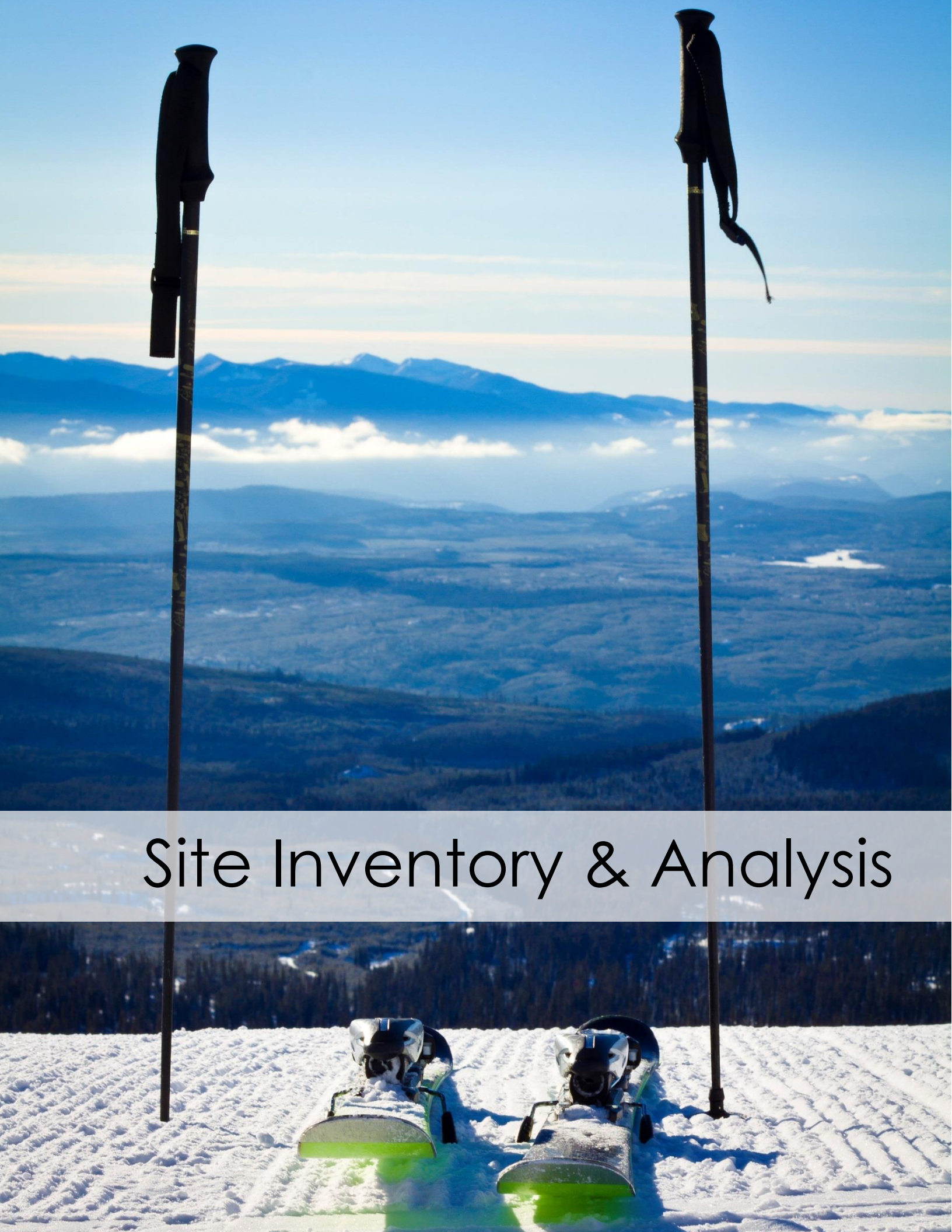


Site Inventory & Analysis

3.0 SITE INVENTORY AND ANALYSIS

3.1 INTRODUCTION

BHA undertook an analysis of the Big White study area to assess the development potential for the expansion and improvement of the existing all-season resort. Given the defined project goals and objectives, a study area of approximately 6,300 hectares (15,568 acres) was identified. Utilizing a combination of TRIM topographic mapping data with 20 metre contour intervals and more detailed LiDAR mapping with 5 and 1 metre contours (acquired in 2016), a digital terrain analysis was undertaken to initiate and guide the mountain and base area planning processes.

3.2 MOUNTAIN TERRAIN ASSESSMENT

The study area was analyzed in terms of slope, elevation, aspect, and fall-line to gain an understanding of the alpine skiing, Nordic skiing, downhill and cross-country mountain biking, and golf course development potential. The spatial analyses, combined with available weather data, a series of site visits, and site knowledge gained from a long history of working with Big White culminated in an understanding of the study area's capability to physically and environmentally support additional four-season recreation activities. Prior planning endeavors, particularly the 1996 and 1999 Master Plans, informed this process as well.

The initial assessments conducted by BHA examined the terrain, assessed the slope and elevation configurations, identified preliminary fall-line patterns and considered associated linkages. At this stage, BHA prepared multiple concepts to identify ski pods and potential lift locations. A coarse analysis of these potential ski pods was then carried out to get a general idea of the possible capacities. The results of the analysis identified the East Peak with its 360° orientation, along with several other adjacent faces, as having significant recreation opportunities with connections to the existing mountain. This represents a potential increase of the CCC to over 20,000 skiers per day as compared to the existing CCC of about 9,000 skiers per day. Moreover, the initial analysis indicated that the development of this terrain would improve the skier distribution of Big White by providing much needed advanced and expert skiing, enabling the Resort to more closely match the accepted market distribution of skier skill classes.

Given the potential to connect the existing trail network to East Peak, the BHA design team began to design detailed ski run alignments, lift configurations and glading opportunities. The following sections highlight the results of the terrain

analysis upon which these assessments were founded. The resultant Mountain Expansion Plan is detailed in Section 4.0.

3.2.1 Mountain Slope Analysis

The Slope Analysis (Figure 3-1) divides the topography of the study area into a range of skiable gradients as they relate to each of the primary skier skill classes. These are as follows:

Table 3-1. Ski Area Slope Analysis Criteria

Skill Class	Low Gradient (%)	High Gradient (%)
Beginner	8	15
Novice	15	25
Low Intermediate	25	35
Intermediate	35	45
Advanced	45	60
Experts	60	80
Extreme	80	+

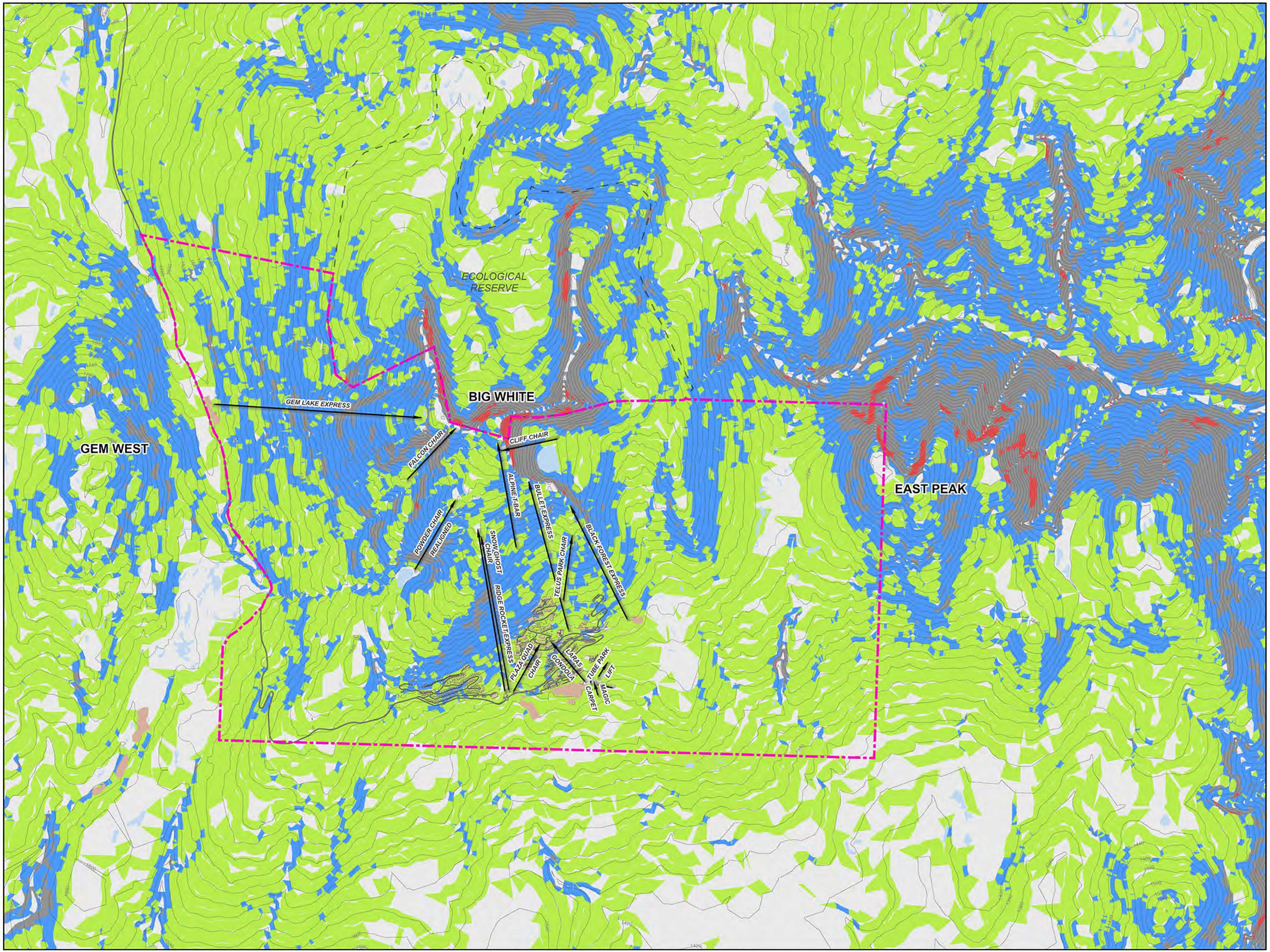
The resultant analysis delineates the general character of the land, illustrating that the study area has an excellent mix of undeveloped ski terrain with the potential to help balance the skiing product offered at the Resort.

The south facing slopes of the East Peak offer predominantly low intermediate/intermediate ski terrain, with small pockets of beginner terrain interspersed at lower elevations. The north facing slopes contain a significant opportunity to develop the advanced and expert terrain that Big White currently lacks. Large contiguous areas of expert ski terrain stretch from the peak of the East Peak down to the valley floor, broken in places by bands of extreme terrain, usually associated with a watercourse.

North of the East Peak, the slopes contain an even mix of intermediate and expert ski terrain, with patches of beginner and extreme terrain. The continuity of the terrain on the East Peak and these southern faces indicates significant potential for a large, balanced, and importantly, well-integrated alpine ski offering.

To the west of the existing CRA, there is also the eastern face of Gem West, which contains considerable areas of intermediate to advanced terrain. The analysis suggests that area is worthy of lift and trail development consideration.

Looking at the slope analysis in isolation, the alpine skiing at Big White could effectively be doubled in size. Critically, this doubling would result in increased advanced and expert terrain, better aligning the ski run distribution at Big White with the skier marketplace.



Big White Ski Resort Master Plan

2020

Legend

- Existing Ski Lifts
- Existing Big White CRA
- Lakes

Ski Slope Analysis

Slope

- Flat
- Beginner Ski Terrain
- Intermediate Ski Terrain
- Expert Ski Terrain
- Extreme

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Ski Slope Analysis

Figure 3-1

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3.2.2 Mountain Bike Slope Analysis

As illustrated on the Mountain Bike Slope Analysis (Figure 3-2), Big White's terrain has numerous areas with high potential for both cross-country and downhill mountain biking. Similar to the Mountain Slope Analysis, the Mountain Bike Slope Analysis involves colour coding the topographic features. However, classification is based on suitability for trail construction rather than rider skill class. Table 3-2 defines these gradients in terms of their desirability for the creation of mountain bike trail development.

Table 3-2. Mountain Bike Slope Classification

Type of Terrain	Mountain Biking Terrain	Range of Acceptable Gradients (%)
Flat	Try to avoid. Drainage will be an issue.	0 - 5%
Preferred	Best range for skill parks, trail hubs, trail intersections, climbing turns and all levels of trail development.	5 - 25%
Possible	Maximum preferred grade for switchbacks.	25 - 40%
Generally Avoid	Switchbacks require retaining structures.	40 - 55%
Avoid	Too steep for Mountain Bike use.	55% +

Slopes between 5% and 25% (light yellow) and 15% to 40% (dark yellow) have significant mountain bike trail development potential. The light red (40-55%) and dark red (55+%) coloured slopes represent terrain that is considered too steep for development. However, in some cases these lands can still be utilized for mountain bike trail development. For example, long benched traverses may be used to link trails, or these areas can be used for expert only features that act as unique or iconic attractions.

Reviewing the analysis, the terrain within Big White's CRA offers significant potential for the development of a full spectrum of downhill and cross-country mountain biking. Preliminary assessment highlighted five pods of lift-serviced mountain biking terrain, each associated with existing ski lifts: Black Forest Express, Bullet Express, Alpine T-Bar and Snow Ghost Express/Ridge Rocket Express. As potential lift-serviced Bike Park facilities, these terrain pods will easily tie back into the existing base areas at the Resort. As such, these pods will inform future development phases of lift-serviced Bike Park facilities.

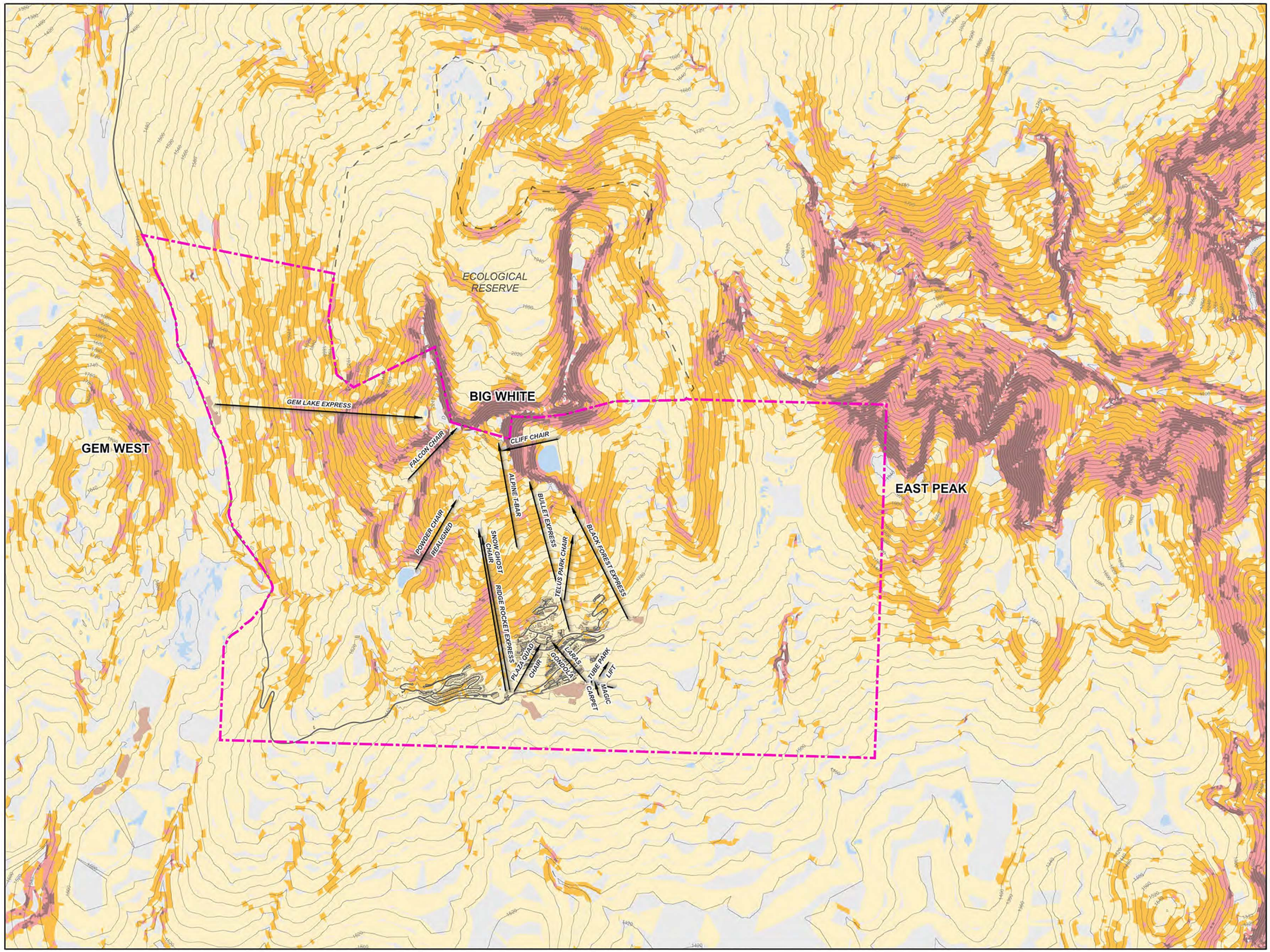
The terrain associated with the Falcon Chair and the Powder Chair have bands of steep terrain that would make mountain biking difficult. However, while the Gem Lake Express has similarly steep slopes and cliff bands, the development of a low-density bike area with longer, more advanced trails would be possible. The area surrounding Rhonda Lake also shows great potential for cross-country mountain biking.

Many of these same areas have the potential to support an extensive network of cross-country mountain bike trails; The east side of Black Forest Express, north of Big White Village, and west of the Snow Ghost Express.

Finally, it is evident that there is great potential to develop lift-accessed, high elevation 'epic' cross-country mountain biking trails throughout the Resort. This will result in a more diversified mountain biking product that is increasingly being expected from an expanding mountain biker marketplace.

Outside the CRA, the lands between the East Peak and Big White are ideal for both downhill and cross-country mountain biking. Early trail development could connect the Resort to these lands for use as cross-country trails or epic trails and be progressively developed as downhill mountain biking with Resort expansion. Beyond this, much of the East Peak and adjacent terrain is far too steep for the development of a high-quality mountain biking product.

The terrain at Big White is well suited to the development of both downhill and cross-country mountain biking.



Big White Ski Resort
Master Plan
2020

Legend
- Existing Ski Lifts
- Existing Big White CRA
- Lakes

MTB Slope Analysis

Slope
- Flat
- Preferrable
- Possible
- Generally Avoid
- Avoid

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MTB Slope Analysis

Figure 3-2

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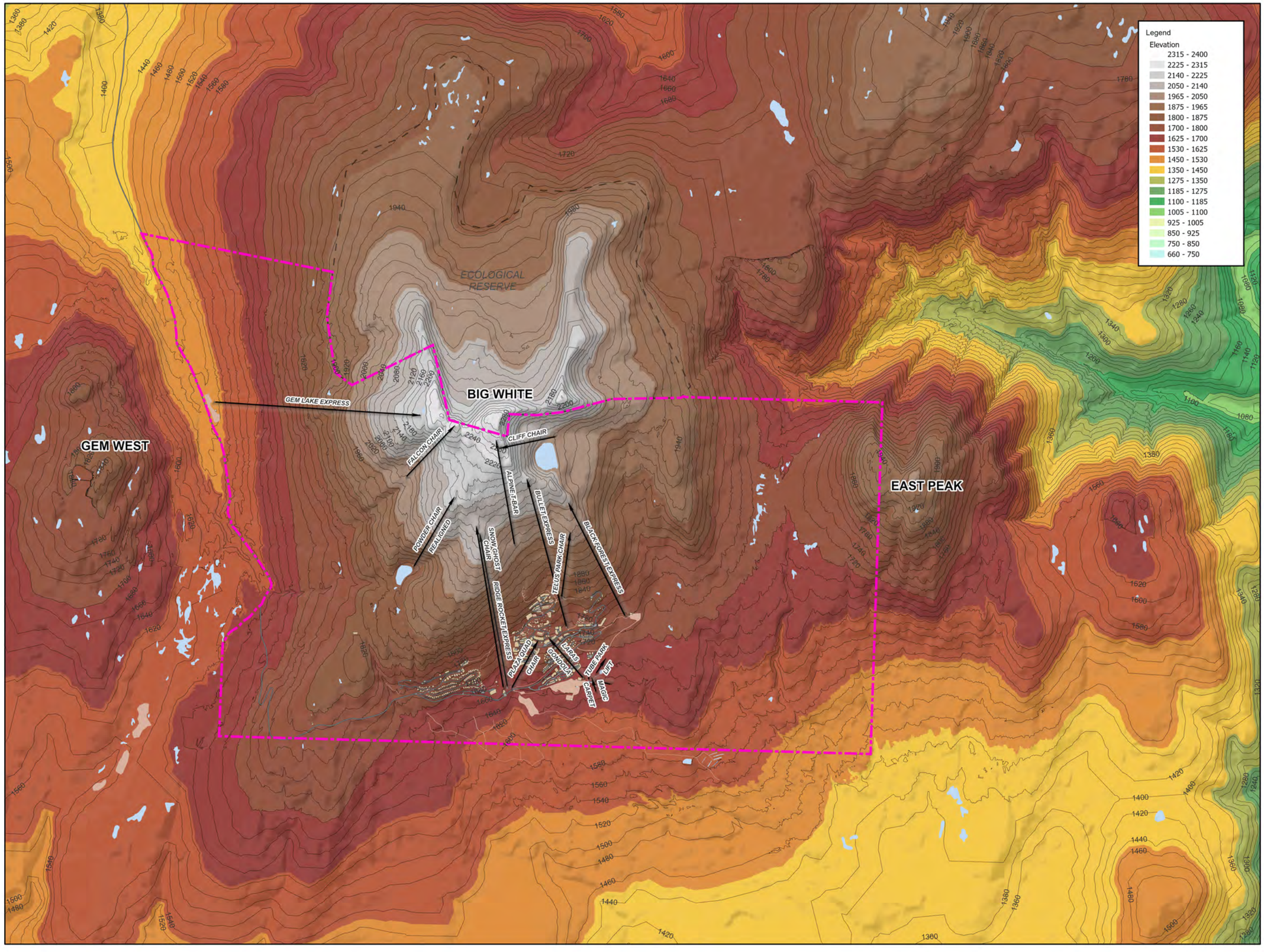
3.2.3 Mountain Elevation Analysis

The Elevation Analysis (Figure 3-3) slices the topographic features of the study area into 150 metre increments, effectively illustrating the height and "flow" of the land.

The highest point in the study area is the peak of Big White Mountain (2,319 metres, 7,607 feet). The Village sits at an elevation of 1,600 metres (5,250 feet) and the lowest developed ski terrain is 1,542 metres (5,050 feet). The study area is dominated by Big White Mountain, with the East Peak (1,960 metres) and the Gem West Peak (1,760 metres) sitting to its east and west, respectively. From the peak of Big White Mountain, ridges radiate out to the north and west forming the height of land from which the terrain descends to an elevation of approximately 1,550 metres before leveling out.

The lowlands surrounding Big White Mountain vary between 1,400 m and 1,700 m. To the west, the Gem West Peak rises approximately 300 m, while the East Peak offers a rise of 450 m on its northern face. Both peaks are generally conical in shape, with the notable exception of a large bowl on the East Peak's northern face.

Big White's existing elevation and vertical drop are similar to other ski resorts in BC, with the distinction of being the highest resort in the Okanagan region. Notably, Big White's base elevation is considerably higher than other BC ski resorts, making it well positioned to remain viable as the impacts of climate change are realized.



Big White Ski Resort Master Plan

2020

Legend

- Existing Ski Lifts
- Existing Big White CRA
- Lakes

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Elevation Analysis

Figure 3-3

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3.2.4 Mountain Aspect Analysis

The Aspect Analysis (Figure 3-4) involves colour-coding the topographic features of the study area to illustrate the orientation and geographical exposure with respect to the eight points of the compass. Receiving reduced direct sunlight, northern exposures are better suited for snow retention and therefore better suited for ski run development. Southern exposures can prove to be problematic for skiing terrain due to reduced snow retention capabilities and a greater probability of snowpack reliability problems. However, southern orientations are more desirable for base area developments and on-mountain lodges.

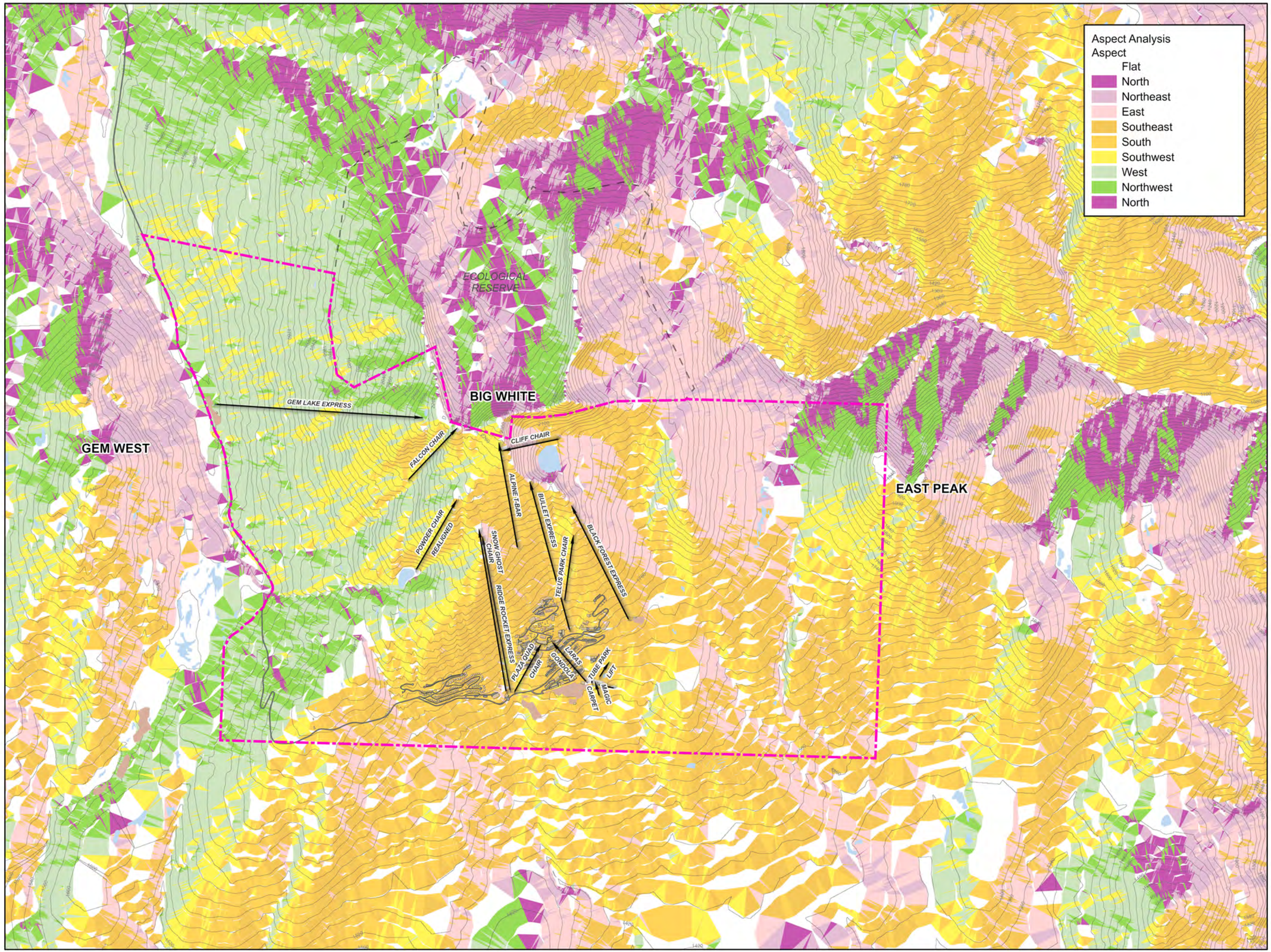
Ski runs that have a high degree of solar exposure can have their susceptibility to "solar burn out" minimized through careful design. This includes detailed grading (angling trails away from direct exposure), reduced trail width (maximizing shade from edge vegetation) and erosion control (directing melt waters away from the trails).

Most of Big White's existing terrain has a southern orientation. However, to date, the slopes above the Village have proven resilient to the increased solar exposure. The same cannot be said of the Gem Lake trails, which have shown a greater risk to solar burn out, especially at the lower elevations that have western orientations that receive direct sun at the end of the day.

The conical shape of the East Peak results in an even mix of solar orientations. As would be expected, the northern face is the most protected from potential solar burn out while southern faces will likely require more detailed ski run design to mitigate the southern exposure. This is also true of the slopes to the north of the East Peak which are dominated by southwest, south, and southeast orientations.

The eastern slopes Gem West Peak, opposite the Gem Lake Express, are predominantly east and northeast facing.

In summary, the Aspect Analysis highlights the challenges of high solar exposure over much to the existing ski area and the considerable opportunity present on the north facing slopes of the East Peak.



Big White Ski Resort
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2020

Legend
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Mountain Aspect Analysis

Figure 3-4

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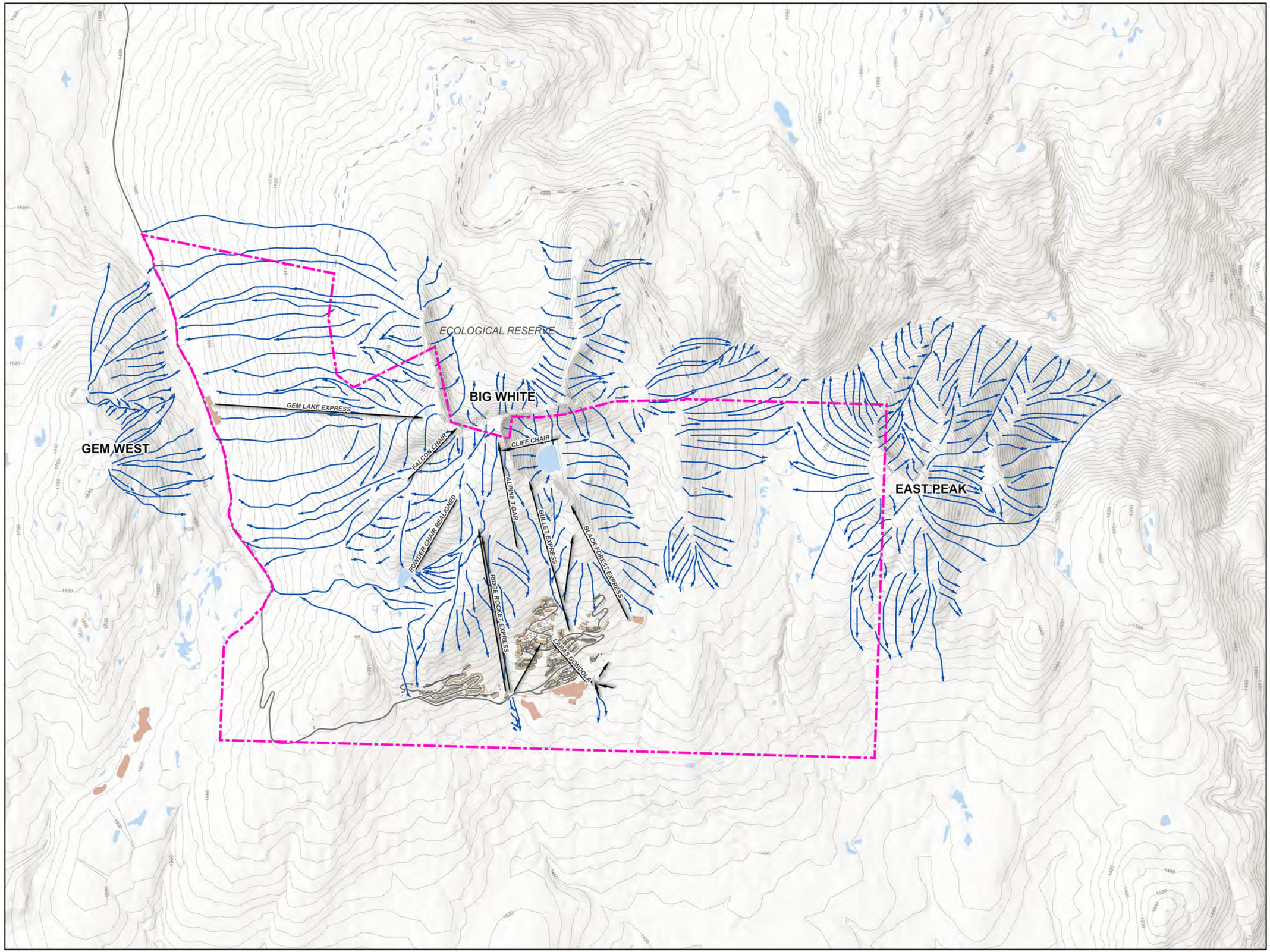
3.2.5 Mountain Fall-Line Analysis

The Fall-Line Analysis (Figure 3-5) was completed to assist in the identification of contiguous skiable areas. A fall-line analysis identifies potential routes that will allow for the natural flow of skiers and snowboarders from the mountain heights to the valley bottoms in a continuous, unbroken fashion. The consistency of trail flow provides the best possible recreational skiing experience while resulting in the least amount of environmental disruption during trail construction. Based on this analysis, defined planning units (terrain pods) can be established and specific run layouts incorporated into the mountain plan. Opportunities for re-alignment and modification of existing runs can also be identified.

The fall-line analysis, in conjunction with the elevation and slope analyses of Big White, illustrate a basic conical shape of both Big White Mountain and the East Peak. The fall-lines radiate outwards 360 degrees from the summit of these two topographic features. Further, analysis indicates that the eastern slopes of Gem West offer a considerable number of potential ski runs.



Big White Ski Resort
Master Plan
2020

Legend
- Fall Lines
- Existing Ski Lifts
- Existing Big White CRA
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Fall-Line Analysis

Figure 3-5

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3.2.6 Mountain Climatological Analysis

The growing influence of climate change presents a challenge to ski areas across British Columbia. Changes to temperature and precipitation regimes will alter the timing and amount of annual snowfall, influencing the length of season and snow quality, impact fire regimes and drought conditions, and generally impact the quality of the guest experience. These changes will create challenges for Big White's existing winter and summer offerings. An understanding of the potential challenges and opportunities posed by climate change, and the broad implications to Big White's operations, have informed this Master Plan and will continue to shape the long-term development at Big White.

To assess future climate change at Big White Ski Resort and its potential impacts, projections were generated for Mean Annual Temperature, Mean Monthly Temperature, Mean Annual Snowfall, and Mean Monthly Snowfall to 2085 using the ClimateBC online tool[4]. Projections were based on two future climate scenarios, or Representative Concentration Pathways (RCP). Representative Concentration Pathways are greenhouse gas concentration scenarios that capture a range of possible greenhouse gas emissions trajectories. They were developed as part of the International Panel on Climate Change's Fifth Assessment Report (IPCC AR5) and are intended to help with climate change modelling and projections. There are four RCPs: 2.6, 4.5, 6, and 8.5. These values refer to the projected radiative forcing (heat gained from the sun minus heat lost to space) in the year 2100 relative to pre-industrial levels. For instance, the RCP4.5 scenario equates to 4.5 W/m^2 greater than pre-industrial levels in 2100. Recent analysis indicates that radiative forcing has increased from 2.16 W/m^2 in 1990 to 3.03 W/m^2 in 2016[5]. As such, the RCP2.6 scenario is unlikely to be realistic. For this analysis, the RCP4.5 and RCP8.5 were chosen as they provide a realistic range of climate change projections as detailed in the IPCC AR5.

The charts presented below represent the averages of three climate change models (CanESM2, CNRM-CM5, and HadGEM2) calculated by the ClimateBC tool. Taking the average of multiple climate change projections, or the ensemble mean, helps to account for model uncertainty, in turn lending confidence to model projections. Model uncertainty, calculated as the standard deviation of model projections, is represented by the error bars. Historic values included were collected from the ClimateBC tool for the 1969 – 2017 period. For simplicity, a single representative site within Big White was chosen for analysis, the same as that used in the review of historic weather and climate presented in Section 2.5.2 (49.73, -118.94, 2,096 m.a.s.l.).

[4] UBC Centre for Forest Conservation Genetics (2019). ClimateBC/WNA/NA https://cfcg.forestry.ubc.ca/projects/climate-data/climatebcwna/#ClimateBC

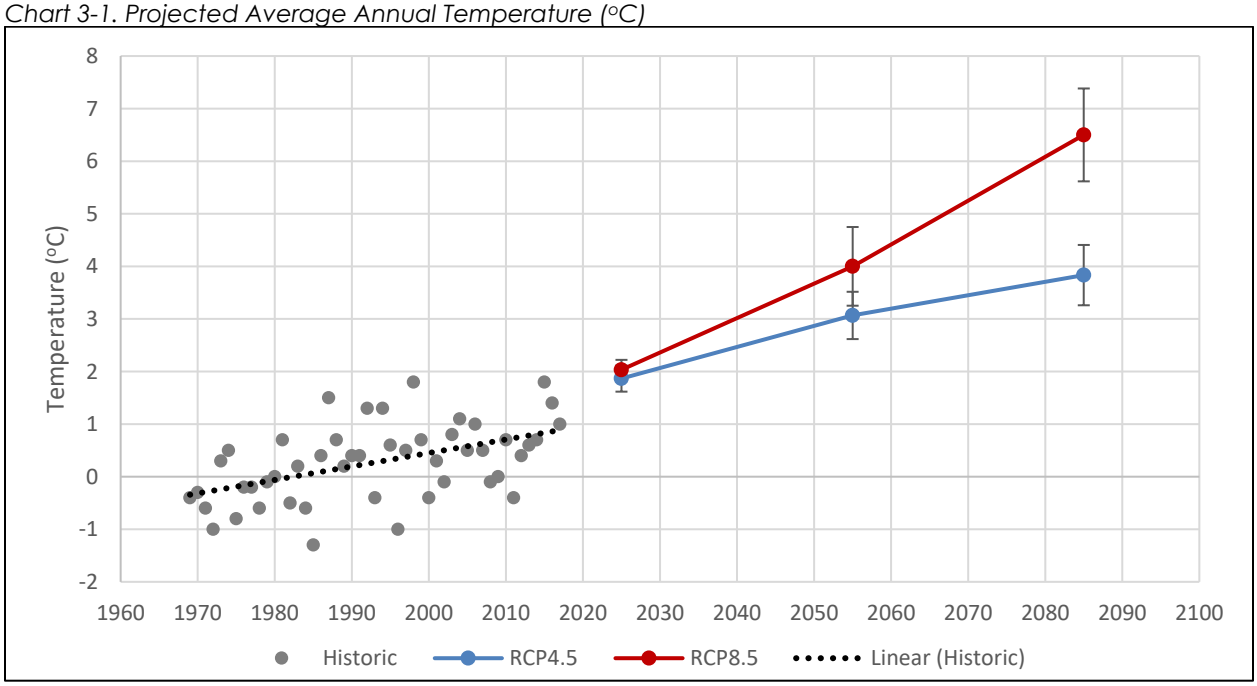
[5] Butler, J. H. & Montzka, S. A. (2017). The NOAA Annual Greenhouse Gas Index (AGGI). Retrieved from: https://www.esrl.noaa.gov/gmd/aggi/aggi.html

Of note, the projections included are made at 30-year intervals extending to 2085. However, decisions regarding the development and management of Big White must take place on much shorter timescales, reflecting dynamic changes in the ski and recreationalist industry and guest marketplace. Thus, this Master Plan and future planning exercises must address the existing realities at the Resort but also allow for the flexibility to adapt to climate trends that will be realized over the span of decades.

Temperature

As projected, the average temperature at Big White is projected to increase regardless of the scenario that is realized. In the RCP4.5 scenario mean annual temperature is projected to increase by 2.8°C by 2085. In contrast, the RCP8.5 scenario projects that mean annual temperature will increase by 5.3°C by 2085. Both models have modest uncertainty that increases as they move further into the future.

Chart 3-1. Projected Average Annual Temperature (°C)



The projected temperature changes are not uniform throughout the year. As illustrated in Chart 3-2, in the RCP4.5 scenario temperature increases are more significant in late winter, spring, and summer, while average temperatures in fall and early winter are less effected. Of the months anticipated to see the greatest change, the projected 4°C increases in February and March present the greatest threat to alpine skiing and snowboarding (see Snowfall below).

Chart 3-2. Projected Temperature by Month - Moderate Scenario (RCP4.5)

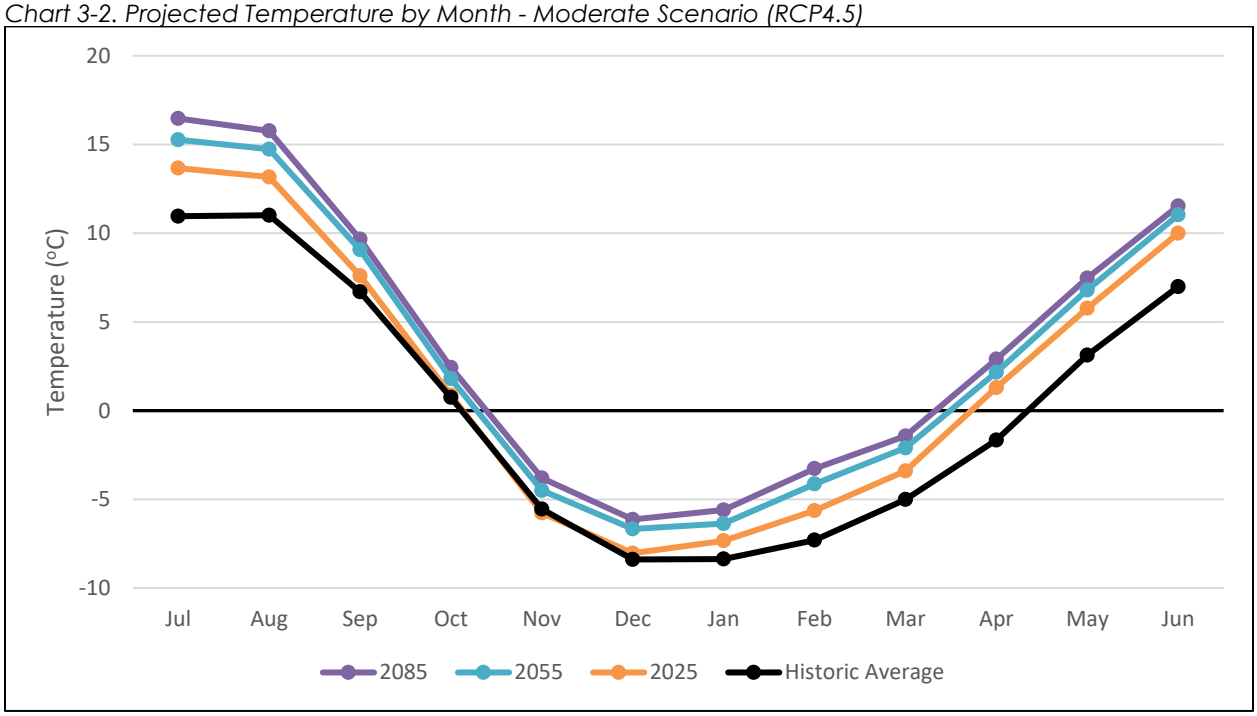
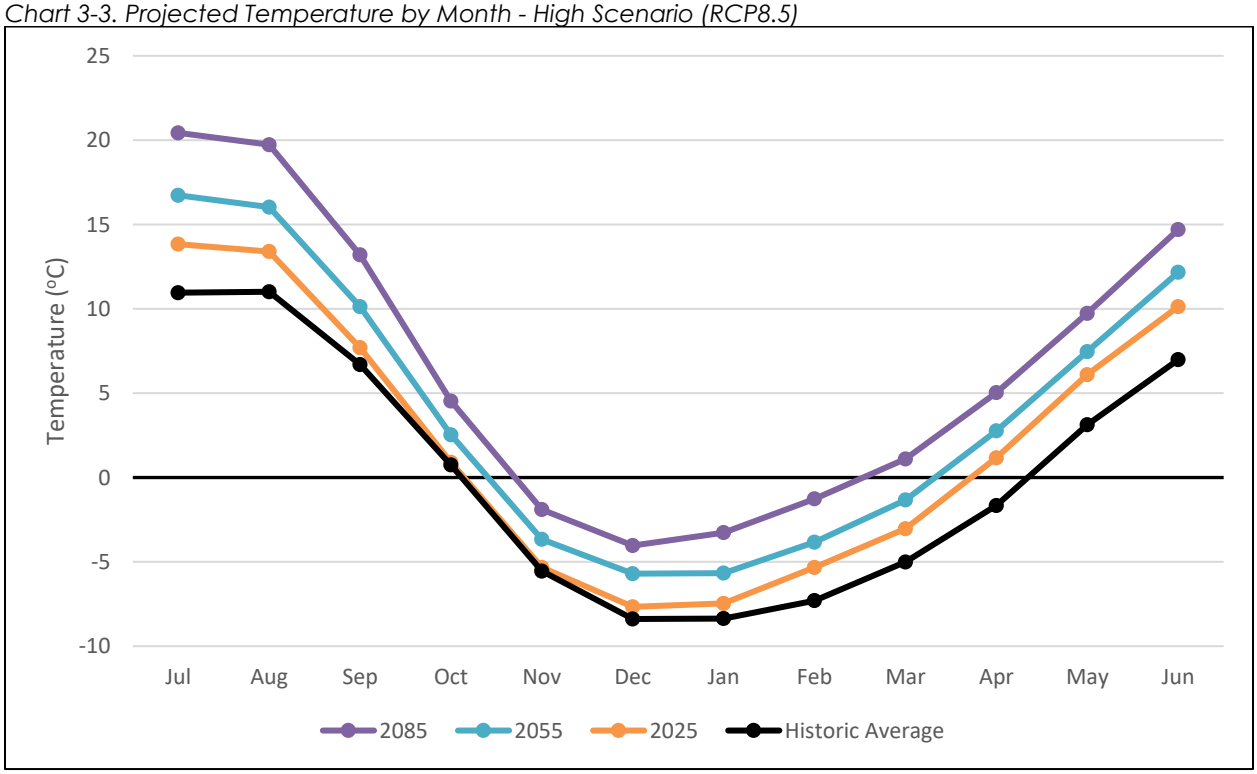


Chart 3-3. Projected Temperature by Month - High Scenario (RCP8.5)



Under the RCP4.5 scenario, temperatures in the summer months are projected to respond to climate change sooner than winter months, increasing by approximately 2.5°C by 2025 and by a further 2°C to 3°C by 2085. Temperatures in the fall and early winter months are projected to remain somewhat stable, increasing by approximately 1.7°C by 2085.

In the RCP8.5 scenario, projected temperature increases are more even throughout the year but more pronounced, with summer temperatures projected to increase by as much as 9°C and winter temperatures projected to increase by as much as 6°C. Further, while temperatures for September through January and projected to remain stable through 2025, all months see significant increases by 2055.

Snowfall

Snowfall at Big White is projected to decrease in both the RCP4.5 and RCP8.5 scenarios, though under the RCP4.5 scenario this decline is minimal relative to historic snowfall records. The scenarios are relatively similar in their projections to 2055, projecting approximately 0.7 m and 1 m decrease in annual snowfall from the estimated 2017 average. The RCP8.5 scenario projects that this downward trend will continue after 2055 while the RCP4.5 scenario indicates that snowfall will experience a limited decline after 2055. Model uncertainty around these projections increases as the projections move into the future.

Chart 3-4. Projected Average Annual Snowfall (m)

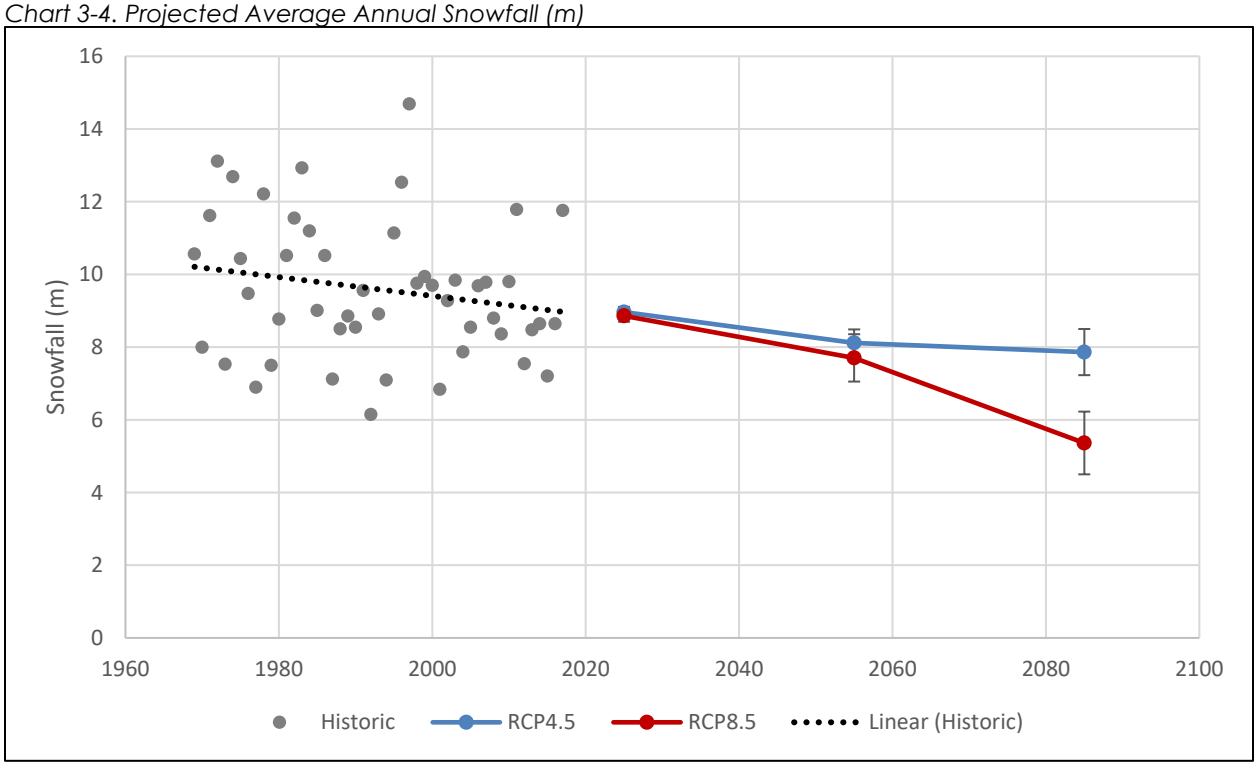


Chart 3-5. Projected Snowfall by Month – Moderate Scenario (RCP4.5)

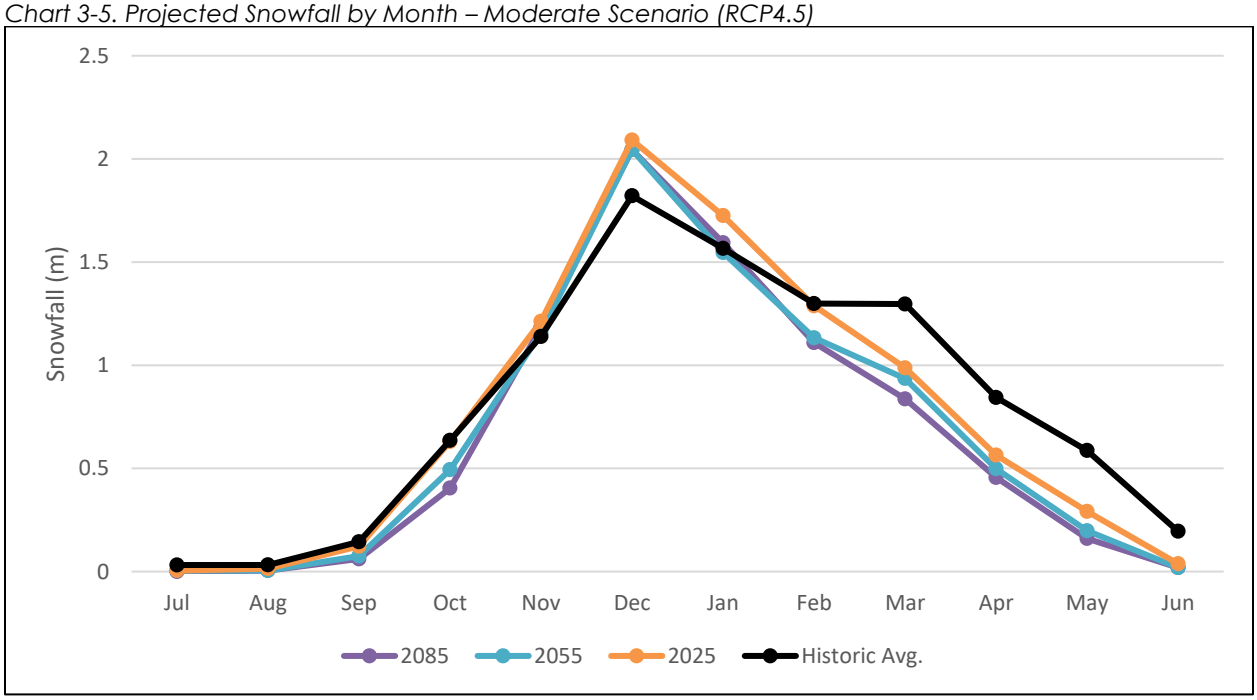
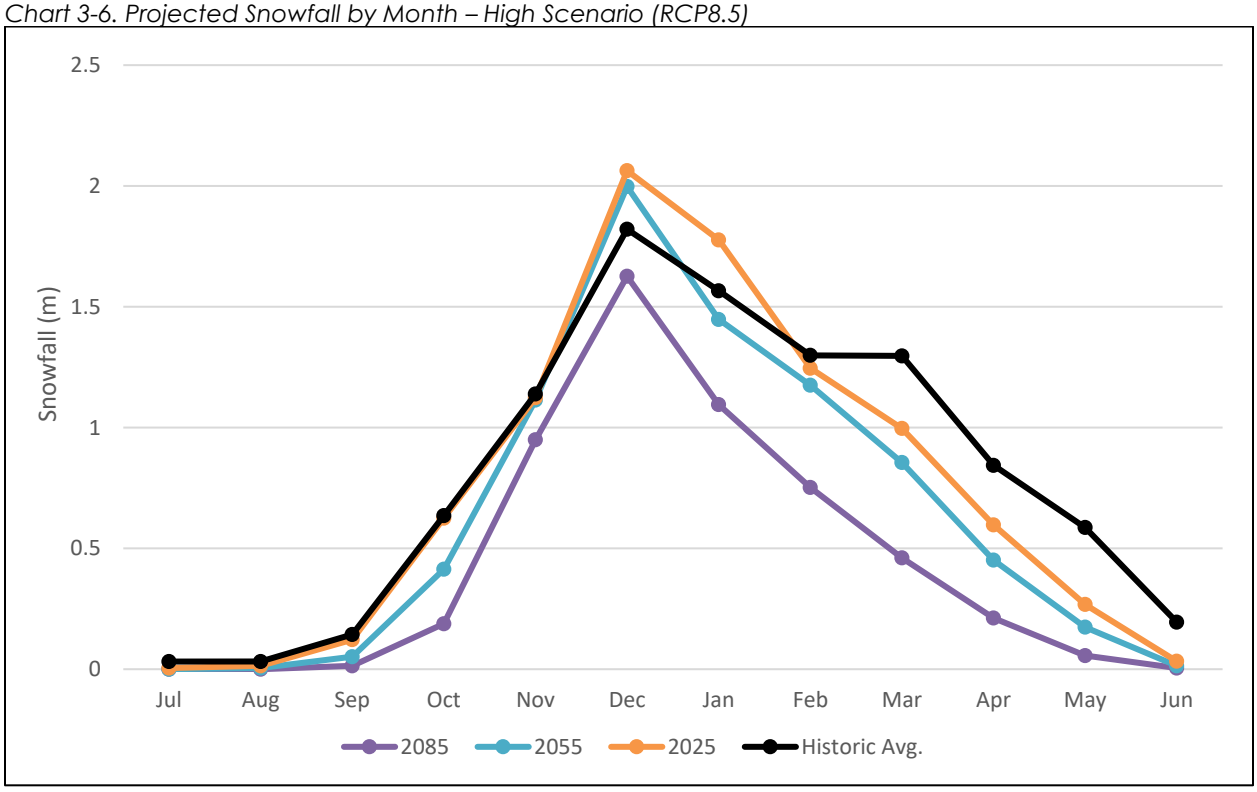


Chart 3-6. Projected Snowfall by Month – High Scenario (RCP8.5)



Owing to its high elevation and relatively cold temperatures, Big White is largely insulated against the impacts of projected climate change to 2085 under both scenarios. Only in the RCP8.5 scenario is snowfall projected to see considerable decline by 2085, and even then, snowfall is projected to exceed 5.5 m annually on average. However, it should be recognized that with the increasing temperatures, seen in Chart 3-2 and 3-3, the type and quality of snow will likely change. The 'champagne' powder Big White is known for will likely become less prominent and a wetter, heavier snow will become more commonplace.

Regardless of which scenarios is realized, the shifts in temperature and snowfall illustrated in the projections for Big White stress the need for a range of mitigation and adaptation strategies to ensure the viability of the Resort into the future. For example, development of a snowmaking system and advanced ski run design techniques can be used to mitigate the effects of warming temperatures in the coming decades, while the expansion of summer and shoulder season recreational offerings will allow Big White to adapt to its changing setting, maintaining the high-quality, outdoor recreation experiences it offers. A range of mitigation and adaptation strategies informed the preferred concept for Big White, detailed in Section 4.

3.3 BASE AREA TERRAIN ANALYSIS

The Base and Village areas were analysed using 1-metre contour mapping data. These analyses examined slope, elevation and aspect to determine the best potential layouts and concepts. The resultant detailed plan is described in Section 4.0 – Master Plan.

3.3.1 Base Area Slope Analysis

The Base Area Slope Analysis of the base lands study area was completed as illustrated in Figure 3-6. The slopes of the lands were categorized based on the physical capability to support specific types of development. The grey areas represent areas with a slope of less than 5%. Generally, this land is ideal for all types of built development (base lodge/village development, high, medium and low density residential, parking lots, settlement ponds, golf courses, etc.). However, it is important to note that these same areas, because they are flat, limit the ski to/ski from qualities. In addition, these lands can have issues with drainage and be environmentally sensitive, adding to development challenges.

Lands with slopes between 5% and 10% (yellow) have significant development potential. With some minimal grading, these lands can all be tied together into a contiguous development opportunity.

The green coloured slopes represent areas with terrain greater than 10% but less than 20% slope. These lands may be utilized for built development but are subject to more difficult access issues. While they are generally too steep for base area staging capabilities and high-density development, they are still conducive to medium and low-density residential development as well as limited golf course considerations. As illustrated, there are a variety of consolidated areas at Big White with this classification.

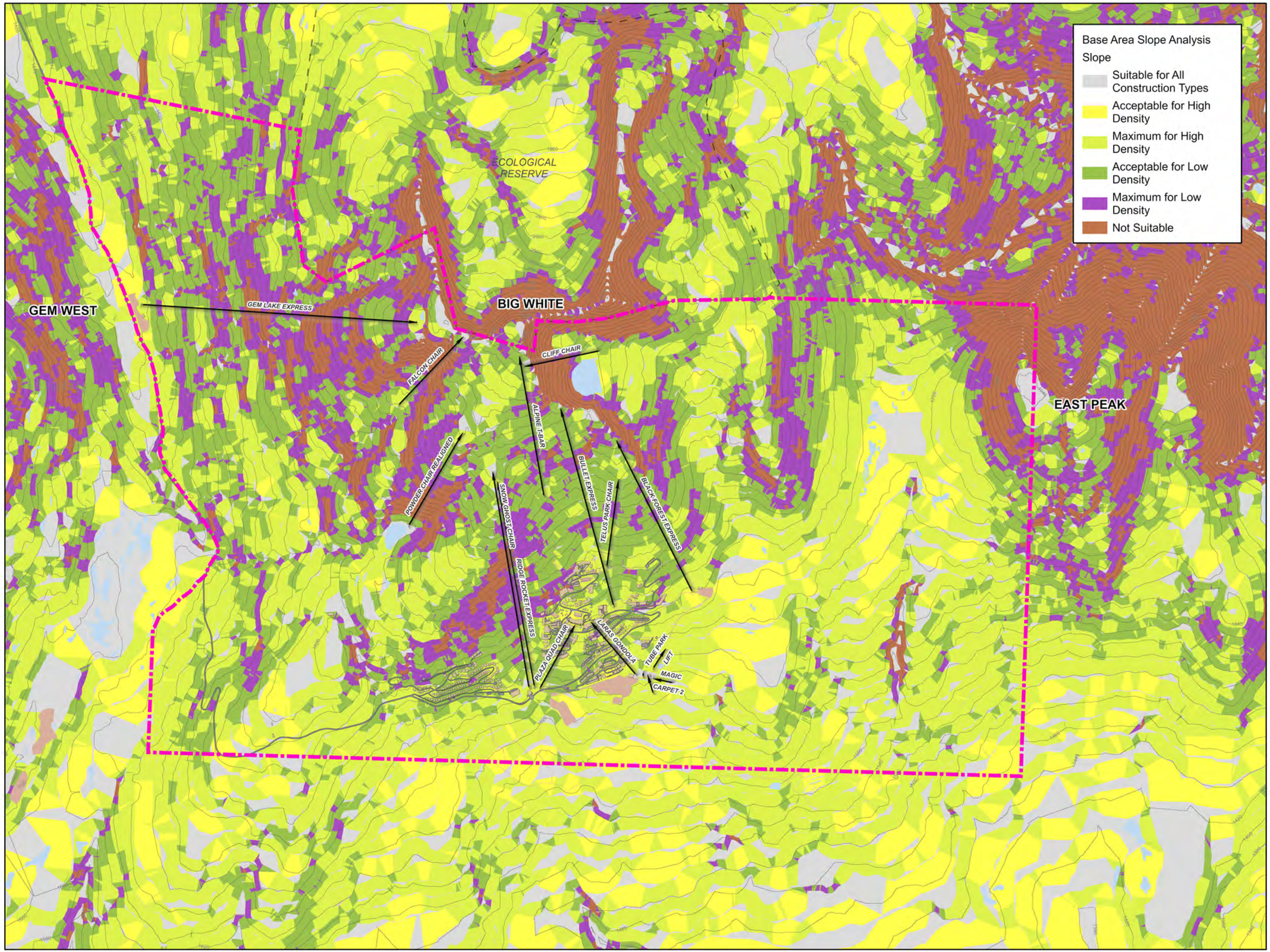
Slopes between 20% and 30% gradients (indicated by light blue) are lands where medium-density development becomes more challenging. The keys to such development are vehicular access and the establishment of enough off-street parking in an economically viable fashion. Low-density single family and duplex type development may be applied to these lands with greater ease than the multi-family, medium-density models. The benefits of development on these slopes usually include ski to/ski from capabilities, unrestricted views, and good solar access.

The dark blue colour represents areas with slopes between 30% and 40%. This generally represents the upper limit for low-density development without incurring access and development expenses that exceed economic viability. The challenges of developing on these slopes are often offset by the benefits of scenic views and excellent solar access.

Finally, pink coloured areas represent slopes greater than 40%. These areas should largely be avoided due to the difficulties of access and the expense of building, unless special circumstances prevail. As illustrated in the Base Area Slope Analysis, there are no contiguous areas with this classification.

In summary, and based on slope classifications, there appears to be large tracts of land capable of supporting a full spectrum of ski to/ski from resort residential development near the existing ski terrain. Further, there are considerable parcels of undeveloped land within and outside the existing CRA suitable for the development of high-density housing/accommodation, parking areas, or golf courses.

The Towering Pines development at Big White.



Big White Ski Resort
Master Plan
2020

Legend
- Existing Ski Lifts
- Existing Big White CRA
- Lakes

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Base Area Slope Analysis

Figure 3-6

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The Big White base area lit up for a night of dining and relaxation after a great day of skiing.

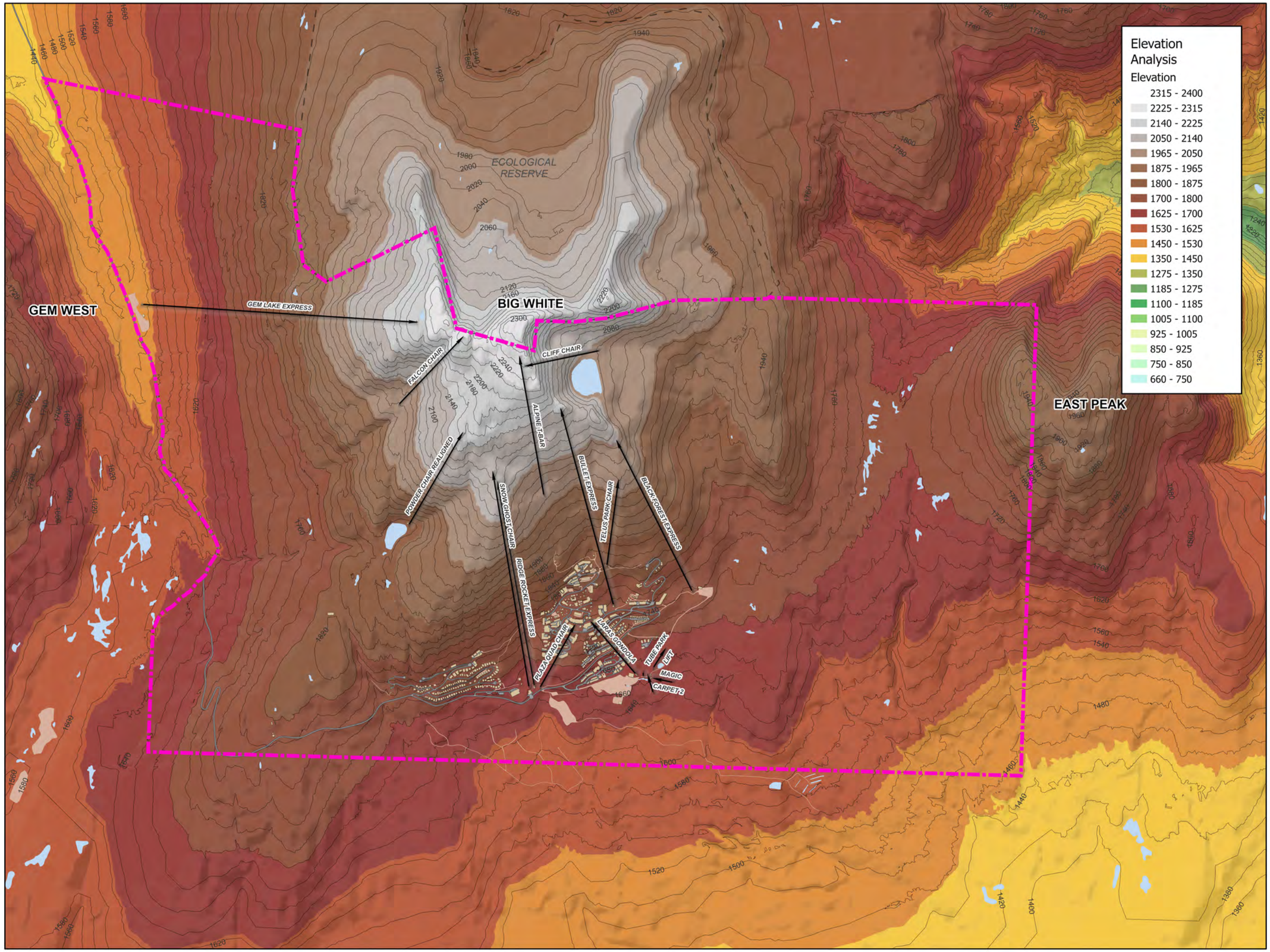
3.3.2 Base Area Elevation Analysis

A Base Area Elevation Analysis has been completed as illustrated in Figure 3-7. The areas of equal elevation have been graphically delineated to identify the general 'flow' of the base lands. This is key in establishing an understanding of the pedestrian, biking, and skiing linkages between the mountain and base areas as well as the adjacent development areas as they relate to the mountain development potential.

3.3.3 Base Area Aspect Analysis

As illustrated on the Base Area Aspect Analysis (Figure 3-8), the orientations of the base area lands are primarily to the south. Lands with such an aspect invariably prove to be very desirable in terms of solar access. In addition, those potential development areas on the steepest slopes will afford excellent views of distant lands and will play a significant role in the final placement and orientation of base area facilities and residential development.

The Woodcutter Cabins at Big White part of a diversity of accommodation options.



Big White Ski Resort
Master Plan
2020

Legend
- Existing Ski Lifts
- Existing Big White CRA
- Lakes

Prepared for:
5315 Big White Road
Kelowna, BC
Canada. V1P 1P3
Tel: (250) 765-3101 Fax: (250) 491-6122
email: bigwhite@bigwhite.com

Planning by:
BHA
4-1005 Alpha Lake Road,
Whistler, B.C.
Canada. V8E 0H5
Tel: 604 932 7002
email: bha@brentharley.com

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Base Area Elevation Analysis

Figure 3-7

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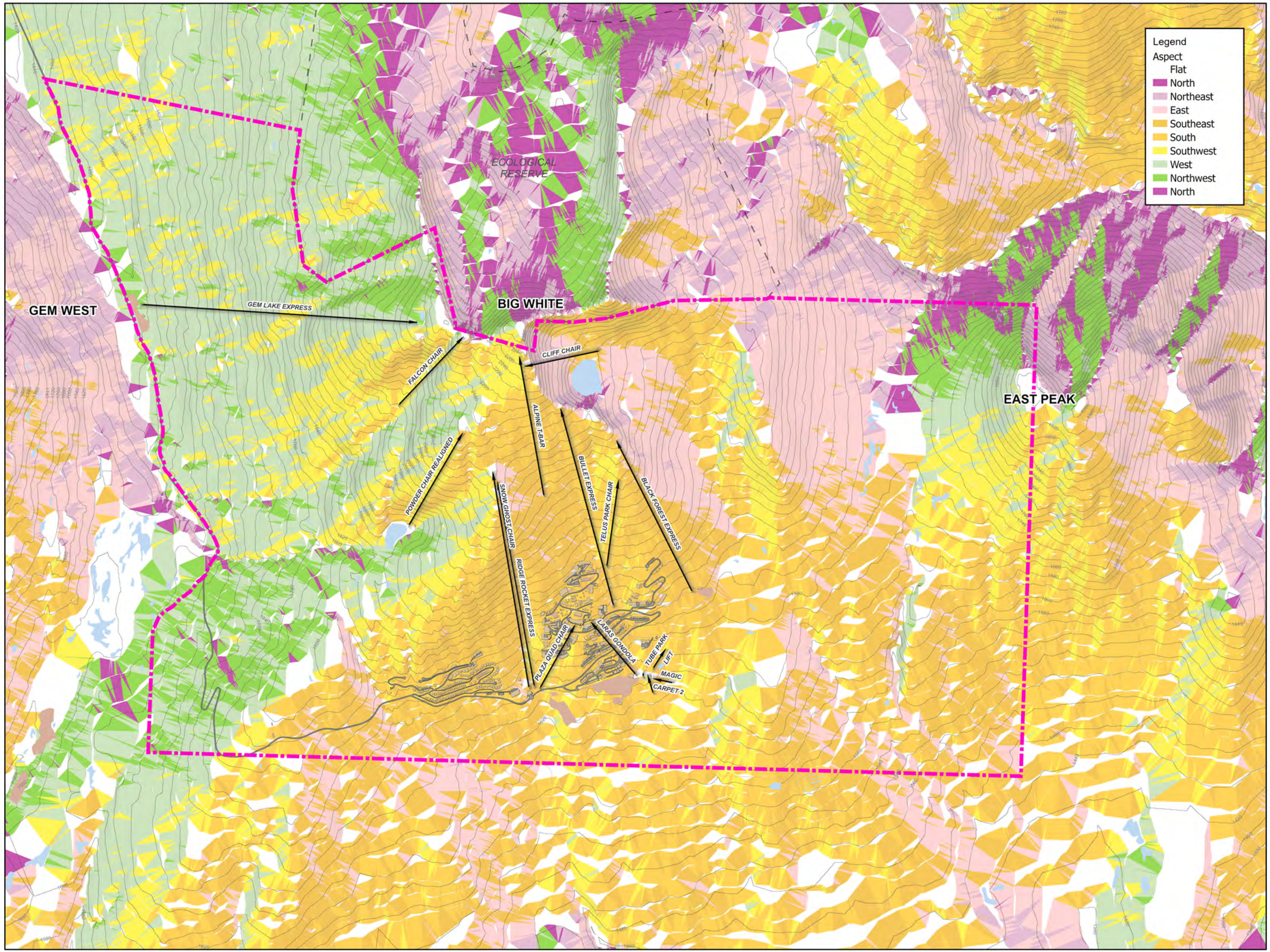

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Base Area Aspect Analysis

Figure 3-8

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3.4 ENVIRONMENTAL REVIEW

From initial concept to final design, the intent of Big White Ski Resort has been to develop a Master Plan that reflects the type, quality, quantity and sensitivity of the local environmental values. To this, Big White has completed a series of environmental reviews and studies throughout the planning process. An environmental review of the resort lands was first completed in 1996 (Environmental Review of Big White Ski Resort – 1996 Resort Master Plan (GeoAlpine)) and was followed-up by a series environmental analyses focused on portions of the existing footprint (Environmental Review of the Black Forest Lands (GeoAlpine)). As part of the 2006 planning process, an environmental review was completed by Cascade Environmental Resource Group Ltd. (Cascade Environmental) for the study area of the aborted Big White Ski Resort Master Plan (see Appendix). Since that time, the study area has been reduced to remove the Big White Ecological Reserve. Further, in preparation for the construction of the Mountain Bike Park and the addition of the Black Forest Connector and Backcountry Chair, Cascade Environmental completed site-specific reviews. From this, an environmental mitigation plan was drafted for the proposed mountain bike trails in the spring of 2017, and an additional report drafted in fall 2018. These reports, their findings and recommendations, were synthesized into a single report for clarity and accessibility, which is available in the Appendix (Cascade Environmental, 2020).

As part of the planning process, BHA has incorporated a wide variety of habitat, species range, and species inventory GIS data from the previous assessments and the DataBC database into a comprehensive mapping database. This GIS database forms the foundation for the environmental analyses contained within this Master Plan.

3.4.1 Environmental Review

The Cascade Environmental report (2020) provides general conclusions on the likely impacts of the proposed development on various species/communities. Terrestrial Ecosystem standards were used to describe the site vegetation, soil and geomorphic features unique to each ecosystem unit within the study area. Wildlife was identified by visual observation, songs, tracks and feeding signs. Potential for use by wildlife was inferred from available habitats, local information, and known distributions. The study findings are outlined below.

Climate

Climate in the study area presents no obvious constraints or concerns with respect to development.

Geology

The geology of the area presents no obvious constraints or concerns with respect to development.

Hydrology

No hydrologic concerns were noted during field visits. With the creation of a large number of new ski runs, surface erosion is likely to deposit sediment in the local stream channels over the first few seasons. Debris flows/torrents in larger creeks are possible if sedimentation is excessive. Walkdowns of the creek systems should be conducted by summer crews prior to the fall to note any accumulations.

The water quality of the creeks within the study area is generally of drinking water quality. While the quality of the water does not present any environmental constraints, the maintenance of the good water should be given high priority.

Previous reports indicate that a significant amount of topsoil in the Big White Village area has been either removed during construction or lost to surface erosion associated with road and infrastructure development (Klaus, 1995). The displacement and removal of mineral soil represents a concern which requires management attention.

Given that the predominantly shallow, rocky soils in the study area represent an obvious limiting factor for plant and tree growth, damage to or loss of these soils will negatively affect the fertility of the area and the ability to successfully replant. Sound forest harvesting practices, trail development practices, proper water management, and conservation of these and other study area soils all will help to minimize surface erosion potential.

Vegetation

Based on the field investigation and communication with the B.C. Conservation Data Centre, there are no known development constraints or concerns associated with rare or endangered vegetation in the study area.

Fish and Wildlife

The expansion and development of Big White into a four-season destination resort will alter wildlife use of the area. The greatest modification of habitat use will likely be associated with changes in vegetative cover due to run cutting in areas used by wildlife for cover and forage. Clearing of habitats at the proposed golf course development site will displace wildlife species currently utilizing these habitats. Increased levels of human presence and recreational activity in the summer months may also affect the summer migration of several wildlife species, but particularly larger mammals such as Grizzly bears. The highway presently appears

to serve to delineate the boundary between the undisturbed Fisheries Sensitive Zone I Wildlife Migration Corridor and Big White Ski Resort (GeoAlpine, 1996).

Although rare and endangered species are not anticipated to occur on the subject property, any future detections should trigger the implementation of appropriate Best Management Practices (BMPs).

Riparian areas within 30 meters of a permanent water course are subject to assessment in accordance with the Riparian Area Regulation (RAR) of the B.C. Fish Protection Act and should be respected.

3.4.2 Environmental Review Recommendations

Cascade Environmental made the following recommendations designed to minimize impacts arising during the expansion of Big White:

- Riparian Area Assessment should be conducted at sites of disturbance to determine appropriate clearing setbacks;
- All wetlands greater than 20 m^2 should be retained. No disturbance such as filling, redirection of runoff etc. should occur. Water utilization for watering and other uses should ensure that current hydrology of wetlands is not altered. A 15m to 30m vegetated setback should be established adjacent to wetlands to protect the unique plant and wildlife values of the wetland and adjacent riparian areas. Often wildlife trees important to bats and other wildlife species are located within the setback area;
- Future developments should consider maintaining recreational trails connecting the services with residential areas;
- Future developments should implement snow clearing plans to ensure that snow storage or removal does not impact fish-bearing water courses;
- Land clearing activity should be conducted with due diligence between April 1 and August 31, to comply with Section 34 of the Wildlife Act, which forbids the destruction of nests occupied by a bird, its eggs, or young (BC MOE, 1996). All areas protected for wildlife habitat should be flagged and enclosed by temporary fence (e.g. snow fence) prior to initiation of work on the site to ensure no encroachment occurs into those areas;
- Prior to clearing, a nesting bird survey should be conducted. During July and August all nests are protected under the BC Wildlife Act, while raptor nests are protected all year. Nests of raptors such as northern goshawk, boreal owl, and great horned owl found during land clearing activity must be adequately protected by forested buffer while the nest is occupied;

- Although rare and endangered species are unlikely to reside on the subject site, Great blue heron may occasionally utilize riparian areas, while Grizzly bears may be found to periodically transit the property. Any future detections should trigger the implementation of appropriate BMPs;
- Vegetation should be retained wherever possible, particularly near creeks and wetlands and within riparian buffers to facilitate wildlife movement. Efforts should be made to conserve snags and wildlife habitat trees. Wildlife movement corridors will be provided if retention zones along creeks are designated as recommended above. Road and trail crossings of these creeks should be designed so that wildlife movement is not impeded or discouraged. The number of stream crossings should be minimized. Bridges rather than culverts or fords are preferred. Planting of additional native, riparian shrubs and trees may be necessary;
- Site preparation and construction works should be monitored by a qualified environmental monitor;
- Future developments should implement stormwater management plans that implement BMPs to ensure the protection of the ecological values of receiving waters. In addition to the post-development storm-water management, a drainage plan should also be developed to deal with concerns related to land clearing, grubbing, and construction. This plan should adhere to the 'Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC Ministry of Environment, 2006)'.

3.4.3 Environmental Mitigation Strategy

Big White recognizes that its natural surroundings are core to the guest experience and a key piece of the resort offering. As such, the Resort has developed an environmental mitigation strategy as an overarching framework to guide mitigation actions. It includes commitments that apply to all proposed projects and areas within the proposed CRA and actions that follow the hierarchy of avoid, minimize, restore, and offset. It has been developed based on the recommendations of the 2020 Cascade Environmental report, draws from best management practices, and will be complemented by site-specific assessment and detailed planning prior to construction.

Commitments

To protect and conserve the natural values found within and surrounding the Resort, Big White will:

General

- Complete site-specific environmental assessments of the proposed infrastructure and facilities, conducted by qualified environmental professionals, during the detailed planning stage and prior to construction.

Watercourses and Riparian Areas

- Preserve riparian areas by observing the appropriate riparian buffers and adhering to the *Riparian Area Protection Regulation* and *Water Sustainability Act*.
- Conduct Riparian Area Assessments at sites of disturbance near watercourses (<30m) to determine appropriate clearing setbacks to protect fish habitat values and water quality.
- Immediately revegetate disturbed soils to prevent erosion and sedimentation.
- Develop a base area stormwater management plan following Provincial best management practices[6] to prevent erosion and sedimentation.
- Develop stormwater management practices for construction following Provincial best management practices[7].
- Develop snow clearing plans that ensure that snow storage and removal do not impact fish-bearing streams.
- Avoid wetlands and sensitive riparian areas.
- Where feasible and appropriate, use bridges for stream crossings as opposed to culverts or fords.
- Preserve, to the greatest extent possible, and enhance where feasible, vegetation and forest near riparian areas.
- Continuously monitor stream sedimentation and conduct visual inspections of streams for debris annually.

[6] For example, Stormwater Planning: A Guidebook for British Columbia (BC Ministry of Water, Land and Air Pollution, 2002), and Best Management Practices Guide for Stormwater (1999)

[7] For example, Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC Ministry of Environment, 2006).

Wildlife and Wildlife Habitat

- Improve, where possible, the habitat suitability of existing ski trails and developed areas (e.g. rock piles as habitat for marmots).
- Optimize, where possible, the positive benefits to wildlife resulting from habitat modification (e.g. increased forage).
- Minimize the impact of development and operations on potential wildlife corridors by avoiding or minimizing use.
- Implement best management practices[8] should Red or Blue listed species be observed.
- Adhere to the General Wildlife Measures of the grizzly bear Wildlife Habitat Area.
- Develop a grizzly bear protocol that prioritizes preservation of habitat and minimizes potential for guest interaction/conflict with grizzly bear[9].
- Work to identify American badger denning sites within the CRA.
- Conduct nesting bird survey prior to construction, and where occupied nests are found, ensure they are protected by a forested buffer area.
- Preserve wildlife trees & bird nests in accordance with Section 34 of the *Wildlife Act*.

[8] For example, Environmental Best Management Practices for Urban and Rural Land Development (BC Ministry of Water, Land and Air Pollution, 2004)
[9] For example, Human-Grizzly Bear Conflict Mitigation Strategy (Grey Owl Consulting, 2020)