Waisvisz, Cora TRAN:EX

From: Welch, Darin TRAN:EX
Sent: Friday, January 26, 2018 2:16 PM
To: 'Patrick Majer'
Subject: PLA's 2013 - 01504 & 2014 - 05407 - Timberline and Timberlanding Subdivision
Attachments: Fernie Alpine Resort - Stormwater.pdf; FAR Master Design StrmWTR.PDF; STMWTR RPT.PDF; RPT Appendix.pdf; BA Blacktop qoute.pdf

Thanks Patrick,

In response to your request below, the Ministry is prepared to support your proposal in principal for ILOC bonding (Road Construction Requirements) for Final Subdivision, however we need confirmation that additional road construction items will be financially represented in the ILOC. MoTI is satisfied with the quantity estimates (materials), please address additional costs needed to accompany the proposal:

1) Signage: a signing plan and cost allocations for signs and installation
2) Drainage Considerations (as per the outcomes and recommendations from the Stormwater Plan (Attached – February 2000)
2) QA/QC (Construction Supervision – Compaction/Materials Testing – costing needs to be estimated at 10%/month of the contractors construction price (Engineering, Testing etc.)
3) Regional Recovery/Project Management/Staffing – should MoTI be required to construct the project, staffing and project management costs would be required. Please include an additional 12% costing to the project for staffing and PM.

Please provide a revised cost estimate including items above.

If you have any questions, give me a shout.

Thanks,
Darin

Darin Welch *(BGIS, BRM)* | ***Development Approvals*** | ***Ministry of Transportation and Infrastructure***
Rocky Mountain District - Cranbrook
Ph: 250.426.1596
Cell: 250.919.3146
darin.welch@gov.bc.ca
Development Approvals Website: http://www.th.gov.bc.ca/DA

Quotation: April 18, 2017
Timberlanding - Phase #1
To: RCR - Fernie
Attn: Patrick Majer

B·A BLACKTOP • CRANBROOK •
T: 250-426-7205
F: 250-426-7841
PO Box 466
Cranbrook, BC

Item #	Description	Unit	Quantity	Unit Price	Amount
1	Resort Drive Subbase @ 300mm Thickness	m^2	4,000	s.17,s.21	
2	Resort Drive Granular Base @ 225mm Thickness	m^2	4,000		
3	Resort Drive Asphalt Paving @ 50mm Thickness	m^2	3,200		
4	Alpine Way Subbase @ 300mm Thickness	m^2	3,050		
5	Alpine Way Granular Base @ 225mm Thickness	m^2	3,050		
6	Alpine Way Asphalt Paving @ 50mm Thickness	m^2	2,440		
7	Trim & Grade Existing (if Required)	m^2	7,050		

Total - **$317,569.00**

Total price does not include trim & grade.

*** Note - The Alpine Way pricing includes Timberlanding Crescent (75m).**
*** GST is additional to all prices.**
*** Billing would be based on actual unit measurements in field.**
*** Aggregates meet MMCD specifications.**
*** If base gravels are installed by others, the trim & grade item may be required.**
*** Prices include one MOB per section for base and one MOB per section for paving.**
*** If additional gravels are required for trim & grade, an additional cost will apply (or supplied & delivered by others).**

Marc Pelletier, Area Manager

Kyle Gallinger, A.Sc.T.

This tender is subject to acceptance of our price, terms and conditions within **30** days and to site conditions being as specified in any engineering drawings and specifications supplied by the customer. Unless noted, we have made no allowances for excavation, sub-grade or sub-base grading, drainage works, wood or concrete curbing, testing costs, crossing permits or fees, traffic control, line painting, adjusting of utilities and other structures or making good damage to existing asphalt.

This Tender is hereby accepted on this 30 **day of** NOVEMBER **, 2017**

Please Print Name PATRICK MAJER

Signature

Waisvisz, Cora TRAN:EX

From: Ron Horton <s.22
Sent: Thursday, February 16, 2017 9:15 AM
To: Patrick Majer
Cc: Ihas, Michele D TRAN:EX; Nichol, Christine TRAN:EX; Bernie Borkenhagen; Mary Lazimbat; Andy Cohen; Michele Bates; Mike Director Area A.; Neil Jackson
Subject: Re: Meeting with RCR and Timberline Residents

Hi Patrick

Just following up on the email trail below. Please let us know when we can get together.

Ron

Sent from my iPhone

On Jan 4, 2017, at 7:45 AM, Patrick Majer <pmajer@skircr.com> wrote:

> HI Ron,
> s.22 and will have a discussion Michelle and Christine in the next few days, after those discussions RCR meet internally as a team and report back to you.
> Thanks everybody, stay warm,
> Patrick
>
> **From:** Ron s.22 Horton |s.22
> **Sent:** Tuesday, January 03, 2017 9:09 PM
> **To:** michele.ihas@gov.bc.ca; Christine TRAN:EXNichol <christine.nichol@gov.bc.ca>; Bernie Borkenhagen <s.22 ; Mary Lazimbat <mary.lazimbat@icloud.com>; Patrick Majer <pmajer@skircr.com>; Andy Cohen <acohen@skifernie.com>; Michele Bates <mbates@rdek.bc.ca>; Mike Director Area A. <mike@directorareaa.ca>
> **Subject:** Meeting with RCR and Timberline Residents
> To all:
> Attached are the minutes to a meeting between several Timberline Residents and RCR held in early December. The intent of the meeting was primarily to followup on the note from Michelle Ihaas earlier in the fall regarding the issues around Timberlanding Development and to review her comments on the six options as presented by the residents. As you can see from the minutes, other issues were discussed.
> One of the outstanding items was for Patrick to clarify with Michelle her comments regarding option two - the keyhole installation on Alpine Way. Patrick, with holiday season behind us, perhaps you could raise this on your priority list.
> Regards
> Ron Horton

Waisvisz, Cora TRAN:EX

From: acohen@skifernie.com
Sent: Tuesday, January 3, 2017 10:18 PM
To: Ron s.22 Horton; Ihas, Michele D TRAN:EX; Nichol, Christine TRAN:EX; Bernie Borkenhagen; Mary Lazimbat; Patrick Majer; Michele Bates; Mike Director Area A.
Subject: Re: Meeting with RCR and Timberline Residents

Thanks Ron. Happy New Year! Patrick is back from s.22
I will speak to him about your note.
All the best.
Andy

From: Ron s.22 Horton
Sent: Tuesday, January 3, 2017 9:09 PM
To: michele.ihas@gov.bc.ca ; Christine TRAN:EXNichol ; Bernie Borkenhagen ; Mary Lazimbat ; Patrick Majer ; Andy Cohen ; Michele Bates ; Mike Director Area A.
Subject: Meeting with RCR and Timberline Residents

To all:
Attached are the minutes to a meeting between several Timberline Residents and RCR held in early December. The intent of the meeting was primarily to followup on the note from Michelle Ihaas earlier in the fall regarding the issues around Timberlanding Development and to review her comments on the six options as presented by the residents. As you can see from the minutes, other issues were discussed.
One of the outstanding items was for Patrick to clarify with Michelle her comments regarding option two - the keyhole installation on Alpine Way. Patrick, with holiday season behind us, perhaps you could raise this on your priority list.
Regards
Ron Horton

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

PROPOSED SUBDIVISION PRELIMINARY LAYOUT APPROVAL

Your File #: 010048836
eDAS File #: 2014-05407
Date: Jan/31/2017

Resorts of the Canadian Rockies;
c/o WSP Canada Inc
WSP Group Inc. Cranbrook Office
303 - 535 Victoria Avenue N
Cranbrook, British Columbia V1C 6S3
Canada

Attention:
Jean Horton
WSP Group Inc., Cranbrook Office

Re: Proposed Subdivision of
Lot 1 District Lots 4128 and 8901 Kootenay District Plan NEP19500
Map: 1789134.9,554692.56
Lot A District Lot 8901 Kootenay District Plan 1687 Except palns 101045, 15604, 17500, 19857, R368, NEP23072, NEP59141, and NEP59794

Your proposal for a 50 lot Conventional subdivision has received preliminary layout approval, subject to the following conditions:

1. Written confirmation from the Regional District of East Kootenay stating that all their bylaw requirements and any other conditions have been satisfied must be submitted prior to final approval.

2. The Natural Hazard Assessment prepared by Groundtech Engineering Ltd. dated November 30, 2015, has been accepted by the Provincial Approving Officer.

   The applicant shall enter into three covenants pursuant to Section 219 of the Land Title Act with the Minister of Transportation and Infrastructure and the Regional District of East Kootenay to restrict building on the lands in accordance with the above noted report. This report shall be added to the covenants as Schedule A pursuant to Section 56 of the Community Charter.

Local District Address
Rocky Mountain District 129 10th Avenue S Cranbrook, BC V1C 2N1 Canada Phone: (250) 426-1500 Fax: (250) 426-1523

For Lots 19-23: Lots are characterized as "Zone 1". Building construction shall conform to Sections 7.4 and 8.0 of the 2015 Groundtech report.

For Lots 1-16 and 24-50: Lots are characterized as "Zone 2". Building construction shall conform to Sections 7.4 and 8.0 of the 2015 Groundtech report.

For both the remainder lands: No development until a natural hazard assessment has been completed to the satisfaction of the Provincial Approving Officer.

Covenants to have priority over all financial charges with appropriate notation on final documents.

3. Written confirmation to be submitted from the Geotechnical Engineer stating that they have reviewed the Plan and the Covenant and that the Plan and Covenant restrict the property in a manner consistent with the Engineer's report.

4. Stormwater management has been considered in previous phases of this development, which was addressed in a report prepared by Urban Systems in February 2000. Recommendations of that report were addressed in an earlier Preliminary Layout Approval (PLA) dated April 20, 2004. The 2004 PLA required implementation of stormwater management plan, based on the recommendations of this report.

   Please provide written confirmation that this plan is in place and whether or not the Regional District of East Kootenay has created a local service area for management of this system.
   If a stormwater management plan is in place it must be clear that the subject lands being reviewed at this time are included in the existing plan, or whether or not additional infrastructure is required.

5. A Certificate of Public Convenience and Necessity (CPCN), As-Built Approval by the Comptroller of Water Rights and a Construction Permit from the Drinking Water Officer must be obtained for the proposed community water system. Notification from the Comptroller that requirements related to water supply have been met is required prior to tender of subdivision plans for examination and approval by the Provincial Approving Officer.

   Contact information for CPCN:
   http://www.env.gov.bc.ca/wsd/contacts/water_utilities.html
   Contact your Health Authority about Construction Permits for drinking water systems.

6. Proposed subdivision roads to be dedicated and established a minimum of twenty (20) metres in width or three (3) metres beyond the extremities of cuts or fills, whichever is greater, terminating in cul-de-sacs. Additional right of way

outside of the constructed turnaround areas is required at 3 m beyond the extremities of cuts or fills, or a minimum of 1.0 m beyond the ditch.

7. Applicant to provide 6 meter by 6 meter corner truncations at the all intersections as per the Provincial Public Undertakings Regulation #513/2004, Part 3, Section 11.

8. Five stop signs to be installed to include: a 3-way stop at the intersection of Timberline Crescent and Alpine Way; one stop sign on Timberlanding Crescent at its intersection with Alpine Way, and one stop sign on Resort Drive at its intersection with Fernie Ski Hill Road.

9. Applicant must complete the attached Design Criteria Checklist to accompany preliminary design drawings for proposed new public road servicing proposed lots 1-16 and proposed lots 24-50 AND from the end of the pavement on Fernie Ski Hill Road. Design Criteria Sheet to be submitted to the Development Technician for approval prior to submitting the road design. Please refer to Chapter 1400 of the BC Supplement to TAC Geometric Design Guide.

10. Proposed subdivision road (Timberlanding Crescent) servicing Lots 24 through 50 shall be designed and constructed from Alpine Road terminating in a 15 meter radius cul-de-sac.

    Fernie Ski Hill Road shall be designed and constructed from end of current pavement to intersection with proposed subdivision road (Resort Drive).

    Proposed subdivision road (Resort Drive) servicing Lots 1 through 16 shall be designed and constructed from Fernie Ski Hill Road terminating in a 15 meter radius cul-de-sac.

    Prior to commencement of any works the applicant shall provide to the Ministry for their written approval, engineered drawings of the three sections of road mentioned above. The drawings shall include a minimum of the plan view, vertical alignment, horizontal alignment and cross-section. The design shall incorporate approved drainage plan features and recommendations from Groundtech Engineering Ltd. November 2015 Geotechnical Site Investigation Report.

    The drawings shall be submitted in a manner and scale as per the BC Supplement to TAC Geometric Design Guide - Chapter 1400. The applicant must also submit a Construction Quality Control Plan prepared by a Professional Engineer. Road Design and Construction Quality Control Plans must be submitted for approval by Ministry of Transportation & Infrastructure prior to construction start up. The roads shall be constructed to a paved standard.

11. The applicant is to retain a Professional Engineer to supervise and certify that all road construction has been completed in accordance with the latest edition of the Ministry's Standard Specifications for Highway Construction. Along with

the written certification, the Professional Engineer shall be responsible for submission of as-built drawings, inspection reports, photographs of different stages of construction, a list of material sources, sieve analysis of all granular material and compaction testing results. Compaction testing results shall be a minimum of one test at ten (10) metre increments or stations and all road base materials shall be compacted such that 100% Standard Proctor Density is achieved as described in Section 202 of the Standard Specifications for Highway Construction.

12. Engineered projects within Ministry of Transportation & Infrastructure rights of way or proposed right of way dedication must comply with this Ministry's Engineer of Record and Field Review Guidelines which can be found on our website at http://www.th.gov.bc.ca/publications/Circulars/All/T_Circ/2009/t06-09%20.pdf.
In accordance with those Guidelines, this project will require that the Coordinating Professional Engineer be identified before any designs are approved.

13. Applicant may wish to provide the road design to all utility companies in regard to infrastructure placement within newly dedicated right of way.

14. It is the responsibility of the developer to ensure that the installation of any new signs (regulatory, etc) meet the Ministry standards as specified by the Catalogue of Standard Traffic Signs, 2010 edition. These signs shall be purchased and installed prior to the completion of the subdivision, by the applicant.

15. The intersection works associated with the construction of the newly dedicated roads, at Alpine Way and Timberline Cresent as well as works along Fernie Ski Hill Road, will require a valid Permit for Works in the Right of Way from the Ministry of Transportation & Infrastructure. Application can be found at: http://www.th.gov.bc.ca/permits/H0020.asp

16. Both remainders will require a covenant prohibiting further subdivision until a Traffic Impact Assessment has been completed to the Ministry's satisfaction. Prior to the assessment, terms of reference for the TIA will need to be approved by the Ministry.

17. As the property appears to contain a water course (Currie Creek), the Registrar of Land Titles may require return to Crown of that water course. The BCLS you engage is advised to check with the Registrar prior to commencement of the legal survey.

18. Applicant shall submit a copy of approval from Ministry of Forests, Lands and Natural Resource Operations (FLNRO) stating approval for any works deemed to require approval under Section 9 of the Water Act.

19. Provincial records indicate the proposed development is located within an area with only limited potential to contain archaeological sites protected by the

Heritage Conservation Act.

However, the applicant should be aware that there is still a chance that the lot may contain previously unrecorded archaeological material that is protected under the Heritage Conservation Act. This would most likely be indicated by the presence of areas of dark-stained soils containing conspicuous amounts of fire-stained or fire-broken rock, artifacts such as arrowheads and other stone tools, or even buried human remains. If such material is encountered during demolition or construction, a Heritage Conservation Act Permit may be needed before further development is undertaken. This may involve the need to hire a qualified archaeologist to monitor the work.

Please contact the Archaeology Branch immediately at (250) 953-3334 if archaeological site deposits are encountered on the subject property.

20. The property being subdivided is within a wildfire interface area and may be subject to a hazard of wildfire. It is therefore recommended that the owner consult the following website and review the Firesmart Manual for information about reducing the risk, http://www.pssg.gov.bc.ca/firecom/pdf/homeowner-firesmart.pdf or contact the Ministry of Forests and Range for more information. Appropriate protection measures should be implemented and maintained, and property purchasers should be advised of the risk.

The approval granted is only for the general layout of the subdivision and is valid for one year from the date of this letter. However, if at any time there is a change in legislation or regulations this preliminary layout approval is subject to review and may be cancelled.

Submission of Final Plans (Survey Plan Certification and Application to Deposit) to be accompanied by a current Tax Certificate (FIN 55), together with a plan examination fee of $50.00 plus $100.00 per lot created by the plan (for a Total of $). If paying by cheque, make payable to the Minister of Finance.

If you have any questions please feel free to call Christine Nichol at (250) 426-1202.

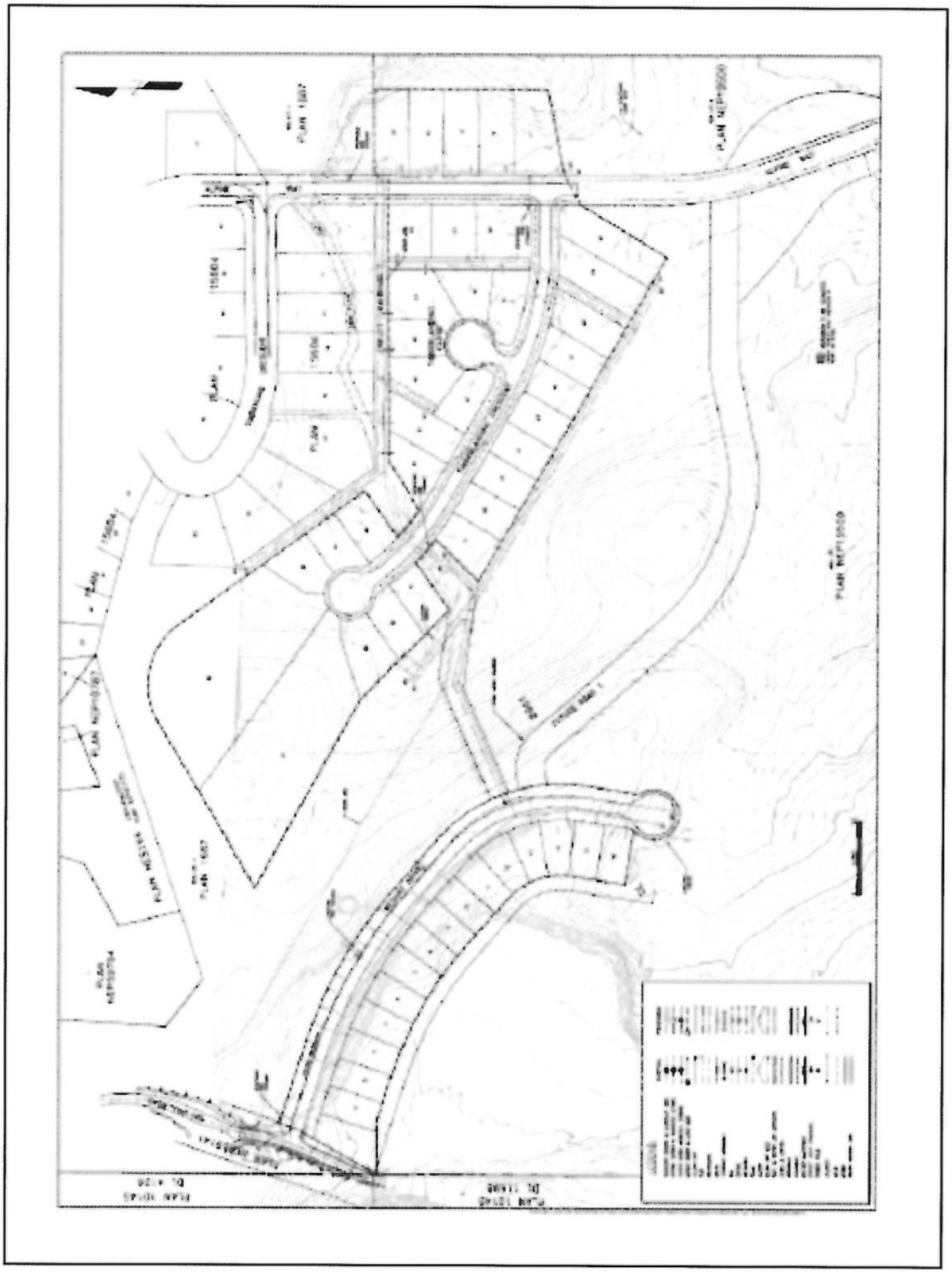
Please quote file number 2014-05407 when contacting this office.

Signed on behalf of Provincial Approving Officer
by

Christine Nichol
District Development Technician

Attachments

cc: Regional District of East Kootenay
Telus Engineering



Waisvisz, Cora TRAN:EX

From: Ihas, Michele D TRAN:EX
Sent: Wednesday, January 18, 2017 5:35 PM
To: Patrick Majer
Cc: Nichol, Christine TRAN:EX
Subject: PAO clarifies Option 2 response
Attachments: Option 2.JPG; August 25 2016 PLA and Layout.docx

Hi Patrick,

Thank you for the phone call explaining what I'm being asked to clarify. I can see now how my response may be construed in more than one way. For reference here is my initial response. Note that I have interpreted the word "keyhole" to mean "cul-de-sac".

Option 1: Baz Greenspace + MOTI Construction Road:

- Alpine Way provides access to lands beyond. Even though RCR now owns the property to the south, Alpine Way is the reasonable and legal access to this land. I feel it is unreasonable at this point to ask RCR to build the "construction" road to public road standards prior to the approval of Timberlanding Phase I. Furthermore, the 2000 Traffic Impact Assessment (TIA) recommends a through connection south of Timberline Village be included in the road network plans. This layout is also supported in the OCP.

Option 2: Keyhole at end of Phase I Timberlanding:

- Terminating Alpine Way at a cul-de-sac at the intersection with Timberlanding Crescent seems reasonable for Phase 1, although the remainder of Alpine Way would need to remain an open legal right of way with future potential construction depending on results of a new TIA. See comments in Option 1.

Hopefully this adds some clarity for Option 2: Having Alpine Road paved with the pavement ending in a cul-de-sac at the intersection with Timberlanding Crescent seems reasonable. Currently the layout does not include a turnaround (cul-de-sac) area along Alpine Way as the majority of traffic will be turning into and out of Timberlanding Crescent and a turnaround along Alpine Road isn't necessary.

The southern portion of Alpine Way would continue to be a physically and legally open, unencumbered, public, gravel road that provides access to lands lying beyond which includes an existing cabin at the far south end. This is supported in the 2000 Traffic Impact Assessment which recommended a through connection south of Timberline Village be included in the road network plans. The current layout is also supported in the OCP. Once Phase I is registered, any further subdivision would require a new TIA.

The idea around the 6 options presented by the residents was that IF RCR was agreeable to submit a revised layout, they were free to do so as the subdivision application is still in-stream. A revised layout is not being required of me. Currently RCR has a PLA with an associated layout (attached).

Please contact me if further clarification is required.

Kind regards,
Michele

Michele Ihas
Provincial Approving Officer
West Kootenay District, BC MOT, 310 Ward Street, Nelson BC V1L 5S4; Ph: 250.354.6526 Fax: 250.354.6547

From: Ron Horton s.22
Sent: Friday, January 13, 2017 2:20 PM
To: Patrick Majer
Cc: Ihas, Michele D TRAN:EX; Nichol, Christine TRAN:EX; Bernie Borkenhagen; Mary Lazimbat; Andy Cohen; Michele Bates; Mike Director Area A.; Neil Jackson
Subject: Re: Meeting with RCR and Timberline Residents

Hi Patrick

Thank you for your note. We look forward to the clarification and your update so that we can continue our discussion.

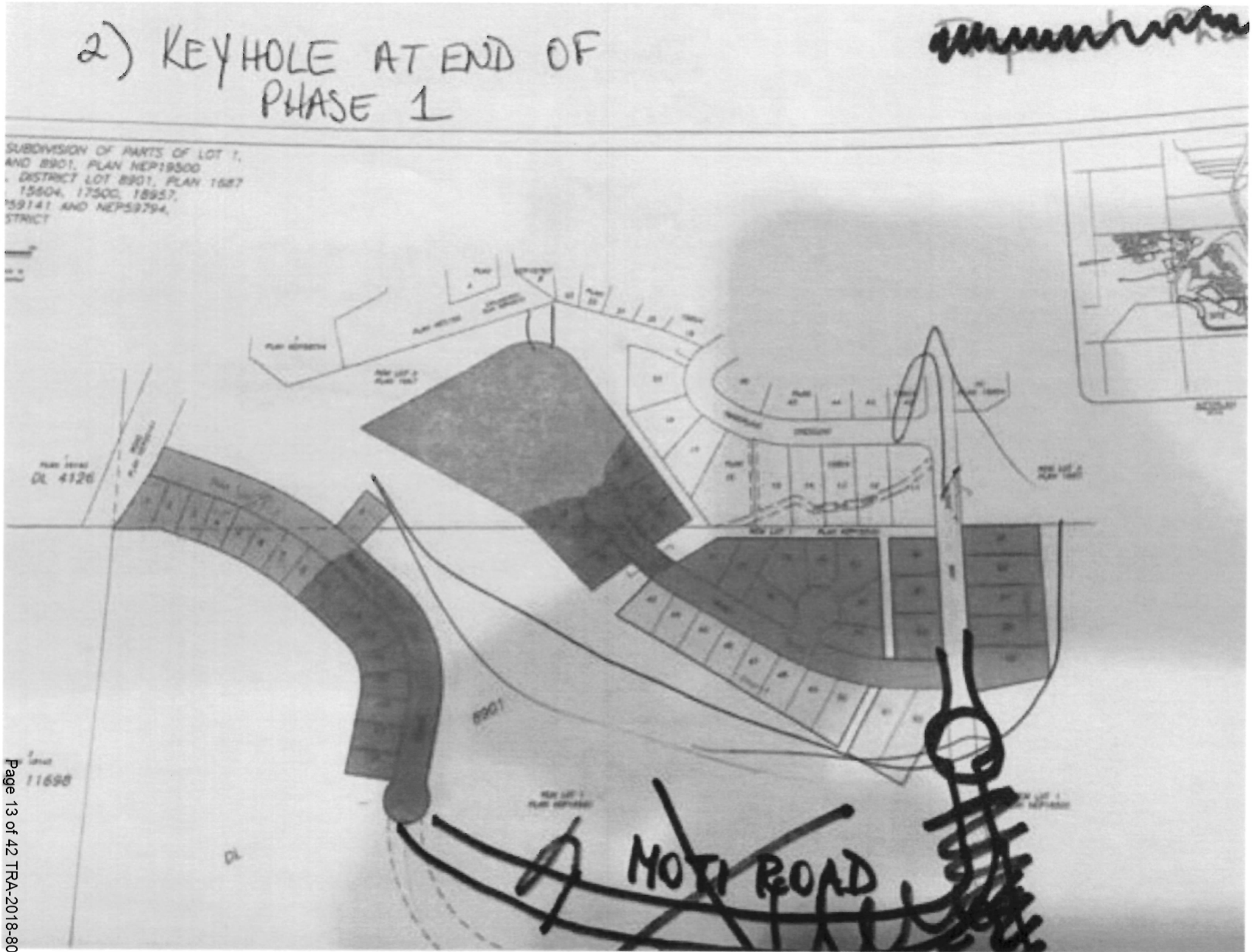
Ron

Sent from my iPhone

On Jan 4, 2017, at 9:45 AM, Patrick Majer <pmajer@skircr.com> wrote:

> HI Ron,
>
> s.22 and will have a discussion Michelle and Christine in the next few days, after those discussions RCR meet internally as a team and report back to you.
>
> Thanks everybody, stay warm,
>
> Patrick
>
> **From:** Ron s.22 Horton s.22
> **Sent:** Tuesday, January 03, 2017 9:09 PM
> **To:** michele.ihas@gov.bc.ca; Christine TRAN:EXNichol <christine.nichol@gov.bc.ca>; Bernie Borkenhagen <s.22 ; Mary Lazimbat <mary.lazimbat@icloud.com>; Patrick Majer <pmajer@skircr.com>; Andy Cohen <acohen@skifernie.com>; Michele Bates <mbates@rdek.bc.ca>; Mike Director Area A. <mike@directorareaa.ca>
> **Subject:** Meeting with RCR and Timberline Residents
>
> To all:
>
> Attached are the minutes to a meeting between several Timberline Residents and RCR held in early December. The intent of the meeting was primarily to followup on the note from Michelle Ihaas earlier in the fall regarding the issues around Timberlanding Development and to review her comments on the six options as presented by the residents. As you can see from the minutes, other issues were discussed.
>
> One of the outstanding items was for Patrick to clarify with Michelle her comments regarding option two - the keyhole installation on Alpine Way. Patrick, with holiday season behind us, perhaps you could raise this on your priority list.
>
> Regards
>
> Ron Horton

2) KEYHOLE AT END OF PHASE 1



BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

PROPOSED SUBDIVISION PRELIMINARY LAYOUT APPROVAL

Your File #: 010048836
eDAS File #: 2014-05407
Date: Aug/25/2016

Resorts of the Canadian Rockies;
c/o WSP Canada Inc
WSP Group Inc. Cranbrook Office
303 - 535 Victoria Avenue N
Cranbrook, British Columbia V1C 6S3
Canada

Attention: WSP Group Inc. Cranbrook Office

Re: Proposed Subdivision of
Lot 1 District Lots 4128 and 8901 Kootenay District Plan NEP19500
Map: 1789134.9,554692.56
Lot A District Lot 8901 Kootenay District Plan 1687 Except palns 101045, 15604, 17500, 19857, R368, NEP23072, NEP59141, and NEP59794

Your proposal for a 50 lot Conventional subdivision has received preliminary layout approval, subject to the following conditions:

1. Written confirmation from the Regional District of East Kootenay stating that all their bylaw requirements and any other conditions have been satisfied must be submitted prior to final approval.

2. The Natural Hazard Assessment prepared by Groundtech Engineering Ltd. dated November 30, 2015, has been accepted by the Provincial Approving Officer.

   The applicant shall enter into three covenants pursuant to Section 219 of the Land Title Act with the Minister of Transportation and Infrastructure and the Regional District of East Kootenay to restrict building on the lands in accordance with the above noted report. This report shall be added to the covenants as Schedule A pursuant to Section 56 of the Community Charter.

   For Lots 19-23: Lots are characterized as "Zone 1". Building construction shall

Local District Address
Rocky Mountain District 129 10th Avenue S Cranbrook, BC V1C 2N1 Canada Phone: (250) 426-1500 Fax: (250) 426-1523

conform to Sections 7.4 and 8.0 of the 2015 Groundtech report.

For Lots 1-16 and 24-50: Lots are characterized as "Zone 2". Building construction shall conform to Sections 7.4 and 8.0 of the 2015 Groundtech report.

For both the remainder lands: No development until a natural hazard assessment has been completed to the satisfaction of the Provincial Approving Officer.

Covenants to have priority over all financial charges with appropriate notation on final documents.

3. Written confirmation to be submitted from the Geotechnical Engineer stating that they have reviewed the Plan and the Covenant and that the Plan and Covenant restrict the property in a manner consistent with the Engineer?s report.

4. Stormwater management has been considered in previous phases of this development, which was addressed in a report prepared by Urban Systems in February 2000. Recommendations of that report were addressed in an earlier Preliminary Layout Approval (PLA) dated April 20, 2004. The 2004 PLA required implementation of stormwater management plan, based on the recommendations of this report.

   Please provide written confirmation that this plan is in place and whether or not the Regional District of East Kootenay has created a local service area for management of this system.

   If a stormwater management plan is in place it must be clear that the subject lands being reviewed at this time are included in the existing plan, or whether or not additional infrastructure is required.

5. A Certificate of Public Convenience and Necessity (CPCN), As-Built Approval by the Comptroller of Water Rights and a Construction Permit from the Drinking Water Officer must be obtained for the proposed community water system. Notification from the Comptroller that requirements related to water supply have been met is required prior to tender of subdivision plans for examination and approval by the Provincial Approving Officer.

   Contact information for CPCN:
   http://www.env.gov.bc.ca/wsd/contacts/water_utilities.html
   Contact your Health Authority about Construction Permits for drinking water systems.

6. Proposed subdivision roads to be dedicated and established a minimum of twenty (20) metres in width or three (3) metres beyond the extremities of cuts or fills, whichever is greater, terminating in cul-de-sacs. Additional right of way outside of the constructed turnaround areas is required at 3 m beyond the

extremities of cuts or fills, or a minimum of 1.0 m beyond the ditch.

7. Applicant to provide 6 meter by 6 meter corner truncations at the all intersections as per the Provincial Public Undertakings Regulation #513/2004, Part 3, Section 11.

8. Applicant must complete the attached Design Criteria Checklist to accompany preliminary design drawings for proposed new public road servicing proposed lots 1-16 and proposed lots 24-50 AND from the end of the pavement on Fernie Ski Hill Road. Design Criteria Sheet to be submitted to the Development Technician for approval prior to submitting the road design. Please refer to Chapter 1400 of the BC Supplement to TAC Geometric Design Guide.

9. Proposed subdivision road (Timberlanding Crescent) servicing Lots 24 through 50 shall be designed and constructed from Alpine Road terminating in a 15 meter radius cul-de-sac.

   Fernie Ski Hill Road shall be designed and constructed from end of current pavement to intersection with proposed subdivision road (Resort Drive).

   Proposed subdivision road (Resort Drive) servicing Lots 1 through 16 shall be designed and constructed from Fernie Ski Hill Road terminating in a 15 meter radius cul-de-sac.

   Prior to commencement of any works the applicant shall provide to the Ministry for their written approval, engineered drawings of the three sections of road mentioned above. The drawings shall include a minimum of the plan view, vertical alignment, horizontal alignment and cross-section. The design shall incorporate approved drainage plan features and recommendations from Groundtech Engineering Ltd. November 2015 Geotechnical Site Investigation Report.

   The drawings shall be submitted in a manner and scale as per the BC Supplement to TAC Geometric Design Guide - Chapter 1400. The applicant must also submit a Construction Quality Control Plan prepared by a Professional Engineer. Road Design and Construction Quality Control Plans must be submitted for approval by Ministry of Transportation & Infrastructure prior to construction start up. The roads shall be constructed to a paved standard.

10. The applicant is to retain a Professional Engineer to supervise and certify that all road construction has been completed in accordance with the latest edition of the Ministry's Standard Specifications for Highway Construction. Along with the written certification, the Professional Engineer shall be responsible for submission of as-built drawings, inspection reports, photographs of different stages of construction, a list of material sources, sieve analysis of all granular material and compaction testing results. Compaction testing results shall be a minimum of one test at ten (10) metre increments or stations and all road base

materials shall be compacted such that 100% Standard Proctor Density is achieved as described in Section 202 of the Standard Specifications for Highway Construction.

11. Engineered projects within Ministry of Transportation & Infrastructure rights of way or proposed right of way dedication must comply with this Ministry's Engineer of Record and Field Review Guidelines which can be found on our website at http://www.th.gov.bc.ca/publications/Circulars/All/T_Circ/2009/t06-09%20.pdf.

    In accordance with those Guidelines, this project will require that the Coordinating Professional Engineer be identified before any designs are approved.

12. Applicant may wish to provide the road design to all utility companies in regard to utility placement within newly dedicated road dedication.

13. It is the responsibility of the developer to ensure that the installation of any new signs (regulatory, etc) meet the Ministry standards as specified by the Catalogue of Standard Traffic Signs, 2010 edition. These signs shall be purchased and installed prior to the completion of the subdivision, by the applicant.

14. The intersection works associated with the construction of the newly dedicated roads, at Alpine Way and Timberline Cresent as well as works along Fernie Ski Hill Road, will require a valid Permit for Works in the Right of Way from the Ministry of Transportation & Infrastructure. Application can be found at: http://www.th.gov.bc.ca/permits/H0020.asp

15. As the property appears to contain a water course (Currie Creek), the Registrar of Land Titles may require return to Crown of that water course. The BCLS you engage is advised to check with the Registrar prior to commencement of the legal survey.

16. Applicant shall submit a copy of approval from Ministry of Forests, Lands and Natural Resource Operations (FLNRO) stating approval for any works deemed to require approval under Section 9 of the Water Act.

17. Provincial records indicate the proposed development is located within an area with only limited potential to contain archaeological sites protected by the Heritage Conservation Act.

    However, the applicant should be aware that there is still a chance that the lot may contain previously unrecorded archaeological material that is protected under the Heritage Conservation Act. This would most likely be indicated by the presence of areas of dark-stained soils containing conspicuous amounts of fire-stained or fire-broken rock, artifacts such as arrowheads and other stone tools, or even buried human remains. If such material is encountered during demolition or construction, a Heritage Conservation Act Permit may be needed

before further development is undertaken. This may involve the need to hire a qualified archaeologist to monitor the work.

Please contact the Archaeology Branch immediately at (250) 953-3334 if archaeological site deposits are encountered on the subject property.

18. The property being subdivided is within a wildfire interface area and may be subject to a hazard of wildfire. It is therefore recommended that the owner consult the following website and review the Firesmart Manual for information about reducing the risk, http://www.pssg.gov.bc.ca/firecom/pdf/homeowner-firesmart.pdf or contact the Ministry of Forests and Range for more information. Appropriate protection measures should be implemented and maintained, and property purchasers should be advised of the risk.

The approval granted is only for the general layout of the subdivision and is valid for one year from the date of this letter. However, if at any time there is a change in legislation or regulations this preliminary layout approval is subject to review and may be cancelled.

Submission of Final Plans (Survey Plan Certification and Application to Deposit) to be accompanied by a current Tax Certificate (FIN 55), together with a plan examination fee of $50.00 plus $100.00 per lot created by the plan (for a Total of $5,050.00). If paying by cheque, make payable to the Minister of Finance.

If you have any questions please feel free to call Christine Nichol at (250) 426-1202.

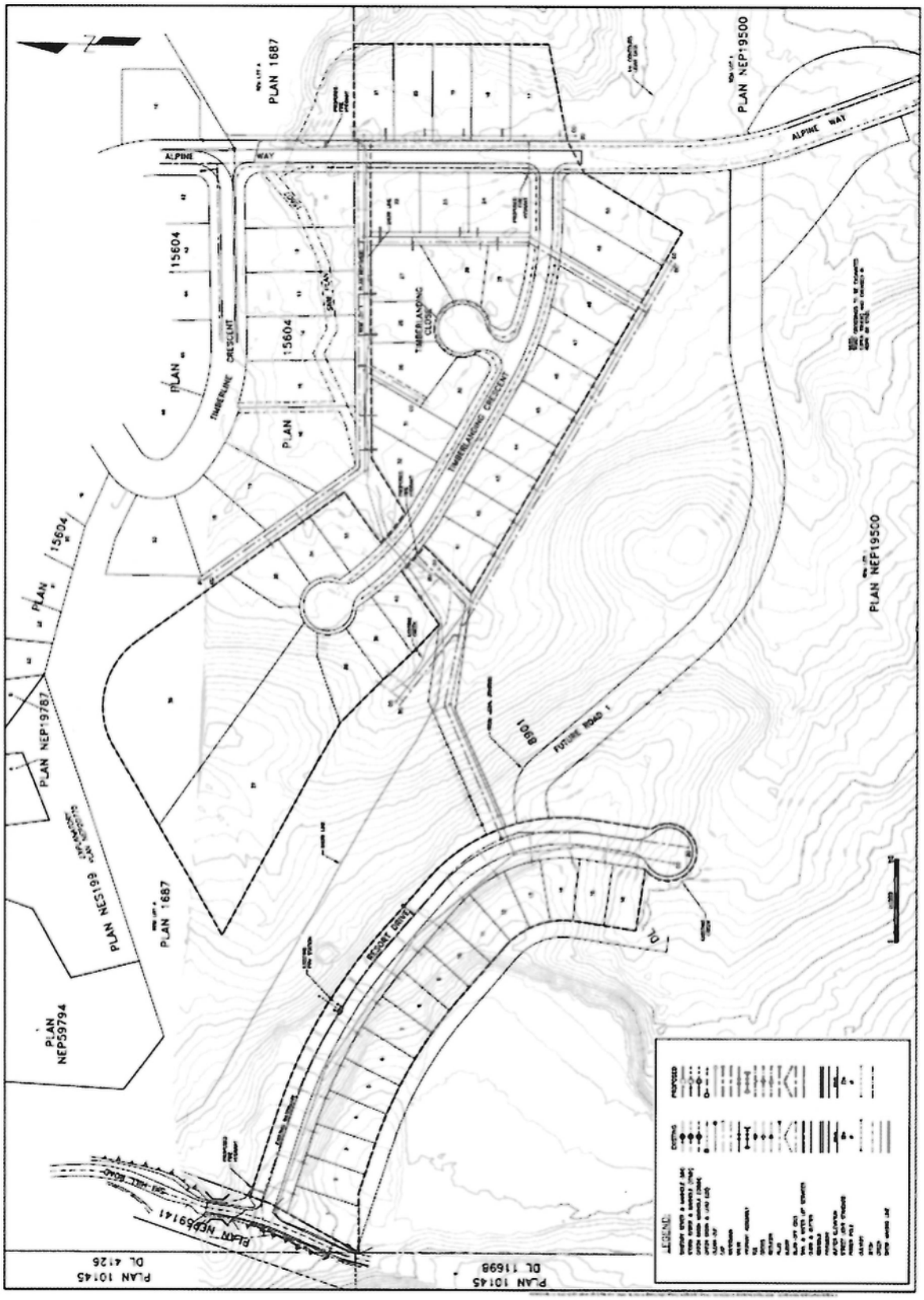
Please quote file number 2014-05407 when contacting this office.

Signed on behalf of Provincial Approving Officer
by

Christine Nichol
District Development Technician

Attachments

cc: Telus Engineering
Regional District of East Kootenay


PLAN 1687
PLAN NEP19500
ALPINE WAY
15604
TIMBERLINE CRESCENT
TIMBERLANDING CRESCENT
TIMBER LANDING CLOSE
PLAN NEP19787
PLAN NES199
PLAN NEP59794
PLAN NEP69141
PLAN 10145
DL 4126
DL 11698
FUTURE ROAD 1
8901
RESORT DRIVE
70
LEGEND

Waisvisz, Cora TRAN:EX

From:	Ron s.22 Horton s.22
Sent:	Tuesday, January 3, 2017 9:09 PM
To:	Ihas, Michele D TRAN:EX; Nichol, Christine TRAN:EX; Bernie Borkenhagen; Mary Lazimbat; Patrick Majer; Andy Cohen; Michele Bates; Mike Director Area A.
Subject:	Meeting with RCR and Timberline Residents
Attachments:	RCR meeting minutes 120716.docx

To all:

Attached are the minutes to a meeting between several Timberline Residents and RCR held in early December. The intent of the meeting was primarily to followup on the note from Michelle Ihaas earlier in the fall regarding the issues around Timberlanding Development and to review her comments on the six options as presented by the residents. As you can see from the minutes, other issues were discussed.

One of the outstanding items was for Patrick to clarify with Michelle her comments regarding option two - the keyhole installation on Alpine Way. Patrick, with holiday season behind us, perhaps you could raise this on your priority list.

Regards

Ron Horton

Meeting Minutes

RCR and Timberline Crescent Residents

December 7, 2016

Attendance:

- Ron Horton
- Mary Lazimbat
- Bernie Borkenhagen
- Andy Cohen
- Patrick Majer

Objective of the Meeting:

- To review MOTI's response to the 6 options presented by the residents
- To discuss what RCR is prepared to do to address residents concerns with respect to traffic from Phase 1 development on Alpine Way, given MOTI's response.

The meeting opened with a request from the residents for RCR to discuss what the long term plans are for development of the ski hill beyond Phase 1 given that RCR now owns the land south of Alpine Way and MOTI has advised that the road system must be available to access RCR lands to the south.

- Andy and Patrick said that there are no specific or detailed plans at this time. It is a big unknown. There are only concepts.
- The current construction road will likely become the main road into the multi residential units of Phase 2. While this road is in the latest OCP it is in a different location. The construction road is on the north side of the creek while the road in the OCP is on the south side of the creek. RCR felt that building a road on the north side of the creek would be less problematic than the south side due to creek crossings.
- The OCP does not include the land that RCR recently purchased and there is no requirement to have it included in the OCP until RCR decides to develop.
- The tentative plan is to have the "construction road" extend to the south and join the extension of Alpine Way which will (may) then extend to a secondary access on the highway. This is a tentative concept and subject to many factors. This concept is not filed with either the RDEK or MOTI and there is no requirement to do so until they develop the lands further.
- 51 houses have been approved in Phase 1.
- Ron Horton asked for a commitment from RCR to not apply for a permit for future land development in a manner that would require access from such new development onto Timberline Crescent. RCR was not willing to provide such a commitment as they had no way of anticipating their needs in the future and felt that they could not provide such a commitment in the absence of knowing what RCR's needs might be in the future
- In the interest of disclosure, Andy Cohen advised that he has owned the multi-development lot in Phase 1 since 1999.

The meeting continued with a discussion of Michelle Ihas' response to the 6 options presented by the residents. An excerpt of that letter is as follows:

Option 1: Baz Greenspace + MOTI Construction Road:
Alpine Way provides access to lands beyond. Even though RCR now owns the property to the south, Alpine Way is the reasonable and legal access to this land. I feel it is unreasonable at this point to ask RCR to build the "construction" road to public road standards prior to the approval of Timberlanding Phase I. Furthermore, the 2000 Traffic Impact Assessment (TIA) recommends a through connection south of Timberline Village be included in the road network plans. This layout is also supported in the OCP.

Option 2: Keyhole at end of Phase I Timberlanding:
Terminating Alpine Way at a cul-de-sac at the intersection with Timberlanding Crescent seems reasonable for Phase 1, although the remainder of Alpine Way would need to remain an open legal right of way with future potential construction depending on results of a new TIA. See comments in Option 1.

Option 3: Connector Road Alternative:
I have asked RCR to comment on this option.

Option 4: Accelerate 2nd Access to Highway 3:
This is not a reasonable request at this time. This will be considered at a subsequent phase and with a recommendation in the new TIA.

Option 5: MOTI Construction Road:
I am of the opinion that upgrading the construction road to MOTI standards is not a reasonable request at this point in the process. This would entail additional geotechnical, engineering design and construction costs. See comments under Option 1.
Operations staff is not in favour of Timberline Crescent being a one-way street.
Stop signs at Timberline and Alpine corner are supported. In fact, we will be requiring RCR to install 5 new stop signs. See attached stop sign location document.

Option 6: Timberlanding Road Connected to MOTI Construction Road:
Having two parallel roads is not good land use planning. See comments for Option 1 and 5 regarding the building of the "construction" road to MOTI standards, reference to the 2000 TIA and the current OCP.

- RCR confirmed that a connector road (Option 3) cannot be built due to the lay of the land.
- RCR did express an interest in Option 2 - **Keyhole at end of Phase I Timberlanding.** They require ending Phase 1 with a keyhole crescent. It was agreed though that a TIA (traffic impact assessment) requested by MOTI could justify breaking through that keyhole for subsequent phases. Patrick did say that building that keyhole would present a problem for the house down the road. A "driveway" would have to be built to accommodate those residents.
- Additional discussion was held on possible traffic mitigation measures as the residents felt that additional traffic caused by the phase I development will have a negative impact. The intersection of lower Timberline Crescent and Ski Hill Road was viewed as problematic, especially in the winter with icy road conditions.
- It was agreed that Patrick would approach Michelle Ihas to get clarification on what she meant about her comments with regards to Option 2. Everyone felt that there was some ambiguity that needed to be clarified. Patrick will connect with Ms. Ihas and let Mary Lazimbat know of progress. Patrick will also discuss possible traffic mitigation strategies with Ms. Ihas.

Ron Horton told RCR about the very strong level of frustration and dissatisfaction by many residents of Timberline Crescent over the end result of the Phase 1 layout and development

process following what we thought was a promise not to make a linkage to Timberline Crescent from Timberlanding.

The meeting closed with contact from Patrick to Michelle Ihas as being the one action item to follow up on. The residents will need to engage MOTI on traffic calming measures on Timberline Crescent in the future.

Page 24 to/à Page 27

Withheld pursuant to/removed as

DUPLICATE

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

SUBDIVISION DESIGN CRITERIA SHEET

Project: Timberlanding – **Resorts of the Canadian Rockies**
eDAS File #: **2014-05407**
Your File #:

Design Element		Present Conditions	MoT Guidelines Criteria	Proposed Project Criteria	Achieved Project Criteria	Comments / Notes *
Road Classification						
Posted Speed		km/h	N/A	km/h	km/h	
Design Speed		km/h	km/h	km/h	km/h	
Curb & Gutter or Open Shoulder			Open Shld			
Basic # of Lanes			2			
Minimum Horiz. Curve Radius		m	m	m	m	T 1420.A.1
Min K Factor on Vertical Curve	Crest					T 1420.A.1
	Sag					
Maximum Grade		%	10%	%	%	T 1420.A.1
Maximum Superelevation		%	%	%	%	T 1420.A.1
Minimum Stopping Sight Distance		m	m	m	m	T 1420.A.1
Finished Top Width		m	m	m	m	T 1420.E
Paved Width		m	m	m	m	T 1420.E
Gravel Shoulder Width		m	m	m	m	T 1420.E
Cul-de-sac or Hammerhead (Fig. 1420.F – L)			Cul-de-sac			T 1420.G
Clear Zone - Offset Width		m	4m	m	m	S 620.13
Minimum Right-of-Way Width		m	20m	m	m	S 1410.01.01
Catchment Width in Rock Cuts		m	0.6m	m	m	F 1420.D
AADT/SADT (xxxx *Design Year*)						
Truck Volume		%	%	%	%	
Design Vehicle			I-BUS			
Intersection Type (Local, Collector, Arterial, T Intersection, Protected T) (Fig. 710.D – H)			Collector			S 710.G.1
Driveway Access Type (Residential or Commercial; Fig. 1420.O or BC Supp. Sect. 730 Type 1A, 1B, 2A, 2B)			Residential			F 730.A
			Type 1A			

** - Justification for deviation from guidelines and proposed mitigation must be referenced by footnote number and documented on the following page(s).*

MoT CRITERIA: District Development Approvals: _____ Date: _____
(Print Name)

PROPOSED CRITERIA: Engineer of Record: _____ Date: _____
(if proposed or achieved criteria is different than MoT criteria) *(Print Name)*

ACCEPTED BY: Regional Mgr, Engineering: _____ Date: _____
(for exceptions to standards) ☐Prop. ☐Achvd *(Signature)*

ACCEPTED BY: Chief Engineer: _____ Date: _____
(for major exceptions to standards) *(Signature)*

Project:
eDAS File #:
Your File #:

Comments / Notes:

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

Application Summary
eDAS File Number: 2014-05407

Subdivision Application:

Subdivision Type: Conventional **No. of Lots:** 52
Selected Office: Rocky Mountain District
Applicant File Number: 010048836

Land Use:
Local Government: RDEK
Property Zoning: CG-8 RR8 RS2
Existing Land Use: Residential **Intended Land Use:** Residential

Surrounding Land Use:
North:
South:
East:
West:
Services:
Proposed Sewage Disposal: Community System **(If other)**
Proposed Water Supply: Community System **(If other)**

MINISTRY OF TRANSPORTATION
RECEIVED
NOV - 4 2014
ROCKY MOUNTAIN DISTRICT
CRANBROOK, BC

Location:

Order Location

Legal Description: Lot 1 District Lots 4128 and 8901 Kootenay District Plan NEP19500

Legal Description: Lot A District Lot 8901 Kootenay District Plan 1687 Except pains 101045, 15604, 17500, 19857, R368, NEP23072, NEP59141, and NEP59794

Subdivision Application Details:

Required Items Include:

- ☑ An authorization letter from the owner if someone else, such as an agent, is applying on the owner's behalf
- ☑ Original plus five copies of a scaleable sketch plan of proposed layout.
  The sketch must include the approximate grades and widths of roads and a design profile, preferably including a cross-section of the proposed road.
  Properly engineered drawings will be required for final approval. The sketch should contain:
  - ☑ The date it was drawn
  - ☑ The scale
  - ☑ North arrow
  - ☑ Legal description of the property being subdivided, and its adjacent properties
  - ☑ Outline of the subdivision in red or heavy black line
  - ☑ All proposed lots, remainders, parks, rights of way, easements and roads showing dimensions and areas
  - ☐ Any existing property lines or roads proposed to be removed, closed or relocated
  - ☐ All steep banks or slopes exceeding 2 m high and all slopes of 25% or greater, within or adjacent to the proposal area
  - ☐ Location of existing buildings and structures on the property and adjacent properties within 30m of property boundaries
  - ☐ Location of any onsite water sources to be developed
  - ☐ Approximate location of all existing and proposed utility services
  - ☑ Existing access roads and other roads and trails on the property (state names of roads)
  - ☐ Site locations of the soil inspection test holes and the percolation tests on each parcel
  - ☐ Approximate extent of area available for sewage disposal surrounding the test holes
  - ☐ Location of sewage disposal system and wells on adjacent properties within 30 m of property boundaries
- ☑ One copy of the current State of Title Certificate so that property encumbrances can be checked
- ☐ Copies of any covenants, easements, rights-of-way or other charges registered against the title. These are available through the Land Title Office
- ☑ A copy of Contaminated Sites Profile form or Contaminated Sites declaration statement, duly completed and signed

Application Summary
eDAS File Number: 2014-05407

Include these items as well, where applicable

- ☐ A copy of the Provincial Agricultural Land Commission application (if located within ALR). While a developer can apply for subdivision approval before he or she receives permission to proceed from the Agricultural Land Commission or the local government if it has been delegated the authority, the Provincial Approving Officer can only give approval if the property has cleared the Land Commission process in the meantime.
- ☐ One copy of any test required by the Regional Health Authority
- ☐ A Development Permit and plan where applicable.
- ☐ A copy of BC Assessment Authority Tax Notice showing property tax classification.

Attachments:

Filename	File Description	Classification
Signed Site Profile.pdf	Site Profile	Document
010048836 Subdivision App!	Letter of Support	Document
Title Lot 1.pdf	Title	Legal Document
Timberlanding - PLA.pdf	Old PLA	Document
Signed Letter of Authorizaito	Letter of Authorization	Legal Document
010048836-PSUB3-R2.pdf	Plan	Plan
Title Lot A.pdf	Title	Legal Document

Subdivision Application Project Details:

Project Description: 52 lots Fernie Ski Hill

Other Information:

Subdivision Application Parties:

Type	Name/Company	Address	Role
Applicant	Cranbrook Office, Focus - Focus Corporation	303 - 535 Victoria Avenue N, Cranbrook, British Columbia V1C 6S3	
Owner	Majer, Patrick - Resorts of the Canadian Rockies		
Contact	Macdonald, Rob - WSP/Focus		Primary

I. CONTACT IDENTIFICATION

A. Name of Site Owner

Last Name | First Name | Middle Initial(s)

(and/or, if applicable)

Company: Resorts of the Canadian Rockies Inc.

Owner's Civic Address: 1505-17th Avenue SW

City: Calgary | Province/State: AB

Country: Canada | Postal/Zip Code: T2T 0E2

B. Person Completing Site Profile (Leave blank if same as above):

Last Name: Majer | First Name: Patrick | Middle Initial(s)

(and/or, if applicable)

Company: Resorts of the Canadian Rockies

C. Person to Contact Regarding the Site Profile:

Last Name: Majer | First Name: Patrick | Middle Initial(s)

(and/or, if applicable)

Company: Resorts of the Canadian Rockies Inc.

Mailing Address: 1505-17th Avenue SW

City: Calgary | Province/State: AB

Country: Canada | Postal/Zip Code: T2T 0E2

Telephone (###) ###-#### : 403-209-3598 | Fax (###) ###-#### : 403-228-1544

II. SITE IDENTIFICATION

Please attach a site map with your application

All Property

Coordinates (using the North American Datum 1983 convention) for the centre of the site:

Latitude	Degrees		Minutes		Seconds	
Longitude	Degrees		Minutes		Seconds	

Please attach a map of appropriate scale showing the boundaries of the site.

For Legally Titled, Registered Property

Site Address (if applicable)

City

Postal Code

PID numbers and associated legal descriptions.

PID	Legal Description	Add	Delete
008-445-648	Lot A, DL 8901, KD Plan 1687 Except Plans 10145,15604,17500,18957, R368, NEP23072, NEP59141, and NEP59794	+	-
017-470-013	Lot 1, DL 4128 and 8901, KD Plan NEP 19500	+	-

Total number of titled parcels represented by this site profile

2

For Untitled Crown Land

PIN numbers and associated Land Description (if applicable).

PIN	Land Description	Add	Delete
		+	-

Total number of untitled crown land parcels represented by this site profile

(and, if available)

Crown Land File Numbers (comma separated)

III. COMMERCIAL AND INDUSTRIAL PURPOSES OR ACTIVITIES

Please indicate below, in the format of the example provided, which of the industrial and commercial purposes and activities from Schedule 2 have occurred or are occurring on this site.

EXAMPLE

Schedule 2 Reference	Description
E1	appliance, equipment or engine repair, reconditioning, cleaning or salvage
F10	solvent manufacturing or wholesale bulk storage

Schedule 2 Reference	Description	Add	Delete
		+	-

IV. AREAS OF POTENTIAL CONCERN

Is there currently or to the best of your knowledge has there previously been on the site any (please mark the appropriate column opposite the question):		**YES**	**NO**
A.	Petroleum, solvent or other polluting substance spills to the environment greater than 100 litres?	☐	☑
B.	Residue left after removal of piled materials such as chemicals, coal, ore, smelter slag, air quality control system baghouse dust?	☐	☑
C.	Discarded barrels, drums or tanks?	☐	☑
D.	Contamination resulting from migration of substances from other properties?	☐	☑

V. FILL MATERIALS

Is there currently or to the best of your knowledge has there previously been on the site any deposit of (please mark the appropriate column opposite the question):		**YES**	**NO**
A.	Fill dirt, soil, gravel, sand or like materials from a contaminated site or from a source used for any of the activities listed under Schedule 2?	☐	☑
B.	Discarded or waste granular materials such as sand blasting grit, asphalt paving or roofing material, spent foundry casting sands, mine ore, waste rock or float?	☐	☑
C.	Dredged sediments, or sediments and debris materials originating from locations adjacent to foreshore industrial activities, or municipal sanitary or stormwater discharges?	☐	☑

VI. WASTE DISPOSAL

Is there currently or to the best of your knowledge has there previously been on the site any landfilling, deposit, spillage or dumping of the following materials (please mark the appropriate column opposite the question):		YES	NO
A.	Materials such as household garbage, mixed municipal refuse, or demolition debris?	☐	☑
B.	Waste or byproducts such as tank bottoms, residues, sludge, or flocculation precipitates from industrial processes or wastewater treatment?	☐	☑
C.	Waste products from smelting or mining activities, such as smelter slag, mine tailings, or cull materials from coal processing?	☐	☑
D.	Waste products from natural gas and oil well drilling activities, such as drilling fluids and muds?	☐	☑
E.	Waste products from photographic developing or finishing laboratories; asphalt tar manufacturing; boilers, incinerators or other thermal facilities (e.g. ash); appliance, small equipment or engine repair or salvage; dry cleaning operations (e.g. solvents); or from the cleaning or repair of parts of boats, ships, barges, automobiles or trucks, including sandblasting grit or paint scrapings?	☐	☑

VII. TANKS OR CONTAINERS USED OR STORED, OTHER THAN TANKS USED FOR RESIDENTIAL HEATING FUEL

Are there currently or to the best of your knowledge have there been previously on the site any (please mark the appropriate column opposite the question):		YES	NO
A.	Underground fuel or chemical storage tanks other than storage tanks for compressed gases?	☐	☑
B.	Above ground fuel or chemical storage tanks other than storage tanks for compressed gases?	☐	☑

VIII. HAZARDOUS WASTES OR HAZARDOUS SUBSTANCES

Are there currently or to the best of your knowledge have there been previously on the site any (please mark the appropriate column opposite the question):		YES	NO
A.	PCB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored?	☐	☑
B.	Waste asbestos or asbestos containing materials such as pipe wrapping, blown-in insulation or panelling buried?	☐	☑
C.	Paints, solvents, mineral spirits or waste pest control products or pest control product containers stored in volumes greater than 205 litres?	☐	☑

IX. LEGAL OR REGULATORY ACTIONS OR CONSTRAINTS

To the best of your knowledge are there currently any of the following pertaining to the site (please mark the appropriate column opposite the question):		YES	NO
A.	Government orders or other notifications pertaining to environmental conditions or quality of soil, water, groundwater or other environmental media?	☐	☑
B.	Liens to recover costs, restrictive covenants on land use, or other charges or encumbrances, stemming from contaminants or wastes remaining onsite or from other environmental conditions?	☐	☑
C.	Government notifications relating to past or recurring environmental violations at the site or any facility located on the site?	☐	☑

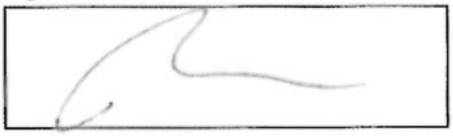
X. ADDITIONAL COMMENTS AND EXPLANATIONS

(Note 1: Please list any past or present government orders, permits, approvals, certificates and notifications pertaining to the environmental condition, use or quality of soil, surface water, groundwater or biota at the site.
Note 2: If completed by a consultant, receiver or trustee, please indicate the type and degree of access to information used to complete this site profile. Attach extra pages, if necessary):

XI. SIGNATURES

The person completing the site profile states that the above information is true based on the person's current knowledge as of the date completed.

Signature



→ **OR:** ☑ By checking this box, I declare that the information contained in this form is complete and accurate information.

Date Signed (MMM/DD/YY)

10/08/14

OFFICIAL USE

Reason for submission *(Please check one or more of the following)*

- ☐ Soil removal
- ☐ Subdivision application
- ☐ Zoning application
- ☐ Development permit
- ☐ Variance permit
- ☐ Demolition permit

Local Government contact:

Name

Agency

Address

Telephone (###) ###-####

Fax (###) ###-####

E-mail

Date Received (YYYY-MM-DD)

Date Submitted to Site Registrar (YYYY-MM-DD)

Date forwarded to Director of Waste Management: (YYYY-MM-DD)

WSP | FOCUS

November 3, 2014

File No.: 010048836

Ministry of Transportation and Infrastructure
19-24th Avenue South
Cranbrook, BC V1C 3H8

Attention :

RE: Subdivision Application for:
Parts of Lot 1 District Lots 4128 and 8901 Kootenay District Plan NEP19500 and Parts of Lot A, District Lot 8901 Kootenay District Plan 1687 except Plans 10145, 15604, 17500, 18957, R368, NEP23072, NEP59141 and NEP59794.

On behalf of our clients, Resorts of the Canadian Rockies Inc. the registered owners of the above referenced properties, we submit this subdivision application of the above referenced properties.

In support of our application we enclose the following:

- Completed subdivision application (eDAS)
- Fee cheques in the amount of $12 600 and $7000
- Supporting information
- Agent Authorization
- Site profile
- Copies of current titles
- Proposed subdivision plan (010048836 PSUB3-R2- 3 Sheets)
- Expired Preliminary Layout Approval (MOTI File 03-011-15507 Dated April 20, 2004)

We trust that you will find the enclosed in order and that the information we have provided is sufficient to process this application. If you have any questions or require further information please contact the undersigned at 250-489-8025 or rob.macdonald@wspgroup.com.

Sincerely,

FOCUS SURVEYS (BC) LIMITED PARTNERSHIP

Rob Macdonald, BCLS
Cranbrook Survey Manager

RM/cm

Focus
303-535 Victoria Avenue North
Cranbrook, BC V1C 6S3

Phone: +1 250-489-8025
Fax: +1 250-489-8053
www.focus.ca / www.wspgroup.com

Page 38 to/à Page 42

Withheld pursuant to/removed as

s.3

Waisvisz, Cora TRAN:EX

From: Patrick Majer <pmajer@skircr.com>
Sent: Thursday, January 18, 2018 10:55 AM
To: Welch, Darin TRAN:EX
Cc: Douglas Clapp, P.Eng.; Tracy Van de Wiel
Subject: RE: MoTI 2014-05407 - Stormwater
Attachments: Fernie Alpine Resort - Stormwater.pdf; FAR Master Design StrmWTR.pdf; STMWTR RPT.pdf; RPT Appendix.pdf

HI Darrin,

Yes the plan is in place and the Timberlanding area is covered by the plan. Attached is a copy of the report. Please make note of the attached maps, one the Stormwater master plan map and the second, a detailed map of the subdivision.

The report identifies two drainage channels, Currie Drainage and SRW 15607 that border the development (North & South) and will also serve the development, both have been preserved and protected during construction.

The second map shows the current subdivision and its relation to the two channels:

The first Channel, (Currie) will serve the upper lots. We intend on registering a SRW (similar to 15607) over this channel. The channels runs dry by late summer most years but flows quite heavy in the spring runoff as it captures runoff from the Currie Bowl.
The second channels serves the lower area and already had culverts in place crossing Alpine Way and Timberlanding Cres. The culvert under Alpine Way was extended to accommodate the Sewer line crossing, as it is outside of the road prism. This drainage flows year round as it begins by capturing two springs, identified on the map. This Drainage Channel has a SRW registered over it already, phase 2 of the development will see this SRW extended over the remainder of the channel.

Also please note, Sediment and Erosion Control was put in place at the end of the upper road and also at various point in the SRW channel. Douglas Clapp from Geo Tech eng. provided some oversight in the area as they were overseeing the fill being placed at the end of the upper road and also prepared the Geo Technical report for the area. I have cc'd him on this email as I believe the RDEK had similar questions.

I have also cc'd Tracy from the RDEK on this email. From my understanding the RDEK will not create a local service area for FAR as the Stormwater system is managed and maintained by the local utility – FARUC, who also provide the Water and Sanitary service for FAR. Funds to maintain the system are collected thru the Rent Charge, registered on most properties at FAR.

Patrick

From: Welch, Darin TRAN:EX [mailto:Darin.Welch@gov.bc.ca]
Sent: Wednesday, January 17, 2018 4:26 PM

To: Patrick Majer
Subject: MoTI 2014-05407 - Stormwater

Hi Patrick,

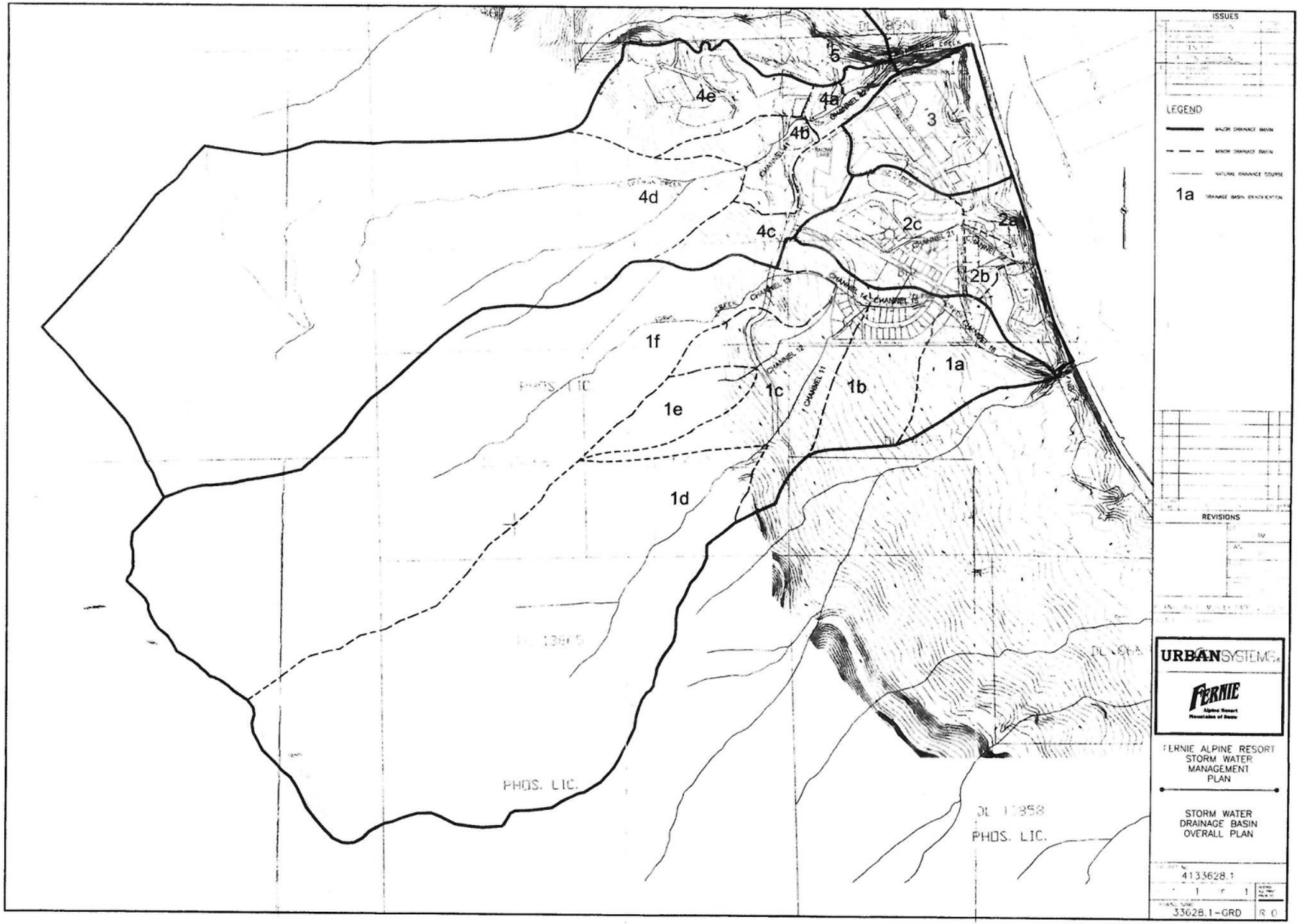
Just wondering if you have addressed condition 4 of this file? The PAO wants MoTI to have confirmation that stormwater reports previously conducted for other projects are relevant and have been evaluated in conjunction with the road design and prior to construction. The condition reads as follows:

manner consistent with the Engineer's report.

Stormwater management has been considered in previous phases of this development, which was addressed in a report prepared by Urban Systems in February 2000. Recommendations of that report were addressed in an earlier Preliminary Layout Approval (PLA) dated April 20, 2004. The 2004 PLA required implementation of stormwater management plan, based on the recommendations of this report.
Please provide written confirmation that this plan is in place and whether or not the Regional District of East Kootenay has created a local service area for management of this system.
If a stormwater management plan is in place it must be clear that the subject lands being reviewed at this time are included in the existing plan, or whether or not additional infrastructure is required.

Thanks,
Darin

Darin Welch (BGIS, BRM) | ***Development Approvals*** | ***Ministry of Transportation and Infrastructure***
Rocky Mountain District - Cranbrook
Ph: 250.426.1596
Cell: 250.919.3146
darin.welch@gov.bc.ca
Development Approvals Website: http://www.th.gov.bc.ca/DA


ISSUES
LEGEND
MAJOR DRAINAGE BASIN
MINOR DRAINAGE BASIN
NATURAL DRAINAGE COURSE
1a DRAINAGE BASIN IDENTIFICATION
REVISIONS
URBANSYSTEMS
FERNIE
Alpine Resort
Mountains of Snow
FERNIE ALPINE RESORT
STORM WATER
MANAGEMENT
PLAN
STORM WATER
DRAINAGE BASIN
OVERALL PLAN
4133628.1
33628.1-GRD
R 0
5
4e
4a
4b
3
4d
4c
2c
2a
2b
1f
1c
1b
1a
1e
1d
CHANNEL 11
CHANNEL 12
CHANNEL 13
CHANNEL 14
CHANNEL 15
CHANNEL 16
CHANNEL 21
PHOS. LIC.
PHOS. LIC.

APPENDIX A

Tables and Graphs

Table A-1 : Data from Natural Catchments in Hydrologic Zone 9 (with area <100km2)

Location	Code	Area (km2)	Period	Years of data	Overall Mean	Mean Flow l/s/km2 10 year	25 year	50 year	100 year	200 year	Coeff of skew	Comment
Albert River at 1310m contour	08NF005	70	1973-87	15	214.0	283	325	356	387	418	2.24	Exclude all but Gumbel
Bower Creek near mouth	08NA067	2	1972-82	11	40.9	67.7	81.2	90.8	100	109	0.54	
Caithness Creek near Galloway	08NG009	39	1914-15,29,50-55	9	93.7	111	113	113	114	115	-1.35	exclude Gumbel
Carbon Tie Creek near McMurdo	08NA087	8	1925-26,29,31,67-74	10	52.9	97	123	143	163	183	1.05	exclude Normal
Connaught Creek above diversion	08NB018	12	1981-86	6	381.0	698	983	1250	1560	1920	1.79	Exclude all but log Pearson
Dry Gulch Creek near Radium Jn	08NA056	4	1964-74	11	5.7	13	20	25	31	38	1.39	exclude Gumbel
Edelweiss Creek near Golden	08NB004	1	1928-29,63-64,67-74	12	81.4	107	119	127	135	143	0.32	
Gray Creek at the mouth	08NK019	84	1970-87	18	85.0	125	143	155	167	178	0.36	
Horner Creek above diversions	08NK026	6	1982-87	6	174.0	223	247	264	280	296	0.17	
Hospital Creek near Golden	08NB002	54	1915,17-18,27-29,63-64	8	73.2	132	208	290	400	543	2.36	Exclude Gumbel & Pearson
Kimberley Creek near Kimberley	08NG057	15	1968-73	6	51.0	78	86	91	95	98	-0.3	exclude Gumbel
Lewis Creek near Ta Ta Creek	08NG049	27	1950-54	5	52.3	64	70	73	77	80	0.26	
Miller Creek near 1160m contour	08NG083	7	1978-83	6	45.1	57	63	67	71	74	0.06	
Phillips Creek near Rossville	08NG048	53	1948-64	17	106.0	152	172	187	200	213	0.06	
Red Canyon Creek near Flagstone	08NG035	16	1928,38-43	7	266.0	342	422	498	592	704	0.69	Exclude all but Normal
Split Creek at the mouth	08NB016	81	1974-87	13	124.0	165	186	200	214	229	0.67	
Ta Ta Creek near Ta Ta Creek	08NG026	18	1927-29,38-39,65-66	7	8.7	10	11	11	12	12	-0.08	
Wolf Creek near Ta Ta Creek	08NG032	30	1928-30,50-54	8	28.8	40	44	46	48	50	0.14	exclude Gumbel
Average of selected stations (shaded) from Hydrologic Zone 9					**108**	**152**	**174**	**190**	**205**	**220**		
				Maximum	173	223	247	264	280	296		
				Minimum	52.9	96.8	123.0	142.7	162.7	178.0		

Table A-2 : Data from Natural Catchments in Hydrologic Zone 8 (with area <100km2)

Location	Code	Area (km2)	Period	Years of data	Overall Mean	Mean Flow l/s/km2 10 year	25 year	50 year	100 year	200 year	Coeff of skew	Comment
Akokli Creek near Boswell	08NH102	51	1948-52	5	115	160	181	195	209	223	0.43	
Anderson Creek near Nelson	08NJ130	9	1945-50,67-87	27	93	166	210	244	279	315	1.08	Exclude normal
Arrow Creek near Ehkolo	08NH084	79	1945,47-51,53-67,69-87	27	173	236	261	278	293	307	0.23	?
Camp Run Creek near Canyon	08NH009	5	1921-27,30-31,64-68	14	103	256	480	727	1065	1520	1.81	Exclude Gumbel & Pearson
Christian Creek near Perry Siding	08NJ069	3	1929,68-74	8	27						0.19	
Coffee Creek near Ainsworth	08NH101	87	1948-52	5	258	330	342	347	351	354	-1.27	Exclude Gumbel
Davis Creek near Crawford Bay	08NH019	1	1924-29	6	45						0.59	
Duck Creek near Wynndel	08NH016	87	1921-24,45-54,79-87	23	89	134	156	172	187	201	0.68	
Falls Creek above B.I.D diversion	08NJ163	33	1981-86	6	218	254	269	279	289	298	-0.03	
Fell Creek near Nelson	08NJ129	4	1967-87	21	116	176	206	227	247	267	0.59	
Five Mile Creek above City Intake	08NJ168	47	1983-87	5	288	354	379	395	410	424	0.11	Exclude Gumbel
Goose Creek near Cresent Valley	08NJ112	84	1971-81	11	181	250	288	316	343	371	0.33	
Harrop Creek near Harrop	08NJ027	42	1925-26,30,68-70,73-74	12	114	178	220	252	285	320	1.98	
Hendryx Creek near Riondel	08NH070	5	1940-43,52,54	6	60	71	77	80	83	87	0.13	
Hidden Creek near the mouth	08NE114	75	1973-87	15	170	237	280	312	345	379	1.77	Exclude Pearson & log Pearson
Huggard Creek near Wynndel	08NH010	3	1921-24,27,65-66	7	22	39	56	71	89	110	1.19	Exclude Gumbel & Pearson
Kelly Creek at 850m contour	08NE113	23	1971-82	12	174	263	309	325	347	368	0.22	
Laird Creek near Balfour	08NJ019	15	1947,49-50,60-61	5	291	451	546	617	687	758	1.46	Exclude log pearson
Lister Creek near Canyon	08NH082	1	1945-50	6	78	117	137	153	168	183	0.62	
McFayden Creek near Vallican	08NJ126	6	1981-84,87	5	141	165	178	187	196	204	0.56	Exclude Normal
McGregor Creek near Crawford Bay	08NH020	4	1925-29	5	11.3						0.98	
Narrows Creek near Proctor	08NJ020	22	1946-50	5	135	259	436	642	938	1370	2.04	Exclude all but Log Pearson
Redfish Creek near Harrop	08NJ061	26	1968-87	20	291	379	418	445	470	494	0.42	Exclude Gumbel
Sandy Creek above Relkoff Diversion	08NJ167	11	1982-85,87	5	165	246	306	356	410	470	1.67	
Selous Creek near Nelson	08NJ098	15	1954,68-75	9	292	487	593	671	746	821	0.61	Exclude Pearson
Smoky Creek above diversions	08NJ162	6	1981-87	7	80.2	144	201	252	312	382	1.87	Exclude Gumbel & Pearson
Sullivan Creek near Canyon	08NH115	6	1964-87	24	54.8	77	87	93	99	105	0.48	
Sutherland Creek above power line	08NJ153	2	1968-70,72-74	6	16.2						-0.47	
Thompson Creek near Kitchener	08NH085	8	1946-48,75-82	11	74.9	103	107	108	110	110	-1.3	Exclude Gumbel
Wilds Creek near Wynndel	08NH015	1	1921-23,26,28-29	6	7.2						1.3	
Wynndel Creek near Creston	08NH012	2	1921-25,62-67	11	10.5						0.4	
Average of selected stations (shaded) from Hydrologic Zone 8					149	219	253	278	301	325		
				Maximum	291	379	418	445	470	494		
				Minimum	83	134	156	172	187	201		

Table A-3 : Otthymo Model Input Data for Catchments

ID number	1a	1b	1c	1d	1e	1f	4a	4b	4c	4d	4e
Area (ha)	17	20	34	152	16	161	12	6	17	217	24
Dry Weather Flow	0	0	0	0	0	0	0	0	0	0	0
CN	60	60	60	60	60	60	60	60	60	60	60
Time to Peak (hrs)	0.23	0.36	0.29	0.47	0.2	0.58	0.28	0.17	0.30	0.6	0.26

Table A-4 : Otthymo Model Input Data for Channels

Parameter							
ID number	11	12	14	15	16	41	42
Channel Length	710	475	150	300	630	350	420
Channel Slope	15.49%	13.68%	14.00%	5.33%	6.67%	10.00%	13.10%
Mannings roughness	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Cross section co-ordinates	0/2	0/2	0/2	0/2	0/2	0/2	0/2
	4/0	4/0	4/0	4/0	4/0	4/0	4/0
	5.5/0	5.5/0	5.5/0	5.5/0	5.5/0	5.5/0	5.5/0
	9.5/2	9.5/2	9.5/2	9.5/2	9.5/2	9.5/2	9.5/2

Table A-5 : Estimation of Flow Depths and Velocities in Channels

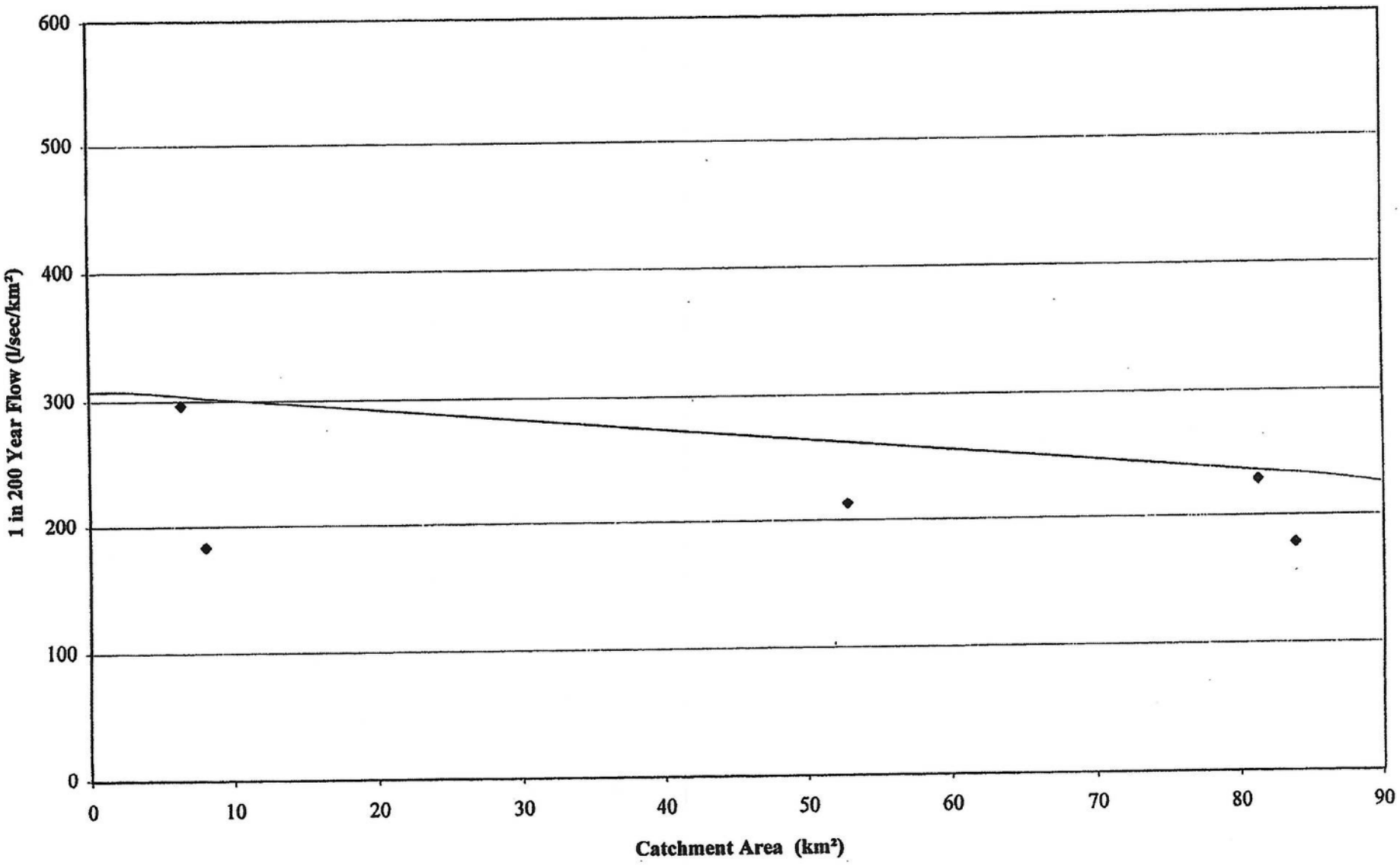
- based on runoff rate of 600 l/s/km²
- see plan at rear of report for catchment areas and channel locations

Catchments	Area ha	1 in 200 flow m³/sec
1a	17	0.10
1b	20	0.12
1c	34	0.20
1d	152	0.91
1e	16	0.10
1f	161	0.97
2a	12	0.07
2b	4	0.02
2c	22	0.13
3	24	0.14
4a	6	0.04
4b	12	0.07
4c	17	0.10
4d	217	1.30
4e	24	0.14

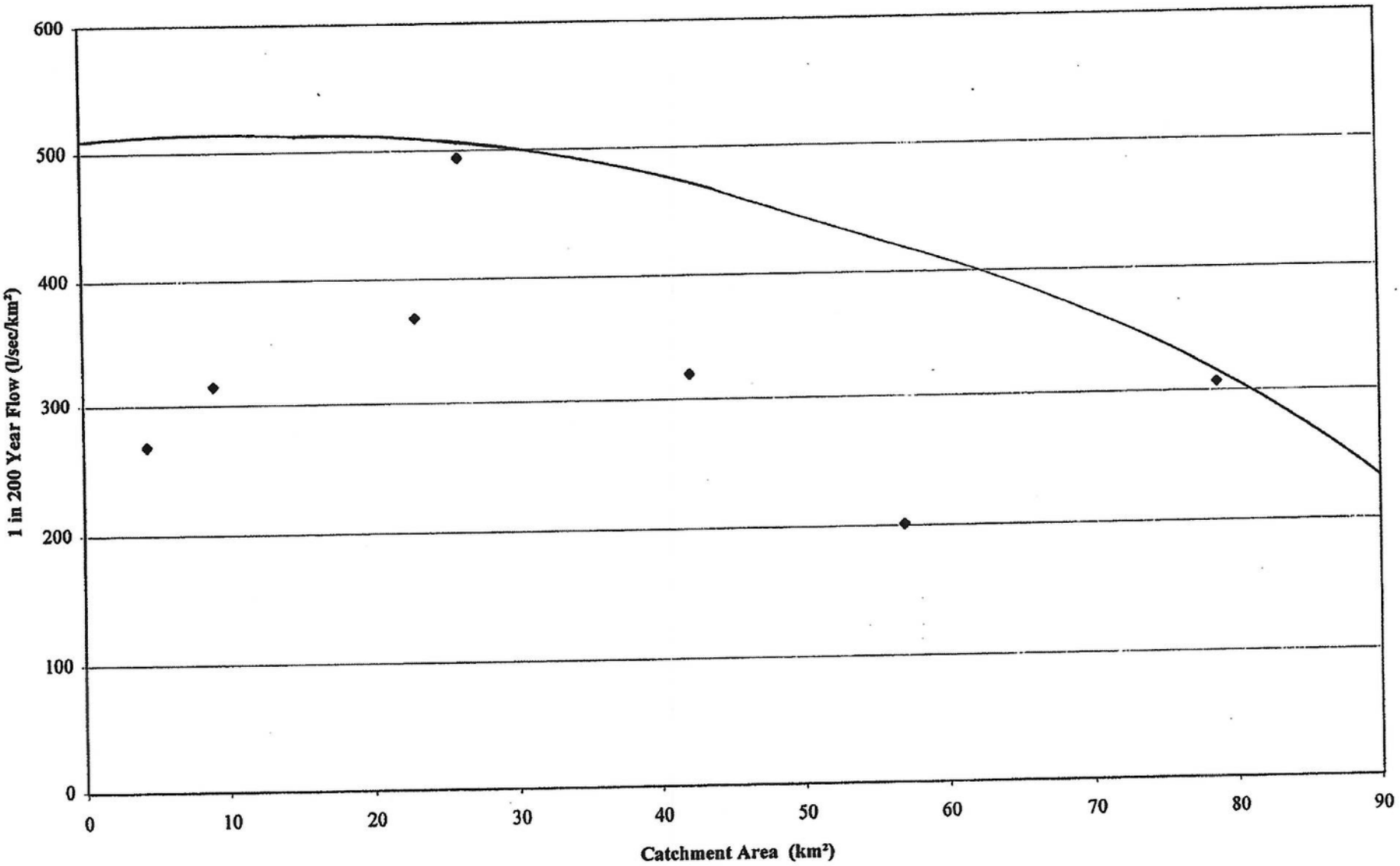
Channels	Contributing catchments	Peak channel flow m³/sec	Ave channel slope %	Min channel slope %	Depth for ave slope m	Depth for min slope m	Velocity for ave slope m/s	Culvert Size (CSP) mm
11	1c, 1d	1.12	15%	14%	0.26	0.27	2.8	1000
14	1e, 1f	1.06	14%	6%	0.26	0.33	2.2	1000
15	1b, 1c,1d,1e, 1f	2.30	5%	5%	0.53	0.53	2.1	1400
16	1a, 1b, 1c,1d,1e, 1f	2.40	8%	4%	0.46	0.54	2.7	1400
above 41	4d	1.30	10%		0.32		2.5	1200
41	4b, 4d	1.37	10%		0.33		2.6	1200
42	4a, 4b, 4c, 4d, 4e	1.66	13%		0.34		3.0	1200
21	2c	0.13	5%	3%	0.11	0.13	1.0	500
22	2c, 2b	0.16	19%	8%	0.08	0.11	1.7	500

Culvert sizing based on the following: culvert projecting from fill, inlet control, round corrugated steel pipe and headwater depth in diameters = 1 (no ponding).

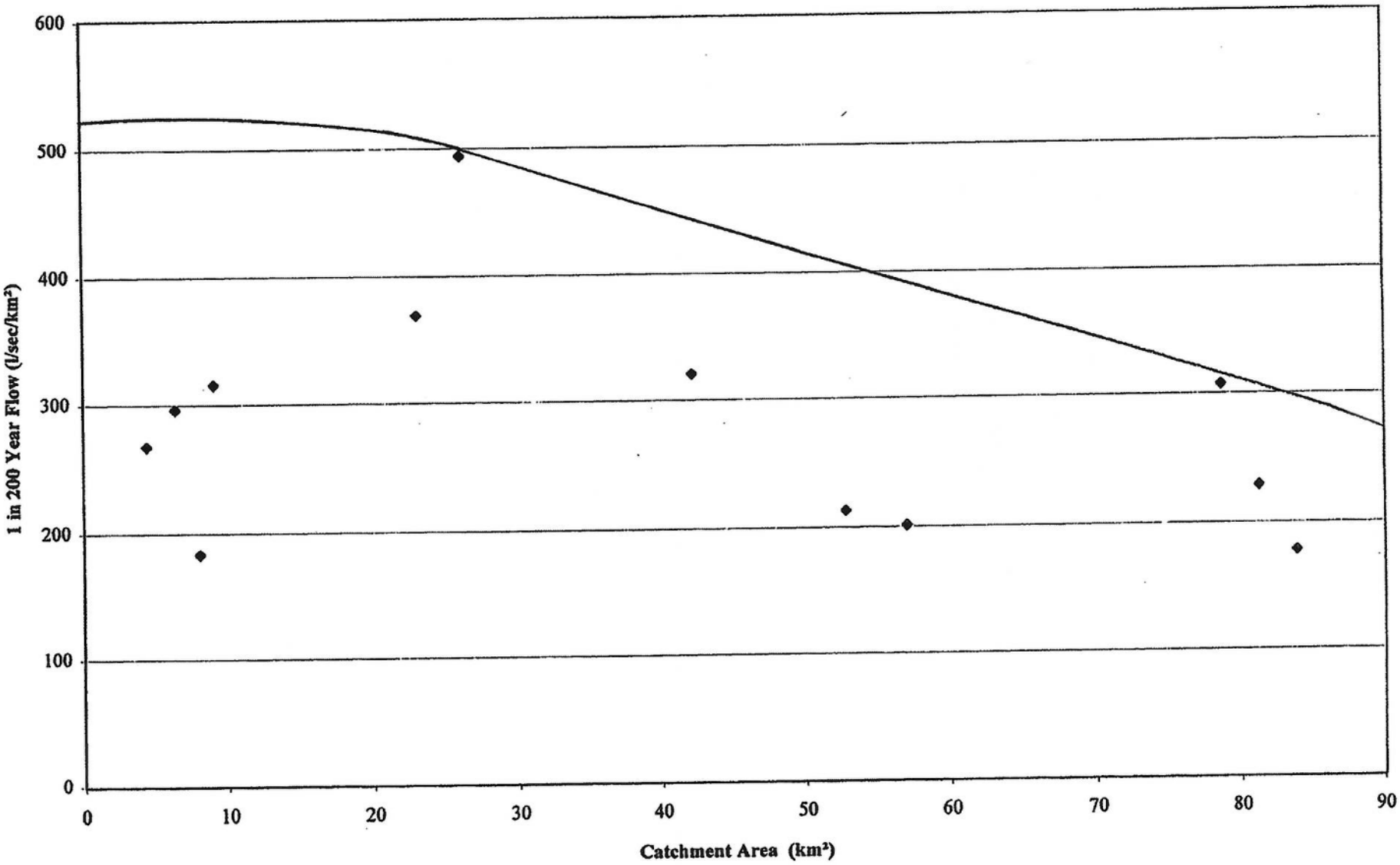
Graph A-1 : 1 in 200 Year Flow versus Catchment Area for Zone 9



Graph A-2 : 1 in 200 Year Flow versus Catchment Area for Zone 8



Graph A-3 : 1 in 200 Year Flow versus Catchment Area for Zones 8 and 9



APPENDIX B

Visual Otthymo Printouts

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 1.0
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    HHHHH    Y    M M M  O   O   Licensed To:
O   O    T      T    H   H    Y    M   M  O   O   Urban Systems Ltd.
 OOO     T      T    H   H    Y    M   M   OOO    v0101-0050
```

Distributed by Greenland Engineering Group. Trademark (TM), Paul Wisner & Assoc., 1996.

***** S U M M A R Y O U T P U T *****

Input filename: Q:\McCormack\Fernie\Area 1 - Final.ott
Output filename: Q:\McCormack\Fernie\Area 1 - Final-1detail.txt
Summary filename: Q:\McCormack\Fernie\Area 1 - Final-1summary.txt

DATE: 3/9/00 TIME: 2:17:27 PM

USER: CAM

Area 1 - Currie Creek

```
*****************************
** SIMULATION NUMBER:   1 **
*****************************
```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C. mm	Qbase cms
START @ .00 hrs								
CHIC STORM [Ptot= 77.41 mm]		10.0						
SCSHYD [CN=60.0] [N = 4.8:Tp .36]	0012 1	10.0	20.00	.14	8.50	8.94	.12	.000
SCSHYD [CN=60.0] [N = 4.8:Tp .20]	0015 1	10.0	16.00	.14	8.33	9.19	.12	.000
CHANNEL[2 : 0015]	0012 1	10.0	16.00	.13	8.33	9.19	n/a	.000
SCSHYD [CN=60.0] [N = 4.8:Tp .58]	0016 1	10.0	161.00	.96	8.83	8.91	.12	.000

ADD [0012 + 0016]	0004	3	10.0	177.00	1.04	8.83	8.94	n/a	.000
CHANNEL[2 : 0004]	0014	1	10.0	177.00	1.04	8.83	8.94	n/a	.000
SCSHYD [CN=60.0] [N = 4.8:Tp .29]	0013	1	10.0	34.00	.26	8.50	8.99	.12	.000
SCSHYD [CN=60.0] [N = 4.8:Tp .47]	0014	1	10.0	152.00	.98	8.67	8.92	.12	.000
ADD [0013 + 0014]	0001	3	10.0	186.00	1.20	8.67	8.93	n/a	.000
CHANNEL[2 : 0001]	0011	1	10.0	186.00	1.24	8.67	8.93	n/a	.000
ADD [0014 + 0011]	0005	3	10.0	363.00	2.24	8.67	8.93	n/a	.000
ADD [0012 + 0005]	0006	3	10.0	383.00	2.38	8.67	8.93	n/a	.000
CHANNEL[2 : 0006]	0015	1	10.0	383.00	2.37	8.67	8.93	n/a	.000
SCSHYD [CN=60.0] [N = 4.8:Tp .23]	0011	1	10.0	17.00	.14	8.33	9.11	.12	.000
ADD [0015 + 0011]	0012	3	10.0	400.00	2.48	8.67	8.94	n/a	.000
CHANNEL[2 : 0012]	0016	1	10.0	400.00	2.51	8.83	8.94	n/a	.000

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 1.0
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    HHHHH    Y    M M M  O   O   Licensed To:
O   O    T      T    H   H    Y    M   M  O   O   Urban Systems Ltd.
 OOO     T      T    H   H    Y    M   M   OOO    v0101-0050
```

Distributed by Greenland Engineering Group. Trademark (TM), Paul Wisner & Assoc., 1996.

******* D E T A I L E D O U T P U T *******

Input filename: Q:\McCormack\Fernie\Area 1 - Final.ott
Output filename: Q:\McCormack\Fernie\Area 1 - Final-1detail.txt
Summary filename: Q:\McCormack\Fernie\Area 1 - Final-1summary.txt

DATE: 3/9/00 TIME: 2:17:27 PM

USER: CAM

Area 1 - Currie Creek

```
**************************
** SIMULATION NUMBER:  1 **
**************************
```

CHICAGO STORM
Ptotal= 77.41 mm

IDF curve parameters: A=1161.000
B= 4.600
C= .809
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	.64	6.17	2.16	12.17	1.90	18.17	.90
.33	.65	6.33	2.34	12.33	1.84	18.33	.89
.50	.66	6.50	2.57	12.50	1.78	18.50	.88
.67	.67	6.67	2.85	12.67	1.73	18.67	.87
.83	.68	6.83	3.21	12.83	1.68	18.83	.86
1.00	.70	7.00	3.69	13.00	1.63	19.00	.85
1.17	.71	7.17	4.37	13.17	1.59	19.17	.84
1.33	.73	7.33	5.40	13.33	1.54	19.33	.83
1.50	.74	7.50	7.18	13.50	1.51	19.50	.82

1.67	.76	7.67	11.05	13.67	1.47	19.67	.81
1.83	.78	7.83	27.44	13.83	1.43	19.83	.80
2.00	.79	8.00	132.70	14.00	1.40	20.00	.79
2.17	.81	8.17	36.39	14.17	1.37	20.17	.78
2.33	.83	8.33	18.53	14.33	1.34	20.33	.77
2.50	.85	8.50	12.55	14.50	1.31	20.50	.76
2.67	.87	8.67	9.57	14.67	1.28	20.67	.76
2.83	.90	8.83	7.78	14.83	1.26	20.83	.75
3.00	.92	9.00	6.59	15.00	1.23	21.00	.74
3.17	.95	9.17	5.73	15.17	1.21	21.17	.73
3.33	.98	9.33	5.08	15.33	1.19	21.33	.72
3.50	1.01	9.50	4.58	15.50	1.16	21.50	.72
3.67	1.04	9.67	4.17	15.67	1.14	21.67	.71
3.83	1.07	9.83	3.84	15.83	1.12	21.83	.70
4.00	1.11	10.00	3.56	16.00	1.10	22.00	.70
4.17	1.15	10.17	3.32	16.17	1.08	22.17	.69
4.33	1.20	10.33	3.11	16.33	1.07	22.33	.68
4.50	1.24	10.50	2.93	16.50	1.05	22.50	.68
4.67	1.29	10.67	2.78	16.67	1.03	22.67	.67
4.83	1.35	10.83	2.63	16.83	1.02	22.83	.66
5.00	1.42	11.00	2.51	17.00	1.00	23.00	.66
5.17	1.49	11.17	2.40	17.17	.99	23.17	.65
5.33	1.56	11.33	2.29	17.33	.97	23.33	.65
5.50	1.65	11.50	2.20	17.50	.96	23.50	.64
5.67	1.75	11.67	2.12	17.67	.94	23.67	.63
5.83	1.87	11.83	2.04	17.83	.93	23.83	.63
6.00	2.00	12.00	1.97	18.00	.92	24.00	.62

DESIGN SCS(0012)	Area (ha)= 20.00	Curve Number (CN) = 60.0
ID= 1 DT=10.0 min	Ia (mm)= 0.2 S	# of Linear Res.(N)= 5.00
	U.H. Tp(hrs)= .36	

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 3.063

PEAK FLOW (cms)= .144 (i)
TIME TO PEAK (hrs)= 8.500
RUNOFF VOLUME (mm)= 8.940
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .115

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

DESIGN SCS(0015)	Area (ha)= 16.00	Curve Number (CN) = 60.0
ID= 1 DT=10.0 min	Ia (mm)= 0.2 S	# of Linear Res.(N)= 5.00
	U.H. Tp(hrs)= .20	

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 4.411

PEAK FLOW (cms)= .138 (i)
TIME TO PEAK (hrs)= 8.333
RUNOFF VOLUME (mm)= 9.189
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .119

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ROUTE CHN (0012) |
| IN= 2---> OUT= 1 |     Routing time step (min)'= 10.00
--------------------
              <------ DATA FOR SECTION (   1.2) ------>
              Distance      Elevation       Manning
                  .00          2.00          .0450
                 4.00           .00          .0450
                 5.50           .00          .0450
                 9.50          2.00          .0450

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH     ELEV       VOLUME     FLOW RATE     VELOCITY   TRAV.TIME
         (m)      (m)      (cu.m.)       (cms)         (m/s)      (min)
         .11      .11    .855E+02          .3          1.67       4.75
         .21      .21    .192E+03         1.0          2.48       3.19
         .32      .32    .320E+03         2.1          3.10       2.56
         .42      .42    .468E+03         3.6          3.61       2.19
         .53      .53    .638E+03         5.5          4.07       1.94
         .63      .63    .829E+03         7.8          4.49       1.76
         .74      .74    .104E+04        10.7          4.88       1.62
         .84      .84    .127E+04        14.1          5.24       1.51
         .95      .95    .153E+04        18.0          5.59       1.42
        1.05     1.05    .180E+04        22.5          5.92       1.34
        1.16     1.16    .210E+04        27.6          6.24       1.27
        1.26     1.26    .242E+04        33.3          6.55       1.21
        1.37     1.37    .275E+04        39.7          6.85       1.16
        1.47     1.47    .311E+04        46.8          7.14       1.11
        1.58     1.58    .349E+04        54.6          7.43       1.07
        1.68     1.68    .389E+04        63.2          7.71       1.03
        1.79     1.79    .432E+04        72.5          7.98        .99
        1.89     1.89    .476E+04        82.6          8.25        .96
        2.00     2.00    .523E+04        93.6          8.51        .93

                                    <---- hydrograph ---->   <-pipe / channel->
                                AREA    QPEAK    TPEAK   R.V.   MAX DEPTH  MAX VEL
                                (ha)    (cms)    (hrs)   (mm)     (m)       (m/s)
INFLOW : ID= 2 (0015)          16.00      .14     8.33    9.19      .05       1.67
OUTFLOW: ID= 1 (0012)          16.00      .13     8.33    9.19      .05       1.67


--------------------
| DESIGN SCS(0016) |   Area     (ha)= 161.00   Curve Number (CN)  = 60.0
|ID= 1 DT=10.0 min |   Ia       (mm)=  0.2 S   # of Linear Res.(N)= 5.00
--------------------   U.H. Tp(hrs)=    .58

     Ia as  0.2xS     (mm)=  33.867
     Unit Hyd Qpeak   (cms)=  15.305

     PEAK FLOW        (cms)=    .957 (i)
     TIME TO PEAK     (hrs)=   8.833
     RUNOFF VOLUME     (mm)=   8.910
     TOTAL RAINFALL    (mm)=  77.411
     RUNOFF COEFFICIENT   =    .115

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

ADD HYD (0004)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0012):	16.00	.133	8.33	9.19
	+ ID2= 2 (0016):	161.00	.957	8.83	8.91
	ID = 3 (0004):	177.00	1.042	8.83	8.94

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN (0014) | IN= 2---> OUT= 1 | Routing time step (min)'= 10.00

<------ DATA FOR SECTION (1.4) ------>

Distance	Elevation	Manning
.00	2.00	.0450
4.00	.00	.0450
5.50	.00	.0450
9.50	2.00	.0450

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.11	.11	.270E+02	.3	1.69	1.48
.21	.21	.607E+02	1.0	2.51	1.00
.32	.32	.101E+03	2.1	3.13	.80
.42	.42	.148E+03	3.6	3.66	.68
.53	.53	.202E+03	5.5	4.12	.61
.63	.63	.262E+03	7.9	4.54	.55
.74	.74	.329E+03	10.8	4.93	.51
.84	.84	.402E+03	14.2	5.30	.47
.95	.95	.482E+03	18.2	5.65	.44
1.05	1.05	.569E+03	22.7	5.99	.42
1.16	1.16	.663E+03	27.9	6.31	.40
1.26	1.26	.763E+03	33.7	6.63	.38
1.37	1.37	.870E+03	40.2	6.93	.36
1.47	1.47	.983E+03	47.4	7.23	.35
1.58	1.58	.110E+04	55.3	7.51	.33
1.68	1.68	.123E+04	63.9	7.80	.32
1.79	1.79	.136E+04	73.4	8.07	.31
1.89	1.89	.150E+04	83.6	8.34	.30
2.00	2.00	.165E+04	94.7	8.61	.29

		<---- hydrograph ----> AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2	(0004)	177.00	1.04	8.83	8.94	.21	2.52
OUTFLOW: ID= 1	(0014)	177.00	1.04	8.83	8.94	.21	2.52

DESIGN SCS(0013) | ID= 1 DT=10.0 min |

Area (ha)= 34.00 Curve Number (CN) = 60.0
Ia (mm)= 0.2 S # of Linear Res.(N)= 5.00
U.H. Tp(hrs)= .29

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 6.464

```
     PEAK FLOW          (cms)=     .256 (i)
     TIME TO PEAK       (hrs)=    8.500
     RUNOFF VOLUME       (mm)=    8.994
     TOTAL RAINFALL      (mm)=   77.411
     RUNOFF COEFFICIENT     =     .116

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

DESIGN SCS(0014)	Area (ha)= 152.00	Curve Number (CN) = 60.0
ID= 1 DT=10.0 min	Ia (mm)= 0.2 S	# of Linear Res.(N)= 5.00
	U.H. Tp(hrs)= .47	

```
     Ia as  0.2xS       (mm)=   33.867
     Unit Hyd Qpeak     (cms)=   17.832

     PEAK FLOW          (cms)=     .985 (i)
     TIME TO PEAK       (hrs)=    8.667
     RUNOFF VOLUME       (mm)=    8.916
     TOTAL RAINFALL      (mm)=   77.411
     RUNOFF COEFFICIENT     =     .115

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

ADD HYD (0001): 1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0013):	34.00	.256	8.50	8.99
+ ID2= 2 (0014):	152.00	.985	8.67	8.92
ID = 3 (0001):	186.00	1.203	8.67	8.93

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

ROUTE CHN (0011): IN= 2---> OUT= 1

```
     Routing time step (min)'= 10.00
```

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning
.00	2.00	.0450
4.00	.00	.0450
5.50	.00	.0450
9.50	2.00	.0450

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.11	.11	.128E+03	.3	1.77	6.67
.21	.21	.287E+03	1.1	2.64	4.49
.32	.32	.478E+03	2.2	3.29	3.59
.42	.42	.700E+03	3.8	3.85	3.08
.53	.53	.954E+03	5.8	4.33	2.73
.63	.63	.124E+04	8.3	4.78	2.48
.74	.74	.156E+04	11.4	5.19	2.28
.84	.84	.190E+04	15.0	5.58	2.12
.95	.95	.228E+04	19.1	5.95	1.99
1.05	1.05	.269E+04	23.9	6.30	1.88
1.16	1.16	.314E+04	29.3	6.64	1.78

1.26	1.26	.361E+04	35.5	6.97	1.70
1.37	1.37	.412E+04	42.3	7.29	1.62
1.47	1.47	.465E+04	49.8	7.60	1.56
1.58	1.58	.522E+04	58.1	7.90	1.50
1.68	1.68	.582E+04	67.2	8.20	1.44
1.79	1.79	.645E+04	77.2	8.49	1.39
1.89	1.89	.712E+04	87.9	8.78	1.35
2.00	2.00	.781E+04	99.6	9.05	1.31

		<---- hydrograph ---->			<-pipe / channel->	
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW :	ID= 2 (0001)	186.00	1.20	8.67	8.93	.22	2.70
OUTFLOW:	ID= 1 (0011)	186.00	1.24	8.67	8.93	.23	2.72

ADD HYD (0005)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0014):	177.00	1.045	8.83	8.94
	+ ID2= 2 (0011):	186.00	1.243	8.67	8.93
	ID = 3 (0005):	363.00	2.240	8.67	8.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0006)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0012):	20.00	.144	8.50	8.94
	+ ID2= 2 (0005):	363.00	2.240	8.67	8.93
	ID = 3 (0006):	383.00	2.375	8.67	8.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN (0015)
IN= 2---> OUT= 1

Routing time step (min) '= 10.00

<------ DATA FOR SECTION (1.5) ------>

Distance	Elevation	Manning
.00	2.00	.0450
4.00	.00	.0450
5.50	.00	.0450
9.50	2.00	.0450

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.11	.11	.540E+02	.2	1.04	4.80
.21	.21	.121E+03	.6	1.55	3.23
.32	.32	.202E+03	1.3	1.93	2.59
.42	.42	.296E+03	2.2	2.26	2.22

.53	.53	.403E+03	3.4	2.54	1.97
.63	.63	.524E+03	4.9	2.80	1.78
.74	.74	.657E+03	6.7	3.04	1.64
.84	.84	.804E+03	8.8	3.27	1.53
.95	.95	.965E+03	11.2	3.49	1.43
1.05	1.05	.114E+04	14.0	3.70	1.35
1.16	1.16	.133E+04	17.2	3.90	1.28
1.26	1.26	.153E+04	20.8	4.09	1.22
1.37	1.37	.174E+04	24.8	4.28	1.17
1.47	1.47	.197E+04	29.2	4.46	1.12
1.58	1.58	.221E+04	34.1	4.64	1.08
1.68	1.68	.246E+04	39.4	4.81	1.04
1.79	1.79	.273E+04	45.3	4.98	1.00
1.89	1.89	.301E+04	51.6	5.15	.97
2.00	2.00	.330E+04	58.4	5.31	.94

		<---- hydrograph ---->			<-pipe / channel->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0006)	383.00	2.38	8.67	8.93	.43	2.29
OUTFLOW: ID= 1 (0015)	383.00	2.37	8.67	8.93	.43	2.29

DESIGN SCS(0011)	Area (ha)=	17.00	Curve Number (CN) = 60.0
ID= 1 DT=10.0 min	Ia (mm)=	0.2 S	# of Linear Res.(N)= 5.00
	U.H. Tp(hrs)=	.23	

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 4.075

PEAK FLOW (cms)= .144 (i)
TIME TO PEAK (hrs)= 8.333
RUNOFF VOLUME (mm)= 9.109
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .118

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0012)
1 + 2 = 3

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0015):	383.00	2.374	8.67	8.93
+ ID2= 2 (0011):	17.00	.144	8.33	9.11
ID = 3 (0012):	400.00	2.475	8.67	8.94

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN (0016)
IN= 2---> OUT= 1

Routing time step (min)'= 10.00

<------ DATA FOR SECTION (1.6) ------>

Distance	Elevation	Manning
.00	2.00	.0450
4.00	.00	.0450
5.50	.00	.0450
9.50	2.00	.0450

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.11	.11	.113E+03	.2	1.16	9.02
.21	.21	.255E+03	.7	1.73	6.07
.32	.32	.424E+03	1.5	2.16	4.86
.42	.42	.621E+03	2.5	2.52	4.16
.53	.53	.846E+03	3.8	2.84	3.69
.63	.63	.110E+04	5.5	3.13	3.35
.74	.74	.138E+04	7.5	3.40	3.08
.84	.84	.169E+04	9.8	3.66	2.87
.95	.95	.203E+04	12.5	3.90	2.69
1.05	1.05	.239E+04	15.7	4.13	2.54
1.16	1.16	.278E+04	19.3	4.36	2.41
1.26	1.26	.320E+04	23.3	4.57	2.30
1.37	1.37	.365E+04	27.7	4.78	2.19
1.47	1.47	.413E+04	32.7	4.99	2.11
1.58	1.58	.463E+04	38.1	5.19	2.02
1.68	1.68	.517E+04	44.1	5.38	1.95
1.79	1.79	.573E+04	50.6	5.57	1.88
1.89	1.89	.631E+04	57.7	5.76	1.82
2.00	2.00	.693E+04	65.4	5.94	1.77

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0012)	400.00	2.48	8.67	8.94	.42	2.52
OUTFLOW: ID= 1 (0016)	400.00	2.51	8.83	8.94	.42	2.53

==========

```
================================================================================

      V    V   I    SSSSS  U   U    A    L
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO    TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 1.0
      O   O     T      T    H   H   Y Y   MM MM  O   O
      O   O     T      T    HHHHH    Y    M M M  O   O   Licensed To:
      O   O     T      T    H   H    Y    M   M  O   O   Urban Systems
       OOO      T      T    H   H    Y    M   M   OOO    V0101-0050

Distributed by Greenland Engineering Group. Trademark (TM), Paul Wisner & Assoc., 1996.
```

******* S U M M A R Y O U T P U T *******

```
  Input   filename: Q:\McCormack\Fernie\Area 4 - CN60 - No urban.ott
  Output  filename: Q:\McCormack\Fernie\Area 4 - CN60 - No urban-1detail.txt
  Summary filename: Q:\McCormack\Fernie\Area 4 - CN60 - No urban-1summary.txt

DATE: 2/23/00                                   TIME: 4:49:18 PM
USER: CAM
```

Area 4 - Boardman Creek

```
    ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************
```

COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C. mm	Qbase cms
START @ .00 hrs								
CHIC STORM		10.0						
[Ptot= 77.41 mm]								
SCSHYD	0044 1	10.0	217.00	1.27	8.83	8.91	.12	.000
[CN=60.0]								
[N = 4.8:Tp .60]								
CHANNEL[2 : 0044]	0004 1	10.0	217.00	1.26	9.00	8.91	n/a	.000
SCSHYD	0042 1	10.0	12.00	.09	8.33	9.01	.12	.000
[CN=60.0]								
[N = 4.8:Tp .28]								
ADD [0004 + 0042]	0008 3	10.0	229.00	1.32	8.83	8.91	n/a	.000
SCSHYD	0045 1	10.0	24.00	.19	8.33	9.04	.12	.000
[CN=60.0]								
[N = 4.8:Tp .26]								

ADD [0008 + 0045]	0010	3	10.0	253.00	1.45	8.83	8.93	n/a	.000
CHANNEL[2 : 0010]	0013	1	10.0	253.00	1.45	8.83	8.93	n/a	.000
SCSHYD [CN=60.0] [N = 4.8:Tp .30]	0043	1	10.0	17.00	.13	8.50	8.98	.12	.000
SCSHYD [CN=60.0] [N = 4.8:Tp .17]	0041	1	10.0	6.00	.05	8.17	9.21	.12	.000
ADD [0043 + 0041]	0014	3	10.0	23.00	.18	8.33	9.04	n/a	.000
ADD [0013 + 0014]	0015	3	10.0	276.00	1.57	8.83	8.94	n/a	.000

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 1.0
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    HHHHH    Y    M M M  O   O   Licensed To:
O   O    T      T    H   H    Y    M   M  O   O   Urban Systems
 OOO     T      T    H   H    Y    M   M   OOO    V0101-0050
```


***** D E T A I L E D O U T P U T *****

Input filename: Q:\McCormack\Fernie\Area 4 - CN60 - No urban.ott
Output filename: Q:\McCormack\Fernie\Area 4 - CN60 - No urban-1detail.txt
Summary filename: Q:\McCormack\Fernie\Area 4 - CN60 - No urban-1summary.txt

DATE: 2/23/00 TIME: 4:49:18 PM

USER: CAM

Area 4 - Boardman Creek

****
** SIMULATION NUMBER: 1 **
****

CHICAGO STORM
Ptotal= 77.41 mm

IDF curve parameters: A=1161.000
B= 4.600
C= .809
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	.64	6.17	2.16	12.17	1.90	18.17	.90
.33	.65	6.33	2.34	12.33	1.84	18.33	.89
.50	.66	6.50	2.57	12.50	1.78	18.50	.88
.67	.67	6.67	2.85	12.67	1.73	18.67	.87
.83	.68	6.83	3.21	12.83	1.68	18.83	.86
1.00	.70	7.00	3.69	13.00	1.63	19.00	.85
1.17	.71	7.17	4.37	13.17	1.59	19.17	.84
1.33	.73	7.33	5.40	13.33	1.54	19.33	.83

1.50	.74	7.50	7.18	13.50	1.51	19.50	.82
1.67	.76	7.67	11.05	13.67	1.47	19.67	.81
1.83	.78	7.83	27.44	13.83	1.43	19.83	.80
2.00	.79	8.00	132.70	14.00	1.40	20.00	.79
2.17	.81	8.17	36.39	14.17	1.37	20.17	.78
2.33	.83	8.33	18.53	14.33	1.34	20.33	.77
2.50	.85	8.50	12.55	14.50	1.31	20.50	.76
2.67	.87	8.67	9.57	14.67	1.28	20.67	.76
2.83	.90	8.83	7.78	14.83	1.26	20.83	.75
3.00	.92	9.00	6.59	15.00	1.23	21.00	.74
3.17	.95	9.17	5.73	15.17	1.21	21.17	.73
3.33	.98	9.33	5.08	15.33	1.19	21.33	.72
3.50	1.01	9.50	4.58	15.50	1.16	21.50	.72
3.67	1.04	9.67	4.17	15.67	1.14	21.67	.71
3.83	1.07	9.83	3.84	15.83	1.12	21.83	.70
4.00	1.11	10.00	3.56	16.00	1.10	22.00	.70
4.17	1.15	10.17	3.32	16.17	1.08	22.17	.69
4.33	1.20	10.33	3.11	16.33	1.07	22.33	.68
4.50	1.24	10.50	2.93	16.50	1.05	22.50	.68
4.67	1.29	10.67	2.78	16.67	1.03	22.67	.67
4.83	1.35	10.83	2.63	16.83	1.02	22.83	.66
5.00	1.42	11.00	2.51	17.00	1.00	23.00	.66
5.17	1.49	11.17	2.40	17.17	.99	23.17	.65
5.33	1.56	11.33	2.29	17.33	.97	23.33	.65
5.50	1.65	11.50	2.20	17.50	.96	23.50	.64
5.67	1.75	11.67	2.12	17.67	.94	23.67	.63
5.83	1.87	11.83	2.04	17.83	.93	23.83	.63
6.00	2.00	12.00	1.97	18.00	.92	24.00	.62

DESIGN SCS(0044)	Area (ha)= 217.00	Curve Number (CN) = 60.0
ID= 1 DT=10.0 min	Ia (mm)= 0.2 S	# of Linear Res.(N)= 5.00
	U.H. Tp(hrs)= .60	

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 19.941

PEAK FLOW (cms)= 1.268 (i)
TIME TO PEAK (hrs)= 8.833
RUNOFF VOLUME (mm)= 8.909
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .115

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ROUTE CHN (0004)	Routing time step (min)'= 10.00
IN= 2---> OUT= 1	

<------ DATA FOR SECTION (4.1) ------>

Distance	Elevation	Manning
.00	2.00	.0450
4.00	.00	.0450
5.50	.00	.0450
9.50	2.00	.0450

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.11	.11	.756E+02	.3	1.43	4.91
.21	.21	.170E+03	.9	2.12	3.30
.32	.32	.283E+03	1.8	2.65	2.64
.42	.42	.414E+03	3.0	3.09	2.27
.53	.53	.564E+03	4.7	3.48	2.01
.63	.63	.733E+03	6.7	3.84	1.82
.74	.74	.920E+03	9.1	4.17	1.68
.84	.84	.113E+04	12.0	4.48	1.56
.95	.95	.135E+04	15.4	4.78	1.47
1.05	1.05	.159E+04	19.2	5.06	1.38
1.16	1.16	.186E+04	23.6	5.34	1.31
1.26	1.26	.214E+04	28.5	5.60	1.25
1.37	1.37	.244E+04	34.0	5.86	1.20
1.47	1.47	.275E+04	40.0	6.11	1.15
1.58	1.58	.309E+04	46.7	6.35	1.10
1.68	1.68	.344E+04	54.0	6.59	1.06
1.79	1.79	.382E+04	62.0	6.82	1.03
1.89	1.89	.421E+04	70.7	7.05	.99
2.00	2.00	.462E+04	80.0	7.27	.96

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0044)	217.00	1.27	8.83	8.91	.26	2.33
OUTFLOW: ID= 1 (0004)	217.00	1.26	9.00	8.91	.26	2.32

DESIGN SCS(0042)	ID= 1 DT=10.0 min

Area (ha)= 12.00 Curve Number (CN) = 60.0
Ia (mm)= 0.2 S # of Linear Res.(N)= 5.00
U.H. Tp(hrs)= .28

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 2.363

PEAK FLOW (cms)= .092 (i)
TIME TO PEAK (hrs)= 8.333
RUNOFF VOLUME (mm)= 9.007
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .116

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0008)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0004):	217.00	1.262	9.00	8.91
+ ID2= 2 (0042):	12.00	.092	8.33	9.01
ID = 3 (0008):	229.00	1.324	8.83	8.91

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

DESIGN SCS(0045)	ID= 1 DT=10.0 min	Area (ha)= 24.00	Ia (mm)= 0.2 S	U.H. Tp(hrs)= .26	Curve Number (CN) = 60.0	# of Linear Res.(N)= 5.00

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 5.090

PEAK FLOW (cms)= .193 (i)
TIME TO PEAK (hrs)= 8.333
RUNOFF VOLUME (mm)= 9.041
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .117

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0010) | 1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0008):	229.00	1.324	8.83	8.91
+ ID2= 2 (0045):	24.00	.193	8.33	9.04
ID = 3 (0010):	253.00	1.448	8.83	8.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN (0013) | IN= 2---> OUT= 1 | Routing time step (min)'= 10.00

<------ DATA FOR SECTION (4.2) ------>

Distance	Elevation	Manning
.00	2.00	.0450
4.00	.00	.0450
5.50	.00	.0450
9.50	2.00	.0450

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.11	.11	.630E+02	.3	1.63	3.58
.21	.21	.142E+03	1.0	2.43	2.40
.32	.32	.236E+03	2.0	3.03	1.93
.42	.42	.345E+03	3.5	3.54	1.65
.53	.53	.470E+03	5.4	3.98	1.46
.63	.63	.611E+03	7.7	4.39	1.33
.74	.74	.767E+03	10.5	4.77	1.22
.84	.84	.939E+03	13.8	5.13	1.14
.95	.95	.113E+04	17.6	5.47	1.07
1.05	1.05	.133E+04	22.0	5.79	1.01
1.16	1.16	.155E+04	27.0	6.11	.96
1.26	1.26	.178E+04	32.6	6.41	.91

1.37	1.37	.203E+04	38.9	6.70	.87
1.47	1.47	.229E+04	45.8	6.99	.83
1.58	1.58	.257E+04	53.5	7.27	.80
1.68	1.68	.287E+04	61.8	7.54	.77
1.79	1.79	.318E+04	71.0	7.81	.75
1.89	1.89	.351E+04	80.9	8.07	.72
2.00	2.00	.385E+04	91.6	8.33	.70

	<---- hydrograph ---->			<-pipe / channel->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0010)	253.00	1.45	8.83	8.93	.26	2.66
OUTFLOW: ID= 1 (0013)	253.00	1.45	8.83	8.93	.26	2.66

DESIGN SCS(0043)	ID= 1 DT=10.0 min				
	Area (ha)= 17.00	Curve Number (CN) = 60.0
	Ia (mm)= 0.2 S	# of Linear Res.(N)= 5.00
	U.H. Tp(hrs)= .30	

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 3.124

PEAK FLOW (cms)= .128 (i)
TIME TO PEAK (hrs)= 8.500
RUNOFF VOLUME (mm)= 8.982
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .116

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

DESIGN SCS(0041)	ID= 1 DT=10.0 min				
	Area (ha)= 6.00	Curve Number (CN) = 60.0
	Ia (mm)= 0.2 S	# of Linear Res.(N)= 5.00
	U.H. Tp(hrs)= .17	

Ia as 0.2xS (mm)= 33.867
Unit Hyd Qpeak (cms)= 1.946

PEAK FLOW (cms)= .055 (i)
TIME TO PEAK (hrs)= 8.167
RUNOFF VOLUME (mm)= 9.211
TOTAL RAINFALL (mm)= 77.411
RUNOFF COEFFICIENT = .119

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0014)
1 + 2 = 3

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0043):	17.00	.128	8.50	8.98
+ ID2= 2 (0041):	6.00	.055	8.17	9.21
ID = 3 (0014):	23.00	.176	8.33	9.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0015) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)      (cms)     (hrs)      (mm)
          ID1= 1 (0013):    253.00    1.453      8.83      8.93
        + ID2= 2 (0014):     23.00     .176      8.33      9.04
          ================================================
          ID = 3 (0015):    276.00    1.574      8.83      8.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================
```


Drainge SRW 15607
(Channels 21&22)
S&E CNTRL - Silt Booms
Extent of Cnstrct
S&E CNTRL - Silt Booms
Proposed 2.0m Gravel Trail
Proposed 2.0m Gravel Trail
S&E CNTRL - Silt Fence
S&E CNTRL - Silt Booms
Currie Drainage (Channels 13-16)

STORMWATER MANAGEMENT MASTER PLAN

(SWMMP)

for

Fernie Alpine Resort

URBAN SYSTEMS ®

#140, 2723 – 37th Avenue NE
CALGARY, Alberta T1Y 5R8
Telephone: (403) 291-1193
Fax: (403) 291-1374

Our File: 4133628.1
Date: Feb. 2000

Table of Contents

Appendix A - Tables and Graphs

Appendix B – Visual Otthymo Printouts

Drawing – Drainage Basins Overall Plan

1. INTRODUCTION

An expansion to the existing development at Fernie Alpine Resort (FAR) is being proposed, and is now in the planning stages. An Official Community Plan (OCP) has been prepared for the resort, including the proposed expansion lands, and has been submitted for approval to the Regional District of East Kootenay (RDEK). A requirement of the OCP, prior to development taking place, is the preparation of a Stormwater Management Master Plan (SWMMP) to provide for the conveyance of drainage through the expansion area, and to protect the water quality of receiving watercourses from runoff resulting from development.

The existing FAR includes the following components:

- a ski area base that includes ski lifts, vehicle parking, three hotels/condotels, a day lodge, plus restaurants and minor commercial uses;
- a residential development called Timberline subdivision that was started in the 1980's (some condominium units and fourplexes remain to be completed);
- a residential and condotel development called Highline Estates Subdivision that was initiated in 1995, and is now nearing buildout.

Highline Estates subdivision, on the north area of FAR, was the most recent expansion at the FAR. It will be nearing full buildout in the 2000 construction season. A stormwater report for Highline Estates was prepared by Reid Crowther and Partners (RCPL) in August 1996. Their report dealt solely with stormwater quantities. This report will determine the peak runoff flow rates that must be conveyed through the development area. However, it will also consider the quality control of stormwater runoff from development before it reaches the receiving watercourse. Runoff quality will be of paramount importance in this SWMMP, as it relates both to construction activities, and to long term development of roads, utilities, buildings, associated parking, and other improvements.

2. STUDY AREA

The study area encompasses all drainageways that enter or flow through the FAR lands, existing and proposed. The enclosed plan shows available topographic information, 1 m contours from air photos for the developed area, and 5 m contours for the upper reaches of the drainage basins. These two different contour intervals have been "blended" at their interface, since they do not match exactly.

FAR is located south of the City of Fernie, and is situated in the lower reaches of drainageways that originate at the peak of the Lizard Range. The general drainage direction, for the most part, is in an east/northeasterly direction to the Elk River, which in turn flows south past the development area.

We have identified five (5) catchment areas that drain into and through FAR, and therefore form the study area.

A) Currie Creek

Currie Creek and its tributaries that flow through FAR form a 400 ha drainage basin that presently conveys runoff and groundwater through the lands that will form part of the new expansion area. This drainage basin has been designated Catchment #1 on our plan of drainage areas.

B) Boardman Creek

Boardman Creek, Catchment #4, extends up the mountain for a total area of 276 hectares. It includes the existing and proposed Village core, and most of Highline Estates in its lower reaches.

C) Catchments 2 & 3

Catchments 2 and 3 are smaller areas that are found between Currie Creek and Boardman Creek catchments, and do not extend up the mountain.

Catchment 2 includes a portion of the proposed expansion lands and Timberline Crescent, south leg. It includes a running stream or creek flowing through the rear of several lots on Timberline Cres. We assume that it is partially spring fed, due to the limited total catchment area of 38 ha. This area includes smaller subcatchments that drain directly across Hwy 3 before reaching the Elk River.

Catchment 3 includes only existing areas consisting of the Timberline Condominiums and the east leg of Timberline Crescent, and Ski Area Road south of the west leg of Timberline Crescent. It has a total area of 24 ha., and drains across Highway 3 by way of a culvert that drains direct to the Elk River.

D) Catchment 5

The northeast area of Highline Estates drains north to a north tributary of Boardman Creek, as shown on the plan at the rear of this document.

The attached plan delineates the drainage boundaries of each main catchment, and shows sub-catchment boundaries for Catchments 1 and 4 (Currie Creek and Boardman Creek). These sub-catchments have been delineated in order to determine the total area and associated flow rate that must be conveyed through any particular section of creek or channel, and culverts and road crossings at those locations.

Hazardous Lands Assessment/Debris Torrent

MoELP has previously expressed concern over the possibility of debris torrent occurring on site. This would be associated with Class 4 or 5 hazardous or unstable lands within the study area that could create a debris blockage that would then cause ponding or backup of runoff, with a major release some time later when the blockage gives way.

FAR hired Geo-Engineering (M.S.T.) Ltd. of Calgary, Alberta to complete a "Report on Development Conditions" in December 1998, for the FAR Expansion Lands (Report #G1513). As part of that report, a natural hazards assessment was undertaken. The report plan identified only Class 1, 2 and 3 areas, with no Class 4 or 5 areas. The following is quoted from page 8 of that report.

"5.0 NATURAL HAZARDS AND STABILITY ASSESSMENT

This assessment was undertaken in two stages. The first stage involved hazard identification, as required by Section 945 of the Municipal Act. This overview was followed by site-specific geotechnical investigations to determine development constraints, and mitigative measures pertaining to individual lots.

5.1 HAZARDS IDENTIFICATION AND EVALUATION

Black-and-white air photos for the development area, as well as the terrain upslope from the property, were first reviewed. Ground truthing of the area, including identified potential problem areas, was then completed during the field reconnaissance undertaken by Mr. Milos Stepanek, P. Eng. on March 30, 1998. The overview identified avalanches and landslides as natural hazards potentially occurring in this general area.

Avalanches are common within the uppermost segments of the mountain ridges above the ski area. Snow cornices develop along the ridge connecting Polar Peak and Grizzly Peak and avalanches descend through numerous chutes leading into the Lizard Bowl. Since the ski area controls the avalanches, they are usually small and do not reach the lower segments of Lizard Bowl. Notwithstanding the avalanche control measures, Lizard Bowl and the proposed subdivision area are separated by a ridge which is approximately parallel to the Elk and Bear ski runs

Several types of landslides occur in the general area. Rock slides are relatively common in the high country, and, for morphological reasons noted previously, these cannot impact the development area.

Smaller, but quite significant, slides also occur in the unconsolidated overburden, namely the glaciolacustrine deposits covering the lowermost slopes in the Elk River valley, along Ski Hill Road and the highway. Review of air photos and the field reconnaissance did not identify any active slope instabilities within the proposed subdivision area.

In the historical context, the ski area has been in operation since 1961 and during the past 27 years, there have been no natural hazard events that would have had an adverse impact on the studies property. Since there are no precedent-setting events in this general area, and the estimated relative probability of developing a landslide of even very modest magnitude is considerably less than 10 percent in 50 years, a formal risk assessment is not, in the writers' opinion, warranted."

We note that we have not included the second stage of the assessment as it pertains to individual lot construction.

From the above, we do not consider debris torrent to be a significant concern due to the lack of Class 4 and 5 natural hazardous areas within which a landslide or instability could occur. We also note that the steepness of the channels will limit the volume of water that could be held back by a blockage caused by logs, deadfall, windfall, or snow.

Runoff Quantity Control

Due to the large drainage areas draining through the site, we do not consider runoff quantity control to be of high priority in the expansion area, as the peak flow will not be greatly influenced by runoff from the relatively smaller developed areas. Also, the timing of the peak runoff from developed areas will not coincide with the timing of peak runoff from the undeveloped larger areas occurring later due to the length of time for runoff from the upper reaches of the catchment areas to reach the development areas.

Notwithstanding the above, detention of storm runoff from the development area should be encouraged and utilized where possible, such as in parking lots.

3. STORMWATER QUANTITY

Two methods were used to estimate the existing runoff from the study area that must be conveyed through Fernie Alpine Resort. The first method was to analyze historical runoff from similar watersheds, and use this data to estimate runoff for the Fernie Alpine Resort drainage area. The second method was to prepare a hydrologic computer model to determine the design runoff for the Fernie Alpine Resort catchment areas from a design storm event.

A) Method 1 – Historical Data Analysis

The resource used for peak stream flow estimation from historical data was the Ministry of Environment "Guide to Peak Flow Estimation for Ungauged Watersheds in the Kootenay (Nelson) Region". This resource divides the Kootenay Region into a number of hydrologic zones. Fernie Alpine Resort lies in hydrologic zone 9.

There are two main streams running through the Fernie Alpine Resort: Currie Creek; and Boardman Creek. The catchment area for Currie Creek, which runs through the proposed subdivision, is 4 km^2 (400 ha). The catchment area of Boardman Creek is 2.8 km^2 (280 ha). The methodology used to estimate the peak flows of these two creeks from historical data is outlined below.

In hydrologic zone 9, there are 59 gauged natural watersheds with an area less than 1,500 km^2. Of these, the watersheds with an area less than 100 km^2 were selected for data analysis. There were only 18 watersheds in this category, and over half of these have less than 10 years of data. The data for these watersheds is shown in Table A-1.

Due to the limited data available for zone 9, and after assessing maps of the area, it was decided to consider data from stations in adjacent hydrologic zone 8.

Again, the stations from natural watersheds with an area less than 100 km^2 were selected for data analysis – 31 in total. The data for these watersheds is shown in Table A-2. It was found that this zone contained several more stations with a small catchment area (less than 10 km^2), and these stations typically had longer periods of data.

The locations of all the selected stations from both hydrologic zones 9 and 8 were identified on a map. Each station was then assessed for suitability, based on the following factors in descending order of priority:

- number of years of data;
- catchment area; and
- aspect of catchment (direction it faces).

As an estimate of the 1 in 200 year peak flow was required, stations that had a high number of years of data were given priority, followed by stations with a similar sized catchment area. Any of the stations that only partially met these criteria, and had a different aspect, were excluded.

Only five stations from the hydrologic zone 9 were considered suitable. These five stations are shaded on Table A-1.

The flow data available for each station from the "Guide to Peak Flow Estimation for Ungauged Watersheds in the Kootenay (Nelson) Region" are as follows:

- the flow estimates in l/s/km^2 for the 10 year, 25 year, 50 year, 100 year, and 200 year return periods for the following frequency distributions:
  - the Log Normal distribution;
  - the Bumbel distribution;
  - the Pearson Type III distribution; and
  - the Log Pearson III distribution.
- the Kolmogorov-Smirnov (K-S) statistic for each distribution.

The K-S statistic is a measure of how well the data set for each station fits that particular frequency distribution. The lower the K-S statistic, the better the fit. Therefore, for each station the distributions with the lowest K-S value were selected, and then the mean of the 1 in 200 year flow estimates was calculated.

The 1 in 200 year flows per catchment area for the five selected stations from hydrologic zone 9 were plotted against their catchment areas on Graph A-1.

Seven stations from hydrologic zone 8 were considered suitable. These seven stations are shaded on Table A-2. The 1 in 200 year flows per catchment area from these seven stations were plotted against their catchment areas on Graph A-2.

A further graph, Graph A-3, was plotted which combines the 1 in 200 year flows per catchment area, for the selected stations from both hydrologic zone 9 and hydrologic zone 8.

An envelope curve can be drawn on each of the graphs such that all the data falls below this curve. Due to the small number of suitable stations, this curve is difficult to define, however the approximate envelope curve is sketched on Graphs A-1, A-2, and A-3. We note that the curve is well above the plots for gauged catchments with less than 10 km^2, which are in the order of 300 $l/s/km^2$.

It should be noted that the reliability of return period estimates is a function of the length of record. It is generally considered that extrapolation past twice the period of record should be avoided where possible. Therefore, to estimate the 1 in 200 year flows, it would be preferable to have at least 100 years of data, however, the stations used typically had only 20 to 30 years of data. Another factor to consider is that the data is prior to 1988, when the majority of the catchments may have been in a more natural state. Clearing and modifications in recent years could serve to increase the gauged stream flows. These factors indicate that it may be reasonable to use a higher figure than 300 $l/s/km^2$ for the 1 in 200 year peak flows, based on this method. Hence, the 500 $l/s/km^2$ value was chosen as the estimate from this method.

Catchment Description	Area	1 in 200 Year Flow per Catchment Area	Estimated 1 in 200 Year Flow
Currie Creek (#1)	4.0 km^2	500 l/s/km^2	2.0 m^3/s
Boardman Creek (#4)	2.76 km^2	500 l/s/km^2	0.8 m^3/s

A second method was also undertaken in order to verify the above order of magnitude flow rates.

B) Method 2 – Hydrologic Computer Model

The hydrologic modeling program utilized by USL was Visual OTTHYMO. It uses mathematical calculations to simulate watershed parameters and conditions to create runoff hydrographs for sub-basin catchment areas. These hydrographs can be subsequently added together or routed through the natural channels as required to assess the runoff volume and peak discharge from the study area.

A description of the basic data required by the computer program, and the assumptions made, are provided below.

Drainage Boundaries

Drainage boundaries, both within and outside of FAR, were determined from 1:5,000 and 1:2,500 contour plans developed from aerial photos, and from site knowledge of the key areas.

The drainage sub-basins within the study area were all classified as undeveloped (rural or natural). The input data for sub-basins are noted below.

Undeveloped Lands (Rural)

The command routine utilized within OTTHYMO for calculating the runoff hydrograph from undeveloped lands and rural areas was DESIGN SCSHYD. This command routine was used for all of the catchments within Fernie Alpine Resort.

The key inputs that are required are the area of the catchment, the SCS Curve Number (CN) and the time to peak for the unit hydrograph (Tp). The input data for the catchments are shown in Table A-3.

1) Area

The area of each catchment was planimetered from the 1:5,000 and 1:2,500 contour plans.

2) SCS Curve Number (CN)

This method of estimating rainfall losses and subsequently runoff hydrographs was developed by the United States Department of Agriculture Soils Conservation Service (SCS). The main parameter that reflects land use and soil type is the Curve Number, or CN. Tables giving values for CN based on hydrologic soil group and antecedent moisture content are well documented and available

After reviewing the Roads and Transportation Association of Canada's Drainage manual 1982, it was decided that both soil types 'B' and 'C' would exist in the study area (shallow loams and silt loams). Based on these soils with a wooded and ungrazed surface cover, the average CN value of 60 was selected.

3) Time to Peak

Time to peak is the length of time that it takes for the peak runoff to occur at the low end of the catchment area, after the peak intensity of the design storm event.

Time to peak (Tp) was calculated by the following relationship:

$Tp = 0.67\ Tc$ where Tc = time of concentration, and
$Tc = 1.7\ Tl$ where Tl = Time lag

Time lag was calculated by the SCS Curve Number Method where

$$Tl = L^{0.8} (0.39\ SCN + 1)^{0.7} / 735 * Y^{0.5}$$

and
L = overland flow length from the head of the basin, m
SCN = (25400/CN) – 254
Y = average slope of land, %

The average slope of the land was calculated using the Average Slope Method discussed in the Roads and Transportation Association of Canada's Drainage Manual 1982. This method avoids the distorting effect of a steep upper portion of a watershed and of a possibly flat lower section. To determine the average slope, the top 15% and the bottom 10% of the catchment are excluded from the catchment length. Therefore, by this method:

$$\text{Average slope} = \frac{\text{difference in elevation after deductions (m)}}{\text{length of deductions (m)}}$$

Channels

The outflow hydrographs are routed through channels to simulate flow through the existing natural watercourses. The input data for the channels are shown in Table A-4. The average slopes and lengths for each stream were estimated from the contour plan. The cross section coordinates were estimated from the site visit.

A literature review resulted in Mannings roughness coefficients for mountain streams of 0.045 being used in the computer model.

Rainfall

Design storm events and rainfall depths were produced on the basis of the intensity-duration-frequency (IDF) curves developed by USL for the City of Fernie in 1998. The IDF curves were prepared from a comparison of 2, 5, and 10 year data in use in Fernie with data from the AES Cranbrook stations. The 100 year return was determined as a multiple of the Cranbrook data. The 24 hour storm duration for the 1 in 100 year event was chosen for the design storm since it was the highest return period available. The rainfall distribution chosen for the synthetic design storm was the Chicago storm distribution with a 33% offset for time to peak.

An additional analysis was done using the rainfall IDF curve estimated for Fernie from the Rainfall Frequency Atlas of Canada. However, this produced lower peak runoff flows so was not considered any further.

RESULTS

The printout of the results from the OTTHYMO model are included in Appendix 2. The peak discharges from the two main catchments of Fernie Alpine Resort are shown in the table below.

Catchment Description	Area	1 in 100 Year Flow	1 in 100 Year Flow per catchment area
Currie Creek (#1)	4.00 km^2	2.5 m^3/s	618 $l/s/km^2$
Boardman Creek (#4)	2.76 km^2	1.6 m^3/s	572 $l/s/km^2$

The OTTHYMO model has produced a 1 in 100 year flow approximately 20% greater than the flow estimated from the historical stream flow method (500 $l/s/km^2$).

SUMMARY OF PEAK RUNOFF CALCULATIONS

We propose that a runoff rate of 600 $l/s/km^2$ of catchment area be utilized for the design of all culvert crossings and other pipes or structures that will be required to convey runoff through the development area from upper draining lands. This rate is considered conservative given results from the limited data for an historical analysis of similar watersheds, and the origin of the city of Fernie IDF curve.

Design of drainage structures such as culverts and road crossings should utilize the above runoff rate of 600 $l/s/km^2$ as the flow required to be conveyed for the contributing drainage area. Table A-5 shows the runoff rate for each major channel through the development areas. It also shows the calculated depth of flow for an assumed conservative channel base of 1.0 m wide with 2:1 sideslopes. The calculations show that each channel can adequately convey the contributing runoff as depths of flows range up to only 0.53 meters for the average channel slope, and 0.54 meters for the minimum channel slope.

Table A-5 also shows the calculated diameter of culvert crossings for each identified channel. The calculations are for circular culverts protruding from the fill area and are based on inlet control with no ponding. (Headwater depth (HW) equal to pipe diameter (D)).

4. STORMWATER QUALITY

As noted earlier in this report, stormwater runoff quality and its potential for impact on the quality of the receiving watercourse, and eventually the Elk River, is of major importance, both during construction activities, and for the longer term development scenarios.

The requirements for each phase of roadworks or utilities, and for each lot prior to development and construction taking place, will be as follows.

- An erosion and sedimentation plan must be prepared for each phase of roadway or utility development and each lot, to provide a plan for prevention of erosion of the construction area, and possible sediment transfer to the receiving watercourse. The plan could include, but not be limited to, such methods as:
  - silt fencing;
  - hay bales;
  - temporary lot grading to divert drainage to treatment area;
  - sedimentation traps (ponds);
  - ditch blocks;
  - infiltration trenches or pits to pass runoff through gravel/sand filters prior to discharge; and
  - seeding of disturbed areas as soon as possible after disturbance.

- A stormwater management plan must also be prepared at the design stage for each area proposed for development, for the long term control of storm runoff quality. Best Management Practices (BMPs) for the particular phase of development or lot shall be incorporated to ensure that the receiving watercourse, and ultimately the Elk River, is not compromised. The plan could include the following, but is not limited to:

- no direct runoff to receiving watercourse;
- roof leaders to be directed to grassed areas or filter strips;
- detention ponds or areas, should the site topography and layout be conducive (as noted earlier, detention for runoff quantity control is not required, but should be encouraged where possible, such as in parking areas);
- catch basins with sump areas to catch sediment and solids;
- catch basins with hooded outlets to prevent floatables from exiting;
- grassed filter strips or buffers;
- ditch blocks to slow down runoff velocity, and allow sediment to drop;
- sedimentation basins or settling areas prior to discharge; and
- a maintenance plan for all storm facilities.

The above will require a commitment and co-operation from FAR, developers, RDEK and MOTH to both the requirement for and to the enforcement of implementation of storm plans for each development. We note the following for consideration:

- The resort should take a leadership role in increasing public awareness of the importance of stormwater quality issues. This would include bringing stormwater quality issues and requirements to the attention of prospective purchasers of lots in the expansion area. It would also include increasing public awareness of quality concerns, possibly by way of a mailout to existing development in the sewer and water utility bills.

- We propose that the RDEK require that an erosion and sedimentation plan and a stormwater runoff quality BMP plan be included within the development permit approval process;

- A commitment to the costs for maintaining stormwater quality enhancement facilities will be necessary from private developers or owners for their own infrastructure and from MOTH for facilities constructed on public roadways;

The reduction of the following non-point source pollutant loadings can also be considered:

- encourage reduction in the use of herbicides and pesticides;
- discourage car washing with detergents;
- encourage the control of litter and pet feces than can be washed into the drainage system; and
- increase public awareness of the detriments associated with dumping oil or other substances into the ditchways or drainageways and/or catch basins (yellow fish program).
- reduce the use of sand or salt use on the streets;
- increase the frequency of street cleaning and parking lot cleaning, especially after spring melt prior to summer storm season;

We propose that the requirements for erosion and sedimentation plans and the use of BMP's in stormwater quality management plans for development, combined with co-operation between FAR, developers, RDEK and MOTH, will result in the protection of the water quality in the receiving watercourses in the FAR expansion lands as they convey runoff to the Elk River.

5. SUMMARY AND CONCLUSIONS

This report has identified the study area for drainage runoff by determining the size and location of drainage catchments that drain through the existing and proposed Fernie Alpine Resort development area. The stormwater quantity or flow that must be conveyed through the development area have been determined such that drainage conveyance works such as culverts and road crossings can be designed to convey the runoff from the larger undeveloped natural drainage areas located above the development area through the development area.

The report has established requirements for erosion and sedimentation plans during construction activities, and stormwater management BMPs for long term runoff quality control, as well as made recommendations for a public awareness program and pollutant source control measures that can be instigated.

The timing of stormwater pollutant loadings are somewhat random in occurrence, depending on storm duration, intensity of rainfall or snowmelt, time between events, and the time for runoff to reach the watercourse. However, should erosion and sedimentation plans be in place prior to construction, BMPs are included in the site design, public awareness is raised in regards to pollutant source control objectives, and adequate maintenance activities take place, we are confident that the further development of Fernie Alpine Resort can take place, and the impact on the receiving watercourses, and ultimately the Elk River, can be minimized.

6. AUTHORIZATION

This report has been prepared for and under authorization of Fernie Alpine Resort LTD..

URBAN SYSTEMS LTD.

Ian Morley, P. Eng. (AB)

T. W. Gowing, P. Eng.

Waisvisz, Cora TRAN:EX

From: Spearman, Kristen TRAN:EX
Sent: Friday, October 14, 2016 3:50 PM
To: Ihas, Michele D TRAN:EX
Subject: FW: Fernie Traffic Impact Assessment
Attachments: Appendix Page 4.pdf; Appendix Page 5.pdf; Appendix Page 6.pdf; Appendix Page 7.pdf; Appendix Page 8.pdf; Figure 1.pdf; Appendix Page 1.pdf; Appendix Page 2.pdf; Appendix Page 3.pdf; Figure 2.pdf; Figure 3.pdf

Hey Michele,

Here you go. I don't see any color on them? Hopefully not an issue with the conversion.
Let me know if I missed any!

Kristen

From: Ihas, Michele D TRAN:EX
Sent: October 14, 2016 11:10 AM
To: Spearman, Kristen TRAN:EX
Subject: HELP Please - do you have Corel Draw ?

Hi Kristen,

I heard you may have Corel Draw on your computer??? If you do, would you mind trying to open these attachments and saving them as pdf's for me? Or even just printing them out in colour?

Thank you!

Michele Ihas
Provincial Approving Officer
West Kootenay District, BC MOT, 310 Ward Street, Nelson BC V1L 5S4; Ph: 250.354.6526 Fax: 250.354.6547

From: Melissa Miller [mailto:mmiller@urbansystems.ca]
Sent: Friday, October 7, 2016 2:13 PM
To: Ihas, Michele D TRAN:EX
Subject: FW: Fernie Traffic Impact Assessment

Hi Michele,

Attached is the report and figures in pdf format. Also I have attached the corel draw and excel files.

Please let me know that you received this email.

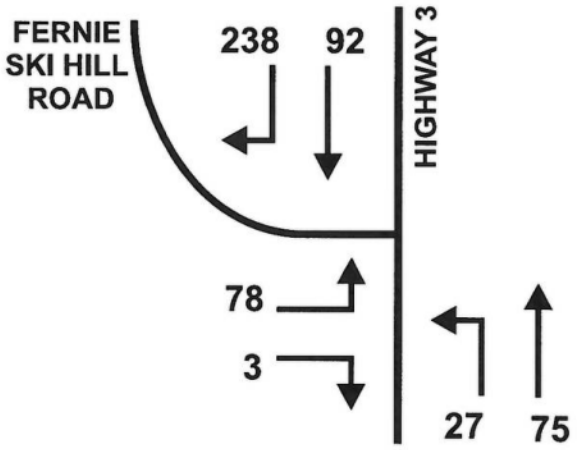
Thanks,

Melissa Miller
Project Coordinator
URBAN systems
Suite 204 – 625 Front Street

Nelson, BC V1L 4B6
T: 250 352 9774 x 5201
mmiller@urbansystems.ca
urbansystems.ca

Existing Traffic (as of April 1999)

AM Peak Hour



PM Peak Hour

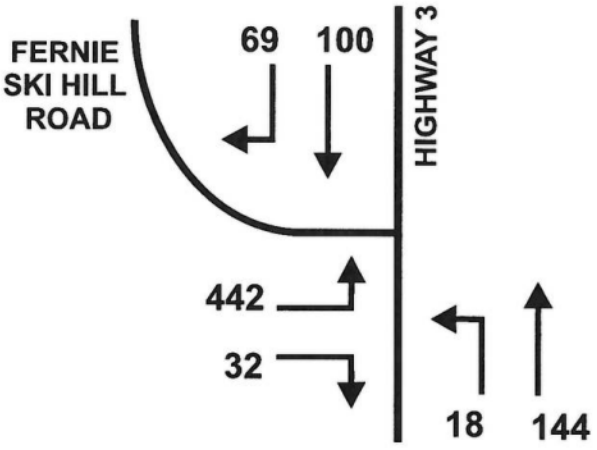


Figure A-1

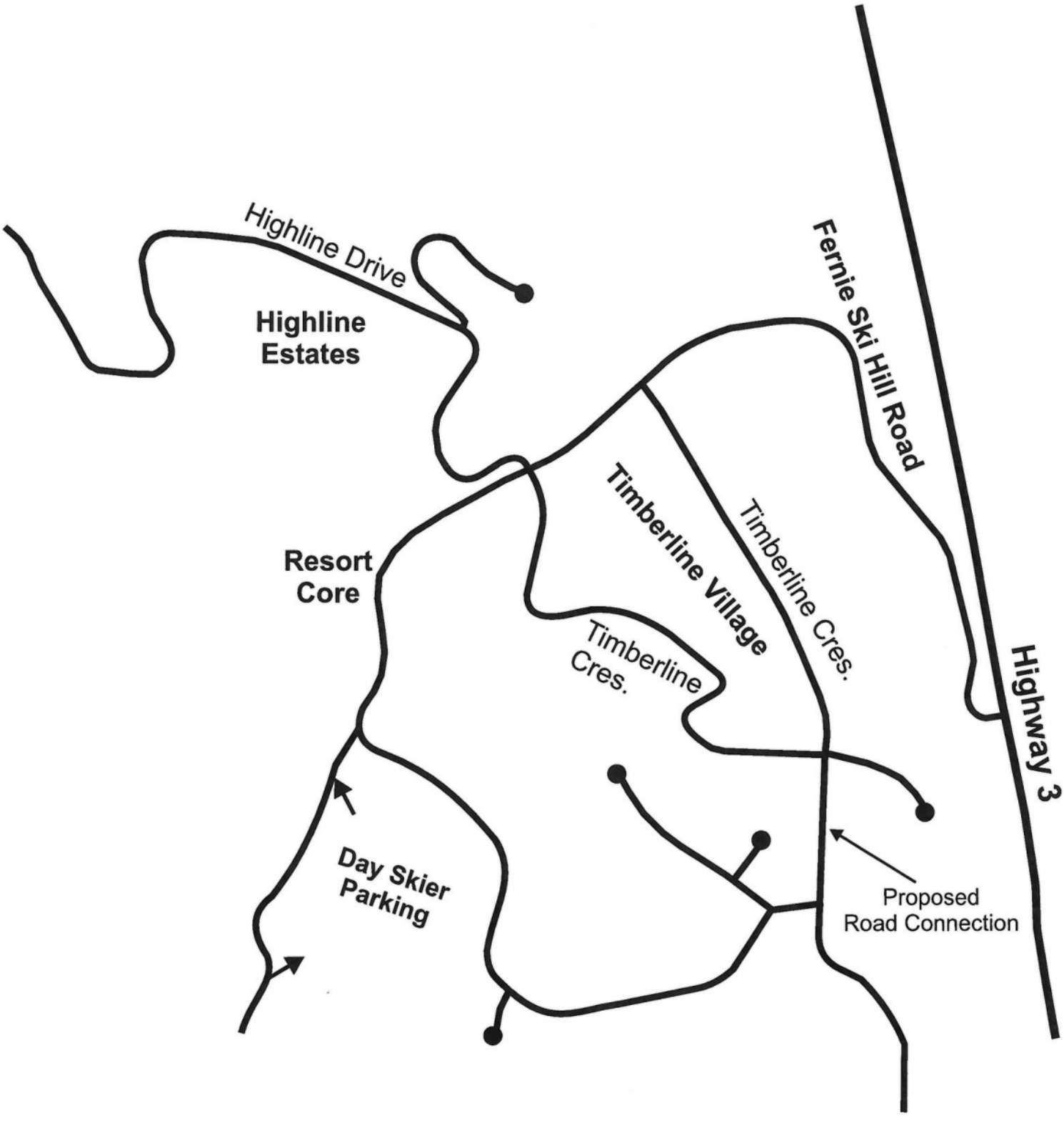


Figure 1: ***Fernie Alpine Resort Internal Road Network***

NOT TO SCALE

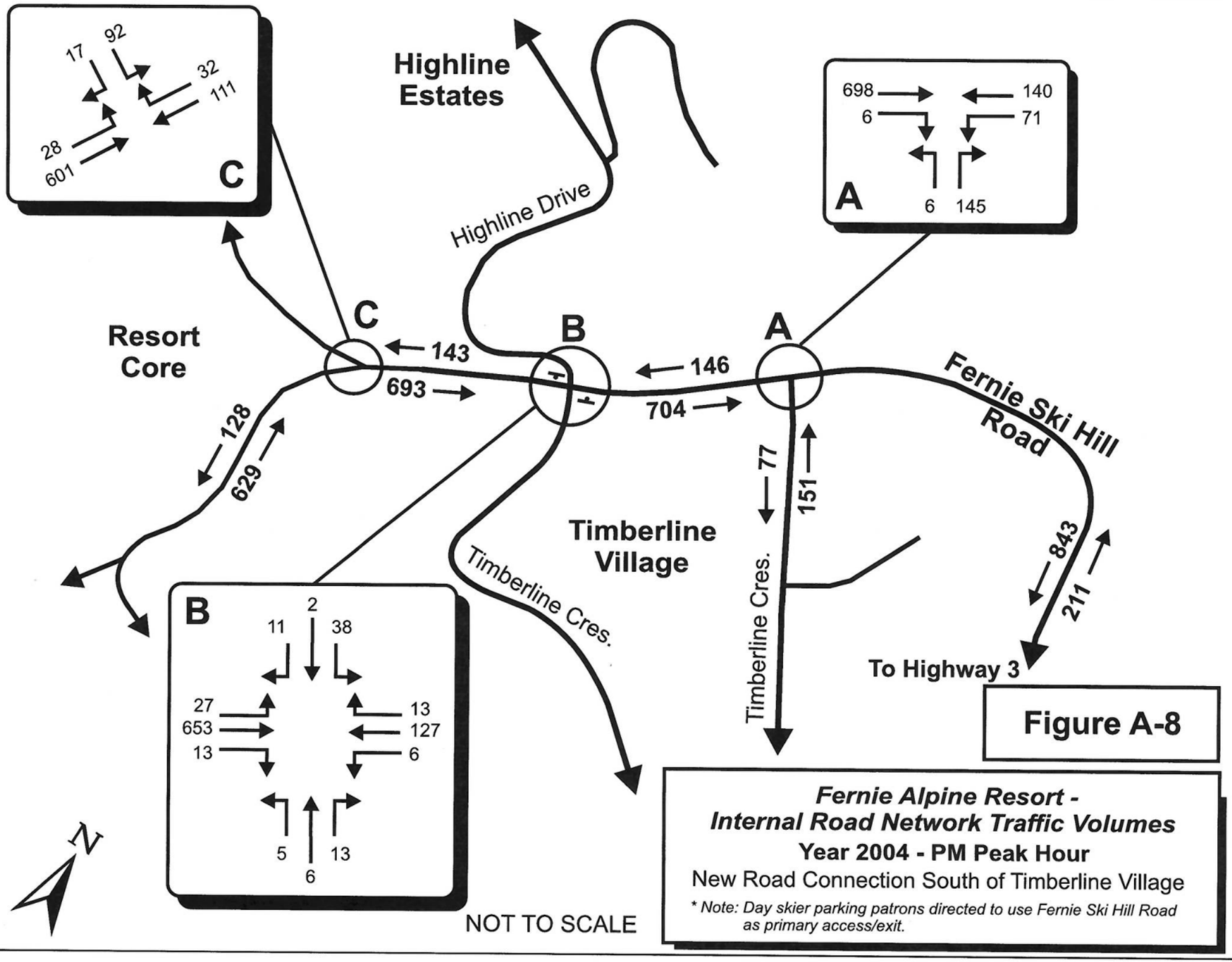


Figure A-8

Fernie Alpine Resort - Internal Road Network Traffic Volumes

Year 2004 - PM Peak Hour

New Road Connection South of Timberline Village

** Note: Day skier parking patrons directed to use Fernie Ski Hill Road as primary access/exit.*

Page 58

Withheld pursuant to/removed as

DUPLICATE

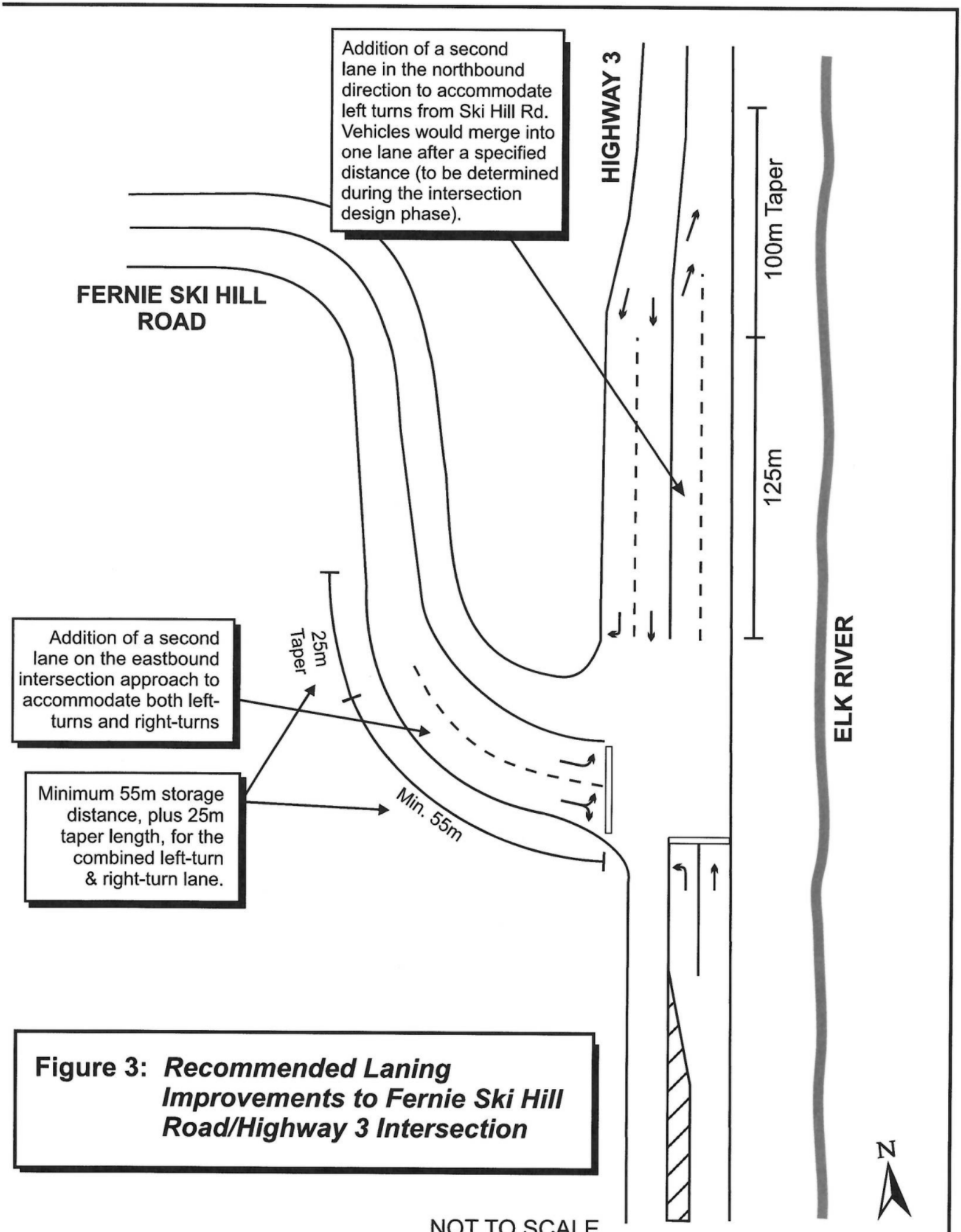


Figure 3: ***Recommended Laning Improvements to Fernie Ski Hill Road/Highway 3 Intersection***

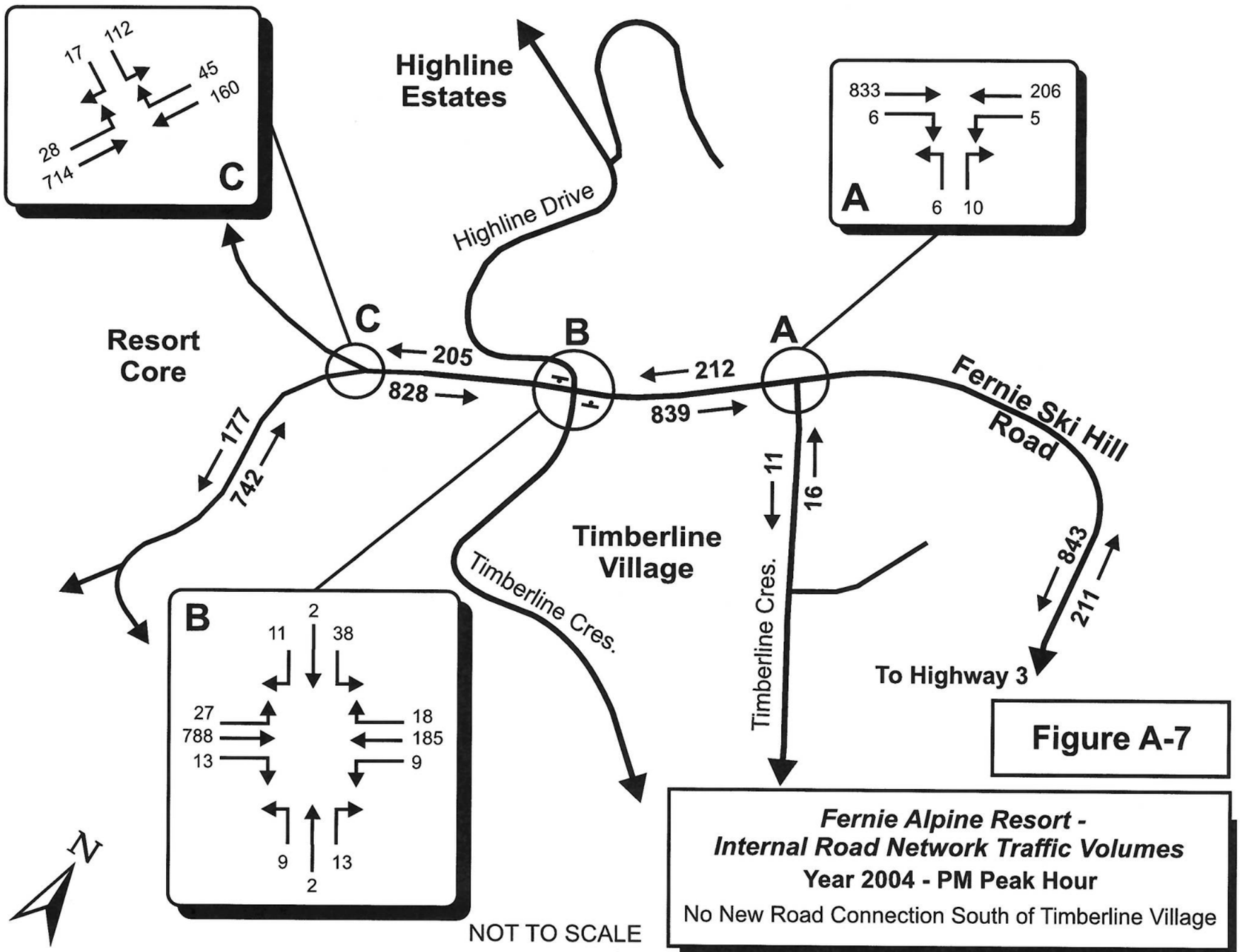


Figure A-7

Fernie Alpine Resort -
Internal Road Network Traffic Volumes
Year 2004 - PM Peak Hour
No New Road Connection South of Timberline Village

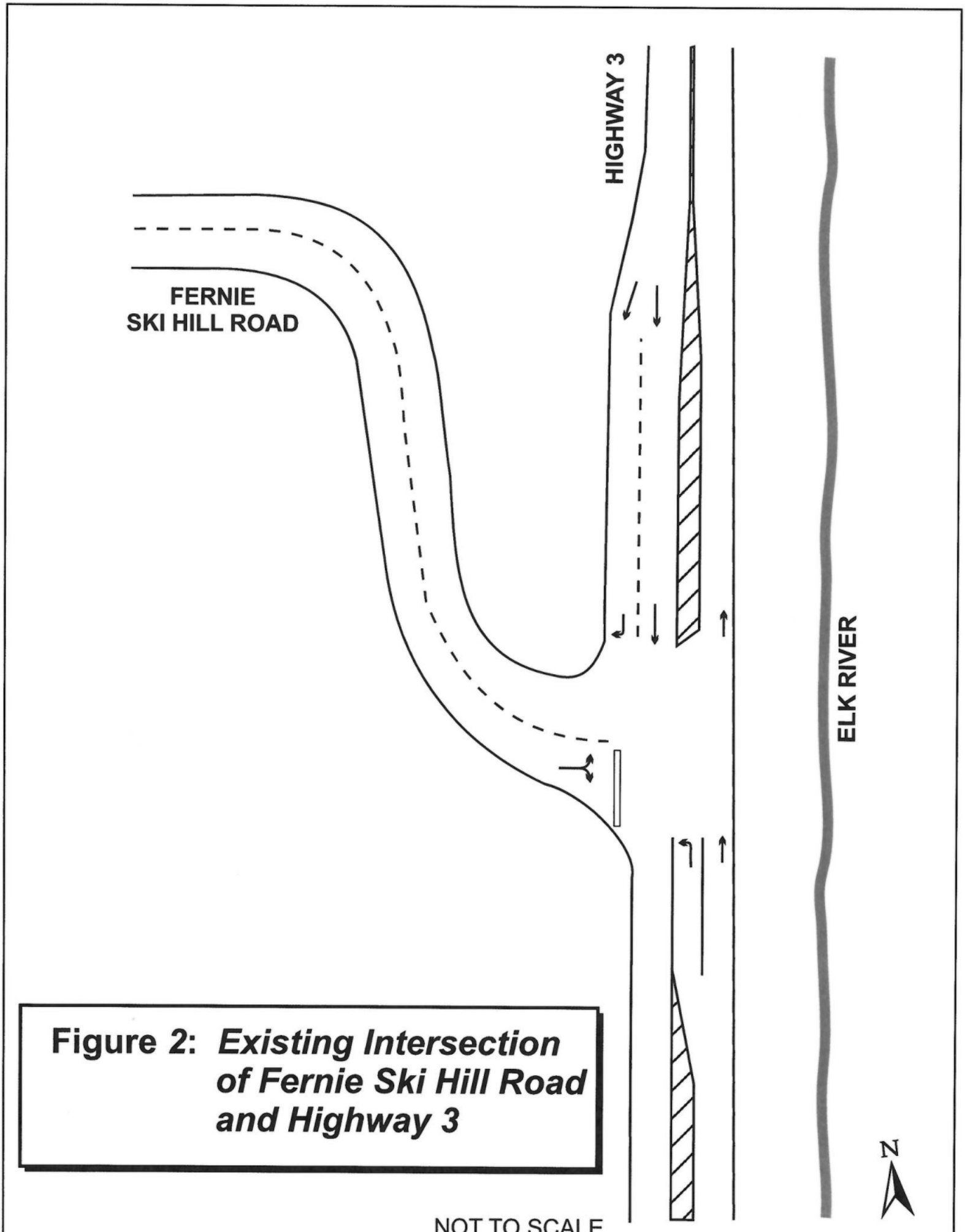
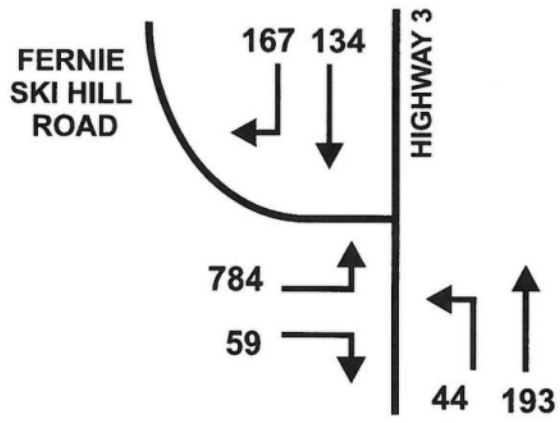


Figure 2: ***Existing Intersection of Fernie Ski Hill Road and Highway 3***

Combined Traffic - Build-out +5 years (2009)

PM Peak Hour



Combined Traffic - Build-out +10 years (2014)

PM Peak Hour

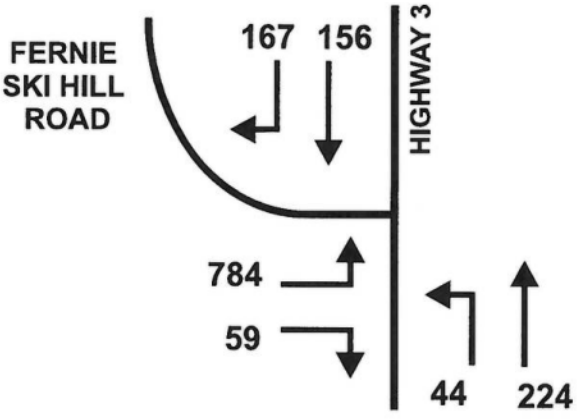
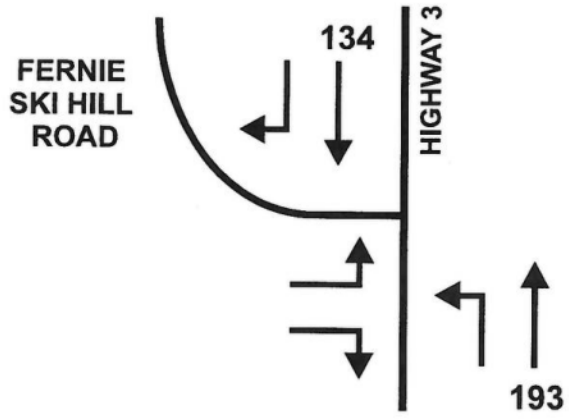


Figure A-6

Background Traffic - Build-out +5 years (2009)

PM Peak Hour



Background Traffic - Build-out +10 years (2014)

PM Peak Hour

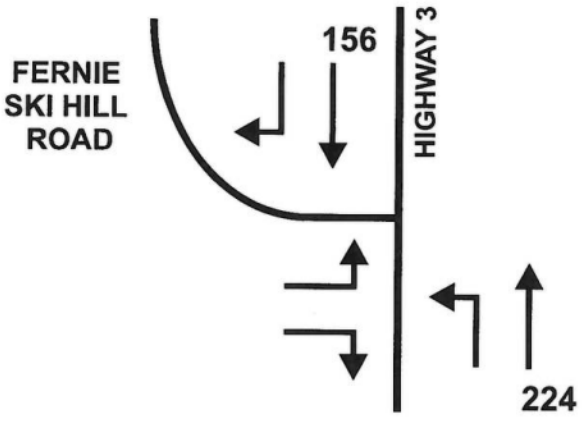
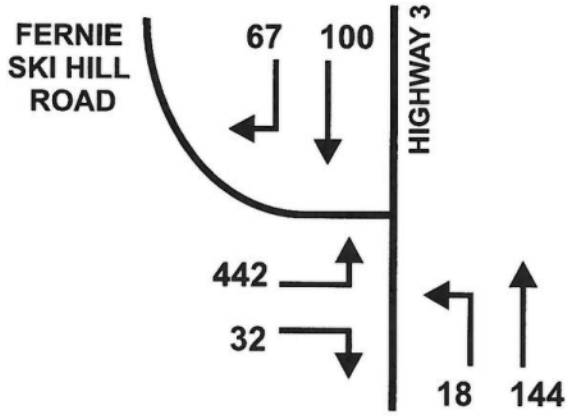


Figure A-3

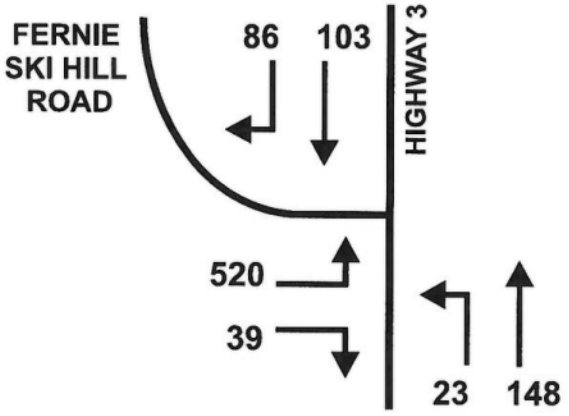
Existing Traffic - 1999

PM Peak Hour



Combined Traffic - Short-Term Future (2000)

PM Peak Hour



Combined Traffic - Long-Term Future (2004)

PM Peak Hour

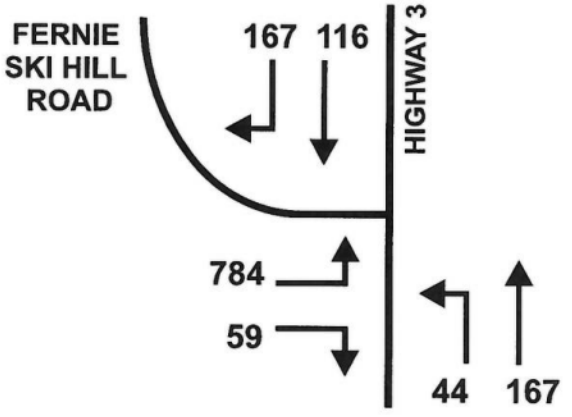
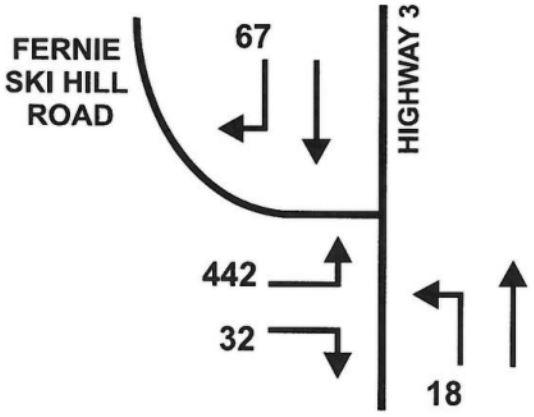


Figure A-5

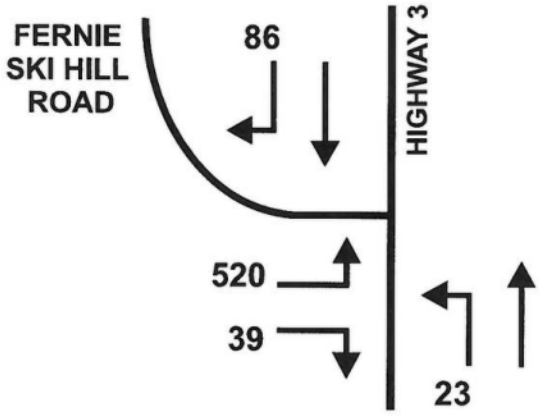
Site Generated Traffic - 1999

PM Peak Hour



Site Generated Traffic - Short-Term Future (2000)

PM Peak Hour



Site Generated Traffic - Long-Term Future (2004)

PM Peak Hour

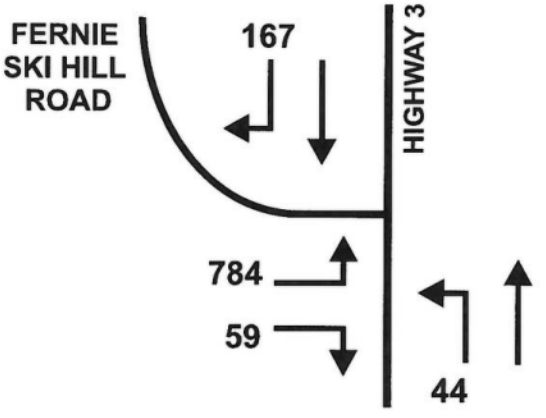
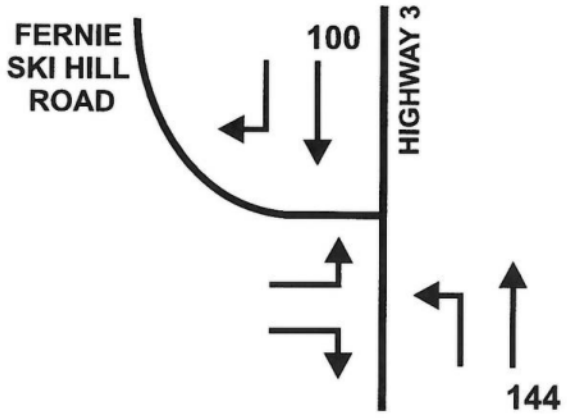


Figure A-4

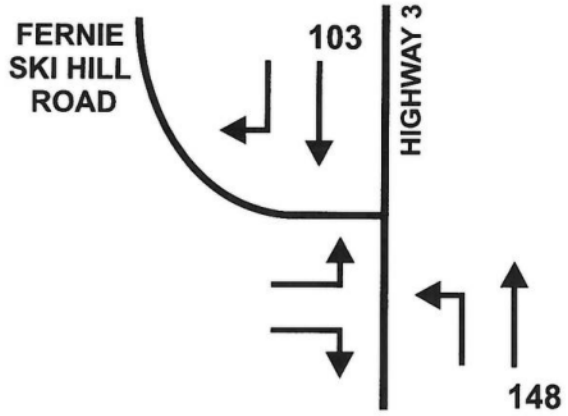
Background Traffic - 1999

PM Peak Hour



Background Traffic - Short-Term Future - 2000

PM Peak Hour



Background Traffic - Long-Term Future - 2004

PM Peak Hour

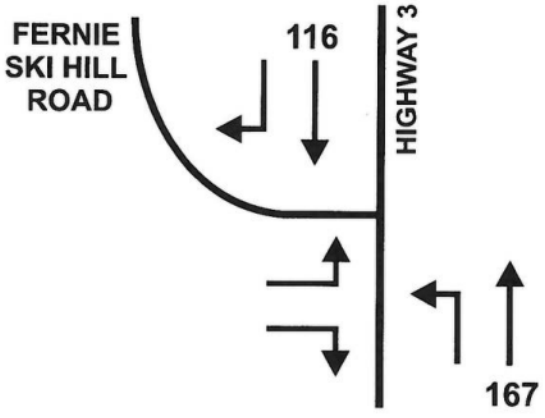


Figure A-2