## **APPENDIX B**

Drill Logs & Completion Details for Monitoring Wells and Pumping Wells

CLIE	ENT N	AME: Deloitte & To	ouche	DRILLER: Cora	Lynn / B	ill Wiebe	BOREHOLE ID: PW1	
PRC	JECT	NAME:Rose Creek	GW Interception	METHOD: Dual	Air Rota	ſy	LOCATION: Cross Valley Dam	
PRC	JECT	NUMBER: 1180	04	N: 6914285.843	<b>E:</b> 5	580156.715	TOC ELEVATION (m): 1017.35	
DEPTH (ft)	SOIL PROFILE		LITHOLOGY SOIL/ROCK DESCRIP	TION	BOR		ADDITIONAL COMMENTS (Yield, water quality, geofabric, special construction design, etc)	DEPTH (m)
- 0 - - 2		Damp, grey-brown, m -	c SAND.			casing from Little dust 0-		0 -
- 4 -		Damo grev-brown f - n	n SAND, trace coarse sand	1 (<10%)		Hammer bo Dusty drilling Water level	-	-
6 - 8		Danip, groy Drown, r		(((())))				2 —
- 10 -		Damp, grey-brown, m - Damp, grey-brown, fine	c SAND with some gravel a gravelly m - c SAND.	and some fine sand.		Collapse of	natural formation from 2 to 69 ft.	-
- 12 - - 14	00000	Damp, grey-brown, c sa	andy f-m GRAVEL.			4200 Johnson 13.75-19 ft k	on 8" stainless steel wire-wrap screen	4 —
- - 16 - - 18	000000	Wet, grey-brown, m - c Wet, grey-brown, c sand	SAND and f - c GRAVEL. dy f GRAVEL				uys.	-
- 20 -	000000	Wet, dark grey, silty f - o	c GRAVEL					6 —
- 22		Wet, dark grey, sandy S	SILT					
- 24 - 26		No recovery.					fast drilling through silt. Unable to nples at 1 ft intervals (no samples for	_
- 28 -		Wet, dark grey, sandy S	SILT				-44 ft, 45-47 ft).	8 —
- 30 - - 32								10
- 34 -		No recovery.						
		APHY SILT (ML) . TYPE BENTON CHIPS (3	ITE BENTO		(GM) ONITE	(G\	RAVEL (SANDY)	ЭСК
7	2			GED/SUPERVISED BY:			TOTAL DEPTH (ft): 69	
-	-	ertson GeoConsu	mental Engineers	IEWED BY: E COMPLETED:	Christoph 16-Aug-2		COMPLETION DEPTH (ft): 69 PAGE 1 OF 2	

CLIE	ENT N	AME: Deloitte & Touche	DRILLER: Cora	Lynn / B	ill Wiebe	BOREHOLE ID: PW1	
PRC	JECT	NAME:Rose Creek GW Interception	METHOD: Dual	Air Rota	ry	LOCATION: Cross Valley Dam	n
PRC	JECT	NUMBER: 118004	N: 6914285.843	B E: 5	580156.715	5 TOC ELEVATION (m): 1017.35	
DEPTH (ft)	SOIL PROFILE	LITHOLOGY SOIL/ROCK DESCF		BOR	=	ADDITIONAL COMMENTS (Yield, water quality, geofabric, special construction design, etc)	DEPTH (m)
- 36							-
-							
- 38							
- 40							12
-							
- 42							_
- 44							
- 44		Wet, dark grey uniform SILT, low plasticity.					
- 46		No recovery.					14 —
-							
- 48		Wet, grey-brown, f gravelly, m - c SAND.					
-		Wet, m SAND.					-
- 50							
- 52		Wet, m - c SAND with some f gravel.					
-		Wet, m - c SAND.					16 —
- 54		Wet, m - c SAND. Wet, m - c SAND with some f - c gravel.				son 8" stainless steel wire-wrap screen	
-					53.75-64.2	5 ft bgs.	
- 56					Hammer bo	ouncing, bouldery 55-59 ft. Driller: present fines between boulders	
- 58					(describes	samples as boulders with c gravel and	
-					m - c sand)	ng with not as many cobbles 59 -63 ft	18
- 60				· · · · · · · · · · · · · · · · · · ·	onward.	ng with hot as many cobbles 59 -65 it	
-							
- 62							-
- 64		Wet, m - c SAND			Small bould	ders 63-66 ft.	
- 04		Wet, f gravelly m - c SAND			2 2 2		
- 66				*	Easier drilli	ng 66-69 ft (small cobbles).	20 —
-		End of hole at 69 ft (21.1 m).			4'11" tailpip	De.	
- 68					Borehole c	ompleted with 8" steel casing on 16-	
STR	ATIG		SAND (GRAVELLY)			RAVEL (SANDY)	OCK
BAC	KFILL		(SW/SP)	ONITE	s/	SW/GP)	
7			OGGED/SUPERVISED BY:			TOTAL DEPTH (ft): 69	
ľ		ing. Geotechnical and Environmental Engineers		Christoph		COMPLETION DEPTH (ft): 69	
		D	ATE COMPLETED:	16-Aug-2	005	PAGE 2 OF 2	

	AME: Deloitte & Touche	DRILLER: Cora Lynn / Bill Wiebe			BOREHOLE ID: PW2	
PROJECT	NAME:Rose Creek GW Interception	METHOD: Dual	Air Rotary	/	LOCATION: Cross Valley Dam	
PROJECT	<b>NUMBER:</b> 118004	<b>N:</b> 6914195.070	<b>E:</b> 580097.780		TOC ELEVATION (m): 1018.639	
DEPTH (ft) SOIL PROFILE	LITHOLOGY SOIL/ROCK DESC		BORE	s	ADDITIONAL COMMENTS (Yield, water quality, geofabric, special construction design, etc)	DEPTH (m)
-0 $-2$ $-4$ $-6$ $-8$ $000$	Dry, It brown, silty m SAND. Dry, brown, m - c SAND with some silt. Dry, brown, silty SAND. Damp, brown-black SAND with some clay. Lot Damp, brown, m - c SAND with some silt, tract above. Damp, brown, silty m SAND, trace organics. Damp, brown, silty m SAND, trace organics. Damp, brown, m - c SAND. Half of coarse san material. Damp brown, f - m SAND with trace silt. Damp, It brown m SAND with trace silt. Damp, It brown well graded f SAND to f GRAV	e clay. Less organics than d is platy metamorphic		casing from Collapse of r Dry dusty dri	air rotary drilling with 10.75" OD steel 0 to 55.5 ft (16.9 m). natural formation from 3.5 to 55.5 ft. illing (8-9 ft). 2.70 m (8.85 ft) bgs (6-Sept-2005).	2
$-10 \frac{2}{00000000000000000000000000000000000$	Damp, sandy f GRAVEL, trace silt. Damp, sandy f GRAVEL. Wet, brown, m-c sand, trace (<5%) gravel. Wet, brown, m-c sand, some (25%) gravel.			at 14-15 ft. #30 Johnsor 24.25 ft bgs. Hammer bou	uncing 15.5 ft. Poor recovery 15-16 ft. asy drilling 15-30 ft, some cobbles	4
- 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(ML) (SM) (SM)	SAND (GRAVELLY) (SW/SP) ITONITE L (1/4") BENTC GROU	(GM) NITE	40.0 ft bgs.	AVEL (SANDY)	6 8 КСК
	ertson GeoConsultants Inc.	AL (1/4") COGGED/SUPERVISED BY: REVIEWED BY: DATE COMPLETED:		llater Wels	TOTAL DEPTH (ft):         55.5           COMPLETION DEPTH (ft):         55.5           PAGE 1 OF 2         2	

	NAME: Deloitte & Touche	DRILLER: Cora L	ynn / Bi	ll Wiebe	BOREHOLE ID: PW2	
PROJEC	T NAME: Rose Creek GW Interception	METHOD: Dual A	ir Rotar	y	LOCATION: Cross Valley Dam	
PROJEC	T NUMBER: 118004	<b>N:</b> 6914195.070	<b>E:</b> 5	80097.780	TOC ELEVATION (m): 1018.639	
DEPTH (ft) SOIL PROFILE			BORE	(	ADDITIONAL COMMENTS (Yield, water quality, geofabric, becial construction design, etc)	DEPTH (m)
- 30 0 0 0 0 0 0 - 32 0 0	Wet, orange-brown, m-c sand, trace gravel (5 Wet, orange-brown, m-c sand, some f gravel (			Hammer drop	s quite easily, less cobbles.	10 -
- 34 - 36 - 38				Very high flow recover sampl water.	vs (orange-brown water). Unable to les 35-44 ft due to high volumes of	
40				Very fast drillin	ng.	12
- 42	Wet, orange-brown, m-c sand with trace (<10%	6) gravel.		#100 Johnson 50.5 ft bgs.	n 8-inch stainless steel screen 40 -	
- 46	Wet, orange-brown, m-c sand with some (20%	.) gravel.		Dark, grey-bro	own water.	14
- 50 - 52	Wet, coarse sand with trace gravel (<5%). Wet, grey-brown sandy SILT.			5 ft tailpipe		16
- 54	Wet, dark grey SILT. Borehole terminated at 5	5.5.ft (16.9 m)		Borehole com Aug-2005.	pleted with 8-inch steel casing on 13-	
STRATIG			GM)			DCK
		.OGGED/SUPERVISED BY: L	aura Fino		OTAL DEPTH (ft): 55.5	
	ertson GeoConsultants Inc.	REVIEWED BY: C	Christoph	Wels C	OMPLETION DEPTH (ft): 55.5	
Mi	ining, Geotechnical and Environmental Engineers	DATE COMPLETED: 1	3-Aug-20	05	PAGE 2 OF 2	

CLIE	NT N	AME: Deloitte & Touche	DRILLER: SDS D	Drilling	BOREHOLE ID: MW1		
PRO	JECT	NAME:Rose Creek GW Interception	METHOD: Sonic			LOCATION: Cross Valley Dam	
PRO	JECT	NUMBER: 118004	<b>N:</b> 6914282.377	<b>E:</b> 58	30153.476	TOC ELEVATION (m): 1016.964	
DEPTH (ft)	SOIL	LITHOLOGY SOIL/ROCK DESCF	RIPTION	BORE		ADDITIONAL COMMENTS (Yield, water quality, geofabric, pecial construction design, etc)	DEPTH (m)
-0 $-2$ $-6$ $-8$ $-10$ $-12$ $-14$ $-16$ $-18$ $-20$ $-22$ $-24$ $-24$		grey brown silty SAND&GRAVEL with pebbles dense, ang-suba, dry d. orange-brown f. SAND & SILT (SM)); fine lay sand & silt; some oxidized (or-bn) layers at ~3.6 yellow-brown f. SAND & SILT (SM); trace grave in sand-silt matrix; yellow-brown c. GRAVEL (GP), trace c. sand; v suba-subr; some root fragments ~6ft grey-black SILT (ML/OL), trace f. sand; moist-w rich; root fragments throughout, wet yellow-brown c. GRAVEL (GP), some sand, we 50% > 10mm; layers of c. and f. pebbles orange-brown c. GRAVEL (GW), some sand, w clasts ~2"; ~20% c. sand; oxidized, Fe staining dark-grey SILT (ML), trace f. sand, trace clay(?) yellow-brown mf. SAND (SW), trace gravel, w	rers (5-10mm) interlayered 3ft; large root at 0.7m, moist el; wet, dense, some pebbles vet; pred. Pebbles & cobbles; ret; low plast, soft, organic- Il-graded, loose, subr-round; rell-graded, loose, subr-round; ), soft, wavy bedding, wet ell-graded, loose, wet		Water level 1 Water interse No. 10 slot so	uous sonic drilling from 0 - 58 ft. .26 m (4.14 ft) bgs 6-Sept-2005. .ected around 5ft. creen from 8 ft to 28 ft. atural formation from 7.4 to 17.5 ft.	
- 28		yellow-brown mf. SAND (SW), trace gravel, w d. grey SILT (ML), trace sand, trace clay; med p					
		CHIPS (3/8")	TONITE BENTO _ (1/4") GROUT	(GM) NITE	GW (GW SAN FILT	ER PACK	ОСК
	<b>P</b> aha		DGGED/SUPERVISED BY:			TOTAL DEPTH (ft): 55	
-	-	ing Geotechnical and Environmental Engineers		Christoph \ 5-Aug-200		PAGE 1 OF 2	

CLIENT	NAME: Deloit	te & Touche	DRILLER: SDS	DRILLER: SDS Drilling			BOREHOLE ID: MW1	
PROJEC	CT NAME:Rose	e Creek GW Interception	METHOD: Sonic			LOCATION: Cross	Valley Dam	
PROJEC	CT NUMBER:	118004	N: 6914282.377	<b>E:</b> 58	80153.476	TOC ELEVATION (m	): 1016.964	
DEPTH (ft) SOIL BDOEILE	TROFILE	LITHOLOGY SOIL/ROCK DESC		BORE		ADDITIONAL COMME (Yield, water quality, geo special construction design	fabric,	
$ \begin{bmatrix} 30 \\ - 32 \\ - 32 \\ - 34 \\ - 36 \\ - 36 \\ - 38 \\ - 40 \\ - 42 \\ - 42 \\ - 44 \\ 0 \\ - 42 \\ - 46 \\ 0 \\ - 50 \\ 0 \\ 0 \\ - 51 \\ 0 \\ 0 \\ 0 \\ - 51 \\ 0 \\ 0 \\ 0 \\ 0 \\ - 51 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	d.grey silty f. S d.grey sandy 3 bottom interlayered L yellow-grey br subr, loose, w l.grey sandy S wet yellow-brown wet d.yellow-brown wet d.yellow-brown wet d.yellow-brown wet grey-brown m towards highe d.yellow brow throughout), w silt (5-10%) in C C C C C C C C C C C C C C C C C C C	AND (SP), trace silt, loose, wet SAND (SM), loose, wet SILT (ML), soft, low plast, wet, tr grey sandy SILT (ML) and silty f own SAND&GRAVEL (GW), we et ILT (ML) with thin layers of f. sa mc. SAND & GRAVEL (GW), t c. SAND (SP), trace f. gravel, w r gravel content near bottom rn sandy GRAVEL (GW), 10-30 rell graded gravel with some larg some parts of section, loose, w	. SAND (SM), soft, wet II-graded f. to v.c. sand, suba- nd, soft, low-medium plasticity race silt, subr-rounded, loose, rell sorted, loose, wet, trending % m.c. sand (variable ge pebbles and cobbles, trace			screen from 43 to 58 ft. natural formation from 44	to 55 ft. 14	
			SAND (GRAVELLY) (SW/SP) NTONITE BENTO	SILTY GRA (GM) NITE	(G	RAVEL (SANDY)	BEDROCK	
			AL (1/4") GROU					
R	bertson Geo	C K K K		Christoph Christoph			5555	
		nd Environmental Engineers	REVIEWED BY: DATE COMPLETED:	5-Aug-200		COMPLETION DEPTH (ft): PAGE 2 O		

	NAME: Deloitte & Touche	DRILLER: SDS Drilling			BOREHOLE ID: MW2	
PROJEC	T NAME: Rose Creek GW Interception	METHOD: Sonic			LOCATION: Cross Valley Dam	
PROJEC	<b>T NUMBER</b> : 118004	N: 6914200.093	<b>E:</b> 5	80100.047	<b>TOC ELEVATION (m):</b> 1018.225	
DEPTH (ft) SOIL PROFILE	LITHOLOGY SOIL/ROCK DESC		BORE		ADDITIONAL COMMENTS (Yield, water quality, geofabric, special construction design, etc)	
-0 -2 -2 -4 -6 -10 -12 -12 $-00^{0}$ $-00^{0}$ -12 $-00^{0}$ $-00^{0}$ -12 $-00^{0}$ $-00^{0}$ -12 $-00^{0}$ -00	light-grey SILT & fm. SAND (SM), moist, dens and d. grey, small twigs and roots buried in sec dark-brown silty f. SAND (SM), some gravel, pi loose, moist dark-brown silty f. SAND (SM), some fine grave organic-rich black layers with twigs no recovery dark-brown silty gravelly SAND (SM), ang-sub occasional large pebbles (~25mm), moist, loos I. grey to pinkish grey rounded boulder(s) (larg dark-brown silty GRAVEL (GM), some f c. sa angularity and composition of gravel, some oxi light-brown silty, sandy GRAVEL (GM), smaller cobbles (>90mm) broken by bit, wet, loose	se; fine layers (1-2mm) of I. diments red. subr - suba pebbles, el (max dia ~10mm), moist, thi a c. sand and v.f. gravel, e e broken fragments), dry ind, highly variable size, de staining around cobbles;we r pebbles suba-subr, larger		Water level No. 10 slott	nuous sonic drilling from 0 - 55 ft. 2.36 m (7.73 ft) bgs 6-Sept-05. screen from 8 ft to 48 ft. natural fomation from 10 to 48 ft.	
- 24 - 26 - 28	olive-brown SAND & GRAVEL (GW), as above (~100mm) grey-brown mc. SAND (SP) some gravel (15- suba-subr, gap-graded (no f. sand or fines and wet	20%), gravel pred. 10-20mm				8 —
STRATIG BACKFIL	L TYPE CHIPS (3/8") (ML) (SM) (ML) (SM) (SM) (SM) (SM) (SM) (SM) (SM) (SM	SAND (GRAVELLY) (SW/SP) TONITE L (1/4") OGGED/SUPERVISED BY:	(GM) NITE	G' (G'	RAVEL (SANDY) PEAT BEDRO W/GP) BEDRO ND TER PACK TOTAL DEPTH (ft): 55	DCK
	ining, Geotechnical and Environmental Engineers		Christoph 6-Aug-200		COMPLETION DEPTH (ft): 55	
1		ATE COMPLETED:	u-∺uy-∠00	5	PAGE 1 OF 2	

CATION: Cross Valley Dam C ELEVATION (m): 1018.225
ITIONAL COMMENTS water quality, geofabric, construction design, etc)
water quality, geofabric,
10
12
14
16
with 2-inch PVC casing on 6-

CLIENT NAME: Deloitte & Touche	DRILLER: SDS Drilling			BOREHOLE ID: P05-01		
PROJECT NAME: Rose Creek GW Interception	METHOD: Sonic	:		LOCATION: Cross Valley Dam		
PROJECT NUMBER: 118004	<b>N:</b> 6914334.946	<b>E:</b> 58	80165.032	TOC ELEVATION (m): 1017.989		
LITHOLOGY SOIL/ROCK DESC		BORE		ADDITIONAL COMMENTS (Yield, water quality, geofabric, pecial construction design, etc)	DEPTH (m)	
<ul> <li>- 0</li> <li>dark-brown gravelly SAND (SW), some silt (10 some twigs throughout</li> <li>- 2</li> <li>- 2</li> <li>- 2</li> <li>- 2</li> <li>- 2</li> <li>- 3</li> <li>- 4</li> <li>- 4</li> <li>- 4</li> <li>- 4</li> <li>- 5</li> <li>- 6</li> <li>- 7</li> <li>- 7</li> <li>- 8</li> <li>- 8</li> <li>- 9</li> <li>- 9</li> <li>- 10</li> <li>- 10</li></ul>			Water level o bgs; Port 2 - (4.03 ft) bgs;	uous sonic drilling from 0 - 85 ft. n 6-Sept-05: Port 1 - 1.07 m (3.51 ft) 1.22 m (3.99 ft) bgs; Port 3 - 1.23 m Port 4: 1.29 m (4.25 ft) bgs; Port 5 - ft) bgs; Port 6 - 1.75 m (5.73 ft) bgs.	0	
yellow-brown sandy SILT (ML), organic rich (p root growth, wet	eat like), strong odour, a lot of			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2	
<ul> <li>grey-black organic rich sandy SILT (ML), stron occasional pebbles and cobbles mixed in, wet</li> <li>10 grey-black silty fm. SAND (SM) w/ some grav</li> <li>orange-brown sandy GRAVEL (GW), trace silt</li> <li>&gt;30% &gt;</li> <li>12 grey silty f. SAND (SM), loose, wet, shiny appendix</li> </ul>	vel (pebbles), loose, wet (5-10%), round-subr particles			en midpoint 11 ft bgs. Tubing er last 15 cm and wrapped in nylon	4	
<ul> <li>- 16</li> <li>orange-brown gravelly m. SAND (SP), well wa subr pebbles, loose, wet</li> <li>- 18</li> <li>- 20</li> <li>O O O O O O O O O O O O O O O O O O O</li></ul>			perforated ov mesh.	en midpoint 18 ft bgs. Tubing rer last 15 cm and wrapped in nylon atural formation from 17.7 to 82 ft.	6	
- 22 0 0 0 - 24 0 0 - 26 0 0 - 26 0 0 - 28	M), suba-subr, loose, wet	0505050505050505050505050 0505050505050			8	
	SAND (GRAVELLY) (SW/SP) ITONITE BENT( AL (1/4") GROU	SILTY GRA (GM) DNITE	GW (GW		CK	
obertson GeoConsultants Inc.	OGGED/SUPERVISED BY: REVIEWED BY: DATE COMPLETED:		ristoph Wels COMPLETION DEPTH (ft):			

CLIENT NAME: Deloitte & Touche	DRILLER: SDS	Drilling		BOREHOLE ID: P05-01		
PROJECT NAME:Rose Creek GW Interception	METHOD: Sonic	-		LOCATION: Cross Valley Dam		
PROJECT NUMBER: 118004	<b>N:</b> 6914334.946		80165.032	TOC ELEVATION (m): 1017.989		
프   그 ㅠ	LITHOLOGY SOIL/ROCK DESCRIPTION		s	ADDITIONAL COMMENTS (Yield, water quality, geofabric, special construction design, etc)	DEPTH (m)	
- 0 0 - 30 0 0 - 30 0 0 - 32 0 0 - 32 0 0 - 0	se, wet				- 10	
<ul> <li>30</li> <li>as above grading to c. SAND, trace gravel</li> <li>38</li> <li>olive-grey sandy GRAVEL w/ some silt (10-1 sand/silt mixture</li> <li>40</li> <li>grey f. SAND (SP), well sorted, very uniform,</li> <li>42</li> </ul>		ା କାର୍ଯ୍ୟ	perforated o mesh.	een midpoint 37 ft bgs. Tubing ver last 15 cm and wrapped in nylon	12 —	
<ul> <li>grey GRAVEL, trace f. sand, trace silt (5-10% sign of weathering or oxidation</li> <li>44</li> <li>grey mf. SAND, very well sorted (no gravel</li> <li>46</li> <li>Igrey gravelly SAND, trace silt (SW), loose,</li> </ul>	, no fines), loose, wet	 			- 14	
- 48 - 50 - 52 grey f. SAND, trace silt (5-10%), (SP), occas	ional thin pebble lavers, loose.				-	
<ul> <li>52</li> <li>grey mf. SAND (SP), trace silt (S-10%), (SP), occas wet</li> <li>grey mf. SAND (SP), trace silt, very uniform</li> <li>54</li> </ul>				een midpoint 55 ft bgs. Tubing	16 —	
- 56 as above, some coarse sand and f. gravel			perforated o mesh.	ver last 15 cm and wrapped in nylon	-	
	SAND (GRAVELLY) (SW/SP) INTONITE AL (1/4") BENTO GROU	(GM) DNITE	GV (GV	AVEL (SANDY)	OCK	
	LOGGED/SUPERVISED BY:	Christoph	Wels	TOTAL DEPTH (ft): 85		
obertson GeoConsultants Inc. Mining, Geotechnical and Environmental Engineers	REVIEWED BY: DATE COMPLETED:	· · ·		COMPLETION DEPTH (ft): 83 PAGE 2 OF 3		

CLIE	IENT NAME: Deloitte & Touche		e & Touche	DRILLER: SDS Drilling			E	BOREHOLE ID: P05-01	
PRO	JECT	NAME:Rose	Creek GW Interception	METHOD: Sonic			L	OCATION: Cross Valley	Dam
PRO	JECT	NUMBER:	118004	N: 6914334.946	<b>E:</b> 58	80165.032	<u>2</u> T	OC ELEVATION (m): 1017	.989
DEPTH (ft)	SOIL		LITHOLOGY SOIL/ROCK DESCRIF	TION	BORE		(Yiel	DITIONAL COMMENTS d, water quality, geofabric, al construction design, etc)	DEPTH (m)
		grey silty SAN loose, wet	D&GRAVEL (SM/GM), suba-subr, w	reakly cemented by fines,	00000000000000000000000000000000000000				18 -
_		grey silty GRA loose, wet	VEL (as above) (GM), suba-subr, w	eakly cemented by fines,	<u>୭୦୭୦୭୦୭୦୭୦୭୦୭୦୭୦୭</u> ୭୦୭୦୭୦୭୦୭୦୭୦୭୦୭୦୭ ୭୦୭୦୭୦୭୦	Port 2 - Scr perforated o mesh.	reen m over la	idpoint 65 ft bgs. Tubing st 15 cm and wrapped in nylo	<sub>on</sub> 20 –
- 72 - 74		grey f. SAND (	(SP), very uniform, loose (?), wet						22 –
- 76 78		grey SILT (roc plasticity	k flour) (ML), some f. sand, trace gra	avel and c. sand, low					-
- - 80 -	000000	grey cemented	GRAVEL, trace silt (GW), loose, we	suba, very dense, dry	<u>odooodod</u> o0o0o0od				24 -
- 82 - - 84			inated at 85 feet.					idpoint 83 ft bgs. Tubing st 15 cm and wrapped in nylo	n
		. TYPE 🗔			GM)	(G	RAVEL 6W/GP) AND LTER P		BEDROCK
	2			GED/SUPERVISED BY: (			ΤΟΤΑ	L DEPTH (ft): 8	
	-		ad Environmental Engineers		Christoph		COMF	PLETION DEPTH (ft): 8 PAGE 3 OF 3	3

CLIE	ENT N	AME: Deloitt	e & Touche	DRILLER: SDS D	Prilling		BOREHOLE ID:	BOREHOLE ID: P05-02	
PRC	JECT	NAME:Rose	Creek GW Interception	METHOD: Sonic			LOCATION: Cross	Valley Dam	
PRC	JECT	NUMBER:	118004	N: 6914264.652	<b>E:</b> 58	80143.404	TOC ELEVATION (m	<b>):</b> 1016.663	
DEPTH (ft)	SOIL PROFILE		LITHOLOG SOIL/ROCK DESC		BORE		ADDITIONAL COMME (Yield, water quality, gec special construction desig	fabric,	
- 0 - 2		grey-black silty	y GRAVEL (GM), suba, cemer	ontent, a lot of roots, musky		6-inch conti	nuous sonic drilling from 0	0 - 17 ft.	
- 🔽		yellow-brown r	dded layers (5-10mm) of silty a nf. SAND, well washed (SP), SAND (SM), some roots, wet			Water level	0.94 m (3.09 ft) bgs (6-Se	pt-2005).	-
- 6		orange-brown loose, wet No recovery	sandy GRAVEL (GW), round-s			Collapse of	natural formation from 4 to	o 17 ft.	
- 8	00000000 00000000	pebble and col olive-brown c. subr-round, loo	bble, loose, wet GRAVEL, some mc. sand (G	/shed (no fines), occ. Rounded P), pred large clasts (50-70mm)		No. 10 slot	screen from 6 ft to 16 ft.	2	
- 10 - 12		No Recovery.							_
- 14 - - 16		• •	ndy SILT (ML), low-med plastic			Borehole co	ompleted with 2-inch PVC	4	
		olive green silt Borehole termi	y f. SAND (SM), loose, wet, sh inated at 17 ft.	ny appearance (biotite?)		Aug-2005.			_
		. TYPE 🗔		SAND (GRAVELLY) (SW/SP) NTONITE AL (1/4") BENTO GROUT	(GM) NITE	(G SA	RAVEL (SANDY)	BEDROCK	
T	-		Consultants Inc. Ind Environmental Engineers	REVIEWED BY:	Christoph Christoph 7-Aug-200	Wels	TOTAL DEPTH (ft): COMPLETION DEPTH (ft): PAGE 1 C	17 16 0F 1	_

CLIENT NAME: Deloitte & Touche			DRILLER: SDS Drilling			BOREHOLE ID: P05-03		
PROJECT NAME:Rose Creek GW Interception			METHOD: Sonic	METHOD: Sonic			LOCATION: Cross Valley Dam	
PROJECT NUMBER: 118004			<b>N:</b> 6914171.021	<b>N:</b> 6914171.021 <b>E:</b> 580087.574			TOC ELEVATION (m): 1019.793	
DEPTH (ft)	SOIL PROFILE	LITHOLOGY SOIL/ROCK DESCF	RIPTION	BC	DRE		ADDITIONAL COMMENTS (Yield, water quality, geofabric, special construction design, etc)	DEPTH (m)
- 0	00000000000000000000000000000000000000	grey-brown silty GRAVEL (GM) some f. sand, p with silt and sand, dense, dry	ebbles and cobbles cement	ed Ba	6-ind	ch contii	nuous sonic drilling from 0 - 25 ft.	0 —
- 2 -	00000000000000000000000000000000000000	white cobble (broken rock fragments)						_
- 4	0000000 0000000	grey-brown silty GRAVEL (GM) some f. sand, p with silt and sand, dense, dry as above (GM)	bebbles and cobbles cement					
— 6 -	00000000000000000000000000000000000000					apse of	natural formation from 5.9 to 8.3 ft.	2 —
- 8		grey-brown mc. SAND trace gravel, trace silt ( d.grey fm. SAND (SW), some gravel, some sil moist						
10								_
- 10		WOOD, large piece of tree olive-brown, silty GRAVEL (GM), some sand, s	ubr-round. HW. moist	/				
-	0'0 	olive-green silty mf. SAND (SM), some organi						
-12		dark-grey sandy SILT (ML), soft-medium stiff, lo fragments, musky odour, fine layers of white as wavy bedding, wet	h (?) mixed in sediments,					
-		as above (ML) but mix of olive-grey and orange	-brown sandy SILT					4
- 14		grey-black silty f.SAND (SM), small twigs and re shiny appearance	oots, musky odour, loose, we	et,	Wate	er level	3.75 m (12.29 ft) bgs.	
-	00000	olive-brown silty gravel, some sand (GM), suba oxidation orange-brown sandy GRAVEL (GW) trace silt ( from 10 mm to >100 mm, round-subr, oxide sta	5-10%), clasts well graded	m				
No. 10 slot screen from 15 ft to 25 ft.								
STRATIGRAPHY       SILTY SAND       SAND (GRAVELLY)       SILTY GRAVEL       GRAVEL (SANDY)       PEAT       A       BEDROCK         BACKFILL TYPE       BENTONITE       BENTONITE       BENTONITE       SAND       SAND       SAND								
CHIPS (3/8") SEAL (1/4") GROUT FILTER PACK								
Construction         LoggeD/SUPERVISED BY:         Christoph Wels         TOTAL DEPTH (ft):         25           Reviewed BY:         Christoph Wels         COMPLETION DEPTH (ft):         25								
		ng. Geotechnical and Environmental Engineers	ATE COMPLETED:		Aug-2005		PAGE 1 OF 2	

LIENT NAM	Deloitte & Touche	DRILLER: SDS D	rilling	BOREHOLE ID: P05-03		
PROJECT N	IE:Rose Creek GW Interception	METHOD: Sonic		LOCATION: Cross Valley Dam		
PROJECT N	IBER: 118004	<b>N:</b> 6914171.021	<b>E:</b> 580087.574	·		
DEPTH (ft) SOIL PROFILE	LITHOLOGY SOIL/ROCK DESCR	IPTION		ADDITIONAL COMMENTS (Yield, water quality, geofabric, pecial construction design, etc)	DE DTH (m)	
18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	hole terminated at 25 feet.		0 0 0 0 0 0 0 0 0 0 0 0 0 0	pleted with 2-inch PVC casing on 7-	6	

STRATIGRAPHY SILT SILTY SAND (ML)	SAND (GRAVELLY)	SILTY GRAVEL OF GF (GM)	RAVEL (SANDY)	BEDROCK
	AL (1/4")	DNITE SA T FIL	ND TER PACK	
	LOGGED/SUPERVISED BY:	Christoph Wels	TOTAL DEPTH (ft):	25
	REVIEWED BY:	Christoph Wels	COMPLETION DEPTH (ft):	25
Mining, Geotechnical and Environmental Engineers	DATE COMPLETED:	7-Aug-2005	PAGE 2 OF	2





October 5, 2005

Christoph Wels, Ph.D. Robertson GeoConsultants Inc. Suite 640, 580 Hornby St. Vancouver, BC V6C 3B6

Dr. Wels:

## Re: GLL - 50707 – Installation and Completion Details for P05-01 Multi-Level at the Faro Mine Site, Yukon

As per your request, here is a brief summary of field activities and completion details associated with the installation of multi-level well P05-01 at the Faro Mine Site. Gartner Lee personnel were on site from August 6<sup>th</sup> to August 9<sup>th</sup> and assisted Robertson GeoConsultants (RGC) with field activities related to both the Down Valley pumping test and the Zone 2 Pit area. This memo summarizes details specific to the design and installation of multi-level well P05-01. The multi-level was installed along the north side of the Rose Creek Valley, within a hundred meters of the Cross-Valley Dam. Christoph Wels of RGC was present on-site to oversee field activities and was responsible for logging the soil cores from the P05-01 borehole. Consequently, no soil logging information is included in this brief report.

The entire soil column at P01-05 was cored using sonic drilling (SDS/Boart Longyear). These cores were used to guide the final design and placement of the sampling ports along the multilevel well. The final construction details are included in the attached figure. The following is a summary of details for P01-05:

## **Construction Materials**

A <sup>3</sup>/<sub>4</sub>" inch OD PVC rod in 10 ft sections was used as the centre stalk for rigidity of the multilevel. These sections were connected using 1 ft long PVC couplings (pieces of larger diameter PVC pipe) fastened with plastic tie wraps. The sampling tubes consist of continuous 5/8" OD HDPE tubing (standard size sampling tubing). Each screened section was constructed directly onto the sampling tubing (i.e. no couplings or attachments) by slotting the HDPE tubing and wrapping it several times with a fine Nitex mesh. All sampling tubes were then fastened to the PVC centre stalk. The screens were wrapped in plastic wrap to protect them and keep them clean



during construction and installation. The protective wrap was removed prior to lowering the device into the casing.

## Multi-Level Well Design and Installation

The final installation details are shown on the attached figure. The casing and core barrel were driven into bedrock to 26.52 m (87 ft) below ground surface. The bedrock surface was encountered at approximately 25.91 m (85 ft) b.g.s. (refer to actual core logs for accurate details). The PVC centre rod on the multi-level was cut so that it would extend past the bottom screen to 87ft (bottom of hole). The device was then lowered down into the installation casing. Silica sand and bentonite (pellets and chips) were emplaced at some locations as the installation casing was pulled back. See Figure 1 for details (attached).

I trust this summary adequately describes the field activities and final design associated with multi-level P05-01 at the Faro Mine. If you have any questions or concerns, please do not hesitate to contact me at 867-633-6474 ext.24.

Yours very truly, GARTNER LEE LIMITED

Marts alf

Martin Guilbeault, M.Sc., P.Eng. Hydrogeologist

Attachments: Figure 1. P05-01 Well Completion Diagram

MG:mg

