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BUNT PROJECT NO:	04-18-0307 & 6165-01
WATT PROJECT NO:	2612.B01
PROJECT:	Latoria South, Olympic View and Royal Beach
SUBJECT:	Traffic Impact Analysis Update
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1.0 Introduction

Bunt & Associates was retained by Gablecraft Homes (Latoria South) and Burrard Group (Olympic View), and Watt Consulting Group Ltd. was retained by Seacliff Properties (RB) Ltd to undertake Transportation Impact Assessments (TIAs) for their respective proposed developments along Latoria Road and Metchosin Road in Colwood, BC. Following the submission of these TIA reports and supplemental analysis by Bunt & Associates, the City of Colwood provided review comments that necessitated further coordination analysis; in particular the City requested consideration of a "capacity-constrained" scenario where Latoria Road would

be retained as a 2/3 lane roadway between Veteran's Memorial Parkway and Metchosin Road as per the City's current Transportation Master Plan configuration. Furthermore, as most of the developers had updated their land use plans since submission of the original TIAs, an update to both consultants' work was required.

This is a joint memo completed by Bunt and Watt and both consultants agree with the summary of findings provided herein.

The previous TIA studies by Bunt and Watt had slightly different study areas; the road network and intersections covered by the work presented herein combined is illustrated in **Exhibit 1**.

2.0 Purpose

The purpose of this memo is to provide updated analysis findings related to the full build out 2040 land use forecasts, analyses, to provide insight to the timing of roadway and traffic control improvements, identify key trigger points for these improvements in relation to development growth. The memo is intended to provide a short summary of the key recommendations and findings. Details regarding analysis methodologies, including trip generation, distribution and assignment, traffic forecasting and modelling assumptions can be found in the original TIAs. Ultimately, both Bunt and Watt's TIA reports may have to be fully updated to account for the updated land use and analysis presented in this joint memo.

The purpose of this memo was not to determine the responsibility for design, funding or construction of various roadway improvements. However, it is noted that some of the identified improvements are already part of regional or City of Colwood Plans. Also, while interpreting the findings, note that the recommended road improvements are required as a result of the <u>total</u> traffic volumes forecasted on the roadway network, which include three components: existing traffic, traffic associated with the Latoria North neighbourhood already under construction, and traffic volumes generated by the proposed developments in Latoria South, Royal Beach, Olympic View and other parcels along the Latoria corridor in the City of Colwood.

Finally, it is important to understand that forecasting future traffic volumes to 2040 is inherently imprecise. The proposed land uses and the pace of development assumed in the analysis may not come to fruition due to market forces. Traffic forecasts have been based on typical generation rates, discounted using judgement for the effects of better transit and the mixed use nature of the site, but do not reflect the potential effects of new technologies or transportation services that may arise. The analysis also does not address a potential future passenger ferry

service from Royal Beach. Therefore, periodic monitoring of the volumes and operations on the road network and ongoing assessment of transportation improvements needs will be required as key phases of each development are built out. The on-going assessment / monitoring of transportation networks through large scale, multi-year/decade projects is a standard practice that ensures the improvements are balanced with actual traffic demands over time.

3.0 Existing Road Network

For reference, the existing road network, laning, and traffic control in the study area is illustrated on **Exhibit 2.** While one section of the Latoria corridor is legally named "Latoria Boulevard", for the purpose of this memo, it has been referred to herein as "Latoria Road" throughout for simplicity.

4.0 Analysis Assumptions & Methods

4.1 Land Use

Since the completion of the Draft TIAs by Bunt and Watt, the land use plans for most of the developments have been updated. The latest land use statistics endorsed by all parties for full build out at the 2040 horizon year are provided in **Attachment 1**. Compared to previous land use plans, the key changes by proposed development site are:

Latoria South

- An increase in overall residential units from 1,827 to 2,022 with an increase in townhouse and apartment units but a decrease in single family units.
- An increase in commercial-retail space from 60,000 to 70,000 sq.ft.
- New general office space of 80,000 sq.ft.

Royal Beach

• An increase in general office space from 125,000 to 743,400 sq.ft.(*)

Olympic View (in both Colwood and Langford)

- A decrease in residential units from 1,507 to 917.
- An increase in commercial-retail space from 30,000 to 40,000 sq.ft.
- A 120-unit hotel within the Olympic View Langford area.

Adjacent Colwood Parcels

• An increase in residential units from 410 to 1,000 (*)

(*) Note that the planned increases in Royal Beach and Adjacent Colwood Parcels densities were accounted for in Watt's June 14, 2019 Final Draft TIA but not in Bunt's May 17, 2019 Draft Addendum Report as Bunt was not aware of the change in Royal Beach land use plans at that time.

The developments listed above represent future developments, in addition to the Latoria North neighbourhood, that have been accounted for in this study. For the purposes of this memo, the developments listed above are referred to as the "Proposed Developments".

No other potential future developments to the west of the Olympic View development in Langford, or to the north in Colwood have been directly accounted for in this analysis.

4.2 Trip Generation

Vehicle trip generation during the weekday AM and PM peak hours was estimated using the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th) edition. Adjustments were made to the base ITE rates to account for the future implementation of the Frequent Transit Network, new Transit Exchanges planned along Latoria Road, increased bicycle and pedestrian connectivity, and the mixed-use nature of applicable sites. Details regarding trip generation methodology were provided to the City previously in the consultants TIA reports. The updated trip generation of all accounted-for developments can be found in **Attachment 2**.

4.3 Trip Distribution and Assignment

External trip distribution and assignment were developed based on a combination of previous studies conducted in the area (2014 Royal Bay Transportation Master Plan and 2018 Latoria Traffic Study) and recent origin-destination plots provided by the Capital Regional District's 2038 Model. Generally, most trips were assumed to have origins and destinations to/from the north, with a higher proportion of traffic expected to use the Veterans Memorial Parkway corridor compared to the Metchosin Road corridor due to capacity constraints on Sooke Road and Island Highway. The trip distribution assumed for each development is summarized in **Attachment 2**.

4.4 **Performance Thresholds to Trigger Improvements**

The traffic operations of study area intersections were assessed using the methods outlined in the 2000 Highway Capacity Manual (HCM), using Synchro/SimTraffic 9 analysis software¹. Roundabouts were assessed using SIDRA intersection (version 8). As agreed with the City of Colwood, the performance thresholds that were used to trigger consideration of roadway or traffic control improvements in the previous TIAs and this updated analysis are listed below:

Signalized Intersections and Roundabouts:

- Overall intersection Level of Service = LOS D or better;
- Overall intersection V/C ratio = 0.90 or less;
- Individual movement Level of Service = LOS E or better; and,
- Individual movement V/C ratio = 0.95 or less.

Unsignalized Intersections:

 Individual movement Level of Service = LOS E or better, unless the volume is very low in which case LOS F is acceptable.

Where traffic operations analysis indicated that these thresholds were exceeded, improvements were assumed to be triggered. In assessing the road network and determining required improvements, both consultants tested a suite of possible improvements in an iterative manner to establish the optimum combination to achieve the desired traffic operations performance thresholds as noted above.

Widening of Metchosin Road to a 4/5 lane cross section was not considered by either consultant even though most of the intersections along the corridor, north of the sites, exceeded desired performance thresholds. Widening of Metchosin Road was considered inconsistent with Colwood's design objectives and its desire to encourage as much traffic as possible to route via Veterans Memorial Parkway to the west.

4.5 Improvement Trigger Analysis

Regarding the improvement trigger analysis, it is important to clarify that Bunt and Watt are not able to inform the Proposed Developments' land use types or densities that can be supported by the road network. The consultants are only able to inform the total number of peak hour

¹ Note, to be consistent with previous TIA work, Bunt employed a combination of Synchro/SimTraffic operations and TAC signal warrant results when considering a percentage build out that would trigger signalization. Watt considered Synchro/SimTraffic operations only.

vehicle trips that can be accommodated on the road network at each of the trigger points. The land use types and densities that could generate the forecasted traffic volumes could vary widely. Also, the consultants did not know the pace of growth/phasing plan for each development.

Therefore, to complete the trigger analysis both Bunt and Watt assumed a simple, straight line growth rate for all Proposed Developments combined from today to 2040 and determined the percentage of total development that could be supported. The approximately horizon year for each trigger can be estimated by applying the "% of build out" trigger to the 20 years between today and 2040 – for example, a "50% build out" trigger should be interpreted as a horizon year of 2030, if all Proposed Developments grow at the same pace to achieve full build out by 2040. Note that if land use plans change, or if development occurs at a different pace than assumed, the percentages (and therefore estimated years for implementation) reported would no longer be valid.

The Latoria North neighbourhood is under construction and its land uses and densities are not proposed to be changed from those assumed in the 2014 Master Transportation Plan. Therefore, solely for the purposes of the analysis summarized in this memo, the Latoria North neighbourhood traffic was considered to be a component future "Background" traffic when conducting the trigger analysis. If Latoria North is not considered by the City to be "Background" traffic on the road network, the recommended improvements would not change – only the "trigger points" for improvements, described as a percentage of total development, would be different.

Finally, while improvements are noted as being "triggered" at a particular level of development, this is not meant to imply that any identified improvement is 100% the result of the Proposed Developments or the responsibility of any one/group of the developers. The improvements identified are a result of the total traffic on the network. Some of the identified improvements may already be planned by the City or be primarily required due to existing Colwood or regional traffic demands on the roadway network and not required because of the additional traffic anticipated with Latoria North or the Proposed Developments. Ultimately, it is expected that the City and the developers will jointly negotiate future improvements that would be designed, funded and/or constructed by the developers.

4.6 Analysis Scenarios

In the 2040 horizon year with the full build out of all the subject developments, key intersections along Latoria Road, Veterans Memorial Parkway, and Metchosin Road were shown to exceed

acceptable performance thresholds with their existing traffic control and laning configurations. Both road network and traffic control improvements will therefore be necessary to meet the desired traffic operations performance thresholds.

Both consultants agreed that within the study area assessed, the Veterans Memorial Parkway & Latoria Road intersection is expected to be the key capacity constraint in the road network.

Watt's June 2019 TIA report and Bunt's May 2019 supplemental analysis with higher densities in Royal Beach confirmed that a road network with a signalized intersection at Veterans Memorial Parkway & Latoria Road and with Latoria Road remaining at its currently planned 2/3 lane cross section could not support the full level of development currently contemplated in the proposed developments. Both consultants agreed that a dual lane roundabout would be required at the intersection to support build out of the proposed developments, and Latoria Road would need to be widened to 4/5 lanes.

We understand that due to right of way width constraints, variable grading, riparian and subsurface conditions, widening Latoria Road to 4/5 lanes may be challenging. Also, the newly constructed section of Latoria Road within Royal Bay would have to be reconstructed. As such, the City of Colwood wanted to understand the level of development that could be supported if Latoria Road was to remain at 2/3 lanes as per the City's current Transportation Master Plan, while retaining the desired performance thresholds for traffic operations.

Therefore two long term scenarios were examined in this joint memo:

- Scenario 1: an "Unconstrained" road network which would have a dual lane roundabout and Latoria at 4/5 lanes between Veterans Memorial Parkway & Metchosin Road; and
- Scenario 2: a "Constrained" road network which would retain Latoria Road at 2/3 lanes and have a signalized intersection at Veterans Memorial Parkway & Metchosin Road.

5.0 Analysis Results

5.1 Scenario 1: Unconstrained Road Network

Required improvements associated with Scenario 1 compared to today's road network are listed below. **Exhibit 3** illustrates the proposed traffic control and laning at full build out in 2040, assuming an "Unconstrained" road network with a dual lane roundabout at Veterans Memorial Parkway & Latoria Road, and Latoria Road widened to 4/5 lanes. Development level triggers for improvements are also noted on the Exhibit. **Attachment 3** provides a tabular summary of the same information.

Note that all corridors and intersection locations listed below and denoted with an asterisk (*) were within Bunt's study area only; therefore, for these locations, the findings represent Bunt's findings alone, which have not been separately validated or confirmed by Watt through detailed analysis.

Veterans Memorial Parkway Corridor

• At 30% build out, widen Veterans Memorial Parkway to a four-lane cross section with turn lanes at intersections as required between Allendale Road and Latoria Road.

Latoria Road Corridor

 At 50% build out, widen Latoria Road/Boulevard to a four-lane cross section with left turn lanes as required at key locations between Veterans Memorial Parkway and Metchosin Road.

Metchosin Road Corridor

 At 65% build out, upgrade Metchosin Road from the City of Colwood southern boundary to Sooke Road to include left turn lanes at key locations and manage access to reduce queue/blocking issues.

Veterans Memorial Parkway & Cairndale Road Intersection (*)

- At 15% build out, install a traffic signal and add eastbound and westbound right turn bays.
- Note that this recommendation may be dependent on the actual routing/use of Wishart/Cairndale by trips originating from /destined to the developments, fronting Wishart properties and the District of Metchosin. If less traffic routes via Wishart/Cairnale the signal may be warranted at a later point in time, beyond 15% build out; however, based on Bunt's analysis it will still be warranted prior to 2040.

Latoria Road & Happy Valley Road Intersection (*)

- New southbound and westbound turn bays have recently been implemented by the City of Langford and these were assumed to be in place in the analysis.
- At 65% build out, install a traffic signal.
- Note, this intersection is not within the City of Colwood.

Latoria Road & Castlewood Road Intersection (*)

• At 50% build out, add eastbound and westbound left turn bays.

Latoria Road & Veterans Memorial Parkway Intersection

- At 5% build out, install a single lane roundabout (built to the ultimate dual lane diameter if currently proposed development densities are approved by the City)
- At 30% build out, provide a second southbound approach lane to the roundabout and two circulation lanes on the west and south sides of the roundabout, one of which would drop at Latoria Road;
- At 50% build out, provide a second eastbound approach lane and construct the westbound right slip lane.
- Refer to **Exhibit 4** which illustrates the recommended sequence of roundabout development from a single lane roundabout to dual lane roundabout based on the trigger points above.

Latoria Road & Wishart Road Intersection

- At 30% build out, install a traffic signal and add an eastbound left turn bay.
- At 50% build out, expand Latoria Road to four lanes west of Wishart Road.

Latoria Road & Quarry Road Intersection (*)

- Install stop control on Quarry Street in Latoria South when connected to Latoria Road, with a westbound left turn bay on Latoria Road.
- At 80% build out, install a traffic signal or implement access management measures

Latoria Road & Ryder Hesjedal Way

• At 50% build out, widen Latoria Road to a four-lane cross-section plus left turn lanes.

Ryder Hesjedal Way & Metchosin Road

- Install stop control on Ryder Hesjedal Way when it is first connected to Metchosin Road with left turn bays on both roads.
- Closer to full build out, additional traffic control may be necessary at this intersection.

Latoria Road & Metchosin Road

- Install signal with the next phase of Latoria South or Royal Beach development.
- At 40% build out, add westbound right turn bay and eastbound right turn bay.
- At 50% build out, widen Latoria Road to four lanes and add southbound right turn bay on Metchosin Road.
- At 60% build out, add second westbound through lane.
- At 85% build out, add northbound right turn bay.

Metchosin Road & Lagoon Road Intersection (*)

• Install signal at 60% of full build out².

Metchosin Road & Painter Road Intersection (*)

- Consider installation of a traffic signal in the long term; periodically monitor volumes, operations and safety when approaching full build out to determine a new traffic signal is required and appropriate.
- We understand that this improvement is already identified in the City's Master Transportation Plan.

Metchosin Road & Wishart Road Intersection

- At 35% build out, realign the eastbound and westbound approaches on Wishart Road to have a separate left and shared through/right lane.
- At 40% build out, add southbound right turn lane on Metchosin Road.

The majority of the full build out recommendations are same or very similar to those presented in the Draft TIAs, with the exception of the recommendation for a second westbound through lane at the Latoria Road & Metchosin Road intersection. However, with the updated land use projections from the developers, many of the improvements will be required earlier in time (percentage of build-out), than originally identified in the Draft TIAs to meet desired performance thresholds, and there will be little reserve capacity available at full build out in 2040.

5.2 Scenario 2: Constrained Road Network

Following the submission of Bunt's and Watt's Draft TIAs, the City of Colwood provided comments indicating potential environmental and right of way constraints that may limit the ability to achieve the traffic control and laning improvements recommended in the Unconstrained Scenario 1 at full build out. In particular, the City is concerned about the impacts of a dual lane roundabout at the intersection of Veterans Memorial Parkway and the widening of Latoria Road to 4/5 lanes between Veterans Memorial Parkway and Metchosin Road.

As a result, the City requested both consultants to explore the level of development that could be supported in a capacity-constrained scenario where a traffic signal is installed at the intersection of Latoria Road & Veterans Memorial Parkway and where Latoria Road remains with a 2/3 lane cross section. Therefore, a second analysis scenario was explored with these features.

^{• &}lt;sup>2</sup> We understand that this intersection has already been identified to be signalized due to other projects.

For the Constrained Scenario, four triggers were explored as follows:

- 1. Trigger to require signalization of Veterans Memorial Parkway & Latoria Road;
- Trigger to provide dual southbound left turn bays at this intersection along with two eastbound receiving lanes on Latoria Road (which would require a short section with a 4 lane cross section);
- Trigger to require a right-in/right-out intersection at Brookside Road on Veterans Memorial Parkway due to blockages causes by the signalized intersection at Veteran's Memorial Parkway & Latoria Road; and
- 4. Trigger to upgrade to a full dual lane roundabout and widen Latoria Road to 4/5 lanes.

For the Scenario 2 trigger assessment, only the analysis results for the intersection of Latoria Road & Veterans Memorial Parkway have been reported as this was determined to be the critical capacity constraint in the study area. The traffic operations at each trigger point as reported by Bunt and agreed with Watt, are summarized in **Attachment 4**.

Trigger to Require Signalization

The intersection of Latoria Road & Veterans Memorial Parkway will require signalization after 5% build out of all developments combined. Four way stop control will operate acceptably until that point in time.

Trigger to Provide Dual Southbound Left Turn Bays at Signal

A single southbound left turn bay, with signalization, was shown to exceed acceptable thresholds after 20% build-out of the subject developments under the current development plans.

This 20% development equates to a total southbound left turn volume of 520 vehicles. After the existing trips (225 vph) and Latoria North full build out trips (135 vph) are accounted for, the Proposed Developments could generate approximately 160 southbound left turn trips in the PM peak hour before this 520-vehicle threshold is reached and a second southbound left turn lane would be required.

Trigger to Require Right-in/out at Brookside on VMP

The third trigger considered was the point when the dual southbound left turn queues would exceed 100m (the distance between Latoria Road and Brookside Road) in the peak hour. Once this 100m queue is reached, it would trigger consideration of restricting the existing intersection

of Brookside Road & Veterans Memorial Parkway to right-in/right-out as queues would occasionally block the intersection during the afternoon peak demand period, preventing northbound left turn and eastbound left turn movements. Alternatively, the City may choose to allow queues to extend beyond Brookside Road during peak demand conditions.

The dual southbound left was found to just exceed 100m at 45% build out. This equates to a southbound left turn volume of 720 vehicles. Of these 720 vehicles, after accounting for the existing volumes (225 vph) and Latoria North full build out volumes (135 vph), 360 trips could be generated by the Proposed Developments.

Trigger at Capacity Limit of Signalized Intersection

The final trigger considered was the point at which a signalized intersection with dual southbound left turn lanes would not meet the desired performance thresholds.

The dual southbound left and signalized intersection as a whole was found to exceed acceptable performance thresholds beyond 55% build out. However, Latoria Road would require widening just before this time, at 50% build out. Therefore, 50% build out is considered the appropriate capacity threshold. At this level of build out, the southbound left turn volume was estimated to be 760 vehicles. After accounting for the existing volumes (225 vph) and Latoria North full build out volumes (135 vph), 400 trips could be generated by the Proposed Developments.

The traffic control, laning, and total forecast volumes at each trigger point for the critical Veterans Memorial Parkway and Latoria Road intersection are shown in **Exhibit 5**.

6.0 Recommended Next Steps

The recommended next steps are:

- The City and developers should confirm the impacts and feasibility of the key improvements required in the full build out scenario including the provision of a dual-lane roundabout at Latoria Road & Veterans Memorial Parkway and widening of Latoria Road to a four-lane cross section.
- Receive confirmation from the City as to the agreed upon future road network and intersections due to the Proposed Developments.
- The City and developers should then work together to determine funding mechanisms and appropriate allocation of costs between developers.

There will be a need for ongoing assessment of the needs of the traffic network over time as individual phases of each development are built. By undertaking ongoing assessments of the transportation network, as phases or projects are development, the timing of triggers can be adjusted to respond to actual conditions and not 20-year projections.



Exhibit 1 Study Network and Development Locations

Latoria South, Olympic View, and Royal Beach Joint Memo 04-18-0307 October 2019



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Exhibit 2 Existing Laning and Traffic Control

Latoria South, Olympic View, and Royal Beach Joint Memo 04-18-0307 October 2019



Scenario 1 Unconstrained Road Network at Full Build Out (2040) - Ultimate Laning and Traffic Control

Exhibit 3

Latoria South, Olympic View, and Royal Beach Joint Memo 04-18-0307 October 2019



Exhibit 4 Veterans Memorial Parkway & Latoria Road Phased Roundabout Laning

Latoria South, Olympic View, and Royal Beach Joint Memo 04-18-0307 October 2019



Scenario 2 Capacity Constraint Triggers at Veterans Memorial Parkway & Latoria Road

Exhibit 5

Latoria South, Olympic View, and Royal Beach Joint Memo 04-18-0307 October 2019

Attachment 1 - Proposed Land Uses

										2040 Full	Build Out								
			Royal B	3ay: 2040		0	Dlympic View: 20	040					Other Latoria Co	orridor Sites: 20	40				T
USE (units)	Туре	Latoria North	Latoria South	Royal Beach	Sub-Total, Royal Bay	In Colwood	In Langford	Sub-Total, OV	1	2	3	4	5	6a	6b	7	8	Sub-Total, Other Site	GRAND TOTAL
	Single Family	448	462	200	1,110	162	110	272	50	60	50			100				260	1,642
	Secondary Suites in SF	28	46	30	104	16	11	27										0	131
RESIDENTIAL (UNITS)	Townhouse/Row House	294	478	700	1,472	178	160	338				80			80	80	100	340	2,150
	Apartment		1,036	1,950	2,986	100	180	280					400					400	3,666
	Subtotal, Res	770	2,022	2,880	5,672	456	461	917	50	60	50	80	400	100	80	80	100	1,000	7,589
	Undesignated Commercial Retail		70	125	195	20	20	40										0	235
RETAIL (1,000 SQFT GFA)	Grocery Store		40		40													0	40
	Subtotal, Comm	0	110	125	235	20	20	40	0	0	0	0	0	0	0	0	0	0	275
	Secondary School	1,400			1,400													0	1,400
SCHOOLS (STUDENTS)	Elementary School		500		500		500	500										0	1,000
	Subtotal, Schools	1,400	500	0	1,900	0	500	500	0	0	0	0	0	0	0	0	0	0	2,400
	Wellness Resort/Hotel					120	120	240										0	240
	Subtotal, Hotel	0	0	0	0	120	120	240	0	0	0	0	0	0	0	0	0	0	240
	Neighbourhood Park	9	1		10													0	10
DARKS (ACRES)	Greenway Neighourhood Park	30			30													0	30
PARKS (ACRES)	Community Park		12		12													0	12
	Subtotal, Park	39	13	0	51	0	0	0	0	0	0	0	0	0	0	0	0	0	51
	Office		80	743	823													0	823
GITTEL (1,000 SQFT GFA)	Subtotal, Office	0	80	743	823	0	0	0	0	0	0	0	0	0	0	0	0	0	823

Notes:

Olypmic View forecasts confirmed by Peter de Zwager, Burrard Group, August 16, 2019 Royal Beach and Parcels 1-8 forecasts provided by Nadine King, Watt Consulting Group, August 16, 2019

South Latoria land uses provided by Ben Mycroft by email September 13, 2019

Attachment 2 - Trip Generation and Distribution

Trip Generation

	External & Passby Trips									
Development	AN	1 Peak Ho	our	PM Peak Hour						
	In	Out	Total	In	Out	Total				
Latoria North	248	293	541	270	176	446				
Latoria South	335	520	855	686	555	1,241				
Royal Beach	827	726	1,553	889	1,120	2,009				
Olympic View	246	391	637	441	324	765				
Adjacent Colwood Parcels	109	334	444	351	211	561				
Total	1,766	2,264	4,029	2,637	2,386	5,023				

Trip Distribution

Orgin/Destination	La	atoria Noi (Resid	rth & Sout ential)	th	Lā	atoria No (Comn	rth & Sou 1ercial)	th		Royal	Beach			Olymp	ic View		Adja	acent Col	wood Par	rcels
	A	М	Р	Μ	A	Μ	P	Μ	A	Μ	P	M	A	Μ	P	М	A	М	Р	M
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
Happy Valley Rd - North	12%	8%	5%	12%	11%	8%	12%	14%	F0/	E0/	F0/	F0/	7%	7%	7%	7%	1.00/	1.00/	1.09/	1.00/
Happy Valley Rd - South	2%	1%	1%	2%	4%	3%	4%	4%	3%	3%	3%	3%	4%	4%	4%	4%	10%	10%	10%	10%
Veterans Memorial Pkwy - North*	46%	53%	57%	45%	40%	48%	47%	40%	50%	50%	50%	50%	69%	69%	69%	69%	50%	50%	50%	50%
Ocean Boulevard	5%	5%	5%	5%	5%	5%	5%	2%											1	
Wishart Rd - North																	10%	10%	10%	10%
Ryder Hesjedal Way - North									1%	2%	1%	2%							1	
Ryder Hesjedal Way - South																			1	
Metchosin Rd - North	28%	29%	28%	29%	28%	25%	23%	28%	34%	33%	34%	33%	15%	15%	15%	15%	20%	20%	20%	20%
Metchosin Rd - South	7%	4%	4%	7%	7%	6%	4%	7%	10%	10%	10%	10%	5%	5%	5%	5%	10%	10%	10%	10%
Desmond Drive					2%	2%	2%	2%											1	
Olympic View					3%	3%	3%	3%											1	
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

* 10% of the trips destined to Veterans Memorial Parkway North were assumed to use Wishart/Cairndale route for Latoria North & South and Royal Beach

Attachment 3

			JOINT S	TUDY INTERSECTIONS - RECOMMEN	DED IMPROVEMENTS	
BUILD OUT (%)	Latoria Rd / VMP	Latoria Rd / Wishart Rd	Latoria Blvd / Ryder Hesjedal Way	Latoria Blvd / Metchosin Rd	Metchosin Rd / Bluffs/ Commons Access	Met
5%	Install single-lane roundabout with ultimate two-lane diameter	Maintain existing laning and traffic control	Maintain existing laning and traffic control	Install signal with left turn lanes (next phase of South Latoria or Royal Beach)	Install stop control on minor street (accesses)	Install stop Hesjedal W
30%	Widen VMP to four-lane cross- section; Widen to dual-lane roundabout	Install signal with eastbound left turn lane				
35%						
40%				Add westbound right and eastbound right turn lanes		
50%	Widen Latoria Rd to to four-lane cross-section with westbound right-turn slip lane	Widen Latoria Rd to to four-lane cross-section with left turn lane	Widen Latoria Rd to to four- lane cross-section with turn lanes	Widen Latoria Rd to to four-lane cross-section; Add southbound right turn lane		
60%				Add second westbound through lane		
85%				Add northbound right turn lane		
100%						Further tran necessary i

chosin Rd / Ryder Hesjedal Way	Metchosin Rd / Wishart Rd
control on Ryder	Maintain existing laning and traffic
ay when connected	control
	Realign intersection to have seperate left and shared through- right lanes on all approaches
	Add southbound right turn lane
fic control may be	
1 long term	

Attachment 3	5
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			BUNT STUDY INTERSECTIO	ONS - RECOMMENDED IMPROVEME	NTS	
BUILD OUT (%)	Veterans Memorial Parkway & Cairndale Road	Latoria Road & Happy Valley Road	Latoria Road & Castlewood Road	Latoria Boulevard & Quarry Street	Metchosin Road & Lagoon Road	Metchosin Road & Painter Road
5%	Maintain existing laning and traffic control	Maintain existing laning and traffic control	Maintain existing laning and traffic control	Install stop control on Quarry Street with westbound left turn bay when initially built	Maintain existing laning and traffic control	Maintain existing laning and traffic control
15%	Install traffic signal and add eastbound and westbound right turn bays					
30%	Widen Veterans Memorial Parkway to four lanes					
50%			Add eastbound and westbound left turn bays			
60%					Install traffic signal and add southbound left turn bay	
65%		Install traffic signal				
80%				Install traffic signal		
100%						Potential signal

Attachment 4 - Full Build Out & Capacity Constrained Trigger Traffic Operations

Tables 1 and **2** below summarize the traffic operations results for intersections requiring improvements from Bunt's Synchro analysis.

	MOVEMENT		AM PEAK HOUI	र		PM PEAK HOUR				
INTERSECTION	MOVEMENT	LOS	V/C	95% Q	LOS	V/C	95% Q			
	Overall	В	0.84	-	В	0.88	-			
	EBL/T	D	0.40	16	D	0.11	8			
	EBR	С	0.01	0	D	0	0			
Veterans	WBL/T	С	0.27	12	D	0.43	21			
Memorial	WBR	D	0.77	64	С	0.39	45			
Cairndale Road	NBL	А	0.00	1	В	0.03	2			
	NBT/R	В	0.78	#193	С	0.90	#223			
	SBL	В	0.59	#38	D	0.89	#124			
	SBT/R	А	0.43	64	А	0.71	155			
	Overall	А	0.48	-	А	0.55	-			
	WBL	В	0.38	22	В	0.52	45			
Latoria Road &	WBR	В	0.12	11	В	0.20	15			
Happy Valley	NBT/R	А	0.50	50	А	0.35	24			
поии	SBL	A	0.51	34	А	0.57	35			
	SBT	Α	0.14	15	Α	0.29	24			
	Overall	-	-	-	-	-	-			
	EBL	Α	0.01	0	Α	0.00	0			
	EBT/R	Α	0.35	0	Α	0.29	0			
Latoria Road &	WBL	А	0.06	2	Α	0.06	2			
Castlewood Road	WBT/R	А	0.19	0	Α	0.38	0			
	NB	С	0.20	16	С	0.10	2			
	SB	С	0.07	2	С	0.09	2			
	Overall	А	-	-	В	-	-			
	EBL/T	А	0.53	23	В	0.68	38			
Latoria Road &	EBT/R	В	0.43	18	В	0.68	32			
Veterans	WBL/T	А	0.22	12	А	0.34	19			
Memorial	WBR	А	0.56	0	А	0.57	0			
(Roundabout)	NB	В	0.65	33	D	0.85	59			
	SBL	В	0.46	27	С	0.85	117			
	SBL/T/R	A	0.46	29	В	0.85	122			
	Overall	В	0.68	-	В	0.79	-			
	EBL	А	0.45	16	В	0.63	#23			
Latoria Road &	EBT	А	0.49	61	А	0.55	66			
Wishart Road	WBT/R	В	0.73	#119	В	0.83	#140			
	SBL	С	0.57	37	С	0.66	46			
	SBR	С	0.04	8	С	0.07	10			
	Overall	A	0.60	-	А	0.59	-			
	EBT/R	А	0.61	73	А	0.63	87			
Latoria	WBL	А	0.05	3	А	0.11	4			
BOUIEVARA &	WBT	А	0.47	50	А	0.58	78			
Quarry Street	NBL	С	0.56	27	С	0.42	19			
	NBR	В	0.18	11	С	0.02	5			

Table 1: Scenario 1 - Fu	Ill Build Out Traffic	Operations (Bunt's	Results)
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INTERSECTION	MOVEMENT	A	AM PEAK HOU	R	1.00	PM PEAK HOU	R
	A H	LOS	V/C	95% Q	LOS	V/C	95% Q
	Overall	C	0.74	-	В	0.83	-
	EBL	C	0.73	#45	C .	0.65	#30
1 stania	EBT/R	В	0.70	84	В	0.67	89
Latoria Roulevard &	WBL	C	0.32	13	В	0.39	18
Ryder Hesjedal	WBT/R	C	0.76	70	C	0.81	#118
Way	NBL	В	0.52	33	C	0.69	45
	NBT/R	В	0.20	22	В	0.12	14
	SBL	C	0.27	19	С	0.24	15
	SBT/R	C	0.18	17	C	0.18	17
	Overall	A	0.42		A	0.41	16
	EBL	В	0.03	2	В	0.01	2
	EBT/R	В	0.06	0	В	0.08	10
Ryder Hesjedal	WBL	В	0.03	2	В	0.01	2
Way & Metchosin	WBT/R	В	0.14	10	В	0.1	8
Road	NBL	А	0.12	9	А	0.23	14
	NBT/R	А	0.48	63	А	0.41	47
	SBL	А	0.03	3	А	0.1	7
	SBT/R	А	0.31	37	A	0.5	61
	Overall	С	0.88	-	С	0.83	-
	EBL	С	0.82	#78	С	0.78	#53
	EBT	С	0.63	106	С	0.76	#104
	EBR	A	0.11	0	В	0.14	14
	WBL	С	0.47	29	С	0.53	24
Latoria	WBT	С	0.56	52	С	0.64	62
Boulevard &	WBR	С	0.17	19	С	0.36	29
Metchosin Road	NBL	C	0.48	44	C	0.62	31
	NBT	D	0.83	#126	C	0.56	54
	NBR	C	0.07	5	C	0.07	4
	SBI	C	0.81	#71	C	0.76	#58
	SBE	B	0.21	33	C	0.68	71
	SBR	R	0.12	10	C	0.42	36
	Overall	R	0.73	-	B	0.73	-
	WBI	C C	0.44	23	C C	0.48	29
Matchesiu Dood	WBR	C C	0.05	10	C C	0.10	11
& Laaoon Road		R	0.78	#207	Δ	0.07	#137
	SRI	Δ	0.70	12	Δ	0.41	71
	SBL	Δ	0.45	65	R	0.79	#190
	Overall	A	0.43	05	P	0.73	#190
	EP	A C	0.07		Б	0.82	- 15
Metchosin Road		<u>ر</u>	0.40	21		0.39	15
& Painter Road	NBL	A	0.06	4	A	0.1	4
		A	0.72	#120	A	0.69	#103
	SB1/R	A	0.63	#126	В	0.89	#232
	Overall	D	0.97	-	L F	0.90	-
	EBL	E	0.97	#163	E	0.89	#99
	ERI/K	C C	0.03	8	C	0.05	9
	WBL	C	0.04	9	C	0.09	12
Metchosin Road	WBT/R	C	0.05	12	С	0.1	17
& Wishart Road	NBL	В	0.06	5	A	0.22	6
	NBT/R	D	0.97	#329	В	0.81	215
	SBL	В	0.06	2	A	0.10	4
	SBT	В	0.65	148	С	0.91	#314
	SBR	В	0.12	11	A	0.23	23

			AM PEAK HOU	R		PM PEAK HOU	R
SCENARIO 2	MOVEMENT	LOS	V/C	95% QUEUE	LOS	V/C	95% QUEUE
	Overall	С			D		
	EB	D	0.78	-	C	0.59	-
	WB	С	0.65	-	C	0.72	-
Trigger 1 (5% Build Out)	NBL	В	0.00	-	A	0.00	-
Bulla Out)	NBT/R	В	0.05	-	A	0.03	-
	SBL	С	0.60	-	С	0.89	-
	SBT/R	С	0.22	-	С	0.46	-
	Overall	В	0.77		В	0.82	
	EBL	В	0.58	46	С	0.69	#67
	EBT/R	В	0.30	38	В	0.17	21
	WBL	В	0.03	4	В	0.02	4
Trigger 2 (20%	WBT	В	0.25	24	В	0.31	36
Build Out)	WBR	В	0.28	21	В	0.26	19
	NBL	С	0.02	2	С	0.01	2
	NBT/R	С	0.21	16	С	0.17	14
	SBL	В	0.71	58	В	0.80	83
	SBT/R	В	0.13	12	A	0.24	15
	Overall	В	0.77		С	0.83	
	EBL	С	0.80	65	D	0.87	80
	EBT/R	В	0.43	47	В	0.22	31
	WBL	С	0.08	6	С	0.07	8
Triaaer 3 (45%	WBT	С	0.50	32	С	0.63	58
Build Out)	WBR	А	0.40	0	А	0.39	0
	NBL	В	0.03	4	С	0.05	4
	NBT/R	С	0.43	33	С	0.42	32
	SBL	С	0.69	70	С	0.79	#103
	SBT/R	А	0.18	18	В	0.43	48
	Overall	В	0.75		С	0.84	
	EBL	С	0.72	#72	D	0.84	#95
	EBT/R	В	0.38	51	В	0.20	34
	WBL	С	0.08	7	С	0.20	11
Trigger 4 (50%	WBT	С	0.49	39	D	0.74	#79
Build Out)	WBR	А	0.42	0	А	0.39	0
	NBL	С	0.04	5	С	0.06	5
	NBT/R	С	0.53	43	D	0.53	42
	SBL	С	0.74	#75	D	0.85	#120
	SBT/R	В	0.22	24	В	0.51	70

 Table 2: Scenario 2 - Capacity Constrained Traffic Operations (Bunt's Results)