thereof. Assigning difficulty levels will also have to consider seasonal conditions, trail length, as well as some subjective considerations. Generally, trail difficulty ratings are based on the most difficult portion of the trail.

Trails designated for cross-country skiing use will have a difficultly rating based on Cross-Country Canada's rating guidelines. The cross-country designation will be identified on maps and trails within cross-country trail marker and use designation logo.

Name: Beginner
Symbol: Green Circle
General

- Fairly flat, wide and smooth (paved or stone dust). Suitable for first-time cyclists and a variety of fitness and age levels.
- Multiple purpose, paved trails adequate for inline skating and wheelchairs.

Detailed

- Maximum grade: 11%
- Maximum sustained grade: 9 percent
- Curve Radius: 2.4 metres (for mountain bikes)

Technical Trail Features

- Generally technical trail features are not appropriate for beginners.
- Wide bridges with a handrail if height of bridge above surface exceeds 60cm.

Name: Intermediate
Symbol: Blue Square
General

- Challenging riding and hiking with steep slopes and/or obstacles, possibly a narrow trail with poor traction. Requires experience and fitness.
- May have some surface treatment or grading.

Detailed
Maximum grade: 25%
Maximum sustained grade: 11%
Curve radius: 1.8 metres (for mountain bikes)
Expected Technical Trail Features
General

- Roots and logs to cross
- Small bridges
- Small rollable drops (mountain bikes)
- Small jumps (mountain bikes)

[10] Paul Kennett; Classic New Zealand Mountain Bike Rides; 1996

Detailed

- Embedded trail obstacles up to 20cm high
- Drop-offs not exceeding 30 cm high with exit cleared of all obstacles
- No bike jumps with consequences for lack of speed
- Maximum jump heights of 45 cm

Name: Difficult
Symbol: Black Diamond
General

- Challenging riding and hiking with long steep climbs, loose surfaces and obstacles, possibly a narrow trail with poor traction. Mountain bikers may have to walk sections. Requires experience and fitness.
- Little or no surface treatment or grading.

Detailed
Maximum grade: 32 %
Maximum sustained grade: 11%
Curve radius: 1.2 metres (for mountain bikes)

Expected Technical Trail Features
General

- Steep descents with sharp transitions
- Elevated bridges and teeter-totters
- Larger jumps
- Mandatory air (for mountain bikes)

Detailed

- Teeter-totter: maximum pivot height less than 1.2 metres above the surface
  - Width of flat decking is a minimum of one-quarter above the height of surface at the pivot point (with a minimum width of 25 cm)
- Mandatory air (mountain bikes) or drop-offs less than 60 cm

8.0 Development Criteria

The goals and planning principles of Kimberley's trails master plan lead to the basic design criteria to direct the process of improving the existing trail base and implementing future trails. The following three criteria were seen to be fundamental to meeting the goals of this master plan.

Linking trails
Local community organizations have made significant progress in trail development within Kimberley. Kimberley's existing volunteer trail providers are impressive with the Nature Park Society, Nordic Club, Friends of Kimberley Integrated Trail Network (Lois Creek), the Rotary Club and Lions Club among others responsible for the development and maintenance of those trail systems. As each resource area tends to be independently managed, an important criterion for the development of a City-wide trail network is to provide linkages between and among existing trails systems to create a continuous uninterrupted system, including links and loops of varying length and levels of difficulty.

Connecting neighbourhoods
The criterion to connect neighbourhoods and tourist accommodations to community facilities, park and open spaces, commercial areas and to each other is intended to build on the existing "trail culture" in Kimberley as well as provide an alternative transportation mode for residents and visitors. Some neighbourhoods also play significant roles as staging areas for trail users and provide linkages to open space areas.

Highlighting points of interest and landscape features
Trails are catalysts for tourism and interpretive programs. Trails can be corridors to experience significant historic, natural, and cultural landscapes. Old settlers' cabins, scenic views, wetlands, wildlife habitat, and other points of interest can be interpreted for residents and visitor looking to experience the area. Using this criterion, the trail network will function to provide access to some of the many points of interest that Kimberley has to offer.

The Quesnel River Walk

Photo Credits: Gordon L. Perry

9.0 Inventory

An inventory of both existing and desired trails was compiled by the Trail Planning Committee in the spring of 2002. City of Kimberley legal maps were used as a basis for the inventory mapping. In addition to base mapping, existing trail mapping, brochures and common knowledge of trail locations were used. Comments on the trail inventory were requested at all Trail Planning Committee meetings and the subsequent public information meetings.

The Trail Planning Committee also identified desired trails, bridges and other features needed to expand the network, create loops and link trails. Trail heads, parking areas, and points of interest are also included on the inventory map. The inventory can be further expanded to include information about trail length, trail difficulty, trail users, trail responsibility and trail maintenance. The City of Kimberley Trail Network is attached as Appendix C and the Urban Trail System is attached as Appendix D.

Generally the trail inventory can be summarized as follows:

- Crown or publicly-owned lands that already have a trail system in place with some form of recreation use agreement in place. Included in this category are the Kimberley Nature Park, Kimberley Nordic Club and the portion of the Mark

Creek Rotary Trail that is within the Ministry of Transportation and Highway's Right-of-Way.

- Crown or publicly-owned lands that have a trail system in place without a formal use agreement but do have informal agreements or interim approvals. The Lois Creek trail network falls into this category, a number of citizens have organized themselves into a group called the Friends of Kimberley Integrated Trail System (K.I.T.S.) in 1997. The Friends of Kimberley Integrated Trail System applied to the Ministry of Forests initially in 1997 and again on December 18, 2002 to manage and maintain the Lois Creek Trail Network as a Forest Service Recreation and Trail Site.

- Informal trails on Crown Land with no use agreements in place. Many of the trails are old mining or forestry roads. Some of these trails do appear on the trail inventory due to their frequent use and potential improvement to the trail network. A commitment to maintain these trails in conjunction with approval for public recreational use from the Crown will be necessary for these trails to be included in trailhead signage or otherwise advertised.

- Several trails occur on privately-owned lands. Trails that have the owner's commitment to a Right-of-Way agreement or License of Occupation have been included in the inventory.

- Many unofficial trails cross private land that are well-known by certain groups of trail users but are not publicized. These trails do not appear on the inventory mapping because they appear to have no status and do not support use by the public as a whole.

- Proposed trails on public or private lands are included in the inventory where there is approval in principle by the land owner. As the trail network expands and trail planning and construction progresses, additional proposed trails are expected to be added to the trail inventory.

- There are several existing trails through both the Mark and Mathew Creek watersheds. These trails will be considered "proposed trails" until recreational trail use in these watersheds have been approved by the Kimberley Watershed Committee.

- A bicycle route on existing roads through the City has been included on the urban trail map. The route will need improvements and signage to publicize its status.

10.0 Trail Design and Construction Standards

This section outlines general construction standards for recreational trail building. Standards are basic guidelines that illustrate typical trail dimensions and construction practices. They are intended to be used as suggested practices for constructing a trail

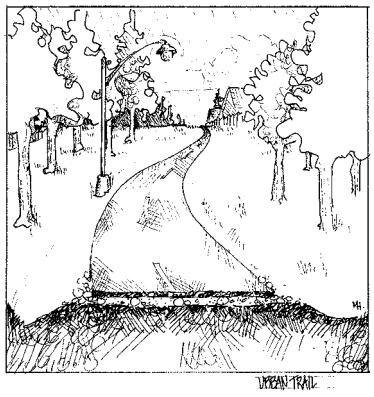
system and may not apply for every situation. Site conditions and trail types will be variable throughout the Kimberley Trail Network, so these standards will give options and ideas on how best to proceed with construction. For additional trail construction techniques refer to the list of references and resources at the end of this document. Consult the Manager of Parks and Recreation to determine the recommended construction standards for a specific trail.

10.1 Trail Types

Trail types are defined as urban, rural, natural surface and low-impact nature trail cross-sections that are designed for use by pedestrians, bicyclists, cross-country skiers, snowshoers, and on urban trails, in-line skaters, and wheelchairs. The urban cross-section can be constructed for more heavily used trails and generally in the urban setting. The rural cross section would be used more likely in the front-country setting to various tread widths depending on use. Natural surface trails are the most cost-effective and preferred trail surface for lower-use trails. Earthen surfaces look natural and generally do not require additional material to be imported. However, poorly drained and wet soils do not make for good trail surfaces. In this situation, low-impact nature trails need to be considered.

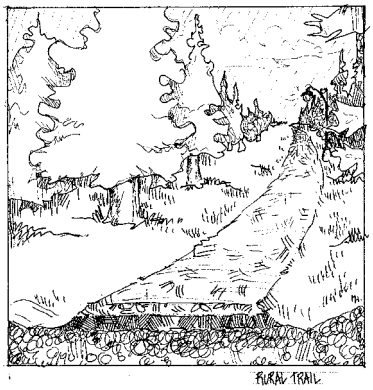
Urban Trail (see Appendix G for cross-section)

- a two-way trail for smooth all season use
- plan for walking, biking and in-line skating where appropriate
- use for groomed cross-country skiing or plow for winter walking
- wheelchair accessible
- plan for asphalt surfacing machine built
- provide benches, garbage receptacles, viewing areas and signage where appropriate
- provide access to community and resort amenities, parks and subdivisions
- provide low-glare illumination for night-use where appropriate
- a six metre right-of-way with a 3 metre tread width



Rural Trail (see Appendix G for cross-section)

- a two-way path for walking, biking, and snowshoeing
- use rural trails for cross-country skiing where appropriate
- use crushed gravel, limestone with fines, well compacted gravel, or existing roadbeds
- remove all embedded trail obstacles



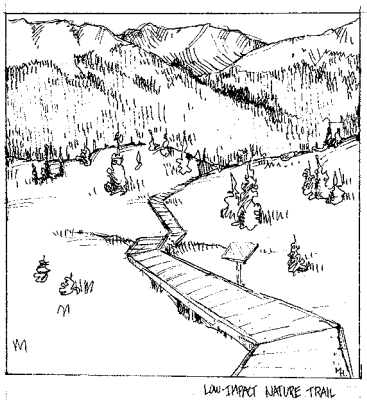
- provide 3 metre tread width for two-way traffic, 1 – 2 metre tread width for single use or one-way trails where appropriate
- clear height to 3 metres
- machine built
- provide illumination for night use where appropriate

Natural Surface Trail

- plan as an unsurfaced one or two-way trail depending on trail usage, sight distance, etc.
- use for hiking, mountain biking, snowshoeing, and ski touring where appropriate
- provide 0.5 to 1 metre tread width on native soil
- clear width 1 to 2 metres
- clear height to 2.5 metres
- may be machine built
- may have rough terrain

Low-Impact Nature Trail

- plan as low impact nature trails or lightly used wilderness trails
- provide a maximum 50 cm tread width
- clear height to 2.5 metres
- avoid tread grubbing
- may have sections of rough terrain
- use board walks to traverse wet or sensitive areas



10.2 Surface Material Options

Tread surfacing will be required where the conditions of the existing soils do not meet the requirements of the intended trail use. The key considerations for tread surfacing are firmness evenness, dryness, strength, appearance, cost and trail use.

Asphalt

Due to the cost and urban character of asphalt, it is generally appropriate for urban trails experiencing a high level of use, or where users such as children, wheelchair users and in-line skaters are intended.

Asphalt is a very durable surface material that is costly at the time of installation but requires very little maintenance for up to ten years if properly installed. The life span of an asphalt trail is entirely dependent upon the quality of the installation.

There are two types of asphalt that can be used for trail paving: hot-mix and cold-mix. Hot-mix is generally used for road surfacing while cold-mix is generally used for patching. The advantage of hot-mix asphalt is that it gives a smoother surface. Cold-mix

has a key advantage for trail applications, as it can be kept "soft" as long as the solvent is kept in the mix (different speeds of curing mixtures are available). This allows more time for laying the asphalt and small trucks and trailers can be used for laying the asphalt.

A proper base must be installed and compacted prior to the installation of the asphalt surface to prevent damage from frost heaving and settlement. Adequate measures for the drainage of base material must be provided. The amount of base material required will depend upon the type of use and site conditions. If the trail is to be used by service vehicles or if there is wet soil conditions, additional layers of base materials will be required. Where such trails are to be used for winter activities, additional depths of base material will be required to counter the effects of increased frost penetration, which will result from compaction of the insulating snow cover.

Engineering expertise should be utilized to determine requirements for base construction.

Gravel and Crushed Stone

Gravel should only be considered for trails in areas of high traffic or areas subject to moderate erosion. Generally, gravel is not suitable for the top layer, as it is difficult for some users to negotiate and may be considered too rough. Crushed stone products are best because the angular crushed granules interlock to create a more stable surface. It is important that the stone is well compacted and that fine rather than course stone is used on the top surface layer to provide adequate firmness and evenness. As binding or sealing layer of stone dust or of asphalt emulsion with stone chips can be used for added smoothness and durability.

For trails where it is important that the surface be firm and smooth, such as bicycle and wheelchair accessible trails, greater depth of crushed stone and more compaction will be required to prevent surface and frost heaving.

Stone Dust (Limestone Screenings)

Stone dust is a recommended surface treatment for multi-use corridors where the trail needs to blend with the rural or natural character of the area. Stone dust is best used as a top course or as a trail hardening material on trails with a low to moderate erosion problem, and that are generally dry. It is not suitable as a base material for wet trails or on soils with low stability, a course granular is recommended for these situations.

Stone dust materials of a fine particle size create a smooth solid surface when applied to the trail surface. A 150mm bed of compacted fines is useable by a wide range of trail user groups and can be easily re-graded as part of the trail bed maintenance.

In areas where the surface is prone to erosion, it is recommended that crusher fines be used. Crusher fines are slightly more course than stone dust and will drain more efficiently. Erosion problems often occur where the corridor cross-section is concave and there is a tendency for water to flow parallel to the corridor.

Soil Cement and Soil Asphalt

Soil cement or asphalt is a mix of cement or asphalt, water and parent materials from the trail bed. This is an excellent mix for repair of eroded sections of trail which receive high traffic, and for trail repairs in remote areas as fewer material (volume and weight) need to be imported. The cement comprises approximately 10 to 15 percent of the final surfacing and the asphalt 3 to 6 percent. Because soil cement and asphalt use existing parent materials, they look very natural and fit well with the surroundings. Soils with high sand or gravel contents are best suited for producing these surfaces.

Cement and asphalt bind soil particles together, increasingly the wearability of soils. This can be further improved if a seal coat of asphalt and stone chips is applied to the surface to prevent water penetration.

Bark Mulch and Wood Chips

Bark mulch and wood chips are good for walking and hiking trails, and are well suited to areas where tree roots are exposed, but can migrate under heavy foot traffic. Chip surfaces are not suitable for bike, wheelchair or equestrian use because they are not firm enough and scatter too easily. Regular inspection and maintenance are recommended to keep wood chips in place. Log or timber stringers can be placed along the edges of the trail to hold the chips in place.

Because chips do not compact well they are difficult to walk on if used as a thick layer. An initial application of 50 to 75 mm is recommended. Chip surfacing will generally have to be dressed once a year to replace chips lost by rotting at the soil surface.

Wood and bark shreds are preferable to wood chips because they compact better resulting in firmer footing and require less maintenance. Shreds bind together to form a mat-like surface that allows infiltration of surface water and holds soil particles in place.

Sawdust is not recommended as a trail surface as it tends to be absorbed into the soil layer and draws up moisture rather than dispersing it.

Natural Surface

Natural surfaces are obviously the most cost-effective and preferred trail surface for lower-use trails. Natural surfaces blend well with the natural environment and generally do not require additional materials to be imported. However, poorly drained and permanently wet soils generally do not make for good trail surfaces. In this situation alternative trail surfaces need to be considered.

10.3 Trail Design Considerations

Boardwalks protect fragile environments from overus

Environmental Conditions
The benefits of a trail network must be balanced with the desire of protecting our natural environment. Trail construction must strive for minimal impact on our natural surroundings. Trails that impact the environment will not only have a low aesthetic value, but also incur a high maintenance cost. All intrusions into the environment have some degree of impact. However, these impacts can be minimized to balance the need for a recreation experience with the impact on the surrounding environment.

Where trails cannot be located away from sensitive soils or poorly drained areas, boardwalks, tread surfacing or trail drainage should be provided. Trail routing, signing and public education can be used to keep people on the trail and direct users away from sensitive areas such as wetlands and grasslands.

Grades
The term "grade" refers to the slope that occurs along any particular section of trail. The slope across the trail tread is referred to as the "cross slope". Grades in this plan will be referred to as a percentage of rise to run.

The ease of movement along a trail, and the comfort and safety of its users will be affected by steepness of grades, length of sustained grades and by the proportion of uphill, downhill and the level portions of the trail.

The type of trail activity and the abilities and interests of users must be considered. For example grades will generally need to be less steep on bicycle trails than on hiking trails and gentler on hiking trails intended for novices than on those for seasoned hikers.

Generally it is advisable to avoid creating long sustained grades. It is better to provide variation, with gently sloping sections giving relief between steep climbs. In situations where grades are very steep it may be more suitable to provide switchbacks, steps or ladders. Trails with sustained grades over 25 percent should be rated difficult.

Grade guidelines to consider are as follows:

Desired grade:	0 to 5 percent
Maximum sustained grade:	6 to 11 percent
Maximum grade for short pitches:	25 percent for a maximum distance of 30 metres

To determine the feasibility of these requirements, consideration must be given to the overall trail situation. If there are only a few steep trail sections it may be feasible to allow for a greater maximum grade limit.

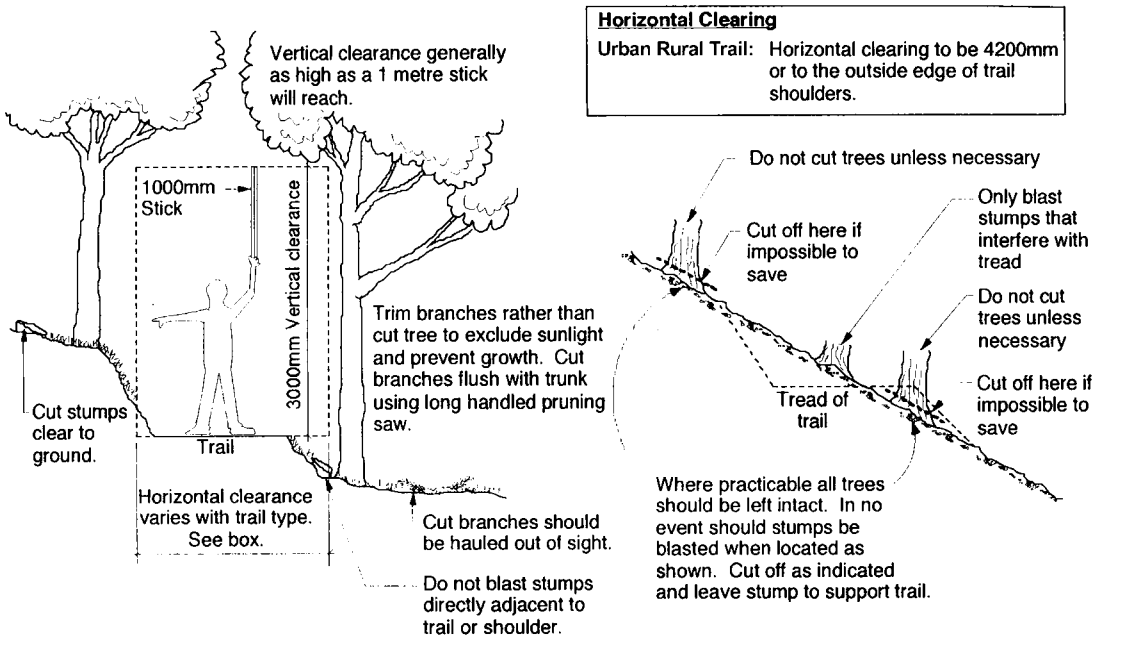
Clearing Height
Vegetation should be cleared to a height that will allow unobstructed headroom. Additional clearance may be needed to compensate for branches drooping with heavy rain or snow.

Pedestrian/Bike trail: 2.5 - 3 metres clearance
Horseback trail: 3– 3.5 metres clearance

On ski and snowshoe trails greater heights must be allowed to compensate for the depth of snow on the ground and branches drooping with the weight of snow.

It is desirable to maintain some cover of branches over the trail. With complete clearing, increased penetration of sunlight will encourage plant growth at the trail edges and extra maintenance will be necessary.

Source: Resort Municipality of Whistler



Clearing Width
Vegetation should only be cleared to the degree necessary to provide safe and unimpaired movement along the designated trail type. Horizontal clearing should be to the outside edge of trail shoulders or drainage swale. Shrubs and small trees that will grow quickly into the right-of-way should be removed. Low growing shrubs and ground cover should be left right up the edge of the trail shoulder or swale. Wherever possible, trails should be routed around large trees and shrubs or plants having special values. However, sometimes it may be beneficial to remove or limb some vegetation to provide views from the trail.

Fall Zone

The fall zone is the area adjacent to a technical mountain bike trail feature, such as an elevated bridge or rock face that the rider may deviate into should they fail to negotiate technical trail feature. Included in the fall zone are the sides of the trail, the bottom of descents and the outside of corners. Injury may be avoided by cutting or digging out sharp objects, trimming tree branches to branch collar or shoulder, covering hazards with softer material (i.e. rotten logs, dirt, bark, etc). In general, the fall zone is a distance of 1 to 1.5 metres of the trail edge. The primary focus of fall zone clearing should be on intermediate trails where a rider is learning how to ride technical trail features**.**

Trail Layout

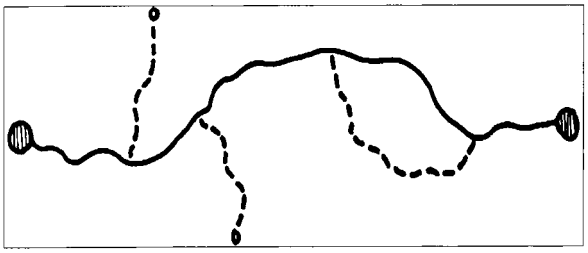
Generally, trail placement should avoid steep slopes and wet areas as these situations pose difficulties for trail maintenance. Water and motorized road crossings should be kept to a minimum. Curvilinear trail layout and grade changes will add interest to the trail. The following forms of layout are commonly used in trail design.

Linear Trails

The linear form of trails is commonly used for long distance and goal-oriented trails or providing connections between communities and amenities.

Spurs can be added to linear trails to allow for a greater variety of experience and additional connections to amenities.

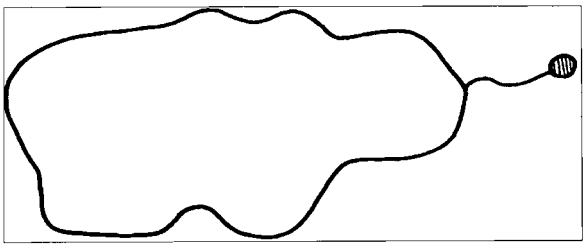
Linear



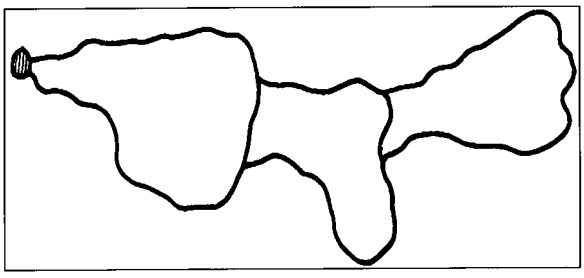
Loop Trail

The loop form, where users are led back to the original starting point of the trail, adds interest as users do not have to retrace their steps, and there is less physical wear on the trail and its environment. There are various forms of loop trail layouts. The stacked loop form offers opportunities for a variety of travel distances and terrain conditions. The satellite loop form provides for a wide range of opportunities. The central loop acts as a collector and the satellites can offer options in terms of difficulty of terrain, interpretive themes, uses, etc.

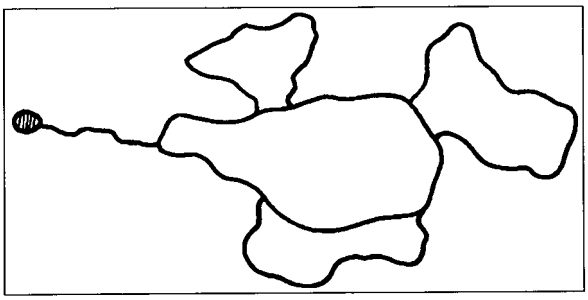
Loop



Stacked Loop



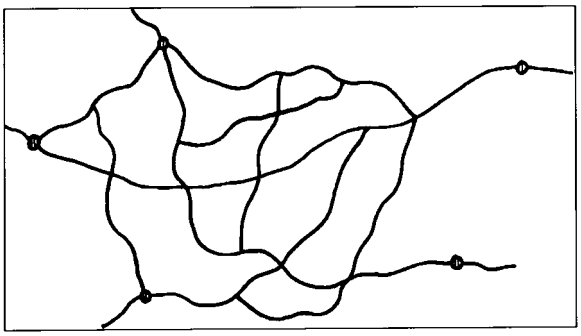
Satellite Loop



Maze Trails

The arrangement makes maximum use of an area by letting people "explore" their own routes. A variety of terrain conditions and distances can be provided by such a design. It is important, however, that such trails be well marked with trail names, directions, and distances to prevent people from becoming lost or over-extending themselves.

Maze



Turning Radius and Sight Lines

Wide gentle curves with good forward sight distances are critical for safety, aesthetically pleasing, and easier to maintain. Avoid sharp-angled turns, turns on steep slopes, or turns at the base of a hill. Although curves and bends should be designed with safety in mind, turns and bends tend to help reduce speeds and add a variety to the trail experience. The minimum turning radius for paved urban trails that are accessible to wheelchairs should be 2 metres. Section 4.5 Trail Difficulty Levels recommends acceptable turning radius for the three difficulty levels. Keeping in mind that turning radius will impact some trail uses (i.e. biking and x-country skiing) more than others (i.e. hiking). A minimum forward sight distances of 30 metres is important for multi-use trails.

Road Crossings

Motorized road crossings must be carefully located, designed and signed in advance to ensure that all trail users and vehicle drivers have good sight distances in all directions. A trail maze may be necessary for busy road crossings (see Appendix G).

Water Crossings

Some water crossings may require bridge construction. Bridges should be used in areas of perennial and intermittent stream crossings, unless seasonal closures are enforced. Slow moving water less than 24 inches deep may be forded with the use of stepping stones (warning signs should be posted at trailhead). Locate bridge crossings to minimize disturbance to streambeds and banks. Straight sections of the waterway and where banks are stable are preferred for crossing.

Culverts can be used to cross deep streams or ditches. Professional assistance is required for bridge or culvert stream crossings.

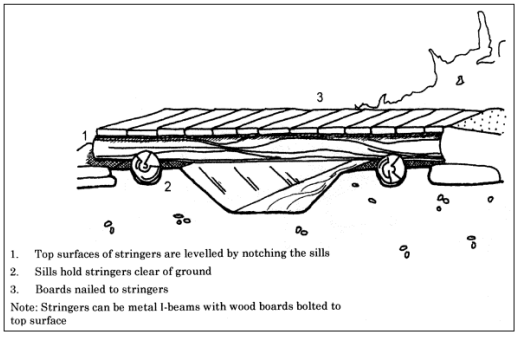
Bridge design should consider the following guidelines:

- the bridges width and weight capacity must meet the needs of the intended users as well as maintenance equipment;
- simple log bridges may be used for stream crossings less than 3 metres wide;
- orient planking at a 45 to 90-degree angle to the direction of travel, gaps between planking oriented in the direction of travel may trap bicycle, stroller or wheelchair tires and endanger trail users;
- planking or rungs should ideally be spaced 1 to 2 centimetres apart;
- rungs should not overhang stringers by more than 5 centimetres;
- surfacing should be non-slip, e.g. rough sawn timber, brushed concrete, asphalt with imbedded stone chips or rolled roofing material (in rustic situations).
- make approaches straight and level;
- must be located above the top of bank to minimize erosion and sedimentation of streams;
- structures in direct contact with water should be inert (for example, natural untreated cedar or pre-cast concrete or steal.
- have barriers on both sides and railing if the bridge is higher than 60 cm;
- where there are railings, bridge width should be 60 cm wider than normal trail tread to allow for the overhang of handle bars;
- frequently used trails overlooking significant water features should consider additional bridge width to accommodate users stopping to view the watercourse without blocking traffic.

Span Diameter Table*

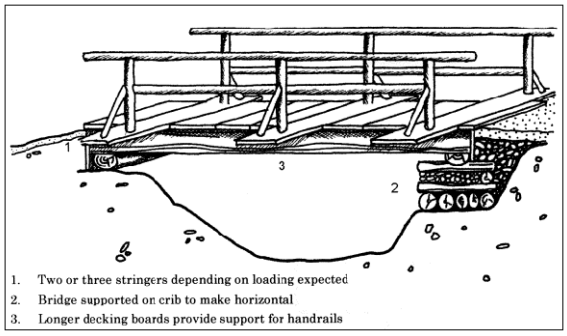
Clear Span (metres)	Douglas-fir Timber (cm) Width x Depth	Peeled Log Diameter (cm)		
		Fir	Spruce	Cedar
0 - 4.5	15.5 x 20.5	22	24	26
4.8 - 6	20.5 x 26	27	29	31
6.3 - 7.5	20.5 x 31	31	34	36
7.8 - 9	31 x 31	36	38	41
9.3 - 10.5	31 x 36	40	43	46
10.8 - 12	36 x 41	43	49	51
12.3 - 13.5	41 x 41	47	52	56
13.8 - 15	41 x 46	51	57	61

** Dimensions provided by Nelson Forest Region*



1. Top surfaces of stringers are levelled by notching the sills
2. Sills hold stringers clear of ground
3. Boards nailed to stringers

Note: Stringers can be metal I-beams with wood boards bolted to top surface



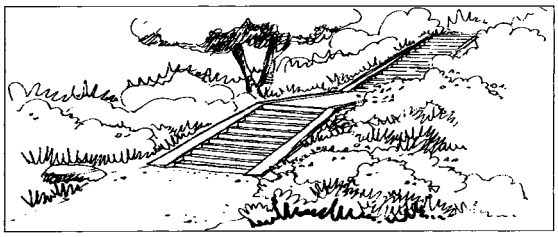
1. Two or three stringers depending on loading expected
2. Bridge supported on crib to make horizontal
3. Longer decking boards provide support for handrails

Source: Ministry of Forests

Steps

Steps can be used on short, steep trail sections to ensure user safety and to help prevent erosion. A series of short

Steps for Bicycle Trails



flights of 14 steps or less, with ample landings in between, is preferable to a single long flight. Handrails should be installed on at least one side where flights are steep and long. A 10 cm rise with a 45 cm tread depth is ideal for multiple use trails. Tread depth should not be less than 30 cm and riser heights should not exceed 20 cm. Narrow paths or ramps should be built on either side of the steps for cyclist to wheel their bikes as they walk up or down. Use of steps requires adequate warning signs and clear visibility, especially from the top approach.

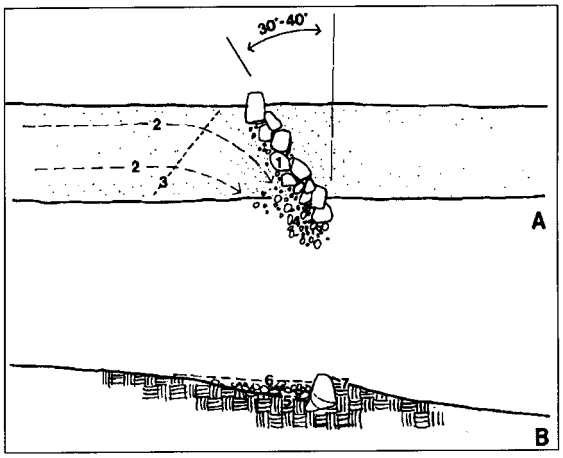
Drainage Control Measures

Excessive water on a trail can significantly limit trail use, creating conditions harmful to the trail and hazardous to the user. Excess water accelerates erosion and damages the trail surface. Trail users seeking to avoid the wet conditions might trample adjacent vegetation.

Some cross-slope is needed along a trail to allow water to drain off the path. However, excessive cross-slopes are difficult for people with mobility difficulties to negotiate. Rapidly changing cross-slopes are not appropriate for urban trail where wheelchairs and walkers may be used. Generally, cross-slopes for urban trail should be less than 4 percent. Consider the intended use of the trail when determining cross-slopes.

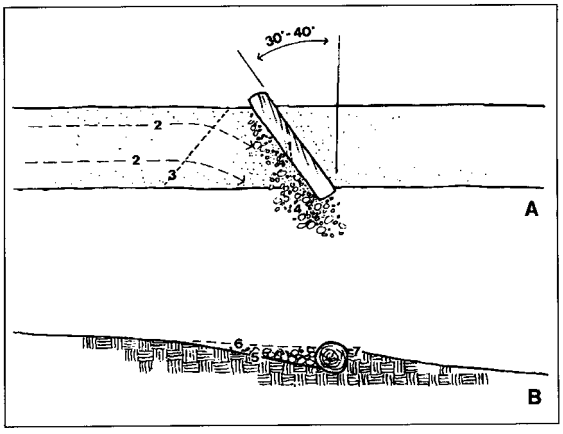
Drainage bars are often used to encourage the flow of water off the trail. Drainage bars consist of rock, wood or rubber structures placed across the trail tread to divert water off the trail on steep slopes. Thin, flexible rubber drainage bars are easier for strollers and other wheeled devices to cross. Mixed-use urban or rural trails should not use drainage bars. Swales and drainage channels can provide the same degree of water runoff while affording better access than drainage bars. Building trails with gentle slopes is the easiest manner to avoid the need for drainage bars.

Rock Water Bar



A Plan view
B Longitudinal section
1 Rocks, 150 mm > in diameter
2 Direction of drainage flow
3 Outside edge of tread dropped starting 2 to 3 m in front of rocks
4 Stone placed in front of and at lower end of rocks to reduce scouring
5 Outside edge of tread
6 Inside edge of tread
7 Tread raised to top of back of rocks

Log Water Bar



A Plan view
B Longitudinal section

1 Log, 15 to 20 cm diameter, top end set into slope
2 Direction of drainage flow
3 Outside edge of tread dropped starting 2 to 3 m in front of log
4 Stone placed in front of and at lower end of log to reduce scouring
5 Outside edge of tread
6 Inside edge of tread
7 Tread raised to top of back of log

Source: Parks Canada

Where water flow is consistent, culverts, short sections of boardwalk, or bridging can be provided. Consider closing wetlands and poorly drained areas during certain times such as the spring thaw. Porous surface materials such as gravel, wood chips, or corduroys (logs or rocks laid on a trail) may be used to improve drainage and mitigate trail erosion.

Mountain Bike Technical Trail Features
Technical trail features are an obstacle on a trail requiring negotiation, the feature can be either man-made or natural such as an elevated bridge or rock face respectively. TTFs must be built and finished to minimize potential injury to a falling rider colliding with the structure or its supports. TTF should incorporate the principle of making riders fall early, by placing a narrow section or difficult turn early while the TTF is still close to the ground (known as a gateway). Inexperienced riders will dismount early before the TTF is high above the ground where the rider is more likely to be injured should a fall occur. By placing the most difficult section of the TTF visible from the entry the rider can make an informed decision before they may get into difficulty with a TTF that may be beyond their ability. Do not construct TTFs with wide, easy entrances leading to high, narrow, difficult features.

Man-made TTFs will only be supported by the City is certain managed situations where risk and liability issues are at a minimum. Difficulty of TTFs must correspond to overall trail difficulty ratings.

The TTF must be built to exceed minimum strength standards of supporting a centred vertical load of 200 kilograms (440 pounds) and a horizontal load of an 80 kilogram (180 pound) adult leaning against the constructed feature with less than 5cm of displacement. Cross bracing of vertical members is required. Do not mount TTFs to living trees as the tree will sway and continue to grow and thus compromise the integrity of the TTF. Nailing to live trees is also harmful to the tree. The preferable method of joining members together is nuts and bolts, the second choice is screws and the last method is ardox nails. Ensure that two-thirds the screw length penetrates the stringer. Loading on a support member should not be done in a way as to rely exclusively on the shear strength of the joining method.

Accessibility
It is important to consider trail elements and characteristics, such as grade, cross-slope, surface type and signage, that have the greatest impact on access. The design needs of all user groups, including people with disabilities, should be considered when planning a trail.

Not only are grade and cross-slope important considerations for wheelchair use but the rate of change of grade over a given distance is an important factor. The maximum recommended rate of change of grade over 0.61 metres (the approximate length of a wheelchair wheelbase) is 13 percent.

When designing a trail with access in mind it is important to consider providing level rest areas wide enough to provide wheelchair users and others a place to rest and gain relief from prevailing grade and cross-slope demands. The most inviting rest areas include a

bench, shade, and an animal proof garbage receptacle. The recommended intervals for rest areas range from 100 to 400 metres depending on the difficulty of the trail.

A trail designed for access must consider changes in level of the trail surface. Ruts caused by erosion, tree roots and rocks protruding from the trail surface materials such as soil and crushed rock almost always have small changes in level. Changes in level can cause many difficulties for people with mobility impairments, such as cane or crutch users. Many cane or crutch users have difficulty lifting their feet high up off the ground, and abrupt changes in level can cause them to trip or fall. A maximum change in level for a trail intended for people with disabilities is 13 millimetres.

The surface material on a trail significantly affects which user groups will be capable of negotiating the path. Soft surfaces such as sand, mud, and loose gravels are difficult for people with mobility impairments to negotiate and should be avoided. Locations where the surface changes unexpectedly can frustrate or even endanger trail users unable to negotiate the new surface. This is especially critical in areas where conditions change dramatically, i.e., from asphalt to a soft or uneven gravel. Providing information about surface changes and other obstacles (i.e., stairs) through signage can help visitors avoid such problems.

Trailhead Facilities

Trailhead facilities provide a base or staging area for associated trail systems. The size of the parking area, where land is available, should be related to the anticipated demand and total trail length. A general rule of thumb used by the BC Ministry of Forests is 1.5 parking stalls per one kilometre of trail. As many of the trails in Kimberley are already existing and may not have adequate or available land at the trailhead, parking and trailhead facilities will have to be provided where land availability permits. Parking areas and trailhead facilities must be noted on all trail mapping and brochures.

Parking facilities used in the winter months must be designed to deal with snow and should be cleared 2 metres beyond the edge of the parking area to allow for snow removal.

All trailheads should contain an animal-proof garbage receptacle and a washroom facility or outhouse where appropriate. At the start of the trail, trailhead signage should be provided to serve as a common focus and to supply trail information.

10.4 Trail Planning and Design Process

A summary of the trail planning and design process is as follows:

Step 1: Project Initiation: Inform Manager of Parks & Leisure Services of project idea.

Step 2: Project Definition: Define the intended scope of the project.

Step 3: Review Trail Requirements: Review the Trails Master Plan and related material.

Step 4: Analyze Trail Resources: Assess land tenure and site characteristics in relation to the needs of trail users and requirements for environmental protection and safety.

Step 5: Concept plans are developed. The concept indicates an approximate route and rationale for its choice. In many cases more than one concept will be developed. Review concepts with City staff and the Advisory Trail Planning Committee.

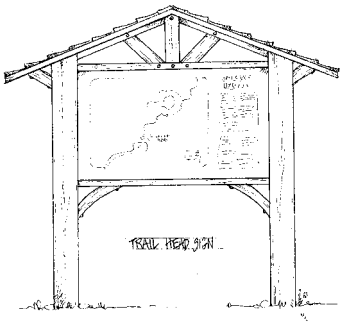
Step 6: Evaluation of Concepts: Comparisons should be made of scenic and interpretive features, variety of experience, trail length and difficulty, environmental disturbance, costs and maintenance requirements. Carefully examine the area for routes between points of interest.

Step 7: Trail Design and Construction: Well designed trails create harmony between the user and the location. Consult City staff for design specifications for the trail based on its location, intended use and difficulty level. Using Kimberley Master Plan's Design and Construction Standards as a guide, determine the trail pattern and approximate length, maximum grade and curve radius, and minimum overhead clearance and width standards. Identify potential trail-use hazards or construction problems, including lakes and streams, motorized roadway intersections, and soils that are erodible or poorly drained. Determine the trails signage requirements. For supplementary information on trail planning, design and construction refer to Parks Canada's *Trail Manual*, BC Parks' *Park Facility Standards,* and the BC Ministry of Forests' *Recreation Manual*.

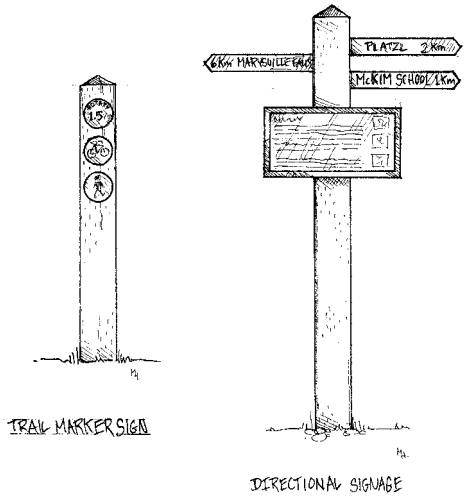
10.5 Sign Guidelines

Signs are a necessary component to trail management. Signs are used to guide, identify, educate, warn or prohibit. Signs are also important to the City's risk management requirements in recreation use management. Signs should blend with the natural setting and be kept to a minimum and used only where necessary to provide users with information about trail amenities, regulations, and risks. Well-designed and maintained signs can create a positive atmosphere and image. Consistency in signs can provide for quick identification. A hierarchy of trail signs should be included as a key element to any trail system. This hierarchy should include:

<u>*Trailhead signing*</u> is typically located at trail entrances, major crossroads and staging areas. This provides orientation to the trail system through mapping and interpretive information. Trailhead signs should also identify trail warnings and closures as well as outline trail etiquette and regulations. Larger in size trailhead signs are visible from a distance and for the passing motorist can be used as a trail "identifier".

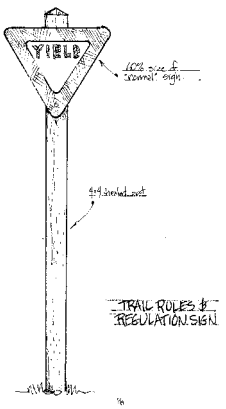


<u>*Trail directional signs*</u> should be located at every trail intersection to cue trail users for destinations and in some cases, distances to destinations. Directional signs are typically small blade signs mounted on a wood or metal post.



<u>*Trail marker signs*</u> should be located at regular intervals along the trail. The purpose of trail markers is to provide a simple visual message to users that they are still on the route. In some cases, trail markers are simply colour coded reflectors fastened to adjacent trees and in other cases trail marker signs may take the form of a bollard with a trail logo, permitted uses and distance marker clearly displayed.

<u>*Trail rules and regulation signs*</u> should be posted at every access point to clearly articulate whom the permitted users are, regulations and laws that apply, as well as trail etiquette, and safety information. Some of this information can be incorporated into the trailhead sign. Warning signs may be needed at various locations such as " Danger, Steep Slope" or "Limited Visibility."

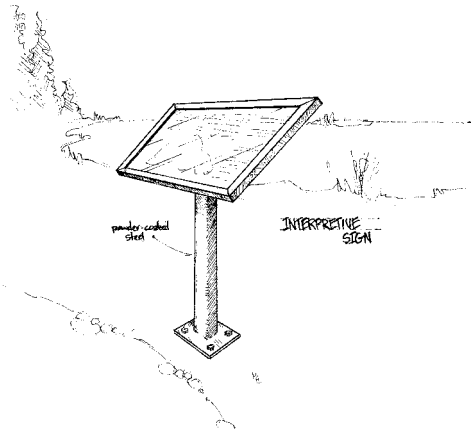


When identifying permitted and prohibited uses it is recommended that the City of Kimberley adopt a set of pictograph signs from the standards set from BC Parks. This ensures that Kimberley's pictograph signs will be both of an international standard and in keeping with pictograph signs already familiar to British Columbians.

Where traffic control signs are needed (stop, yield, curve ahead, etc.) it is recommended that recognizable traffic control signs be used from the Uniform Traffic Control Devices for Canada Manual (UTCDCM). These signs are intended to be easily recognized, and offer a high degree of visibility.

UTCDCM standards may be adapted, by reducing the prescribed size of warning signs from vehicular, highway standards (typically 60cm X 60cm) to 20cm X 20cm for pedestrian and bicycle users. This is designed to aid in setting a visual and marked difference between roadways and trails.

Interpretive signs should be located at key trail features having a story to be told. These features may be cultural, historical, or natural. Interpretive signs should be highly graphic and easy to read.



The design and construction of the trail signing system should incorporate a "family" of design elements, materials and techniques. The use of similar material and design elements will become immediately recognizable by the trail user. Consistent use of the trail logo on all sign types is a strong identifier and unifier. Vandal resistance must be considered when specifying materials and construction methods for signage.

11.0 Trail Maintenance

Trail maintenance keeps trails at or near constructed or intended conditions. Regular trail maintenance can enhance user safety, provide continued trail access and preserve the trail environment. A high maintenance standard implies quick response to trail deterioration. Programs such as "Adopt-a-Trail" encourage local volunteers to maintain a section of trail as a service for all the recreation users of the trail.

Due to the magnitude of Kimberley's trail amenities, the limited resources of the City of Kimberley and committed volunteer resources an Adopt-a-Trail program in Kimberley is recommended. Adopt-a-Trail documentation has been drafted and attached as Appendix E.

Reasonable care must be taken to ensure that trails are free from danger. Regular inspection and records showing dates of inspection, the state of the trail, hazards, required

repairs or remedies and the actions taken to correct the hazards should be pursued and the records maintained. The frequency and method of inspection will be determined on a trail by trail bases.

General Trail Maintenance Guidelines

- Prepare an annual Trail Maintenance Plan
- Practice environmentally sound maintenance and use techniques appropriate for the type of trail. For example, avoid the use of chemicals to retard vegetation growth.
- Inspect trails in the spring and maintain them throughout the summer and fall on an as-needed basis.
- Prioritization of all trail maintenance tasks are:
  - Correct unsafe trail conditions;
  - Repair environmental damage;
  - Restore the trail to desired conditions.

Annual Spring Tasks

- Check the structural integrity of trail features, such as bridges, steps, and railings. Repair damages.
- Clear windfalls and dangerous trees from the trail bed for safety and to prevent detouring.
- Remove loose rocks and debris from the tread surface.
- Repair trail washouts.
- Remove new plant growth (in the spring when the new growth is soft).
- Level the trail tread as necessary and restore the trail grade to the original slopes. Fill ruts, holes, low spots, or muddy areas.
- Clear and maintain drainage feature to minimize trail erosion and environmental damage. Check and repair water bars, drainage ditches, culverts and drainage dips. Construct additional drainage works if needed.
- Check, repair or replace signs and trail markers prior to the high-use season.

Weekly or Monthly Tasks (As Trail Use Warrants)

- Maintain trailhead facilities such as toilets or waste containers.
- Re-supply trailhead information kiosks with route brochures.

12.0 Implementation Plan

In order to formalize a trail network in Kimberley an implementation plan is needed to guide trail development and the formalization of a trail network. It is important that issues identified in this plan are resolved and trail planning, design and construction consider the standards identified in this document.

Phase 1 – Risk Management (2003)

- Ensure legal access to identified existing trails is obtained;
- Co-ordinate an Adopt-a-Trail Program for all existing trails identified by the Master Plan;
- Establish level of difficulty for all trails;

- Identify hazards, correct situation or identify risk on trails maps or close the trail and erect signage;
- Improve trail signage, post signs at all trail entrances indicating that the trail is a "recreational trail" and that trail users "use at their own risk".
- Assess all trail-road intersections and determine if safety precautions are needed.

Phase 2 – Seek Funding (ongoing)

- In order to expedite the implementation of this plan funding sources in addition to the City of Kimberley will have to be pursued;
- Seek public and private cost-sharing and granting opportunities;
- Explore potential partnership opportunities with local business, including sign and trail sponsorships.

Phase 3– Trail Mapping and Signage Plan (2003)

- Improve trail mapping by using GPS to identify trail locations, establish trail profiles (elevation gained and lost), and trail length.
- Map trail difficulty ratings for all trails.
- Identify and map all trail hazards, obstacles and significant maintenance requirements.
- Determine signage needs and develop a sign plan for each trail area using the sign standards developed by this plan.

Phase 4 – Trail Network Promotion (ongoing)

- Market trails as a community and tourist amenity;
- Develop a trail marketing plan in conjunction with other marketing initiatives including the Chamber of Commerce, Kimberley Vacations, Tourism Rockies and the Kimberley Alpine Resort.
- Establish a Trail Network Brochure which illustrates the trails, trail difficulty, trail rules and regulations, trail risks, trail etiquette and other educational information that will reduce user conflicts and user impacts.

Phase 5 – Signing Trails (2003 - may require to be phased over a number of years depending on funding)

- Erect entrance signs at trailheads which incorporate trail maps, trail closures, trail rules and regulations;
- Place directional signs at all trail intersections;
- Post trail markers along routes;
- Post any necessary regulation or warning signs along trails;
- Dedicate interpretive routes and points of interest, install interpretive signs.

Phase 6– Improve Existing Trails (this phase can be concurrent with all other phases)

- Generally improve trails by improving trail surface, trimming and removing deadfall, reducing erosion, constructing stairs and bridges.
- The construction of the bridges identified on Schedule C and D will significantly improve the Kimberley Trail Network.
- Upgrade sections of trail to allow for consistent trail difficulty ratings.
- Identify high use multiple purpose rural trails that may support trail widening and surface hardening.
- Paved urban trails have been identified as a priority. Pave high use urban trail such as the Mark Creek Lions/Rotary trail (attempt to develop a paved loop trail).

Phase 7– Construct New Trails (funding dependant)

- Construct proposed trails as funding becomes available.
- The Rotary Club plans to construct a new trail from Marysville Falls to the Riverside Resort Campground in 2003, 2004 and 2005.
- Paved urban trails have been identified as a priority.
- The construction of the bridges identified on Schedule C and D will significantly improve the Kimberley Trail Network. Install the bridge structures donated to the City from the Cranbrook Forest District.
- Pursue the potential opportunity of a rails-to-trails conversion of the Kimberley-Cranbrook CPR line.
- New trails should consider the development criteria as well as other planning considerations established by the Trail Network Master Plan. Providing unique trail experiences, creating links between trail resources and looping trails should be considered when planning new trails.

13.0 Recommendations

The key to successfully implementing an integrated trail network system in Kimberley will be developing Council policy that will foster that development. It is recommended that the City of Kimberley:

- Update its Official Community Plan to include policies that will encourage the development of an integrated trail network system:
- Adopt policies that may require land developers at the time of subdivision, to dedicate potential trails or trailhead areas as park in accordance with, and to the extent permitted in the *Local Government Act*;
- Amend the Subdivision Servicing Bylaw to include trail construction specifications outlined in Appendix G.
- Consider the use of amenity zoning as per Section 904 of the *Local Government Act* to encourage and secure the development of a paved urban trail network.
- Secure necessary trail right-of-way agreements as part of the development approval process;

- Link policy and regulations pertaining to trail planning, design, construction, and maintenance to the Trails Master Plan;
- Commit to ongoing recreational trail planning;
- Consider the possibility of providing limited motorized recreational vehicle and equestrian trails to access the "backcountry" from within the City boundaries;
- Encourage regional trail connections that will connect communities and provide an alternative mode of transportation
- Contemplate expanding the City boundaries to include recreation trail amenities such as the Lois Creek Trails and the Horse Barn Valley/Dipper Lake area;
- Evaluate public recreational trail use within the Mark Creek and Mathew Creek watersheds;
- Provide animal-proof garbage receptacles and garbage removal at key trailhead locations;
- Provide snow removal from trailhead parking areas;
- Establish a Trail Planning Advisory Committee to assist with the implementation of the Trails Master Plan, future trail planning, and improve communications between stakeholder groups;
- Commit funding to implement the Trails Master Plan, within its resources.

14.0 List of References and Additional Resources

Trail Manual. Parks Canada, 1985

Park Facility Standards, BC Parks, as amended.

Recreation Manual, Ministry of Forests, as amended.

Designing Trails for Access. US Office of Human Environment, 1999

Whistler Trail Standards: Environmental and Technical Trail Features (First Draft). Resort Municipality of Whistler, September 2001.

Bruce-Grey Trails Network Master Plan. ESG International, 2000.

Toronto's Waterfront and the Sustainable City: Final Report. Royal Commission on the Future of the Toronto Waterfront, 1992. Ontario Queen's Printer.

Statewide Parks Study .Colorado State Parks, 1992.

National Survey on Active Transportation. Environonics, 1998.

Physical Activity Benchmarks Report. CFLRI (Canadian Fitness and Lifestyle Research Institute), 1997.

Physical Inactivity as a Risk Factor for Coronary Heart Disease. A WHO and International Society and Federation of Cardiology Position Statement. Bulletin of the WHO. WHO (World Health Organization), 1994.

Physical Activity and Health. A Report of the Surgeon General. U.S. Department of Health and Human Services, 1996. Atlanta, GA.

Linkages: Built Environment, Wellbeing and Active Living. Active Living – Go For Green, 1995. Warren, N.M., 1998.

Nova Scotia Hiking Trails Study. Nova Scotia Trail Federation.

APPENDIX E
Kimberley's Adopt a Trail Program

The Adopt-A-Trail Program is a voluntary agreement between a particular organization, a business, or individual(s) and the City of Kimberley. The adoption of a trail by a given organization requires that they provide the maintenance needed to sustain recreation use by the public throughout the operating season. The City has developed Trail Construction and Maintenance Standards to follow when constructing and maintaining trails. The City of Kimberley will make the decision as to which trails or routes should be adopted and will assign trails based on adoption requests and maintenance needs.

Objectives of the Program

- Create a spirit of cooperation between different user and community groups, businesses and the City.
- Promote land stewardship, physical fitness, and instill a sense of pride and ownership for volunteers.
- Allow the continued enjoyment of the trails in our forests, year after year, for generations.
- Promote all aspects of trail safety.

Trail Maintenance Activities

The level of required maintenance varies with each trail. The organization adopting a trail, capabilities must be matched with the level of each trails maintenance needs.

Maintenance responsibilities will include:

- Reviewing the Trail Maintenance Standards outlined in the Kimberley Trail Network Master Plan.
- Removing litter and any foreign items from the trail at least once each spring, summer and fall.
- Removing logs and brush that encroach onto the trail.
- Clean out waterbars or other drainage structures.
- Completing a Trail Maintenance Assessment Form regarding the condition of the trail and listing problems that need attention and submit form to the City.

Maintenance responsibilities may also include some or all of the following:

- Review the Trail Design and Construction Standards in the Kimberley Trail Network Master Plan.
- Install and repair waterbars or other drainage structures.
- Provide protection to stream crossings, meadows, and wet areas.
- Improve and maintain trail traction by rock or log placement, stair construction, and or the addition of surface materials.
- Maintain trails to the designated difficulty rating.
- Remove traces of any use that occurs off the designated trail.
- Install, maintain and replace trail markers.
- Install, maintain, and replace trail signs and notices as needed.
- Other related maintenance activities as specified on the Volunteer Agreement.

Trail Maintenance Standards

Preserving the quality of the trail experience, while providing a minimum level of soil and vegetation disturbance, should be the goals of the Adopt-A-Trail volunteers. Trail user safety and enjoyment as well as environmental protection should be considered priorities whenever trail maintenance is performed. It is important that all Adopt-A-Trail Volunteers are familiar with the goals and standards outlined in the Kimberley Trail Network Master Plan.

Safety

Safety is the most important consideration while working on a trail. There is always the potential for accidents while using trail maintenance and construction tools in the woods. Maintainers need to be constantly aware of these dangers. The best way to work safely is simple: use common sense. The following is a good safety checklist:

- Let someone know where you are;
- Carry a small first aid kit;
- Where a good pair of work gloves and boots;
- Where long pants when working in brush;
- Be certain that all tool heads and handles are tight with no cracks;
- Carry tools on the trail safely.

City of Kimberley

Adopt-A-Trail Program

Adoption Request

Date of Request:_____

We would like to enter into an agreement with the City of Kimberley to Adopt-A-Trail as part of the City's Adopt-A-Trail Program.

Organization/Group Name: _____

Contact Person: _____

Mailing Address: _____

Phone Daytime: _____ Phone Evening: _____

Fax: _____ E-Mail:_____

We are interested in adopting _____from the list of adoptable trails.

If this route is no longer available, we would like to adopt one of the following:

1._____
2._____
3._____

Please complete this form and the volunteer agreement and return them both to:

Trail Coordinator
City of Kimberley
340 Spokane Street
Kimberley, BC
V1A 2E8

City of Kimberley
Adopt-A-Trail Program
Contract Agreement

THIS AGREEMENT is entered into between_____, hereafter called the VOLUNTEER, and the City of Kimberley, hereafter called the CITY.

WHEREAS, the VOLUNTEER is prepare to provide services as follows:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

All work will be done in accordance to the Kimberley Trail Network Master Plan.

Whereas, the VOLUNTEER agrees to provide the above services at the following times:

_____
_____

It is understood that the VOLUNTEER will not expect reimbursement for incidental expenses, except as mutually agreed upon.

WHEREAS, the City agrees to provide trail maintenance standards, technical advice, guidance and where necessary inspection.

_____
_____
_____
_____

WHEREAS, the VOLUNTEER agrees to submit the Trail Maintenance Assessment Form to _____within one week of completing the mandatory Spring, Summer and Fall inspections.

The CITY shall decide on all questions which may arise as to the promptness and acceptability of service provided by the VOLUNTEER and that the CITY may void or

cancel this agreement by given written notice to the VOLUNTEER, thereby voiding or canceling said agreements. The VOLUNTEER may cancel this agreement at any time, for any reason by giving notice to the CITY.

This Agreement is accepted by:

Name: City of Kimberley Date:	Name: Group Name: Date:

Group name: _____ Date: _____

Person completing form: _____ Phone #: _____

Trail name: _____ Trail distance: _____

General conditions of trailhead:_____

Is there any evidence of vandalism? Where? _____

General conditions of trail signs and markers:_____

Are the trail markers and cautionary signs located at appropriate locations? Are they visible?_____

Was there litter at the trailhead or along the trail? _____

Was there any evidence of erosion along the trail? Gullies, clogged or missing water bars, or washouts? If so, please describe and note location? Please confirm that maintenance was completed in these areas and if any additional maintenance is required._____

Was there any (or evidence of) water standing on the trail? Was there multiple treadways around the wet areas? If so, please note location: _____

_____

_____

_____

_____

_____

Were there any areas along the trail that are obstructed by blowdowns or overgrowth? Please confirm that maintenance was completed in these areas and if any additional maintenance is required._____

_____

_____

_____

_____

Are there any areas along the trail that appear to be damaged by trail users?_____

_____

_____

_____

Please make note of any additional maintenance concerns or improvement suggestions for the subject trail: _____

_____

_____

_____

_____

_____

_____

Please return to: City of Kimberley, 340 Spokane Street, Kimberley, BC, V1A 2E8

APPENDIX F

Construction Cost Estimates

Trail Construction Costs

Material	Description	Cost/Linear M	Construction Cost/KM
Asphalt (3 m wide)	New trail construction – clearing and grading	$75 - $100	$75,000 - $100,000
Asphalt (3 m wide)	On existing trail bed – no clearing or grading	$ 45 - $63	$45,000 - $63,000
Gravel (3 m wide)	New trail construction – clearing and grading	$40	$40,000
Natural Surface	Costs dependent on terrain, soils, access, etc	$ 0.50 - $5	$500 - $5000

*Costs were derived from several different sources and may not reflect actual costs as each situation is unique. Estimates costs do not consider volunteer labour.

Trail Sign Costs

Sign Type	Cost Per Sign
Trailhead A	$2000
Trailhead B	$800
Trailhead C	$300
Directional Sign	$300 - $400
Trail Marker A	$100 - $200
Trail Marker Blaze	$7 - 8
Liability Sign	$13- $15
Warning Sign	$70 - $125
Interpretive Sign	$800

* All costs based on volunteer installation on site.

Bridge Costs

Bridge Type	Description	Cost Estimate
Rustic - Treated Wood	2 m wide by 8 m long	$3000 - $5000#
Rural	Minor crossings	$5000 - $20,000
Engineered Bridge	Major crossings, urban and rural trails.	$50,000 - $200,000

labour costs vary due to situation, material approx. $1500 (Source: MoF Gold Rush Snowmobile Trail)

Bridges range from boardwalks and timber bridges with decking, to engineer structures to accommodate maintenance vehicles and withstand flood events.