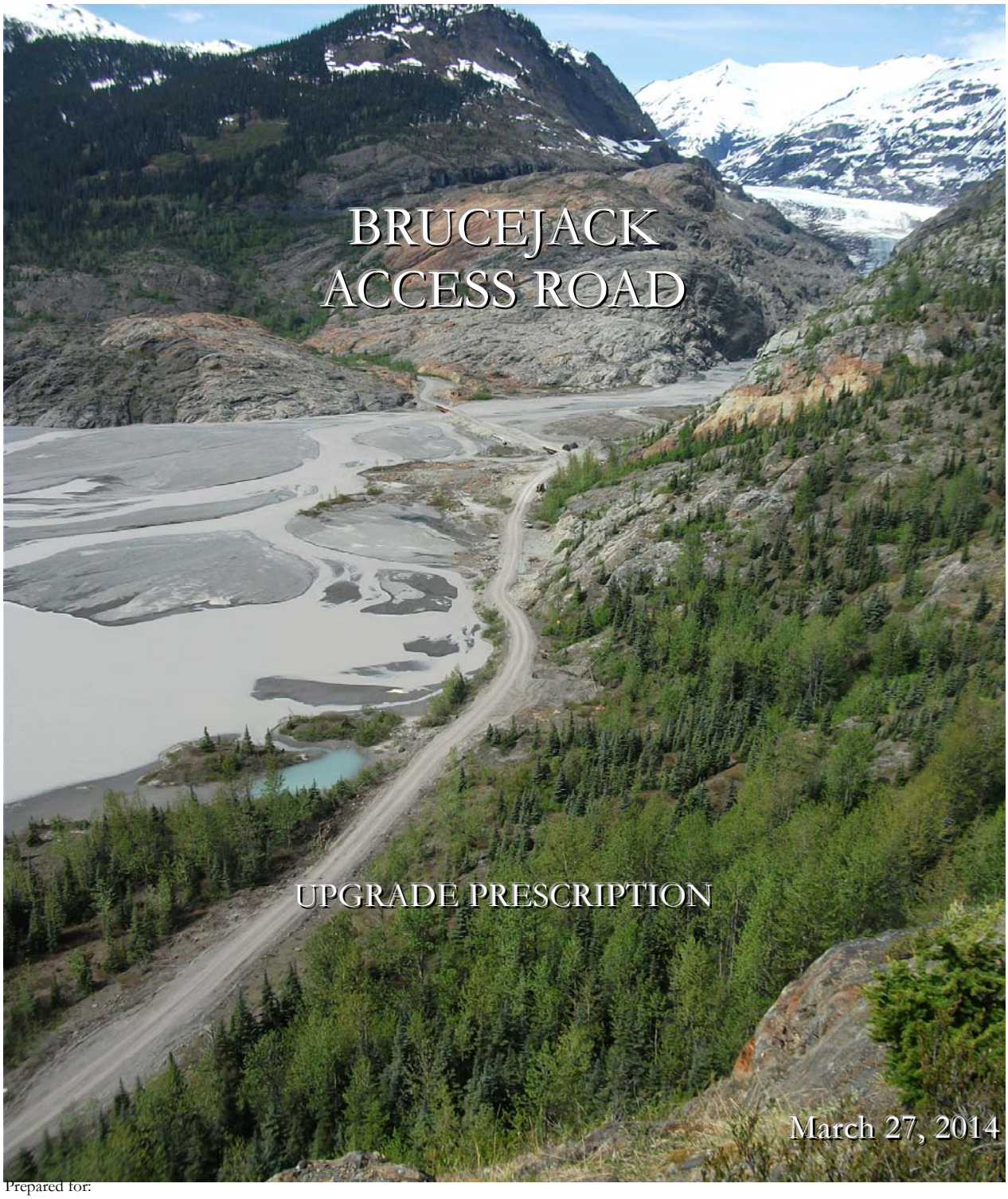
Appendix 5-G

Brucejack Access Road: Upgrade Prescription

ERM



BRUCEJACK ACCESS ROAD

UPGRADE PRESCRIPTION

March 27, 2014

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Background Information:

Cypress Forest Consultants Ltd. (Cypress) has been locating, engineering and designing resource roads and associated drainage features in Northwest B.C. since 1994. Our work has been mainly on the steep, difficult terrain of the British Columbia North Coast where riparian and terrain issues are continually present. Extensive training and experience is brought to bear on existing conditions utilizing a comprehensive adherence to the web of permits and legislative framework get the right professional and economic fit for a given area.

In February of 2010 Cypress was approached by George and Darlene Simpson, of Tsetsaut Ventures Limited (TVL) to have a look at possible road and bridge locations for accessing Pretium Resources' Brucejack mineral property (owned by Silver Standard Resources Inc. at that time).

From September through October 2010, Cypress established and surveyed a road center line from Highway 37N across the Bell-Irving River, thence across Wildfire Creek, and up the north side of the Wildfire ridge, heading west, then through the Scott Pass and down Scott Creek valley to hook up with the old Newhawk road just west of Bowser Lake. Cypress performed an upgrade survey of Newhawk Road (along the Bowser flats) to its end, where it used to access Knipple Glacier. From here the access consists of an ice road continuing up the Knipple Glacier.

The Brucejack access road was constructed from 2011 to 2013 from Highway 37, approximately at km 215, to the Brucejack Gold Mine Project. Construction activities through winter and early spring in poor soil types (silty tills with intermittent silty clay till) have resulted in less than optimum construction practices utilized to ensure continuous activities.

In June of 2013 Cypress completed an as-built survey of the Brucejack access road to:

- assess the existing state of the road and its related drainage features (bridges, culverts)
- identify the existing clearing limits,
- inventory and report on quarries, spoils, stockpiles, laydown areas and camp clearing limits,
- inventory the new construction road cut/fill limits,
- gather upgrade requirements to bring the road to Operational standards which would support a 40 km/hr haul speed
- identify and report on maintenance issues and offer an industry Standard Road Inspection Form and Inspection Schedule (Note Industry Standard relates to Forestry Roads which is legally defined in the Foresters Act. This road falls under the Mines Act and specific legal requirements will not apply but will be included by default as Best Management Practices. The Handbook for Mineral and Coal Exploration in British Columbia – A Working Field Guide 2008/2009 Edition recommends that users refer to The Forest Road Engineering Guidebook 2002 [FREG] http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/road/fre.pdf which will be used for all design criteria).

Methodology:

The As-built survey was completed in June/July of 2013 with the use of a Trimble R8 GNSS System (RTK) and a Trimble GeoExplorer 6000 series GNSS. The As-built survey forms the foundation data base upon which the Upgrade prescriptions are based.

Survey Control was established along the Brucejack access road corridor and was used to ensure accurate data. Each road edge was captured multiple times. This data was supplemented with all located drainage features; upgrade points, the as-built cut/fill limit as well as the existing timber clearing limits approximately every 133m (averaged distance). All Quarries, Spoil Sites, Camp Locations and Laydown areas and other road construction related clearings were perimeter surveyed.

Due to expediency and scope of the project the accuracy of the as built data collection is generally limited to +/- 35cm vertically and to +/- 15cm horizontal. In sections of the road with narrow right of way widths and tall timber the satellite uplink is affected and accuracy was noted to drop. Within these areas a horizontal accuracy of +/- 80cm and +/- 120cm vertically was noted. (To achieve a sub decimeter level of accuracy would have increased the survey time by a factor of ~30)

During the survey, extensive inspection of the as-built state of the road was completed to assess any outstanding construction conditions required to bring the road from a temporary standard to a permanent standard. During this assessment an inspection of the associated drainage features was undertaken and reviewed for installation damage, proper location and efficacy. A table of drainage feature conditions will be included.

A set of Plan and Profile drawings with a scale of 1:1500 (Plan), 1:1500H 1:150V (Profile) have been produced to complement this report and assist in the location of prescription features and upgrade alignment issues.

Below is a summary of alignment controls used for Forest Roads in British Columbia. (*FREG 2002*). The Brucejack access road will be designed with a 5m Stabilized Road width and a 40 km/h design speed. This results in a 95m minimum stopping site distance (SSD) and a minimum horizontal curve radius of 65m. It recommends Favorable Grades of 12% (14% for pitches <150m) and for Adverse Grades of 8% (10% for pitches <100m).

With design speed of 40 km/hr and where the Length of Vertical Curvature (LVC) is >SSD of 95m this will result in vertical curve values (K values) 9.6 for crest curve and 8.5 for sag curves. Where LVC is <SSD of 95m the K value will be derived from FREG table A2.2. In general the length of vertical curvature should incorporate the length of the longest axle configuration (approx. 20m)

Forest Road Engineering Guidebook

Table 2. Summary of alignment controls for forest roads.

Stabilized Road Width (m)	Design Speed (km/h)	Minimum Stopping Sight Distance[a] (m)	Minimum Passing Sight Distance for 2-Lane Roads (m)	Minimum Radius of Curve (m)	Suggested Maximum Road Gradient[b,c]				
					Favourable		Adverse		
					S	P[d]	S	P[e]	Switchbacks
4	20	40		15	16%	18% for distance <150 m	9%	12% for distance <100 m	8%
5–6	30	65		35	12%	14% for distance <150 m	8%	10% for distance <100 m	8%
	40	95		65					
8+	50	135	340	100	8%	10% for distance <200m	6%	8% for distance <100m	6%
	60	175	420	140					
	70	220	480	190					
	80	270	560	250					

NOTE: These are suggested alignment controls for average conditions on forest roads. Variations can be expected, depending on, for example, site conditions and time of use.

[a] For two-lane and single-lane one-way roads, multiply the minimum stopping sight distance by 0.5.

[b] There are no absolute rules for establishing maximum road gradient. Maximum grades cannot generally be established without an analysis to determine the most economical grade for the site-specific conditions encountered. The maximum grade selected for design purposes may also depend on other factors such as: topography and environmental considerations; the resistance to erosion of the road surface material and the soil in the adjacent drainage ditches; the life expectancy and standard of road; periods of use (seasonal or all-weather use); and road surfacing material as it relates to traction, types of vehicles and traffic, and traffic volume. Apply other grade restrictions in special situations. For example:

- On horizontal curves sharper than 80 m radius, reduce the adverse maximum grade by 0.5% for every 10 m reduction in radius.
- As required at bridge approaches, and at highway and railway crossings.

[c] S – sustained grade; P – short pitch

[d] Design maximum short-pitch favourable grades so that they are followed or preceded by a section of slack grade. The average grade over this segment of the road should be less than the specified sustained maximum.

[e] Design maximum short-pitch adverse grades as momentum grades.

Table A2.2. Minimum K values, where LVC < SSD.

Crest curve: One-lane, two-way road

Design speed (km/h) \ A	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
20											0.2	0.6	0.9	1.2	1.3	1.5	1.6	1.6
30							1.6	2.9	3.6	4.1	4.3							
40				0.5	5.6	8.0	9.1	9.5										
50			8.9	16.5	19.0													
60		12.5	28.9	32.5														
70		42.5	51.4															
80	35.7	75.9																

Crest curve: Two-lane road

Design speed (km/h) \ A	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
20										0.3	0.6	0.7	0.8	0.9	0.9
30					0.6	1.9	2.5	2.9	3.0						
40			0.1	4.1	5.6	6.1									
50		2.4	10.1	12.1											
60		15.7	20.1												
70	10.3	29.0													
80	35.3														

Sag curve: One- and two-lane road

Design speed (km/h) \ A	2	3	4	5	6	7	8
20				0.4	1.4	1.8	2.0
30			2.4	4.3	4.9		
40		0.6	6.6	8.2			
50		6.2	12.2				
60		11.8	17.9				
70		17.3	23.5				
80		24.3	30.5				

UPGRADE PRESCRIPTION:

An important note on road chainage distances conveyed in this report.

All distances used in this report and listed on the Upgrade maps are relative to the Kilometer Boards located in the field. These kilometer boards do not match the actual field distances (likely due to vehicle calibration-tire diameter to odometer issues). To facilitate the identification of Upgrade locations the actual field chainage (red numerals on Plan and Profile) has been adjusted to match the Kilometre Boards (Black numerals on Plan and Profile). A measure line has been included on the Plan and Profile with 20m segment distance to assist in locating prescription sites. The measure line should only be used relative to the noted Km boards in increasing chainage. (do not measure backwards from Km boards, only upwards).

Road Design Speed and Speed Zones

The Brucejack access road was initially planned and located with a 30 km/hr design speed with design criteria which affects both the horizontal and vertical alignment of the road system. On Pretiums request Cypress Forest Consultants has prepared an Upgrade Assessment of activities required to bring the road up to a 40 km/hr design speed where logistically feasible.

Specific sections of the Brucejack access road have been designated into Speed Zones to: reflect the existing conditions encountered along the road, address worker safety and dust control around camps and helicopter laydown areas, as well as, ensure a safe travel speed into constricted travel zones such as single lane bridges, and blind vertical and horizontal curves.

It must be noted that road surface roughness, and surface shape play a very important role in safe vehicle travel at the proposed design speed. Excessive roughness (pot holes, washboarding, bony surface- lack of fines) or poor road shape/condition (rutting, poor or improper superelevation, poor vertical/horizontal alignment) can lead to loss of vehicle control and proper care must be taken to ensure all factors are in place prior to allowing /designating a design speed. A post construction review should be completed by a Qualified Professional.

Generally the Brucejack access road will require variable depth surfacing (pit run gravel or 3” minus shot rock, which has been compacted, to 200 mm to 300 mm depth) and shaping from 3 km to 34 km and from 54.5 km to 58 km. The gravel will provide a suitable base from which maintenance activities can work from.

On horizontal curves with a design radius of 65 m a MAXIMUM 3% superelevation (or crossfall) is prescribed. (1/3 of an inch per foot or 3 cm per meter). This will assist in maintaining the design speed through the tighter corners. Do not exceed the 3% as the presence of ice and snow can cause slow or heavy vehicles to slide down the gradient or have erratic vehicle behavior.

Standard road width has been designed and constructed to a 5000 mm (5m) width. To address safe two way traffic along the Brucejack access Road, in all locations with sight distances below the Minimum Site Stopping Distance of 95m (blind vertical and horizontal curves) the road width is proposed to be

widened to 10025 mm (double lane) to allow traffic to safely pass. This standard permits the passage of a maximum width pick-up truck (2440 mm) and a 40 Ton Rock Truck (3430 mm), with one half vehicle width safe clearance on either side of the design vehicle. The exception being the safe passage distance between vehicles is half the pick-up vehicle width (1220 mm) and not half the Rock Truck vehicle width (1715 mm). Important note- this standard may not facilitate large trucks (Rock truck, Highboy, ect) passing at design speed. Radio control and pullout will be required.

Road width which would allow for safe passage of 2 rock trucks: Truck 1 (3430 mm) + Truck 2 (3430 mm) + 3 times half truck width (1715 mm x 3 = 5145 mm). 3430 + 3430 + 5145 = 12005 mm.

It is recommended that signage be posted in both directions of travel to identify the proposed road speed zones with the exception of the 10 km zones across bridges beyond the wildfire bridge.

The following Speed Zones have been proposed for the Brucejack access road:
NOTE: All reported Chainage has been adjusted to match the Kilometre Boards (Black numerals on Plan and Profile).

CHAINAGE	DESIGN SPEED	COMMENT
• 0+000 to 0+239	15 km/hr Zone	– Highway laydown and locked gate.
• 0+239 to 0+330	10 km/hr Zone	- BELL-IRVING BRIDGE
• 0+330 to 1+290	15 km/hr Zone	- Wildfire Camp and helicopter laydown
• 1+290 to 1+948	40 km/hr Zone	
• 1+948 to 2+008	15 km/hr Zone	- Approach to Bridge
• 2+008 to 2+061	10 km/hr Zone	- WILDFIRE BRIDGE
• 2+061 to 2+548	15 km/hr Zone	- Wildfire Cut 15-16% grades
• 2+548 to 4+154	40 km/hr Zone	-
• 4+154 to 4+244	15 km/hr Zone	- Approach to Bridge
• 4+244 to 4+262	10 km/hr Zone	- BRIDGE # 3
• 4+262 to 7+553	40 km/hr Zone	
• 7+553 to 7+740	20 km/hr Zone	- Existing site conditions (deep gullys) Cost prohibitive to achieve 40 km/hr
• 7+740 to 7+876	40 km/hr Zone	
• 7+876 to 8+075	20 km/hr Zone	- Existing site conditions (deep undulations) Cost prohibitive to achieve 40 km/hr
• 8+075 to 9+046	40 km/hr Zone	
• 9+046 to 9+353	20 km/hr Zone	- Existing site conditions (deep undulations) Cost prohibitive to achieve 40 km/hr
• 9+353 to 12+687	40 km/hr Zone	

CHAINAGE	DESIGN SPEED	COMMENT
12+687 to 12+719	10 km/hr Zone	- BRIDGE # 5
17+533 to 17+661	30 km/hr Zone	- Existing site conditions (wetlands) Prohibit realignment
17+661 to 21+217	40 km/hr Zone	
21+217 to 21+369	20 km/hr Zone	- Upper switchback topographic constraint Prohibit realignment
21+369 to 23+144	40 km/hr Zone	
23+144 to 23+240	20 km/hr Zone	- Lower switchback topographic constraint Prohibit realignment
23+240 to 23+507	40 km/hr Zone	
23+507 to 23+522	10 km/hr Zone	- BRIDGE # 6 (GASSY CREEK)
23+522 to 28+951	40 km/hr Zone	
28+951 to 29+386	25 km/hr Zone	- Switchback topographic constraint Prohibit realignment
29+386 to 30+455	40 km/hr Zone	
30+455 to 30+477	10 km/hr Zone	- BRIDGE # 7 (LITTLE SCOTT CREEK)
30+477 to 32+546	40 km/hr Zone	
32+546 to 32+691	25 km/hr Zone	- Switchback topographic constraint Prohibit realignment
32+691 to 34+780	40 km/hr Zone	
34+780 to 35+445	30 km/hr Zone	- Switchback topographic constraint Prohibit realignment
35+445 to 35+923	20 km/hr Zone	- Switchback topographic constraint Prohibit realignment
35+923 to 36+700	40 km/hr Zone	
36+700 to 36+798	10 km/hr Zone	- BRIDGE # 8 (SCOTT CREEK)
36+798 to 40+341	40 km/hr Zone	
40+341 to 36+700	10 km/hr Zone	- BRIDGE #9 15.24m
40+356 to 40+766	40 km/hr Zone	
40+766 to 40+781	10 km/hr Zone	- BRIDGE #11 15.24m
40+781 to 47+004	40 km/hr Zone	
47+004 to 47+019	10 km/hr Zone	- BRIDGE #16 15.24m Span
47+019 to 48+746	40 km/hr Zone	

CHAINAGE	DESIGN SPEED	COMMENT
48+746 to 48+925	10 km/hr Zone	BRIDGE #18 27.432m Steel Span
50+006 to 51+109	40 km/hr Zone	
51+109 to 51+287	15 km/hr Zone	Bowser Camp and helicopter laydown
51+287 to 53+882	40 km/hr Zone	
53+882 to 54+179	10 km/hr Zone	BRIDGE #20 27.432m Steel Span BRIDGE #21 36.576m Steel Span
54+179 to 55+253	40 km/hr Zone	
55+253 to 55+970	30 km/hr Zone	Topographic constraint Prohibit realignment
55+970 to 59+320	20 km/hr Zone	Topographic constraint Prohibit realignment

Upgrade Prescriptions

NOTE: All reported Chainage has been adjusted to match the Kilometre Boards (Black numerals on Plan and Profile).

On implementation: The prescriptions below are based on visual inspections and from the As built survey. The visual inspection incorporates professional interpretation and opinion, and the as built survey can incorporate an integral error. A follow-up site by site review should be completed with a coarse filter for further action. (ie does the prescription match the existing conditions? Is the prescription required? Are there any unforeseen issues associated with prescriptions?)

Following the site by site review, all horizontal/vertical realignment actionable items should have a site survey completed to Survey Level 4 -Construction Staking (See FREG pg 8). This survey data should then be used to design the realignment and then used for follow-up site staking. This will assist in minimizing earthworks and site disturbance. This will limit the overall site footprint /environmental impact and to ensure the proposed design specifications are met and accurately located in the field for construction staff. It is strongly recommended that a Qualified Professional assist in implementation as the level of technical and legal constraints required to achieve a satisfactory result are not readily evident due to the limited scope of this report or from the accompanying Plans and Profiles.

UPGRADE PRESCIPTIONS:

- Points 1-3 — Post a sign at Bridge approach with GVW by axle configuration, or Max GVW including load.
- Point 5 — Sign posting single lane bridge ahead.
- Point 6 — Permanent barrier (no post) required.
- Point 16 — Sign posting single lane bridge ahead.
- Point 57 — Sign posting single lane bridge.
- 16+292 — Point 81 Possible Gravel Pit to right. Requires more exploration.
- Point 17 — Bad vertical humps. Remove during surfacing activities.
- 3+000 TO 34+000 — Surfacing gravel required (200 mm to 300 mm depth, 3” minus shot rock or pit run gravel compacted.
- 4+280 TO 4+466 — DOUBLE LANE - BLIND CORNER AMENDMENT SITE #1
- 4+755 TO 4+871 — HORIZONTAL ALIGNMENT - AMENDMENT SITE #2 Required to meet 40km/hr Design Speed (15 km/hr design speed as is)
- 4+921 TO 4+984 — HORIZONTAL GRADE AMENDMENT SITE #4 Required to meet 40km/hr Design Speed (30 km/hr design speed as is)
- 5+180 TO 5+267 — DOUBLE LANE - BLIND CORNER AMENDMENT SITE #5
- 5+634 TO 5+703 — HORIZONTAL GRADE AMENDMENT SITE #6 Required to meet 40km/hr Design Speed (20 km/hr design speed as is)
- 7+033 TO 7+081 — DOUBLE LANE - BLIND CORNER AMENDMENT SITE #7
- 7+580 TO 7+610 — DOUBLE LANE - BLIND CORNER AMENDMENT SITE #8
- 8+280 — 500 XDrain Required
- 9+186 TO 9+357 — HORIZONTAL GRADE AMENDMENT SITE #9
- 9+569 — Point 41 Sharp vertical curve. Possible Drill and Blast Rock in ditch line.
- 9+827 — WOOD IN ROAD CULVERT 500 DIA XDrain REQ
- 10+304 — WATER ON ROAD CULVERT 500 DIA XDrain REQ
- 11+417 — CULVERT 400 DIA REQ Wetland Connectivity
- 11+798 — No Culvert NCD Requires 500 cmp
- 12+643 — Sharp vertical crest curve. Road needs to be lowered and superelevated.

- 13+861 CULVERT 500 DIA REQUIRED
- 14+306 to 14+380 HORIZONTAL GRADE AMENDMENT SITE #10
- 15+420 CULVERT 600 DIA REQUIRED
- 16+214 CULVERT 600 DIA REQUIRED
- 16+776 TO 16+866 HORIZONTAL GRADE AMENDMENT SITE #11 Required to meet 40km/hr Design Speed (30 km/hr design speed as is)
- 17+062 TO 17+128 HORIZONTAL GRADE AMENDMENT SITE #12 DOUBLE LANE - BLIND CORNER
- 17+560 TO 17+647 HORIZONTAL GRADE AMENDMENT SITE #13 DOUBLE LANE - BLIND CORNER
- 18+307 TO 18+384 HORIZONTAL GRADE AMENDMENT SITE #14 DOUBLE LANE - BLIND CORNER
- 22+019 TO 22+072 HORIZONTAL GRADE AMENDMENT SITE #15 Required to meet 40km/hr Design Speed (15 km/hr design speed as is)
- 22+325 TO 22+407 HORIZONTAL GRADE AMENDMENT SITE #16 DOUBLE LANE - BLIND CORNER Also Required to meet 40km/hr Design Speed (20 km/hr design speed as is)
- 22+852 TO 22+899 HORIZONTAL GRADE AMENDMENT SITE #17 DOUBLE LANE - BLIND CORNER
- 25+008 500 DIA XDRAIN REQUIRED
- 25+226 TO 25+287 HORIZONTAL GRADE AMENDMENT SITE #18 DOUBLE LANE - BLIND CORNER Required to meet 40km/hr Design Speed (30 km/hr design speed as is)
- 25+435 500 DIA XDRAIN REQUIRED
- 25+372 TO 25+478 HORIZONTAL GRADE AMENDMENT SITE #19 DOUBLE LANE - BLIND CORNER Required to meet 40km/hr Design Speed (20 km/hr design speed as is)
- 26+345 500 DIA XDRAIN REQUIRED
- 26+175 TO 26+197 HORIZONTAL GRADE SITE #20 DOUBLE LANE - BLIND VERTICAL CURVE
- 26+382 TO 26+425 HORIZONTAL GRADE SITE #21 DOUBLE LANE - BLIND CORNER Existing road conditions meet the design specs No Upgrade is proposed.
- 26+539 Very sharp vertical crest curve - Cut to grade

- 26+663 Very sharp vertical crest curve - Cut to grade
- 26+766 TO 26+825 HORIZONTAL GRADE AMENDMENT SITE #22 Existing road conditions meet the design specs No Upgrade is proposed.
- 26+943 Point 280 Very sharp vertical sag curve - Fill to grade
- 27+211 Point 283 Very sharp vertical crest curve - Cut to grade
- 27+150 TO 27+213 HORIZONTAL GRADE AMENDMENT SITE #23 Required to meet 40km/hr Design Speed (20 km/hr design speed as is)
- 27+674 TO 27+723 HORIZONTAL GRADE AMENDMENT SITE #24 DOUBLE LANE - BLIND CORNER Required to meet 40km/hr Design Speed (20 km/hr design speed as is)
- 27+645 and 27+716 Point 124U and 290 Very sharp vertical sag curve - Fill to grade
- 27+838 TO 27+897 HORIZONTAL GRADE AMENDMENT SITE #25 DOUBLE LANE - BLIND CORNER
- 28+038 Point 294 Very sharp vertical sag curve - Fill to grade
- 28+196 Point 296 Very sharp vertical sag curve - Fill to grade
- 28+251 TO 28+305 HORIZONTAL GRADE AMENDMENT SITE #26 DOUBLE LANE - BLIND VERTICAL CURVE
- 28+969 to 29+089 Surface erosion down running surface. Super elevate grade to drain to inside ditch line.
- 28+980 TO 29+056 HORIZONTAL GRADE AMENDMENT SITE #27 DOUBLE LANE - BLIND CORNER
- 29+274 TO 29+382 HORIZONTAL GRADE AMENDMENT SITE #28 DOUBLE LANE - BLIND CORNER
- 29+730 Point 132U Very sharp vertical sag curve - Fill to grade
- 30+504 Point 138U Very sharp vertical sag curve - Fill to grade
- 30+591 TO 30+686 HORIZONTAL GRADE AMENDMENT SITE #29 DOUBLE LANE - BLIND CORNER
- 30+724 TO 30+788 HORIZONTAL GRADE AMENDMENT SITE #30 DOUBLE LANE - BLIND CORNER
- 31+258 Point 139U Very sharp vertical crest curve - Cut to grade

- 31+429 TO 31+489 HORIZONTAL GRADE AMENDMENT SITE #31 DOUBLE LANE - BLIND CORNER Required to meet 40km/hr Design Speed (20 km/hr design speed as is)
- 31+548 TO 31+683 HORIZONTAL GRADE AMENDMENT SITE #32 Required to meet 40km/hr Design Speed (25 km/hr design speed as is)
- 31+602 Point 322 Very sharp vertical sag curve - Fill to grade
- 31+683 TO 31+743 HORIZONTAL GRADE AMENDMENT SITE #33 DOUBLE LANE - BLIND CORNER Required to meet 40km/hr Design Speed (20 km/hr design speed as is)
- 32+815 Point 337 Very sharp vertical sag curve - Fill to grade
- 32+824 TO 32+867 HORIZONTAL GRADE AMENDMENT SITE #34 DOUBLE LANE - BLIND CORNER
- 33+277 TO 33+319 HORIZONTAL GRADE AMENDMENT SITE #35 DOUBLE LANE - BLIND CORNER
- 33+525 TO 33+638 HORIZONTAL GRADE AMENDMENT SITE #36 DOUBLE LANE - BLIND CORNER
- 33+656 TO 33+747 HORIZONTAL GRADE AMENDMENT SITE #37 Required to meet 40km/hr Design Speed (25 km/hr design speed as is)
- 33+911 TO 34+041 HORIZONTAL GRADE AMENDMENT SITE #38 DOUBLE LANE - BLIND CORNER/CURVE
- 34+477 TO 34+538 HORIZONTAL GRADE AMENDMENT SITE #39 DOUBLE LANE - BLIND CORNER/CURVE
- 34+802 TO 34+881 HORIZONTAL GRADE AMENDMENT SITE #40 DOUBLE LANE - BLIND CORNER
- 35+298 TO 35+372 HORIZONTAL GRADE AMENDMENT SITE #41 DOUBLE LANE - BLIND CORNER
- 35+450 TO 35+476 HORIZONTAL GRADE AMENDMENT SITE #42 DOUBLE LANE - BLIND CORNER
- 35+573 TO 35+638 HORIZONTAL GRADE AMENDMENT SITE #43 DOUBLE LANE - BLIND CORNER
- 35+677 TO 35+807 HORIZONTAL GRADE AMENDMENT SITE #44 DOUBLE LANE - BLIND CORNER Straighten Alignment and Widen to 20m Radius Corner

- 35+870 TO 35+920 HORIZONTAL GRADE AMENDMENT SITE #45 DOUBLE LANE - BLIND CORNER
- 36+123 TO 36+176 HORIZONTAL GRADE AMENDMENT SITE #46 DOUBLE LANE - BLIND CORNER
- 36+049 Point 158U Very sharp vertical sag curve - Fill to grade
- 37+871 TO 37+927 HORIZONTAL GRADE AMENDMENT SITE #47 DOUBLE LANE - BLIND CORNER
- 37+949 TO 38+100 HORIZONTAL GRADE AMENDMENT SITE #48 DOUBLE LANE - BLIND CORNER Site appears close to required design specifications.
- 38+879 TO 38+950 HORIZONTAL GRADE AMENDMENT SITE #49 DOUBLE LANE - BLIND CORNER
- 39+244 TO 39+283 HORIZONTAL GRADE AMENDMENT SITE #50 DOUBLE LANE - BLIND CORNER
- 39+698 TO 39+759 HORIZONTAL GRADE AMENDMENT SITE #51 DOUBLE LANE - BLIND CURVE
- 40+375 Lower Priority - No Turnout Right on HWY Side of Bridge #9. One exists on left side of road 20m before bridge requires vehicle to cross roadway to clear traffic.
- 44+545 TO 44+646 HORIZONTAL GRADE AMENDMENT SITE #52 DOUBLE LANE - BLIND CORNER
- 45+027 TO 45+082 HORIZONTAL GRADE AMENDMENT SITE #53 DOUBLE LANE - BLIND CORNER
- 45+027 TO 45+082 HORIZONTAL GRADE - VERTICAL CURVE AMENDMENT SITE #54 DOUBLE LANE - BLIND CORNER
- 45+531 TO 45+607 HORIZONTAL GRADE AMENDMENT SITE #55 DOUBLE LANE - BLIND CORNER
- 46+743 TO 46+798 HORIZONTAL GRADE AMENDMENT SITE #56 DOUBLE LANE - BLIND CORNER
- 47+596 TO 47+336 HORIZONTAL GRADE AMENDMENT SITE #57 DOUBLE LANE - BLIND CORNER
- 47+836 TO 47+904 HORIZONTAL GRADE AMENDMENT SITE #58 DOUBLE LANE - BLIND CORNER

- 51+810 TO 51+860 HORIZONTAL GRADE AMENDMENT SITE #59 DOUBLE LANE - BLIND CORNER
- 52+753 TO 52+808 HORIZONTAL GRADE AMENDMENT SITE #60 DOUBLE LANE - BLIND CORNER
- 54+500 TO 58+000 Surfacing gravel required (200 mm to 300 mm depth, 3” minus shot rock or pit run gravel compacted.
- 54+437 TO 54+489 HORIZONTAL GRADE AMENDMENT SITE #61 DOUBLE LANE - BLIND CURVE
- 54+750 TO 54+783 HORIZONTAL GRADE AMENDMENT SITE #62 DOUBLE LANE - BLIND CURVE
- 55+233 TO 55+294 HORIZONTAL GRADE AMENDMENT SITE #63 DOUBLE LANE - BLIND CURVE
- 55+568 TO 55+648 HORIZONTAL GRADE AMENDMENT SITE #64 DOUBLE LANE - BLIND CURVE
- 55+917 TO 56+092 HORIZONTAL GRADE AMENDMENT SITE #65 DOUBLE LANE - BLIND CORNER
- 56+349 TO 56+418 HORIZONTAL GRADE AMENDMENT SITE #66 DOUBLE LANE - SWITCHBACK
- 56+459 TO 56+498 HORIZONTAL GRADE AMENDMENT SITE #67 DOUBLE LANE - BLIND CURVE
- 56+849 TO 56+908 HORIZONTAL GRADE AMENDMENT SITE #68 DOUBLE LANE – SWITCHBACK
- 56+949 TO 57+010 HORIZONTAL GRADE AMENDMENT SITE #69 DOUBLE LANE – SWITCHBACK
- 57+253 TO 57+321 HORIZONTAL GRADE AMENDMENT SITE #70 DOUBLE LANE - BLIND CURVE
- 57+499 TO 57+588 HORIZONTAL GRADE AMENDMENT SITE #71 DOUBLE LANE - BLIND CURVE (vertical) CORNER (Horizontal)
- 57+732 TO 57+767 HORIZONTAL GRADE AMENDMENT SITE #72 DOUBLE LANE - BLIND CURVE
- 57+990 TO 58+043 HORIZONTAL GRADE AMENDMENT SITE #73 DOUBLE LANE - BLIND CORNER
- 58+483 TO 58+531 HORIZONTAL GRADE AMENDMENT SITE #74 DOUBLE LANE - BLIND CURVE
- 58+760 TO 58+805 HORIZONTAL GRADE AMENDMENT SITE #75 DOUBLE LANE - BLIND CURVE

Table of Drainage Features and Conditions

The following table lists the existing ***drainage*** features along the Brucejack access road and includes feature comments and maintenance notes

Maintenance measures are outlined in Cohoon, C. Brucejack Maintenance, Remediation & Upgrade Prescription, Cypress Forest Consultants Ltd. October11, 2013.

P-Stn	Cul DIA / LENGTH	Feature Comment
m.	mm.	
289.1	52m Steel Span w Jump span	Bell-Irving River Bridge
2156.6	52m Steel Span	Wildfire Creek Bridge
2361.6	500	S6 Scour Protect at Outlet and slope below road
2373.3	1000	S6 Scour Protect at Outlet and slope below road
2459.8	500	XDrain Scour Protect at Outlet
2624.4	500	NCD Scour Protect at Outlet and slope below road
2549.8	500	XDrain
2738.9	1000	S6 Silt fencing in place. Spoil sluff threatning inlet
2937.2	500	XDrain
3063.2	1000	(S6) Crk
3117.2	500	NCD
3170.6	600	NCD
3343.8	1600	(S6) Crk
3388.3	600	NCD
3630.5	600	(S6) Crk
3734.3	500	XDrain
3979.7	600	XDrain
4192.5	18.288 m (60') STEEL SPAN	BRIDGE #3
4260.8	600	(S6) Crk
4380.0	500	NCD
4444.1	500	NCD
4646.7	500	XDrain
4778.9	600	(S6) Crk
4889.1	800	(S6) Crk
4927.9	600	XDrain
5146.6	1000	(S6) Crk
5320.4	500	NCD Outlet Buried-Requires extension
5466.3	600	(S6) Crk
5583.2	500	(S6) Crk
5677.9	1400	(S6) Crk Armoured Inlet
5857.7	600	(S6) Crk
5992.3	1200	(S6) Crk Armoured Inlet
6187.4	500	NCD
6284.9	500	NCD Outlet buried
6368.9	500	NCD
6489.1	500	NCD Requires extension
6561.5	800	NCD
6708.1	500	(S6) Crk
6805.5	500	XDrain
6960.2	1400	(S6) Crk Armoured Inlet
7186.7	1600	(S6) Crk Armoured Inlet
7317.7	500	XDrain
7540.9	1400	(S6) Crk Armoured Inlet
7615.3	500	XDrain Outlet Buried -Extend culvert
7687.5	500	XDrain
7765.5	600	NCD
7819.9	500	NCD Outlet buried
7981.3	500	XDrain Outlet Buried -Extend culvert
8113.9	1600	(S6) Crk Armoured Inlet
8376.7	500	NCD Outlet Buried -Extend culvert
8421.0	500	XDrain
8527.8	1200	(S6) Crk Armoured Inlet
8570.2	500	XDrain
8634.3	500	XDrain
8703.1	500	NCD Outlet Buried -Extend culvert
8774.8	1600 x 1 900 x 2	(S6) Crk Armoured Inlet
8883.9	500	NCD Outlet Buried -Extend culvert
8928.7	500	NCD
9016.5	1200	(S6) Crk Armoured Inlet
9096.2	1600	(S5) Crk Armoured Inlet
9202.9	500	NCD

9367.3	1000	(S6) Crk Armoured Inlet
9548.4	500	XDrain
9636.9	500	XDrain
9706.5	500	NCD
9916.6	600	NCD
10832.6	500	XDrain
10961.3	500	(S6) Crk
10994.3	500	XDrain
11158.0	600	NCD Inlet Buried - Extend culvert
11670.4	600	NCD Outlet Buried - Extend Culvert
11720.5	800	S6 Strm Inlet Buried Extend culvert
11758.2	600	NCD Inlet Buried Extend culvert
11942.9	800	S6 Strm Inlet Outlet Buried extend culvert
12027.1	500	NCD
12080.3	500	XDrain Inlet buried Extend culvert
12180.9	600	NCD
12395.8	500	XDrain
12551.9	12.000 m (39.4') CONCRETE SPAN	BRIDGE #5
12659.4	500	XDrain
13000.0	800	S6 Strm
13043.6	500	XDrain Inlet Buried - Extend Culvert
13165.1	600	NCD
13421.1	800	S6 Strm Inlet damaged but functional
13457.1	500	XDrain Inlet buried Extend culvert
13547.3	600	NCD
13698.4	500	NCD Inlet buried Extend culvert
13752.0	600	NCD Inlet buried Extend culvert
13900.9	600	XDrain Inlet buried Extend culvert
14099.0	500	XDrain Inlet buried Extend culvert
14423.1	500	XDrain Culvert crushed under road non functional. Replace
14589.3	500	NCD Inlet damaged but functional
14636.9	500	XDrain Inlet buried Extend culvert
14769.8	500	XDrain Culvert elevated draining thru fill
14822.7	500	NCD Inlet buried Extend culvert
14868.8	500	NCD Inlet Outlet buried Extend culvert
14954.4	800	NCD Culvert crushed under road non functional. Replace w 600 culvert
15005.1	600	NCD Inlet buried Outlet crushed Extend culvert
15135.3	500	NCD Outlet buried Extend culvert
15336.7	800	S6 Strm
15506.9	500	NCD Inlet crushed Outlet buried Extend culvert
15582.9	500	XDrain
15636.5	500	NCD Inlet buried Extend culvert
15686.1	500	XDrain Outlet Buried - Extend Culvert
15825.7	1000	S6 Strm
15949.5	1000	S6 Strm
16098.1	1100	S6 Strm
16427.9	500	NCD
16488.3	500	NCD Culvert crushed non functional. Replace w 500 culvert
16615.7	1200	S5 Strm
16721.1	500	XDrain Culvert elevated draining thru fill
16828.4	500	XDrain Outlet Buried - Extend Culvert
16980.9	500	XDrain
17123.3	500	XDrain
17251.9	1200	NCD
17379.6	500	XDrain Outlet Buried - Extend Culvert
17472.1	500	XDrain
17601.5	600	XDrain Outlet Buried - Hand Clean or Extend Culvert
18261.8	500	XDrain Culvert crushed non functional. Replace w 500 culvert
18395.3	1 x 2.5 WC	S5 Strm
18626.0	600	NCD
18694.6	500	XDrain Outlet Buried - Extend Culvert
18828.6	600	NCD
18854.9	1600	S5 Strm
18997.3	500	XDrain Outlet Buried - Extend Culvert Pipe elevated draining thru fill
19150.1	500	Xdrain Culvert crushed non functional. Replace w 500 culvert
19189.7	800	S6 Strm
19302.0	600	S6 Strm
19415.3	500	NCD
19491.1	600	NCD Sump inlet
19541.7	600	NCD Sump inlet
19605.6	500	NCD Inlet buried Extend culvert
19709.1	500	XDrain Sump Inlet Outlet Buried - Extend Culvert
19834.3	1000	S6 Strm
19918.0	600	XDrain Sump Inlet Install ditchblock
19953.7	500	NCD Inlet Outlet buried Extend culvert Install ditchblock
20019.1	800	(S6) Crk Armoured Inlet
20129.3	500	XDrain
20208.8	500	XDrain Inlet buried Extend culvert Sump Inlet
20339.8	500	XDrain

20473.7	500	NCD Inlet buried Extend culvert
20622.4	800	S6 Strm
20808.7	600	NCD
21198.2	500	XDrain
21320.9	600	XDrain
21392.1	500	XDrain
21471.5	1000	NCD
21498.0	600	S6 Strm
21611.8	500	NCD
21991.8	500	NCD Sump inlet
22045.9	600	NCD Sump inlet
22199.0	500	NCD
22327.1	1000	S6 Strm
22470.0	1000	S6 Strm
22599.0	500	NCD
22699.2	600	NCD
22728.0	500	XDrain
22917.1	500	XDrain
23061.1	600	S6 Strm
23184.1	1000	(S6) Crk
23326.1	15.240 m (50') STEEL SPAN	BRIDGE #6 GASSY CREEK
23488.9	500	NCD
23538.4	500	NCD
23808.2	500	XDrain
23915.9	500	XDrain
24004.7	500	NCD
24204.8	500	NCD
24299.0	500	XDrain
24351.1	500	NCD
24416.7	1000	S6 Strm
24571.2	600	NCD Outlet buried hand clean
24798.3	600	NCD Requires ditch block
24851.5	500	NCD
24945.2	500	S6 Strm
24986.0	800	S6 Strm
25053.6	500	NCD
25262.9	500	XDrain
25352.9	500	XDrain
25447.6	500	XDrain
25703.5	500	XDrain
25942.0	500	S6 Strm
25956.5	500	NCD
26174.1	500	NCD
26229.3	500	NCD
26442.1	500	XDrain Crushed under road requires replacement
26663.8	500	XDrain
26995.4	500	XDrain
27268.3	500	Xdrain Inlet Outlet buried requires extension and ditch block
27341.3	500	NCD
27422.1	500	NCD
27490.6	500	NCD
27529.4	500	XDrain
27711.2	500	(S6) Crk
27865.6	1400	(S6) Crk
27906.4	500	XDrain
28134.8	500	XDrain
28188.4	500	NCD Inlet Outlet buried extend culvert
28656.1	500	XDrain
28788.8	500	XDrain Sump inlet
28861.7	500	XDrain
28941.1	500	NCD Sump inlet
29095.7	500	NCD
29266.9	500	XDrain
29404.8	500	XDrain
30146.6	21.336 m (70') STEEL SPAN	BRIDGE #7 LITTLE SCOTT CREEK
30499.4	500	XDrain Sump inlet
30653.9	500	XDrain
30864.0	900	(S6) Crk
30938.8	500	XDrain
31152.0	500	NCD
31249.1	500 x2, 600x1	(S6) Crk
31308.0	500	NCD
31400.5	500	XDrain
31508.1	900	(S6) Crk
31607.4	500	NCD
31711.6	600	(S6) Crk
31764.1	500	NCD
31882.6	500	XDrain
31982.6	500	XDrain
32089.4	1000	(S6) Crk Armoured Inlet

32333.1	500	(S6) Crk
32636.8	500	XDrain
33040.3	500	XDrain Inlet Outlet buried extend culvert
33287.8	500x2	(S6) Crk
33524.9	500	XDrain
33896.2	500	XDrain Inlet Outlet buried extend culvert
34105.6	500	XDrain Inlet bent but functional
34797.8	500	NCD
34958.2	600	NCD Inlet buried clean inlet
35460.7	600	NCD
35651.2	1100	(S6) Crk
36285.7	24.384 m (80') STEEL SPAN	BRIDGE # 8 SCOTT CREEK BRIDGE
37556.3	500 CPP	XDrain
38939.0	500 CPP	NCD
39424.2	1800 CSP	(S6) Crk
39479.0	500	(S6) Crk Inlet Outlet crushed replace or armour ditch and ditchrun
39795.5	15.24 m (50') STEEL SPAN	BRIDGE #9
40221.6	15.24 m (50') STEEL SPAN	BRIDGE #11
40036.3	1x3 WC	(S4) Crk Wood Culvert
40357.6	1x3 WC	(S4) Crk Wood Culvert
40562.9	1x3 WC	(S4) Crk Wood Culvert
41351.0	1x4WC	(S3) Crk Wood Culvert
44817.1	1x7WC	(S3) Crk Wood Culvert
45028.5	500 CPP	XDrain
46257.0	750 CPP	(S4) Strm
46405.8	15.24 m (50') STEEL SPAN	BRIDGE #16
47292.4	500	XDrain
47606.2	1x6WC	(S3) Crk Wood Culvert
47975.9	1x6WC	(S3) Crk Wood Culvert
48200.5	27.432 m (90') STEEL SPAN	BRIDGE #18
49267.0	27.432 m (90') STEEL SPAN	BRIDGE #19
51376.2	500 CPP	XDrain
51500.6	750 CPP	XDrain
52289.3	750	XDrain
53266.1	21.336 m (70') STEEL SPAN	BRIDGE #20
54470.2	36.576 m (120') STEEL SPAN	BRIDGE #21
54710.8	1000	(S6) Crk
54801.0	600	NCD Sump inlet
54840.6	1x7WC	(S3) Crk Wood Culvert
56777.1	1200	(S5) Crk Requires additional 1200 Armour required on Inlet (Ditchblock)