District of Coldstream

NULLI SECUNDUS

Major Roadway Network Plan

11640075.01 / April 2004

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Executive Summary

In response to growth and a desire to proactively maintain access and mobility within the Community, the District of Coldstream has undertaken the development of this major roadway network plan. The objectives of this document are as follows:

- Examine and review the performance of the existing roadway network within the District of Coldstream to establish the baseline condition and determine where problems exist today;
- Develop a forecast condition based upon known and planned land use changes and growth in traffic volumes to determine where problems might exist in the future;
- Examine a range (where appropriate) of potential solutions to identified problems and develop a recommended solution for each;
- Ultimately establish the preferred major roadway network plan, along with the upgrade strategy required to support community growth.
- Confirmation of the roadway network classification and the development of associated preliminary design guidelines for discussion purposes.

The methodology to undertake the assignment was based upon a field data collection exercise and the District's planned land use changes over a 20 year horizon. The report was developed in consultation with District staff to ensure consistency with current initiatives to the extent possible.

A detailed assessment of the major roadway network under existing conditions has indicated that the network is performing satisfactorily and no indications of systemic level deficiencies were detected. At the forecast (+20 year) planning horizon, a few minor problems were detected, which occur primarily at the confluence points of the major corridors. The problems are largely based upon the lack of appropriate turning lanes and the delays arising from longer wait times generated by the increased traffic volumes. Other deficiencies detected relate to design inconsistency with the anticipated usage characteristics. The locations and problem details are summarized in Table ES-1.

Table ES-1 – Problem Summary

Location	Nature of Issue
Kalamalka Rd & Westkal Rd	Intersection Capacity Deficiency Future Eastbound Traffic
Kalamalka Rd & Postill Dr	Intersection Capacity Deficiency Future Northbound Traffic
Kalamalka Rd & Kidston Rd	Intersection Delay Deficiency Future Northbound Traffic
Kalamalka Rd & Aberdeen Rd	Intersection Delay Deficiency Future Southbound Traffic
Hwy 6 & Kalamalka Rd	Intersection Safety & Capacity Deficiency Insufficient for Northbound Traffic
Aberdeen Rd & Middleton Dr	Intersection Delay Deficiency Future Eastbound Traffic
Hwy 6 & Buchanan Road	Design Inconsistency Intersection Configuration Inappropriate for Use
Westkal Road	Design Inconsistency Roadway Configuration Inappropriate for Use
Postill Drive	Design Inconsistency Roadway Configuration Inappropriate for Use
Kalamalka Road Westkal Rd to Kalavista Dr	Design Inconsistency Roadway Configuration Inappropriate for Use
Kalamalka Road Westkal Rd to Vernon	ROW Width Insufficient ROW for Future Expansion

A series of improvement strategies have been developed aimed at resolving these problem locations. Of note, the scope of the intersection improvements included the use of innovative treatments such as modern roundabouts at two locations (Kalamalka & Westkal, Kalamalka & Kalavista) and neighbourhood traffic calming (Posthill Drive). The use of these technologies is rapidly emerging in BC, which offer significant benefits over a more traditional approach to treating the problems. These are summarized along with their cost and timing implications in Table ES-2.

Table ES-2 – Improvement Strategy

Project Location	Improvement	Time Frame	Cost Estimate
Westkal Rd	Revise Design X-Section	Short Term	$ 1,490,000
Postill Dr (Phase 1 and 2 Combined)	Traffic Calming	Short Term	$ 224,000
TOTAL SHORT TERM (0-5 Years)			***$ 1,714,000***
Kalamalka Lake Rd & Westkal Rd	Upgrade Intersection	Medium Term	$ 325,000
Aberdeen Rd & Kalamalka Lake Rd	Upgrade Intersection	Medium Term	$ 167,000
TOTAL MED TERM (5-10 Years)			***$ 492,000***
Kalamalka Lake Rd & Kidston Rd	Upgrade Intersection	Long Term	$ 325,000
Hwy 6 & Buchanan Rd/Aberdeen Rd	Upgrade Intersection	Long Term	$ 27,000
Aberdeen Rd & Middleton Dr	Upgrade Intersection	Long Term	$ 24,000
TOTAL LONG TERM (10+ Years)			***$ 376,000***
		Overall Total	**$ 2,582,000**

In addition to responding to the range of existing and forecast problem locations, the exercise included the development of road form guidelines for consideration by the District of Coldstream, particularly when building in topographically challenging and environmentally sensitive areas, such as on Middleton Mountain. While the results are only conceptual in their nature and subject to further refinement by District staff, the exercise did conclude that substantial capacity exists to modify the current roadway design guidelines to better accommodate the context of the local conditions. The possibilities are illustrated in Figures 6 and 7.

The exercise also included a detailed review and assessment of the Grid Road concept, as discussed in detail in Appendix B. The District of Coldstream has contemplated this connection, linking the waterfront area on Kalamalka Road to Highway 97, for many years and this assessment has concluded that while the connection remains desirable, its implementation is challenging (costly) and its need can be deferred beyond the planning horizon. Four alignment options were assessed in detail to support this conclusion, along with a review of the forecast traffic flow and demand for mobility in this direction. This conclusion does, however, dictate that Westkal Road will be required to accommodate a more significant mobility based function over the planning horizon, and a short term improvement recommendation has been included in this regard.

1.0 BACKGROUND

The roadway network within the District of Coldstream is subject to increasing pressures related to community growth with a public expectation for high standards of performance. The District's Official Community Plan identifies the need to further stratify and develop a major roadway network plan aimed at supporting the identified growth while maintaining and/or improving the quality of mobility within the community, the subject of this report. In addition to consistency with public expectation, good roadway network performance is integral to business development and providing a strong local economy.

1.1 Objectives

The objectives of this study are as follows:

- Examine and review the performance of the existing roadway network within the District of Coldstream to establish the baseline condition and determine where problems exist today;
- Develop a forecast condition based upon known and planned land use changes and growth in traffic volumes to determine where problems might exist in the future;
- Examine a range (where appropriate) of potential solutions to identified problems and develop a recommended solution for each;
- Ultimately establish the preferred major roadway network plan, along with the upgrade strategy required to support community growth.

1.2 Methodology

The methodology established to achieve the noted objectives is based on sound transportation planning principles and was developed in consultation with District staff. It is briefly outlined as follows:

- Review background literature and meet with District staff to establish the context for the assignment, key background documentation included:
  - North Okanagan Shuswap Corridor Management Plan (Ministry of Transportation 2000);
  - District of Coldstream Official Community Plan (USL 1999);
  - Highway 6 Corridor Preservation Strategy (Kneeshaw 2000);
  - District of Coldstream Transportation Overview (USL 1993).

- Undertake a traffic data collection exercise to effectively establish existing performance conditions and a basis for determining a future forecast scenario;
- Forecast future performance (+20 years) based upon known land use changes and growth in traffic volumes, industry standard traffic trip generation rates and a manual network trip assignment model;
- Clearly identify problems based upon discussion with District staff and the technical analysis;
- Develop recommended solutions to the identified problems based upon performance and cost measures.

The exercise is intended to be largely technical, with all requirements for community and political consultation being handled by District staff in a separate exercise.

1.3 Issues

Several known issues created the impetus to developing this plan and are to be specifically addressed, as follows:

- Westkal Road and its frequent use by through traffic, its unique set of design challenges and circumstances;
- Postill Drive and its frequent use by non-local through traffic and a need to improve safety and function for local residents;
- Kickwillie Loop Road and its ability to service traffic growth and the Grid Road concept; and,
- Roadway design standards and their applicability within the District of Coldstream.

2.0 NETWORK ISSUES

Ultimately, the effectiveness of a major roadway network plan is based upon its ability to meet the travel demand of the Community. This section outlines network performance indicators for current and forecast conditions to ensure adequate performance can be achieved over the planning horizon (+20 years).

As the District grows, alternative transportation modes such as public transit, cycling and even walking may play a more significant role in supplying the mobility needs. At present and for the foreseeable future, however, automobile and truck trips are the dominant mode of transportation and, as such, this assessment has focused exclusively on their characteristics. Future iterations of this document will need to consider alternative transportation modes in a more holistic fashion as comprehensive planning for pedestrians, cyclists and transit services are integral components of a municipal transportation plan.

To support the demand for travel, the District has recently undertaken several network level improvements which are included in the base case for network analysis, as follows:

- The installation of bicycle lanes on Kalamalka Road between Aberdeen Road and Kalamalka Lake Road;
- Kalamalka Lake Road & Westkal Road intersection improvements;
- The installation of bicycle lanes on Kidston Drive along with widening, resurfacing and repainting between widening Kalamalka Road and Kalamalka Lake Provincial Park; and
- Aberdeen Road & Kalamalka Road intersection improvements.

2.1 Travel Demand

The allocation of current and future land use within the District has a direct impact upon the demand for roadway travel and the associated implications upon the major roadway network. Land uses generate demand for mobility to varying degrees; commercial representing the most significant traffic generator, followed by industrial, institutional and residential. The assessment of future mobility needs is largely based upon the Districts' Official Community Plan and future land use strategy. The guidance provided by these documents has been supplemented by direct dialogue with District Planning and Engineering staff to ensure consistency with current development applications. The major growth nodes and forecast changes in land use (over a 20 year planning horizon) within the District are illustrated in Figure 1.

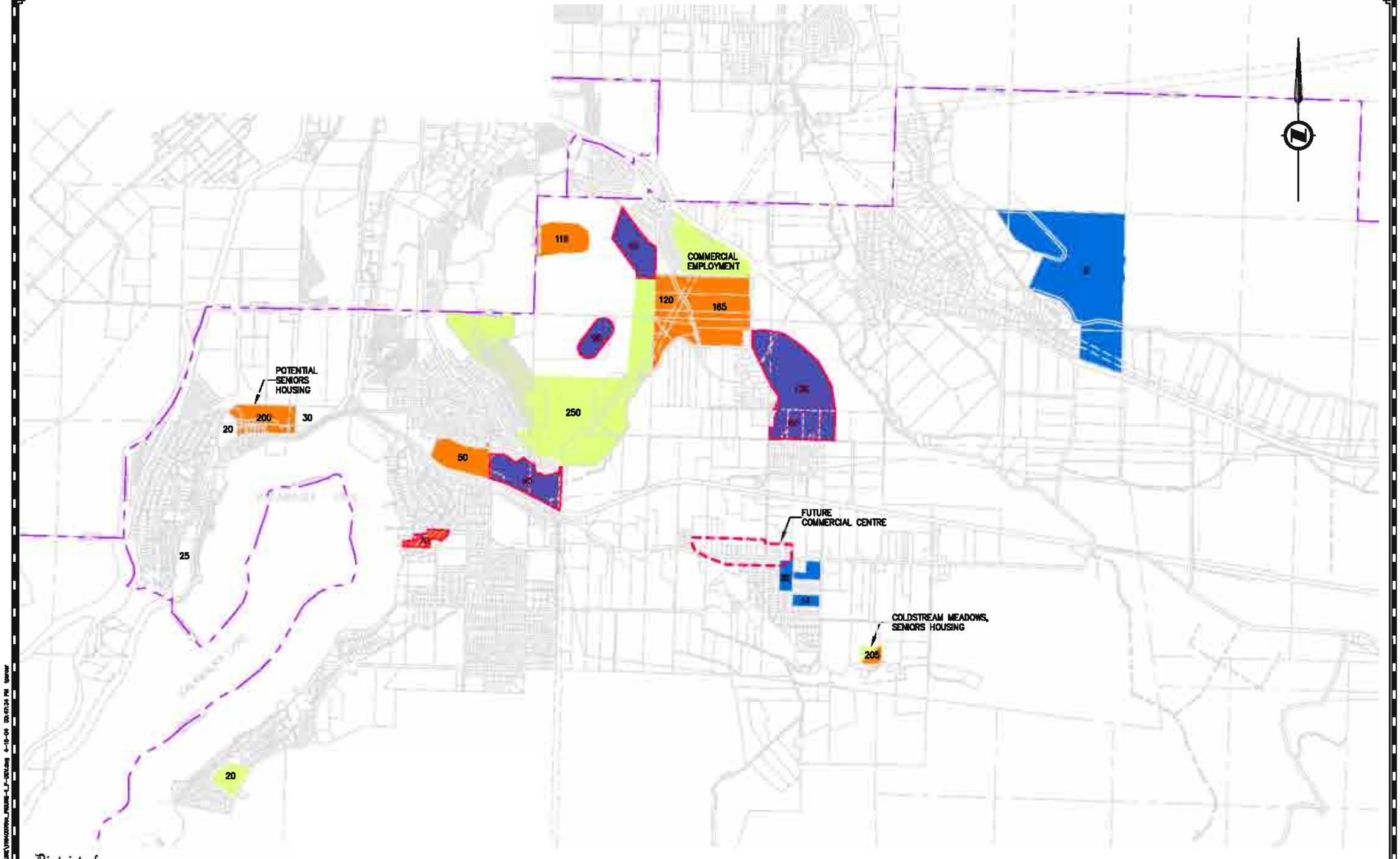

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FIGURE 1

FUTURE DEVELOPMENT NODES

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FIGURE 1

FUTURE DEVELOPMENT NODES

LEGEND

- 0 TO 5 YEARS
- 5 TO 10 YEARS
- 10 YEARS AND BEYOND
- MULTI-FAMILY DEVELOPMENT AREAS
- ### APPROXIMATE NUMBER OF RESIDENTIAL UNITS

Existing traffic volume and roadway/intersection configurations were assembled through a field data collection exercise undertaken in May and early June of 2003. These 'shoulder' season conditions offer a good representation of conditions for this exercise as peak summer conditions would generate results that could perhaps be over-designed for the remaining 10 months of the year. Some delay and congestions is therefore expected to be accommodated during the summer months. The results of the data collection exercise are illustrated in Figure 2. Generally, peak hour traffic volume trends are characterized as being reasonable for the roadway conditions, and few chronic system level problems are anticipated. The roadway network is characterized as being primarily rural in nature, and intersections are primarily STOP controlled (no traffic control signals within the District yet except on Highways 6 & 97).

A technical assessment of major roadway network performance is undertaken in this section to establish the benchmark for comparison and the range of potential problems in the future. As the limiting factor associated with roadway networks is usually related to intersections, the assessment is first in the form of an intersection capacity analysis, followed by an overall network assessment of connectivity and capacity.

2.1.1 Existing Conditions

Intersection capacity analysis was undertaken for the PM peak hour of roadway activity at the identified locations. The analysis was undertaken using Synchro V5.0 software, which is based upon the Transportation Research Boards' (TRB) Highway Capacity Manual (2000) methodology (standard industry methodology). This analysis methodology utilizes traffic volumes, lane configurations and assigned traffic control criteria to determine the level of service (LOS) for the intersection being analyzed, which is based upon a benchmark for average delay (in seconds) encountered by a vehicle at any given intersection. The measure of delay is deemed to be the most reliable measure of driver discomfort and frustration, fuel consumption and travel time. A reference letter A through F is assigned to the controlled approach at a stop or yield controlled intersection which denotes the delay condition being experienced. Generally, LOS levels A and B indicate good intersection operating conditions, C and D indicate fair operating conditions, E indicates marginal operating conditions, while F denotes an intersection failure. Details pertaining to the LOS reference criteria are offered in Table 1 for unsignalized intersections.

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FIGURE 2

EXISTING (2003) WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES, LANING & TRAFFIC CONTROL

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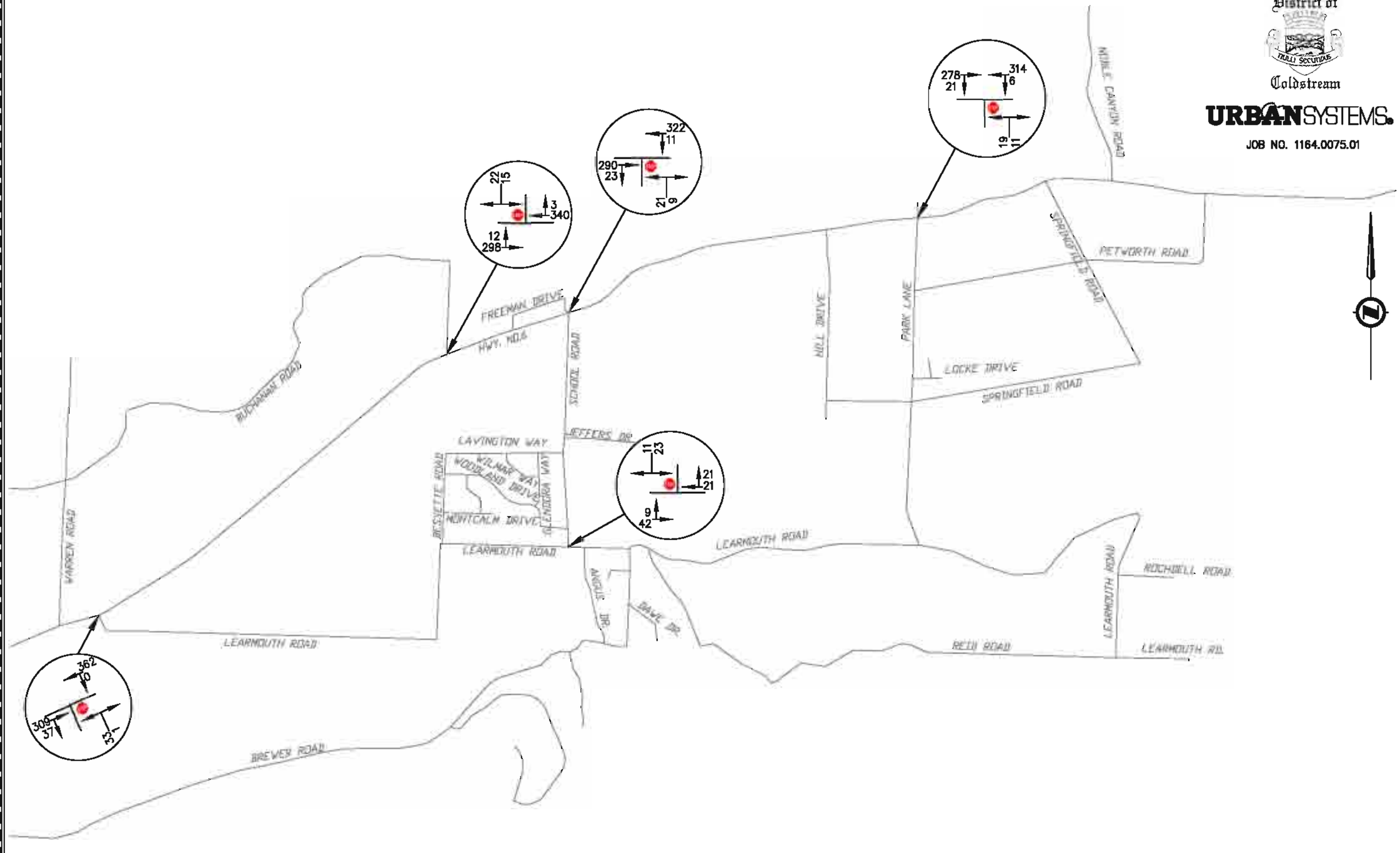


FIGURE 2

EXISTING (2003) WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES, LANING & TRAFFIC CONTROL

Table 1 - Level of Service and Delay Criteria – Unsignalized

Level of Service (LOS)	Average Total Delay (seconds per vehicle)
A	<10
B	>10 and <15
C	>15 and <25
D	>25 and <35
E	>35 and <50
F	> 50

The intersection approach LOS is described in terms of average delay per vehicle at the STOP controlled approach for the peak hour period. Based upon the data collected, the weekday afternoon peak hour period has been utilized in this analysis as the control or design period. Delays exceeding 50 seconds per vehicle, on average, are deemed to represent an unsatisfactory condition denoting an approach failure. It is at this point that research indicates that motorists begin to demonstrate signs of frustration, which can lead to taking chances and safety performance problems.

The analysis results are offered in Table 2, based upon the field traffic volumes identified in Figure 2. The headings in are described as follows:

- LOS – Level of Service
- V/C – Volume to Capacity Ratio – The actual traffic volumes divided by the theoretical capacity of the approach. As the V/C ratio approaches 1.0, performance begins to degrade.
- Delay – Delay encountered per vehicle at the intersection or on the specific approach, described in seconds.
- Critical Movement – The worst movement, or in most cases, the movement that is most likely to degrade overall intersection performance.

Table 2 - Intersection Capacity Analysis

Existing (2003) Conditions – Weekday PM Peak Hour

Intersection	Critical Movement	LOS	V/C	Delay sec
Hwy 97 & College Way	NB Thru	B	0.48	10.1
Hwy 6 & Middleton Way/15th St	EB Thru	B	0.50	10.1
Hwy 6 & Buchanan Rd/Aberdeen Rd	EB Left	B	0.54	11.7
Kalamalka Rd & Westkal Rd	EB Left	E	0.59	49.7
Kalamalka Rd & Postill Dr	NB	C	0.39	21.3
Kidston Rd & Coldstream Creek Rd	EB	A	0.01	9.2
Kidston Rd & Kalamalka Rd	NB	B	0.24	13.5
McClounie Rd & Kalamalka Rd	NB	B	0.12	11.3
Sarsons Rd & Middleton Way	WB	A	0.01	8.6
Sarsons Rd & Middleton Dr	SB	A	0.02	8.6
Aberdeen Rd & Middleton Dr	EB	A	0.03	9.9
Aberdeen Rd & Kalamalka Rd	SB	B	0.22	11.5
Coldstream Cr Rd & Kalamalka Rd	NB	B	0.10	10.7
Hwy 6 & Kalamalka Rd	NB	D	0.50	30.6
Hwy 6 & Learmouth Rd	NB	C	0.09	15.1
Hwy 6 & Buchanan Rd	SB	B	0.08	12.5
School Rd & Learmouth Rd	SB	A	0.04	9.0
Hwy 6 & Park Lane	NB	B	0.07	13.0
Postill Dr & Kidston Rd	SB	B	0.22	10.5
Husband Rd & Kalamalka Rd	WB	C	0.24	22.5

Results indicate that the intersection functionality conditions are reasonable within the District and few discernable problematic trends are evident from an intersection *capacity* and *delay* perspective, under existing conditions. Only the intersection of Westkal Road and Kalamalka Road is approaching a level of delay (for the stopped eastbound traffic emerging from Westkal Road) that is indicative of a potential cause for concern in the future. Note that the focus of these results is on capacity and delay, and this does not preclude the existence of safety or design related issues, as discussed later.

In addition to reviewing the intersection functionality, corridor segment traffic volumes are summarized in Table 3.

Table 3 - Corridor Traffic Volumes

Existing (2003) Conditions – Weekday PM Peak Hour

Corridor Segment	Total Traffic Volume	Peak Split
College Way	415	60/40
Westkal Rd - Kickwillie to Kalamalka	420	50/50
Kalamalka Rd - North of Westkal	1125	65/35
Kalamalka Rd - Westkal to Kalavista	1120	60/40
Kalamalka Rd - Kalavista to Aberdeen	935	60/40
Kalamalka Rd - Aberdeen to Hwy 6	360	65/35
Postill Dr - Kalamalka to Kidston	300	55/45
Kidston Rd	320	60/40
Aberdeen Rd	350	55/45
Hwy 6	1200	60/40

Similarly, at the corridor level, few problematic trends are noted that relate specifically to roadway capacity under existing conditions. Depending upon the classification of the roadway, capacity exists to accommodate between 1,000 and 1,500 vehicles per hour per direction on a two lane roadway (upwards of 2,000 vehicles in both directions as a minimum). Only Kalamalka Road, in the vicinity of the Westkal intersection, even approaches this upper limit (at approximately 730 vehicles in the peak direction of flow). Under existing conditions, the major roadway network is performing satisfactorily from a roadway capacity perspective, suggesting ample opportunities to accommodate growth without major corridor level upgrades (such 4 laning) in the foreseeable future.

It is important to note that while these conclusions are sound, there are likely periods during the summer months when the traffic volumes utilized in this analysis are exceeded. These summer peaks or spikes, however, would not be considered appropriate for use as design guidelines due to their short duration. Some minor congestion during these periods is therefore expected to be accommodated.

2.1.2 Forecast Conditions

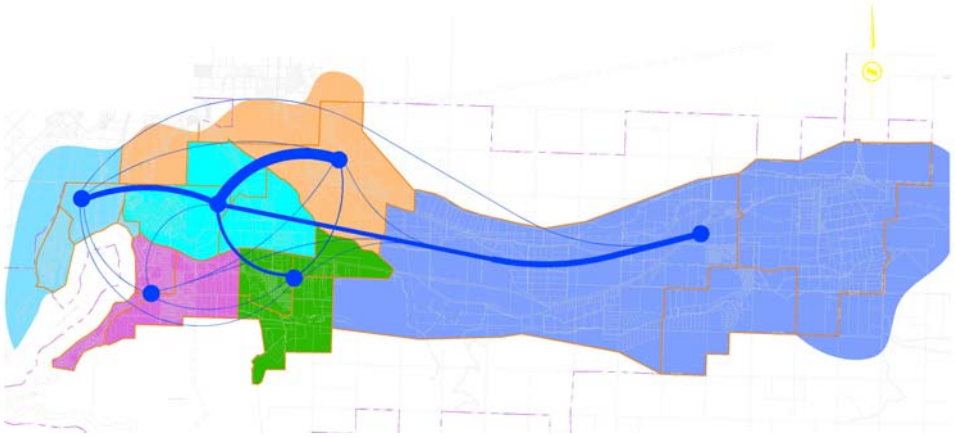
Forecast roadway network conditions were developed based upon the future land use assumptions and the resulting traffic volumes arising from new development and the background growth in the existing traffic volumes. The major roadway network was simulated on a manual trip assignment model to distribute the new forecast trips across the network. New automobile trips were generated for the new land uses based upon standard industry methodology *(ITE Trip Generation Manual – 6th Edition)*, as outlined in Table 4.

Table 4 - ITE Vehicle Trip Generation Rates

Development Type	Trip Rate per Unit Weekday PM Peak	% Inbound To the Development
Single Family	1.2	64%
Multi – Family	0.7	66%
Community Commercial	6.3	50%
Senior Housing	0.9	30%

These new vehicle trips were grouped based upon the anticipated location of the trip destination. A simplified visual representation of the vehicle trip demand is presented in Figure 3, where the thicker lines represent heavier forecast growth in travel demand within the Community. The majority of the growth in activity levels emerges from or is destined to the Middleton Mountain area, with primary demand forecast to Highway 6 and Vernon to the north and Highway 97 to the west.

Figure 3 - Vehicle Trip Demand by Zone



Vehicle trips are assigned to the road network based upon shortest and/or fastest route. In terms of the District of Coldstream, most new trips ultimately end up on Kalamalka Road, Westkal Road, Aberdeen Road and Highway 6. Key attributes of this assignment algorithm are summarized in Table 5. The assignment assumes that the Middleton Way to Middleton Drive connection will be completed within the next five years. As little development or growth is forecast towards the eastern end of the District (Lavington area), few implications to the major roadway network are considered in this section.

Table 5 - Forecast Trip Assignment Methodology

Trip Origin	Trip Destination	Route Selection
Middleton Mountain N of Middleton Dr	East of Kalamalka Rd & Hwy 6	100% Hwy 6 via Aberdeen Rd
Middleton Mountain N of Middleton Dr	Vernon & North	100% Hwy 6 via Sarsons Rd
Middleton Mountain	East of Kalamalka Rd & Hwy 6	100% Hwy 6 via Middleton Dr and Aberdeen Rd
Middleton Mountain	Vernon & North	50% Kalamalka Lake Rd 25% Hwy 6 via Middleton Way 25% Hwy 6 via Sarsons Rd
East of Aberdeen Road	Middleton Mountain	100% Middleton Drive Way
All Origins	Highway 97 Southbound - Kelowna	100% via College Way

During the summer months, the roadway network in Coldstream accommodates a variety of users, including pedestrians, cyclists, roller-bladers as well as vehicles, such as at this location crossing Kalamalka Road to access the beach.

The resulting forecast intersection capacity analysis is presented in Table 6, with detected problematic areas highlighted in red. Forecast volumes are illustrated in Figure 4.

Table 6 - Intersection Capacity Analysis
Future (2023) Conditions – Weekday PM Peak Hour

Intersection	Critical Movement	LOS	V/C	Delay (sec)
Hwy 97 & College Way	WB Left	B	0.24	13.8
Hwy 6 & Middleton Way/15th St	EB Thru	B	0.65	11.2
Hwy 6 & Buchanan Rd/Aberdeen Rd	EB Left	B	0.66	14.9
Kalamalka Rd & Westkal Rd	EB Left	**F**	2.20	> 500
Kalamalka Road & Postill Dr	NB	**F**	0.99	116.0
Kidston Rd & Coldstream Creek Rd	EB	A	0.01	9.5
Kidston Rd & Kalamalka Rd	NB	**E**	0.63	37.1
McClounie Rd & Kalamalka Rd	NB	C	0.25	17.4
Sarsons Rd & Middleton Way	SB	A	0.06	3.3
Sarsons Rd & Middleton Dr	SB	D	0.77	29.5
Aberdeen Rd & Middleton Dr	EB	**F**	0.93	73.2
Aberdeen Rd & Kalamalka Rd	SB	**F**	0.89	53.5
Coldstream Creek Rd & Kalamalka Rd	NB	C	0.40	15.4
Hwy 6 & Kalamalka Rd	NB	**F**	1.34	257.0
Hwy 6 & Learmouth Rd	NB	C	0.25	24.9
Hwy 6 & Buchanan Rd	SB	C	0.14	16.9
School Rd & Learmouth Rd	SB	A	0.05	9.1
Hwy 6 & Park Lane	NB	C	0.12	17.5
Postill Dr & Kidston Rd	SB	B	0.32	12.0
Husband Rd & Kalamalka Rd	WB	**E**	0.49	42.7

Table 6 identifies a number of likely future problematic locations, which occur primarily at the confluence points of the major corridors. The problems are largely based upon the lack of appropriate turning lanes and the delays arising from longer wait times generated by the increased traffic volumes.

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FIGURE 4

FUTURE (2023) WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES ON EXISTING ROAD NETWORK

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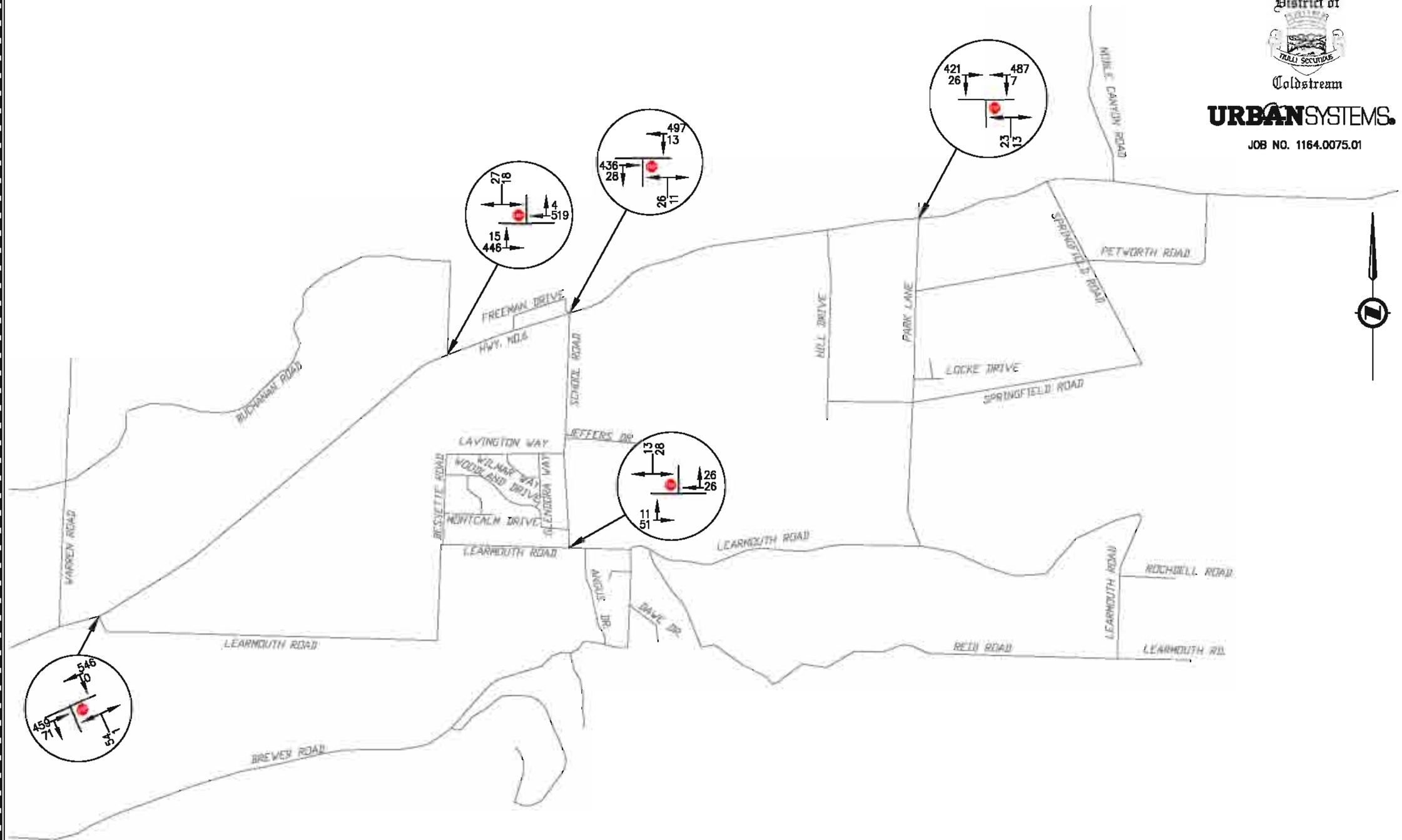

FIGURE 4

FUTURE (2023) WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES ON EXISTING ROAD NETWORK

Corridor segment traffic volumes are summarized in Table 7.

Table 7 - Corridor Segment Traffic Volumes
Future (2023) Conditions – Weekday PM Peak Hour

Corridor Segment	Total Traffic Volume	Directional Split
College Way	550	55/45
Westkal Rd - Kickwillie Loop to Kalamalka	820	55/45
Kalamalka Rd - North of Westkal	1400	60/40
Kalamalka Rd - Westkal to Kalavista	1670	60/40
Kalamalka Rd - Kalavista to Aberdeen	1440	60/40
Kalamalka Rd - Aberdeen to Hwy 6	400	55/45
Postill Dr - Kalamalka to Kidston	430	60/40
Kidston Rd	920	50/50
Aberdeen Rd	640	55/45
Hwy 6	1755	55/45

Corridor level weekday peak hour traffic volumes remain manageable over the 20 year planning horizon. Similar to existing conditions, only Kalamalka Road, in the vicinity of the Westkal intersection, even approaches the upper limit of two lane roadway capacity. While this volume of traffic may be manageable at this horizon date, the analysis does suggest that consideration be given to accommodating an expanded facility (on Kalamalka Road from the Kalavista intersection north to Vernon) at some point beyond the planning horizon. Roadway right-of-way acquisition to a 25 m standard (particularly north of Westkal Road) along this segment of the corridor should be considered as opportunities present themselves. Overall, the major roadway network is forecast to perform satisfactorily from a roadway capacity perspective.

2.2 Network Classification

The existing major roadway network in the District of Coldstream is classified in Schedule D of the OCP. This schedule, although sufficient for inclusion in a document such as an OCP, is somewhat limited when considering more detailed network needs and modifications. A more detailed and appropriate roadway network and classification strategy is key to establishing the context within which improvements can be considered and consistency with community expectation.

Major roadways generally serve two primary purposes – community access and mobility. These two purposes often conflict as roads that provide access to many individual properties, such as neighborhood residential streets, cannot offer a high degree of mobility as vehicles accessing and egressing private driveways conflict with and slow moving traffic on the main road. Further, the safety of the roadway network may begin to become compromised by mixing traffic with significantly differing expectations. For these reasons, a classification or hierarchy system is typically established and is based upon the anticipated ***function*** (as opposed to volume) of a particular roadway. This classification establishes the context for the link in question, guiding elements which pertain to its use such as:

- Design Criteria (i.e. curve radius, ROW width, asphalt width & depth, etc.);
- Access Provision (i.e. # and frequency of driveways);
- Posted Speed Limits;
- Truck and Commercial Vehicle Uses;
- Maintenance Priority; etc.

Some key guiding principles to be considered for the various roadway classes are summarized in Table 8.

Table 8 - Roadway Classification General Characteristics

Criteria	Provincial Highway	Arterial	Collector	Local
Primary Function	Provincial & Regional Traffic	Regional & Municipal Traffic	Municipal Traffic Linking Locals to Arterials	Municipal Traffic Land Access
Speed Limit Range	80 km/h +	50 – 60 km/h	50 km/h	40 – 50 km/h
Bicycle Facilities	None	Designated	Designated/Shared	Shared
Parking	Not Permitted	Not Desirable	Permitted	Permitted
Transit	Express Service	Yes	Yes	None
Traffic Calming	None	None	Yes	Yes

The roadway classification categories are briefly described as follows:

Arterial Road

The primary function of an arterial road is the provision of mobility. It is intended serve regional traffic traveling between major origins and destinations within a community. Direct access is often restricted to some commercial driveways and a few previously existing residential driveways. Speed limits are generally at least 50 km/h and on-street parking is discouraged outside of town centre areas. These are generally transit corridors where applicable, and traffic calming is not normally a consideration.

Collector Road

A collector roadway typically serves a dual function, providing mobility between local roads and arterial roads and access to individual properties. On-street parking is generally permitted and transit service is provided where applicable. Posted speed limits are typically 50 km/h. Middleton Way is an example of a collector road.

Local Road

The primary objective of local roadways is to provide access to private properties. They allow access to and from the arterial/collector roadway network, but through vehicle travel is generally discouraged. Speed limits are usually low, not more than 50 km/h, and are often lowered in school zones. Traffic calming methods are now commonly used to discourage the use of these roadways for through travel. Kalavista Drive and Venables Drive are examples of local roads.

The recommended roadway network classification is illustrated in Figure 5.

DISTRICT OF COLDSTREAM MUNICIPAL BOUNDARY

FIGURE 5

ROADWAY NETWORK CLASSIFICATION

LEGEND

- PROVINCIAL HIGHWAY
- ARTERIAL
- COLLECTOR
- LOCAL

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DISTRICT OF COLDSTREAM MUNICIPAL BOUNDARY

DISTRICT OF COLDSTREAM MUNICIPAL BOUNDARY

FIGURE 5

ROADWAY NETWORK CLASSIFICATION

LEGEND

- PROVINCIAL HIGHWAY
- ARTERIAL
- COLLECTOR
- LOCAL

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2.3 Road Form

Generally, roadway design criteria are subject to the provisions of the District's Sub-Division and Development Servicing Bylaw, the BC MMCD documents and the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads*. In all cases, proper identification of the roadway classification will provide suitable design guidance to achieve an appropriate roadway design.

In the last decade, the philosophy of roadway design has been changing, particularly in the context of local roadways. This shift in approach is reflected in recent documentation from the US Department of Transportation – Federal Highway Administration (FHWA), the guiding source for most of the roadway geometric design criteria published and utilized in Canada and most of the world. A recent report (FHWA-PL-01-026) jointly published by the FHWA the American Association of State Highway and Transportation Officials (AASHTO) and the National Cooperative Highway Research Program (NCHRP) captured this shift succinctly in the following excerpt:

'A properly design roadway takes into consideration mobility and safety while addressing natural and human environmental aspects. To achieve such a balance, tradeoffs among these factors are needed and are routinely performed either explicitly or implicitly. Recently, emphasis has been placed upon the existing flexibility in design guidelines and the use of creative design in addressing the site-specific project needs has been encouraged. This philosophy was coined in the US as 'context sensitive design (CSD)' and represents an approach in which a balance is sought between safety and mobility needs within the community interests. Both the FHWA and AASHTO recognize that flexibility that exists in the current design guidelines while acknowledging that the current focus on providing high levels of mobility may conflict with some interests of the community.'

Conceptually, most municipalities in BC have embraced this shift in roadway design principles. British Columbia, with its topography and challenging terrain, is perhaps the most suited to lead in this shift of any Province in Canada, or any jurisdiction in North America for that matter. A recent and high profile example is the Sea-to-Sky Highway 99 Project, for which a context sensitive approach was ultimately developed and will be implemented.

In addition to having a marked effect upon the cost and impact of development within a community, other benefits to considering a more context sensitive approach, particularly on local roadways, include:

- **Cost Less to Build and Maintain.** Less road base is needed and less surface area is paved. This results in lower materials and labour costs. Previous experiences suggest a 2 m reduction in local street width results in at least a 10% reduction in paving, sidewalk and finishing costs.

- **Reduce the Negative Impacts of Stormwater Run-Off.** Paved streets are impervious surfaces which prevent the infiltration of stormwater into the ground (i.e. paved streets increase the volume of stormwater run-off) which contributes to flooding, erosion, and habitat destruction, as well as reducing the groundwater supply. Excess and unnecessary paving also contributes to increased pollution of surface waters as a result of contaminants from the roadway surface entering the stormwater system. Many jurisdictions recognize reducing street widths (where appropriate) as a means of reducing the volume of water run-off.

- **Reduce the Negative Environmental Impacts of Construction.** A narrower street cross-section, used where applicable and appropriate, will help minimize environmental impacts by consuming less land.

- **Encourage More Efficient Land Use.** The land saved by using reduced street design standards can be used for other purposes including housing, landscaping and public open spaces.

- **Increase Traffic Safety.** Narrow street designs, when used in the appropriate context, will discourage the use of local streets by through traffic and help reduce traffic volumes and speeds. This will contribute to create quiet, safe residential streets with lower traffic volumes and speeds. Excessive and unnecessary width encourages greater vehicle speeds. Lower vehicle speeds will also reduce the severity of all automobile collisions.

- **Improve Neighbourhood Character and Sense of Place.** The positive environmental, land use, and traffic safety impacts of reduced roadway widths all work to improve the character and livability of residential neighbourhoods. As noted, the purpose of local roadways should not be to solely move traffic safely and efficiently and provide for maintenance equipment, but to ensure that the needs of people for a residential/resort neighbourhood that is quiet, safe, pleasant, convenient and sociable are met as well.

The domain of roadway design opportunities for use within the District of Coldstream are outlined within this section. Efforts have been placed upon balancing the need for mobility, maintenance/operations, amenity space along with minimizing the roadway 'footprint' in the largely challenging topographical conditions within which new roadways will be built. In all cases, the design elements presented respect appropriate engineering standards for roadway construction in sloping terrain.

Unlike the more rigorously defined roadway alignment criteria, the roadway cross-section template is more of a subjective element that is influenced by the surrounding land uses, topography, preferences and unique characteristics of the community in which they reside. While some elements of the roadway cross-section template are not flexible (i.e. the width of a vehicle remains a constant), most are subject to some local influence. Efforts have been placed upon balancing the need for mobility, maintenance/operations, amenity space with minimizing the roadway 'footprint' in the largely challenging topographical conditions within which new roadways will be built in the District of Coldstream.

Concepts for roadway design elements and cross-sections for local and collector roadways are included in the ensuing sections (note that no new arterial roadways are anticipated to be constructed over the planning horizon). These concepts are aimed solely at investigating potential opportunities to reduce the costs and impacts of roadway construction in delicate and sensitive areas. They are not intended to explicitly replace the existing standards, but to rather act as a starting point for further discussion.

2.3.1 Local Roads

Local roadways within a community are intended to serve a multitude of functions that extend well beyond moving traffic. These roadways are the integral component of the social fabric of any neighborhood and contribute to the social well-being of the community. In this regard, design guidelines which are as sensitive to non-vehicular users of the roadway space as they are to vehicular access have been developed, recognizing the balanced function that is desired on this order of roadway. The key design intent is summarized in Table 9 and Figure 6.

Table 9 - Local Roadway Design Guidelines

ROW Width	Design Speed	Max Grade	Street Width	Parking	Curb & Gutter	Sidewalk
14 m Min	30 km/h Min 50 km/h Max	12 %	6.0 m [1]	+ 2.4 m [2]	Raised	1 x 1.5 m

Notes:

[1] Street Width Does Not Include Provisions for Parking if Required.

[2] Parking Requirements as Determined by Land Use Conditions.

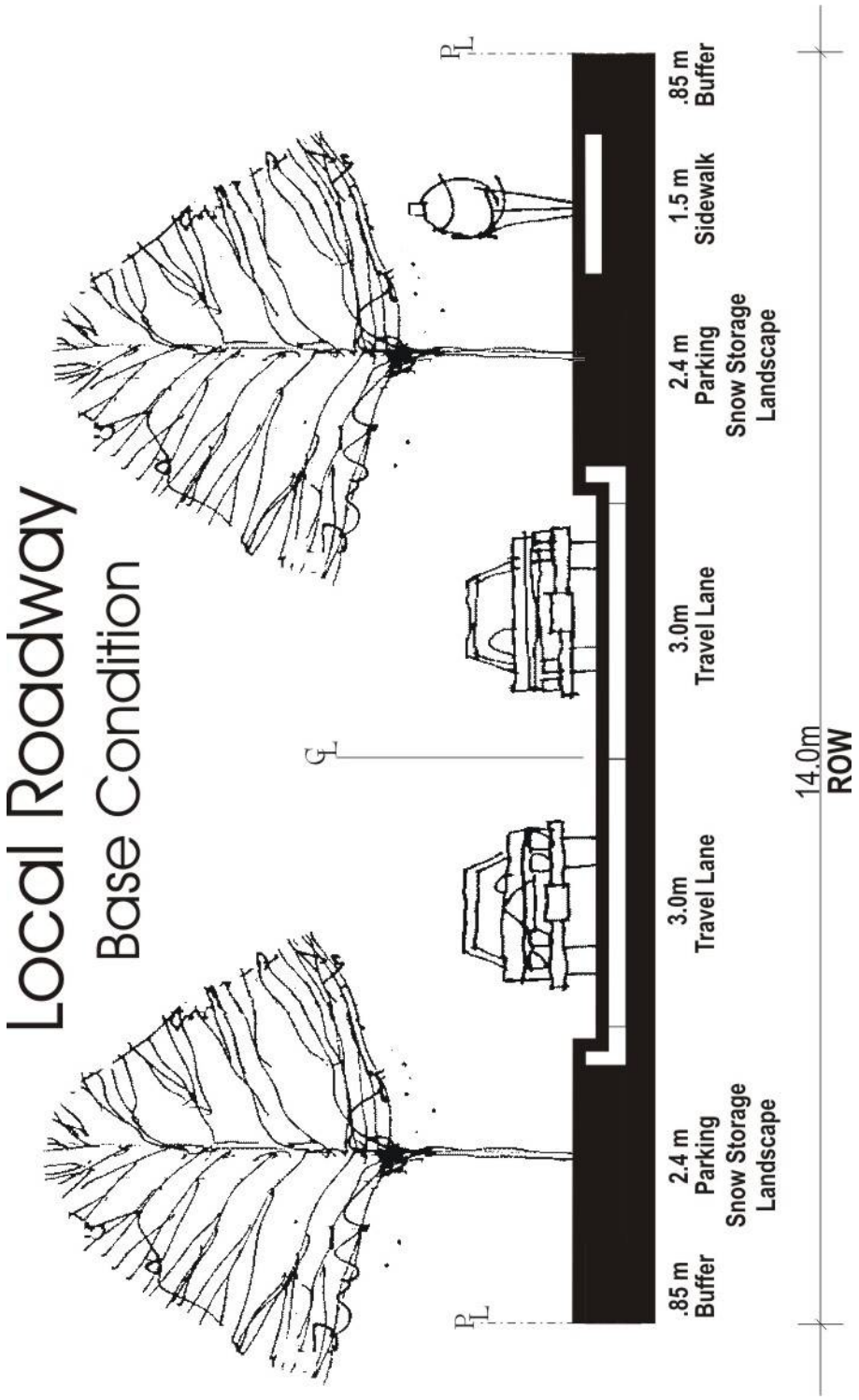
In general, care and proper engineering judgment must be utilized when combining minimum thresholds for horizontal and vertical geometry. Such situations should be avoided.

All identified general design intent is consistent with the Transportation Association of Canada's *Geometric Design Guide for Canadian Roads*.

Cut and fill slopes may be contained within roadway reserves and/or easements, or ultimately retained with a wall.

At the extreme end of the design ranges, this roadway type may contribute to a requirement for more intense winter maintenance activities.

Figure 6 - Local Roadway Cross-Section Concept



2.3.2 Collector Roads

Collector roads serve to link neighbourhoods and local roadways together, and in many cases will also connect the Community to the arterial roadway or Provincial highway. As noted, their function is intended to serve a duality of purposes; primarily related to mobility with due consideration for land access. Consequently, traffic volumes are expected to be higher than what is typically experienced on local roadways, in the range of 2,000 AADT upwards of 10,000 AADT. Key design intent has been generated to reflect this fact and is summarized in Table 10 and Figure 7.

Table 10 - Collector Roadway Design Guidelines

ROW Width	Design Speed	Max Grade	Street Width	Parking	Curb & Gutter	Sidewalk
18 m Min	50 km/h	10%	8.6 m [1]	+ 2.4 m [2]	Raised	2 x 1.8 m

Notes:
[1] Street Width Does Not Include Provisions for Parking if Required.
[2] Parking Requirements as Determined by Land Use Conditions.

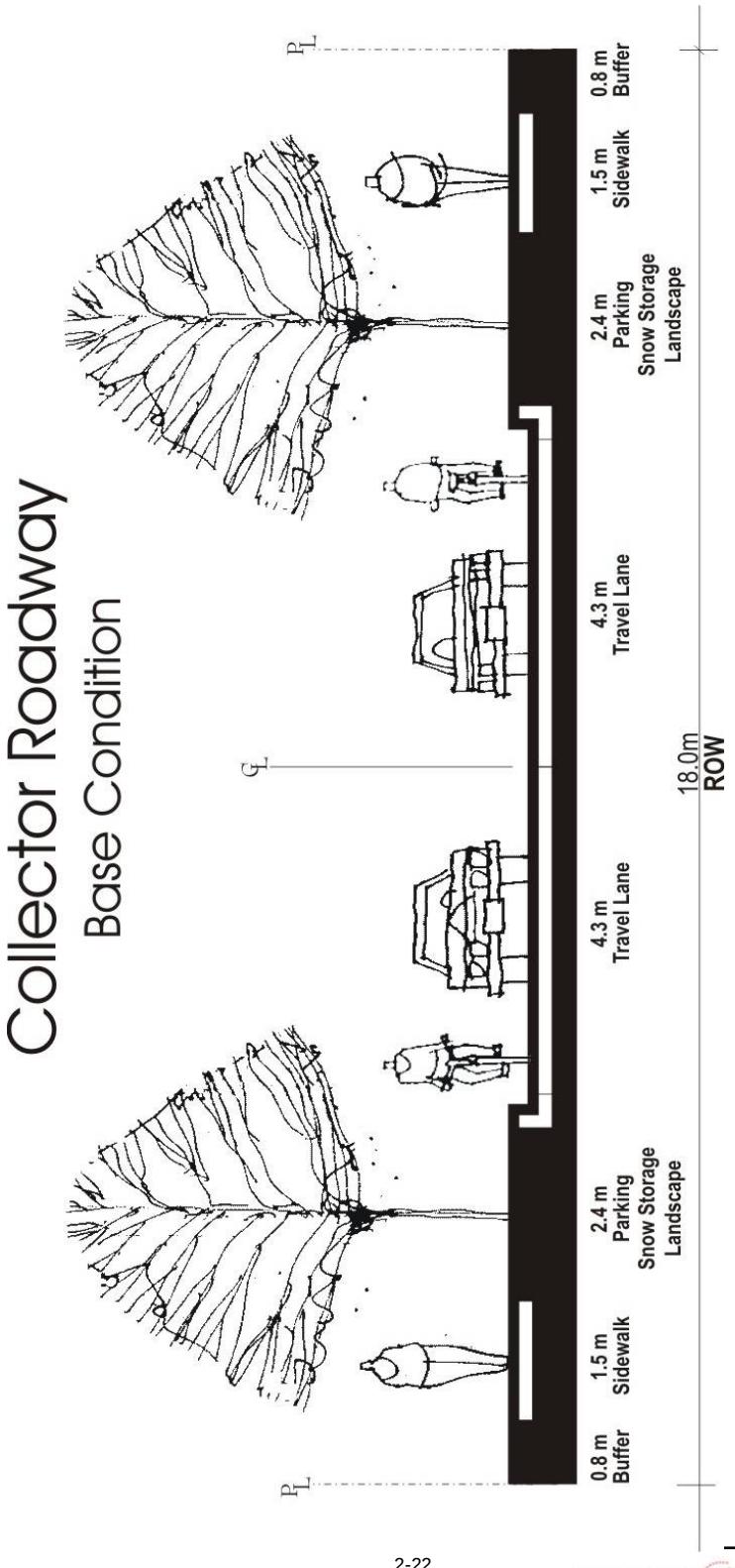
In general, care and proper engineering judgment must be utilized when combining minimum thresholds for horizontal and vertical geometry. Such situations should be avoided.

All identified general design intent is consistent with the Transportation Association of Canada's *Geometric Design Guide for Canadian Roads*.

The travel lane width of 4.3 m is intended for combined consideration of automobiles and bicycles. The travel lane width may be reduced to 3.5 m where this is not necessary.

At the extreme end of the design ranges, this roadway type may contribute to a requirement for more intense winter maintenance activities.

Figure 7 - Collector Roadway Cross-Section Concept



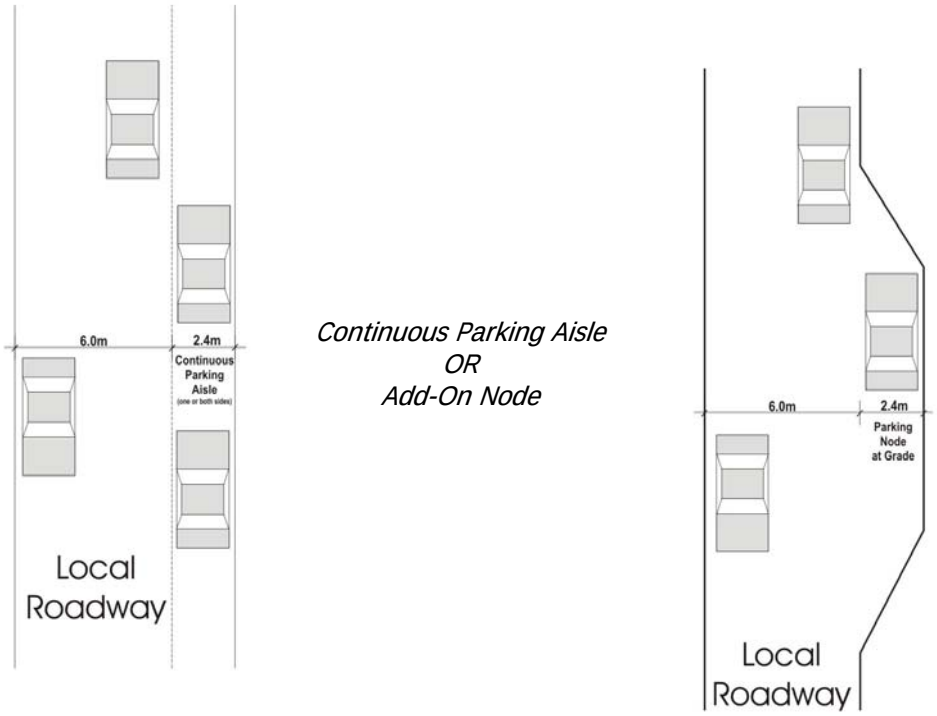
2.3.3 On-Street Parking

The requirement for on-street parking has a significant effect on both the cross-section and ROW width required for roadways. Generally, the total amount of on-street parking varies according to the density of development fronting the street (i.e. dense development such as multi-family housing will generate a higher demand for on-street parking than will single family housing). Accordingly, the needs will vary across the community depending upon the circumstances relating to the adjacent land use, topography, and provisions for both private and public off-street parking facilities in the area. In order to maximize flexibility and opportunity as it relates to roadway construction, the provision of on-street parking facilities should be discretionary, to be determined within the relative context of the various land uses within the community. Consideration as to how their provision would be incorporated into the context of the design concepts presented herein, however, is addressed.

The requirements for provision of these facilities is illustrated in Figure 8, which should be interpreted as tool box 'add-ons' that can be inserted adjacent to the roadway cross-section elements identified in previous sections without necessarily impacting the overall ROW width. The design intent in steep terrain is to provide parking where it is necessary and appropriate, as opposed to providing defacto parking infrastructure as might be considered under less challenging circumstances.

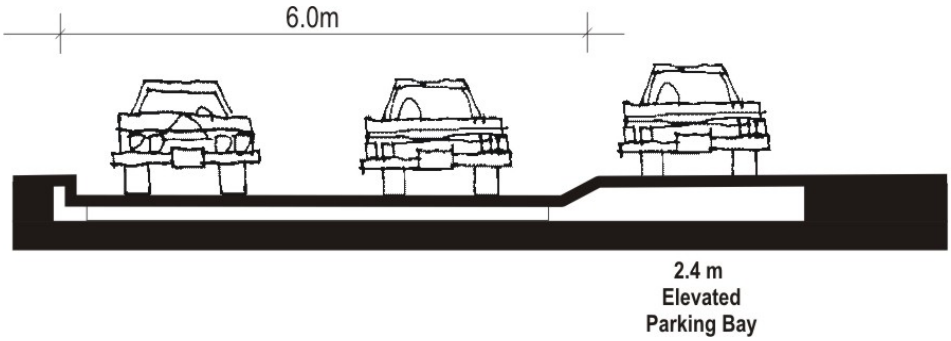
In areas more topographically challenging than this location (just outside of the District Hall on Kalamalka Road), the creation of a defacto parking aisle can result in significant excess roadway width and cost.

Figure 8 – Potential Alternate On-Street Parking Configurations



Continuous Parking Aisle
OR
Add-On Node

Elevated Parking Aisle/Node



2.4 Problem Summary

This section identifies the anticipated challenges on the major roadway network expected to require attention from the District of Coldstream over the planning horizon. These results are based upon the analysis undertaken herein and are a direct product of the District's OCP and Land Use Plan. Resolution strategies are presented in Section 3. Table 11 summarizes the identified challenges.

Table 11 - Roadway Network Problem Summary

Location	Nature of Issue
Kalamalka Rd & Westkal Rd	Intersection Capacity Deficiency Future Eastbound Traffic
Kalamalka Rd & Postill Dr	Intersection Capacity Deficiency Future Northbound Traffic
Kalamalka Rd & Kidston Rd	Intersection Delay Deficiency Future Northbound Traffic
Kalamalka Rd & Aberdeen Rd	Intersection Delay Deficiency Future Southbound Traffic
Hwy 6 & Kalamalka Rd	Intersection Safety & Capacity Deficiency Insufficient for Northbound Traffic
Aberdeen Rd & Middleton Dr	Intersection Delay Deficiency Future Eastbound Traffic
Hwy 6 & Buchanan Road	Design Inconsistency Intersection Configuration Inappropriate for Use
Westkal Road	Design Inconsistency Roadway Configuration Inappropriate for Use
Postill Drive	Design Inconsistency Roadway Configuration Inappropriate for Use
Kalamalka Road Westkal Rd to Kalavista Dr	Design Inconsistency Roadway Configuration Inappropriate for Use
Kalamalka Road Westkal Rd to Vernon	ROW Width Insufficient ROW for Future Expansion

3.0 IMPROVEMENT STRATEGY

In response to the identified list of existing and forecast challenges related to the roadway network, this section outlines the mitigation strategy for each, complete with a forecast implementation date and cost estimate. Note that implementation links to other maintenance and rehabilitation programs have not been included in this analysis, but should be considered to be equally important when considering project timing.

3.1 Westkal Rd & Kalamalka Rd

An existing and future capacity related challenge has been detected at the intersection of Kalamalka Road and Westkal Road, primarily related to eastbound (Westkal) access to the busy Kalamalka Road corridor. The intersection configuration is presently awkward and unsuitable to accommodate future growth in traffic volumes.

A modern roundabout is recommended at this location as opposed to a more conventional intersection upgrade, such as the installation of a traffic control signal. A modern roundabout offers distinct advantages at this location, as follows:

- A unique 'gateway' treatment at the entrance/egress to the District's beachfront area
- A traffic calming effect upon entering/egressing this area of busy interaction with driveway access and pedestrians, particularly during the summer months
- Less land consumption and impact upon adjacent business driveways than a more traditional intersection upgrade
- Strong and sustainable performance for the long term, and reduced accident occurrence frequency and severity
- Reduced driver frustration and vehicle emissions
- Lower life cycle costs than a traffic control signal (a single traffic control signal installation is typically estimated to cost in the range of $125,000, with $5,000 to $10,000 required in annual maintenance costs in perpetuity)

For capital planning purposes, implementation is recommended in the 5-10 year horizon (medium term), although the installation would offer benefits in the short term as well. The improvement concept is illustrated in Figure 9. A preliminary cost estimate has been established at $325,000 (included in Appendix A). This estimate is subject to further refinement as the design process advances. In particular, unknowns (at this point) relating to private property impacts, utility and geotechnical implications can substantially alter this result. Appropriate contingencies have been applied.

FIGURE 9

KALAMALKA ROAD AND WESTKAL ROAD IMPROVEMENT CONCEPT

SCALE 1:1000

1164.0075.01

URBANSYSTEMS.

3.2 Postill Dr & Kalamalka Rd

A future capacity related challenge has been detected at the intersection of Postill Drive and Kalamalka Road, primarily related to northbound (Postill) access to the busy Kalamalka corridor. As traffic volumes grow, the analysis confirms that access to Kalamalka Road will become increasingly difficult to achieve, and unacceptable delays will be experienced by northbound motorists at the STOP sign.

No specific improvements aimed at resolving this issue are proposed at this location over the planning horizon. Traffic volumes currently being experienced along the Postill corridor will be substantially reduced through the implementation of a more comprehensive strategy as discussed in Section 3.10. Accommodating the increased traffic volumes accessing and egressing Postill Drive at this location will only serve to encourage its use by non-local through traffic, contrary to its local roadway designation.

3.3 Kidston Rd & Kalamalka Rd

Similarly, a potential future capacity related challenge has been detected at the intersection of Kidston Road and Kalamalka Lake Road, primarily related to northbound (Kidston) access to the busy Kalamalka corridor. As traffic volumes grow, the analysis confirms that access to Kalamalka Road will become increasingly difficult to achieve, and unacceptable delays will be experienced by northbound motorists at the STOP sign. As this is the collector road in the area which is intended to accommodate traffic access and egress to the neighbourhood, it will be important to ensure that strong mobility to and through this intersection is retained.

It is also important to note, however, that the failure threshold is not breached in the forecast scenario (LOS E for northbound traffic) unless a north leg is added to the intersection (LOS F for northbound traffic) as has been discussed. In this regard, no capital improvements are recommended in the short to medium term, but rather the location is identified as one which will need to monitored and additional right-of-way should be acquired as opportunities present themselves in the coming years. A modern roundabout is envisioned for this location in the long-term (10+ years) as opposed to a more traditional intersection upgrade, such as the installation of a traffic control signal, with advantages as identified in Section 3.1. The improvement concept is illustrated in Figure 10. Similar to Section 3.1, a preliminary cost estimate has been established at $325,000 (included in Appendix A).

FIGURE 10

KALAMALKA ROAD AND KIDSTON ROAD IMPROVEMENT CONCEPT

SCALE 1:1000

1164.0075.01

URBAN SYSTEMS.

3.4 Aberdeen Rd & Kalamalka Rd

A future delay related challenge has been detected at the intersection of Aberdeen Road and Kalamalka Road, primarily related to southbound (Aberdeen) access to the busy Kalamalka Road corridor. As traffic volumes grow, access to Kalamalka Road will become increasingly difficult to achieve, and unacceptable delays will be experienced by southbound motorists at the STOP sign.

An intersection upgrade is recommended at this location in recognition of its central location and key junction status of the two primary arterial corridors within the Community. In particular, separation of the southbound and eastbound left-turning traffic will allow for reduced delay and sustainable intersection performance over the planning horizon.

For capital planning purposes, implementation is recommended in the 5-10 year horizon (medium term). The improvement concept is illustrated in Figure 11. A preliminary cost estimate has been established at $167,000. This estimate is subject to further refinement as the design process advances. In particular, unknowns (at this point) relating to private property impacts, utility and geotechnical implications can substantially alter this result. Appropriate contingencies have been applied.

FIGURE 11

KALAMALKA ROAD AND ABERDEEN ROAD IMPROVEMENT CONCEPT

SCALE 1:1000

1164.0075.01

URBANSYSTEMS.

3.5 Hwy 6 & Kalamalka Rd

A future capacity related challenge has been detected at the intersection of Kalamalka Road and Hwy 6, primarily related to northbound (Kalamalka Road) access to Highway 6. The single lane approach is insufficient to accommodate the forecast travel demand, and the intersection configuration is awkward and potentially dangerous due to limited visibility. While it is recognized that this represents an inter-jurisdictional issue with the Province of British Columbia, this intersection does significantly impact the District of Coldstream's major roadway network as it is the terminus for the primary arterial corridor within the Community. According to Ministry of Transportation statistics, the intersection is 'accident prone' and possesses a historical accident rate that is higher than it should be for a facility of its nature, indicating that some investigation into an upgrade is warranted. Anecdotally, staff indicates that this location is the site of the majority of traffic related incidents within the District. Driver workload at this intersection is high based on the combination of horizontal alignment, the railway crossing and intersection in close proximity. The highway curves into the intersection at a posted advisory of 30 km/h, along a stretch of highway that is otherwise posted at 80 km/h.

Further discussion with the Ministry of Transportation is recommended.

Highway 6 looking west at the Kalamalka Road intersection and through the back to back curves

3.6 Aberdeen Rd & Middleton Dr

A future delay related challenge has been detected at the intersection of Aberdeen Road and Middleton Drive, primarily related to Eastbound (Middleton) access to Aberdeen Road upon future residential development density increases on Middleton Mountain. As development occurs, access to Aberdeen Road (and subsequently to Highway 6 and/or Kalamalka Road) will become increasingly difficult to achieve and unacceptable delays will be experienced by eastbound motorists at the single lane approach to the STOP sign.

An intersection upgrade is recommended at this location to support the use of the major roadway network and facilitate development on Middleton Mountain. In particular, separation of the eastbound left-and right turning traffic will allow for reduced delay and sustainable intersection performance over the planning horizon with the existing STOP sign control in place.

For capital planning purposes, implementation is recommended in the 10+ year horizon (long term), and it is directly linked to the rate of development on the east side of Middleton Mountain. The improvement concept is illustrated in Figure 12. A preliminary cost estimate has been established at $24,000. This estimate is subject to further refinement as the design process advances. In particular, unknowns (at this point) relating to private property impacts, utility and geotechnical implications can substantially alter this result. Appropriate contingencies have been applied.

FIGURE 12

ABERDEEN ROAD AND MIDDLETON DRIVE
IMPROVEMENT CONCEPT

SCALE 1:1000
1164.0075.01

URBANSYSTEMS.

3.7 Hwy 6 & Buchanan Rd / Aberdeen Rd

The alignment and approach configuration of the north leg of the intersection of Buchanan Road and Highway 6 is awkward, poorly defined and prone to driver confusion. As traffic volumes grow, these issues are exacerbated resulting in a poor performing intersection and undue public exposure to a safety hazard. While it is recognized that this location is inter-jurisdictional with the Province of British Columbia, this intersection does significantly impact the District of Coldstream's major roadway network as it is the western terminus for the a significant collector roadway corridor within the community (Buchanan Road). According to Ministry of Transportation statistics, the intersection is accident prone and possesses a historical accident rate that is higher than it should be for a facility of its nature, indicating that some investigation into an upgrade is warranted. Driver workload at this intersection is high and alignment definition is poor based on the Buchanan Road approach alignment, the intersection with North Aberdeen Road (dead-end) all in close proximity to Highway 6.

An improvement concept is illustrated in Figure 13. It is noted that this improvement need not address mobility concerns related to traffic volume: as illustrated in Table 6, the level of service for this signalized intersection is expected to remain good beyond the 2023 horizon year. Minor changes in traffic loading due to land use changes will not adversely impact the operation of this intersection. For capital planning purposes, implementation is recommended in the 10+ year horizon (long term). Although significant benefits from this improvement could be accrued immediately, it should be recognized that the concept will require further analysis and consultation with the Ministry of Transportation, which requires time. A preliminary cost estimate has been established at $27,000, and some amount of cost sharing from the Province of British Columbia should potentially be expected. This estimate is subject to further refinement as the design process advances. In particular, unknowns (at this point) relating to private property impacts, utility and geotechnical implications can substantially alter this result. Appropriate contingencies have been applied.

FIGURE 13

HIGHWAY 6 AND BUCHANAN ROAD/ABERDEEN ROAD IMPROVEMENT CONCEPT

URBANSYSTEMS.

SCALE 1:1000
1164.0075.01

3.8 Westkal Rd

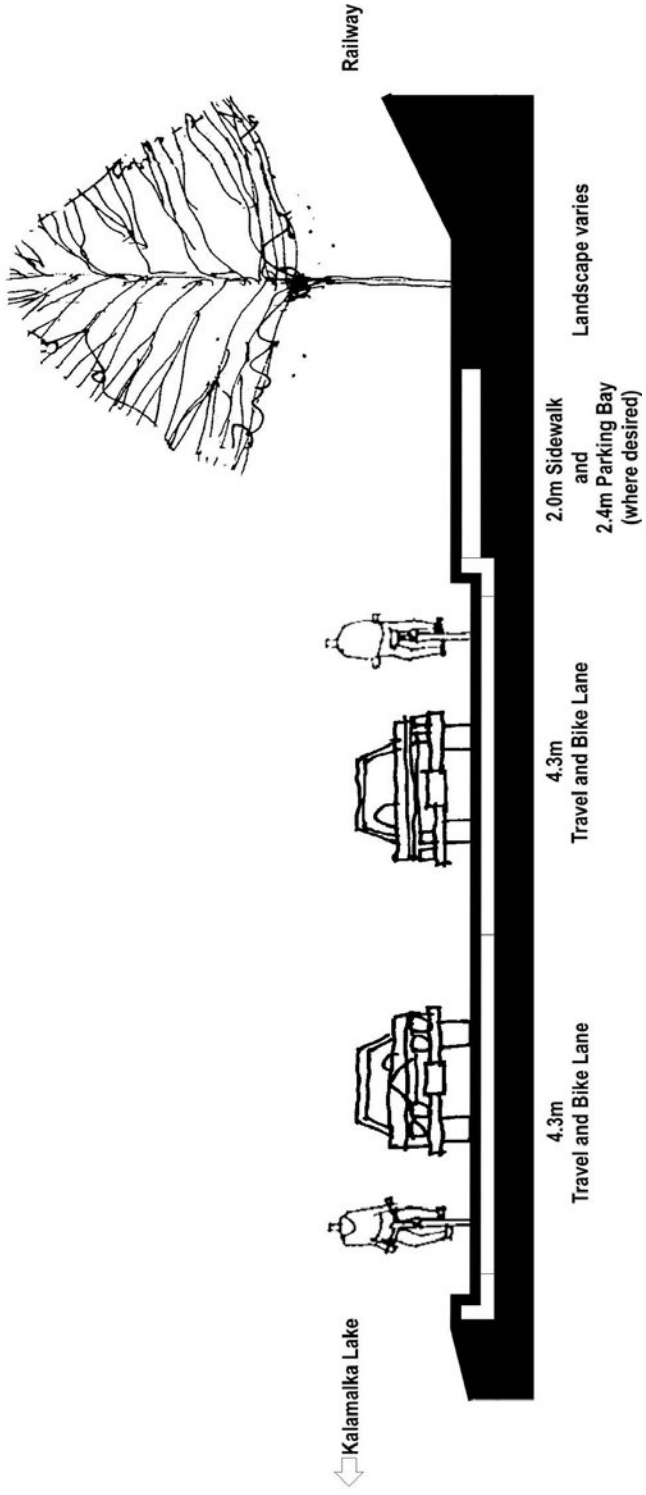
The design and configuration of Westkal Road has been identified as being inappropriate for the usage characteristics that are currently being experienced. In particular, higher than expected traffic volumes connecting between the central district and beachfront area and OUC and Highway 97 are creating quality of life and safety issues for the residents along its length. The corridor is characterized as possessing a relatively narrow width between the railway line and Kalamalka Lake along with numerous and poorly-defined driveway access points and no explicit accommodation for pedestrians and/or cyclists. The recent (2002) installation of speed tables are a testament to the District's desire to alleviate the conditions being experienced.

Despite these concerns, Westkal Road must continue to support the high travel demand between central Coldstream and the Highway 97 corridor for the foreseeable future, as it is the only link available over the planning horizon. Note that some discussion relating to the Grid Road concept of replacing Westkal Road has been included in Appendix B, however, it is generally thought to be beyond the planning horizon and some immediate accommodation is required in the short term. Improvements to the design of the corridor should be considered that will both accommodate the travel demand while respecting the unique characteristics and constraints that exist at this location.

In this regard, a customized roadway cross-section has been developed with an aim to developing the District's vision for this corridor. The section is illustrated in Figure 14. Notable features include shared travel lane widths to accommodate cyclists and vehicles and parking pockets installed where opportunities exist, and a wide sidewalk to accommodate pedestrians. Landscaping will be introduced where possible. Little to no property acquisition needs are anticipated at this point.

For capital planning purposes, implementation is recommended in the 0-5 year horizon (short term). A preliminary cost estimate has been established at $1,490,000. This estimate is subject to further refinement as the design process advances. In particular, unknowns (at this point) relating to private property impacts, utility and geotechnical implications can substantially alter this result. Appropriate contingencies have been applied.

Figure 14 - Westkal Road Cross-Section Design Concept



3.9 Postill Dr

Postill Drive is a local road connecting Kalamalka Road and Kidston Road. The usage characteristics of this roadway have become more consistent with a collector road in recent years as motorists attempt to save time when traveling to the residential area and beyond to Kalamalka Lake Provincial Park. This type of usage is inconsistent with the District's and resident's expectations, and a strategy to return the function of this roadway to that of a local roadway is being considered.

A neighbourhood traffic calming strategy has been developed aimed at maintaining pedestrian, cyclist and local user access to the neighbourhood while discouraging the use of this roadway by through traveling traffic (by effectively increasing the travel time over what would be required to use the Kidston Road corridor). The use of speed humps (which are now well accepted within the Community) along with curb extensions at each end are proposed, as illustrated in Figure 15. District staff should consult with the community on this proposal in advance of implementation.

The strategy is presented in two phases, the second relating to the Kalavista Road corridor. The need for this latter phase is contingent upon the success of the first phase and the extent to which traffic chooses to divert away from Postill to Kalavista. Travel time measurements and a review of the roadway alignment and configuration would suggest that this scenario is unlikely to be required; however, it is included for completeness. Cross-section improvements, such as lane narrowing and/or a sidewalk along Postill Dive have been discussed with District staff as potential incremental additions to this scenario, but they are not explicitly required in the context of the improvements noted. Consistent with sound transportation planning principles, options that include closing Postill Drive (or Kalavista Drive) at one or both ends and/or in the middle are not being considered at this point due to the anticipated adverse implications to emergency service access and response times and the impacts to local residents.

For capital planning purposes, implementation is recommended in the 0-5 year horizon (short term). A preliminary cost estimate has been established at $174,000 for the first phase and $50,000 for the second phase. This estimate is subject to further refinement as the design process advances. In particular, unknowns relating to utility and geotechnical implications can substantially alter these results. Appropriate contingencies have been applied.

FIGURE 15

POSTILL DRIVE
IMPROVEMENT CONCEPT

URBAN SYSTEMS

1164.0075.01

3.10 Kalamalka Rd - Westkal Rd to Kalavista Dr

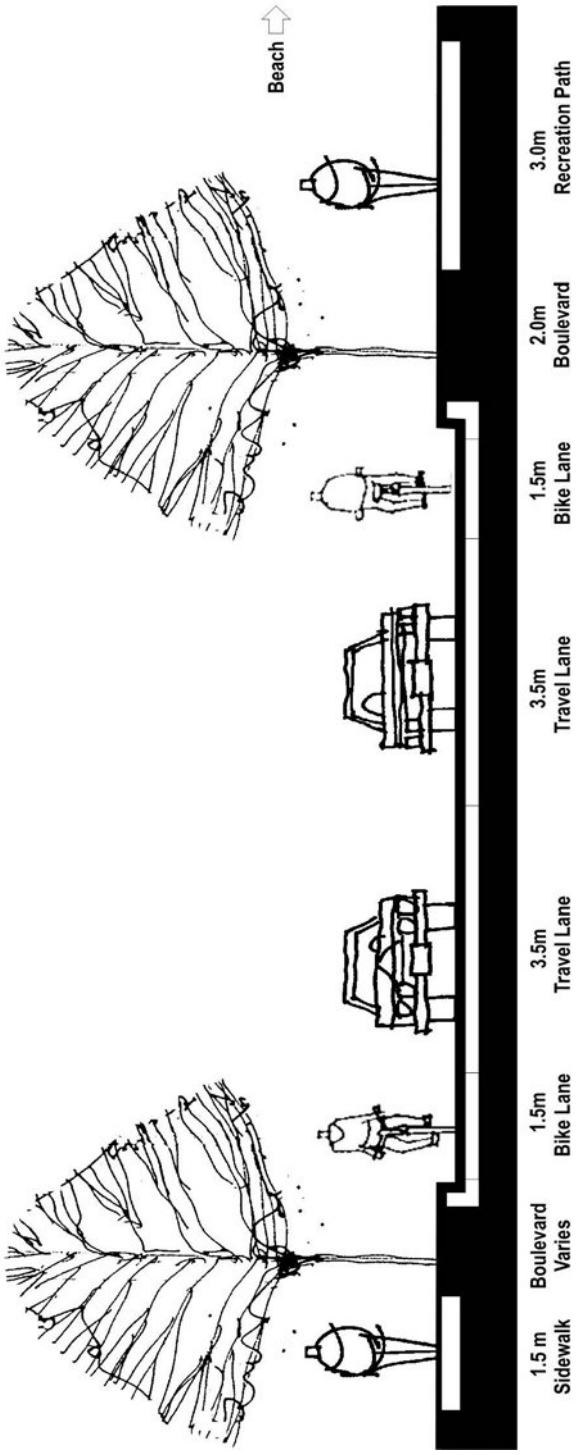
While no specific capacity or delay related deficiencies were noted in this busy section of the Kalamalka Lake Road corridor between the Westkal Road intersection and Kalavista Drive, its unique circumstances and importance to the community as the beachfront area would suggest that some consideration be given to a design configuration that is better able to respond to the varying and often conflicting needs of pedestrians, cyclists, and the associated crossing demand and interaction. During the summer months, this area is often congested and highly vulnerable roadway users are often unduly exposed to these challenging traffic conditions (see cover photo).

In this regard, a design cross-section has been developed and is illustrated in Figure 16 which sets aside a full 3.0 m of recreational pathway along the beachfront area to accommodate the movements of these vulnerable roadway users, complimented by a 2.0 m wide landscaped boulevard. The roadway traffic is accommodated in two 3.5 m travel lanes and two 1.5 m bicycle lanes, with a separate sidewalk on the north side. Some consideration might be given to the ultimate location of the existing overhead utilities.

This initiative is offered for discussion purposes only at this point, as further dialogue and consideration will be required by the District of Coldstream. As such, no specific project or cost estimate has been generated, beyond the conceptual design cross-section. Given the implications and possibilities in this area, further exploration of this concept with landscape architecture input and community interaction is recommended.

Kalamalka Road looking west between Kalavista and Westkal

Figure 16 - Kalamalka Road (Westkal to Kalavista) Cross Section Design Concept



3.11 Kalamalka Rd - Westkal Rd to Vernon

The section of Kalamalka Road proceeding north from the Westkal Road intersection is a key arterial link in the District's major roadway network plan. It links the District with the City of Vernon and Highway 6, and offers a parallel route to the Highway 97 corridor which is expected to become significantly more congested over the planning horizon. While this analysis has not specifically suggested that any problems exist with this segment of the corridor at this point in time or in the next 20 years, it is noted here for future consideration as it relates to roadway ROW acquisition. Often as properties develop, opportunities to secure additional ROW present themselves, and new developments should recognize future roadway needs to ensure compliance with these requirements.

In this regard, this segment of the Kalamalka Road corridor is noted as being a candidate for a potential future expansion to four lanes beyond the planning horizon. In this regard, future ROW needs should be recognized now for the reasons cited. A 25 m ROW is a recommended minimum requirement in this regard.

4.0 THE PLAN

The major roadway network plan for the District of Coldstream is summarized in Figure 17. Recommended capital initiatives are identified and color-coded according to the anticipated timing related to their need. It should be noted that this timing is generally development dependent, and so is wholly linked to economic activity levels. Linking implementation to maintenance and rehabilitation initiatives (i.e. when repaving/excavation work might be going on in the area for other reasons) should also be considered as it will present a more reliable perspective upon when implementation might be achieved and offers economies of scale.

Details of the recommended capital improvement projects are listed in Table 12. Note that this table does not include elements of these improvements that may be achievable through the application of development cost charges or as direct elements of a development approval process.

Table 12 - Roadway Network Project Summary

Project Location	Improvement	Time Frame	Cost Estimate
Westkal Rd	Revise Design X-Section	Short Term	$ 1,490,000
Postill Dr (Phase 1 and 2 Combined)	Traffic Calming	Short Term	$ 224,000
TOTAL SHORT TERM (0-5 Years)			***$ 1,714,000***
Kalamalka Lake Rd & Westkal Rd	Upgrade Intersection	Medium Term	$ 325,000
Aberdeen Rd & Kalamalka Lake Rd	Upgrade Intersection	Medium Term	$ 167,000
TOTAL MED TERM (5-10 Years)			***$ 492,000***
Kalamalka Lake Rd & Kidston Rd	Upgrade Intersection	Long Term	$ 325,000
Hwy 6 & Buchanan Rd/Aberdeen Rd	Upgrade Intersection	Long Term	$ 27,000
Aberdeen Rd & Middleton Dr	Upgrade Intersection	Long Term	$ 24,000
TOTAL LONG TERM (10+ Years)			***$ 376,000***
		Overall Total	**$ 2,582,000**

4.1 Next Steps

To complement the work undertaken to date on this initiative, consideration should be given to incorporating and/or overlaying the roadway network maintenance schedule in an effort to identify some of the opportunities discussed above and to encapsulate the roadway network initiatives under one document.

In addition, consideration should also be given to establishing a sidewalk network master plan and a bicycle network master plan to begin the process of fostering alternate travel mode uses within the District. In both cases, these vulnerable roadway users require special care and consideration around specific trip generators and destinations such as schools, tourist attractions. Similarly, initiatives required in these categories need to be considered in concert with these works to enable more holistic problem capital project programming for the transportation network.

DISTRICT OF COLDSTREAM MUNICIPAL BOUNDARY

FIGURE 17

ROADWAY NETWORK PLAN

LEGEND

INTERSECTION IMPROVEMENTS
- SHORT TERM
- MEDIUM TERM
- LONG TERM

CORRIDOR UPGRADES
- SHORT TERM
- MEDIUM TERM
- LONG TERM

District of Coldstream

URBAN SYSTEMS

JOB NO. 1164.0075.01

APPENDIX A

Cost Estimates

DISTRICT OF COLDSTREAM

Westkal / Kalamalka Intersection Improvements (Roundabout)

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Common excavation	cu. m	500	$6.00	$3,000.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	250	$18.00	$4,500.00
2.3	Subgrade preparation including finishing and compaction	sq. m	2900	$2.00	$5,800.00
2.4	Removals - full depth pavement reclamation	sq. m	2900	$4.00	$11,600.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel - 150 mm thickness	sq. m	2900	$6.00	$17,400.00
3.2	Granular base for curbs, 100 mm thick	sq. m	300	$3.00	$900.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel - 300 mm thickness	sq. m	2900	$9.00	$26,100.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	300	$4.00	$1,200.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course - 75 mm	sq. m	2600	$13.00	$33,800.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	445	$55.00	$24,475.00
6.2	Concrete curb for traffic islands	l. m	260	$60.00	$15,600.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$2,500.00
7.2	All temporary line painting for base course asphalt	L.S.			$2,500.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	21	$750.00	$15,750.00
10.0 Landscaped Boulevard		L.S.			$15,000.00
12.0 Traffic Control		L.S.			$45,000.00

SUBTOTAL 1	$225,125.00
ENGINEERING & CONTINGENCY (35%)	$78,793.75
SUBTOTAL 2	$303,918.75
GST	$21,274.31
TOTAL	$325,193.06

DISTRICT OF COLDSTREAM

Kidston / Kalamalka Intersection Improvements (Roundabout)

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Common excavation	cu. m	1000	$6.00	$6,000.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	500	$18.00	$9,000.00
2.3	Subgrade preparation including finishing and compaction	sq. m	2600	$2.00	$5,200.00
2.4	Removals - full depth pavement reclamation	sq. m	1900	$4.00	$7,600.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel - 150 mm thickness	sq. m	2600	$6.00	$15,600.00
3.2	Granular base for curbs, 100 mm thick	sq. m	300	$3.00	$900.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel - 300 mm thickness	sq. m	2600	$9.00	$23,400.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	300	$4.00	$1,200.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course - 75 mm	sq. m	2500	$13.00	$32,500.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	425	$55.00	$23,375.00
6.2	Concrete curb for traffic islands	l. m	205	$60.00	$12,300.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$2,500.00
7.2	All temporary line painting for base course asphalt	L.S.			$2,500.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	28	$750.00	$21,000.00
10.0 Landscaped Boulevard		L.S.			$15,000.00
12.0 Traffic Control		L.S.			$45,000.00
				SUBTOTAL 1	$223,075.00
				ENGINEERING & CONTINGENCY (35%)	$78,076.25
				SUBTOTAL 2	$301,151.25
				GST	$21,080.59
				TOTAL	$322,231.84

DISTRICT OF COLDSTREAM

Aberdeen / Kalamalka Intersection Improvements

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Common excavation	cu. m	50	$6.00	$300.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	25	$18.00	$450.00
2.3	Subgrade preparation including finishing and compaction	sq. m	1400	$2.00	$2,800.00
2.4	Removals - full depth pavement reclamation	sq. m	300	$4.00	$1,200.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel				
	- 150 mm thickness	sq. m	800	$6.00	$4,800.00
3.3	Shoulder gravel, 100 mm thick	sq. m	610	$6.00	$3,660.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel				
	- 300 mm thickness	sq. m	800	$9.00	$7,200.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course				
	- 50 mm	sq. m	600	$9.00	$5,400.00
	- 75 mm	sq. m	1400	$13.00	$18,200.00
5.2	Level course asphalt, 100mm depth	sq. m	700	$50.00	$35,000.00
6.0 Concrete Walks, Curbs and Gutters					
6.2	Concrete curb for traffic islands	l. m	15	$75.00	$1,125.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$2,000.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	1	$750.00	$750.00
8.2	Relocate signs	ea.	3	$400.00	$1,200.00
9.0 Precast and Cast-in-Place Concrete					
9.1	Precast concrete low barriers	ea.	8	$200.00	$1,600.00
9.2	Allen Block retaining wall	V sq. m	40	$250.00	$10,000.00
10.0 Landscaped Boulevard		L.S.			$7,200.00
11.0 Mobilization		L.S.			$2,500.00
12.0 Traffic Control		L.S.			$10,000.00
				SUBTOTAL 1	$115,385.00
				ENGINEERING & CONTINGENCY (35%)	$40,384.75
				SUBTOTAL 2	$155,769.75
				GST	$10,903.88
				TOTAL	$166,673.63

DISTRICT OF COLDSTREAM

Aberdeen / Middleton Intersection Improvements

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
2.0 Roadway Excavation, Embankment and Compaction					
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	25	$18.00	$450.00
2.3	Subgrade preparation including finishing and compaction	sq. m	155	$2.00	$310.00
2.4	Removals - full depth pavement reclamation	sq. m	155	$4.00	$620.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel - 150 mm thickness	sq. m	155	$5.00	$775.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel - 300 mm thickness	sq. m	155	$9.00	$1,395.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course - 50 mm	sq. m	155	$9.00	$1,395.00
6.0 Concrete Walks, Curbs and Gutters					
6.2	Concrete curb for traffic islands	l. m	10	$60.00	$600.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$1,500.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	1	$750.00	$750.00
8.2	Relocate signs	ea.	1	$400.00	$400.00
10.0 Landscaped Boulevard		L.S.			$2,000.00
11.0 Mobilization		L.S.			$3,500.00
12.0 Traffic Management		L.S.			$2,500.00
			SUBTOTAL 1		$16,195.00
			ENGINEERING & CONTINGENCY (35%)		$5,668.25
			SUBTOTAL 2		$21,863.25
			GST		$1,530.43
			TOTAL		$23,393.68

DISTRICT OF COLDSTREAM

Hwy 6 / Buchanan Intersection Improvements

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
2.0 Roadway Excavation, Embankment and Compaction					
	2.2 Imported embankment fill, 150mm minus pit run gravel	cu. m	100	$18.00	$1,800.00
	2.3 Removals - full depth pavement reclamation	sq. m	200	$4.00	$800.00
3.0 Granular Base					
	3.3 Shoulder gravel, 100 mm thick	sq. m	300	$6.00	$1,800.00
5.0 Hot Mix Asphalt Concrete Paving					
	5.1 Remove raised island, prepare and repave	L.S.			$2,500.00
7.0 Painted Pavement Markings					
	7.1 All permanent line painting for surface course asphalt	L.S.			$2,500.00
8.0 Signs					
	8.2 Relocate signs	ea.	1	$400.00	$400.00
9.0 Precast and Cast-in-Place Concrete					
	9.1 Precast concrete low barriers	ea.	20	$200.00	$4,000.00
11.0 Mobilization		L.S.			$3,500.00
12.0 Traffic Control		L.S.			$1,000.00
				SUBTOTAL 1	$18,300.00
				ENGINEERING & CONTINGENCY (35%)	$6,405.00
				SUBTOTAL 2	$24,705.00
				GST	$1,729.35
				TOTAL	$26,434.35

DISTRICT OF COLDSTREAM

Westkal Road

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1.0 Clearing and Grubbing					
1.1	General clearing and grubbing including isolated tree removal	L.S.			$2,500.00
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Earthworks	cu. m	4500	$6.00	$27,000.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	1000	$18.00	$18,000.00
2.3	Subgrade preparation including finishing and compaction	sq. m	12000	$2.00	$24,000.00
2.4	Removals - full depth pavement reclamation	sq. m	8200	$4.00	$32,800.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel - 150 mm thickness	sq. m	9200	$6.00	$55,200.00
3.2	Granular base for curbs, 100 mm thick	sq. m	1500	$3.00	$4,500.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel - 300 mm thickness	sq. m	9200	$9.00	$82,800.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	1500	$4.00	$6,000.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course - 75 mm	sq. m	9200	$13.00	$119,600.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	2000	$55.00	$110,000.00
6.2	Sidewalks, 100mm thick, including granular base	sq. m	2000	$60.00	$120,000.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$2,000.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	8	$750.00	$6,000.00
9.0 Precast and Cast-in-Place Concrete					
9.1	Allen Block retaining wall	V sq. m	1400	$250.00	$350,000.00
10.0 Landscaped Boulevard		L.S.			$20,000.00
12.0 Traffic Control		L.S.			$48,000.00
				SUBTOTAL 1	$1,028,400.00
				ENGINEERING & CONTINGENCY (35%)	$359,940.00
				SUBTOTAL 2	$1,388,340.00
				GST	$97,183.80
				TOTAL	$1,485,523.80

DISTRICT OF COLDSTREAM

Postill Drive - Phase 1

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Common excavation	cu. m	100	$6.00	$600.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	50	$18.00	$900.00
2.3	Subgrade preparation including finishing and compaction	sq. m	1100	$2.00	$2,200.00
2.4	Removals - full depth pavement reclamation	sq. m	1100	$4.00	$4,400.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel				
	- 150 mm thickness	sq. m	500	$6.00	$3,000.00
3.2	Granular base for curbs, 100 mm thick	sq. m	400	$3.00	$1,200.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel				
	- 300 mm thickness	sq. m	500	$9.00	$4,500.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	400	$4.00	$1,600.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course				
	- 75 mm	sq. m	500	$13.00	$6,500.00
5.2	Asphalt speed hump	ea.	4	$1,000.00	$4,000.00
5.3	Asphalt raised crosswalk	ea.	1	$1,500.00	$1,500.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	500	$55.00	$27,500.00
6.2	Sidewalks, 100mm thick, including granular base	sq. m	550	$60.00	$33,000.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$2,500.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	10	$750.00	$7,500.00
8.2	Relocate signs	ea.	3	$400.00	$1,200.00
10.0 Landscaped Boulevard		L.S.			$7,500.00
11.0 Mobilization		L.S.			$2,500.00
12.0 Traffic Control		L.S.			$8,000.00
				SUBTOTAL 1	$120,100.00
				ENGINEERING & CONTINGENCY (35%)	$42,035.00
				SUBTOTAL 2	$162,135.00
				GST	$11,349.45
				TOTAL	$173,484.45

DISTRICT OF COLDSTREAM

Postill Drive - Phase 2

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
5.0 Hot Mix Asphalt Concrete Paving					
	5.2 Asphalt speed hump	ea.	8	$1,000.00	$8,000.00
7.0 Painted Pavement Markings					
	7.1 All permanent line painting for surface course asphalt	L.S.			$5,000.00
8.0 Signs					
	8.1 Supply and install signs (including concrete base)	ea.	16	$750.00	$12,000.00
10.0 Landscaped Boulevard		L.S.			$2,500.00
11.0 Mobilization		L.S.			$3,500.00
12.0 Traffic Control		L.S.			$2,500.00
				SUBTOTAL 1	$33,500.00
				ENGINEERING & CONTINGENCY (35%)	$11,725.00
				SUBTOTAL 2	$45,225.00
				GST	$3,165.75
				TOTAL	$48,390.75

APPENDIX B

Grid Road Discussion

BACKGROUND

It has been assumed for more than 30 years that an arterial road would eventually connect College Way to Kalamalka Lake Road. This link is intended to replace the mobility function provided by the Westkal Road corridor, linking the central Coldsteam area to OUC and Highway 97. There is a demonstrated strong demand for travel in this direction, and it is likely that latent demand exists as well given the draw that Highway 97 and Kelowna place upon all elements of the local roadway network.

It is likely that the concept of a connection at this location was originally generated by the Ministry of Transportation as part of a long term vision for the core municipal road network. The concept has been supported in the past by the District of Coldstream due to the perception that it is necessary (for mobility reasons) and as partial funding was previously available from the Provincial government. Given the current fiscal constraints and the lack of a discernable funding program from the Province, the potential for cost sharing in the implementation of this connection is low.

Over the past year the development of this Major Roadway Network Plan was initiated and, simultaneously, the property that the Grid Road alignment passes through changed ownership. The new owners are keenly interested in developing the property with single family lots requiring, and a decision regarding the need for and the alignment of the future Grid Road was required.

CHALLENGES

The area possesses challenging and steep terrain making the construction of a new road difficult in this area. Key obstacles include:

Topography

The elevation difference between College Way and Kalamalka Road relative to the horizontal separation prohibits construction of a direct connection between the 2 roads. An extended road length is necessary to create a connection with acceptable vertical geometry.

The land available to establish a right-of-way for Grid Road all slopes toward Kalamalka Lake and Vernon Creek. Due to the topography, significant earthwork quantities are required resulting in high road construction costs regardless of the option pursued.

The vertical and horizontal difference between Highway 97 and a logical connection point with Kalamalka Road makes achieving an 8% overall road grade (desirable for a roadway of this classification) almost impossible.

Connection Points

On the uphill end of Grid Road concept there are 3 connection points available - a new intersection with Highway 97 south of the College, following the alignment of Reservoir Road or continuing the alignment of College Way before the switchback to Kick Willie Loop Road. A brief review of the concept of a new intersection with Highway 97 determined that the capital costs are prohibitively high, and this option was abandoned.

On the downhill end of Grid Road there are 2 logical connection points. The first location is the existing intersection of Westkal Road and Kalamalka Road. This intersection is already faced with the challenge associated with a T-intersection on a horizontal curve, and safely connecting the Grid Road at this location is challenging. The other option is to intersect Kalamalka Road across from Husband Road. The geometry of this option is acceptable; however, the configuration is inconsistent with travel desire lines and may affect the viability and ultimate use of the new route.

Railway

Regardless of the alignment option pursued, the Grid Road will need to cross the railway to connect with Kalamalka Road. To date, it has been indicated that at an at-grade crossing of the railway will not be acceptable. Due to the elevation of the railway relative to Kalamalka Road, a grade separated crossing will make the transition back to Kalamalka Road difficult. Significant re-grading of the existing roads will be necessary to provide acceptable vertical geometry between the existing railway and Kalamalka Road.

Due to the high costs and impacts associated with the notion of a grade separated at this location, a defensible argument for an at-grade crossing could be made, and this assumption has been included in all subsequent analyses.

Aesthetics

As noted, the construction of the Grid Road will result in a significant amount of earthwork due to the existing topography. The side slope along the road alignment will result in large cut slopes on the uphill side of the road and large fill slopes on the downhill side of the road. Combined with the cut and fill slopes most options need considerable soil retaining structures in excess of 5.0 m in height. The large cut and fill slopes and potential retaining wall all be largely visible from the south (Kalamalka Lake and travelers on Highway 97).

When considering aesthetics, the preferred Grid Road alignment is along the north-south side slope ultimately connecting to Reservoir Road. This alignment faces east (as opposed to south in all other options) which is approximately perpendicular Kalamalka Lake and less visible from the south.

Community Impact

Currently there is a measurable amount of traffic that 'short cuts' through Coldstream from Highway 97 to access Highway 6. Due to the geometry and location of the route within Coldstream, however, the traffic is predominantly limited to passenger cars driven by people familiar with the roads within Coldstream. It could be suggested that the majority of northbound Highway 97 traffic destined to Highway 6 uses the intersection of Highway 97 and Highway 6 within the City of Vernon at present. The current road geometrics along College Way, KickWillie Loop and Westkal Road naturally deter traffic. Construction of any Grid Road alignment will improve exposure of the route through Coldstream and will likely result in increased traffic 'short cutting' along Kalamalka Road.

In addition to the aesthetic implications noted earlier, the construction of a Grid Road alignment will generally result in negative impacts to the community.

Road Usage

Traffic data collection and forecasts were completed as part of the development of this Major Roadway Network Plan. The data suggests that an alternate link is not explicitly required from a capacity perspective provided that the existing Westkal corridor can be utilized for mobility purposes.

OPTIONAL ALIGNMENT COMPARISON

A numerous of potential alignment options were explored in this exercise. Many have not proven to be viable. The issues and key features of the options investigated are as follows:

Option 1

- Does not meet arterial design criteria, collector criteria are achieved.
- Design speed is 50 Km/hr.
- Requires significant retaining walls or right-of-way along the Tree Farm property.
- The vertical geometry for a level crossing at the railway and to match the existing Kalamalka Road elevation is substandard and not desirable.
- Grade separated railway crossing results in a large and expensive structure due to the separation of the railway and creek. Also, with a grade separated crossing, either significant re-grading of Kalamalka Road is necessary or the spanning of it with transitional ramps.

Option 2

- Does not meet arterial design criteria, collector criteria are achieved.
- Design speed is 50 Km/hr.
- Requires more new road construction than any other option.
- This option has the greatest impact to the Tree Farm.
- The general store on Kalamalka Road needs to be purchased and removed.

- An at-grade crossing of the railway results in significant re-grading of the existing Westkal and Kalamalka intersection. Westkal will either need to be converted into a dead-end street or significant property purchased to re-grade to match the new intersection elevation.
- A grade separated railway crossing results in the intersection with Kalamalka Road and Westkal Road becoming problematic as approximately 8 m of fill is necessary at the intersection location, resulting in the Kalamalka Road crossing under the railway impossible to maintain. Without significant land purchase and road reconstruction this option can not be achieved.

Option 3a

- Does not meet arterial design criteria, collector criteria are achieved.
- Design speed is 50 Km/hr.
- The intersection geometry with Kalamalka Road is not desirable.
- The at-grade railway the crossing angle is not desirable.
- To achieve acceptable geometry the existing elevation of Westkal Road needs to be raised considerably and it needs to be converted to a dead-end road.
- Several properties need to be purchased on the lake side of the existing Westkal Road alignment.

Option 3b

- Does not meet arterial design criteria, collector criteria are achieved.
- Design speed is 50 Km/hr.
- Same issues as stated with Option 1 regarding the railway crossing.

COST ESTIMATES

Capital cost estimates were completed for the 4 different options investigated. Class D cost estimates, including a contingency allowance of 35%, are appropriate given the level of site investigation. These estimates, which have been prepared with limited site information, are based on probable conditions affecting the project. The cost estimates represent the summation of all identifiable project component costs and should be used for planning purposes only.

The cost estimates reflect 2003 construction values based on tender prices received for similar types of work performed within the Okanagan Valley. No allowances have been made for SROW or property acquisition, interim financing, legal fees or District administration charges. Net GST of 3% has been included in the estimates.

The cost estimates prepared in this report assume that all of the works within each project would proceed under a single contract. If the projects are broken into smaller assignments, the costs need to be reviewed as the component costs are expected to increase.

A geotechnical investigation is required to confirm the soil conditions and assumptions made regarding the road construction. The current construction cost estimates assume, with the exception of some topsoil overburden, that the native material will be useable for road construction. If this assumption is incorrect the capital cost estimates could significantly increase.

In summary the capital cost estimates for each option are as follows:

Option	Estimated Cost
Option 1 – College Way to Husband Road	$4,650,000
Option 2 – Reservoir Road to Westkal Road	$5,250,000
Option 3a – College Way to Westkal Road Through Proposed Development	$2,340,000
Option 3b - College Way to Husband Road Through Proposed Development	$5,825,000

Detailed construction cost estimates for each option are included. All the above estimates assume that a level crossing is pursued and approval obtained. If a grade separated crossing is deemed unavoidable an additional $3.5 – $7 M needs to be added to all the above construction cost estimates.

RECOMMENDATION

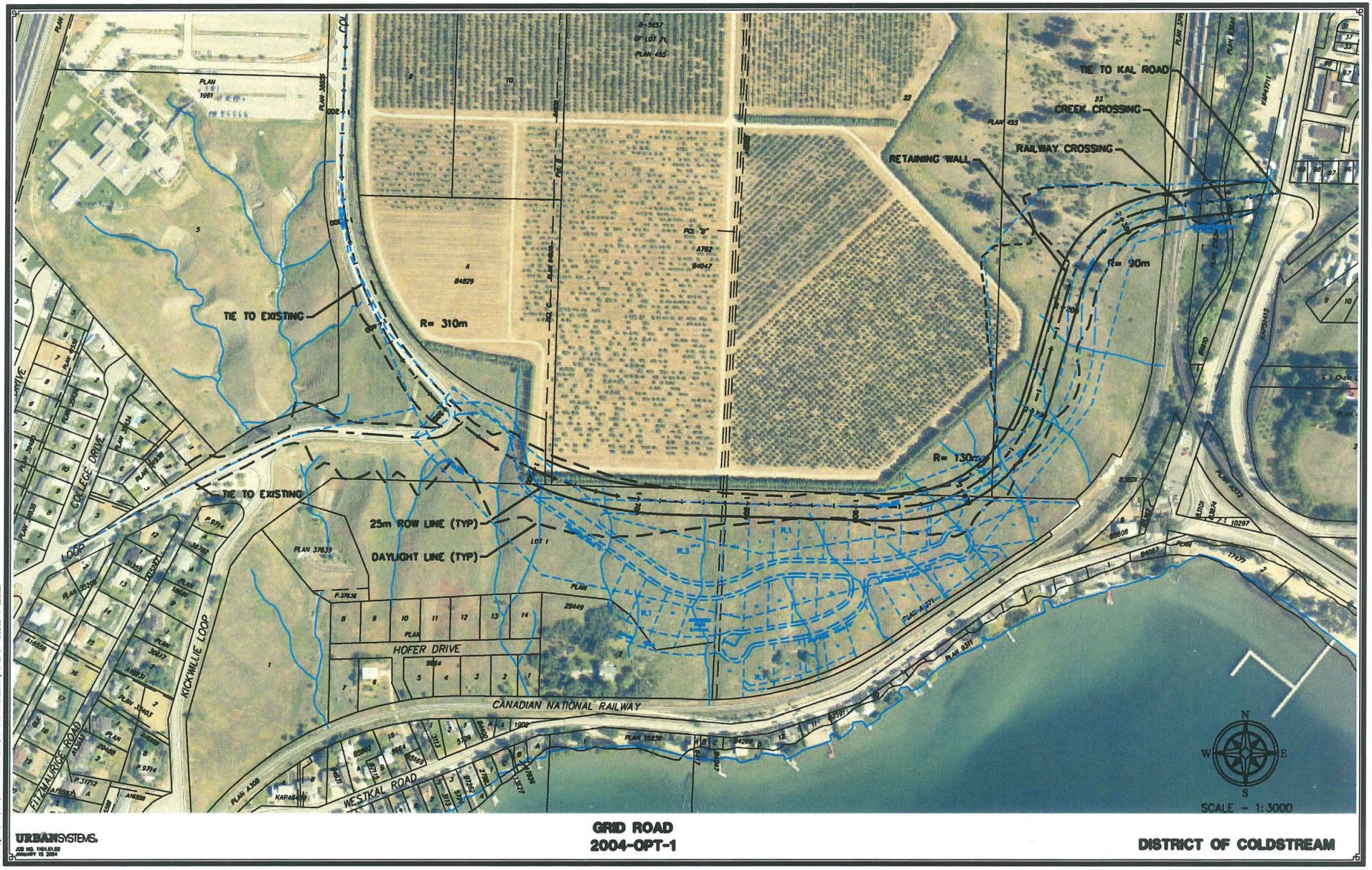
All the options have significant technical issues and high capital costs that make construction of a new arterial road to connect Highway 97 to Kalamalka Road challenging. Regardless of the option selected a new road that meets the geometric requirements of an arterial road is not possible. Construction of an arterial road will likely promote more traffic to 'short cut' through Coldstream when attempting to travel to and from Highway 97 and Highway 6. Also, construction of the Grid Road will challenge the aesthetic character of Coldstream. Therefore, the following course of action is recommended:

1. Retain the 20 m right-of-way from the developer on the south side of the Tree Farm property. If the goals of the District and/or the traffic volumes are significantly more than currently predicted the land necessary to construct a link between College Way and Kalamalka Road will be available in the future. Travel demand will remain strong, and corridor ROW retention is advisable.
2. Invest in the current Westkal Road connection to address the traffic flow for the next 20 years, as identified earlier in this report. The existing design cross section should be updated to better accommodate traffic and adequately address pedestrian and parking issues.
3. Update/adjust the road development cost charges (DCC) bylaw to reflect the changes (Grid Road is not required within the next 20 years).

DISTRICT OF COLDSTREAM

Grid Road and Kickwillie tie-in

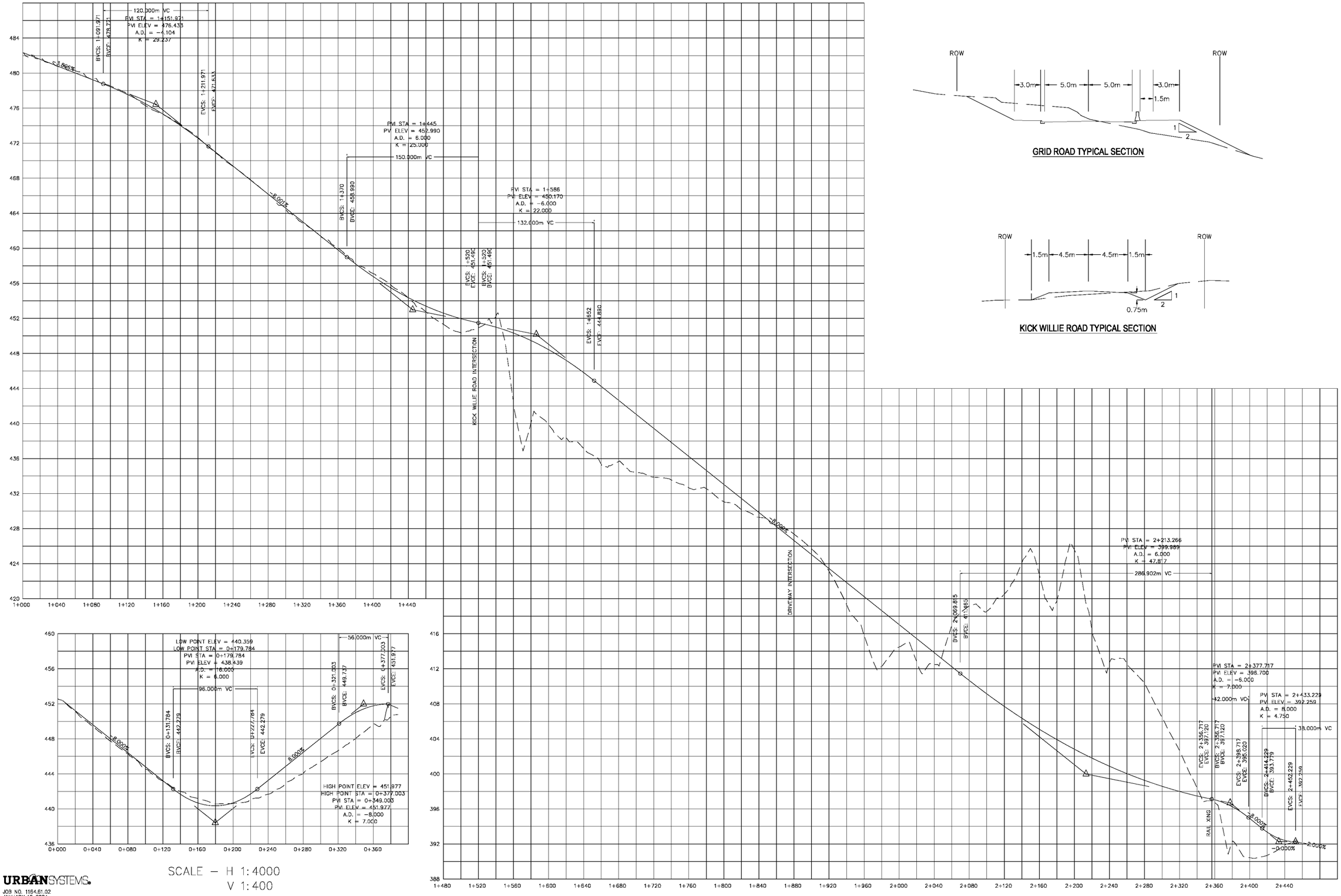
ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1.0 Clearing and Grubbing					
1.1	General clearing and grubbing including isolated tree removal	L.S.			$25,000.00
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Earthworks	cu. m	295000	$5.00	$1,475,000.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	1000	$18.00	$18,000.00
2.2	Subgrade preparation including finishing and compaction	sq. m	23000	$1.00	$23,000.00
2.3	Removals - full depth pavement reclamation	sq. m	4700	$4.00	$18,800.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel				
	- 150 mm thickness	sq. m	13200	$6.00	$79,200.00
3.2	Granular base for curbs, 100 mm thick	sq. m	1600	$3.00	$4,800.00
3.3	Shoulder gravel, 100 mm thick	sq. m	500	$6.00	$3,000.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel				
	- 300 mm thickness	sq. m	13200	$9.00	$118,800.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	1600	$4.00	$6,400.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course				
	- 50 mm	sq. m	2300	$9.00	$20,700.00
	- 75 mm	sq. m	11000	$13.00	$143,000.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	2180	$45.00	$98,100.00
6.3	Sidewalks, 100mm thick, including granular base	sq. m	3300	$55.00	$181,500.00
6.4	Sidewalk driveway crossing, 150mm thick, including granular base	sq. m	30	$85.00	$2,550.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$5,000.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	10	$750.00	$7,500.00
8.2	Relocate signs	ea.	1	$400.00	$400.00
9.0 Precast and Cast-in-Place Concrete					
9.1	Precast concrete low barriers	ea.	440	$200.00	$88,000.00
9.2	Allen Block retaining wall	V sq. m	3300	$250.00	$825,000.00
10.0 Landscaping and cleanup		L.S.			$50,000.00
12.0 Traffic Control		L.S.			$20,000.00
				SUBTOTAL 1	$3,213,750.00
				ENGINEERING & CONTINGENCY (35%)	$1,124,812.50
				SUBTOTAL 2	$4,338,562.50
				GST	$303,699.38
				TOTAL	$4,642,261.88



URBANSYSTEMS.

GRID ROAD
2004-OPT-1

DISTRICT OF COLDSTREAM



GRID ROAD TYPICAL SECTION

KICK WILLIE ROAD TYPICAL SECTION

SCALE – H 1:4000
V 1:400

URBANSYSTEMS.

JOB NO. 1164.61.02
JANUARY 15 2004

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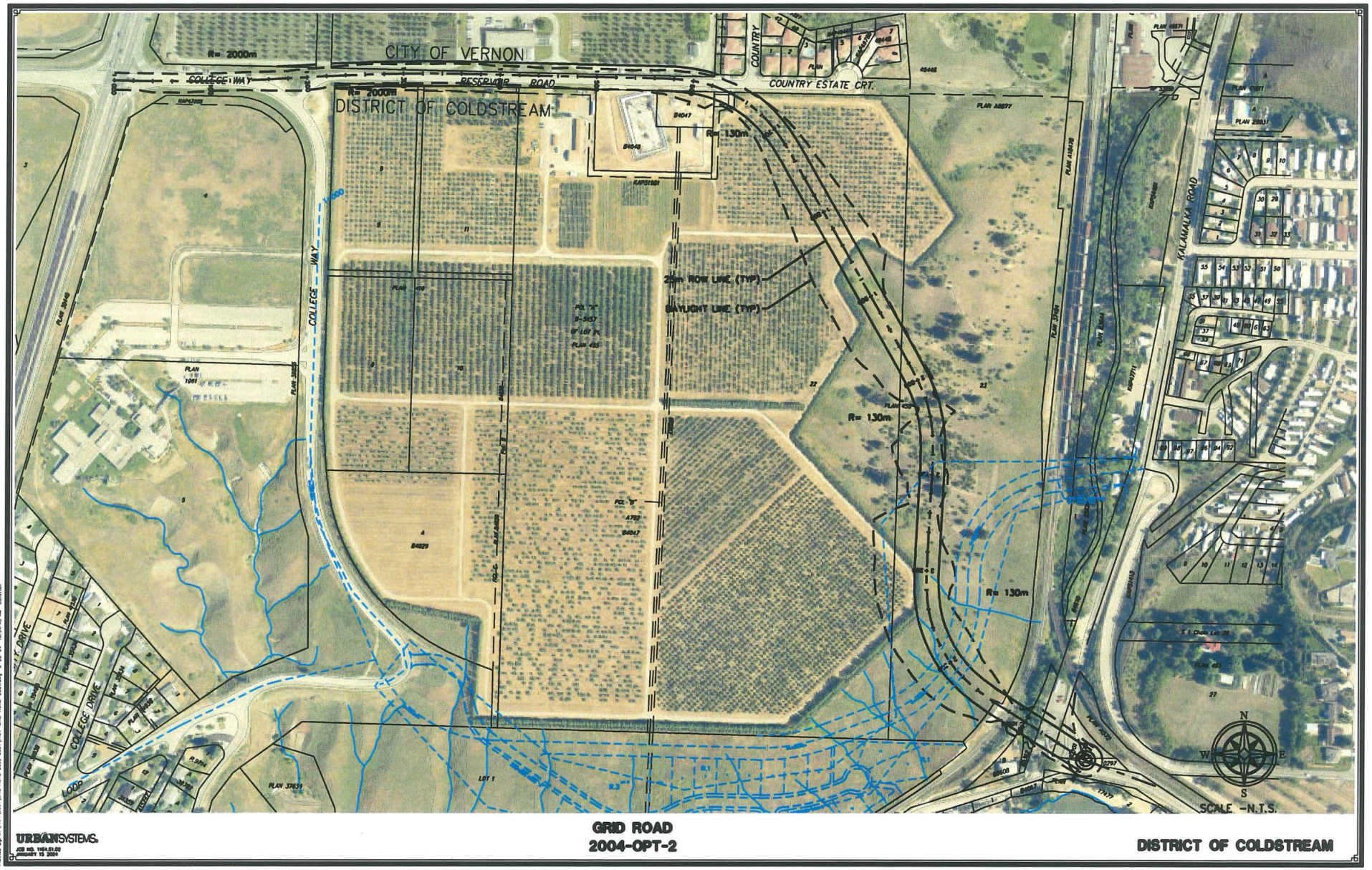
GRID ROAD 2004-OPT-1

DISTRICT OF COLDSTREAM

Grid Road Option 2

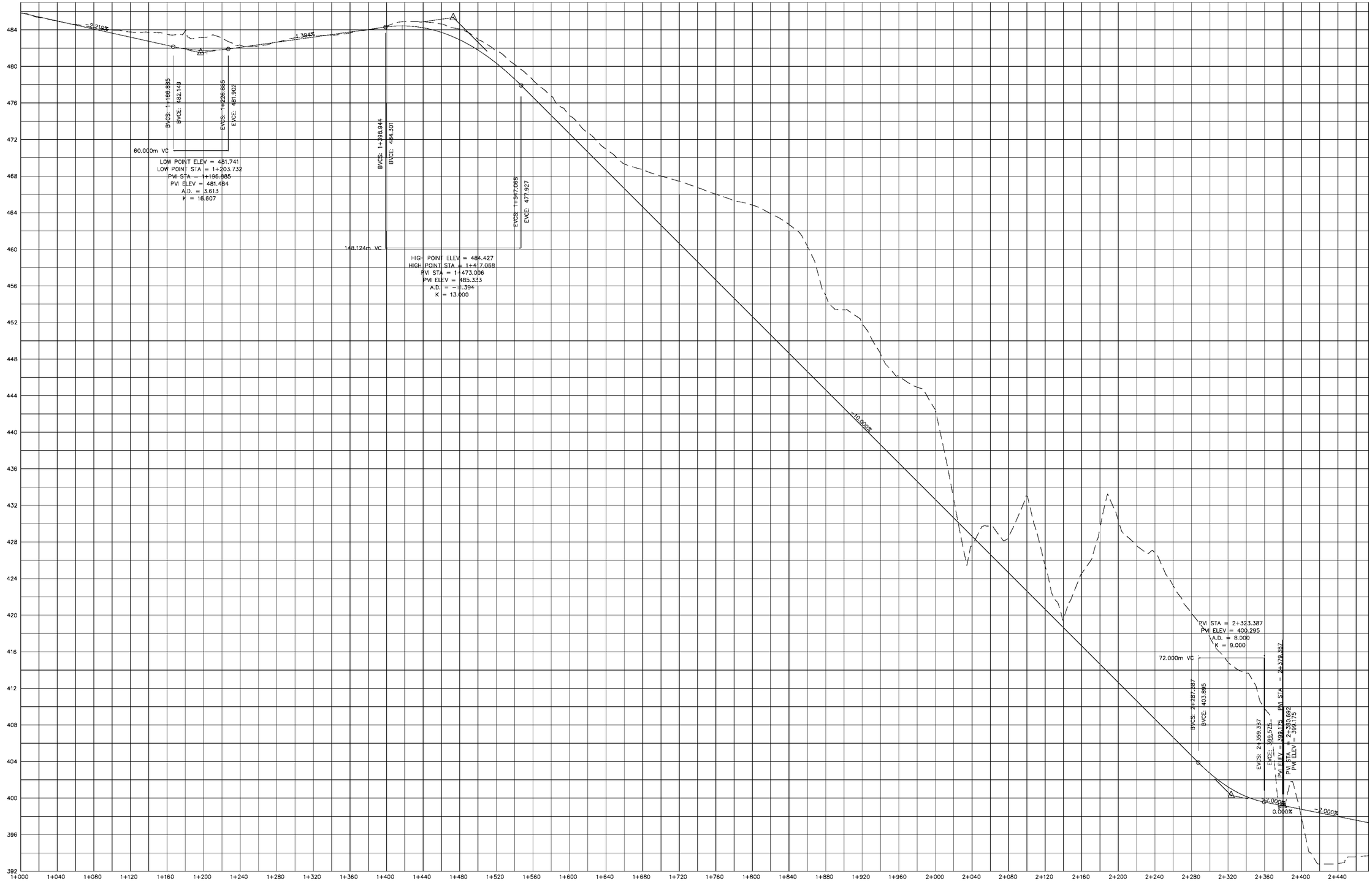
ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1.0 Clearing and Grubbing					
1.1	General clearing and grubbing including isolated tree removal	L.S.			$20,500.00
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Earthworks	cu. m	341490	$5.00	$1,707,450.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	1000	$18.00	$18,000.00
2.2	Subgrade preparation including finishing and compaction	sq. m	27636	$1.00	$27,636.00
2.3	Removals - full depth pavement reclamation	sq. m	6200	$4.00	$24,800.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel				
	- 150 mm thickness	sq. m	14700	$6.00	$88,200.00
3.2	Granular base for curbs, 100 mm thick	sq. m	2205	$3.00	$6,615.00
3.3	Shoulder gravel, 100 mm thick	sq. m	0	$6.00	$0.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel				
	- 300 mm thickness	sq. m	14700	$9.00	$132,300.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	2205	$4.00	$8,820.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course				
	- 50 mm	sq. m		$9.00	$0.00
	- 75 mm	sq. m	14700	$13.00	$191,100.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	2940	$45.00	$132,300.00
6.3	Sidewalks, 100mm thick, including granular base	sq. m	4410	$55.00	$242,550.00
6.4	Sidewalk driveway crossing, 150mm thick, including granular base	sq. m	60	$85.00	$5,100.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$5,000.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	10	$750.00	$7,500.00
8.2	Relocate signs	ea.	1	$400.00	$400.00
9.0 Precast and Cast-in-Place Concrete					
9.1	Precast concrete low barriers	ea.	588	$200.00	$117,600.00
9.2	Allen Block retaining wall	V sq. m	3300	$250.00	$825,000.00
10.0 Landscaping and cleanup		L.S.			$50,000.00
12.0 Traffic Control		L.S.			$20,000.00
				SUBTOTAL 1	$3,630,871.00
				ENGINEERING & CONTINGENCY (35%)	$1,270,804.85
				SUBTOTAL 2	$4,901,675.85
				GST	$343,117.31
				TOTAL	$5,244,793.16



URBANSYSTEMS.

GRID ROAD
2004-OPT-2

DISTRICT OF COLDSTREAM



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URBANSYSTEMS

JOB NO. 1164.61.02
JANUARY 15, 2004

GRID ROAD
2004-OPT-2

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DISTRICT OF COLDSTREAM

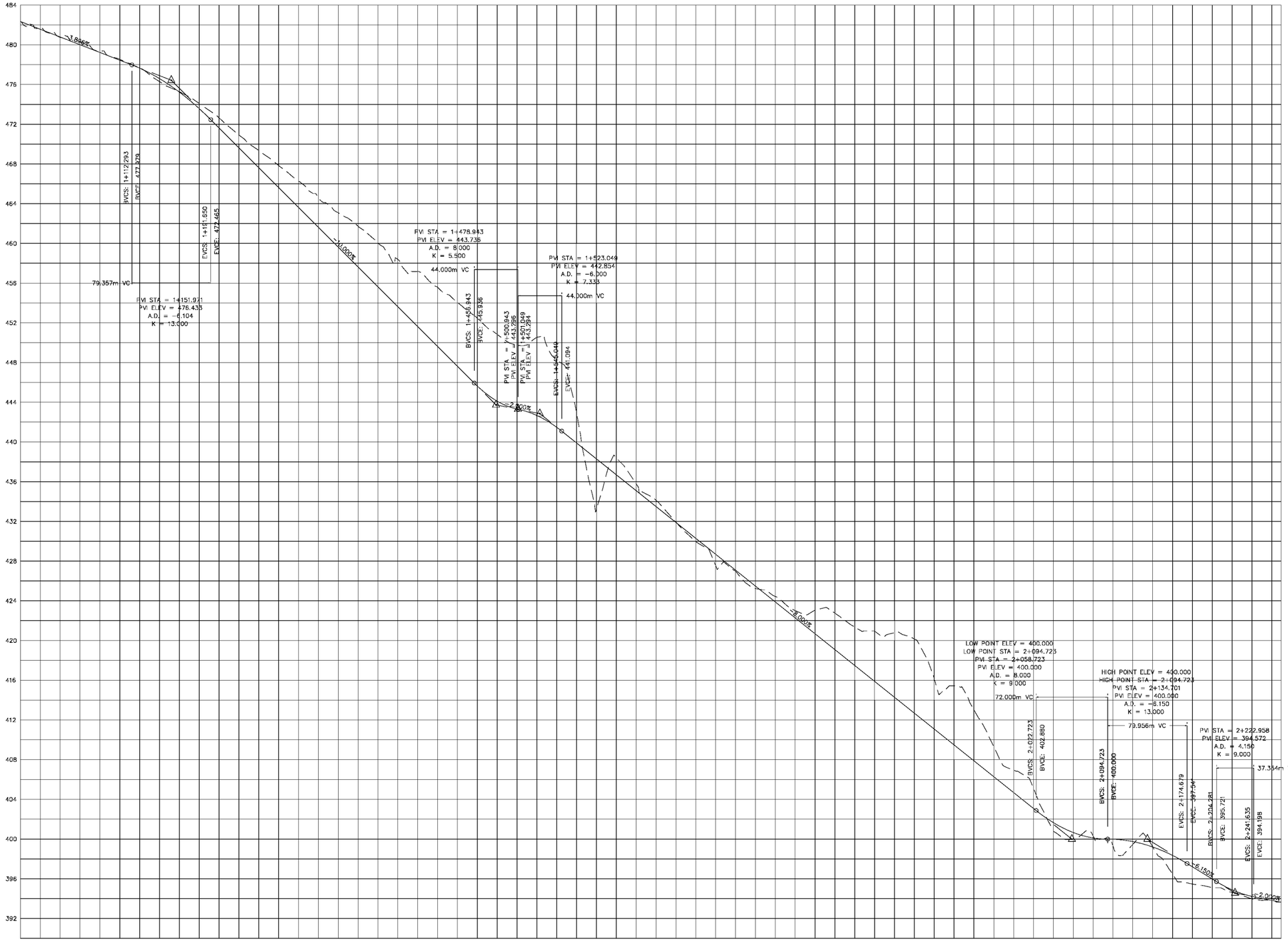
Grid Road Option 3a and Kickwillie tie-in

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1.0 Clearing and Grubbing					
1.1	General clearing and grubbing including isolated tree removal	L.S.			$18,000.00
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Earthworks	cu. m	101848	$5.00	$509,240.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	1000	$18.00	$18,000.00
2.2	Subgrade preparation including finishing and compaction	sq. m	21426	$1.00	$21,426.00
2.3	Removals - full depth pavement reclamation	sq. m	5250	$4.00	$21,000.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel				
	- 150 mm thickness	sq. m	12450	$6.00	$74,700.00
3.2	Granular base for curbs, 100 mm thick	sq. m	1530	$3.00	$4,590.00
3.3	Shoulder gravel, 100 mm thick	sq. m	500	$6.00	$3,000.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel				
	- 300 mm thickness	sq. m	12450	$9.00	$112,050.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	1530	$4.00	$6,120.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course				
	- 50 mm	sq. m	2250	$9.00	$20,250.00
	- 75 mm	sq. m	10200	$13.00	$132,600.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	2040	$45.00	$91,800.00
6.3	Sidewalks, 100mm thick, including granular base	sq. m	3060	$55.00	$168,300.00
6.4	Sidewalk driveway crossing, 150mm thick, including granular base	sq. m	60	$85.00	$5,100.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$5,000.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	10	$750.00	$7,500.00
8.2	Relocate signs	ea.	1	$400.00	$400.00
9.0 Precast and Cast-in-Place Concrete					
9.1	Precast concrete low barriers	ea.	408	$200.00	$81,600.00
9.2	Allen Block retaining wall	V sq. m	1000	$250.00	$250,000.00
10.0 Landscaping and cleanup		L.S.			$50,000.00
12.0 Traffic Control		L.S.			$20,000.00
				SUBTOTAL 1	$1,620,676.00
				ENGINEERING & CONTINGENCY (35%)	$567,236.60
				SUBTOTAL 2	$2,187,912.60
				GST	$153,153.88
				TOTAL	$2,341,066.48

URBANSYSTEMS.

GRID ROAD
2004-OPT-3A

DISTRICT OF COLDSTREAM



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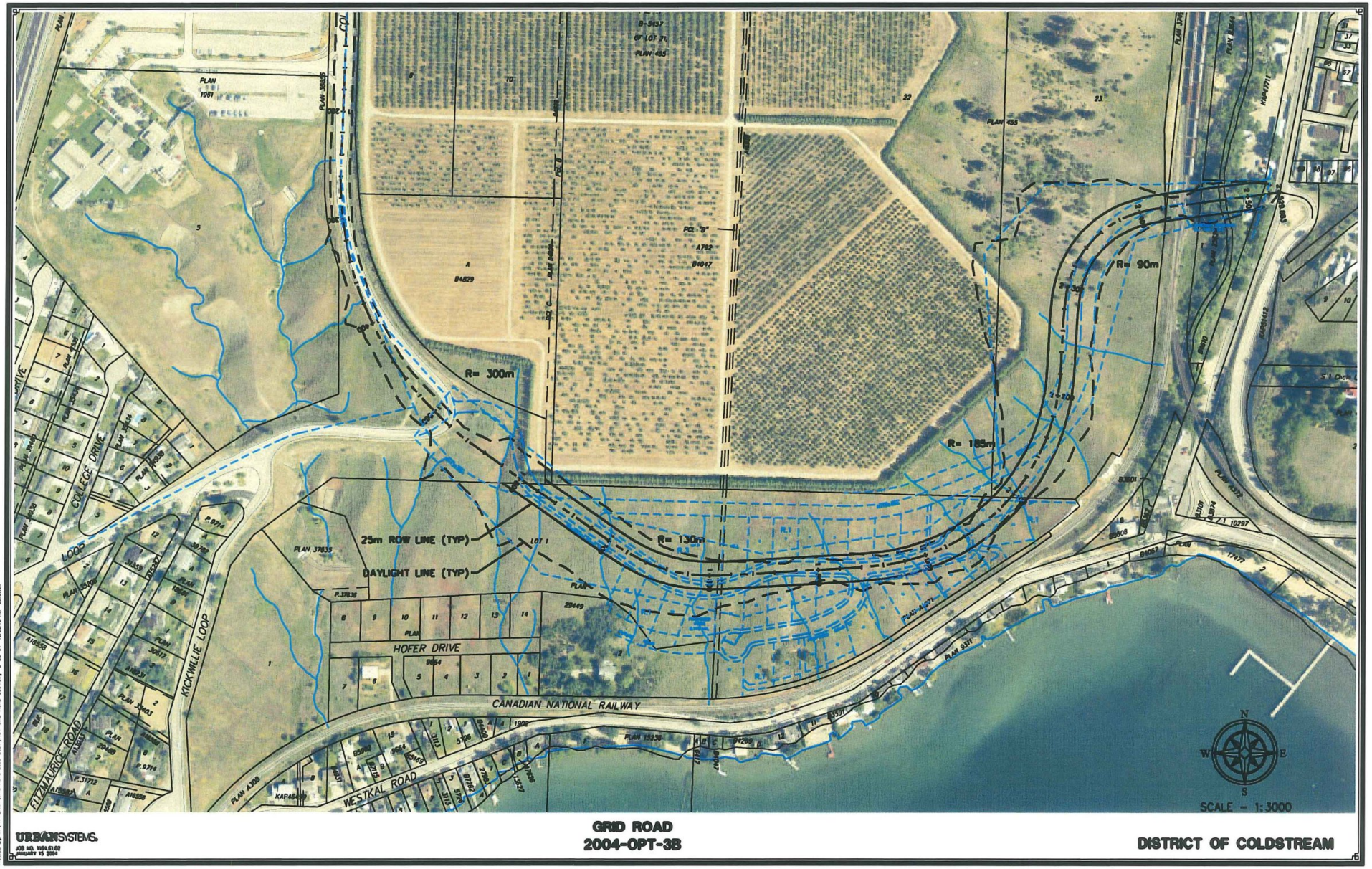
JOB NO. 1164.61.02
JANUARY 15 2004

GRID ROAD
2004-OPT-3A

DISTRICT OF COLDSTREAM

Grid Road Option 3b and Kickwillie tie-in

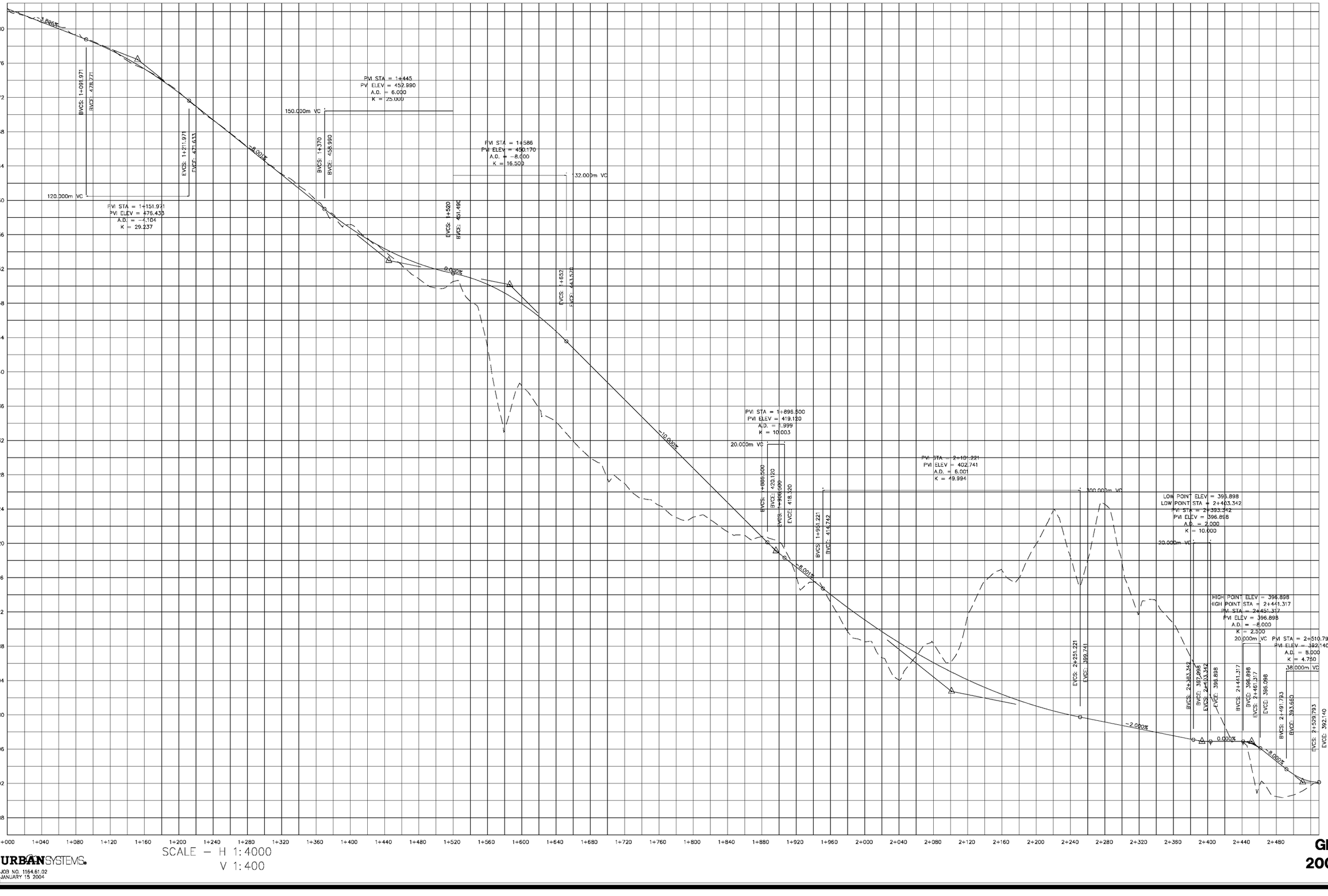
ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1.0 Clearing and Grubbing					
1.1	General clearing and grubbing including isolated tree removal	L.S.			$33,000.00
2.0 Roadway Excavation, Embankment and Compaction					
2.1	Earthworks	cu. m	433400	$5.00	$2,167,000.00
2.2	Imported embankment fill, 150mm minus pit run gravel	cu. m	1000	$18.00	$18,000.00
2.2	Subgrade preparation including finishing and compaction	sq. m	26220	$1.00	$26,220.00
2.3	Removals - full depth pavement reclamation	sq. m	5250	$4.00	$21,000.00
3.0 Granular Base					
3.1	Granular base, 19 mm minus crushed gravel				
	- 150 mm thickness	sq. m	15000	$6.00	$90,000.00
3.2	Granular base for curbs, 100 mm thick	sq. m	1913	$3.00	$5,737.50
3.3	Shoulder gravel, 100 mm thick	sq. m	500	$6.00	$3,000.00
4.0 Granular Subbase					
4.1	Granular subbase, 75mm minus crushed gravel				
	- 300 mm thickness	sq. m	15000	$9.00	$135,000.00
4.2	Granular subbase for curbs, 200 mm thick	sq. m	1913	$4.00	$7,650.00
5.0 Hot Mix Asphalt Concrete Paving					
5.1	Asphalt surface course				
	- 50 mm	sq. m	2250	$9.00	$20,250.00
	- 75 mm	sq. m	12750	$13.00	$165,750.00
6.0 Concrete Walks, Curbs and Gutters					
6.1	Barrier curb and gutter	l. m	2550	$45.00	$114,750.00
6.3	Sidewalks, 100mm thick, including granular base	sq. m	3825	$55.00	$210,375.00
6.4	Sidewalk driveway crossing, 150mm thick, including granular base	sq. m	60	$85.00	$5,100.00
7.0 Painted Pavement Markings					
7.1	All permanent line painting for surface course asphalt	L.S.			$5,000.00
8.0 Signs					
8.1	Supply and install signs (including concrete base)	ea.	10	$750.00	$7,500.00
8.2	Relocate signs	ea.	1	$400.00	$400.00
9.0 Precast and Cast-in-Place Concrete					
9.1	Precast concrete low barriers	ea.	510	$200.00	$102,000.00
9.2	Allen Block retaining wall	V sq. m	3300	$250.00	$825,000.00
10.0 Landscaping and cleanup		L.S.			$50,000.00
12.0 Traffic Control		L.S.			$20,000.00
				SUBTOTAL 1	$4,032,732.50
				ENGINEERING & CONTINGENCY (35%)	$1,411,456.38
				SUBTOTAL 2	$5,444,188.88
				GST	$381,093.22
				TOTAL	$5,825,282.10



GRID ROAD
2004-OPT-3B

URBANSYSTEMS.

DISTRICT OF COLDSTREAM



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JOB NO. 1164.61.02
JANUARY 15 2004

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GRID ROAD
2004-OPT-3B

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