VI. DEVELOPMENT COMPONENTS

VI.1 Introduction

The size, scale, and phasing of the base area/village development is a function of the expansion plans for the mountain, the need for complementary amenities and staging facilities in the base area, and the amount of overnight accommodation that Silver Star can successfully support.

All effort should be made to ensure that any development is completed in an environmentally sensitive fashion, such that the natural setting is left unaltered to the greatest degree possible. Silver Star's guests come to the resort to enjoy the out of doors environment. As such, the sensitive establishment of the development components discussed below, are key to the ongoing success of the resort.

VI.2 The Mountain Master Plan

At build-out, the Silver Star Ski Area Master Plan (1994) calls for the following developments:

- 661 hectares of skiable terrain
- 14 lifts
- CCC potential of 14,714 skiers per day

The development will occur over five phases. The Silver Star management has made an active decision to pursue the first three phases of development and expansion of the mountain facilities, which will bring the CCC to 8,874 skiers per day. The focus of this development will include the installation of the Town Chair Express, the Silver Woods Express, and the Trinity Express.

These plans provide the baseline from which the base area/village space use and accommodation requirements (number of bed units) can be calculated, subsequently leading to a well balanced and complementary Base Area Master Plan.

VI.3 Space Use Requirements

Based on the proposed CCC of 8,874 skiers per day, and taking into account the developed space at Silver Star to this point, the space use requirements for the base area at build-out have been determined. In addition to facilities specifically designed to meet the needs of the alpine skiers, facilities to take into account nordic skiers and non-skiing guests must be taken into account.

Typically, on a day when the proposed CCC of 8,874 alpine skiers are in attendance, the number of extra visitors would total approximately 700, bringing the total number of resort visitors to about 9,580 people at one time. On such a day, as defined in Table 7, approximately 125,000 square feet of space is required to service the skier's activities. In addition, another 28,000 square feet of premium space will be required to provide for destination visitors.

At this time, the amount of ski related development in place at Silver Star represents approximately 36% of what will be required for the facilities to service the needs of the mountain in a balanced and pleasant fashion at based on a CCC of 8,874 skiers. The exact location of the skier related and premium space is a function of a more detailed village planning exercise.

Further, parking for about 2,700 cars will be required. The location of the parking is a function of the amount of additional parking that can be created in a more detailed village plan, combined with the amount of parking that will be absorbed in the creation of additional ski to/ski from residential development.

Bus parking must also be addressed. As defined in Table 7, parking for 36 buses is required. In reality, the actual number of buses that would have to be parked is a function of the establishment of a shuttle system from Vernon and the amount of multi-day tour traffic in which guests would be delivered to Silver Star and picked up again upon their departure.

Silver Star: Base Area Analysis

Table 7: Expansion Space Use Requirements
Based On The 1994 Mountain Master Plan

CCC = 8,874
Guests = 710
Total = 9,584

Service/Function	Existing Space(Sq.Ft)	Space Required	Difference From Ideal	Percentage Of Ideal
Restaurant	11,780	31,339	(19,559)	38%
Kitchen/Scramble	5,906	12,536	(6,630)	47%
Bar/Lounge	5,017	3,354	1,663	150%
Women's Rest Rooms	1,367	9,776	(8,409)	14%
Men's Rest Rooms	1,230	6,517	(5,287)	19%
Ski School	2,080	4,881	(2,801)	43%
Equip Rental/Repair	2,175	8,253	(6,078)	26%
Retail Sales	1,600	7,188	(5,588)	22%
Ski Patrol/First Aid	960	3,195	(2,235)	30%
Public Lockers	2,195	5,271	(3,076)	42%
Day Care/Nursery	1,500	10,205	(8,705)	15%
Ticket Sales	400	887	(487)	45%
Administration	2,800	5,324	(2,524)	53%
Employee Lounge	750	887	(137)	85%
Storage Space	954	2,631	(1,676)	36%
Mechanical/Furnace	398	1,096	(699)	36%
Circ./Wall/Waste	4,334	11,948	(7,614)	36%
Total Ski Related Space	45,446	125,289	(79,843)	36%
Destination Space	13,540	27,945	(14,405)	48%
Total Resort Space	58,986	153,234	(94,248)	38%
Total Car Parking	1,630	2,715	(1,085)	60%
Total Bus Parking	7	36	(29)	19%

VI.4 Residential Development

VI.4.1 Future Residential/Overnight Accommodation Requirements

It is the opinion of Silver Star's management team that the on-mountain accommodation capacity has had a significant impact on the attendance results at Silver Star Mountain Resort. A strong demand has been displayed by guests who will only visit if they can stay on-mountain. Furthermore, a large and expanding regional market within a three hour drive of Silver Star is anticipated to increase the incidence of weekend overnight visits and the requirements for accommodation at Silver Star Mountain.

Regardless, increased residential development and overnight accommodation will be required as skiing capacity at Silver Star increases to an eventual planned CCC of 8,874. The Comfortable Carrying Capacity (CCC) of the mountain dictates the size and amount of the various facilities to be developed in the village/base area, in order to establish a well balanced resort. This includes the amount of built space necessary to provide for skier service functions, as well as the amount of space provided for parking cars and buses. It also impacts on the amount of real estate development the resort can be expected to support.

VI.4.2 Bed Units Required at Build-Out

There are some general patterns that provide a basis from which the number of bed units (BUs) necessary to support the ongoing success of a ski resort may be established. In an analysis of the ski industry, S.e Canada has determined that the number of bed units for a regional/destination resort should be about 0.8 BUs per unit of the CCC of the skiing facilities.

To support the Silver Star Master Plan's projected CCC of 8,874 skiers, 7,099 bed units will be required. It must be noted that this is a very generalized conclusion. Actual numbers and type of overnight accommodations developed at Silver Star must be based on a real estate market analysis that takes into account the existing and potential real estate development, physical potential of the site, absorption rates, and perceived market demand. Further, the number of BUs must adhere to the accepted provincial standards of ski area development in B.C. In the case of Silver Star, being situated in close proximity to Vernon's accommodation base, the bed unit calculation must take into account development within the greater regional context.

VI.4.3 Public Versus Private Overnight Accommodations

As previously discussed, many resorts strive to achieve a 60:40 private to public bed ratio. At present, Silver Star Mountain Resort provides a private to public bed unit ratio of 62:38, which appears to be in-line with current market demand.

Translating this 60:40 ratio to the 7,099 bed unit requirement established in Section VI.4.2, the following breakdown can be established to guide residential and overnight accommodation development:

Private Beds

- 60% of total bed units required at build-out = 4,259

Public Beds

- 40% of total bed units required at build-out = 2,840

A further breakdown into unit types assumes a 70:30 split of private beds between single family and condominium (multi-family) units. Public bed units are to be allocated on a 50:50 basis between condominium units and hotel rooms.

Private Beds:

Single Family Units

- 70% of private bed unit requirements = 2,981 bed units
- @ 6 beds per unit = 497 single family units.

Multi-Family Units

- 30% of private bed unit requirements = 1,278 bed units
- @ 4 beds per unit = 319 multi-family units.

Public Beds:

Multi-Family Units

- 50% of public bed unit requirements = 1,420 bed units
- @ 4 beds per unit = 355 multi-family units.

Hotel Rooms

- 50% of public bed unit requirements = 1,420 bed units
- @ 2 beds per hotel room = 710 hotel rooms.

VI.4.4 Summary of Existing Units and Future Requirements

A comparison of the existing accommodation development at Silver Star with the accommodation capacities required to meet an expanded CCC of 8,874, the following future development requirements have been determined:

Existing Units (Built/Committed):

- Single Family Units: 254 units (1,524 bed units)
- Multi-Family Units (private/public): 115 units (460 bed units)
- Hotel Bed Units: 348 bed units

Units Required at Build-Out (CCC = 8,874):

- Single Family Units: 497 units (2,981 bed units)
- Multi-Family Units (private/public): 674 units (2,698 bed units)
- Hotel Bed Units: 1420 bed units

Additional Real Estate Development Requirements:

- Single Family Units: 243 units (1,458 bed units)
- Multi-Family Units (private/public): 559 units (2,236 bed units)
- Hotel Bed Units: 1072 bed units

VI.5 Amenities and Attractions

The amenities and attractions of a year round resort must be constantly evaluated and upgraded to coincide with the development of the mountain, village and reidential areas. Consideration must be given to the following activities as detailed planning and design of silver Star's Base Area continues:

- The expansion of the cross country ski trails

- The expansion of a paved trail system for roller blading, hiking and biking

- The expansion of the horseback riding and mountain bike trail systems
- The choice of location and the establishment of a golf course
- The establishment of an arena adjacent to the Village
- The establishment of tennis courts
- The establishment of a church/chapel
- The provision for amphitheatre and stage facilities to host concerts
- The development of mountain environment gardens
- Provision for paragliding
- Association with adjacent heliskiing with staging facilities from Silver Star.

VIII. THE BASE AREA MASTER PLAN

VIII.1 The Preferred Concept

After each of the development concepts were fully evaluated, a Preferred Concept for Silver Star's base area was generated. This provided the basis for the creation of the Base Area Master Plan.

VIII.2 Silver Star Village

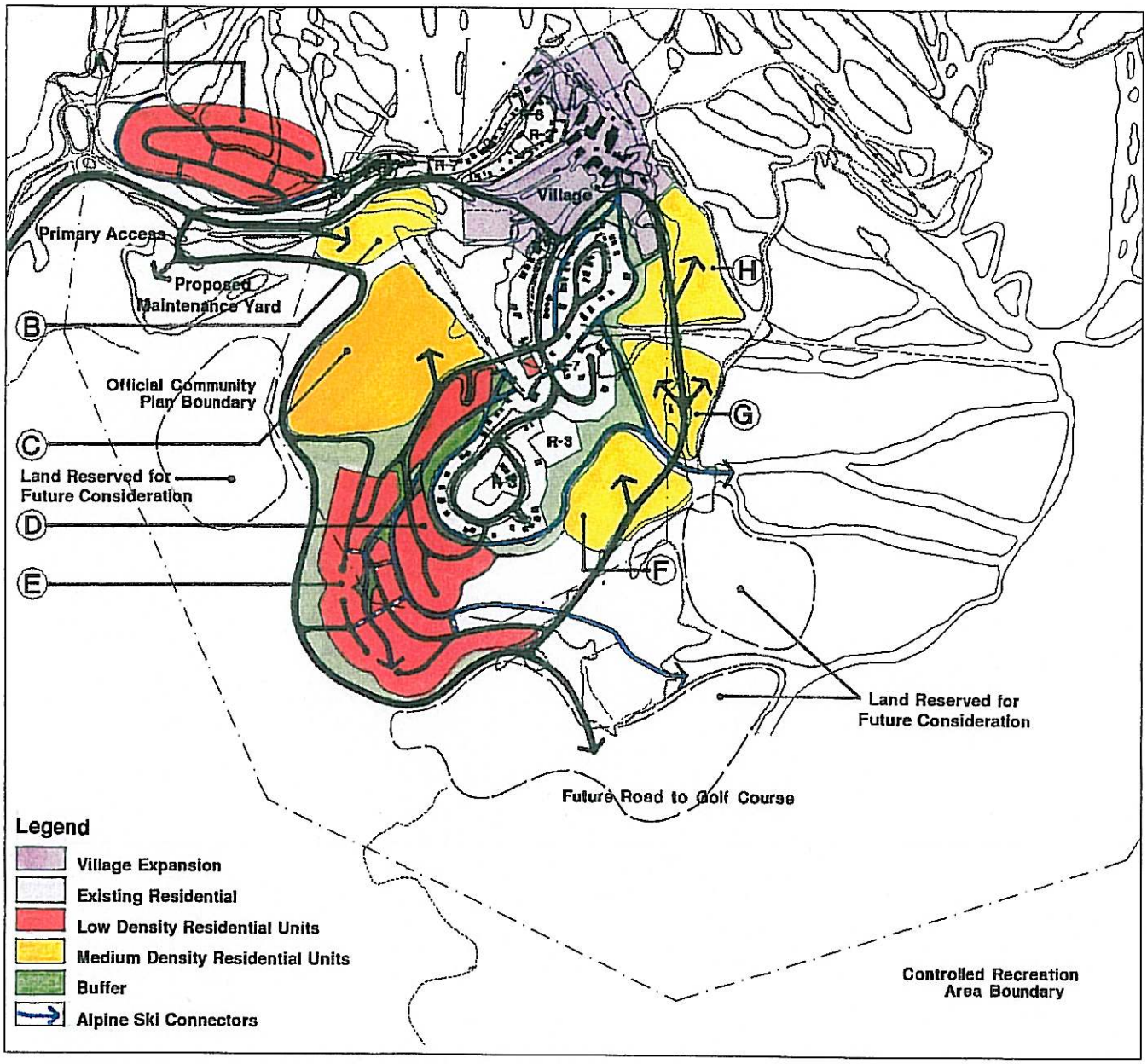
Although the detailed plans for Silver Star Village are still being developed, the area delineated for the Village is more that sufficient to both satisfy the space use requirements necessary to bring the current operation into balance, and to enable a well integrated development matching the needs of the phased expansion of the mountain. Section IX, Phasing, more fully delineates the breakdown of the built space to be developed in the Village as the resort expands.

VIII.3 Residential

The Preferred Concept calls for the establishment of ski to/ski from real estate subdivisions. Without exception, all of the proposed development for overnight accommodation meets the criteria for ski to/ski from residential such that all residents and guests will be able to access the alpine skiing facilities and return home with, in the worst case scenario, a short walk.

The proposed density of the residential development parcels is well within prescribed zoning requirements (See Appendix 1). An average single family unit density of 7.4 units per hectare compares favourably with that of existing residential development areas. Similarly, a proposed multi-family unit density of 15.0 units per hectare is considerably lower than that of the proposed Grandview and Silver Queen Mews/ Mount Royal developments (densities of 23.1 and 26.6 units per hectare, respectively).

The following list summarizes the proposed real estate development, and breakdown by unit type, to meet the increased capacity projections for Silver Star Mountain. Each proposed real estate development parcel is described and outlined in the Base Area Master Plan (Figure 7). Potential hotel development sites are described separately.



SILVER STAR MOUNTAIN

BASE AREA MASTER PLAN

JANUARY 1995

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Real Estate Development Parcel	Area (Ha)	Proposed Development (Unit Type)
A	11.2	76 SFU
B	4.7	71 MFU
C	13.6	204 MFU
D	7.5	58 SFU
E	14.2	109 SFU
F	7.0	105 MFU
G	5.0	75 MFU
H	6.9	104 MFU
Totals:		
SFU	32.9	243 SFU (7.4 units/Ha)
MFU	37.2	559 MFU (15.0 units/Ha)
	70.1	

VIII.3.1 Potential Real Estate Development Parcels

Parcel A

- 11.2 hectares
- Direct ski access from future Attridge Lift
- Acceptable skier walking distance to Attridge collector, ski access to Silver Queen Chair, ski to/ski from within acceptable skier walking distance of Mid-T Tee Bar
- Predominantly less than 30% slope
- Predominantly southern exposure
- Close to Village, primary access road
- No interference with existing facilities
- Skier bridges required to access upper extent of development parcel

Parcel B

- 4.7 hectares
- Direct ski access to/from Silver Queen ski pod
- Predominantly less than 30% slope
- Predominantly S-SE exposure
- Close to Village, primary access road, skating and swimming pond

- Direct access from Silver Star Road
- Requires realignment of existing cross-country ski trails
- Direct cross-country ski trail access
- Incorporates OCP designated future Commercial Resort - Accommodation District

Parcel C

- 13.6 hectares
- Direct ski access to/from Silver Queen ski pod
- Predominantly less than 30% slope
- Predominantly NW-W exposure with south-facing pocket of developable land
- Close to Village, primary access road, skating and swimming pond
- Requires realignment of existing cross-country ski trails
- Direct cross-country ski trail access
- Incorporates OCP designated future Commercial Resort - Accommodation District
- Ideal location/high quality development site suitable for the establishment of a unique "Resort Park" residential development

Parcel D

- 7.5 hectares
- Ski access to/from Silver Queen Chair, acceptable skier walking distance from potential alpine ski connector
- Ski access to future Silver Woods Express at 10% with acceptable walking distance to potential connector
- Parcel involves residential development of slopes greater than 40%
- Exposure: NW-W-SW
- Requires realignment of existing cross-country ski trails
- Direct cross-country ski trail access
- Incorporates OCP designated future residential (low density) district and future road corridors outlined in the OCP

Parcel E

- 14.2 hectares
- Ski access to/from Silver Queen Chair, acceptable skier walking distance from potential alpine ski connector

- Ski access to future Silver Woods Express at 10% with acceptable walking distance to potential connector
- Predominantly less than 30% slope; some slopes greater than 40%
- Exposure ranges from NW to SE
- Requires realignment of existing cross-country ski trails
- Direct cross-country ski trail access
- Incorporates OCP designated future residential (low density) district and future road connectors outlined in the OCP

Parcel F

- 7.0 hectares
- Direct ski access to/from future Silver Woods ski pod
- Predominantly less than 30% slope
- Exposure: E-SE
- Requires realignment of existing cross-country ski trails
- Direct cross-country ski trail access
- Close proximity to water treatment ponds; potentially in viewshed

Parcel G

- 5.0 hectares
- Direct ski access to/from future Silver Woods ski pod
- Predominantly less than 30% slope; some slopes greater than 40%
- Predominantly eastern exposure
- Requires minimum realignment of existing cross-country ski trails
- Direct cross-country ski trail access
- Skiers bridge or underpass required for vehicular access to real estate opportunities

Parcel H

- 6.9 hectares
- Direct ski access to/from future Silver Woods ski pod
- Adjacent to Village, close to primary access road
- Predominantly less than 30% slope; some slopes greater than 40%
- Predominantly eastern exposure
- Requires minimum realignment of existing cross-country ski trails
- Direct cross-country ski trail access

- Require relocation of existing RV parking area
- Displaces proposed maintenance yard (OCP designation)

VIII.3.2 Land Reserved for Future Consideration

Additional land parcels, while not required to meet the real estate development requirements of a CCC of 8,874, are indicated as "Land Reserved for Future Consideration" and would be the next parcels considered if the CCC was to be increased beyond the 8,874 figure. These parcels do not, for the most part, provide ski to/ski from opportunities.

VIII.3.3 Potential Hotel Development Sites

As per the figures generated in Section VI.4.3, 1,072 additional hotel bed units are required to meet a CCC of 8,874. The potential hotel development sites provide direct ski to/ski from access, and are described below.

Upper Village Expansion

- Lands between the existing Pinnacles development and the Chilcoot Conference Centre.
- 400 bed unit hotel proposed.

Proposed Palace Hotel

- Proposed hotel development site to the southeast of the existing Village Centre.
- Phase I designed to provide 192 bed units; future phases required to bring hotel capacity up to 400 bed units.

Lower Village Expansion

- Lands beyond the proposed Palace Hotel development site and to the east of the existing RV lot.
- 150 hotel bed units in association with an expansion of Village commercial facilities.

Village In-fill

- An additional 122 bed units provided through in-fill development within the existing Village Centre.

VIII.4 Existing Vegetation and Buffer Zones

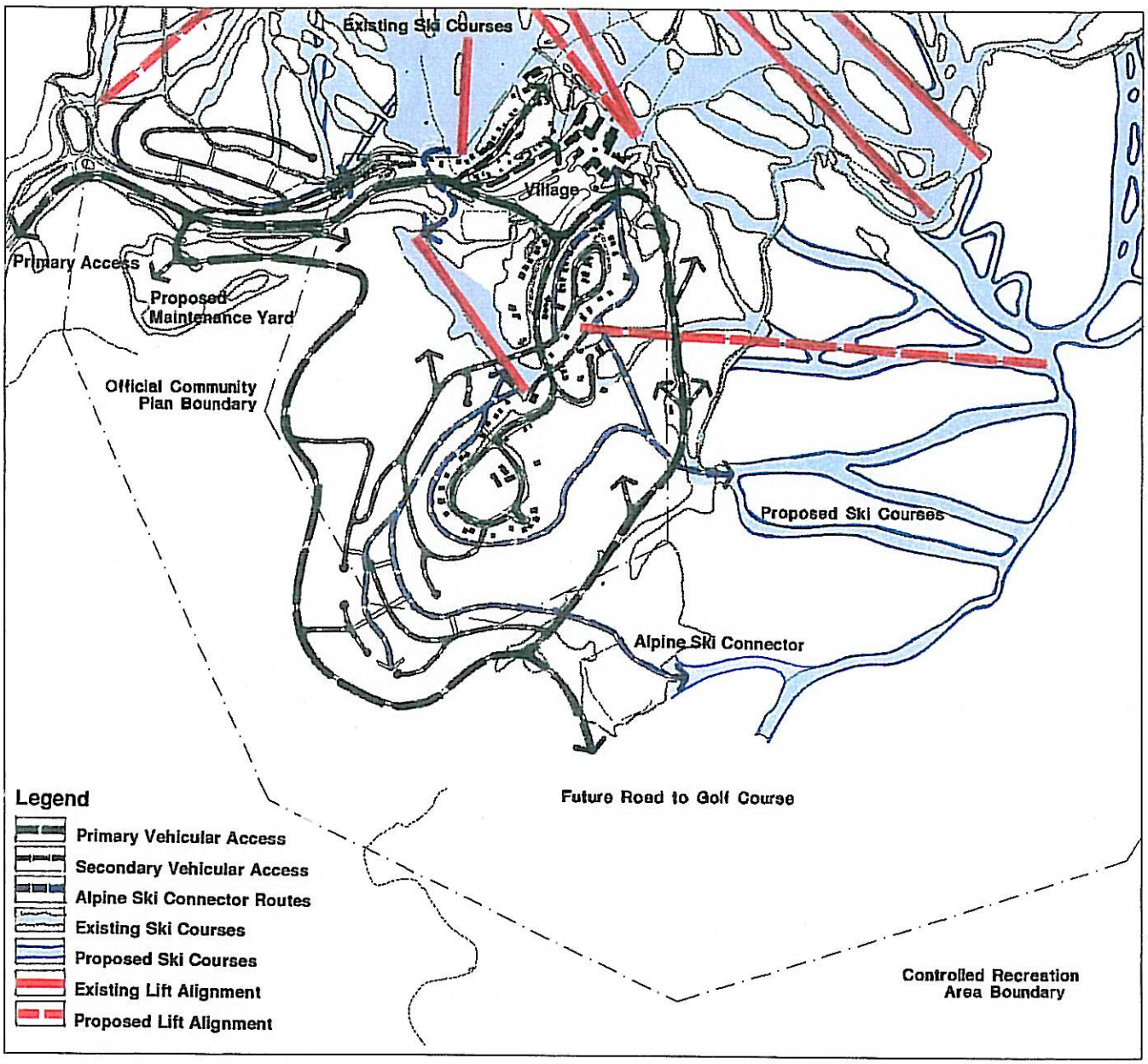
As illustrated in Figure 8, significant buffer zones of existing vegetation have been delineated throughout the residential development. The intent is to maintain the park-like, development-in-the-woods setting by visually separating development packages. Further, the ski connector routes will visually and physically tie the buffer zones together. In addition, there has been an obvious effort, in the existing development, to maintain as much vegetation around building sites as possible. We highly recommend that this exercise be continued and, where possible, formalized as covenants to development.

VIII.5 Access and Circulation

Silver Star Road will remain the main access route servicing the resort (see Figure 8). As planned, a primary vehicular access road will effectively ring the resort. This proposed road will provide access to the various residential developments around the Knoll, enabling residents and guests there, to enter and exit that area of the resort without going through the Village, thus reducing the congestion and traffic volumes in the Village area. This ring road will also establish access to a to the proposed future golf course and ultimately down to Lumby (creating an alternative access to the resort).

Alpine ski connector routes have been included as a key component of the residential subdivision. These routes will also act as vegetative buffer zones, acting to maintain the mountain and park setting. Several skier bridges and underpasses will have to be constructed to ensure that the skiing (and vehicular traffic) can move in an uninterrupted fashion.

Some of the cross-country trails will have to be redesigned to accommodate the new road alignments and development. However, the new layout will result in no net loss of nordic skiing.



SILVER STAR MOUNTAIN

CIRCULATION PLAN

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JANUARY 1995

VIII.6 Employee Housing

The close proximity of Vernon to Silver Star has enabled the resort to draw upon the population base of that City to provide the resort with its employees. As such no employee housing has been seen as necessary nor has it been provided for within the Base Area Master Plan. The success of any resort is highly dependant upon its employees. This issue of employee housing should be monitored in an ongoing basis and addressed as the needs arise.

VIII.7 Official Community Plan Boundary

The Official Community Plan Boundary will have to be expanded to take into account the proposed development lands. The exact location of that boundary remains to be determined.

VIII.8 Controlled Recreation Area Boundary

The development as proposed within this Base Area Master Plan will not require an expansion of the Controlled Recreation Area Boundary. However, future golf course development may require use of lands that lie outside of this area.

VIII.9 Maintenance Area

As proposed in the mountain Master Plan, a new, hidden from view, maintenance area will be established with direct vehicular access from Silver Star Road. This location also affords direct on snow snowcat access to the Silver Queen ski trails. Once in place, this will enable the removal of the existing maintenance facilities, currently located in the heart of the Village, dramatically improving the opportunities for character and ambience improvements to the resort in general.

VIII.10 Infrastructure

According to Silver Star management, all infrastructure capacity requirements for water, sewer and power, to the level necessary to accommodate the scale of development proposed in this plan, have or will be provided for.

IX. PHASING

IX.1 Introduction

The phased development of any resort is an issue of carefully choreographing the incremental establishment of the various components such that the offering is a well integrated and balanced facility at any given time. To the publics eye, the resort must always appear and function as a complete entity. The length of time for any phase of development is a function of the acceptance of the resort marketplace. In the worst case scenario, it is possible that the resort will never develop beyond its current size. As such, an incomplete or broken development, waiting for the next phase of activity, may prove to be the deterrent to actually achieving the threshold required to move on to that level activity.

The following tables and descriptions outline the basic scale of the base area development at Silver Star, matched to the CCC of the Alpine skiing, necessary to create and maintain a balance on a phase by phase basis. It must be noted that the numbers presented are meant to provide the fundamental level of development. They are not absolute. Rather they give the general size and scale of development and must be reviewed in an ongoing fashion, based on the current trends and desires of the resort market place.

IX.2 The Village

Although the Village plans are still being developed, Tables 8, 9, and 10 define the amount of skier related and destination related built space required to balance with the proposed expansion of the mountain facilities. The exact location of this space remains to be determined. It should be noted that at this time, it is anticipated that the bulk of this space will be allocated for development within the Village, and a portion will be designated for development at Paradise Camp, on top of the mountain. By the time Phase 3 is reached, there may be need to establish another on-mountain facility, which would be accounted for within these numbers.

In addition, the parking requirements for each phase have been delineated.

Silver Star: Base Area Master Plan

Table 8: Space Use Requirements - Phase 1
Based On The 1994 Mountain Master Plan

CCC = 6,571
Guests = 526
Total = 7,097

Service/Function	Existing Space(Sq.Ft)	Space Required	Difference From Ideal	Percentage Of Ideal
Restaurant	17,658	23,206	(5,548)	76%
Kitchen/Scramble	7,063	9,282	(2,219)	76%
Bar/Lounge	1,890	2,484	(594)	76%
Women's Rest Rooms	5,508	7,239	(1,731)	76%
Men's Rest Rooms	3,672	4,826	(1,154)	76%
Ski School	2,750	3,614	(864)	76%
Equip Rental/Repair	4,650	6,111	(1,461)	76%
Retail Sales	4,050	5,323	(1,273)	76%
Ski Patrol/First Aid	1,800	2,366	(566)	76%
Public Lockers	2,970	3,903	(933)	76%
Day Care/Nursery	5,750	7,557	(1,807)	76%
Ticket Sales	500	657	(157)	76%
Administration	3,000	3,943	(943)	76%
Employee Lounge	500	657	(157)	76%
Storage Space	1,482	1,948	(466)	76%
Mechanical/Furnace	618	812	(194)	76%
Circ./Wall/Waste	6,732	8,847	(2,115)	76%
Total Ski Related Space	70,593	92,773	(22,180)	76%
Destination Space	24,708	32,471	(7,763)	76%
Total Resort Space	95,301	125,244	(29,943)	76%
Total Car Parking	1,630	2,011	(381)	81%
Total Buses	15	27	(12)	56%

Silver Star: Base Area Master Plan

Table 9: Space Use Requirements - Phase 2
Based On The 1994 Mountain Master Plan

CCC = 7,498
Guests = 600
Total = 8,098

Service/Function	Existing Space(Sq.Ft)	Space Required	Difference From Ideal	Percentage Of Ideal
Restaurant	23,206	26,480	(3,274)	88%
Kitchen/Scramble	9,282	10,592	(1,310)	88%
Bar/Lounge	2,484	2,834	(350)	88%
Women's Rest Rooms	7,239	8,260	(1,021)	88%
Men's Rest Rooms	4,826	5,507	(681)	88%
Ski School	3,614	4,124	(510)	88%
Equip Rental/Repair	6,111	6,973	(862)	88%
Retail Sales	5,323	6,073	(751)	88%
Ski Patrol/First Aid	2,366	2,699	(334)	88%
Public Lockers	3,903	4,454	(551)	88%
Day Care/Nursery	7,557	8,623	(1,066)	88%
Ticket Sales	657	750	(93)	88%
Administration	3,943	4,499	(556)	88%
Employee Lounge	657	750	(93)	88%
Storage Space	1,948	2,223	(275)	88%
Mechanical/Furnace	812	926	(115)	88%
Circ./Wall/Waste	8,847	10,095	(1,248)	88%
Total Ski Related Space	92,773	105,861	(13,088)	88%
Destination Space	32,471	37,051	(4,581)	88%
Total Resort Space	125,244	142,913	(17,669)	88%
Total Car Parking	2,011	2,294	(284)	88%
Total Buses	27	30	(4)	88%

Silver Star: Base Area Master Plan

Table 10: Space Use Requirements - Phase 3
Based On The 1994 Mountain Master Plan

CCC = 8,874
Guests = 710
Total = 9,584

Service/Function	Existing Space(Sq.Ft)	Space Required	Difference From Ideal	Percentage Of Ideal
Restaurant	26,480	31,339	(4,859)	84%
Kitchen/Scramble	10,592	12,536	(1,944)	84%
Bar/Lounge	2,834	3,354	(520)	84%
Women's Rest Rooms	8,260	9,776	(1,516)	84%
Men's Rest Rooms	5,507	6,517	(1,011)	84%
Ski School	4,124	4,881	(757)	84%
Equip Rental/Repair	6,973	8,253	(1,280)	84%
Retail Sales	6,073	7,188	(1,115)	84%
Ski Patrol/First Aid	2,699	3,195	(495)	84%
Public Lockers	4,454	5,271	(817)	84%
Day Care/Nursery	8,623	10,205	(1,582)	84%
Ticket Sales	750	887	(138)	84%
Administration	4,499	5,324	(826)	84%
Employee Lounge	750	887	(138)	84%
Storage Space	2,223	2,631	(408)	84%
Mechanical/Furnace	926	1,096	(170)	84%
Circ./Wall/Waste	10,095	11,948	(1,853)	84%
Total Ski Related Space	105,861	125,289	(19,427)	84%
Destination Space	37,051	43,851	(6,800)	84%
Total Resort Space	142,913	169,140	(26,227)	84%
Total Car Parking	2,294	2,715	(421)	84%
Total Buses	30	36	(6)	84%

IX.3 Residential Development

Table 11 summarizes the amount and type of overnight accommodation and residential development on a phase by phase basis. Figure 7, The Base Area Master Plan, delineates the proposed residential development, by unit type, to the completion of Phase 3.

IX.4 Development Summary

All of the space use and residential components of the Base Area Master Plan are represented in Table 11.

Silver Star: Base Area Master Plan
Table 11: Development by Phase

	Existing	Phase 1	Phase 2	Phase 3
CCC	5,000	6,571	7,498	8,874
Accommodation Development				
Permitted BUs @ 80% of CCC	4,000	5,257	5,998	7,099
BUs Existing	2,332	4,000	5,257	5,998
BUs To Be Developed	1,668	1,257	742	1,101
Private BUs @ 60% Of Permitted	2,400	3,154	3,599	4,260
Existing Private BUs	1,440	2,400	3,154	3,599
Private BUs To Be Developed	960	754	445	660
Single Family Units (@ 70% Private BUs)	280	368	420	497
Existing Private SFU	254	280	368	420
SFU To Be Developed	26	88	52	77
Multifamily Units (@30% Private BUs)	180	237	270	319
Existing Private MFU	54	180	237	270
Private MFU To Be Developed	126	57	33	50
Public BUs @ 40% Of Permitted	1,600	2,103	2,399	2,840
Existing Public BUs	892	1,600	2,103	2,399
Public BUs To Be Developed	708	503	296	441
Multifamily Units (@ 50% Public BUs)	200	263	300	355
Existing Public MFU	61	200	263	300
Public MFU To Be Developed	139	63	37	55
Hotel Rooms (@ 50% Public BUs)	400	526	600	710
Existing Hotel Rooms	174	400	526	600
Hotel Rooms To Be Developed	226	126	74	110
Skier Related Space				
Required (Sq. Ft.)	70,593	92,773	105,861	125,289
Existing (Sq.Ft.)	45,446	70,593	92,773	105,861
Space To Be Developed (Sq. Ft.)	25,147	22,180	13,088	19,428
Destination Related Space				
Required (Sq. Ft.)	24,708	32,471	37,051	43,851
Existing (Sq.Ft.)	13,540	24,708	32,471	37,051
Space To Be Developed (Sq. Ft.)	11,168	7,763	4,580	6,800
Parking				
Required Cars (Stalls)	1,620	2,011	2,294	2,715
Existing Cars (Stalls)	1,630	1,620	2,011	2,294
Stalls To Be Developed	(10)	391	283	421
Required Buses (Stalls)	15	27	30	36
Existing Buses (Stalls)	7	15	27	30
Stalls To Be Developed	8	12	3	6

SFU - Single Family Units
MFU - Multifamily Units

APPENDIX 1

Official Community Plan Zoning Designations

Residential and overnight accommodation development is guided by zoning requirements as outlined in the Official Community Plan. The OCP outlines in detail permitted uses of land, buildings and structures, building size, floor area, height, lot area, lot coverage, lot frontage, parking , setbacks, etc. The following section outlines key points that are applicable for our planning purposes.

Five zones are designated within the Silver Star Base Area Master Plan study area:

Recreation Commercial Resort Centre (C.6)

- Concentration of commercial development, on a mixed use basis with accommodation and recreation development.
- Maximum permitted density of 40,000 m^2 of floor area per hectare.

Recreation Commercial Resort Accommodation (C.7)

- Principle purpose is to provide multi-unit condominium or hotel units in areas outside the village centre.
- Limited range of complementary commercial and recreational use (of a scale that does not detract from C.6 facilities).
- Maximum permitted density of 40,000 m^2 of floor space per hectare
- Parking for both day skiers and overnight guests is to be provided on-site and not on public roads.
- OCP accepted parking ratio: 2.7 skiers per vehicle.

Residential Apartment and Multi-Family Zone (R.3)

- Apartment, row housing, multi-family dwellings (including three and four family dwellings), single family cluster housing, single family and two family dwellings.

- Maximum permitted gross density of 45 units per hectare; maximum permitted gross density for single family cluster housing of 6 units per hectare.

- Lot coverage shall not be greater than 40% of the lot area for all buildings and structures.

Residential Seasonal Single Family Zone (R.6)

- Seasonal single family dwellings (intended for use during part of the year only).

- Lot coverage not to exceed 35% of the lot area.

Residential Resort One and Two Family Zone (R.7)

- Single family and two family dwellings, with bachelor dwelling units (rental suites) permitted.

- Bachelor dwelling units restricted to 1 per low density dwelling unit (complete with external access and 1 off-street parking stall).

- Lot coverage not to exceed 35% of the lot area.

- Maximum permitted density of 18 dwelling units per hectare.

Official Community Plan Parking Requirements

As per the 1986 O.C.P. for Silver Star, the following are the parking requirements:

- Parking for both day skiers and accommodation is to be provided on-site and not on public roads.

- The area required for parking is based on a ration of 2.7 skiers per vehicle. Accommodation parking is based on a ratio of one (1) parking space per two(2) sleeping units, in which a sleeping unit is defined as a bedroom or living room. A two (2) bedroom unit plus a living room would be considered as three (3) sleeping units.

- On-site parking for commercial facilities and accommodation shall be

provided in accordance with recognized parking standards.

The Regional District of North Okanagan Zoning by-Law No. 725 (1986), states the following standards apply:

- 1.5 parking spaces per dwelling unit for multi-family residential developments with a gross density greater than 25 units per acre.
- Two (2) parking spaces per dwelling unit for multi-family residential development with a gross density of less than 25 units per acre.
- Two (2) parking spaces per dwelling unit for single family and duplex residential developments.
- One (1) parking space per sleeping room including living room for ski resort accommodation.
- One (1) parking space per 4 person capacity for a tourist attraction.

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Prepared for:

Silver Star Mountain Resort

Prepared by:

GEOALPINE ENVIRONMENTAL CONSULTING

March 1995

Environmental Review of Silver Star Mountain Resort
1994 Ski Area Master Plan and Current Development Practices

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1.0 Introduction

Silver Star Mountain Resort is in the process of updating its Master Plan. Bill 29, the Environmental Assessment Act, and the new Forest Practices Code, are pending implementation and will set new standards of environmental responsibility for developers and operators of mountain resorts. In view of these pending requirements and in light of public interest over potential environmental impacts arising from mountain development, it was decided to incorporate a general environmental review of the plan and present development practices, as an appendix to the Master Plan. GeoAlpine Environmental Consulting was retained to conduct the review. The study team for the review consisted of Dave Williamson, B.E.S. and Mike Nelson, R.P.Bio.

1.1 Scope of Review

The environmental review consisted gathering available information pertaining to the development of Silver Star Mountain Resort. As part of that process a detailed review of the following documents was conducted:

- Silver Star Mountain Resort Ski Area Master Plan, Draft, May 1994,
- Silver Star Village Official Community Plan, Draft, December 1994
- Official Community Plan Report, Schedule "A" to Silver Star Village Community Plan Designation By-Law No. 723, 1986
- Silver Star Mountain Resorts, Environmental Policy, November 1, 1993
- Okanagan Timber Supply Area Integrated Resource Management, Timber Harvesting Guidelines, February 1992
- Canada West Ski Areas Association, Guidelines for Environmental Good Practices for Ski Areas, May 1992.

Cursory site visits took place over the period of January 20 - 23, 1995, and a number of interviews were conducted with Silver Star Mountain Resort staff, including Mike Randell, Mountain Manager.

In addition, government agencies with jurisdiction on, or adjacent to the Resort, were contacted and solicited for input. These agencies included: the Federal Department of Fisheries and Oceans, the Provincial Ministry of Forests, the Ministry of Environment, Lands and Parks; BC Lands, BC Parks, Environmental Protection, and Fish and Wildlife Sections.

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1.2 Limitations

This Environmental Review has been prepared in part from information provided to GeoAlpine Environmental Consulting. The accuracy of information provided to GeoAlpine Environmental Consulting is not guaranteed.

Neither all or part of the contents of this Environmental Review shall be used by any party, other than the client, without the express of written consent of GeoAlpine Environmental Consulting and if such consent is granted, a surcharge may be rendered.

No Samples of any soils, water, gas, or chemicals were taken, or analyzed by GeoAlpine Environmental Consulting in the preparation of this Environmental Review. GeoAlpine Environmental Consulting does not warrant or guarantee the actual subsoil conditions. GeoAlpine Environmental Consulting does not warrant or guarantee that the current activities will not contaminate the site. Should this Environmental Review contain an error or omission then the liability, if any, of GeoAlpine Environmental Consulting shall be limited to the fee received by GeoAlpine Environmental for the preparation of this report.

2.0 General Description of Area

The study area of Silver Star Mountain Resort is located within Silver Star Provincial Park, in the North Okanagan Regional district. It is located 20 km northeast of Vernon by road and 12 km southeast of Armstrong, as the crow flies. For purposes of analysis the study area was divided into 7 drainages; BX Creek, Coldstream Creek, Vance Creek, Trinity Creek, Putnum Creek, Fortune Creek and Miriam Creek. The ski pods, and drainages of the study area are identified in the site map; Figure 1.

2.1 Geology

Information pending.

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Map 1 Study Area

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2.2 Geomorphology

The physiology of the study area is predominated by Quaternary deposition at all but the upper elevations (above 1700 m) and the western slopes of Silver Star Mountain. In these areas' bedrock outcroppings occur and the depth of overburden is frequently less than 1 m. The eastern, leeward slopes and drainages of the study area are generally characterized by deep morainal and colluvial deposits of glacial till (Belsham, 1978). As a result, the creeks have a dendritic pattern with deeply incised banks.

2.3 Hydrology

Silver Star Provincial Park and the Controlled Recreation Area contained therein lies on the headwaters of the divide between two major river systems. These are the Fraser River system via the Shuswap River and the Columbia River system via Okanagan Lake and River. Watercourses draining this area in to the Shuswap River include Fortune Creek, Putnam and Miriam Creek via Trinity Creek, and Vance Creek via Bessette Creek. BX Creek and Coldstream Creek drain the study area in the Okanagan system. The Water Survey of Canada (WSC) has established Stream gauging stations on some of these drainages. A summary of available WSC information for these stations is found in Table 1.

2.3.1 Fortune Creek

The northwestern portion of Silver Star Provincial Park and the northwestern fringe of the Controlled Recreation Area is drained by Fortune Creek, which flows into the Shuswap River near Enderby. Within the park, Fortune Creek drains an area whose elevation ranges from 1,880 m to 1,100 m. The average gradient of the creek within the park is approximately 11%. Downstream of the park boundary the creek steepens to about 17%, until it reaches the broad valley bottom near Armstrong at the 400 m elevation. A Water Survey of Canada gauging station is located on Fortune Creek near Armstrong. At the gauging station, the creek has a drainage area of 41.2 km^2 and a total annual discharge ranging from 9,650 to 32,200 dam^3 (mean 19,700 dam^3).

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Table 1 Historical Streamflow Summary (to 1990), Water Survey of Canada

Name	Station No.	Period of Record	Drainage Area (km^2)	Regulated/ Natural Flow	Mean Annual Discharge (m^3/s)	Maximum Daily Discharge (m^3/s)	Minimum Daily Discharge (m^3/s)
Okanagan/Columbia Drainage System							
BX Creek above Vernon Intake	08NM020	1921 - 90	55.7	Regulated	0.297	4.56	0.000
BX Creek below Swan Lake Control Dam	08NM123	1959 - 78	120	Regulated	0.258	2.94	0.00
Coldstream Creek above Kalavista Diversion	08NM179	1970 - 82	207	Regulated	0.626	8.30	0.096
Coldstream Creek above Municipal Intake	08NM142	1967 - 90	58.5	Natural Flow	0.249	4.04	0.017
Coldstream Creek at Mouth	08NM154	1969 - 70	205	Regulated	n/a	2.34	n/a
Coldstream Creek near Lavington	08NM124	1959 - 79	61.9	Regulated	0.211	3.91	0.000
Shuswap/Fraser Drainage System							
Bessette Creek above Beaverjack Creek	08LC039	1970 - 90	603	Regulated	3.42	50.4	0.194
Bessette Creek above Lumby Lagoon Outfall	08LC042	1973 - 90	469	Regulated	3.04	36.6	0.136
Bessette Creek near Lumby	08LC005	1919, 43 - 83*	253	Regulated	n/a	23.1	0.007
Fortune Creek at Stepney	08LC031	1950 - 60*	132	Regulated	n/a	9.06	0.008
Fortune Creek near Armstrong	08LC035	1911 - 12, 59 - 84	41.2	Natural Flow	0.623	4.85	0.000
Shuswap River at Outlet of Mabel Lake	08LC019	1927 - 36, 51 - 79	4040	Regulated since 1940	81.1	552	9.12
Shuswap River at Outlet of Sugar Lake Reservoir	08LC018	1926 - 40, 71 - 79, 84 - 86, 90	1130	Regulated since 1940	38.4	371	0.320
Shuswap River near Enderby	08LC002	1911 - 36, 60 - 90	4690	Regulated since 1940	87.7	626	10.6
Shuswap River Near Lumby	08LC003	1913, 17 - 36, 45 - 73, 84 - 86, 90	2000	Regulated since 1940	50.3	552	0.566
Trinity Creek above Diversion	08LC048	1981 - 84*	42.9	Natural Flow	n/a	4.85	n/a
Trinity Creek near the Mouth	08LC050	1985 - 90*	191	Regulated	n/a	35.1	n/a
Vance Creek below Deafies Creek	08LC040	1970 - 90	73.3	Natural Flow	0.479	5.60	0.018

n/a Not available

* Flows recorded from April to September only

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2.3.2 Miriam Creek

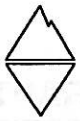
The extreme northern eastern portion of Silver Star Provincial park is drained by the easterly flowing Miriam Creek. Waters from this creek flow into Trinity Creek, which tends north into the Shuswap River. The Miriam Creek drainage basin was calculated at approximately 15.1 km^2 by the study team. All of the drainage basin lies outside of the Silver Star Mountain Resort Controlled Recreation Area Boundary. The stream channel is approximately 7 km long, ranging in elevation from 670 m at its confluence with Trinity Creek to about 1,700 m at its headwaters. The average stream gradient is 13 %, with gradients of 25% observed in the upper reaches. There are no WSC gauging records available for this drainage, however, Trinity Creek has been gauged both upstream of Miriam Creek (immediately upstream of Putnam Creek), and at its confluence with the Shuswap River.

2.3.2 Miriam Creek

The extreme northern eastern portion of Silver Star Provincial park is drained by the easterly flowing Miriam Creek. Waters from this creek flow into Trinity Creek, which tends north into the Shuswap River. The Miriam Creek drainage basin was calculated at approximately 15.1 km^2 by the study team. All of the drainage basin lies outside of the Silver Star Mountain Resort Controlled Recreation Area Boundary. The stream channel is approximately 7 km long, ranging in elevation from 670 m at its confluence with Trinity Creek to about 1,700 m at its headwaters. The average stream gradient is 13 %, with gradients of 25% observed in the upper reaches. There are no WSC gauging records available for this drainage, however, Trinity Creek has been gauged both upstream of Miriam Creek (immediately upstream of Putnam Creek), and at its confluence with the Shuswap River.

2.3.3 Putnam Creek

Putnam Creek drains the bulk of the northeastern portion of Silver Star Provincial Park. As with Miriam Creek, Putnam flows eastward into Trinity Creek. The Putnam Creek drainage basin is approximately 31.3 km^2, with approximately 12.9 km^2, or 41.2% of the total drainage basin within the Silver Star Mountain Resort Controlled Recreation Area Boundary. The total length of Putnam Creek is about 12.6 km long. For its first 10.3 km, the gradient of the creek is 6%, rising from 700 m to 1,200 m. The stable terrace located adjacent to and immediately downstream of the Putnam Creek Chair Load Station is situated within this lower gradient zone. The mature western red cedar - western



hemlock forest occupying the riparian fringe provides evidence of the relative stability of the channel profile through this reach. For the remainder of its length, Putnam Creek's gradient increases to an average of 17%, with the creek rising rapidly to its headwaters at approximately 1,700 m elevation. Again no stream gauging records area available of Putnam Creek.

2.3.4 Vance Creek

The southeastern portion of Silver Star Provincial Park, and 10.2 km^2 of the Controlled Recreation Area, is drained by Vance Creek. This creek flows east and southeast into Bessette Creek, which in turn flows into the Shuswap River approximately 15 km upstream of Mabel Lake. The Vance Creek drainage area is approximately 73.3 km^2, with about 10.2 km^2, or 14% of the total drainage basin within the Silver Star Mountain Resort Controlled Recreation Area Boundary. Within the Controlled Recreation Area, Vance Creek appears to be more actively eroding its channel bed than Putnam Creek. Its upper reach, extending from 1040 m to 1640 m, the main channel has an average gradient of 12%, while the gradient of its tributaries at this elevation range from 12 to 20%. Vegetation on the stream banks consists mainly of young alders, indicating recent changes to the stream profile. Side banks above the channels often exceed 50% and numerous slope failures were noted on the January site visit. Between the park boundary and the 720 m elevation, where Vance Creek enters the Trinity Valley, the average gradient lessened to an average of approximately 5%. The Vance Creek drainage area upstream of the Trinity Valley was calculated at approximately 36.4 km^2 by the study team. Within the Trinity Valley, the gradient of Vance Creek was about 4%.

A WSC gauging station has been located on Vance Creek below Deafies Creek since 1970. The creek has a total annual discharge ranging from 6,840 to 26,700 dam^3 (mean 15,100 dam^3) at the gauging station, for the period of record. Three WSC stations have also been located on Bessette Creek.

2.3.5 Upper Coldstream Creek

Coldstream Creek Drains a small portion of the extreme south of Silver Star Provincial Park. It flows southwest into Kalamalka Lake, which drains north and then southwest to Okanagan Lake via Vernon Creek. Coldstream Creek's total drainage area is about 207 km^2, with approximately 1.4 km^2 within the Silver Star Mountain Resort Controlled Recreation Area.

Coldstream Creek has been gauged at four locations by WSC, and is the subject of a 2 1/2 year study by the Water Investigations Branch of the then BC Department of Lands,

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Forests and Water Resources, released in 1974. The Water Investigations Branch report (1974) divides the Coldstream into two sub-basins, the upper and lower sub-basins. The Upper Coldstream sub-basin corresponds to the WSC Station No. 08NM142, and has a drainage area of 58.5 km^2. With a maximum and minimum elevation of 1660 m and 600 m respectively, the annual runoff for the period of record ranges from 2,750 dam^3 to 14,700 dam^3 (mean of 7,850 dam^3). Within the Upper Coldstream drainage, the mean gradient of the creek channel is 5%, however, within Silver Star Provincial Park, the gradient steepens to and average of 13%.

The Lower Coldstream drainage includes the remainder of the Coldstream watershed. While there are no water licenses in the upper sub-basin, the total quantity of water licensed for consumption purposes in 1974, in the lower sub-basin exceeds the total mean annual runoff from both sub-basins (Water Investigations Branch, 1994; WSC). Also of note is that although the mean annual total discharge of Coldstream Creek at the mouth is 19,800 dam^3, 90% of this water flow occurs during freshet.

2.3.6 BX Creek

BX Creek, draining the southwestern portion of Silver Star Provincial Park and 2.7 km^2 of the Controlled Recreation Area, flows southwest into Swan Lake, which drains into Okanagan Lake via lower BX Creek and Vernon Creek. The BX Creek drainage basin is 55.7 km^2 at the Vernon Intake, which is located approximately 9.5 km downstream of the park boundary. Nearer its confluence with Vernon Creek, the drainage area is approximately 120 km^2. About 2.7 km^2, or 2.3% of the total drainage basin is within the Silver Star Mountain Resort Controlled Recreation Area Boundary. The stream's gradient ranges from an average of 11% above 1,100 m, to less than 5% below that elevation.

BX Creek has been gauged at two stations by WSC, above the Vernon water intake and below the Swan Lake control dam. The former station, with a drainage area of 55.7 km^2, has a longer period of record. Total annual discharge at this station ranges from 4,580 to 15,900 dam^3 (mean 9,380 dam^3).

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2.4 Ecology

The study area is located within the Southern Interior Ecoprovince, in the Thompson Okanagan Plateau Ecoregion, Northern Okanagan Highlands (NOH) Ecosection, east of the Okanagan Basin Ecosection.

2.4.1 Biogeoclimatic Zones

Silver Star Mountain Resort contains Interior Douglas-fir (IDF) and Montane Spruce (MS) Biogeoclimatic zones. The upper reaches of the mountain contain a minor presence of Engelmann Spruce - Subalpine Fir (ESSF). This small zone is anomalous to the local region. It appears to be a site specific edaphic response and a function of Silver Star Mountain's higher elevation relative to surrounding terrain.

2.5 Soils

Soils mapping carried out under the supervision of J. Belsham, BC Department of Agriculture, Soils Branch, in 1978, identifies all soils in the study area at a scale of 1:50,000 (Soils of the Vernon Map Area 82L).

Soils of Silver Star Mountain and the associated ridge tops of Fortune, Putnam and BX Creeks, are classified as Orthic Humo-Ferric Podzol (O.HFP), as per the Canadian system of Soil Classification (CanSIS, 1993). The ecological moisture regime of the soils is xeric and corresponds to the Engelmann Spruce - Subalpine Fir transitional Biogeoclimatic Zone. This zone conforms to dry southern, moist western and moist southern forested Biogeoclimatic units in the area.

Soils of the upper reaches of Vance and Miriam Creek, are also classified as Orthic Humo-Ferric Podzol (O.HFP). There are also minor occurrences of this soil type in the Fortune, BX Creek drainages, and in the vicinity of the Knoll. However, the ecological moisture regime of these soils is mesic and found in the Interior Western Red Cedar - Western Hemlock transitional Biogeoclimatic Zone. The soils correspond to that of Thompson River and Shuswap River moist Interior Western Red Cedar - Western Hemlock Biogeoclimatic units.

Other soils of the Interior Western Red Cedar - Western Hemlock transition zone include Eluviated Dystric Brunisol (E.DYB) and Brunisolic Gray Luvisol (BR.GL). Eluviated Dystric Brunisol was inventoried in the middle reaches of Putnam and Vance Creeks.

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These soils generally have a xeric moisture regime, although hydric variations are noted in valley bottoms. Brunisolic Gray Luvisol was noted in the lower reaches of Putnam and Vance Creeks, in association with the Trinity Creek drainage. These soils generally have a mesic moisture regime.

Soils of the Coldstream and middle to lower reaches of BX Creek, are classified as Orthic Gray Luvisol (O.GL) and Eluviated Eutric Brunisol (E.EB). There are also minor occurrences of Orthic Dystric Brunisols (O.DYB). The ecological moisture regime of the soils is generally mesic, except for O.DYB, which tend toward xeric. The soils correspond to the Interior Douglas-Fir Biogeoclimatic Zone. These soils are found in the Thompson Plateau Very Dry and Dry Montane, Okanagan Dry Montane, and Shuswap Highlands and Okanagan Semi-Moist Interior Douglas-Fir Biogeoclimatic units.

2.6 Vegetation

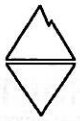
Information on vegetation and forest cover was obtained through a review of Forest Cover mapping (BC Forests, 82L.035), Forest Zonation mapping (E.L.U.C. Secretariat), air photo analysis, and the January 1995 site visit.

The easterly aspect drainage basins of Miriam and Putnam Creeks are similar in their vegetation composition. At elevations generally below 1370 m a dense coniferous mature climatic climax forest dominates the landscape. The forest is composed mainly of western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*). This forest type was verified during site visits as occurring in riparian strip of Putnam Creek. A young seral coniferous forest of Douglas fir (*Pseudotsuga menziesii*) and western larch (*Larix occidentalis*), with occasional black cottonwood (*Populus tricocarpa*), is also present.

At higher elevations, dense to open coniferous mature climatic climax forests of subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) are common. Regenerating dense, mixed, young seral forest of trembling aspen (*Populus tremuloides*), lodgepole pine (*Pinus contorta*) and Engelmann spruce are also present.

The lower elevations of the southerly aspect drainages of Vance, Coldwater and BX Creeks generally consist of dense coniferous mature climatic climax Douglas fir forest. Maturing seral coniferous forests of lodgepole pine and western larch are noted in these drainages, as well. Occurrences of western red cedar are also observed within the BX Creek drainage.

Upper elevations of these drainages are composed of a variety of vegetation associations ranging from alpine meadows at the top of Silver Star Mountain to open and



dense maturing climatic climax coniferous forests. Forest species noted in the prior surveys included subalpine fir and Engelmann spruce. Pockets of maturing seral stage forest composed of Douglas fir and Engelmann spruce were also observed.

Alpine meadowland and ski trail vegetation appears to be composed of a mix of naturally occurring plants along with introduced exotic grasses and legumes. Introduced plant species and revegetation practices are discussed later in this report.

2.7 Fisheries and Aquatic Habitat

Available information concerning the fish presence and distribution in the drainages both within the project area and in the surrounding area was reviewed. The fisheries' records for these creeks, however, are sporadic, with the records presently being updated. Present information is mainly confined to larger systems in the valley bottoms. Information reviewed included that found in the joint DFO MOELP Stream Information Summary database (DFO, 1990), the Kalamalka - Wood Lake Basin Water Resource Management Study (Water Investigations Branch, 1974), and in the Freshwater Fishing Directory and Atlas (BC Outdoors, 1995).

2.7.1 Fortune Creek

The Stream Information Summary (SIS) database indicates the presence of coho and chinook salmon (*Onchorhynhchus kisutch* and *O. tshawytscha*, respectively), and rainbow trout (*O. mykiss*). The salmon are noted to occur from the confluence of Fortune Creek with the Shuswap River to approximately 15 km upstream, near Armstrong. This is approximately 4 km from the Silver Star Provincial Park boundary and 10 km from the Silver Star Mountain Resort Controlled Recreation Area boundary.

2.7.2 Miriam and Putnam Creek

Records for Miriam and Putnam Creek were unavailable at the time of writing. However, Trinity Creek that both the previously mentioned creeks flow into, is known to support coho and chinook salmon, Dolly Varden char (*Salvelinus malma*), kokannee (*O. nerka*), mountain whitefish (*Prosopium williamsoni*), and rainbow trout. The SIS database indicates that there is a culvert at the Trinity Valley Road and waterfalls 500 m upstream of the road, which pose an obstruction to migration of coho and chinook salmon. The distribution of the other species within this system has not been elucidated.

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2.7.3 Vance Creek

Fisheries' records for Vance Creek are also lacking, although Bessette Creek, into which Vance Creek flows, is listed in the SIS database. Fish known to occur in Bessette Creek include sockeye salmon (*O. nerka*), coho and chinook salmon, sculpin (*Cottus sp.*), dace (*Rhinichthys sp.*), mountain whitefish, rainbow trout, redside shiner (*Richardsonius balteatus*) and sucker (*Catostomus sp.*). Due to the low gradients in the lower reaches of Vance Creek, it is likely that at least some of these species also utilize that creek.

2.7.4 Coldstream Creek

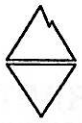
Coldstream Creek is known to provide spawning habitat for both kokanee and rainbow trout in its lower 6 km (Water Investigations Branch, 1974). At approximately 6.7 km upstream of its mouth, the gradient of Coldstream Creek increases, and there is a log jam that prevents further fish migrations past this point. The report also noted that the creek could support these species along 15 km of its 25 km length if it was in pristine condition. Minimum discharge requirements to support a viable fisheries in Coldstream Creek are also detailed in the Water Investigations Branch (1974) report. The minimum recommended flow for the spring rainbow trout spawning period (April to May) and the kokanee spawning period (September to November) is 0.226 m^3/s. The mean monthly discharge was lower than this quantity during for five months between 1970 and 1992. The recommended absolute minimum flow to maintain a resident population of rainbow trout was 0.045 m^3/s. The minimum flow has not dipped below this critical level at the WSC gauging stations near the mouth or above the Kalavista diversion. The extreme minimum daily discharge for the period of record at the later station (the station for which there is a lengthier record) was 0.096 m^3/s, observed on February 10, 1971.

2.7.5 BX Creek

No SIS records are presently available for BX Creek.

2.8 Wildlife and Wildlife Habitat

Little inventory and habitat assessment work appears to have been done on the subject site. The main source of information used in the review was Canada Land Inventory survey data collected in the 1970's. Additional wildlife information was gathered by contacting Chris Guppy and Roseanne Van Ee. Mr. Guppy was able to provide



information on a unique species of butterfly. Ms. Van Ee contributed information she gathered as a naturalist working in the area over the past 10 years.

2.8.1 Wildlife

Wildlife information is limited for the entire region. The local agencies are presently relying on CLI information and anecdotal knowledge for decision making. However, under the pending BC Forests Practices Code, Species Accounts will be produced and maintained. These accounts should update wildlife information for the area.

Silver Star Mountain hosts a number of significant plant species including white rein orchid (), cotton grass (), mountain genetian (), giant helliborine (), mitrewort (), and a variety of sedges (*Carex spp.*) (Fax Memo from R. Van Ee, Mar. 5, 1995).

The Silver Star area provides summer range habitat for a number of ungulate species including Moose (*Alces alces*), Mule Deer (*Odocoileus hemionus*), and White-tailed Deer (*O. virginianus*). In addition some notable animal species are also present including: Mountain Bluebirds (*Sialia currucoides*), Lincolns sparrow (*Melospiza lincolnii*), Northern pocket gopher (*Thomoys talpoides*), and ermine (*Mustela erminea*)(Fax Memo from R. Van Ee, Mar. 5, 1995).

There is a genetically unique breeding population of Apollo Butterfly (*Parnassius phoebus*) whose only known habitat is in the rocky outcroppings of the western upper slopes of Silver Star Mountain. It feeds on exclusively on Stone Crop (*Sedum laneolatum*) and it lays its eggs on the rock. As mentioned in the next section of the report, the vegetation in this area has achieved a level of stasis. Therefore, as long as these two factors remain unaffected, there will be no habitat management concerns for the butterflies (pers. comm. C. Guppy, Mar. 3, 1995).

It is anticipated that the newly formed Conservation Data Centre will provide information regarding Red and Blue listed species of the Silver Star Provincial Park area, in the future.

2.8.2 Habitat

Much of the Controlled Recreation Area is summer habitat for ungulates. Moose have been sighted in the parking lots of Silver Star Mountain Resort, in the past. Mule deer are common, but like the White-tailed Deer, the main herd seems to be associated with the Coldstream drainage. White-tailed Deer appear to be expanding their summer range

up into the Controlled Recreation Area, possibly taking advantage of the grazing opportunities afforded by the ski runs.

In addition to the aforementioned summer range habitat for ungulates, the riparian habitat and the forest edge habitat created by the ski tails, three additional significant habitats were also identified (Fax Memo from R. Van Ee, Mar. 5, 1995). The subalpine bogs that occur throughout the area, but particularly along the southeast ridge of the Coldstream/Vance divide, provide habitat for a range of wetland species. A wet grassland habitat was also identified in conjunction with the forest edges. During the January site visit, a number of wildlife trees were identified in the Putnam Creek drainage. These trees provide the food source for woodpeckers (*Dryocopus pileatus* and *Picoides spp.*) and sapsuckers (*Sphyrapicus spp.*). They also provide important secondary cavity dweller habitat for juncos (*Junco hyemalis*) and chickadees (*Parus spp.*).

3.0 Ski Area Master Plan 1994 - Draft

3.1 Existing Terrain

3.1.1 Vance Creek

The Vance Creek/Summit Attridge areas form the original ski area, which dates back to the late 1920's. Ski lifts were installed in the 1950's as skiing became more popular. Base facility development took place through the 1960's and 70's. As a result, the ski slopes of the Vance Creek area have developed a natural low-growing vegetation cover composed mainly of shrubs, forbs and grasses. The slopes are stable and have well-established drainage pattern.

The more recent construction of the Vance Creek Express Lift and its associated infrastructure has caused some concerns with environmental protection agencies. The crossing of Vance Creek, on the Aberdeen Skiway may have resulted in altering the stream profile of Vance Creek. The concern for increased rates of erosion and the resultant turbidity was identified. Site visits revealed some evidence of bank failure, both above and below the crossing. However, it is not at present known if these failures represent an increase over the natural rate of gully erosion presently taking place, or if the observed slope failures were the result of the installation of the crossing. There is a need to examine the stream bed in summer to see if it is stable, and if any remedial action is needed..

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3.1.2 Summit Attridge

The contingency water storage reservoir is located within the Summit Attridge ski cell. Environmental concerns associated with this area relate to drainage, since a residential development is located below the ski cell and above BX Creek.

3.1.3 Village

A skating pond was developed at the source of BX Creek, in 1994. It replaced an area described as a wet seepage zone (Golder, 1994), that served to collect surface water from the Village, the parking lots and the Knoll. This pond will continue to serve as a settling pond for any construction activity in the base area. The outflow from the pond should incorporate and a flow control structure and an oil trap, to protect BX Creek downstream.

3.1.4 Cross Country Area

The cross country and biathlon trail system of the area represents low potential for negative environmental impact. The settling and exfiltration ponds of the wastewater treatment system do present an environmental condition. However, the potential for negative impact to the to the Vance, Coldstream or BX watersheds appears to be low. Silver Star Mountain Resort is currently responsible for monitoring groundwater quality and Rick Guitan is retained to supervise the monitoring program and conduct analysis of the samples. Jeff Randall, Engineer, Environmental Protection Branch, MOELP, is responsible for ensuring permit compliance and has no concerns at this time.

3.1.5 Putnam Creek

The existing ski related development in the Putnam Creek drainage maintains or exceeds the minimum riparian setbacks (Chilibeck, 1992). At present there is only one crossing of the upper middle reach of Putnam Creek. Silver Star Mountain Resort appears to be minimizing creek crossings, and at present there are no culverts in the middle reaches.

Ski run, chair lift development and glading programs do not appear to compromise the stability of upper Putnam Valley slopes. However, it should be noted that the area was viewed in the winter when only significant slope failure would be visible.

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Silver Star Mountain Resort staff, were unaware of prior biophysical stream inventory or sampling data availability for the upper and middle reaches of Putnam Creek. At this time it is not known if there is a resident fish population, or if there is fishery's habitat values for the upper and middle reaches of Putnam Creek.

3.2 Future Expansion

A central comment of the Ski Area Master Plan identifies the need for future growth and expansion. From a standpoint of potential environmental impact, expansion needs to be addressed in terms of viability, maximum (target) size and the effect expansion will have on the surrounding park. Since the Controlled Recreation Boundary is completely within the Silver Star Park, it is assumed that any expansion will occur into parkland. Present provincial policy is directed toward preservation and acquisition of additional Protected Areas to meet the goal of 12% regionally. If Silver Star Provincial Park adopts a policy of "no net loss", a land swap will be required if Silver Star Mountain Resort expands. There appears to be other Crown Land that may be preferable for park (R.G. Pearson, Letter to Minister of Environment, Lands and Parks, from Western Canada Wilderness Committee, Dated Jan. 18, 1995). These lands need to be identified and analyzed for suitability as park.

3.2.1 Valhalla

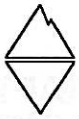
The plans for the Valhalla ski cell were reviewed and the following general comments are offered. The load station, and collector runs at the load area should respect riparian setbacks from all creeks (Chilibeck, 1992). Stream crossings should be minimized to reduce impact to the riparian zone. Free span log bridges are preferred to culverts because they do not cause a loss of aquatic habitat.

The Valhalla cell is located entirely within the Controlled Recreation Area Boundary.

3.2.2 Trinity Bowl

The presently proposed load area location appears to be too close to the creek. Prior to final design the feasibility of a relocated load area that respects setbacks from creeks should be determined.

Full development of this proposed area would require redefinition of the Controlled Recreation Area Boundary. The south lobe of the ski cell extends into Silver Star



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Provincial Park. The bottom of the cell extends outside of the Controlled Recreation Area, into Crown Land.

3.2.3 Silver Woods

The entire proposed ski cell lies within the existing Controlled Recreation Area. However, the proposed load station and maze area is too close to Vance Creek. Relocation of the load and realignment of the lift may be required to respond to the need for preservation of the riparian strip. Another concern with this area is the potential for creek crossings and earthworks at confluence's of creeks, as appears to be proposed at the load station.

3.2.4 Deer Park

The lift alignment and trail infrastructure proposed for this ski cell appear to respond well to environmental constraints of the site. The entire cell is within the Controlled Recreation Area. Considering the information reviewed, the study team has no concerns at this time.

3.2.5 Miriam Creek

Miriam Creek Ski Pod is identified as a viable skiing cell. However, its development is not anticipated in the foreseeable future. No lift alignments or ski trail locations were identified or reviewed in by the study team. It currently lies entirely outside the Controlled Recreation Area, and partially within the provincial park.

3.2.6 Southeast Ridge - Golf Course

If Silver Star Mountain Resort seeks to become a true four season resort, development of a golf course near their present skiing operation would provide a summer amenity and recreational opportunity. Three areas are identified on the Base Area Master Plan as having suitable terrain for golf. The identified areas are located south and southeast of Silver Star Mountain on the relatively flat ridge that divides Vance Creek and Coldstream Creek drainage basins. The three parcels (from north to south) have an area of 40 ha, 280 ha and 30 ha each. Optimal area for development of an 18 hole championship class golf course, with minimal environmental impact, is approximately 80 ha (pers. comm. B. Harley, s-e canada, Mar. 2, 1995).

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Prior to development of a golf course in this area, additional environmental habitat information is needed. Adequate planning and environmental impact assessment can not be conducted with the existing information voids. The following gaps in information will have to be addressed:

- A feasibility study to ascertain whether a golf course in this area is economically viable,
- An ecological Land Survey which would include a vegetation survey that is not limited to forest productivity, but includes wetland delineation, and a wildlife survey to elucidate habitat usage (preliminary discussions with MOELP staff indicate that this area may be valuable white-tailed deer rutting habitat),
- A fisheries inventory and biophysical assessment of adjacent drainages (no information is available of fish usage in the upper reaches of the creeks in the area), and
- A preliminary heritage study.

The above environmental input must be collected prior to the golf course preliminary design stage. This will allow environmentally sensitive areas to be identified and avoided. The culmination of the above would be an "environmental feasibility study".

The next phase of planing would involve addressing operational concerns and assessing the overall environmental impact of siting and operating a golf course at this local. The impact assessment would build upon the information gathered in the previous phase. An impact assessment would deal with the following:

- Feasibility
- Ecological Land Survey
- Aquatic Biophysical Survey
- Terrestrial Environment including vegetation, wildlife, and habitat
- Cultural Environment, on site and off site concerns
- Potential environmental concerns related to siting
- Impact assessment and mitigation strategy

During the second phase, it would also be desirable to be collecting baseline water quality data. The local watercourses and ground water should be sampled for parameters such as nitrogen, phosphorus, potassium, suspended solids, coliform bacteria, and other compounds associated with operation and construction of a golf course.

During the detailed design phase of the golf course, a construction and operations plan should be prepared. The environmental construction plan would address such concerns as:

- Drainage control,
- Water quality,
- Preservation of conservation areas,
- Scheduling of construction activities,
- Land clearing and woody debris disposal,
- and other concerns related to construction activities.

The operations management plan should be developed so that best management practices are used during operation of the golf course. Best management practices for the golf courses in the Fraser Valley are presently being developed by Environment Canada. King County has also developed a manual of best management practices for construction and operation of golf courses (King County Environmental Division, 1993). Other golf courses in the area and with similar climatic, elevation, environmental and operational considerations should be investigated when developing a specific operation management plan for the proposed golf course. The operational management plan should have the following components:

- Integrated Pest Management, to reduce reliance on pesticides,
- Fertilizer Management, to indicate how fertilization with sewage works in other similar areas, and how it can be made to work on this site,
- Irrigation Management, to address water supply and source concerns
- Spill Response Program
- Waste Management Program
- Wildlife Management Program, to prevent attraction of undesirable species and discourage displacement of desirable ones.
- Water Quality Monitoring Program, to set objectives for water quality and provide for on-going monitoring of adjacent streams and ground water to provide for a level of comfort for concerned stakeholders.

4.0 Current Development Practices

In reviewing development practices on Silver Star Mountain Resort, the study team relied on information provide by staff and contained within the Ski Area Master Plan and the Environmental Policy.

4.1 Integrated Resource Management

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Silver Star Mountain Resort presently manages an extensive, land based recreational resource situated in a natural alpine setting. Apart from downhill and cross country skiing, there is hiking, mountain biking, and sightseeing. The key component to all these activities is the natural setting in which they take place. The natural setting of Silver Star Mountain includes montane and alpine ecosystems of regenerating and old growth forest. There is also a natural and man made alpine meadow component as well. All these components are managed to maximize the recreational opportunities in the area. Naturally occurring events, like fire, mass wasting of slopes, and parasitic infestations need to be avoided to protect the economic viability of the resort. As a result, the resources of the area are managed in a way that attempts to balance conservation with development.

4.1.1 Ski Trails

Development of ski trails reduce the forest inventory and create artificial meadowlands. Ski trail increase the forest edge and change the wildlife habitat, as a result. Generally, these meadows are not naturally sustainable and must be managed to prevent the return to forest.

The ski run planning and development process was reviewed, and appears to be environmentally responsive. Silver Star Mountain Resort run planners work with existing topography to minimize contouring in ski run development. This reduces the impacts of disturbance and shortens the time of slope rehabilitation. Local contractors, familiar with the accepted practices are preferred, and used in all aspects of trail building. Drainage and runoff control measures appear to be adequate. No evidence of excessive erosion was noted.

4.1.2 Slope Maintenance

Upon completion of earthworks, the newly constructed ski hills are rehabilitated to restore continuous vegetative cover. Silver Star Mountain Resort appears to be diligent in the revegetation of slopes. Special seed mixes are prepared in consultation with Dawson Seeds, a respected and experienced supplier of seed and fertilizer to the ski industry. The standard application rate for seeding is 50 kg/ha, which may be considered light, but provides good opportunity for invading native plant species. Fertilizer is avoided on all but the most difficult conditions. If seasonal time constraints preclude seeding in the late summer, then seed is applied over snow in the spring. Staff reports the success rate of these practices to be very good.

Once the slope vegetation is established, the invading shrubs must be controlled. Mechanical cutting methods are preferred.

4.1.3 Glading

A large portion of the Putnam Creek pod is regenerating forest as a result of a natural burn. As a result, the forest is a mix of Maturing Climatic Climax and Young Seral stages (E.L.U.C. Secretariat, 1976). Within the young seral mixed forest, trembling aspen dominates. The stands are very tightly spaced and preclude tree skiing. A glading program to remove deciduous trees was instituted to open up the forest for tree skiing and provide spacing for the preserved conifers. Various methods were tried but the most successful in terms of economics and environmental sensitivity was the use of staff fallers and select contractors for yarding. The natural seral succession has been interrupted in favour of a managed recreational forest.

Samples of the glading program in Putnam Creek were visited during the January 1995 site visit. No evidence of slope destabilization was observed.

4.1.4 Pest Control

Management of Silver Star Mountain Resort expressed concerns over the potential for beetle infestations to spread into the Controlled Recreation Area from the Provincial Park. The park staff may consider blowdowns and insect infestations to be part of a natural process, but Silver Star Mountain Resort would prefer to control any outbreaks to protect the managed forest within the Controlled Recreation Area.

Control of wildlife access to food waste around the Village is concern that is identified in most of the documents reviewed by the project team. The concerns are addressed through the Environmental Policy, By-laws and the Official Community Plan.

5.0 Recommendations and Conclusions

Silver Star Mountain Resort has operated with relatively little intervention from government agencies in the past. This condition is changing and is probably the incentive behind this study. A number of factors are contributing to these changing conditions.

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Silver Star Mountain Resort appears to be growing, gaining market share and as a result experiencing a raised public profile. With higher profile, Silver Star Mountain Resort should anticipate increased scrutiny of their operations and practices.

Increasing numbers of downstream resource users are resulting from the population growth the region is experiencing. Since Silver Star Mountain Resort is at the top of 6 watersheds, any negative environmental impact originating from within the Controlled Recreation Area may be observed lower in the watershed or have negative downstream effects.

Silver Star Mountain Resort appears to be getting more involved with an ongoing forest management program. As a result, Silver Star Mountain Resort may find itself subjected to the jurisdiction of the Forest Practices Code. The Forest Practices Code regulates a wide range of environmental protection practices.

The BC Waste Management Act, Bill 26, may affect future permitting requirements as well as handling of waste and hazardous materials.

The BC Environmental Assessment Act, Bill 29, may affect the process of planning for expansion and development of the resort. Silver Star Mountain Resort may be subjected to environmental impact assessment review processes prior to development approvals. It is not presently known at what level of development the process will be applied.

Considering these factors Silver Star Mountain Resort should continue to prepare for these potential eventualities in the following ways:

1. With the implementation of the Forest Practices Code, Silver Star Mountain should consider preparing a Forest Development Plan for the management of the forests within the Controlled Recreation Area. This document would form the framework for a database containing resource inventories and biophysical assessments produced in the future.
2. Silver Star Mountain Resort should follow and adhere to the Land Development Guidelines for the Protection of Aquatic Habitat, in all future development.
3. Silver Star Mountain Resort should commission a study to sample for presence of resident fish in Putnam Creek, Vance Creek, and BX Creeks. If residents are found, the creek should be subjected to an aquatic biophysical survey to assess fisheries value.
4. Prior to any further ski pod development, Silver Star Mountain Resort should consider construction of downstream settling ponds.
5. Under the pending BC Environmental Assessment Act, environmental assessment may be required prior to new development or expansion.

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6. Silver Star Mountain Resort staff should record sightings of wildlife. Sightings should be managed in a database of wildlife inventory for future use in environmental assessment.

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