

Technical Memorandum

DATE: October 21, 2014

OUR FILE: 0743.008.B

TO: Mr. Lonny Miller
Manager of Public Works and Capital Projects
Village of Pemberton
Box 100, 7400 Prospect Street
Pemberton B.C. V0N 2L0

FROM: Bruce Daykin, Eng.L.

RE: **VILLAGE OF PEMBERTON**
Asset Management Strategy - Roads Condition Assessment and Capital Plan

Introduction

Kerr Wood Leidal was engaged by the Village of Pemberton to complete an assessment of the condition of the Village roads, and provide a 5 year capital plan for making improvements.

The scope of work was outlined in a proposal from KWL dated May 21, 2014. The work program includes:

- Preparing and inventory of the roads
- Conducting an assessment in the field
- Preparing a capital plan
- Forecasting revenue requirements, with Class D cost estimates
- Identifying O&M requirements

1. Inventory

An inventory of the Village roads has been prepared on an Excel spreadsheet. Based on an earlier inventory received from the Village, roads are grouped into the following zones:

- Airport
- Benchlands
- Downtown
- Highway
- Hill
- Industrial Way
- Plateau
- The Glen

The roads were divided into segments and listed alphabetically with numbers assigned for each segment, typically 1 segment per block. The list of 73¹ segments is provided in a spreadsheet format. The total length of the roads is approximately 16.06 km.

¹ The inventory contains 75 segments, with a total length of 15.4km, however Segments 10 and 24 were determined to be provincial highway and are therefore not included in the totals for Village roads.



2. Field Work

A site visit was conducted on June 17 to 19, 2014 by Bruce Daykin. The roads were inspected initially by a driving tour, followed by walking most of the roads for a detailed observation of the condition of the asphalt. Notes were taken to record the types and extent of surface distress, and a visual rating was assigned to each segment, using the PASER System, as described below.

2.1 Rating System

The Pavement Surface Evaluation and Rating (PASER) system was utilized for the Village roads in order to provide a uniform assessment method. This method is well suited to urban roads and evaluates for the following criteria:

1. Surface defects such as ravelling, (loss of fines), flushing and polishing,
2. Surface deformation such as rutting and distortion
3. Cracking by type: transverse, reflection, longitudinal, block and alligator
4. Patches and potholes

The ratings can be summarized as follows:

- 9-10: new or like new
- 8: very good
- 7-6: good, signs of aging, crack filling required
- 5-4: fair, cracking extensive, structural repair warranted
- 3: poor, some potholes, needs major patching prior to overlay or replacement
- 2-1: very poor, potholes and patches, needs reconstruction

The age of the pavement was also indicated where estimates were made possible by discussions with local residents or municipal staff.

A copy of the PASER Evaluation Manual is attached in Attachment A.

2.2 Assessment Results

The results of the field survey are presented in Table 1 and Figures 1 and 2, and in a large format map in Attachment B. Various types of surface distress observed are indicated with low (L), moderate (M), and high (H) notation, and the overall condition rating for each segment is given. The rating number assigned has also been indicated on Figures 1 and 2 and Attachment B.

Table 1: Village of Pemberton Roads Inventory and Condition Assessment

SEGMENT	ROUTE	AREA	FROM	TO	Length (km)	Pavement Width (m)	CLASS	Raveling	Flushing	Polishing	Rutting	Distortion	Xverse Cracks	Refl. Cracks	Long.Cracks	Block Cracks	Alligator Cracks	Patches	Potholes	Condition rating	Note
1	Eagle Ridge Drive	Benchlands	Pemberton Meadows R	Dogwood St	0.43	7.0	C	L												8	5 years old or less
2	Eagle Ridge Drive	Benchlands	Dogwood St	End	0.22	7.5	C	L												8	5 years old or less
76	Collins Road	Benchlands	Pemberton Meadows R	End	0.19	3.0	L	M							M	M	H			3	ext. alligator cracks, long. & block cracking
3	Arbutus Street	Downtown	Portage Rd	Crabapple Ct	0.06	9	L	L												7	6 year old+/-, curb 7 gutter, 2 conc. swks
4	Arbutus Street	Downtown	Crabapple Ct	End	0.1	9	L	L												7	6 year old+/-, curb 7 gutter, 2 conc. swks
55	Alder Drive	Downtown	Urdal Rd	End	0.2	7.5	L	L												7	good condition, 10 year old +/-
5	Aspen Blvd	Downtown	Portage Rd	Oak St	0.3	9	C	L					L		L					6	good, 1 bad x-trench, re-seal long. joint east side
6	Aster Street	Downtown	Frontier St	Prospect St	0.12	10	L	L			L		L		L					5	bad trench mid block
7	Aster Street	Downtown	Prospect St	Pioneer St	0.06	19	C								L					5	newer but more cracks
8	Aster Street	Downtown	Pioneer St	Dogwood St	0.05	12	C	L												7	older but solid
9	Aster Street	Downtown	Dogwood St	End (Cedar St)	0.1	37	L	M			M		M				M			3	poor, reconstruction req'd
10	Birch Road	Downtown	Frontier St	Prospect St	0.1	15w/ 13e	A	L					L		L					6	re-sealing cracks req'd, curb& gutter, swk.
11	Camus Street	Downtown	Frontier St	Prospect St	0.1	7.5	L	L							L		L			6	n. side new, sealing cracks req'd south 70%
12	Cedar Street	Downtown	Dogwood St	Aster St	0.14	7	LA	L			L				L		L	L		4	only a lane
13	Cottonwood Street	Downtown	Portage Rd	End	0.17	7.5	L	L							L					6	centreline joint requires sealing
14	Crabapple Court	Downtown	Arbutus St	End	0.05	7.5	L								L					6	centreline joint requires sealing
15	Flint Street	Downtown	Portage Rd	End	0.17	8	L	M					L		L					7	good cond.
16	Frontier Street	Downtown	Aster St	Portage Rd	0.13	27	L	L					L	L	L	L	L	M	L	4	station street and parking, poor cond.
17	Frontier Street	Downtown	Portage Rd	Camus St	0.13	15.8s / 9n	L	L					L		L	L	L			5, 9, 4	s. 1/3 older, mid-block new, n. 20% poor
18	Frontier Street	Downtown	Camus St	Walnut St	0.27	7	L	L			L				L	L	L			5, 8	s 70% sections of trench damage, n 30% good
19	Oak Street	Downtown	Aspen Blvd	Willow Dr	0.1	14	C	L					L		L	L		L		6	s 50% newer, long. joint req's seal
20	Oak Street	Downtown	Willow Dr	Urdal Rd	0.3	9	C	L							L					6	re-seal 2 long. trench joints, s. 50% newer
21	Poplar Street	Downtown	Aspen Blvd	End	0.33	7.5	L	L					M		M		M			5	sections of alligator cracking
22	Prospect Street	Downtown	End	Aster St	0.1	9	L	L			M	L	L		M	M	M	M		4.5	poor condition
23	Prospect Street	Downtown	Aster St	Birch Rd	0.12	15, 10	C	L							L	L	L			3.5	severe trench damage, 6 laterals and main
24	Prospect Street	Downtown	Birch Rd	Pemberton Meadows R	0.13	10	X													7	MOT section, good cond.
25	Prospect Street	Downtown	Pemberton Meadows R	Walnut St	0.3	7.5	L	L						L	L	L				5	trench joints at centreline req. seal, reconst. 4x3
26	Walnut Street	Downtown	Frontier St	Prospect St	0.1	7.5	L	L							L			L		5	failing on 25% at trench and s. edge
27	Willow Drive	Downtown	Oak St	End	0.1	7.5	L	L												7	newer, 10 year +/-
28	Park Street	Highway	Sea to Sky Hwy	End	0.05	7.5	L	L												8	newer
29	Vine Road	Highway	Portage Rd	End	0.33	7.5	L	L												8	newer
30	Elmwood Street	Hill	Dogwood St	End	0.01	7.5	L				L		L		L		L	L		5	may be poor base/ subbase
31	Dogwood Street	Hill	Aster St	Fernwood St	0.25	11	C	L												8	v. good cond, misor dith erosion at sw end
32	Dogwood Street	Hill	Fernwood St	Elmwood St	0.08	7.5	C	L												8	newer, 5 year +/-
33	Dogwood Street	Hill	Elmwood St	Greenwood St	0.12	6	C	L												8	newer, 5 year +/-
34	Dogwood Street	Hill	Greenwood St	Eagle Ridge Dr	0.23	6	C	L												7	newer, 5 year +/-
35	Fernwood Drive	Hill	End	Dogwood St	0.11	7.5	L						L			M	L			4	may be poor base/ subbase, no ditch
36	Fernwood Drive	Hill	Dogwood St	End	0.15	4	L	M							M	M				4	lane, poor cond.
37	Greenwood Street	Hill	Dogwood St	End	0.23	6.5, 7.5	L	L,M					/L		/L					8, 5	w 1/2 newer, e. 1/2 15 year +/-, on rock knoll
38	Balsam Street	The Glen	Laurel Rd	Harrow Rd	0.18	7.2	L	M							L					7	long. Cracks at centreline
39	Harrow Road	The Glen	Portage Rd	Balsam St	0.12	7.5	C	M									L			7	cracking in 3 sections, 10x1
40	Harrow Road	The Glen	Balsam St	Lupin St	0.1	7.6	C	M									L			7	cracking in 1 section, 10x3
41	Harrow Road	The Glen	Lupin St	Larch St	0.1	7.3	C	M							L					7	
42	Harrow Road	The Glen	Larch St	Hemlock St	0.2	7	C	M							L					7	ditches good

Table 1: Village of Pemberton Roads Inventory and Condition Assessment

SEGMENT	ROUTE	AREA	FROM	TO	Length (km)	Pavement Width (m)	CLASS	Raveling	Flushing	Polishing	Rutting	Distortion	Xverse Cracks	Refl. Cracks	Long Cracks	Block Cracks	Alligator Cracks	Patches	Potholes	Condition rating	Note
43	Harrow Road	The Glen	Hemlock St	End	0.05	7	C	M												5	very short section at gravel transition
44	Hemlock Street	The Glen	End	Laurel Rd	1.7	7.5, 7.2	L	M					L							7	
45	Hemlock Street	The Glen	Laurel Rd	Larch Rd	0.09	7.5	L	M					M							6	crack sealing req'd
46	Hemlock Street	The Glen	Larch Rd	Harrow Rd	0.09	7.3	L	M					L		L	L				5	
47	Laburnum Road	The Glen	End	Laurel Rd	0.09	7.8	L	M					M		M					4	ditch weak
48	Larch Road	The Glen	Hemlock St	Harrow Rd	0.29	7.5	L	M					M		L					5	
49	Laurel Street	The Glen	Balsam St	Lupin St	0.1	7.3	L	M												7	v. good except cracks in intersection
50	Laurel Street	The Glen	Lupin St	Laburnum St	0.1	7.8	L	M					M		M	M	M			4	fair
51	Laurel Street	The Glen	Laburnum St	Olive St	0.09	7.5	L	M					M		L					5	
52	Laurel Street	The Glen	Olive St	Hemlock St	0.09	7.3	L	M					I		L					6	
53	Lupin Street	The Glen	Laurel Rd	Harrow Rd	0.18	7.5	L	L												7	v. good, no cracks
54	Olive Street	The Glen	Laurel Rd	End	0.13	7.5	L	M					L							6	
56	Artisan Road	Industrial Way	Old Mill Rd	Industrial Way	0.09	9	IL	L												7.5	newer, 5 year +/-
57	Carpenter Road	Industrial Way	Industrial Way	End	0.11		IL	L					L							7.5	
58	Industrial Way	Industrial Way	Portage Rd	Artisan Rd	0.08	7.5	IC	L												7.5	
59	Industrial Way	Industrial Way	Artisan Rd	Carpenter Rd	0.09	7.5	IC	L					L							7.5	
60	Industrial Way	Industrial Way	Carpenter Rd	Timberlane Rd	0.18	7.5	IC	L					L		L					5	cross trench damage, re-sealing req'd
61	Industrial Way	Industrial Way	Timberlane Rd	Stonecutter Pl	0.14	7.5	IC	L					L		L					6	some poor x trench patches
62	Industrial Way	Industrial Way	Stonecutter Pl	Venture Pl	0.07	7.5	IC	L												7	good cond.
63	Industrial Way	Industrial Way	Venture Pl	End	0.09	7.5	IL	L												7	good cond.
64	Old Mill Road	Industrial Way	Artisan Rd	Carpenter Rd	0.13	9	IL													8	newer, 5 year +/-, curb and gutter
65	Old Mill Road	Industrial Way	Carpenter Rd	End	0.2	s9, n7.5	IL	L					L			L		L	s8, n 6	s 6	s half is newer
66	Stonecutter Place	Industrial Way	Industrial Way	End	0.17	7.5	IL	L					L			L		L		6	trench patches
67	Timberlane Road	Industrial Way	Industrial Way	Old Mill Rd	0.09	7.5	IL	L					L		L			L		6	trench patches
68	Venture Place	Industrial Way	Industrial Way	End	0.06	7.5	IL	L												7	good cond.
69	Pemberton Farm Road East	Plateau	Portage Rd	End	0.78	7	C	L											M	5	bad alignment east side
70	Pinewood Drive	Plateau	Pemberton Farm Rd E	End	0.1	7	L	L					L		L					6	
71	Airport Road	Airport	Portage Rd	km 0.4 bend	0.4	7.0	C	L					L		L					6	
72	Airport Road	Airport	km 0.4 bend	km 1.2 bridge	0.8	7.0	C	L					L		L					6	
73	Airport Road	Airport	km 1.2 bridge	km 1.7 Green R FS Rd	0.5	7.0	C	L					L		L					6	
74	Airport Road	Airport	km 1.7 Green R FS Rd	km 2.6 Meadows d/w	0.9	7.0	C	L					L		L					6	some patches. long. cracks repaired at edge
75	Airport Road	Airport	km 2.6 Meadows d/w	End	1.15	7.0	C	L					L		L					6	some patches. long. cracks repaired at edge

Total Length 16.06 km

Class Legend
 A = Arterial
 C = Collector
 IC = Industrial Collector
 L = Local
 LL = Limited Local
 IL = Industrial Local
 LA = Lane
 X = Prov Hwy - curb and sidewalk only

Condition Legend
 L= light damage
 M= moderate damage
 H= heavy damage

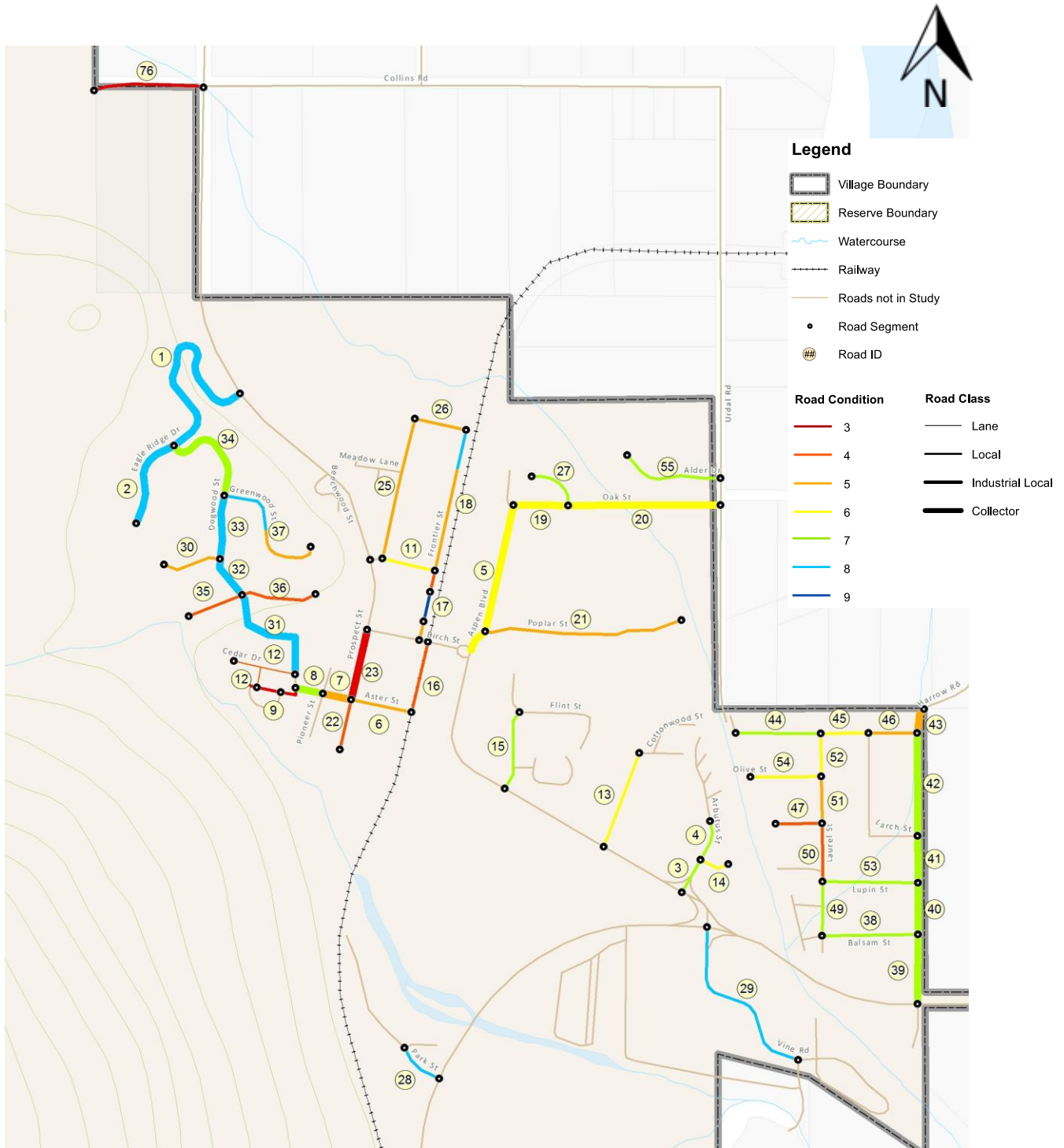
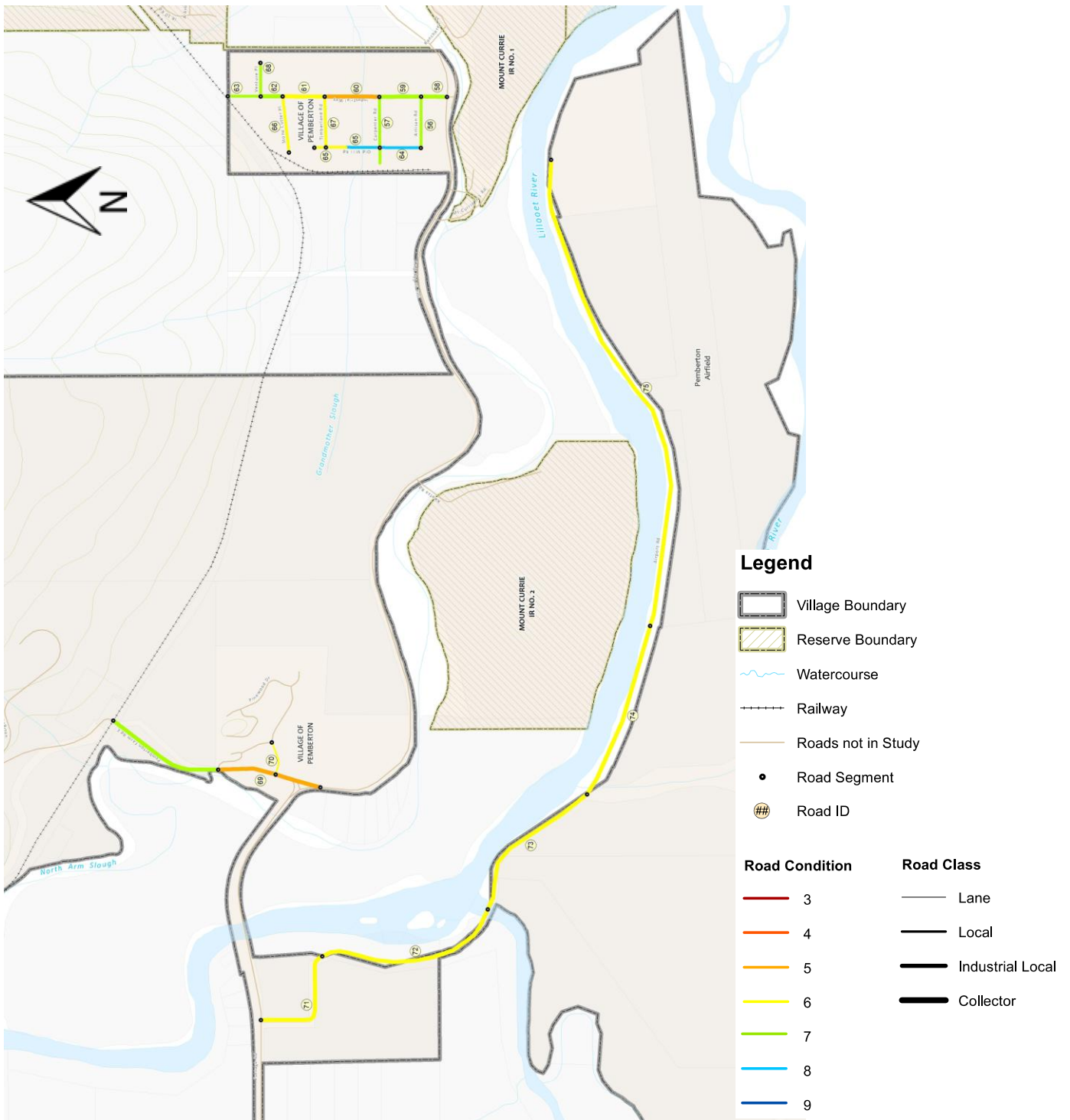


Figure 1: Road Asset Condition Map 1: Downtown, Hill, Glen, Benchlands and Highway Zones



Figure 2: Road Asset Condition Map 2: Airport, Plateau and Industrial Way Zones



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Most roads are good condition, with a rating of 6 to 7. A small group of roads are rated at about 8, being 5 years old or less (Figure 3).

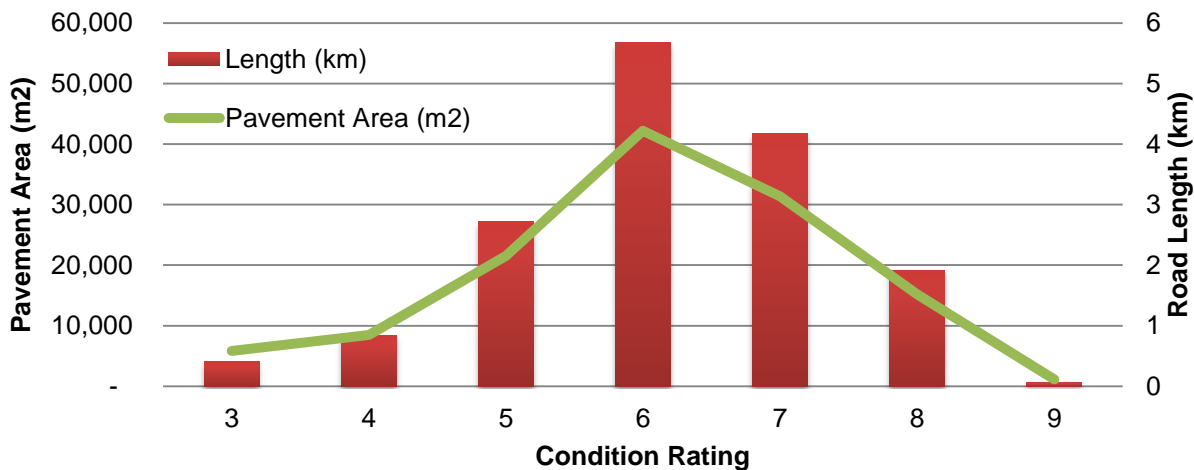


Figure 3: Pavement Condition Distribution

The worst condition roads include a small group of about 6 blocks with PASER ratings of 3 to 4. A moderately sized group of about 15 blocks has ratings of about 5, where the age is around 20 years. No extensive loss of surface integrity was noted; therefore, no ratings of 1-2 were assigned.

3. Capital Plan

The recommended course of action is to undertake road asset renewal over the next 5 years as follows;

Years 1 to 2: Group A Roads, Worst Condition

Four road segments in the Downtown zone were rated 3 to 4.5, poor to fair condition. They are located in areas of relatively high traffic and therefore appear to be the highest priority for upgrading. The combined length of the four segments in Group A is 450m.

Years 3-5: Group B Roads, Fair Condition

Fifteen road segments located in the Downtown, the Hills and Glen zones that were rated 4 to 5 are recommended for renewal within 3 to 5 years. Pavements in these 15 segments are 20 years old or more, and the segments identified show more distress than others in the same area and age.

Extensive alligator and longitudinal crackings with numerous patches were noted in a short dead end section of local road in the Benchlands and was rated 3, poor condition. As the traffic volume on this section of road is low, priority for its upgrading appears to be less urgent and has been included in the 3-5 year renewal group.

The Group A and B road segments are listed below with the capital cost estimates.



Beyond Year 5: Good to Excellent Condition

Selected road segments in the Industrial Park and Pemberton Farm Road are approaching the condition of Group B roads, and will require likely renewal within ten years (2.47 km total). No estimates have been prepared for renewing these assets. They could either be reassessed within five years, or be included for renewal in Year 3-5 with Group B.

Assuming an average life expectancy of 40 years, other Village roads (approximately 12 km, typically ranging in condition from 6 to 9), will require renewal in years 2020-2064. For long-range capital planning purposes it is assumed that:

- roads of condition 6 will require renewal between 2020 and 2034;
- roads of condition 7 will require renewal between 2035 and 2044; and
- roads of condition 8 or higher will require renewal between 2045 and 2054.

The schedule and cost estimates for renewing these roads will be determined based on future assessments.

3.1 Capital Cost Estimates

Class D capital cost estimates have been prepared for the Group A and B Roads. The estimates are based on a conceptual scope of renewal work, using unit prices quoted in June 2014 by a contractor active in the Pemberton area.

The general assumption is that the asphalt that is distressed in terms of surface deformation and severe cracking is because of poor conditions in the ground below, rather than faults with the asphalt. In some cases there is obvious poor backfilling of trenching from previous utility installation at fault as shown by the alignment of the cracking and settlement. In other cases not aligned with utilities, inadequate road base or sub-base gravels or soft subgrade is suspected at fault. Both situations are best repaired by re-excavation and reconstruction of the gravel layers. The degree of earthworks necessary can best be determined by a Geotechnical investigation prior to during construction. Meanwhile we have made assumptions about the volumes of material to be excavated and removed and quantities of gravel to be imported.

Group A: Worst Condition Roads, Years 1 and 2

The Group A estimates were made with some preliminary measurements of the failed sections which were made during the site visit on June 19, 2014. In most cases complete removal and replacement is budgeted for the portion that is distressed and on City property. Parking areas that appear to be private such are not included in the budget, as noted on the estimate sheets.

An exception to full paving scope is Segment 16 of Frontier Street where options for full or partial re-paving are given, and the entire width has been included, assuming it is all public land.

The Group A estimates are summarized in Table 2. Refer to detailed estimates in Attachment C.



Table 2: Group A, Worst Condition Roads

Item	Location	Length (m)	Capital Cost
1	Segment 22: Prospect Street, south of Aster	90	\$160,000
2	Segment 23: Prospect Street, Aster to Birch	130	\$270,000
3	Segment 9: Aster St, west end	70	\$140,000
4 Alt. A	Segment 16; Frontier, Aster to Portage (Station) - repave failed sections only	120	\$260,000
4 Alt. B	Segment 16; Frontier, Aster to Portage (Station) - repave all		\$370,000
Total	(Carrying item 4, Alt. B)	410	\$940,000

As noted above, the estimates are very preliminary and can be refined with further investigation and geotechnical engineering prior to construction.

Group B, Fair Condition Roads, Year 3-5

The capital estimate for Group B, Fair Condition Roads, was made with similar assumptions, and no detailed measurements. The general strategy is assumed to be possible in two ways:

- a. Where a block has a mixture of good and bad conditions, cut out and patch the specific areas where severe cracking or deformation is found, and then seal cracks and overlay the entire block with new asphalt.
- b. Where the entire block is in very poor condition, full re-paving is proposed.

Each of these strategies has some cost advantages because patching at \$36/m² is generally a much higher unit cost than paving at \$19/m², for similar 65mm thickness. If very much patching is required, complete paving can be more economic. The Village may also make decisions on the preferred strategy closer to construction, based on which product they prefer, and amount of funding available. At this time some of each strategy is included in the estimates.

The Group B estimates are summarized in Table 3. Refer to detailed estimates in Attachment C.

Table 3: Group B, Fair Condition Roads

Item	Zone	No. of Segments	Total Length (m)	Capital Cost
1	Downtown	7	1450	\$660,000
2	Hills	3	360	\$270,000
3	The Glen	5	660	\$490,000
4	Benchlands	1	190	\$70,000
Total		15	2,470	\$1,670,000

Long-Range Renewal Forecast

For long-range financial forecasting and to estimate a sustainable annual cost of service, it is assumed that road renewals will cost \$922/m on average, in 2014 dollars (approximate average for Groups A & B). Combined with the assumed life expectancies and renewal timeline based on current pavement condition, a conceptual long-range capital forecast is developed in Figure 4.

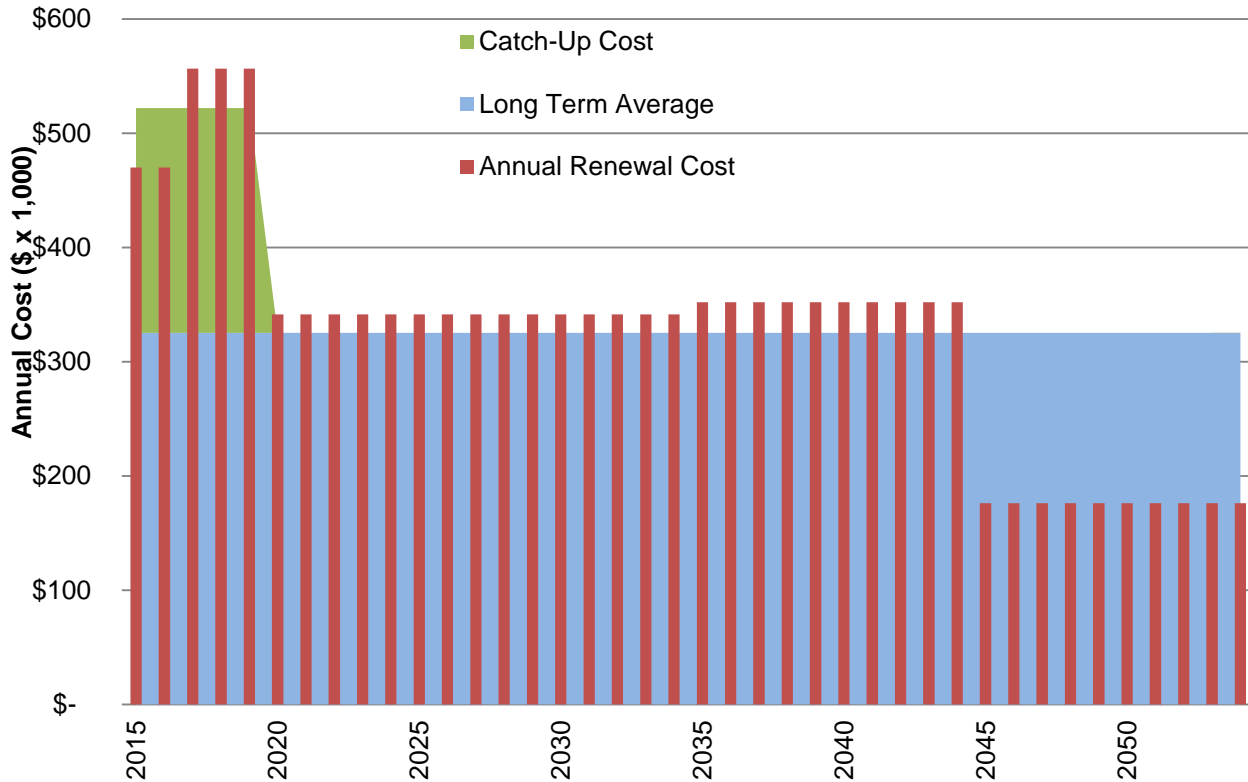


Figure 4: Long-Range Renewal Cost Forecast

The forecast provides a high-level basis for establishing a sustainable annual renewal budget; however, an ongoing program of road condition assessment and capital planning will be required to refine these estimates for annual capital planning and budgeting.

Based on the current total length of Village roads, the sustainable long-term annual cost of pavement renewals is roughly \$325,000. However, an additional “catch-up” budget of roughly \$197,000/year is required in years 2015-2019 (\$984,000 total) to overcome historical underinvestment in road asset renewal and to sustain current service levels over time.

4. Underground Services

Planning for pavement renewal should consider the condition and renewal timing for other municipal assets in the roadway, including water, sanitary and storm sewers, catch basins; and third party utilities such as gas, electric and communications. The following specific planning provisions are recommended:

1. Before finalizing budget requests for road renewal, compile available information on the material, age, condition, capacity and maintenance activities for all underground municipal assets.



2. Conduct CCTV inspection of sanitary and storm sewers under pavement that is to be renewed (a budget of \$8.00/m of pipe is recommended (assuming total inspection contract of 5-10km). In addition to CCTV, flow monitoring to assess inflow and infiltration (I&I) rates in areas where repaving is planned should be considered as part of a Village-wide program.
3. Contact the owners of third party utilities to advise them of the proposed timing of pavement renewal, and the opportunity to reduce their reinstatement costs if their infrastructure requires renewal.
4. Where municipal water or sewer assets in the roadway are likely to require renewal within 20 years due to age/material, history of failures, observed structural condition (CCTV) or a capacity constraint; consider expanding the pavement renewal project to include renewal of the aged assets, and retaining a qualified engineering consultant to develop plans and cost estimates.
5. For medium-long term asset renewal, develop an inventory, condition assessment and capital plan for the Village's underground services, and integrate renewal planning for roads and underground services.

5. Operation and Maintenance

There is evidence of crack sealing that has been performed in the past on some Village roads. There are substantial areas that would benefit from further crack sealing, which will prevent water from entering the road base and accelerating deterioration of the pavement system. Regular crack sealing and prompt repair of open cracks and potholes can also prevent damage to pavement base courses that can dramatically increase the cost of renewal (i.e. requiring full depth reconstruction vs. milling and overlay). Where significant block cracking or alligator cracking is present, the condition is beyond sealing and some major patching or reconstruction is necessary.

Drainage system maintenance is also necessary for maximizing asset life cycles and maintaining safe conditions for road users. Ditches, culverts, gutters, storm sewers, catch basins and culverts should be regularly inspected and cleaned as required to maintain proper drainage of the full pavement structure to prevent frost damage and maintain sufficient capacity to prevent flooding.

We understand the Village does not presently have roads repair crew and equipment. Repair work in the past may have been done periodically by contractors. The Village may undertake to perform some crack sealing and minor repair work under their own forces in the future. We have not prepared O&M estimates at this time.



6. Closure

We trust this report provides the information required at this time to allow the Village of Pemberton to consider embarking on a road renewal program. KWL would be pleased to assist with implementation, including assessments of underground services, refinement of project scope and cost estimates, and strategies for tendering to obtain competitive pricing. We look forward to you review and comments.

KERR WOOD LEIDAL ASSOCIATES LTD.

Prepared by:

Bruce Daykin, Eng L.
 Project Engineer

Attachments

- A. PASER Manual
- B. Large Format Map
- C. Detailed Cost Estimates – Group A & B Renewals

Reviewed by:

Colwyn Sutherland, ASCT
 Project Manager

Statement of Limitations

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This document represents KWL's best professional judgement based on the information available at the time of its completion and as appropriate for the project scope of work. Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by members of the engineering profession currently practising under similar conditions. No warranty, express or implied, is made.

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Revision History

Revision #	Date	Status	Revision	Author
V1	October 21, 2014	Final	Updated total length of the roads	CPS
V0	October 3, 2014	Final		CPS

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 consulting engineers

Village of Pemberton
 Roads Asset Management Plan
 Preliminary Construction Cost Estimate

August 1, 2014

Group A, Worst Condition Roads

Segment 22: Prospect Street, south of Aster

Assume reconstruction of 90 m x 7m asphalt (original width), no curb or sidewalk

Condition Rating 4.5; pavement rutting, distortion and all types of cracking

Item	Description	Assumed Quantities	Unit	Estimated Quantity	Unit Rate \$	TOTAL PRICE
A	Roadworks					
1	Remove and dispose asphalt	92x6.5 +18x7	m2	730	\$6	\$4,380
2	Remove sidewalk					\$0
3	Excavate and re-compact failed trenches, assume backfill replacement	assume 90 x 2.5 x 1m deep	m3	230	\$100	\$23,000
4	Excavate and dispose of unsuitable material beneath road	assume 40% of paved area x 300mm thick plus 60% at 150mm	m3	150	\$30	\$4,500
5	Remove, stockpile and replace gravel to expose unsuitable material		m3	300	\$25	\$7,500
6	Roadbase	match disposal quantity	m3	150	\$50	\$7,500
7	Fine grading		m2	900	\$4	\$3,150
8	Asphalt paving, 75mm thick	92m x 7 + flares	m2	700	\$23	\$16,100
9	Incidentals	adjust signs, manholes, valve boxes, etc.	ls	1	\$10,000	\$10,000
10	Line painting		ls	1.0	\$3,000	\$3,000
		Subtotal				\$79,100
B	General Requirements					
1	Density Testing and proof rolling, 10%					\$7,900
2	Mobilization, 10%					\$7,900
3	Survey Layout, 5%					\$4,000
4	Traffic Control, 10%					\$7,900
		Subtotal				\$27,700
TOTAL CONSTRUCTION						\$110,000
Engineering design, 7.5%						\$8,000
Construction administration and inspection, 10%						\$11,000
Contingency, 25%						\$28,000
TOTAL BUDGET						\$160,000

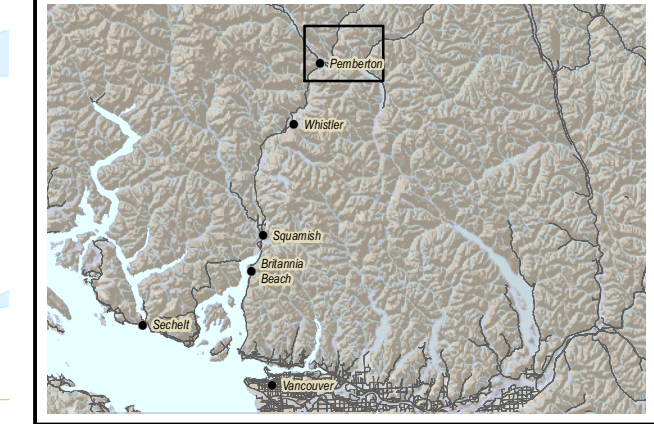


Legend

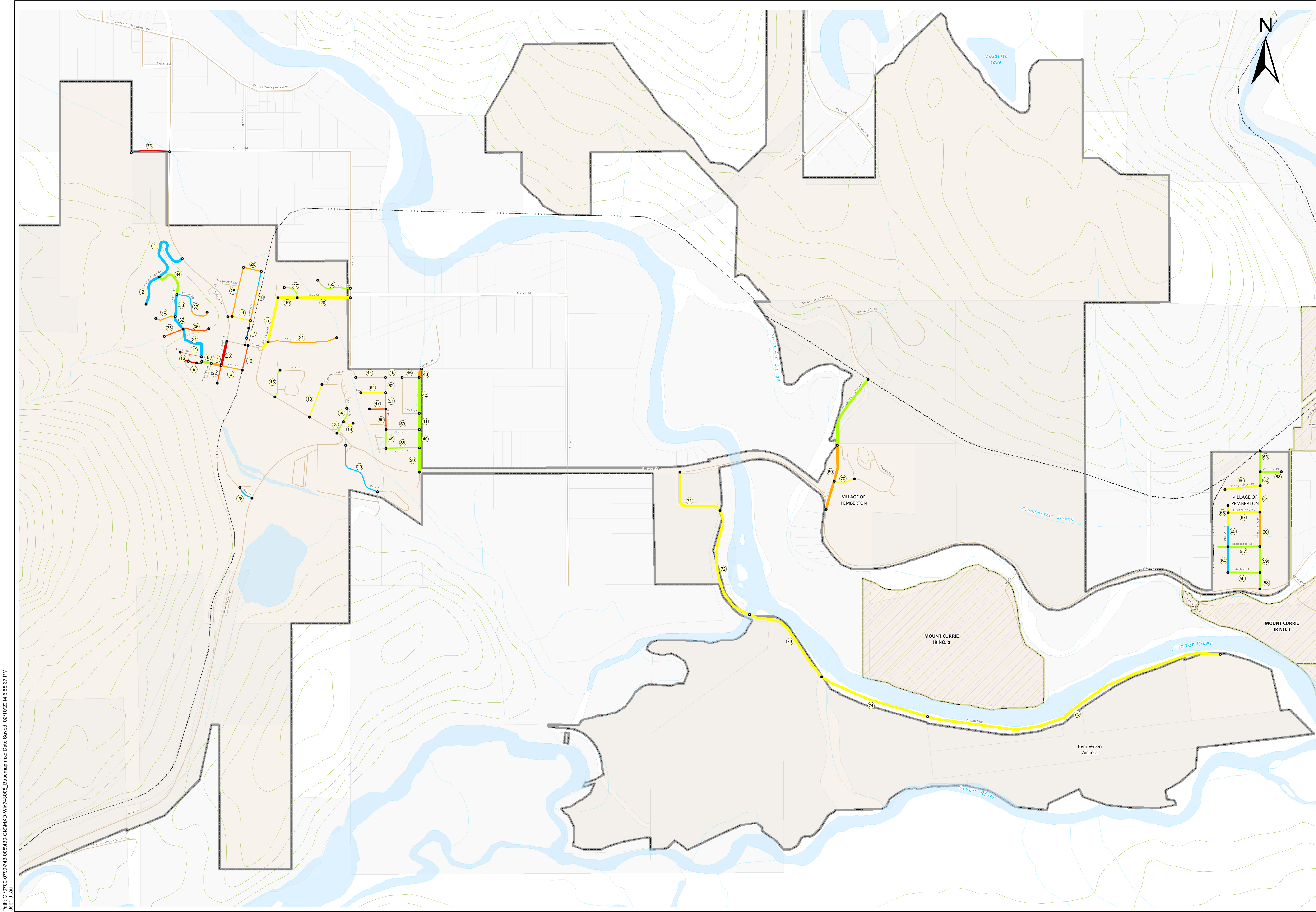
- Village Boundary
 - Reserve Boundary
 - Watercourse
 - Railway
 - Roads not in Study
 - Road Segment
 - Road ID
- | Road Condition | Road Class |
|----------------|------------------|
| 2 | Lane |
| 3 | Local |
| 4 | Industrial Local |
| 5 | Collector |
| 6 | |
| 7 | |
| 8 | |
| 9 | |



No.	REVISIONS	DATE



**Village of Pemberton
Asset Management Strategy
Roads Inventory and
Condition Assessment
July 2014**



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 User: jluu

Village of Pemberton
 Roads Asset Management Plan
 Preliminary Construction Cost Estimate

August 1, 2014

Group A, Worst Condition Roads

Segment 23: Prospect Street, Aster to Birch

Assume reconstruction of 126m x 10.2m asphalt (original width), excluding Rona's parking or sidewalk

Condition Rating 3.5; failed sewer trench backfill; longitudinal, block and aligator cracking

Item	Description	Assumed Quantities	Unit	Estimated Quantity	Unit Rate \$	TOTAL PRICE
A	Roadworks					
1	Remove and dispose asphalt	126 x10.2	m2	1,300	\$6	\$7,800
2	Remove sidewalk					\$0
3	Excavate and re-compact failed trenches, assume backfill replacement	main 126m, 6 laterals @ 8m=174mx2.0x1.5	m3	520	\$100	\$52,000
4	Excavate and dispose of unsuitable material beneath road	assume 30% of paved area @ 0.5m thick	m3	200	\$30	\$6,000
5	Remove, stockpile and replace gravel to expose unsuitable material		m3	300	\$25	\$7,500
6	Roadbase, supply and place	match disposal quantity	m3	200	\$50	\$10,000
7	Fine grading		m2	1,300	\$4	\$4,550
8	Asphalt paving, 75mm thick	92m x 7 + flares	m2	1,300	\$23	\$29,900
9	Incidentals	adjust signs, manholes, valve boxes, etc.	ls	1	\$15,000	\$15,000
10	Line painting		ls	1.0	\$5,000	\$5,000
		Subtotal				\$137,800
B	General Requirements					
1	Density Testing and proof rolling, 10%					\$13,800
2	Mobilization, 10%					\$13,800
3	Survey Layout, 5%					\$6,900
4	Traffic Control, 10%					\$13,800
		Subtotal				\$48,300
TOTAL CONSTRUCTION						\$190,000
	Engineering design, 7.5%					\$14,000
	Construction administration and inspection, 10%					\$19,000
	Contingency, 25%					\$48,000
TOTAL BUDGET						\$270,000

Village of Pemberton
 Roads Asset Management Plan
 Preliminary Construction Cost Estimate

August 1, 2014

Group A, Worst Condition Roads

Segment 9: Aster St, west end

Assume reconstruction of 70m x 11m centre asphalt, excluding parking area either side

Condition Rating: 3; pavement rutting, distortion, transverse and alligator cracking

Item	Description	Assumed Quantities	Unit	Estimated Quantity	Unit Rate \$	TOTAL PRICE
A	Roadworks					
1	Remove and dispose asphalt	70x11	m2	800	\$6	\$4,800
2	Remove sidewalk					\$0
3	Excavate and re-compact failed trenches, assume backfill replacement		m3	0	\$100	\$0
4	Excavate and dispose of unsuitable material beneath road	assume 100% of paved area @ 0.6m thick	m3	480	\$30	\$14,400
5	Remove, stockpile and replace gravel to expose unsuitable material		m3	0	\$25	\$0
6	Roadbase, supply and place	match disposal quantity	m3	480	\$50	\$24,000
7	Fine grading		m2	800	\$4	\$2,800
8	Asphalt paving, 75mm thick	92m x 7 + flares	m2	800	\$23	\$18,400
9	Incidentals	adjust signs, manholes, valve boxes, etc.	ls	1	\$10,000	\$10,000
						\$0
		Subtotal				\$74,400
B	General Requirements					
1	Density Testing and proof rolling, 10%					\$7,400
2	Mobilization, 10%					\$7,400
3	Survey Layout, 5%					\$3,700
4	Traffic Control, 10%					\$7,400
		Subtotal				\$25,900
TOTAL CONSTRUCTION						\$100,000
Engineering design, 7.5%						\$8,000
Construction administration and inspection, 10%						\$10,000
Contingency, 25%						\$25,000
TOTAL BUDGET						\$140,000

Village of Pemberton
 Roads Asset Management Plan
 Preliminary Construction Cost Estimate

August 1, 2014

Group A, Worst Condition Roads

Segment 16; Frontier, Aster to Portage (Station)

Assume reconstruction of asphalt at failed sections only, replace sidewalk on west side

Condition Rating: 4; severe cracking over trench and isolated sections; irregular surface in center area

Item	Description	Assumed Quantities	Unit	Estimated Quantity	Unit Rate \$	TOTAL PRICE
A Roadworks						
1	Remove and dispose asphalt, failed sections	5x123 +10x1 +3x20 + 48x6	m2	1,000	\$6	\$6,000
2	Remove sidewalk	123x 1.2x .15	m3	25	\$80	\$2,000
3	New sidewalk	123x1.5	m2	185	\$80	\$14,800
4	Excavate and re-compact failed trenches, assume backfill replacement	60x2.5x1	m3	150	\$100	\$15,000
5	Excavate and dispose of unsuitable material beneath other failed sections	850m2x 0.6	m3	500	\$30	\$15,000
6	Remove, stockpile and replace gravel to expose unsuitable material		m3	200	\$25	\$5,000
7	Roadbase, supply and place	match disposal quantity	m3	500	\$50	\$25,000
8	Fine grading		m2	1,000	\$4	\$3,500
9	Asphalt paving, 75mm thick	5 x 123 on west side, failed trench area	m2	620	\$23	\$14,260
10	Asphalt patching, 75mm	balance of other failed areas	m2	380	\$39	\$14,820
11	Incidentals	adjust signs, manholes, valve boxes, etc.	ls	1	\$15,000	\$15,000
12	Line painting		ls	1.0	\$10,000	\$10,000
		Subtotal				\$140,400
B General Requirements						
1	Density Testing and proof rolling, 10%					\$14,000
2	Mobilization, 10%					\$14,000
3	Survey Layout, 5%					\$800
4	Traffic Control, 10%					\$14,000
		Subtotal				\$42,800
TOTAL CONSTRUCTION						\$180,000
Engineering design, 7.5%						\$14,000
Construction administration and inspection, 10%						\$18,000
Contingency, 25%						\$45,000
TOTAL BUDGET						\$260,000

Village of Pemberton
Roads Asset Management Plan
Preliminary Construction Cost Estimate

August 13, 2014
Group B, Fair Condition Roads
Downtown Section
Condition Rating: less than 6

Item	Description	Segment/Qty								Unit	Estimated	Unit Rate	TOTAL
		6	7	12	17	18	25	26	21				
		Aster	Aster	Cedar	Frontier	Frontier	Prospect	Walnut	Poplar				
									Quantity	\$	PRICE		
	Total Area	1300	600	1000	2200	1900	2300	750	2500				
A	Roadworks												
1	Crack sealing	300	300				600			m	1,200	\$2	\$2,400
2	Remove and dispose asphalt	120	200	1000	760	350	120	250	300	m2	3,100	\$6	\$18,600
3	Remove sidewalk									m2	0	\$10	\$0
4	Excavate and re-compact failed trenches, assume backfill replacement	90				350				m3	440	\$100	\$44,000
5	Excavate and dispose of unsuitable material beneath road	60	100	300	304		60	125	90	m3	1,039	\$30	\$31,170
6	Remove, stockpile and replace gravel to expose unsuitable material	24	40	200	152	70	24	50		m3	560	\$25	\$14,000
7	Roadbase	18	30	300	228	76	60	125	90	m3	927	\$50	\$46,350
8	Fine grading			1000	760	350			300	m2	2,410	\$4	\$8,435
9	Asphalt paving, 65mm thick, incl base grading, >500m2			1000	760					m2	1,760	\$19	\$33,440
10	Asphalt patching, 65mm thick, < 500 m2	120	200			350	120	250		m2	1,040	\$36	\$37,440
11	Asphalt overlay, 40mm	1200	600			1900	2300	750	300	m2	7,050	\$16	\$112,800
12	Incidentals, adjust manholes, valve boxes, etc.	1	1	0.5	1	1	1	1	0.5	ls	7	\$5,000	\$35,000
13	Line painting	1	1	0.5	1	1	1	1	0.5	ls	7	\$3,000	\$21,000
	Subtotal	\$45,140	\$32,100	\$61,500	\$53,980	\$94,875	\$56,440	\$41,750	\$18,850				\$402,200
B	General Requirements												
1	Density Testing and proof rolling, 10%	\$4,500	\$3,200	\$6,200	\$5,400	\$9,500	\$5,600	\$4,200	\$1,900				\$40,200
2	Mobilization, 10%	\$4,500	\$3,200	\$6,200	\$5,400	\$9,500	\$5,600	\$4,200	\$1,900				\$40,200
3	Survey Layout, 10%	\$4,500	\$3,200	\$6,200	\$5,400	\$9,500	\$5,600	\$4,200	\$1,900				\$40,200
4	Traffic Control, 10%	\$4,500	\$3,200	\$6,200	\$5,400	\$9,500	\$5,600	\$4,200	\$1,900				\$40,200
	Subtotal	\$18,000	\$13,000	\$25,000	\$22,000	\$38,000	\$22,000	\$17,000	\$8,000				\$160,800
	TOTAL CONSTRUCTION	\$60,000	\$50,000	\$90,000	\$80,000	\$130,000	\$80,000	\$60,000	\$30,000				\$560,000
	Engineering design, 7.5%	\$5,000	\$4,000	\$7,000	\$6,000	\$10,000	\$6,000	\$5,000	\$2,000				\$42,000
	Construction administration and inspection, 10%	\$6,000	\$5,000	\$9,000	\$8,000	\$13,000	\$8,000	\$6,000	\$3,000				\$56,000
	Contingency, 25%	\$15,000	\$13,000	\$23,000	\$20,000	\$33,000	\$20,000	\$15,000	\$8,000				\$140,000
	TOTAL BUDGET	\$90,000	\$70,000	\$130,000	\$110,000	\$190,000	\$110,000	\$90,000	\$40,000				\$800,000

Village of Pemberton
Roads Asset Management Plan
Preliminary Construction Cost Estimate

August 13, 2014
Group B, Fair Condition Roads
Hill Section
Condition Rating: less than 6

Item	Description	Segment/Qty				Unit	Estimated	Unit Rate	TOTAL
		30	35	36					
		Elmwood	Fernwood	Fernwood					
						Quantity	\$	PRICE	
	Total Area	750	825	600					
A	Roadworks								
1	Crack sealing				m	0	\$2	\$0	
2	Remove and dispose asphalt	750	825	600	m2	2,175	\$6	\$13,050	
3	Remove sidewalk				m2	0	\$10	\$0	
4	Excavate and re-compact failed trenches, assume backfill replacement				m3	0	\$100	\$0	
5	Excavate and dispose of unsuitable material beneath road	300	330	240	m3	870	\$30	\$26,100	
6	Remove, stockpile and replace gravel to expose unsuitable material	0			m3	0	\$25	\$0	
7	Roadbase	300	330	240	m3	870	\$50	\$43,500	
8	Fine grading				m2	0	\$4	\$0	
9	Asphalt paving, 65mm thick, incl base grading, >500m2	750	825	600	m2	2,175	\$19	\$41,325	
10	Asphalt patching, 65mm thick, < 500 m2				m2	0	\$36	\$0	
11	Asphalt overlay, 40mm				m2	0	\$16	\$0	
12	Incidentals, adjust manholes, valve boxes, etc.	1	1	0.5	ls	3	\$5,000	\$12,500	
13	Line painting	1	1	0.5	ls	3	\$3,000	\$7,500	
	Subtotal	\$50,750	\$55,025	\$38,200				\$144,000	
B	General Requirements								
1	Density Testing and proof rolling, 10%	\$5,100	\$5,500	\$3,800				\$14,400	
2	Mobilization, 10%	\$5,100	\$5,500	\$3,800				\$14,400	
3	Survey Layout, 10%	\$5,100	\$5,500	\$3,800				\$14,400	
4	Traffic Control, 10%	\$5,100	\$5,500	\$3,800				\$14,400	
	Subtotal	\$20,000	\$22,000	\$15,000				\$57,600	
TOTAL CONSTRUCTION		\$70,000	\$80,000	\$50,000				\$200,000	
	Engineering design, 7.5%	\$5,000	\$6,000	\$4,000				\$15,000	
	Construction administration and inspection, 10%	\$7,000	\$8,000	\$5,000				\$20,000	
	Contingency, 25%	\$18,000	\$20,000	\$13,000				\$50,000	
TOTAL BUDGET		\$100,000	\$110,000	\$70,000				\$290,000	

Village of Pemberton
Roads Asset Management Plan
Preliminary Construction Cost Estimate

August 13, 2014
Group B, Fair Condition Roads
the Glen
Condition Rating: less than 6

Item	Description						Unit	Estimated	Unit Rate	TOTAL
		46	47	48	50	51				
		Hemlock	Laburnum	Larch	Laurel	Laurel				
							Quantity	\$	PRICE	
A	Roadworks									
	Total Area	700	700	2200	800	700				
1	Crack sealing	1000		1500			m	2,500	\$2	\$5,000
2	Remove and dispose asphalt	200	700	400	800	700	m2	2,800	\$6	\$16,800
3	Remove sidewalk						m2	0	\$10	\$0
4	Excavate and re-compact failed trenches, assume backfill replacement						m3	0	\$100	\$0
5	Excavate and dispose of unsuitable material beneath road	60	210	120	320	210	m3	920	\$30	\$27,600
6	Remove, stockpile and replace gravel to expose unsuitable material	20	140	80	80	70	m3	390	\$25	\$9,750
7	Roadbase	60	280	160	320	210	m3	1,030	\$50	\$51,500
8	Fine grading	200	700		800	700	m2	2,400	\$4	\$8,400
9	Asphalt paving, 65mm thick, incl base grading, >500m2		700	400	800	700	m2	2,600	\$19	\$49,400
10	Asphalt patching, 65mm thick, < 500 m2	200		400			m2	600	\$36	\$21,600
11	Asphalt overlay, 40mm	700		1100			m2	1,800	\$16	\$28,800
12	Incidentals, adjust manholes, valve boxes, etc.	1	1	1	1	1	ls	5	\$5,000	\$25,000
13	Line painting	1	1	1	1	1	ls	5	\$3,000	\$15,000
	Subtotal	\$35,600	\$51,750	\$66,600	\$58,400	\$46,500				\$253,900
B	General Requirements									
1	Density Testing and proof rolling, 10%	\$3,600	\$5,200	\$6,700	\$5,800	\$4,700				\$25,400
2	Mobilization, 10%	\$3,600	\$5,200	\$6,700	\$5,800	\$4,700				\$25,400
3	Survey Layout, 10%	\$3,600	\$5,200	\$6,700	\$5,800	\$4,700				\$25,400
4	Traffic Control, 10%	\$3,600	\$5,200	\$6,700	\$5,800	\$4,700				\$25,400
	Subtotal	\$14,000	\$21,000	\$27,000	\$23,000	\$19,000				\$101,600
TOTAL CONSTRUCTION		\$50,000	\$70,000	\$90,000	\$80,000	\$70,000				\$360,000
	Engineering design, 7.5%	\$4,000	\$5,000	\$7,000	\$6,000	\$5,000				\$27,000
	Construction administration and inspection, 10%	\$5,000	\$7,000	\$9,000	\$8,000	\$7,000				\$36,000
	Contingency, 25%	\$13,000	\$18,000	\$23,000	\$20,000	\$18,000				\$90,000
TOTAL BUDGET		\$70,000	\$100,000	\$130,000	\$110,000	\$100,000				\$510,000

Village of Pemberton
Roads Asset Management Plan
Preliminary Construction Cost Estimate

October 2, 2014
Group B, Fair Condition Roads
Benchlands Section
Condition Rating: less than 6

Item	Description	Segment/Qty	Unit	Estimated	Unit Rate	TOTAL
		76		Quantity	\$	PRICE
		Collins				
	Total Area	570	m2			
A	Roadworks					
1	Crack sealing		m	0	\$2	\$0
2	Remove and dispose asphalt	570	m2	570	\$6	\$3,420
3	Remove sidewalk		m2	0	\$10	\$0
4	Excavate and re-compact failed trenches, assume backfill replacement		m3	0	\$100	\$0
5	Excavate and dispose of unsuitable material beneath road	228	m3	228	\$30	\$6,840
6	Remove, stockpile and replace gravel to expose unsuitable material	0	m3	0	\$25	\$0
7	Roadbase	228	m3	228	\$50	\$11,400
8	Fine grading		m2	0	\$4	\$0
9	Asphalt paving, 65mm thick, incl base grading, >500m2	570	m2	570	\$19	\$10,830
10	Asphalt patching, 65mm thick, < 500 m2		m2	0	\$36	\$0
11	Asphalt overlay, 40mm		m2	0	\$16	\$0
12	Incidentals, adjust manholes, valve boxes, etc.		ls	0	\$5,000	\$0
13	Line painting		ls	0	\$3,000	\$0
	Subtotal	\$32,490				\$32,500
B	General Requirements					
1	Density Testing and proof rolling, 10%	\$3,200				\$3,300
2	Mobilization, 10%	\$3,200				\$3,300
3	Survey Layout, 10%	\$3,200				\$3,300
4	Traffic Control, 10%	\$3,200				\$3,300
	Subtotal	\$13,000				\$13,200
	TOTAL CONSTRUCTION	\$50,000				\$50,000
	Engineering design, 7.5%	\$4,000				\$4,000
	Construction administration and inspection, 10%	\$5,000				\$5,000
	Contingency, 25%	\$13,000				\$13,000
	TOTAL BUDGET	\$70,000				\$70,000