

# Deloitte & Touche

## 2008 Annual Inspection Waste and Water Management Facilities Vangorda Mine, Yukon Territory

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*Prepared for:*

**Deloitte & Touche Inc.**

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Range Mining Corporation  
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*Project Reference Number  
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*January 2009*

**2008 Annual Inspection  
Waste and Water Management Facilities  
Vangorda Mine, Yukon Territory**

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**SRK Project Number 1CD003.111**

**January 2009**

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# 1 Introduction

At the request of Deloitte and Touche Inc. (DTI), Mr. Peter Healey of SRK Consulting (Canada) Inc. (SRK) completed an inspection of the waste and water management facilities at Vangorda Plateau Mine on August 6 to 8, 2008. The Vangorda mine is located 16 km south of the Faro Mine, Yukon Territory as shown on Figure 1. The annual inspection of the Vangorda mine site focuses on the geotechnical performance and stability of the following structures:

- Vangorda Waste Rock Containment Facility including the seepage collection system ;
- Little Creek Dam;
- Vangorda Creek Diversion;
- Sludge Pond Embankments at the Water Treatment Plant;
- Grum Settling Pond;
- V-15 Seepage Collection System;
- The Grum Interceptor Ditch; and
- The Sheep Pad Sediment Ponds below the Overburden Stockpile.

A plan of the Vangorda Plateau area and the above components are shown in Figure 2 and on the aerial mosaic on Figure 3.

This report presents our observations and comments on the performance and stability of the structures and provides recommendations for any remediation, where appropriate.

## 2 Vangorda Waste Rock Pile

### 2.1 Observations

#### 2.1.1 Seepage Collection System

##### Transverse Drains and Weirs

During construction of the original till starter dyke, six transverse drains were installed beneath the dyke to allow seepage to drain from the waste dump. These drains were connected to the seepage collection channel during the 1994 upgrading. V-Notch weirs were installed in four of the drains to monitor the flow.

During this year's inspection, seepage flow was observed at Weir #6 (Photo 1), Weir #5 (Photo 2), Weir #3 (Photo 3), Drain #4 (Photo 4) and Weir #2 (Photo 7). The flow in each of these drains varied from a trace to about 0.5L/min.

##### Seepage Collection Channel

As seen in the photo 5, seepage in the Vangorda seepage collection channel around the Waste dump tends to pond in places along the channel. While it is recognized that the gradient of the channel is very flat because of grade constraints, it appears that the HDPE culvert that was installed several years ago to permit vehicles to cross the channel (see the background in photo 5) is blocking the flow to Little Creek Pond.

#### 2.1.2 Starter Dyke and Till Cover

In 2006, DTI resloped sections of the till dyke at the western end of the waste rock dump. A small shallow subsidence was observed on the sideslope of these resloped areas as shown on Photo 8. Furthermore, wet spots were also noted in a number of areas at the crest of the dyke. It is believed the wet spots and the shallow subsidence are the result of an elevated water table within the waste rock behind the dyke.

The remaining unresloped sideslopes of the till dykes around the perimeter of the dump continue to experience some erosion (Photo 9). However, there are no signs of major instability. DTI continues to maintain the integrity of the upper reaches of the ditch by regular removal of sediment both above and within the channel.

#### 2.1.3 Instrumentation

In accordance with SRK's recommendations, DTI has been taking water level readings twice a year from the piezometers that were installed in the till starter Dyke in 1994. A summary of the water level readings taken to date in the piezometers are presented in Table 1. Water levels, as recorded on September 23, 2008 in Piezometers P94-01A, 01B, 02A and 02B, are shown in Figures 4 and 5.

The levels in these piezometers show increases varying from 1 to 4m. This rise in the water table is consistent with the wet spots observed on the till dyke slopes.

**Table 1: Water Levels in Piezometers and Groundwater Wells – Vangorda Rock Pile**

Measured Static Water Level (meters)

underlined readings (begin in 1998) indicate that no water was identified (hole was dry or frozen).

readings post Sep/98 given as metres below top of plastic piezometer pipe.

readings prior to Nov/98 could be metres below to top of piezo. pipe or steel casing.

Date	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47
	GW-94-01	GW-94-02	GW-94-03	GW-94-04	GW-94-05*	P-94-01A	P-94-01B	P-94-02A	P-94-02B	P-94-02C	P-94-03A	P-94-03B	P-94-04A	P-94-04B
3-May-94	8.28	14.33	11.28	14.33	11.56	12.37	6.05	10.57	6.12	13.08	14.10	9.80	12.17	8.99
21-Jun-94	7.45	8.65	9.15	9.65		NR	NR	NR	NR	NR	NR	NR	NR	NR
30-Jun-95						7.79	5.62	8.02	6.11	9.02	13.91	9.80	11.35	8.99
13-Jul-95						7.80	5.59	NR	NR	NR	NR	NR	NR	NR
30-Jul-95						7.86	5.48	7.99	6.12	8.81	13.68	9.80	11.83	8.99
26-Aug-95	6.89	8.47		9.05		NR	NR	NR	NR	NR	NR	NR	NR	NR
31-Aug-95	7.36					7.93	4.85	7.97	6.06	8.66	13.62	NR	12.60	NR
17-Oct-95	7.14	8.26		9.37		7.90	4.23	8.70	5.76	8.54	13.41	NR	11.88	NR
20-Nov-95	7.10	8.18		9.19		NR	NR	NR	NR	NR	NR	NR	NR	NR
13-Mar-96	7.44	9.23		9.39		NR	NR	NR	NR	NR	NR	NR	NR	NR
28-May-96	7.50	9.34	10.00	10.25		8.34	5.38	9.94	6.12	9.37	14.12	NR	12.77	NR
24-Sep-96	7.50	7.43	7.95	9.17		10.40	5.30	8.30	6.12	8.66	13.68	9.88	12.80	8.99
13-May-97	6.84	9.42	9.96	9.53		9.17	5.67	7.74	6.40	9.51	12.78	9.96	12.78	9.62
11-Jul-97						9.80	5.90	7.92	6.12	8.97	14.10	9.80	9.97	9.00
11-Aug-97	6.75	8.38	8.41	8.81	1.99	9.59	5.25	8.10	6.25	8.77	12.84	9.96	12.62	9.21
14-Oct-97	6.76	8.58	9.15	8.99		9.51	4.96	7.99	6.23	8.94	12.96	9.96	12.73	9.21
23-Dec-97	6.70	9.05	9.53	9.13		9.25	4.76	7.68	6.07	8.95	12.70	9.81	12.66	9.02
31-May-98	6.72	8.60	9.73	9.59	1.86	9.52	5.25	8.05	6.24	9.20	12.87	9.95	12.77	9.20
25-Jul-98						10.20	5.22	8.04	6.20	9.11	12.58	9.92	12.79	9.18
15-Sep-98	6.67	8.85	9.52	9.10	2.40	10.02	5.22	7.98	6.20	9.22	12.54	9.92	12.83	9.19
16-Nov-98						10.32	5.11	7.93	6.11	9.06	12.45	9.78	12.70	8.99
31-Dec-98	6.70	9.06	9.91	9.23		NR	NR	NR	NR	NR	NR	NR	NR	NR
18-Jun-99	6.88	9.24	10.24	10.18		9.96	5.09	8.35	6.11	9.48	12.48	9.77	12.70	8.99
12-Oct-99	6.81	7.58	8.81	8.79		10.01	5.10	8.16	5.73	8.82	12.49	9.78	12.71	8.97
31-May-00	5.75	8.68	8.26	9.33	1.84	10.20	5.10	7.85	5.93	8.97	12.48	9.78	12.66	8.88
5-Sep-00	6.66					NR	NR	NR	NR	NR	NR	NR	NR	NR
9-Oct-00	4.98	3.96	6.90	8.35	0.93	NR	NR	NR	NR	NR	NR	NR	NR	NR
9-Jul-01						10.42	4.84	8.86	7.72	5.46	12.84	9.78	10.84	8.88
4-Sep-02						10.75	5.30	7.99	6.02	9.33	13.53	9.78	NR	8.91
27-May-03						10.57	5.06	7.82	5.87	9.20	14.08	9.78	NR	8.93
9-Sep-03						10.65	5.04	7.84	5.87	9.15	13.86	9.78	NR	8.93
8-May-04						10.61	5.26	8.03	5.94	9.21	14.08	9.78	NR	8.98
8-Sep-04						10.72	5.20	7.79	5.77	9.44	14.08	9.78	NR	8.99
19-May-05						10.27	5.08	7.48	5.62	8.88	12.85	9.78	NR	8.99
9-Sep-05						10.37	4.88	7.44	5.45	8.91	13.28	9.78	NR	8.99
16-May-06						10.70	5.39	8.09	6.11	9.35	14.08	9.78	NR	NR
11-Sep-06						11.04	5.54	7.99	5.84	9.17	13.89	9.78	NR	NR
10-May-07						10.62	5.89	7.95	6.12	9.57	14.07	9.77	NR	8.99
27-Aug-07						10.94	6.04	8.21	6.12	8.88	14.04	9.78	NR	8.99
18-Sep-08						6.86	4.41	7.32	5.01	8.60	12.47	9.82	NR	8.89

NR Not recorded

\*: depth to bottom of hole GW-94-05 (V38) checked as 14.7m on Sep 15/98.

**Table 1: Water Levels in Piezometers and Groundwater Wells – Vangorda Rock Pile (Cont'd)**

Top of Pipe Elevations (masl)

V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47
GW-94-01	GW-94-02	GW-94-03	GW-94-04	GW-94-05	P-94-01A	P-94-01B	P-94-02A	P-94-02B	P-94-02C	P-94-03A	P-94-03B	P-94-04A	P-94-04B
1117.445	1117.405	1118.431	1116.165	1101.673	1136.555	1136.493	1138.41	1138.332	1129.84	1134.373	1134.459	1134.609	1134.327

Piezometric Elevation (masl)

Date	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47
	GW-94-01	GW-94-02	GW-94-03	GW-94-04	GW-94-05	P-94-01A	P-94-01B	P-94-02A	P-94-02B	P-94-02C	P-94-03A	P-94-03B	P-94-04A	P-94-04B
3-May-94	1109.165	1103.075	1107.151	1101.835	1090.113	1124.185	1130.443	1127.84	1132.212	1116.76	1120.273	1124.659	1122.439	1125.337
21-Jun-94	1109.995	1108.755	1109.281	1106.515										
30-Jun-95						1128.765	1130.873	1130.39	1132.222	1120.82	1120.463	1124.659	1123.259	1125.337
13-Jul-95						1128.755	1130.903							
30-Jul-95						1128.695	1131.013	1130.42	1132.212	1121.03	1120.693	1124.659	1122.779	1125.337
26-Aug-95	1110.555	1108.935		1107.115										
31-Aug-95	1110.085					1128.625	1131.643	1130.44	1132.272	1121.18	1120.753		1122.009	
17-Oct-95	1110.305	1109.145		1106.795		1128.655	1132.263	1129.71	1132.572	1121.3	1120.963		1122.729	
20-Nov-95	1110.345	1109.225		1106.975										
13-Mar-96	1110.005	1108.175		1106.775										
28-May-96	1109.945	1108.065	1108.431	1105.915		1128.215	1131.113	1128.47	1132.212	1120.47	1120.253		1121.839	
24-Sep-96	1109.945	1109.975	1110.481	1106.995		1126.155	1131.193	1130.11	1132.212	1121.18	1120.693	1124.579	1121.809	1125.337
13-May-97	1110.605	1107.99	1108.476	1106.635		1127.385	1130.823	1130.67	1131.932	1120.33	1121.593	1124.499	1121.829	1124.707
11-Jul-97						1126.755	1130.593	1130.49	1132.212	1120.87	1120.273	1124.659	1124.639	1125.327
11-Aug-97	1110.695	1109.025	1110.021	1107.355	1099.683	1126.965	1131.243	1130.31	1132.082	1121.07	1121.533	1124.499	1121.989	1125.117
14-Oct-97	1110.685	1108.825	1109.281	1107.175		1127.045	1131.533	1130.42	1132.102	1120.9	1121.413	1124.499	1121.879	1125.117
23-Dec-97	1110.745	1108.355	1108.901	1107.035		1127.305	1131.733	1130.73	1132.262	1120.89	1121.673	1124.649	1121.949	1125.307
31-May-98	1110.725	1108.805	1108.701	1106.575	1099.813	1127.035		1130.36		1120.64		1124.509	1121.839	1125.127
25-Jul-98						1126.355		1130.37		1120.73			1121.819	
15-Sep-98	1110.775	1108.555	1108.911	1107.065	1099.273	1126.535		1130.43		1120.62			1121.779	
16-Nov-98						1126.235		1130.48		1120.78				
31-Dec-98	1110.745	1108.345	1108.521	1106.935										
18-Jun-99	1110.565	1108.165	1108.191	1105.985		1126.595		1130.06		1120.36				
12-Oct-99	1110.835	1109.825	1109.621	1107.375		1126.545		1130.25		1121.02				
31-May-00	1111.695	1108.725	1110.171	1106.835	1099.833	1126.355		1130.56	1132.402	1120.87			1121.949	1125.447
5-Sep-00	1110.785													
9-Oct-00	1112.465	1113.445	1111.531	1107.815	1100.743									
9-Jul-01						1126.135	1131.653	1129.55	1130.612	1124.38	1121.533	1124.679	1123.769	1125.447
4-Sep-02						1125.81	1131.19	1130.42	1132.31	1120.52	1120.85	1124.68	NR	1125.42
27-May-03						1125.99	1131.43	1130.59	1132.46	1120.64	1120.30	1124.68	NR	1125.40
9-Sep-03						1125.91	1131.45	1130.57	1132.46	1120.69	1120.51	1124.68	NR	1125.40
8-May-04						1125.945	1131.233	1130.380	1132.397	1120.635	1120.298	1124.679	NR	1125.352
8-Sep-04						1125.835	1131.293	1130.620	1132.562	1120.400	1120.293	1124.679	NR	1125.337
19-May-05						1126.290	1131.412	1130.930	1132.712	1120.959	1121.528	1124.679	NR	1125.337
9-Sep-05						1126.185	1131.609	1130.970	1132.887	1120.930	1121.098	1124.679	NR	1125.337
16-May-06						1125.855	1131.103	1130.320	1132.222	1120.490	1120.293	1124.679	NR	NR
11-Sep-06						1125.515	1130.953	1130.420	1132.492	1120.670	1120.483	1124.679	NR	NR
10-May-07						1125.940	1130.603	1130.465	1132.212	1120.270	1120.303	1124.689	NR	1125.337
27-Aug-07						1125.615	1130.458	1130.200	1132.212	1120.960	1120.333	1124.679	NR	1125.337
18-Sep-08						1129.700	1132.088	1131.095	1133.322	1121.240	1121.908	1124.639	NR	1125.442

## **2.1.4 Rock Pile**

Old tension cracks are still evident in places along the crest at the northeast end of the dump. The cracks have not widened since the last inspection and there was no sign of instability.

## **2.2 Recommendations**

### **2.2.1 Transverse Drains**

The drains should be inspected monthly for any signs of instability around the outlets and deterioration of the steel v-notch weirs. The inspection should include recording of any flow or seepage.

### **2.2.2 Seepage Collection Channel**

SRK understands that DTI removed the HDPE culvert along the toe of the dump in the fall of 2008 after the inspection and regraded the bottom of the channel to permit any ponded water to escape to the Little Creek Pond.

### **2.2.3 Till Covers and Berms**

In the upper reaches of the seepage collection channel at the location of the till cover, DTI should continue to monitor any sediment build-up and periodically remove the sediment that accumulates in the channel.

### **2.2.4 Instrumentation**

Water level readings should continue to be taken from standpipe piezometers in the till berm around the rock pile. These readings should be taken at least twice a year. SRK understands that Gartner Lee (AECOM) monitors the water level readings and samples water quality from the original groundwater wells GW94-01 to -05.

As the till dyke in the vicinity of P94-04A has been regraded to a flatter configuration, replacement of this piezometer is not a high priority. However, if a drillrig is in the area for other reasons, then a replacement piezometer(s) could be installed.

More frequent monitoring of the 1994 Piezometers along the crest of the till dyke are recommended to establish whether there is a trend or pattern in the rising water table behind the dyke. Results should be forwarded to SRK.

### **2.2.5 Rock Pile**

DTI should continue to inspect, monthly, the surface of the Vangorda rock fill for any signs of widening of these cracks.

## 3 Little Creek Dam

### 3.1 Observations

Water level in the pond (Photo 10) during our inspection on August 6, 2008 was recorded at about 1110m. No cracks or major settlement of the dam were observed and no seepage was observed along the downstream toe. Erosion rills are evident on both the upstream and downstream slopes of the dam (Photo 11).

The upstream and downstream faces of the dam show no evidence of surficial movement, bulging or instability.

In 1994, six pneumatic piezometers and three thermistors were installed along the crest of the Little Creek dam. The six piezometers are located at three separate locations; two piezometers, one deep and one shallow, at each location. The location of the piezometers and thermistors are shown on Figure 6 and the 2008 piezometric levels are shown in section on Figures 7, 8 & 9. Actual readings are presented in Appendix B. The levels are normally taken twice year in May and August. However, this year because of abnormal fluctuations that were noted in the piezometers last year, SRK requested that readings be taken twice a week over the period April to September. The results are provided in the Appendix B. No unusual behaviour was noted in the readings.

The 900mm CMP emergency spillway (Photo 12) was inspected and is in good condition.

The culvert plunge pool and outlet are shown on Photo 13.

### 3.2 Recommendations

DTI should continue to regularly monitor the crest of the dam for any cracks, settlement or surficial movement of the slope.

As the water levels in LCD 2 and 3 now correlate with pond water levels, SRK recommends that the frequency of readings of the pneumatic piezometers can be reduced to once a month. Monitoring of the thermistors can remain on a semi-annual basis and the results compiled and forwarded to SRK.

DTI should also continue to remove any build-up of debris at the inlet end of the culvert spillway.

If the Little Creek pond is to become a long-term structure to collect seepage from the Vangorda Dump or to function as a polishing pond for the treatment plant, the spillway would need to be modified to accommodate a larger flood event and should possibly be relocated to the north end of the dam in an open channel.

## 4 Vangorda Creek Diversion

### 4.1 Observations

In accordance with a recommendation from SRK, an emergency overflow spillway (2x1m diameter CSP's) was installed at the headworks of the diversion in August 2005 (Photo 14). DTI continues to maintain the 2.4m diameter flume to ensure safe passage of flow in Vangorda Creek. Boulders that fall into the flume (Photo 15) are periodically removed. There are no signs of instability or settlement of the embankment at the headworks of the diversion. However, the cross braces that support the flume continue to deteriorate and water continues to escape through cracks in the flume.

DTI continues to pump water from a small seepage collection pond in the old Vangorda Creek ditch back into the flume. This is part of an overall plan to reduce flow of clean water into the Vangorda Pit.

The 2m diameter CMP culvert in the plunge pool shows signs of wear and tear around the entrance to the pipe (Photo 16). A trash rack has been installed at the entrance.

The exit culvert and the drop box structure remain intact and functioning satisfactorily.

### 4.2 Recommendations

DTI should continue to monitor the sideslopes above the flume for sloughing and areas of instability and should top-up riprap along the flume where the material has settled below the rim of the culvert sections. Any debris or rocks that accumulate in the flume, at the entrance to the 2m CMP or at the headwork's trashrack should be removed. SRK should be notified of any excessive seepage from the flume and increase of discharge into the pit. If any damage to the cross braces and if the structural integrity of any of the flume sections is compromised by ice formation or slides, DTI should replace the impacted sections.

SRK recommends that final design of the diversion for closure be initiated and plans to implement the reconstruction of the flume be scheduled as early as 2010.

## 5 Sludge Pond Embankment-Vangorda Water Treatment Plant

### 5.1 Observations

At the time of our inspection, the sludge pond was full (Photo 17). SRK inspected the downstream slopes and crests of the four embankments that make up the sludge pond. Neither subsidence of the slopes, nor settlement of the crest and no tension cracks were observed (Photo 18 and 19).

### 5.2 Recommendations

- Ensure that the pond level does not exceed 2m. below crest; and
- Continue to monitor on a monthly basis, the crest and sideslopes for cracking or any signs of sloughing

## 6 Grum Settling Pond

### 6.1 Observations

SRK inspected the riprapped open channel spillway, which conveys flow from the Grum settling pond to the Grum Interceptor Ditch (GID). The spillway is functioning normally. There was no sign or any instability or cracking in the surrounding dyke. No seepage was observed along the toe of the dyke.

### 6.2 Recommendations

The crest of the embankment around the pond should be monitored monthly for cracks and any seepage into and out of the pond.

## 7 Grum Interceptor Ditch and Sheep Pad Settling Pond

### 7.1 Observations

In the upper reaches of the GID, the ditch slopes remain stable and the vegetation continues to provide effective erosion control of the ditch sideslopes (Photo 20). However, debris and the odd boulder are beginning to partly block culvert outlets and entrances along the route (Photo 21).

SRK inspected the pond dyke and found no sign of slope instability, settlement or cracking.

## 7.2 Recommendations

- Monitor monthly the crest of the settling pond dykes for any cracks;
- Monitor monthly the toe of the dykes for any seeps; and
- Clear any debris that accumulates at either end of the GID culverts and the settling pond spillway. SRK understands that this was completed this year.

# 8 Grum Dump

## 8.1 Observations

The slopes of the lower benches of the Grum Dump were inspected and showed no signs of further erosion. SRK also inspected the diversion ditch along the main haul road adjacent to the Grum Dump, which was constructed to divert runoff away from the dump and into the Vangorda Pit. Since the construction of the haul road ditch, erosion on the dump slopes has diminished and significantly less sediment has accumulated in the sediment trap at V15. The ditch is performing satisfactorily.

Flow from the main stem of Grum Creek and from Tributary B is directed to the temporary sedimentation holding area located just above Vangorda Creek called Moose Pond (See Figure 2) The mine also installed a siphon pipeline from the pond to the V2 sampling station, which was intended to drain any water that may accumulate in the pond. The siphon pipe has never been used because there has not been any significant accumulation of water in the pond. DTI plans to maintain the Moose Pond sediment basin for drainage from the Main stem of Grum Creek until final closure planning is complete.

Four monitoring wells were installed in the 2005 season, southeast of the Grum Dump as part of investigations arising from the 2004 trigger of Adaptive Management Plan (AMP) Event #4. A summary of the AMP Event #4 response investigations, carried out in 2006, is included in the Faro Mine Complex AMP Annual Review for 2007.

In 2006, increasing concentrations of zinc were observed at the outlet of the V15 sedimentation pond upstream of Tributary A. In response to this finding, DTI installed a Bentomat lined diversion ditch in August, 2007.

During the inspection of the ditch, a subsidence was observed on the upstream side of the channel (Photo 22). Material from the subsidence had sloughed over the erosion protected sideslope and entered the channel. The cause of the subsidence appears to be seepage from the hillside above. There was no indication of ice or permafrost.

Further down the diversion channel there is a tributary ditch, which captures hillside seepage and discharges the flow into the V-15 diversion as shown in Photo 23. During the inspection it was noted that flow in the ditch has undermined the sideslope at the confluence point causing exposure of the Bentomat clay liner.

## 8.2 Recommendations

DTI should continue to monitor any sediment build-up in the V15 pond and clean it out when necessary.

The culverts and pipes should be inspected monthly to ensure there are no blockages or restrictions to the flow.

As further soil movement is likely which may block the flow in the channel, SRK recommends that the sloughed material be removed from the channel and the subsidence area be stabilized. SRK recommends that the stabilization involve removal of all loose saturated material from the slope followed by the placement of a gravel/rock buttress. Geotextile filter fabric should be placed over the slope prior to placing the buttress material.

SRK also recommends that where the flow has been undermining the Bentomat liner, the later be extended back up the tributary channel and protected with gravel or rock.

SRK understands that DTI completed this work in the fall after our inspection. However, DTI will inspect the slide area after the spring freshet for any further movement.

This report, “**2008 Annual Inspection Waste and Water Management Facilities – Vangorda Mine**”, has been prepared by SRK Consulting (Canada) Inc.

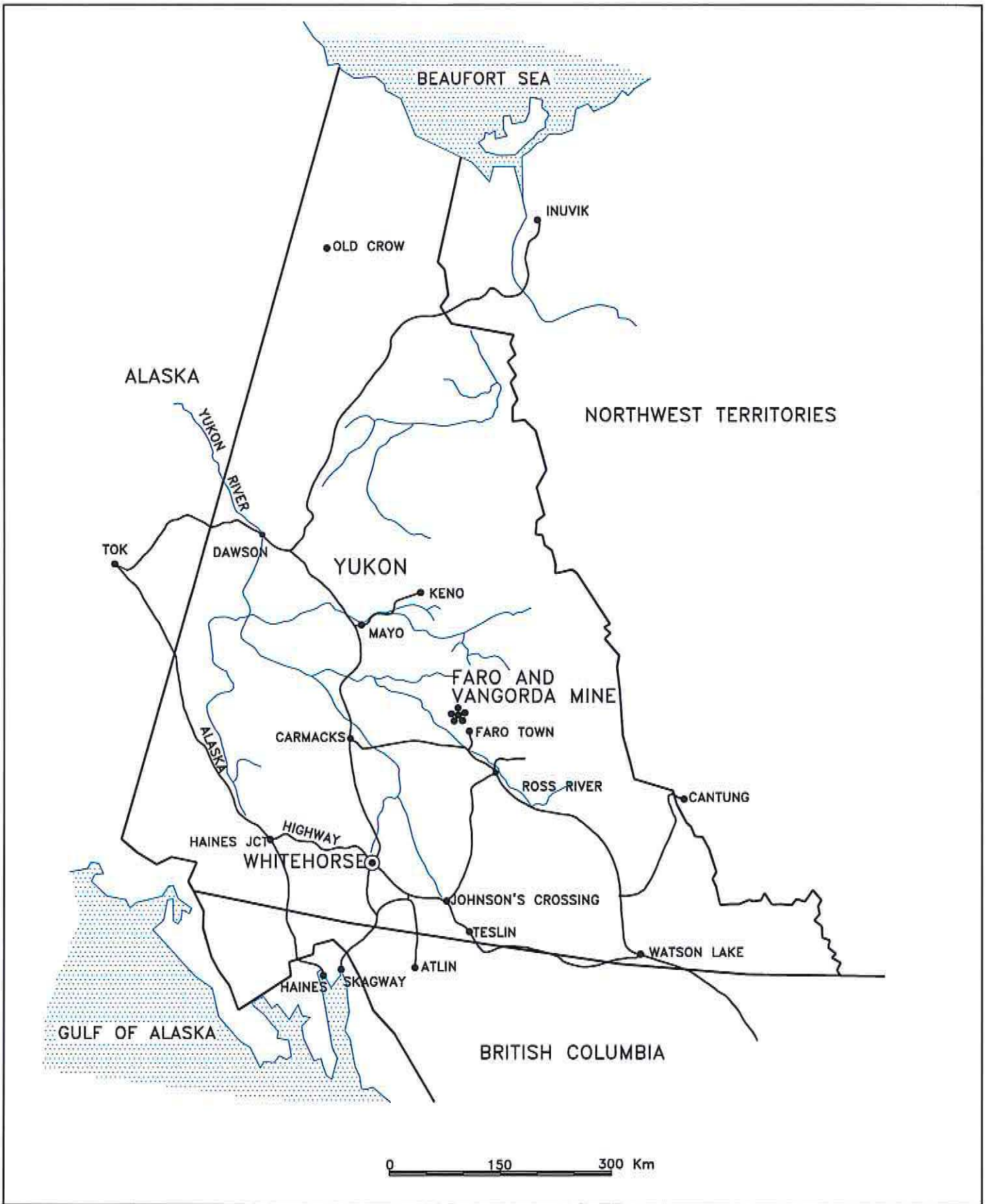
Prepared by



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Peter Healey, P.Eng.

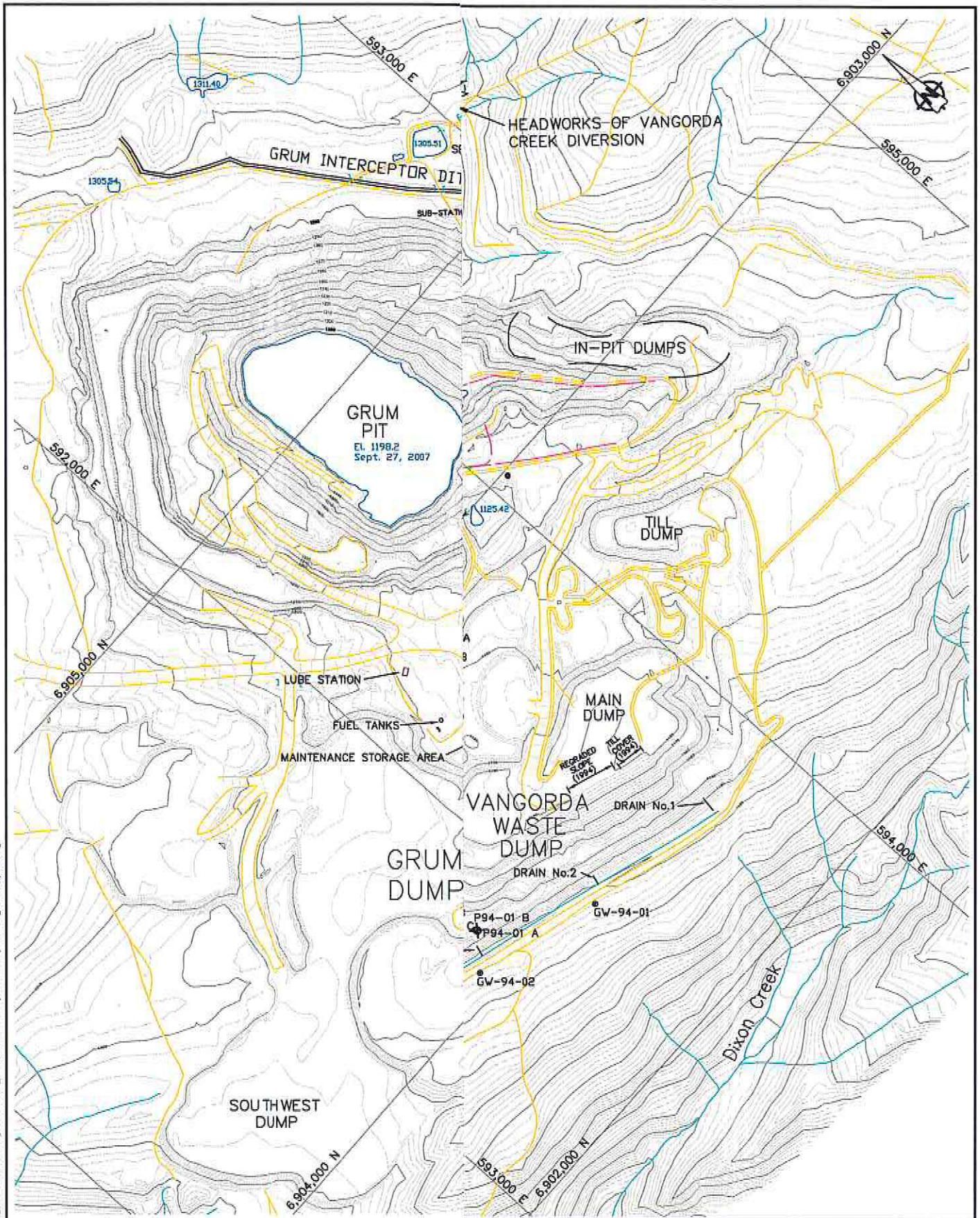
**Figures**



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 <p><b>SRK Consulting</b> Engineers and Scientists</p>	<p><b>Deloitte &amp; Touche</b></p>	<p>LOCATION MAP</p>	
<p>SRK JOB NO.: 1CD003.111 FILE NAME: yukon.dwg</p>	<p>Vangorda Plateau Mine</p>	<p>DATE: Jan. 2009</p>	<p>APPROVED: _____ FIGURE: 1</p>

J:\M\_SITES\FM\196\_1200311\_2008 Geotech\Inspection\140\_AutoCAD\2008 Inspection Report dig\site\_planning



Map Scale: 1:2500  
Contour Interval: 2m  
Date of Photography: 03/07/25  
Scale of Photography: 1:20000  
Survey control derived from existing 1:20000 photography  
Survey control based on: UTM Projection, NAD27  
Compiled by The ORTHOSHOP, Calgary, September 2003  
WO 8856

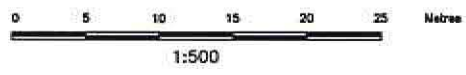
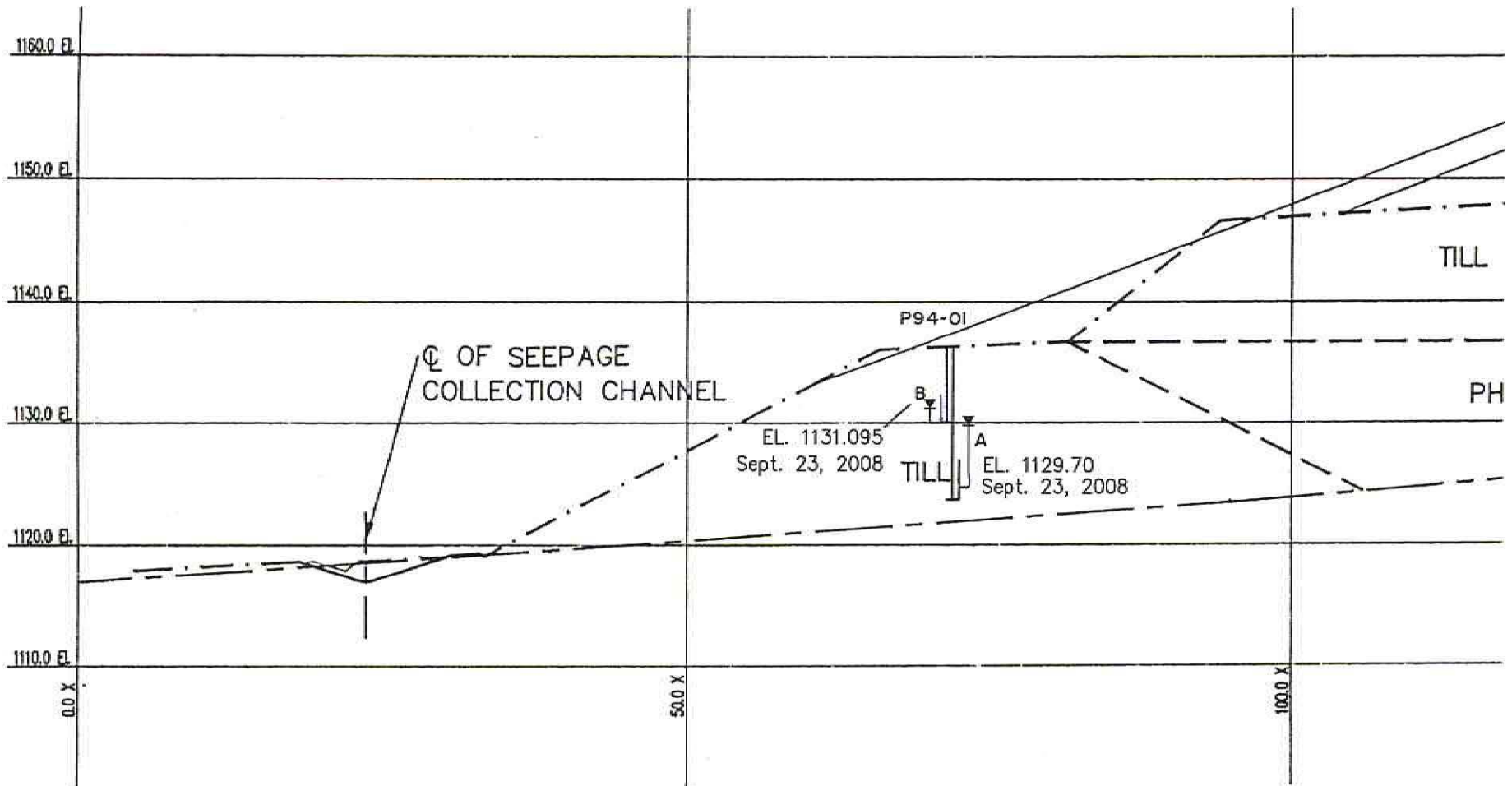
**oitte  
duche**

Plateau Mine

**GENERAL ARRANGEMENT PLAN**

DATE: Jan. 2009	APPROVED:	FIGURE: 2
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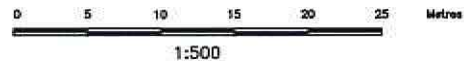
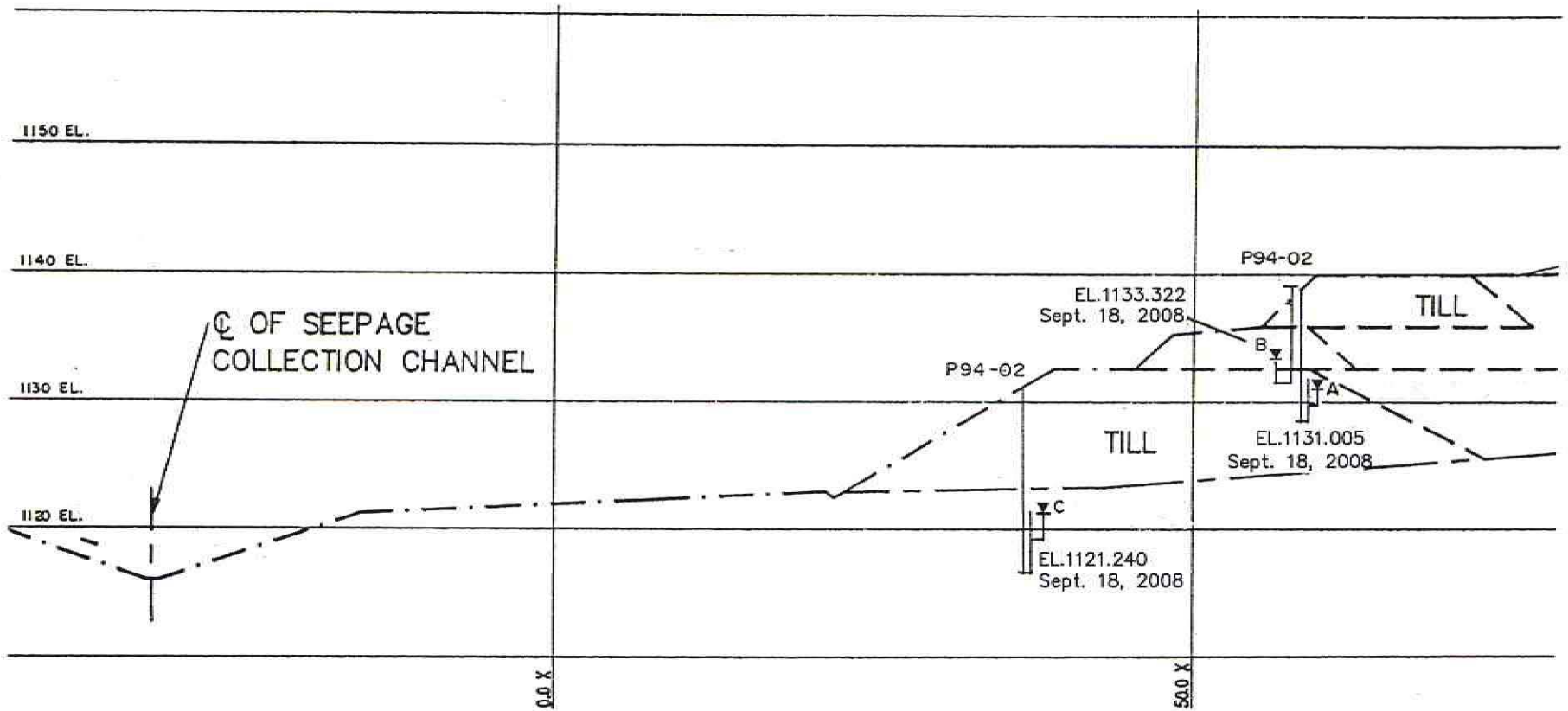
**Deloitte & Touche**

SECTION D-3  
CHANNEL STA. 4+80

SRK JOB NO.: 1CD003.111  
FILE NAME: FIG-4.dwg

Vangorda Plateau Mine

DATE: Jan. 2009	APPROVED:	FIGURE: 4
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**Deloitte & Touche**

SECTION D-4  
CHANNEL STA. 9+00

SRK JOB NO.: 1CD003.111

FILE NAME: FIG-5.dwg

Vangorda Plateau Mine

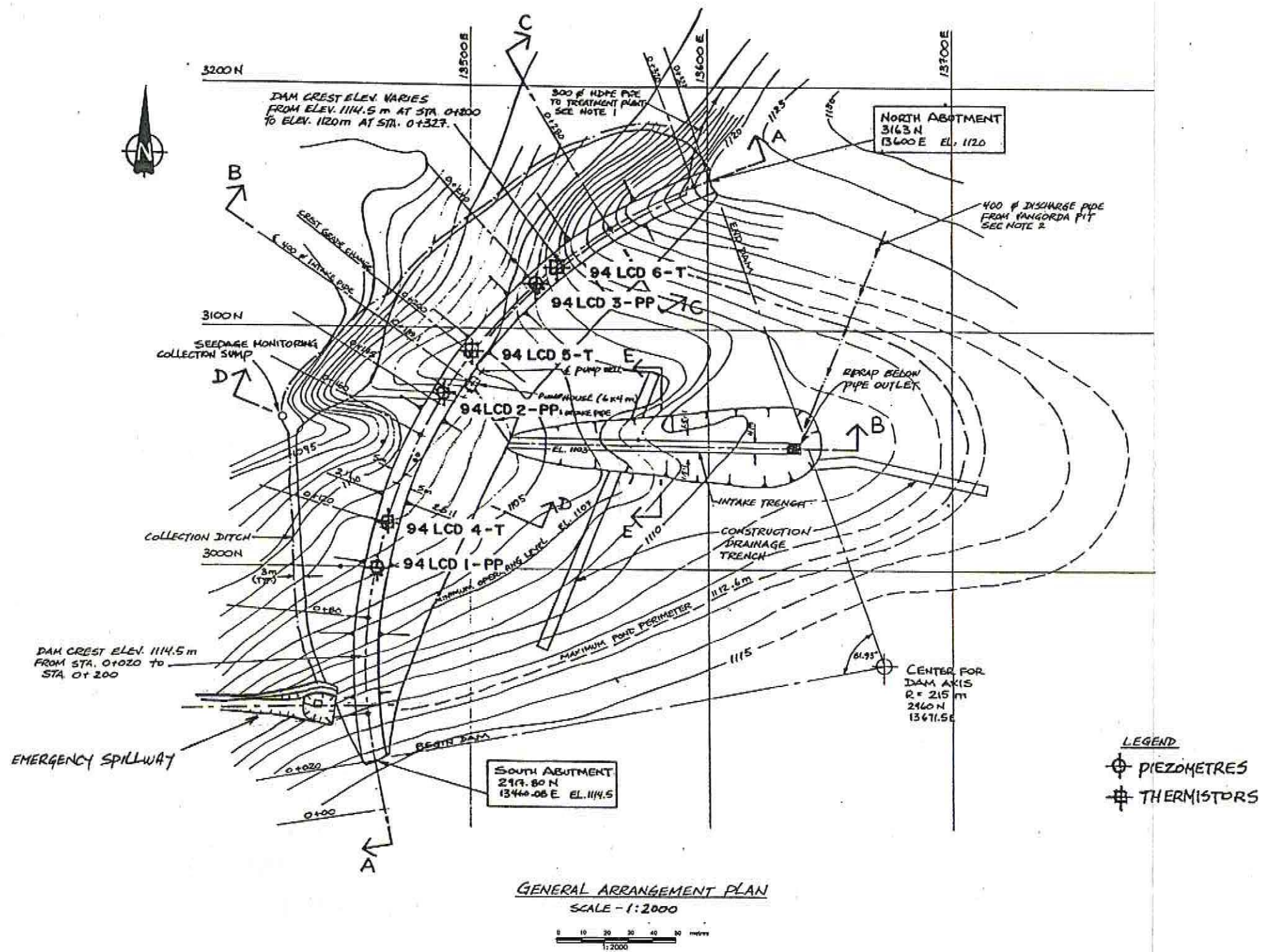
DATE:

Jan. 2009

APPROVED:

FIGURE:

5



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**Deloitte & Touche**

**LITTLE CREEK DAM  
GENERAL ARRANGEMENT PLAN**

SRK JOB NO.: 1CD003.111

FILE NAME: FIG-6.dwg

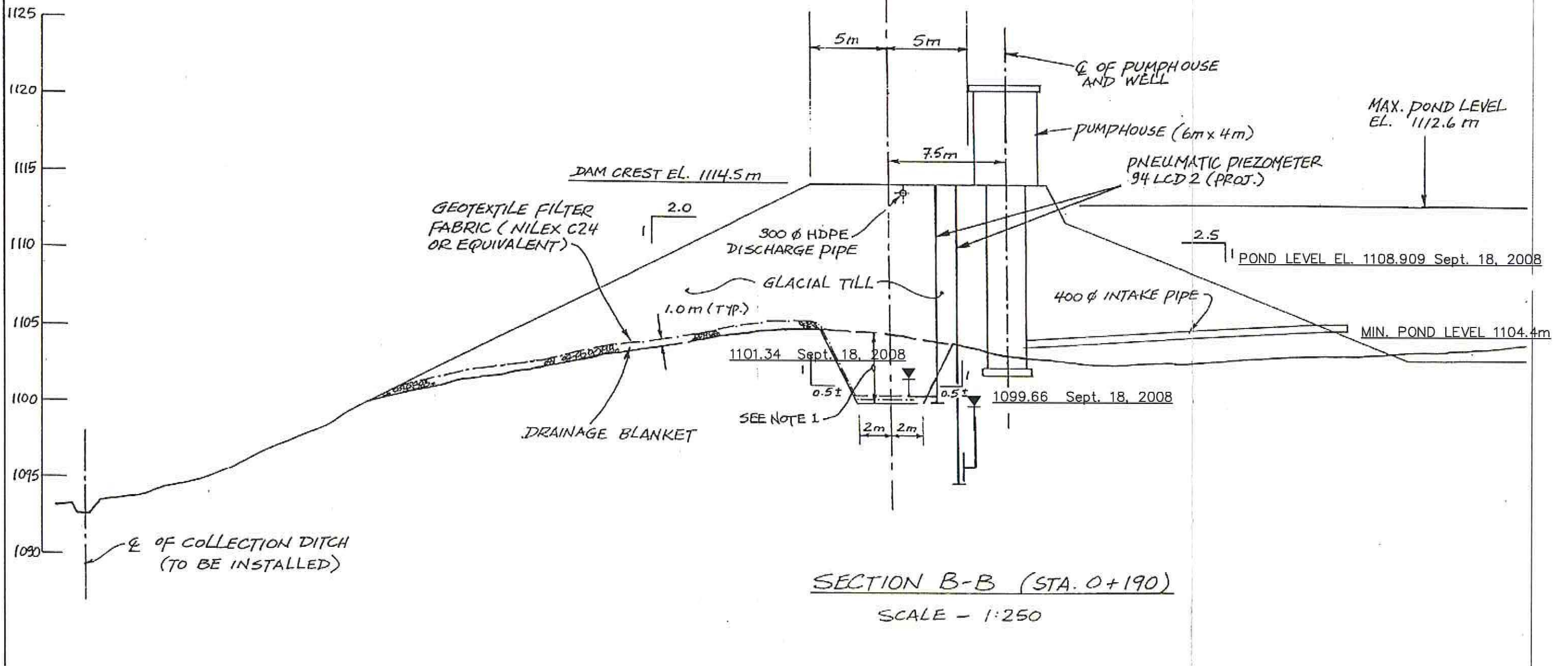
Vangorda Plateau Mine

DATE: Jan. 2009

APPROVED:

FIGURE: 6

ELEV. (m)



SECTION B-B (STA. 0+190)

SCALE - 1:250



A:\01\_SITES\FAC\1086\_1CD003.111\_2008\_DetailedInspection\040\_040\040\2008\_Inspection\_Report.dwg\Fig-7.dwg



**Deloitte & Touche**

LITTLE CREEK DAM  
SECTION B-B

SRK JOB NO.: 1CD003.111

FILE NAME: FIG-7.dwg

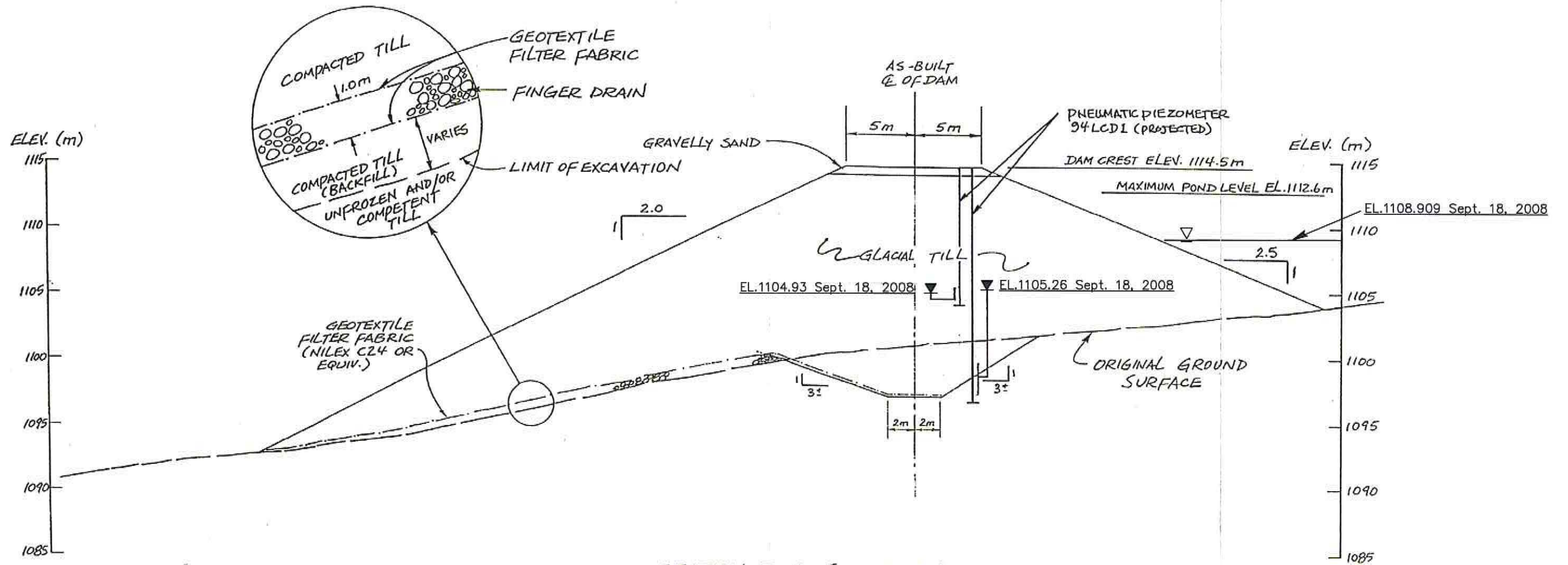
Vangorda Plateau Mine

DATE: Jan. 2009

APPROVED:

FIGURE: 7

J:\01\_SITES\PARO\1006\_100003111\_2008\_Geotech\Inspection\100\_100003111\_2008\_Inspection Report.dwg\Fig-8.dwg



SECTION D-D (STA. 0+144)  
SCALE - 1:300



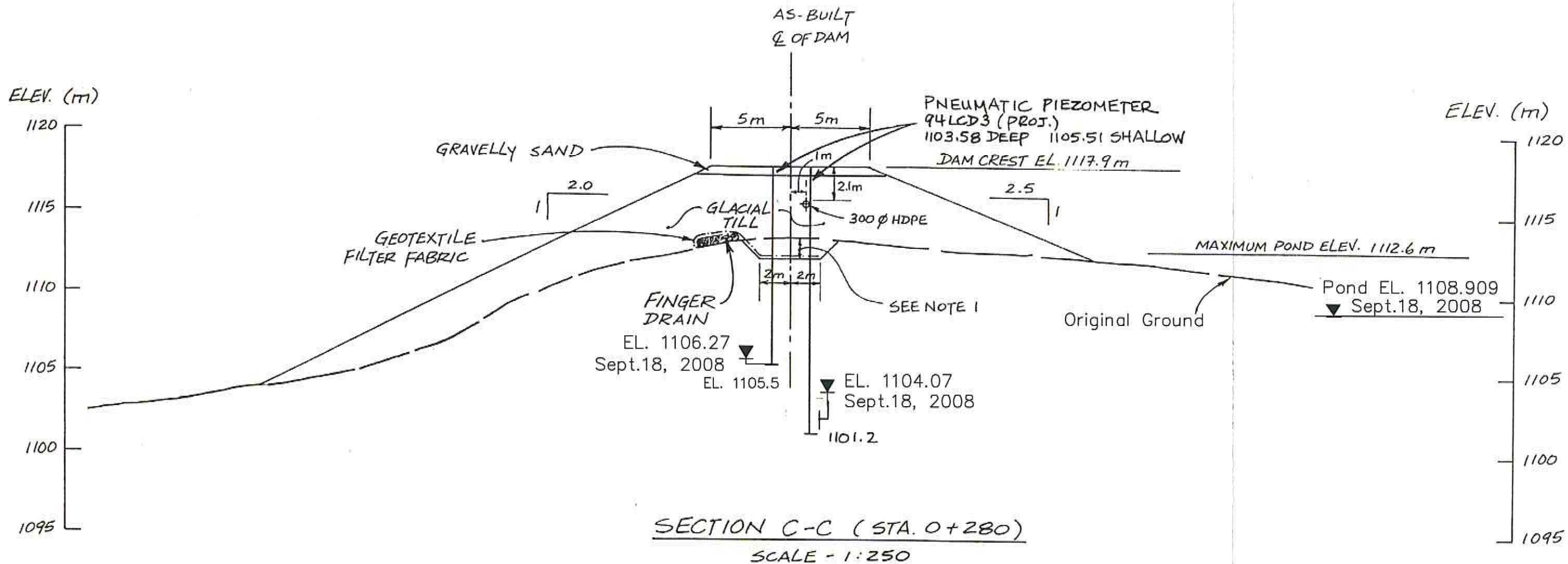
**Deloitte & Touche**

LITTLE CREEK DAM  
SECTION D-D

SRK JOB NO.: 1CD003.111  
FILE NAME: FIG-8.dwg

Vangorda Plateau Mine

DATE: Jan. 2009	APPROVED:	FIGURE: 8
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J:\01\_SITES\PARO\095\_1CD003.11\_2008\_Geotech\inspection\040\_autocad\2008\_inspection\_Report.dwg\FIG-9.dwg



**Deloitte & Touche**

LITTLE CREEK DAM  
SECTION C-C

SRK JOB NO.: 1CD003.111

FILE NAME: FIG-9.dwg

Vangorda Plateau Mine

DATE: Jan. 2009

APPROVED:

FIGURE:

9

**Appendix A**  
**Photos**



Photo 1: Vangorda Waste Dump, Weir #6



Photo 2: Vangorda Waste Dump, Weir #5



Photo 3: Vangorda Waste Dump, Weir #3



Photo 4: Drain 4 at toe of Vangorda Waste Dump



Photo 5: Seepage Collection Channel along toe of Vangorda Waste Dump

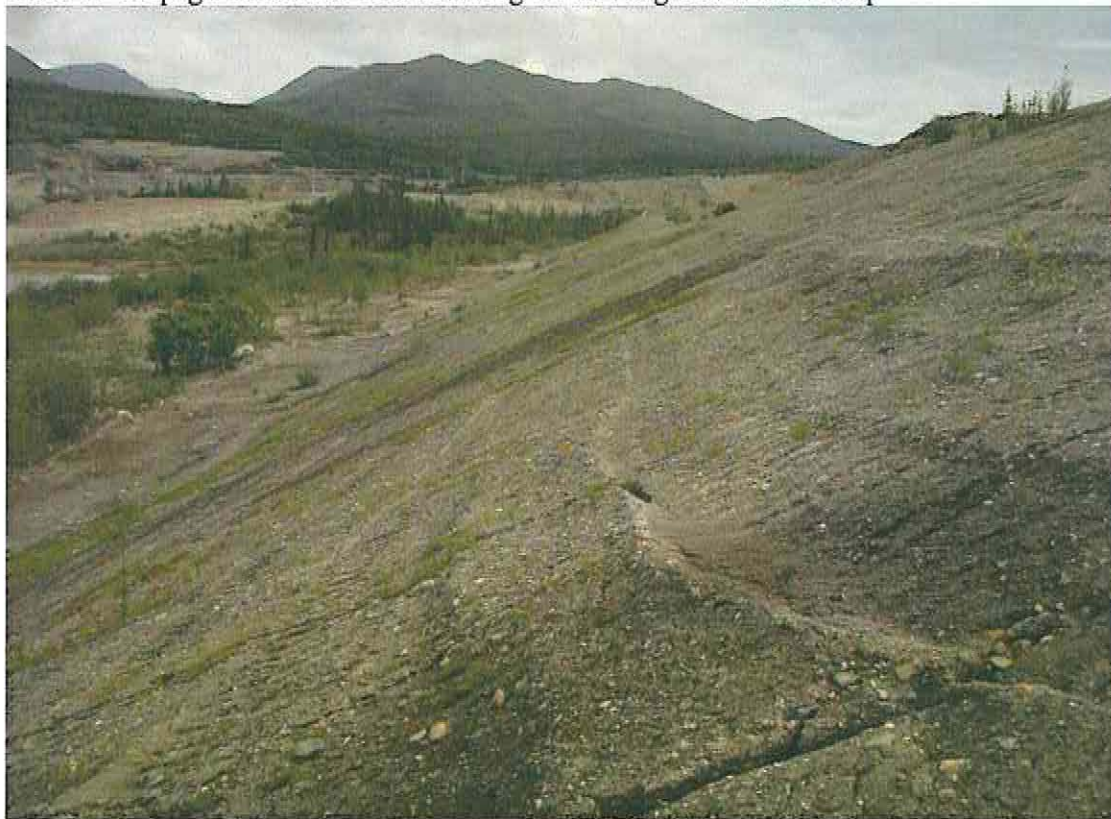


Photo 6: Till Slope above Weirs #5 and #6



Photo 7: Drain #2 at toe of Vangorda Waste Rock Dump



Photo 8: Wetspots and a shallow subsidence on the resloped surface of the Till Starter Dyke at the Vangorda Waste Dump



Photo 9: Erosion Gullies in the till cover on Vangorda Dump



Photo 10: Little Creek Pond Dam



Photo 11: Erosion gullies on downstream slope of LCD

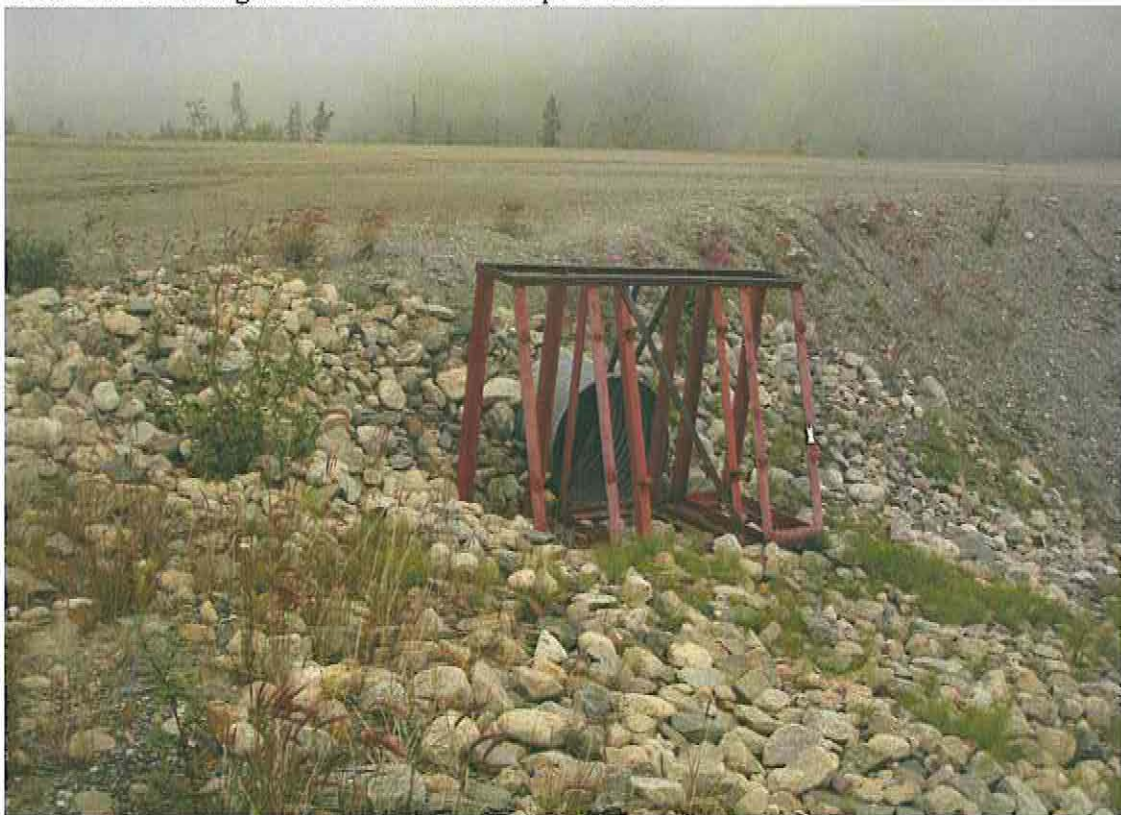


Photo 12: Emergency culvert (inlet) at Little Creek Pond



Photo 13: Outlet to plunge pool of emergency spillway at Little Creek Pond



Photo 14: Emergency Spillway at the headworks of Vangorda Creek Diversion



Photo 15: Vangorda Creek Diversion (lower reaches)



Photo 16: Inlet to the 2m dia CMP at the Vangorda Creek diversion plunge pool



Photo 17: Sludge Pond at Water Treatment Plant



Photo 18: Till Embankment around the Sludge Pond



Photo 19: Downstream slope of the dyke around the Sludge Pond

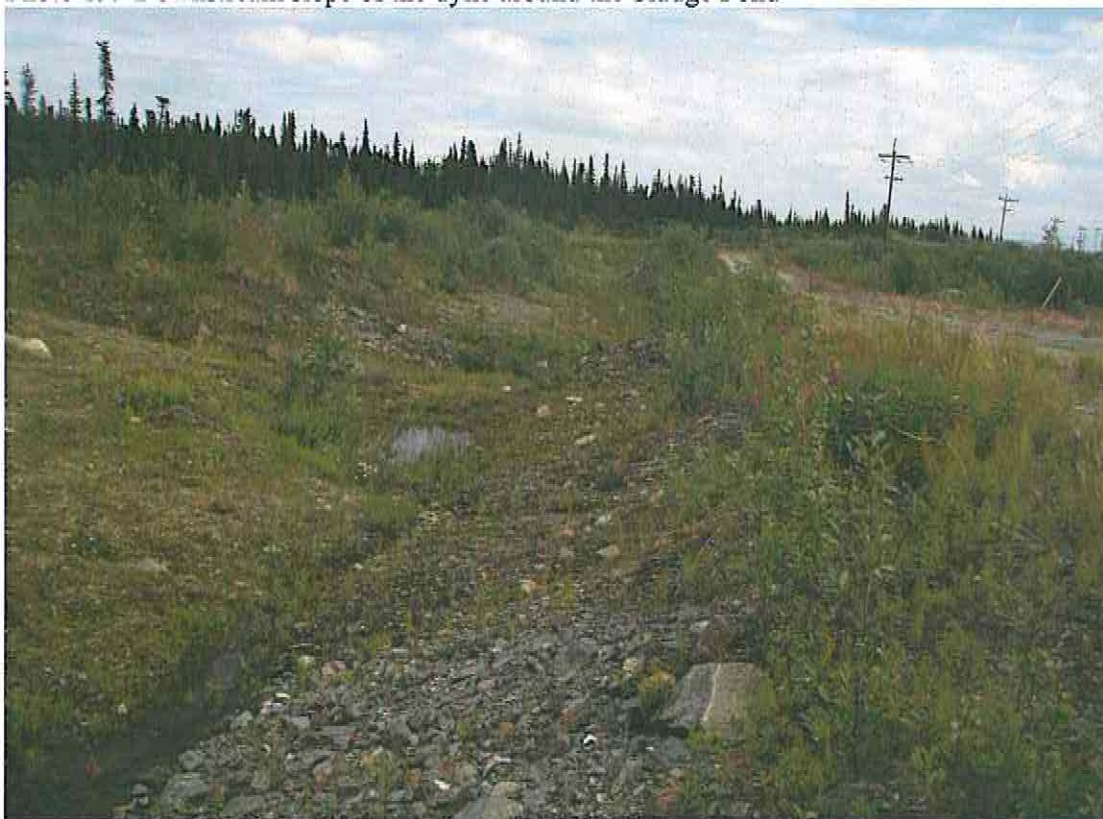


Photo 20: Grum Interceptor Ditch



Photo 21: Debris accumulation at culvert entrances along Grum Interceptor Ditch

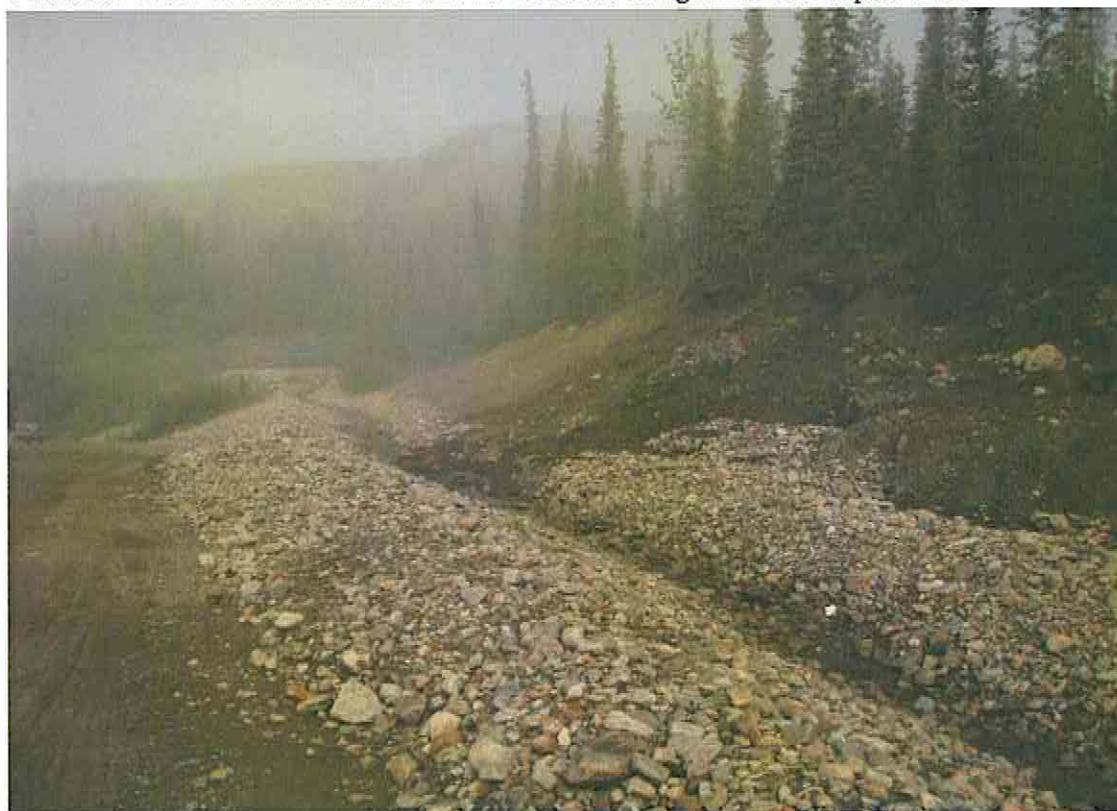


Photo 22: Subsidence on the V-15 Seepage Interceptor ditch

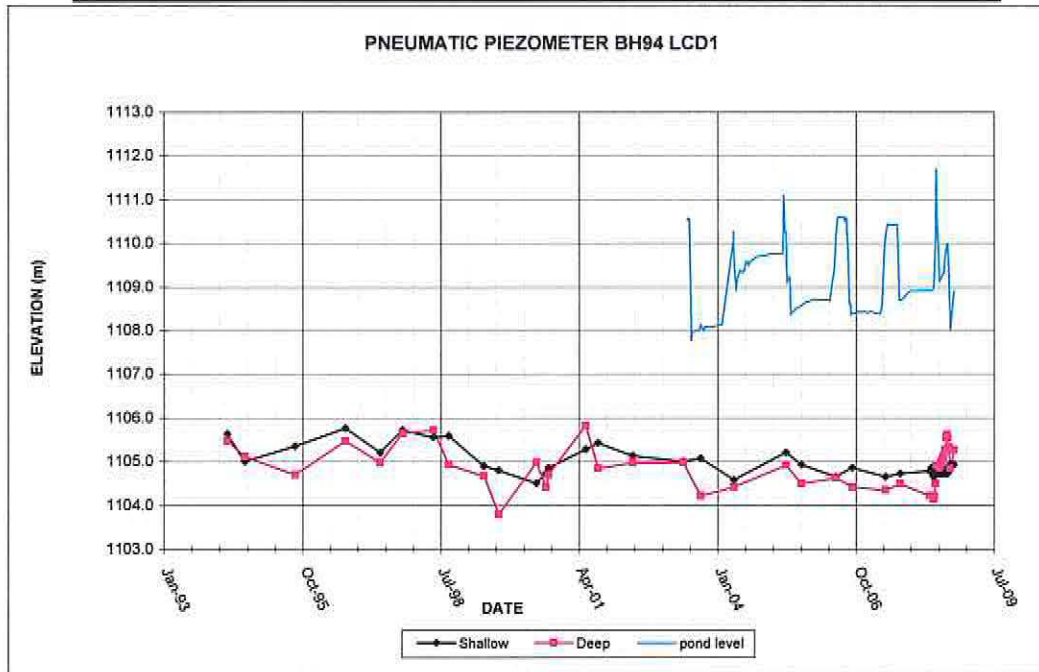


Photo 23: Seepage discharge into V-15 diversion

**Appendix B**  
**Pneumatic Piezometer and Thermistor Readings – Little Creek Dam**

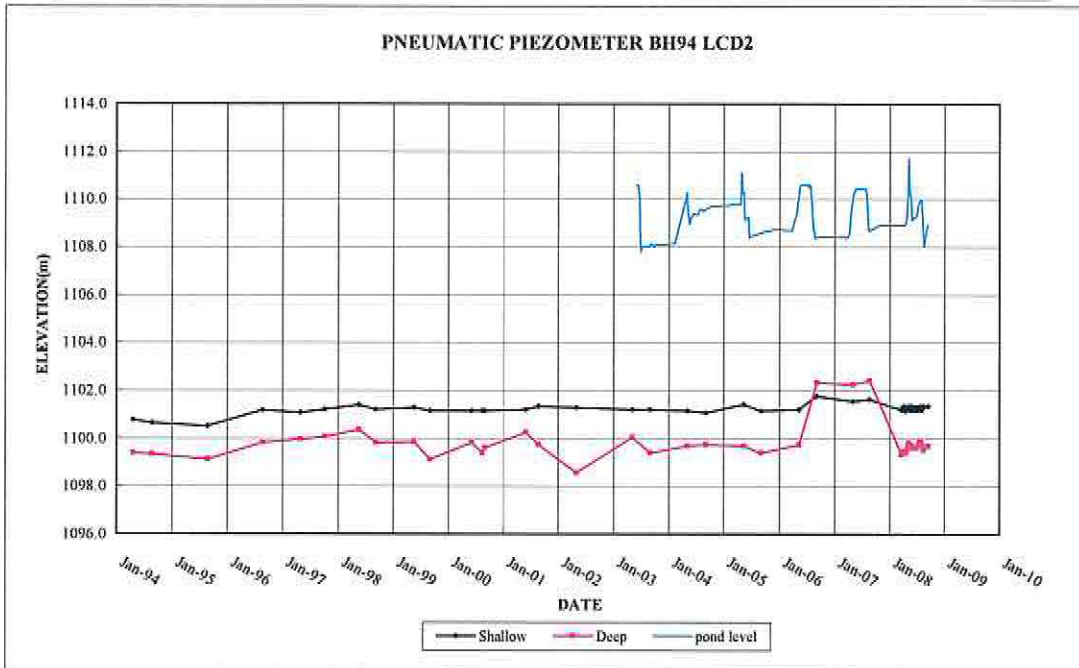
Little Creek Dam Pneumatic Piezometers

BH94 LCD1		Location: Little Creek Dam Crest		Ground Elevation: 1114.5m		Coordinates: 3000N, 13480E	
Date Installed: June '94		Shallow Tip Elevation: 1103.6		Surface Protector: yes		Deep Tip Elevation: 1097.0	
Date	Reading (psi)		Piezometric Elevation (m)		Pond Level		
	Shallow	Deep	Shallow	Deep			
May-94	2.9	12.1	1105.63	1105.47			
Sep-94	2.0	11.6	1105.00	1105.12			
Sep-95	2.5	11.0	1105.35	1104.70			
Sep-96	3.1	12.1	1105.77	1105.47			
May-97	2.3	11.4	1105.21	1104.98			
Oct-97	3.02	12.36	1105.71	1105.65			
May-98	2.79	12.46	1105.55	1105.72			
Sep-98	2.85	11.33	1105.60	1104.93		~1109.5	
May-99	1.85	10.95	1104.90	1104.67			
Sep-99	1.71	9.70	1104.80	1103.79		~1105	
Jun-00	1.30	11.40	1104.51	1104.98			
Aug-00	1.60	10.60	1104.72	1104.42			
Sep-00	1.80	11.00	1104.86	1104.70			
5-Jun-01	2.40	12.60	1105.28	1105.82		1109.33	
30-Aug-01	2.60	11.20	1105.42	1104.84		1108.55	
9-May-02	2.20	11.40	1105.14	1104.98		1109.78	
10-May-03	2.00	11.40	1105.00	1104.98		1110.54	
9-Sep-03	2.10	10.30	1105.07	1104.21		1108.13	
8-May-04	1.40	10.60	1104.58	1104.42		1110.01	
19-May-05	2.30	11.30	1105.21	1104.91		1110.27	
9-Sep-05	1.90	10.70	1104.93	1104.49		1108.57	
16-May-06	1.50	10.90	1104.65	1104.63		1109.99	
11-Sep-06	1.80	10.60	1104.86	1104.42		1108.40	
10-May-07	1.50	10.50	1104.65	1104.35		1110.18	
27-Aug-07	1.60	10.70	1104.72	1104.49		1108.69	
27-Mar-08	1.7	10.3	1104.79	1104.21		1108.91	
4-Apr-08	1.70	10.30	1104.79	1104.21		1108.90	
10-Apr-08	1.80	10.30	1104.86	1104.21		1108.90	
21-Apr-08	1.50	10.20	1104.65	1104.14		1108.94	
28-Apr-08	1.70	10.30	1104.79	1104.21		1109.225	
5-May-08	1.60	10.70	1104.72	1104.49		1110.191	
12-May-08	1.80	11.30	1104.86	1104.91		1111.696	
15-May-08	1.70	11.30	1104.79	1104.91		1110.697	
20-May-08	1.60	11.30	1104.72	1104.91		1110.311	
26-May-08	1.60	11.30	1104.72	1104.91		1109.919	
2-Jun-08	1.80	11.20	1104.86	1104.84		1109.116	
11-Jun-08	1.60	11.30	1104.72	1104.91		1109.176	
18-Jun-08	1.80	11.40	1104.72	1104.98		1109.213	
24-Jun-08	1.70	11.50	1104.79	1105.05		1109.272	
2-Jul-08	1.60	11.50	1104.72	1105.05		1109.295	
7-Jul-08	1.60	11.60	1104.72	1105.12		1109.323	
15-Jul-08	1.60	11.80	1104.72	1105.26		1109.732	
22-Jul-08	1.70	12.20	1104.79	1105.54		1109.903	
29-Jul-08	1.80	12.30	1104.86	1105.61		1109.948	
4-Aug-08	1.60	12.20	1104.72	1105.54		1109.968	
11-Aug-08	1.70	11.90	1104.79	1105.33		1109.181	
21-Aug-08	1.90	11.20	1104.93	1104.84		1108.010	
18-Sep-08	1.90	11.80	1104.93	1105.26		1108.909	



**Little Creek Dam Pneumatic Piezometers**

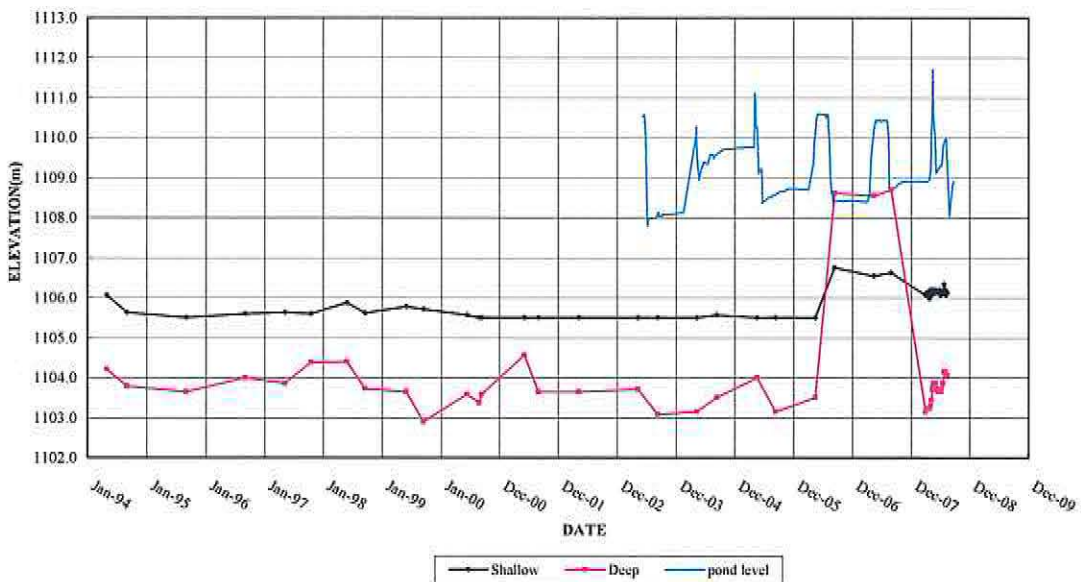
Date	Reading (psi)		Piezometric Elevation (m)		Pond Level
	Shallow	Deep	Shallow	Deep	
May-94	0.4	6.4	1100.78	1099.38	
Sep-94	0.2	6.3	1100.64	1099.31	
Sep-95	0.0	6.0	1100.50	1099.10	
Sep-96	0.85	7.0	1101.17	1099.80	
May-97	0.8	7.2	1101.06	1099.94	
Oct-97	1.00	7.34	1101.20	1100.04	
May-98	1.25	7.78	1101.38	1100.35	
Sep-98	0.98	7.00	1101.19	1099.80	-1109.5
May-99	1.10	7.05	1101.27	1099.84	
Sep-99	0.91	6.00	1101.14	1099.10	-1105
12-Jun-00	0.90	7.00	1101.13	1099.80	
23-Aug-00	0.90	6.40	1101.13	1099.38	
8-Sep-00	0.90	6.70	1101.13	1099.59	
5-Jun-01	1.00	7.60	1101.20	1100.22	1109.33
30-Aug-01	1.20	6.90	1101.34	1099.73	1108.55
9-May-02	1.10	5.20	1101.27	1098.54	1109.78
10-May-03	1.00	7.30	1101.20	1100.01	1110.538
9-Sep-03	1.00	6.40	1101.20	1099.38	1108.127
8-May-04	0.90	6.80	1101.13	1099.66	1109.323
8-Sep-04	0.80	6.90	1101.06	1099.73	
19-May-05	1.30	6.80	1101.41	1099.66	
9-Sep-05	0.9	6.4	1101.13	1099.38	
16-May-06	1.00	6.90	1101.20	1099.73	1110.293
11-Sep-06	1.80	10.60	1101.78	1102.32	1108.403
10-May-07	1.50	10.50	1101.55	1102.25	
27-Aug-07	1.60	10.7	1101.62	1102.39	
27-Mar-08	1	6.3	1101.2	1099.31	1108.909
4-Apr-08	1.10	6.40	1101.27	1099.38	1108.904
10-Apr-08	1.20	6.50	1101.34	1099.45	1108.904
21-Apr-08	0.90	6.40	1101.13	1099.38	1108.943
28-Apr-08	1.10	6.50	1101.27	1099.45	1109.225
5-May-08	1.10	6.70	1101.27	1099.59	1110.191
12-May-08	1.20	7.00	1101.34	1099.80	1111.695
15-May-08	1.10	6.90	1101.27	1099.73	1110.697
20-May-08	1.00	6.90	1101.20	1099.73	1110.311
26-May-08	1.00	6.80	1101.20	1099.66	1109.919
2-Jun-08	1.20	6.80	1101.34	1099.66	1109.116
11-Jun-08	1.00	6.70	1101.20	1099.59	1109.176
18-Jun-08	1.00	6.70	1101.20	1099.59	1109.213
24-Jun-08	1.10	6.70	1101.27	1099.59	1109.272
2-Jul-08	1.00	6.70	1101.20	1099.59	1109.295
7-Jul-08	1.10	6.70	1101.27	1099.59	1109.323
15-Jul-08	1.00	6.80	1101.20	1099.66	1109.732
22-Jul-08	1.10	7.00	1101.27	1099.80	1109.903
29-Jul-08	1.20	7.10	1101.34	1099.87	1109.948
4-Aug-08	1.00	7.00	1101.20	1099.80	1109.968
11-Aug-08	1.00	6.80	1101.20	1099.66	1109.181
21-Aug-08	1.20	6.60	1101.34	1099.52	1108.010
18-Sep-08	1.20	6.80	1101.34	1099.66	1108.909



Little Creek Dam Pneumatic Piezometers

Date	Reading (psi)		Piezometric Elevation (m)		Pond Level
	Shallow	Deep	Shallow	Deep	
May-94	0.8	4.3	1106.06	1104.21	
Sep-94	0.2	3.7	1105.64	1103.79	
Sep-95	0.0	3.5	1105.50	1103.65	
Sep-96	0.15	4.0	1105.61	1104.00	
May-97	0.2	3.8	1105.64	1103.86	
Oct-97	0.14	4.54	1105.60	1104.38	
May-98	0.54	4.58	1105.88	1104.41	
17-Sep-98	0.17	3.62	1105.62	1103.73	-1109.5
29-May-99	0.40	3.50	1105.78	1103.65	
12-Sep-99	0.30	2.42	1105.71	1102.89	-1105
12-Jun-00	0.10	3.40	1105.57	1103.58	
23-Aug-00	0.00	3.10	1105.50	1103.37	
8-Sep-00	0.01	3.40	1105.51	1103.58	
5-Jun-01	0.00	4.80	1105.50	1104.56	1109.33
30-Aug-01	0.01	3.49	1105.51	1103.64	1108.55
9-May-02	0.01	3.50	1105.51	1103.65	1109.78
10-May-03	0.00	3.60	1105.50	1103.72	1110.538
9-Sep-03	0.00	2.70	1105.50	1103.09	1108.127
8-May-04	0.00	2.80	1105.50	1103.16	1109.323
8-Sep-04	0.10	3.30	1105.57	1103.51	
19-May-05	0.01	4.00	1105.51	1104.00	
9-Sep-05	0.00	2.80	1105.50	1103.16	
16-May-06	0.00	3.30	1105.50	1103.51	1110.293
11-Sep-06	1.80	10.60	1106.76	1108.62	1108.403
10-May-07	1.50	10.50	1106.55	1108.55	
27-Aug-07	1.60	10.70	1106.62	1108.69	
27-Mar-08	0.8	2.8	1106.06	1103.16	1108.909
4-Apr-08	0.90	2.90	1106.13	1103.23	1108.904
10-Apr-08	0.90	2.90	1106.13	1103.23	1108.904
21-Apr-08	0.70	2.90	1105.99	1103.23	1108.943
28-Apr-08	1.00	3.00	1106.20	1103.30	1109.225
5-May-08	0.80	3.20	1106.06	1103.44	1110.191
12-May-08	0.90	3.60	1106.13	1103.72	1111.696
15-May-08	1.00	3.70	1106.20	1103.79	1110.697
20-May-08	0.90	3.80	1106.13	1103.86	1110.311
26-May-08	0.90	3.80	1106.13	1103.86	1109.919
2-Jun-08	1.00	3.80	1106.20	1103.86	1109.116
11-Jun-08	0.90	3.60	1106.13	1103.72	1109.176
18-Jun-08	0.90	3.50	1106.13	1103.65	1109.213
25-Jun-08	1.00	3.60	1106.20	1103.72	1109.272
2-Jul-08	0.80	3.50	1106.06	1103.65	1109.295
7-Jul-08	0.90	3.60	1106.13	1103.72	1109.323
15-Jul-08	0.90	3.80	1106.13	1103.86	1109.732
22-Jul-08	1.20	4.20	1106.34	1104.14	1109.903
29-Jul-08	1.00	4.20	1106.20	1104.14	1109.948
4-Aug-08	0.80	4.10	1106.06	1104.07	1109.968
11-Aug-08	0.90	4.10	1106.13	1104.07	1109.181
21-Aug-08	1.10	4.30	1106.27	1104.21	1108.010
18-Sep-08	1.10	4.10	1106.27	1104.07	1108.909

PNEUMATIC PIEZOMETER BH94 LCD3



Little Creek Dam Thermistors

BH94 LCD-4		Location: Little Creek Dam Crest		Elevation: 1114.5m	Coordinates: 3015N, 13465E																							
Date Installed: 8-Jun-94		Thermistor Type: SINCA	Ice-Bath: RTD's	Calibration: not applied	Surface Protector: yes																							
Depth Correction	0	Ro (Ohms)=		1854																								
Depth on String	Actual Depth	Resistivity (Ohms)																										
(m)	(m)	15-Jun-94	16-Sep-94	22-Sep-95	25-Sep-96	8-May-97	17-Oct-97	28-May-98	17-Sep-98	4-Jun-99	12-Sep-99	6-Jun-00	8-Sep-00	9-May-02	4-Sep-02	10-May-03	9-Sep-03	8-Sep-04	19-May-05	9-Sep-05	16-May-06	11-Sep-06	10-May-07	27-Aug-07	Mar. 27/08 (1)	Mar. 27/08 (2)		
1.0	-1.0	1893	1908	1909	1896	1847	1872	1872	1909	1867	1914	1873	1900	1842	1912	1851	1921	1921	1952	1921	1849	1915	1849	1915	1849	1937	1843	1839
1.5	-1.5	1869	1913	1906	1898	1845	1881	1854	1911	1853	1913	1854	1902	1841	1909	1850	1919	1925	1852	1880	1848	1915	1847	1929	1906	1857		
2.0	-2.0	1852	1911	1900	1894	1840	1884	1849	1908	1848	1906	1849	1893	1838	1900	1846	1913	1921	1848	1915	1845	1910	1842	1917	1837	1835		
2.5	-2.5	1851	1909	1898	1892	1841	1888	1850	1906	1846	1902	1850	1897	1841	1896	1848	1909	1918	1849	1912	1847	1909	1845	1910	1896	1857		
14.5	-14.5	1873	1871	1872	1874	1874	1873	1873	1872	1874	1873	1874	1873	1876	1874	1876	1875	1875	1878	1877	1878	1876	1879	1878	1878	2012	1860	
15.0	-15.0	1872	1870	1871	1872	1872	1871	1871	1871	1873	1872	1873	1872	1874	1873	1874	1873	1874	1876	1876	1877	1876	1877	1876	1876	1884	1877	
15.5	-15.5	1874	1873	1875	1876	1876	1875	1875	1875	1877	1876	1876	1876	1878	1877	1878	1877	1878	1880	1880	1880	1880	1881	1881	1881	1992	1901	
16.0	-16.0	1870	1868	1870	1871	1871	1870	1870	1870	1871	1871	1871	1871	1873	1872	1873	1872	1873	1875	1875	1875	1875	1876	1876	1876	1887	1878	
16.5	-16.5	1870	1869	1869	1871	1871	1871	1870	1871	1872	1871	1871	1871	1873	1872	1873	1873	1873	1875	1875	1875	1875	1876	1876	1876	1877	1875	
17.0	-17.0	1870	1870	1871	1872	1872	1872	1872	1871	1873	1872	1873	1872	1874	1873	1874	1874	1874	1876	1876	1876	1877	1879	1900	1929	1877		

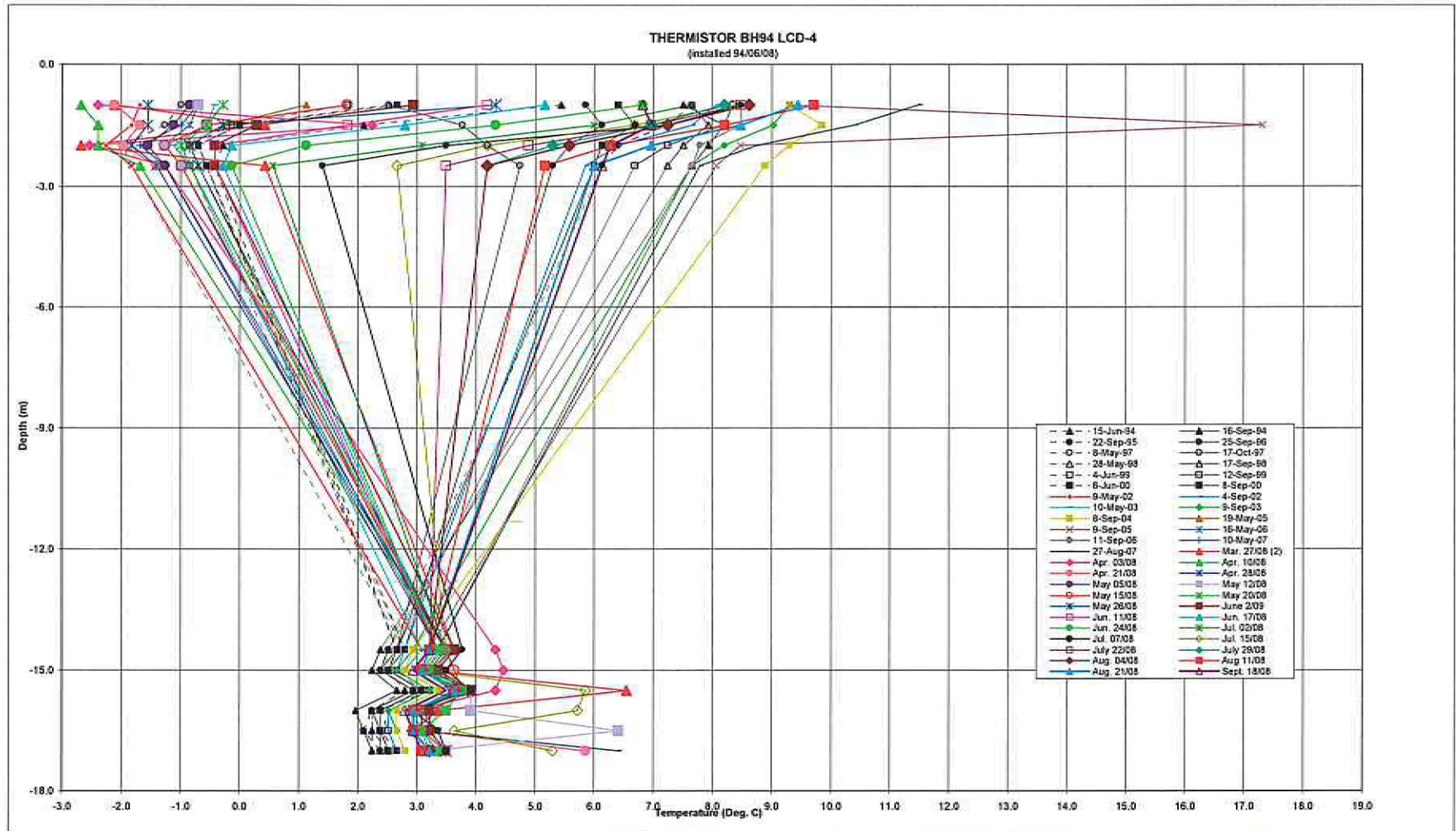
Depth on String	Actual Depth	Temperature (°C)																												
(m)	(m)	Apr. 03/08	Apr. 10/08	Apr. 21/08	Apr. 28/08	May 05/08	May 12/08	May 15/08	May 20/08	May 26/08	June 2/09	Jun. 11/08	Jun. 17/08	Jun. 24/08	Jul. 02/08	Jul. 07/08	Jul. 15/08	July 22/08	July 29/08	Aug. 04/08	Aug 11/08	Aug. 21/08	Sept. 18/08							
1.0	-1.0	1837	1835	1839	1843	1848	1849	1867	1852	1885	1875	1884	1891	1903	1909	1915	1914	1915	1913	1916	1924	1922	1903							
1.5	-1.5	1870	1837	1842	1843	1846	1850	1850	1850	1852	1856	1867	1874	1885	1897	1906	1902	1904	1904	1906	1913	1915	1904							
2.0	-2.0	1836	1837	1840	1841	1843	1845	1845	1847	1848	1851	1851	1853	1862	1876	1879	1884	1889	1892	1894	1899	1904	1899							
2.5	-2.5	1845	1842	1844	1844	1845	1847	1847	1848	1849	1851	1851	1852	1853	1858	1864	1873	1879	1884	1884	1891	1897	1898							
14.5	-14.5	1885	1879	1879	1879	1878	1879	1879	1879	1879	1879	1880	1878	1878	1878	1881	1879	1877	1877	1877	1877	1877	1877	1877	1877	1877				
15.0	-15.0	1886	1877	1877	1877	1878	1878	1880	1877	1877	1878	1877	1876	1877	1878	1879	1876	1876	1876	1876	1876	1876	1876	1876	1876	1876	1876			
15.5	-15.5	1885	1881	1881	1881	1882	1881	1880	1881	1882	1881	1880	1881	1881	1881	1882	1895	1880	1880	1880	1880	1880	1880	1880	1879	1879	1879			
16.0	-16.0	1875	1876	1876	1876	1875	1875	1882	1876	1876	1876	1877	1879	1875	1876	1875	1895	1875	1875	1875	1875	1875	1875	1875	1874	1874	1874			
16.5	-16.5	1876	1876	1876	1876	1876	1876	1900	1876	1876	1876	1877	1876	1876	1876	1878	1878	1880	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875		
17.0	-17.0	1877	1878	1896	1877	1878	1877	1877	1877	1879	1879	1879	1877	1878	1879	1879	1892	1877	1877	1877	1876	1877	1876	1877	1876	1876	1876	1876		

Depth on String	Actual Depth	Temperature (°C)																								
(m)	(m)	15-Jun-94	16-Sep-94	22-Sep-95	25-Sep-96	8-May-97	17-Oct-97	28-May-98	17-Sep-98	4-Jun-99	12-Sep-99	6-Jun-00	8-Sep-00	9-May-02	4-Sep-02	10-May-03	9-Sep-03	8-Sep-04	19-May-05	9-Sep-05	16-May-06	11-Sep-06	10-May-07	27-Aug-07	Mar. 27/08 (1)	Mar. 27/08 (2)
1.0	-1.0	5.4	7.5	7.7	5.9	-1.0	2.5	2.5	7.7	1.8	8.3	2.7	6.4	-1.7	8.1	-0.4	9.3	9.3	1.1	9.3	-0.7	8.5	-0.7	11.5	-1.5	-2.1
1.5	-1.5	2.1	8.2	7.2	6.1	-1.3	3.8	0.0	7.9	-0.1	8.2	0.0	6.7	-1.8	7.7	-0.6	9.0	9.8	-0.3	17.3	-0.8	8.5	-1.0	10.4	7.2	0.4
2.0	-2.0	-0.3	7.9	6.4	5.6	-2.0	4.2	-0.7	7.5	-0.8	7.2	-0.7	6.1	-2.3	6.4	-1.1	8.2	9.3	-0.8	8.5	-1.3	7.8	-1.7	8.8	-2.4	-2.7
2.5	-2.5	-0.4	7.7	6.1	5.3	-1.8	4.7	-0.6	7.2	-0.8	6.7	-0.6	6.0	-1.8	5.9	-0.8	7.7	8.9	-0.7	8.1	-1.0	7.7	-1.3	7.8	5.9	0.4
14.5	-14.5	2.7	2.4	2.5	2.8	2.8	2.7	2.7	2.5	2.8	2.7	2.8	2.7	3.1	2.8	3.1	2.9	2.9	3.4	3.2	3.4	3.4	3.5	3.4	21.6	3.6
15.0	-15.0	2.5	2.2	2.4	2.5	2.5	2.4	2.4	2.4	2.7	2.5	2.7	2.5	2.8	2.7	2.8	2.7	2.8	3.1	3.1	3.2	3.1	3.2	3.1	4.2	3.2
15.5	-15.5	2.8	2.7	2.9	3.1	3.1	2.9	2.9	2.9	3.2	3.1	3.1	3.1	3.4	3.2	3.4	3.2	3.4	3.6	3.6	3.6	3.6	3.8	3.8	18.9	6.5
16.0	-16.0	2.2	2.0	2.2	2.4	2.4	2.2	2.2	2.2	2.4	2.4	2.4	2.4	2.7	2.5	2.7	2.5	2.7	2.9	2.9	2.9	2.9	3.1	3.1	4.6	3.4
16.5	-16.5	2.2	2.1	2.1	2.4	2.4	2.4	2.2	2.4	2.5	2.4	2.4	2.4	2.7	2.5	2.7	2.7	2.7	2.9	2.9	2.9	2.9	3.1	3.1	3.2	2.9
17.0	-17.0	2.2	2.2	2.4	2.5	2.5	2.5	2.5	2.4	2.7	2.5	2.7	2.5	2.8	2.7	2.8	2.8	2.8	3.1	3.1	3.1	3.2	3.5	6.4	10.4	3.2

Depth on String	Actual Depth	Temperature (°C)																										
(m)	(m)	Apr. 03/08	Apr. 10/08	Apr. 21/08	1843	May 05/08	May 12/08	May 15/08	May 20/08	May 26/08	June 2/09	Jun. 11/08	Jun. 17/08	Jun. 24/08	Jul. 02/08	Jul. 07/08	Jul. 15/08	July 22/08	July 29/08	Aug. 04/08	Aug 11/08	Aug. 21/08	Sept. 18/08					
1.0	-1.0	-2.4	-2.7	-2.1	-1.5	-0.8	-0.7	1.8	-0.3	4.3	2.9	4.2	5.2	6.8	7.7	8.5	8.3	8.5	8.2	8.6	9.7	9.4	6.8					
1.5	-1.5	2.2	-2.4	-1.7	-1.5	-1.1	-0.6	-0.6	-0.3	0.3	1.8	2.8	4.3	6.0	7.2	6.7	7.0	7.0	7.2	8.2	8.5	7.0	6.3					
2.0	-2.0	-2.5	-2.4	-2.0	-1.8	-1.5	-1.3	-1.3	-1.0	-0.8	-0.4	-0.4	-0.1	1.1	3.1	3.5	4.2	4.9	5.3	5.6	6.3	7.0	6.3					
2.5	-2.5	-1.3	-1.7	-1.4	-1.4	-1.3	-1.0	-1.0	-0.8	-0.7	-0.4	-0.4	-0.3	-0.1	0.6	1.4	2.7	3.5	4.2	4.2	5.2	6.0	6.1					
14.5	-14.5	4.3	3.5	3.5	3.5	3.4	3.5	3.5	3.5	3.5	3.6	3.4	3.4	3.4	3.5	3.8	3.5	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2		
15.0	-15.0	4.5	3.2	3.2	3.2	3.2	3.4	3.6	3.2	3.2	3.4	3.2	3.1	3.2	3.4	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	2.9	2.9	2.9		
15.5	-15.5	4.3	3.8	3.8	3.8	3.9	3.9	3.8	3.6	3.8	3.9	3.8	3.6	3.8	3.8	3.9	3.9	3.6	3.6	3.6	3.6	3.6	3.6	3.5	3.5	3.5		
16.0	-16.0	2.9	3.1	3.1	2.9	2.9	2.9	3.1	3.1	3.1	3.2	3.5	2.9	3.5	3.1	2.9	5.7	2.9	2.9	2.9	2.9	2.9	2.9	2.8	2.8	2.8		
16.5	-16.5	3.1	3.1	3.1	3.1	3.1	6.4	3.1	3.1	3.1	3.2	3.1	3.1	3.1	3.4	3.4	3.6	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9		
17.0	-17.0	3.2	3.4	5.9	3.2	3.4	3.2	3.2	3.2	3.5	3.5	3.5	3.2	3.4	3.5	3.5	5.3	3.2	3.2	3.2	3.1	3.2	3.1	3.2	3.1	3.1		

Little Creek Dam Thermistors



Little Creek Dam Thermistors

BH94 LCD-5		Location: Little Creek Dam Crest		Elevation: 1114.5m		Coordinates: 3090N, 13500E																				
Date Installed: 8-Jun-94		Thermistor Type: SINCA RTD's		Ice-Bath: Surface		Calibration: not applied Protector: yes																				
Depth	Correction	R <sub>0</sub> (Ohms)=		1854																						
Depth on String	Actual Depth	Resistivity (Ohms)																						Mar. 27/08	Mar. 27/08 (2)	
(m)	(m)	15-Jun-94	16-Sep-94	22-Sep-95	25-Sep-96	8-May-97	17-Oct-97	28-May-98	17-Sep-98	4-Jun-99	12-Sep-99	6-Jun-00	8-Sep-00	9-May-02	4-Sep-02	10-May-03	9-Sep-03	8-Sep-04	19-May-05	9-Sep-05	16-May-06	11-Sep-06	10-May-07	27-Aug-07	(1)	(2)
1.0	-1.0	1903	1908	1906	1887	1847	1663	1882	1900	1873	1907	1852	1893	1842	1910	1852	1917	1916	1877	1919	1849	1909	1849	1937	1827	1837
1.5	-1.5	1880	1909	1902	1890	1843	1873	1854	1904	1854	1906	1856	1895	1841	1907	1849	1917	1923	1854	1919	1848	1911	1849	1928	1836	1860
2.0	-2.0	1864	1910	1899	1890	1842	1879	1851	1903	1851	1903	1852	1894	1842	1902	1849	1913	1922	1852	1917	1848	1909	1845	1918	1839	1840
2.5	-2.5	1855	1907	1896	1888	1842	1882	1851	1900	1850	1897	1852	1892	1844	1897	1851	1908	1918	1853	1914	1849	1907	1847	1910	1852	1851
14.5	-14.5	1879	1872	1871	1873	1872	1872	1871	1870	1872	1871	1871	1870	1873	1872	1873	1872	1873	1875	1875	1876	1875	1876	1876	1876	1879
15.0	-15.0	1879	1873	1873	1876	1874	1874	1873	1872	1874	1873	1873	1872	1875	1874	1875	1874	1875	1877	1877	1878	1877	1878	1877	1877	1879
15.5	-15.5	1880	1875	1874	1876	1875	1875	1874	1873	1874	1874	1874	1873	1875	1875	1876	1875	1876	1878	1877	1878	1878	1878	1879	1896	1909
16.0	-16.0	1878	1876	1877	1879	1877	1877	1876	1875	1877	1876	1876	1875	1877	1877	1878	1877	1878	1879	1879	1880	1880	1880	1883	1885	1904
16.5	-16.5	1868	1868	1868	1870	1869	1869	1867	1867	1868	1868	1868	1867	1869	1869	1869	1869	1870	1871	1871	1871	1871	1872	1873	1871	1871
17.0	-17.0	1873	1873	1874	1876	1874	1874	1873	1872	1873	1873	1873	1872	1874	1874	1874	1874	1875	1876	1876	1877	1877	1877	1884	1881	1884

Depth on String		Actual Depth		Temperature (°C)																						Mar. 27/08	Mar. 27/08 (2)
(m)	(m)	15-Jun-94	16-Sep-94	22-Sep-95	25-Sep-96	8-May-97	17-Oct-97	28-May-98	17-Sep-98	4-Jun-99	12-Sep-99	6-Jun-00	8-Sep-00	9-May-02	4-Sep-02	10-May-03	9-Sep-03	8-Sep-04	19-May-05	9-Sep-05	16-May-06	11-Sep-06	10-May-07	27-Aug-07	(1)	(2)	
1.0	-1.0	6.8	7.5	7.2	4.6	-1.0	1.3	3.9	6.4	2.7	7.4	3.9	5.4	-1.7	7.8	3.9	8.8	8.6	3.2	9.0	-0.7	7.7	-0.7	11.5	-3.8	-2.4	
1.5	-1.5	3.6	7.7	6.7	5.0	-1.5	2.7	0.0	7.0	0.0	7.2	0.3	5.7	-1.8	7.4	-0.7	8.8	9.6	0.0	9.0	-0.8	7.9	-0.7	10.3	-2.5	0.8	
2.0	-2.0	1.4	7.8	6.3	5.0	-1.7	3.5	-0.4	6.8	-0.4	6.8	-0.3	5.6	-1.7	6.7	-0.7	8.2	9.4	-0.3	8.8	-0.8	7.7	-1.3	8.9	-2.1	-2.0	
2.5	-2.5	0.1	7.4	5.9	4.7	-1.7	3.9	-0.4	6.4	-0.6	6.0	-0.3	5.3	-1.4	6.0	-0.4	7.7	8.9	-0.1	8.3	-0.7	7.4	-1.0	7.8	-0.3	-0.4	
14.5	-14.5	3.5	2.5	2.4	2.7	2.5	2.5	2.4	2.2	2.5	2.4	2.2	2.2	2.7	2.5	2.7	2.5	2.7	2.9	2.9	3.1	2.9	3.1	3.1	15.7	3.5	
15.0	-15.0	3.5	2.7	2.7	3.1	2.8	2.8	2.7	2.5	2.8	2.7	2.7	2.5	2.9	2.8	2.9	2.8	2.9	3.2	3.2	3.4	3.2	3.4	3.2	3.2	3.2	
15.5	-15.5	3.6	2.9	2.8	3.1	2.9	2.9	2.8	2.7	2.8	2.8	2.7	2.9	2.9	2.9	3.1	2.9	3.1	3.4	3.2	3.4	3.4	3.4	3.5	3.5	5.9	
16.0	-16.0	3.4	3.1	3.2	3.5	3.2	3.2	3.1	2.9	3.2	3.1	3.1	2.9	3.2	3.2	3.4	3.2	3.4	3.5	3.5	3.6	3.6	3.6	4.1	4.3	7.0	
16.5	-16.5	2.0	2.0	2.0	2.2	2.1	2.1	1.8	1.8	2.0	2.0	2.0	1.8	2.1	2.0	2.1	2.1	2.2	2.4	2.4	2.4	2.4	2.5	2.7	2.4	2.4	
17.0	-17.0	2.7	2.7	2.8	3.1	2.8	2.8	2.7	2.5	2.7	2.7	2.7	2.5	2.8	2.8	2.8	2.8	2.8	2.9	3.1	3.1	3.2	3.2	4.2	3.8	4.2	

Depth on String		Actual Depth		Temperature (°C)																						Mar. 27/08	Mar. 27/08 (2)
(m)	(m)	Apr. 03/08	Apr. 10/08	Apr. 21/08	Apr. 28/08	May 05/08	May 12/08	May 15/08	May 20/08	May 25/08	June 2/08	Jun. 11/08	Jun. 17/08	Jun. 24/08	Jul. 02/08	Jul. 07/08	Jul. 15/08	July 22/08	July 29/08	Aug. 04/08	Aug 11/08	Aug 21/08	Sept. 18/08	(1)	(2)		
1.0	-1.0	-1.1	-2.8	-2.3	-1.7	-1.3	-0.7	-0.3	-0.1	1.7	3.9	4.9	5.7	7.5	7.8	8.5	8.3	8.3	8.2	8.6	9.7	9.2	6.3				
1.5	-1.5	-2.0	-2.4	-1.8	-1.5	-1.3	-1.0	-0.8	-0.6	-0.4	0.4	2.7	3.4	4.6	5.7	6.0	7.5	6.8	7.0	7.2	8.2	8.3	6.5				
2.0	-2.0	0.3	-2.0	-1.5	-1.4	-1.1	-1.0	-0.8	-0.7	-0.6	-0.1	0.4	1.3	2.5	3.8	3.9	4.9	5.3	5.3	5.6	6.3	7.2	6.3				
2.5	-2.5	-1.3	-1.4	-1.1	-1.0	-0.8	-0.7	-0.6	-0.6	-0.4	-0.1	-0.1	0.1	0.6	1.8	2.2	3.4	3.8	4.2	4.2	5.2	6.1	6.0				
14.5	-14.5	3.2	3.1	3.1	3.1	3.1	3.1	2.9	2.9	3.1	3.1	2.9	2.9	3.1	3.2	3.2	3.2	2.9	3.2	3.2	3.2	2.8	2.8				
15.0	-15.0	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.4	3.2	3.2	3.4	3.4	3.5	3.2	3.1	3.1	3.1	3.1	3.1	3.1				
15.5	-15.5	3.5	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.4	3.4	3.4	3.4	3.4	4.7	3.2	3.6	3.6	3.6	3.2	3.2				
16.0	-16.0	3.5	3.5	3.5	3.5	3.6	7.8	3.6	3.5	5.0	3.6	3.8	3.5	3.6	3.8	3.9	6.3	3.5	2.9	2.9	2.9	3.5	3.5				
16.5	-16.5	4.2	2.4	2.4	2.4	2.8	3.5	2.5	2.8	2.5	2.4	2.4	2.8	2.8	2.7	3.9	2.4	2.9	2.9	2.9	2.9	2.4	2.4				
17.0	-17.0	3.1	3.1	3.1	3.2	3.2	5.7	3.2	3.2	3.1	3.1	3.2	3.2	3.2	3.4	3.4	3.1	3.2	3.2	3.2	3.1	3.1	3.1				



Little Creek Dam Thermistors

BH94 LCD-6		Location: Little Creek Dam Crest		Elevation: 1114.5m		Coordinates: 3125N, 13535E																				
Date Installed: 10-Jun-94		Thermistor Type:		SINCA RTD's		Ice-Bath Calibration:		Surface Protector:		yes																
Depth Correction: 0.4		Ro (Ohms)=		1854																						
Depth on String	Actual Depth	Resistivity (Ohms)																				Mar. 27/06	Mar. 27/06			
(m)	(m)	15-Jun-94	16-Sep-94	22-Sep-95	25-Sep-96	8-May-97	17-Oct-97	28-May-98	17-Sep-98	4-Jun-99	12-Sep-99	6-Jun-00	8-Sep-00	9-May-02	4-Sep-02	10-May-03	9-Sep-03	8-Sep-04	19-May-05	9-Sep-05	16-May-06	11-Sep-06	10-May-07	27-Aug-07	(1)	(2)
1.0	-1.4	1881	1915	1913	1909	1853	1875	1866	1909	1864	1912	1868	1903	1850	1913	1857	1920	1923	1860	1921	1855	1915	1853	1949	1841	1852
1.5	-1.9	1858	1909	1902	1903	1841	1877	1849	1901	1849	1899	1850	1894	1841	1899	1848	1908	1916	1850	1912	1847	1906	1844	1913	1842	1847
2.0	-2.4	1857	1910	1901	1903	1843	1882	1850	1901	1850	1896	1852	1895	1845	1896	1851	1906	1915	1852	1910	1849	1904	1846	1904	1850	1848
2.5	-2.9	1858	1907	1899	1901	1843	1883	1850	1897	1849	1891	1851	1891	1846	1891	1852	1901	1910	1853	1906	1850	1900	1847	1904	1856	1872
10.0	-10.4	1896	1884	1884	1894	1883	1881	1852	1861	1883	1880	1883	1861	1886	1883	1886	1884	1884	1866	1886	1889	1866	1888	1907	1922	1903
10.5	-10.9	1877	1875	1875	1887	1875	1873	1875	1873	1876	1873	1874	1873	1877	1875	1878	1876	1876	1860	1878	1881	1878	1880	1913	1894	1909
11.0	-11.4	1880	1877	1877	1889	1878	1874	1876	1875	1878	1875	1876	1875	1880	1877	1881	1878	1879	1862	1880	1883	1880	1882	1892	1894	1894
11.5	-11.9	1877	1875	1875	1886	1875	1872	1874	1872	1875	1872	1874	1873	1877	1875	1878	1876	1876	1860	1877	1880	1878	1879	1892	1893	1880
12.0	-12.4	1880	1875	1875	1885	1874	1871	1873	1872	1874	1871	1874	1872	1877	1874	1877	1874	1875	1879	1877	1880	1877	1878	1895	1893	1879
12.5	-12.9	1876	1875	1875	1886	1875	1872	1873	1872	1875	1872	1874	1872	1876	1874	1877	1874	1875	1879	1877	1879	1877	1879	1878	1880	1880

Depth on String	Actual Depth	Temperature (°C)																				Mar. 27/06	Mar. 27/06		
(m)	(m)	Apr. 03/06	Apr. 10/06	Apr. 21/06	Apr. 28/06	May 05/06	May 12/06	May 15/06	May 20/06	May 26/06	June 2/06	Jun. 11/06	Jun. 17/06	Jun. 24/06	Jul. 02/06	Jul. 07/06	Jul. 15/06	July 22/06	July 29/06	Aug. 04/06	Aug 11/06	Aug. 21/06	Sept. 18/06	(1)	(2)
1.0	-1.4	1840	1845	1849	1851	1853	1855	1861	1853	1859	1865	1879	1884	1900	1899	1904	1919	1910	1909	1912	1920	1920	1905		
1.5	-1.9	1842	1841	1844	1845	1847	1848	1848	1850	1849	1852	1853	1855	1870	1874	1877	1897	1890	1891	1894	1899	1903	1897		
2.0	-2.4	1847	1847	1848	1849	1850	1850	1851	1849	1852	1854	1853	1854	1855	1862	1867	1886	1885	1888	1892	1897	1897			
2.5	-2.9	1851	1850	1850	1851	1851	1851	1852	1850	1852	1854	1853	1853	1853	1854	1855	1868	1874	1878	1881	1885	1890	1894		
10.0	-10.4	1890	1888	1888	1888	1887	1888	1888	1875	1886	1888	1886	1886	1887	1889	1887	1888	1884	1884	1884	1884	1884	1884		
10.5	-10.9	1880	1880	1880	1880	1879	1882	1881	1877	1879	1880	1879	1879	1882	1878	1877	1878	1878	1877	1877	1877	1877	1877		
11.0	-11.4	1883	1882	1882	1882	1882	1882	1884	1878	1881	1882	1881	1880	1880	1882	1881	1893	1879	1879	1879	1879	1879	1879		
11.5	-11.9	1881	1879	1879	1880	1879	1880	1879	1879	1882	1880	1878	1878	1882	1878	1877	1885	1877	1877	1877	1877	1876	1876		
12.0	-12.4	1879	1879	1879	1879	1879	1884	1878	1874	1878	1879	1878	1877	1876	1877	1876	1880	1875	1875	1875	1875	1875	1875		
12.5	-12.9	1879	1878	1878	1879	1881	1878	1881	1877	1879	1879	1878	1878	1883	1881	1879	1878	1876	1876	1876	1876	1876	1876		

Depth on String	Actual Depth	Temperature (°C)																				Mar. 27/06	Mar. 27/06		
(m)	(m)	Apr. 03/06	Apr. 10/06	Apr. 21/06	Apr. 28/06	May 05/06	May 12/06	May 15/06	May 20/06	May 26/06	June 2/06	Jun. 11/06	Jun. 17/06	Jun. 24/06	Jul. 02/06	Jul. 07/06	Jul. 15/06	July 22/06	July 29/06	Aug. 04/06	Aug 11/06	Aug. 21/06	Sept. 18/06	(1)	(2)
1.0	-1.4	-2.0	-1.3	-0.7	-0.4	-0.1	0.1	1.0	-0.1	0.7	1.5	3.5	4.2	6.4	6.3	7.0	9.0	7.8	7.7	8.1	9.2	9.2	7.1		
1.5	-1.9	-1.7	-1.8	-1.4	-1.3	-1.0	-0.8	-0.8	-0.8	-0.7	-0.3	-0.1	0.1	2.2	2.8	3.2	6.0	5.0	5.2	5.6	6.3	6.8	6.0		
2.0	-2.4	-1.0	-1.0	-0.8	-0.7	-0.6	-0.6	-0.4	-0.7	-0.3	0.0	-0.1	0.0	1.1	1.8	4.5	3.9	4.3	4.7	5.3	6.0	6.0			
2.5	-2.9	-0.4	-0.6	-0.6	-0.4	-0.4	-0.4	-0.3	-0.6	-0.3	0.0	-0.1	-0.1	0.0	0.1	2.0	2.8	3.4	3.8	4.3	5.0	5.6			
10.0	-10.4	5.0	4.7	4.7	4.7	4.6	4.7	4.7	2.9	4.5	4.7	4.5	4.5	4.6	4.9	4.6	4.3	4.2	4.2	4.2	4.2	4.2			
10.5	-10.9	3.6	3.6	3.6	3.6	3.5	3.9	3.8	3.2	3.5	3.6	3.5	3.5	3.9	3.4	3.2	3.4	3.4	3.2	3.2	3.2	3.2			
11.0	-11.4	4.1	3.9	3.9	3.9	3.9	3.9	4.2	3.4	3.8	3.9	3.8	3.6	3.9	3.8	5.4	3.5	3.5	3.5	3.5	3.5	3.4			
11.5	-11.9	3.8	3.5	3.5	3.6	3.5	3.6	3.5	3.5	3.9	3.6	3.4	3.4	3.9	3.4	3.2	4.3	3.2	3.2	3.2	3.1	3.1			
12.0	-12.4	3.5	3.5	3.5	3.5	3.5	4.2	3.4	2.8	3.4	3.5	3.4	3.2	3.1	3.2	3.1	3.6	2.9	2.9	2.9	2.9	2.9			
12.5	-12.9	3.5	3.4	3.4	3.5	3.8	3.4	3.8	3.2	3.5	3.5	3.4	3.4	4.1	3.8	3.5	3.4	3.1	3.1	3.1	3.1	3.1			

Little Creek Dam Thermistors

