BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

NANISIVIK MINE, A DIVISION OF CANZINCO LTD.

2006 ANNUAL GEOTECHNICAL INSPECTION

NANISIVIK MINE, NUNAVUT

FINAL

PROJECT NO.: 0255-013-08
DATE: JANUARY 10, 2007

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
1605, 840 - 7 Avenue SW
Calgary, Alberta T2P 3G2
Tel.: (403) 250-5185
Fax: (403) 250-5330

Project No. 0255-013-08
January 10, 2007

Mr. Bob Carreau
Corporate Manager, Environmental Affairs
Breakwater Resources Limited
Suite 950, 95 Wellington Street West
Toronto, ON
M5J 2N7

**RE: 2006 ANNUAL GEOTECHNICAL INSPECTION
NANISIVIK MINE, NUNAVUT**

Dear Bob:

Please find attached our above captioned report on the 2006 Annual Geotechnical Inspection undertaken at Nanisivik Mine. A memo outlining maintenance and monitoring requirements from our site visit was left with Mr. Murray Markle, Site Manager.

If there are any questions or comments regarding this report, please contact the undersigned at your convenience.

Regards,
BGC ENGINEERING INC.
per:

Geoff Claypool, P.Eng. (AB)
Geological Engineer
(direct line 403/250-5185 ext. 104)

Enclosure: Report, Figures, Appendices

GKC/sf

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LIMITATIONS OF REPORT

BGC Engineering Inc. (BGC) prepared this report for the account of Nanisivik Mine, a division of CanZinco Ltd. The material in it reflects the judgement of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a third party makes of this report, or any reliance on decisions to be based on it are the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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1.0 INTRODUCTION

Nanisivik Mine is wholly owned and operated by CanZinco Ltd., which is a division of Breakwater Resources Ltd. Nanisivik Mine is located on the Borden Peninsula on northern Baffin Island, just south of Strathcona Sound, as shown on Figure 1.

Mining operations at Nanisivik ceased in September 2002. Site operations are currently conducted under Nunavut Water Board License NWB1NAN0208 (the License), dated October 1, 2002 which entitles CanZinco (the Licensee) to use water and dispose of waste associated with the closure and reclamation of the mine. Part H, Item 6 of the License states the following:

> "An inspection of the earthworks, the geological regime, and the hydrological regime of the West Twin Disposal Area, East Adit Treatment Facility, and fuel containment berms shall be carried out annually during the summer by a Geotechnical Engineer."

Additionally, the Nunavut Water Board's Letter of Approval (NWB 2004) states the following:

> "In addition to the requirements outlined in Part H, item 6, of the License, the Licensee shall include inspection of all portals, adits, mine openings, ventilation shafts associated with the mine and an examination of the area around the Industrial Complex ice lens."

Also, the approved Nanisivik Mine Reclamation and Closure Monitoring Plan (GLL 2004a) states that the annual geotechnical inspection will include "all earth structures, water diversions, rock slopes and soil covers by a professional engineer." As per the Monitoring Plan, "the engineers report will include a professional review and assessment of all thermal monitoring information and flow information relevant to a physical stability assessment."

In fulfillment of these regulatory requirements, Mr. Bob Carreau, Vice-President Environmental Affairs for Breakwater Resources Ltd., requested that BGC Engineering Inc. (BGC) conduct an inspection visit. The current report provides a summary of the conditions observed and any resulting recommendations and maintenance issues. Table 1 provides a list of the structures that were included within the inspection.

Table 1 - Summary of Inspection Items

Facility Type	Inspection Item
Embankments and Containment Structures	West Twin Dike
	Test Cell Dike
	East Twin Creek Diversion Dike
	East Adit Treatment Facility Dikes
	Day Tank Farm Spill Containment Berm
	Main Tank Farm Spill Containment Berm
	West Twin Outlet Structure
Thermal Covers	Surface Cell
	Test Cell
	Toe of Test Cell Dike
	Toe of West Twin Dike
	Landfill
	West Open Pit
	East Open Pit
	Oceanview Pit
	Area 14
Mine Openings, Crown Pillars and Raises	00/01 Portals and crown pillar
	17 N Portal
	Oceanview Portal
	K-Baseline Portal
	Area 14 Portal
	9S Portal
	Lower Adit
	Shale Hill Raise
	Oceanview East and West Raises
	Area 14 Raise
Shale and Armour Borrow Areas	Mt. Fuji Shale Borrow Area
	West Twin Shale Borrow Area
	East Twin Shale Borrow Area
	Area 14 Shale Borrow Area
	Townsite Shale Borrow Area
	Shale Hill Shale Borrow Area
	Twin Lakes Delta Armour Borrow Area
	Kuhulu Lake Road Borrow Area
	09S/17N Armour Borrow Area
	Chris Creek Armour Borrow Area
Industrial Complex	Mill Foundation
	Former Portal to Mill Foundation

All pre-1998 site investigation work, geotechnical design and construction monitoring of the West Twin and East Adit containment structures was carried out by Terratech, a division of SNC Inc. and Mr. Frank Tordon, P.Eng. Initial design work relating to the East Twin diversion dike and channel and the dump containment ponds was provided by Kilborn Engineering Ltd. Golder Associates Ltd. prepared the annual inspection reports for the waste containment dikes in 1998 and 1999, while BGC provided the annual inspection reports for 2000 through 2005. These other reports should be reviewed in combination with this current report for the sake of consistency regarding performance and maintenance issues.

2.0 MINE RECLAMATION ACTIVITIES

The Final Closure and Reclamation Plan was submitted to the Nunavut Water Board for review and approval in March 2004. The review process included a technical meeting in Yellowknife in May 2004 and a public hearing in Arctic Bay in June 2004. The Board conveyed its approval of the plan in a letter to Breakwater dated July 6, 2004.

The reclamation of the mine site has been ongoing since August 2004. Since then, the following reclamation activities related to the geotechnical inspection have been completed:

- Thermal covers have been constructed over tailings in the Surface Cell, Test Cell, toe of the Test Cell Dike, toe of the West Twin Dike and at the Upper Dump Pond.
- Thermal covers have been constructed over waste rock in the West Open Pit, East Open Pit, Oceanview Pit and Area 14 waste rock pile.
- A thermal cover was constructed over the Nanisivik Landfill.
- Portal plugs and thermal covers have been constructed at the Oceanview Portal, K-Baseline Portal, 17 North Portal, 88 North Portal, 00 Portal and 01 Portal.
- The 00/01 crown/rib pillar was supported by constructing a fill pillar beneath it.
- The West Twin Dike Spillway was constructed to convey water from the Surface Cell to the Reservoir.
- The West Twin Outlet Channel was constructed to provide elevation control in the Reservoir.
- Additional armour was applied to a portion of the face of the East Twin Creek Diversion Berm.

Reclamation items which remain uncompleted include the following:

- Decommissioning of the East Adit Treatment Facility Dikes;
- Construction of portal plugs at the 09 South and Lower Adit portals;
- Construction of a thermal cover over contaminated soils in the Mill Foundation;

It is anticipated that these items will be completed in 2007.

3.0 CLIMATIC INFORMATION

Climatic data has been collected by Environment Canada since 1976 at the Nanisivik Airport, which is located approximately 10 km south of the West Twin Disposal Area (WTDA) and approximately 250 m higher in elevation. The recorded climate data were analysed in Golder (1998) to provide a basis for deriving the existing climate parameters such as precipitation, air temperatures and lake evaporation at the project site. The following list is a summary of the main climatic parameters based on the data available in 1998:

- The mean annual air temperature was –15.2°C.
- The mean annual precipitation totals 240 mm.
- The 24 hour Probable Maximum Precipitation (PMP) value was estimated to range from 140 to 210 mm.
- The mean annual lake evaporation value, as measured at the Nanisivik site, was approximately 200 mm.

Figure 2 illustrates the long-term mean monthly temperature values (Nanisivik Airport) versus the monthly values for 2005 and a portion of 2006. Figure 3 shows the long-term monthly total precipitation values as compared to the monthly values recorded in 2005 and a portion of 2006. Table 2 provides a summary of the climate data recorded at the Nanisivik airport since 2003. Data from 1993 (the first year the test covers were monitored) is also included in Table 2 for comparison purposes.

Table 2 - Summary of Climate Data 2003-2005

Parameter	Nanisivik Normals (1977-2005)	1993	2003	2004	2005
Mean Annual Air Temperature	-15.0 ^{o}C	-14.8 ^{o}C	-13.3 ^{o}C	-15.7 ^{o}C	-13.5 ^{o}C
Total Annual Precipitation	254.3 mm	235.7 mm	333.3 mm	304.7 mm	501.6 mm

As can be seen, 2005 was an above-average year for both air temperature and precipitation. The mean annual air temperature (MAAT) was approximately 1.4°C warmer than the long term average and 1.2°C warmer than the MAAT recorded in 1993. Only the mean monthly temperature recorded in May was observed to be cooler than the long term monthly average. The remainder of the months have mean monthly temperatures equal to or warmer than the long term average for that month. The total annual precipitation was nearly double the long term average. This is related to high precipitation amounts in July (as rain) and in October (as snow).

Climate data collected to-date in 2006 indicates that the MAAT will, again, likely be above-average. The mean monthly temperatures recorded at the Nanisivik Airport between January and October 2006 have been on average 2.9°C warmer than the long term average. Only the mean monthly temperature recorded in June was observed to be cooler than the long term monthly average. The precipitation recorded between January and May 2006 was approximately two and one-half times the long term average of these months.

To further assess the thaw season climate data, the average monthly temperatures between May and September for 2003 through 2006 are provided in Table 3. Once again, the data from 1993 has been included for comparison purposes.

Table 3 - Summary of Thaw Season Climate Data 2003-2006

Parameter	Average Monthly Air Temperatures (°C)					Average Air Temperature (May – September) (°C)
	May	June	July	August	September	
Monthly Average (1977-2005)	**-10.4**	**-0.2**	**4.9**	**1.5**	**-5.4**	**-1.9**
1993	-5.7	1.4	6.7	1.2	-4.9	-0.3
2003	-8.6	0.0	6.3	0.3	-5.1	-1.4
2004	-9.2	-1.8	2.8	1.2	-4.8	-2.4
2005	-11.3	1.4	4.6	4.1	-4.8	-1.2
2006	-6.1	-1.7	5.7	4.7	-1.9	+0.1

The data indicates that the average monthly temperature during the thaw season in 2006 has been approximately 2°C warmer than the long term average and approximately 0.4°C warmer than what was recorded in 1993 (the first year the test covers were monitored).

It should be noted that although 2005 and the first ten months of 2006 were observed to be warmer than average, the observed air temperatures were still cooler than the 1:100 year “Best Estimate” and “High Sensitivity” estimates for global warming, which were -12.3°C and -10.1°C, respectively (BGC 2004a). These estimates were used in the thermal cover design, as documented in BGC (2004b).

4.0 MINE DESCRIPTION

Mining was conducted at Nanisivik Mine between 1976 and 2002. During that time, mining was conducted at four small open pits (West Open Pit, East Open Pit, East Trench and Oceanview Open Pit) and underground (Main Lens, Area 14, Oceanview and K-Baseline). The location of each mining area is illustrated on Figure 1. The ore was processed at the mill and the tailings were transported to the WTDA located at West Twin Lake.

The WTDA was comprised of an upper, solids retention pond, named the Surface Cell and a lower, water retention pond, called the Reservoir, as shown on Figure 4. During operations, tailings were deposited into the Surface Cell along the perimeter to promote stratification of sediments and to clarify waters returning to the decant/siphon pipe. Excess water was then siphoned or pumped into the Reservoir from where it was reclaimed for use in the mill. Occasionally tailings were discharged directly into the Reservoir.

The Reservoir and a final polishing pond are separated by a rockfill causeway and stop log structure. Water from the polishing pond was then discharged to Twin Lakes Creek at the decant structure located at the outlet from the pond. The decant structure was replaced in 2005 by the West Twin Outlet Channel.

Due to the extraction of potable water from East Twin Lake, it is a requirement of the water licence that the Reservoir (formerly, West Twin Lake) elevation remain lower than the East Twin Lake level. Table 4 presents a summary of the month end lake levels recorded since July 2005:

Table 4 - East Twin Lake and Reservoir Water Levels
July 2005 – September 2006

Month	Month End Reservoir Elevation (m)	Month End East Twin Lake Elevation (m)
Jul.'05	369.80	372.17
Aug.'05	368.70	372.19
Sep.'05	368.95	372.03
Oct.'05	368.95	372.03
Nov. '05	368.95	372.02
Dec. '05	368.95	372.01
Jan. '06	368.95	372.00
Feb. '06	368.95	371.97
Mar. '06	368.95	371.92
Apr. '06	368.95	371.90
May '06	369.20	371.91
Jun. '06	369.92	372.33
Jul. '06	369.91	372.26
Aug. '06	370.41	372.05
Sep. '06	370.35	372.04

The low Reservoir levels recorded between July 2005 and May 2006 are related to the draw down of the Reservoir in 2005. This was completed to permit construction of the tailings cover at the toe of the Test Cell Dike and Toe of the West Twin Dike. The increase in water levels in the Reservoir between May and September 2006 is related to recharging of the Reservoir from surficial run-off. It should be noted that, although not reflected in the month end data, the Reservoir was drawn down again to approximately 369.6 m elevation in July 2006 to permit reclamation of the tailings high points in the Reservoir. It should also be noted that the maximum observed Reservoir water level (370.41 m elev.) is higher than the design normal water level (370.2 m elev.) due to the continued presence of the culverts in the access road to East Twin Lake. Once these culverts are removed and the road is breached, it is anticipated that the normal water level in the Reservoir will be 370.2 m, as designed for final closure conditions.

5.0 REVIEW OF 2005 MAINTENANCE RECOMMENDATIONS

The 2005 Annual Geotechnical Inspection Report (BGC 2005) outlined a number of maintenance recommendations. These recommendations, and their status, as observed during the 2006 inspection, are provided in Table 5.

Table 5 - Summary and Status of 2005 Maintenance Recommendations

Inspection Item	Recommended Maintenance (2005)	Comments
East Adit Treatment Pond Dike	• Monitor water levels.	• Information from site staff indicates water level was monitored throughout 2006 and pond water was transferred from treatment pond to retention pond prior to the water level reaching within 1 m of the crest, as recommended in BGC (2005).
East Adit Treatment Pond Dike	• Repair/replace GCL on upstream side.	• Information from site staff indicates that the sinkhole was backfilled and the GCL in the adjacent area was realigned in 2005.
Main Tank Farm Spill Containment Berm	• Repair liner tears and cover exposed areas of the liner.	• Exposed areas noted in 2005 remained exposed during 2006 inspection.
Day Tank Farm Spill Containment Berm	• Repair liner tears and cover exposed areas of the liner.	• Exposed areas remained exposed during 2006 inspection.

Considering the impending decommissioning of the East Adit dikes and the Day Tank Farm berm, the actions completed by Breakwater in response to the recommended maintenance items are considered adequate. The recommendations for the Main Tank Farm berm (repair any liners tears and cover exposed portions of the liner) are still considered valid, and these recommendations stand.

6.0 INSPECTION CONDITIONS

Mr. Geoff Claypool, P.Eng (AB), conducted the geotechnical site inspection between August 22 through 28, 2006. Each of the embankments and structures were inspected on foot. Pertinent observations were recorded by photograph. The photographs and field notes constitute the field record (the Field Memo is kept on file at BGC) and provides the basis for this formal report.

After completion of the site inspection tour, a memo (attached in Appendix I) was left with Mr. Murray Markle, Site Manager, summarizing the conditions observed and the resulting recommendations.

6.1 Embankments and Containment Structures

Several embankments and containment structures were constructed at Nanisivik Mine throughout its history for various purposes. These include the following:

- West Twin Dike,
- Test Cell Dike,
- East Adit Treatment Pond Dike,
- East Adit Retention Pond Dike,
- Day Tank Farm Spill Containment Berm, and
- Main Tank Farm Spill Containment Berm.

The following sections provide a summary of the inspection conditions at each of the structures mentioned above. It should be noted that since the West Twin Dike and Test Cell Dike have been incorporated into the Surface Cell and Test Cell tailings covers, the inspection conditions for these structures are reviewed in Section 6.4 (Thermal Covers).

6.1.1 East Adit Treatment Facility Dikes

Construction Details

The East Adit Treatment Facility is located approximately 3 km east of the mill, downslope from the East Adit area, as shown on Figure 1. The facility is comprised of a Treatment Pond and a Retention Pond, both of which employ earthen dikes to retain surface water flow. Water retained in this area is runoff water from the surrounding drainage basin, where the water quality is affected and/or impacted by exposed natural sulphide outcrops.

Both dikes are shale rockfill structures mixed with a combination of one or more of the following: regional talus, glacial till, marine clay and/or bentonitic clay. The crest of the Treatment Pond Dike is approximately 5 m above the surrounding ground surface. The crest of the Retention Pond Dike is approximately 3 m above the surrounding ground surface. Slope angles on the upstream and downstream faces of these dikes vary from the angle of repose (~1.25H:1V) to approximately 2H:1V.

The reclamation plan for the dikes involves breaching to restore natural drainage to the area (CanZinco 2004).

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-1). The main observations made during the inspection are summarized by the following:

- No deformation was observed in the crest of either dike.
- No seepage was observed at the toe of either dike.
- No erosion of sloughing of either the upstream or downstream face of either of the dikes was observed.

In general, the dikes appeared to be in a satisfactory condition and no maintenance was recommended.

6.1.2 Day Tank Farm Spill Containment Berm

Construction Details

The Day Tank Farm Spill Containment Berm is located just uphill from the Industrial Complex, as shown on Figure 1. The berm provides contingency storage for fuels should the day tanks leak or spill. The berm is approximately 4 m high at its highest point and has a crest width of approximately 2 m. The side slopes of the berm vary from approximately 1.5H:1V to 1.75H:1V.

CanZinco (2004) details the reclamation plan for the facility which involves the following:

- The liner is to be removed and disposed of underground according to the Waste Disposal Plan.
- Hydrocarbon contaminated soils are to be relocated to the underground mine, in accordance with the Underground Waste Disposal Plan.
- The areas which are disturbed during reclamation are to be backfilled and/or contoured to their surroundings.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-2). The main observations made during the inspection are summarized by the following:

- No deformation of the crest of the berm was observed.
- No seepage was observed at the toe of the berm.
- No erosion of sloughing of either the upstream or downstream face of the berm was observed.
- No water was observed in the bottom of the containment cell.
- The liner in the bottom of the cell was observed to be disturbed in the northwest corner of the cell.
- The liner was observed to be exposed at various locations inside of the berm.

In general, the berm appeared to be in a satisfactory condition and no maintenance was recommended. If the berm is required to be in use beyond 2007, it is recommended that the exposed portions of the liner be covered to prevent damage from occurring.

6.1.3 Main Tank Farm Spill Containment Berm

Construction Details

The Main Tank Farm Spill Containment Berm is located adjacent to the loading dock at Strathcona Sound, just west of the concentrate storage building (Figure 1). The berm provides contingency storage for fuels should the fuel storage tanks leak or spill.

The berm is approximately 5 m high at its highest point and has a crest width of 1 to 3 m. The side slopes of the berm are approximately 1.5H:1V to 2H:1V.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-3). The main observations made during the inspection are summarized by the following:

- No deformation of the crest of the berm was observed.
- No seepage was observed at the toe of the berm.
- No erosion or sloughing of either the upstream or downstream face of the berm was observed.
- The liner is exposed at several locations on the inside of the north berm.

During the excavation of hydrocarbon contaminated soils in the dock area in 2006, a portion of the main tank farm spill containment berm was affected. The affected area was approximately 10 m long (along the berm), from the crest to the toe of the berm. The excavation has resulted in an oversteepening of the berm face and exposure of a portion of the underlying GCL liner.

In general, the berm appears to be in a satisfactory condition, except for the area affected during excavation of nearby hydrocarbon soils. The affected area should be re-sloped to match the grade of the adjacent slopes and the GCL liner should be re-buried to prevent damage to the liner. It is also recommended that any area of exposed liner within the berm be covered to prevent damage from occurring.

6.2 Water Conveyance Structures

Several water conveyance structures were constructed at Nanisivik Mine, both prior to and during the reclamation process. These include the following structures:

- West Twin Dike Spillway;
- West Twin Outlet Channel; and
- East Twin Creek Diversion Berm and Channel.

The following sections provide a summary of the inspection conditions at each of the structures mentioned above.

6.2.1 West Twin Dike Spillway

Construction Details

The West Twin Dike Spillway is located at the south end of the Surface Cell, as show on Figure 4. The spillway conveys water from the Surface Cell to the Reservoir. The physical details of the spillway are summarized by the following:

- The spillway is approximately 550 m long.
- The base of the spillway is approximately 6 m wide.
- The grade of the spillway varies from 0% at the inlet to 7% near the middle of the spillway and 2% at the outlet.
- The bottom of the spillway is founded on rock from the inlet to 100 m down gradient of the access ramp. The remainder of the spillway bottom is comprised of rockfill.
- The side slopes of the spillway vary from near vertical in rock to approximately 3:1 in soil side slopes.
- Side slopes composed of poor quality rock or soil are armoured with rip rap.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-4). The main observations are summarized by the following:

- There was a small pond at the spillway inlet. The depth of the pond did not exceed 30 cm.
- Some iron staining was observed on rocks at the inlet.
- Some organic materials were observed growing on rocks at inlet.

- The bottom of spillway was observed to be very undulating down gradient of the access ramp.
- Significant thermokarsting was observed in the spillway side wall near the outlet.
- Some slope debris was observed in the base of the spillway. This was attributed to an area of slope instability in the rock outcrop above the spillway.
- Some minor erosion of the access ramp was observed to be occurring on southwest side of the ramp.
- The north side of spillway was not yet rip rapped.

The following maintenance items were recommended:

- The bottom of spillway should be leveled using a dozer, especially down gradient of the access ramp.
- The thermokarst near the outlet should be repaired with rock fill.
- The north (left) side of spillway should be rip rapped to prevent erosion.
- The area of slope instability that results in debris falling into the spillway should be repaired by resloping.
- The access road adjacent to the spillway should be leveled with a dozer.
- The area around the deflection berms should be re-leveled.

6.2.2 West Twin Lake Outlet Channel

Construction Details

The West Twin Lake Outlet Channel is located in the northeast corner of the WTDA, as show on Figure 4. The channel conveys water from the Reservoir into Twin Lakes Creek. The channel replaces the former decant station located in the same area. The physical details of the channel are summarized by the following:

- The main design feature of the channel is a steel-reinforced, concrete wall which provides water retention and elevation control for the Reservoir.
- The concrete wall is approximately 7 m wide and 0.3 m thick.
- The overflow elevation of the wall is approximately 370.2 m.
- The wall contains sloping side walls (4H:1V) and the top of the side walls is approximately 370.8 m.
- The concrete wall is founded into the underlying bedrock via a steel-reinforced, concrete footing.
- The channel is armoured to approximately 370.8 m elevation, upstream and downstream of the wall.
- A plunge pool is located downstream of the wall to provide energy dissipation during flooding events.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-5). The main observations are summarized by the following:

- It was observed that the concrete wall contains approximately five small cracks.
- It was also observed that during periods of minor inflow into the Reservoir, the water level behind the wall decreased slightly (approximately 5 cm), possibly indicating minor seepage losses through the foundation of the wall.
- The rip rap in the plunge pool was observed to be slightly undersized.

The following maintenance items were recommended:

- Additional, larger rip rap (D_{50} = 300 mm) should be placed in the plunge pool. The rip rap may be sourced from the nearby existing stockpiles located at the crest of the East Twin Creek deflection berm.
- Inspect the wall for further cracking.
- Monitor the water level upstream of the wall to assess leakage.

6.2.3 East Twin Creek Diversion Dike and Channel

Construction Details

The East Twin Creek Diversion Dike is located along Twin Lakes Creek between East Twin Lake and the West Twin Outlet Channel, as shown on Figure 4. The diversion dike and channel deflect flow from East Twin Lake away from its previous drainage course, which drained directly into West Twin Lake (the Reservoir). The flow from the diversion channel combines with the flow from the Reservoir downstream of the West Twin Outlet Channel.

The crest of the diversion dike is approximately 2 m above the adjacent ground level and is comprised of sand, gravel and cobbles derived from the nearby Twin Lakes sand and gravel deposit.

A portion of the dike was regraded during reclamation construction to provide a configuration less susceptible to erosion. Additionally, the regraded portion of the dike was armoured with riprap to prevent future erosion from occurring.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-6). No indications of erosion of the dike were observed. The armoured portion of the dike was inspected and observed to be in satisfactory condition. No additional maintenance was recommended.

6.3 Thermal Covers

6.3.1 Surface Cell Tailings Cover

Construction Details

A thermal cover was constructed over the tailings in the Surface Cell in 2004 and 2005. The thermal cover consists of a 1 m thick layer (minimum thickness) of granular shale overlain by a 0.25 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Mt. Fuji and Area 14 borrow areas (Figure 1). The armour material was sourced from the Twin Lakes Delta deposit (Figure 1). The Surface Cell tailings cover is drained by a series of swales which convey surface water to the spillway inlet located at the south end of the Surface Cell.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-7). The main observations are summarized by the following:

- Some cracking and minor settlement of the cover was observed in the east/west drainage swale.
- A small head pond was present at the spillway inlet (approximately 30 cm deep).
- No erosion of the cover was observed.

In general, the Surface Cell reclamation cover appeared to be physically stable and no maintenance was recommended.

Monitoring Data

The Surface Cell is instrumented with ten thermistors, seven vibrating wire piezometers, six frost gauges and two monitoring wells. The location of each of these instruments is provided on Figure 5. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided, for interpretation purposes, on Figures 6 through 10.

The instrumentation has two main purposes; monitor the depth of the active layer thaw and monitor the ground temperatures, pore pressures and water quality in the talik during freezeback.

Figure 6 provides data from the thermistors installed along the periphery of the Surface Cell talik. The graphs illustrate the following:

- Cooling of ground temperatures is occurring, even at depth (i.e. at 18 m in BGC03-15, at 25 m in BGC03-07).

- The freezing front appears to be migrating deeper, as illustrated on the graph of the data obtained from thermistor BGC03-09.

Figure 7 provides data from thermistors installed near the centre of the talik. The graphs illustrate the following:

- The upper 10 m of the ground profile are frozen.
- The near surface ground temperatures are cooling.
- The ground temperatures in the centre of the talik appear to be warming slightly at intermediate depths (10 to 20 m bgs).

The warming ground temperatures observed in the centre of the talik are likely related to the heat flow from the surrounding ground, which is cooling. It should be noted that thermistor BGC03-10 which is near the centre of the talik, still appears to be warming at intermediate depths. Whereas ground temperatures at similar depths indicated by thermistor BGC03-11, which is approximately 150 m away from BGC03-10, appear to have stabilized. This stabilization of ground temperatures only a short distance from the centre of the talik may indicate that warming of the centre of the talik is a localized, short term phenomena.

Figure 8 provides data collected from some of the piezometers installed in the Surface Cell talik. The graphs indicate the following:

- The piezometers indicate that pore pressures within the Surface Cell talik are generally between 2 and 5 m artesian.
- The pore pressures are continuing to increase.
- Based on a comparison of the data from piezometers BGC05-10 and BGC05-06, the pore pressures appear to increase towards the centre of the talik (i.e. BGC05-06, ~4 m artesian) and decrease towards the upstream face of the West Twin Dike (i.e. BGC05-10, piezometric surface near ground surface).
- The data from piezometer BGC03-12 indicates that the piezometer tip froze when the tip temperature reached approximately -0.6°C. This provides an indication of the freezing point depression of the pore water within the talik.
- The data from piezometer BGC03-35 indicates that the thawed pore water at 14 m depth is approximately -1.3°C. This is likely related to a higher solute concentration in the centre of the talik.

Figures 9 and 10 provide data collected from thermistors and frost gauges important to monitoring active layer thaw and interpreting overall cover performance. The graphs indicate the following:

- The maximum thaw depth recorded by the frost gauges ranged from 1.0 to 1.75 m bgs (approximate average of 1.3 m bgs).
- The thaw depths indicated by the thermistors were, on average, deeper than those indicated by the frost gauge data.

- The temperature recorded at 0.9 m bgs in thermistor BGC03-11 was cooler in 2006 than it was in 2005, despite the warmer air temperatures. This demonstrates the effect of the addition of the armour layer, which was not applied to the cover until September 2005.
- The thaw depths recorded in thermistor BGC03-11 were similar in 2005 and 2006. This may indicate that an ice saturated layer has begun to develop at the base of the cover.
- The thaw depths recorded in thermistor BGC03-37 were similar in 2005 and 2006. This thermistor was installed in the old test cover at the north end of the Surface Cell. It is known that the bottom of the cover is ice saturated at this location from the test pit program conducted in July 2004. The fact that the active layer thaw did not penetrate into the underlying tailings during an extreme warm year (see Tables 2 and 3) may provide long term verification of the cover design, when ice saturation is allowed to develop.
- On Figure 10, the average active layer thaw recorded from the Surface Cell frost gauges was compared to the active layer thaw observed in the Test Covers in 1993, the first year after construction. It was observed that the active layer thaw was observed to be greater in 2006, but it should be reiterated that 2006 was warmer year in comparison to 1993 (see tables 2 and 3).

An additional note on the interpretation of the geothermal monitoring data. For the purposes of interpretations made in this report, the following assumptions were made:

- In the active layer, ground conditions are considered "thawed" when ground temperatures of 0°C and warmer are observed.
- In the talik, ground conditions are considered "thawed" when ground temperatures of warmer than -0.5°C are observed. This is to account for freezing point depression effects.

Additionally, interpretations of active layer thaw derived from thermistor data is to be treated with caution. This is due to the fact that the thermal regime near the tailings/cover interface is non-linear (i.e. Figure 9, BGC03-11). Calculation of the depth of active layer thaw using thermistor data requires using linear interpolation between two thermistor nodes. Therefore, thermistor data typically overestimates active layer thaw, the degree to which can vary depending on actual node placement.

The results of the water quality testing completed on the samples collected from the monitoring wells installed in the Surface Cell are provided in Table 6.

Table 6 - Summary of Water Quality Monitoring Results from Surface Cell Wells

Monitoring Well	Sample Date	Field Parameters		Total Metals Concentrations (mg/L)		
		pH	Conductivity (mS/cm)	Chromium	Lead	Zinc
BGC05-11	October 13, 2005	10.94	3.23	<0.001	0.004	0.010
	August 27, 2006	11.29	3.69		0.058	0.080
BGC05-12	October 13, 2005	10.28	4.92	0.004	0.628	0.540
	August 27, 2006	10.33	3.69		0.208	0.290

The results from the water quality testing indicate the following:

- The metals concentration at the freezing front (BGC05-11, closer to the dike) are lower than they are in the middle of the talik (BGC05-12).
- The metals concentrations in the middle of the talik are decreasing over time.
- The metals concentrations at the freezing front are increasing over time.

The increasing concentration of metals observed at the freezing front is likely related to rejection of metals as the pore water freezes, a process known as cryoconcentration. This process was expected to occur as the talik freezeback occurs. The increased metal concentration has likely resulted in an increased freezing point depression in the centre of the talik. This is somewhat verified by the piezometer tip temperatures observed in BGC03-35, which is approximately -1.3°C.

Note that the conclusions stated above are based on a limited data set and additional data will be required to accurately assess temporal trends.

6.3.2 West Twin Dike

Construction Details

The West Twin Dike is a frozen core, upstream constructed, earth fill dike that separates the Surface Cell and the Reservoir (Figure 4). The dike is constructed of frozen, compacted shale and founded on frozen, settled tailings. The dike is approximately 14 m high and the downstream face slopes at an angle of approximately 15°. In 2005, the downstream face of the dike was surfaced with a 0.25 m thick layer (minimum thickness) of sand, gravel and cobbles sourced from the Twin Lakes Delta.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-8). The main observations made during the inspection are summarized by the following:

- No settlement or cracking of the crest was noted;
- The downstream face of the dike shows no indications of erosion or settlement;
- No seepage was noted on the face of the dike or at the toe of the dike.

In general, the dike appeared to be in a satisfactory condition and no maintenance was recommended.

Monitoring Data

The West Twin Dike is instrumented with five thermocouple cables installed within the dike and four thermistors and one vibrating wire piezometer installed from the crest of the dike. The location of each of these instruments is provided on Figures 5 and 14. The instruments were monitored biweekly between May and October in 2006. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring, for interpretation purposes, are provided on Figures 11 through 13.

Figure 11 provides data from thermistors BGC03-33 and BGC03-34, which provide a continuous geothermal monitoring profile from 5 m below the crest of the dike to approximately 24 m bgs. The data indicates the following:

- The entire profile is cooling over time.
- Only a small zone of potentially thawed tailings remains between 22 and 23 m bgs.
- The thawed zone is cooling over time from both the top and bottom.

Figure 12 provides data from additional thermistors installed from the crest of the dike, as well as one vibrating wire piezometer installed within the thawed zone at depth. The data indicates the following:

- The profile immediately upstream of the dike is frozen to approximately 20 m bgs.
- The pore pressures within the thawed zone at depth are approximately 3.5 m artesian and continue to increase over time (an increase of approximately 1.5 m between September 2005 and September 2006). This is not considered a threat to the stability of the dike considering the depth and small extent of the areas exhibiting high pore pressures.
- The active layer thaw in the crest of the dike was greater than 2 m, deeper than the average observed in the Surface Cell (1.3 m). This may be attributed to the increased shale thickness at this location (> 2 m).

Figure 13 provides data from the thermocouples installed within the dike. The data indicates that the dike and the dike foundation remained in a frozen state throughout 2006. It should be noted that the thermocouple data is quite erratic and is only considered accurate to within 1°C. Hence, only nominal conclusions may be based on the data obtained from the thermocouples.

6.3.3 Test Cell Tailings Cover

Construction Details

A thermal cover was constructed over the Test Cell in 2004 and 2005. The thermal cover consists of a 1 m thick layer (minimum thickness) of granular shale overlain by a 0.25 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Mt. Fuji, East Twin and Area 14 borrow areas (Figure 1). The armour material was sourced from the Twin Lakes Delta deposit (Figure 1). The Test Cell tailings cover is drained by a main swale which conveys surface water directly into the Reservoir.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-9). The main observations are summarized by the following:

- No erosion of the cover was observed.
- No significant areas of settlement were observed.
- The outlet of Test Cell remained without rip rap.

The following maintenance items were recommended:

- The shoreline at the outlet should be rip rapped.
- The bottom of the outlet trench should be rip rapped.

Monitoring Data

The Test Cell is instrumented with two thermistors, four vibrating wire piezometers, two frost gauges and two monitoring wells. The location of each of these instruments is provided on Figure 14. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figures 15 and 16.

Figure 15 provides geothermal and piezometric monitoring data collected from the Test Cell in 2006. The data indicates the following:

- The subsurface profile in the Test Cell at the toe of the West Twin Dike is frozen to approximately 16 m bgs.
- The subsurface profile in the middle of the Test Cell is frozen to approximately 5 m bgs.

- The piezometric data collected from piezometers BGC05-22 and BGC05-20 indicate that there is only a minor hydraulic gradient (approximately 0.1 m head over 90 m distance) between the middle of the Test Cell and the edge of the Test Cell.
- When the piezometric monitoring data collected from piezometer BGC05-20 is compared to the water level in the Reservoir, a good correlation is observed. This indicates that the talik and the Reservoir are hydraulically connected.

Figure 16 provides data collected from thermistors and frost gauges important to monitoring active layer thaw in the Test Cell and interpreting overall cover performance. The graphs indicate the following:

- The maximum thaw depth recorded by the frost gauges ranged from 1.3 to 1.45 m bgs.
- The active layer thaw depths calculated from the thermistor data from BGC05-04 nominally agree with the data collected from the frost gauges. This is as a result of node placement above and below the tailings/cover interface, in close proximity to the interface.
- The data from thermistor BGC05-19 provides an example of the non-linearity of the thermal regime at the tailings/cover interface.
- The water quality observed at the West Twin Outlet Channel was plotted versus that active layer thaw depth in the Test Cell cover. As can be seen, there was an increase in the zinc concentrations as the active layer thaw migrated into the tailings. Despite the noted increase, the measured zinc concentrations at the outlet were well below the discharge criteria for monthly mean zinc concentrations.

The results of the water quality testing completed on the samples collected from the monitoring wells installed in the Test Cell are provided in Table 7.

Table 7 - Summary of Water Quality Monitoring Results from Surface Cell Wells

Monitoring Well	Sample Date	Field Parameters		Total Metals Concentrations (mg/L)		
		pH	Conductivity (mS/cm)	Chromium	Lead	Zinc
BGC05-21	August 27, 2006	9.43	4.92		0.501	0.950
BGC05-23	August 27, 2006		>5.00		0.150	1.010

The data indicates the following:

- There is only a minor difference in the zinc concentrations at the edge of the talik (05-23) compared to the centre of the talik (05-21).
- The zinc concentrations in the Test Cell talik (0.95 to 1.01 mg/L) are higher than the concentrations observed in the Surface Cell talik (0.08 to 0.29 mg/L).

Note that the conclusions stated above are based on a limited data set and additional data will be required to accurately assess temporal trends.

6.3.4 Test Cell Dike

Construction Details

The Test Cell Dike is an earth fill dike that separates the Test Cell and the Reservoir (Figure 4). The dike is constructed of frozen, compacted shale and founded on frozen, settled tailings. The dike was approximately 4 m high. During reclamation, the top 2 m of the dike were removed and placed in the Test Cell as cover material. The remnant dike was surfaced with a layer of armour material, approximately 0.25 m thick. As such, the dike is now essentially integrated into the Test Cell cover.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-10). The main observation made during the inspection was that the surface of the north/south arm of the Test Cell dike was observed to be soft and undulating with some minor settlement. It was recommended that additional compaction be applied to the surface of the north/south arm of the dike.

Monitoring Data

The Test Cell Dike is instrumented with three thermistors. The location of each of these instruments is provided on Figure 14. The instruments were monitored bi-weekly between May and October in 2006. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figure 17. The monitoring data indicates the following:

- The dike and foundation immediately beneath the dike remained in a frozen state throughout 2006.
- The foundation of the dike is frozen to between 16 and 20 m bgs.
- The subsurface profile beneath the dike continues to cool, even at depths of 20 m.
- The freezing front is migrating downwards, as shown by the data from BGC03-22.

6.3.5 Toe of Test Cell Dike Tailings Cover

Construction Details

A thermal cover was constructed over the tailings at the toe of the Test Cell Dike in 2005. The thermal cover consists of a 1 m thick (minimal thickness) layer of granular shale overlain by a 0.25 m thick layer (minimal thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Mt. Fuji and Area 14 borrow areas (Figure 1). The armour material was sourced from the Twin Lakes Delta deposit (Figure 1). The rip rap was sourced from the dolostone outcrop at the south end of the West Twin Dike.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-11). The main observations are summarized by the following:

- No erosion of the cover was observed.
- No erosion of the rip rap or disturbance due to ice plucking was observed.

In general, the tailings cover at the toe of the Test Cell Dike appears to be in satisfactory condition. As such, no maintenance was recommended.

Monitoring Data

The cover at the toe of the Test Cell Dike is instrumented with two thermistors, one vibrating wire piezometer and two frost gauges. The location of each of these instruments is provided on Figure 14. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figure 18. The graphs indicate the following:

- The subsurface profile at the toe of the Test Cell dike is frozen to approximately 15 m bgs. The subsurface profile is frozen, despite being along a shoreline which was periodically submerged in water. The fact that permafrost exists at this location, to the extent it does, is considered beneficial to the overall Test Cell talik freezeback. This is because it exceeds expectations and assumptions made in the contaminant loading model (CanZinco 2004) which assumed a completely thawed tailings profile adjacent to the water.
- The monitoring data from piezometer BGC05-28 was plotted against the water level elevation in the Reservoir and a good correlation was observed. This demonstrated the hydraulic connectivity that exists between the tailings at depth in the Test Cell and the water in the Reservoir.

- The active layer thaw data from the frost gauges indicates an increased depth of thaw (greater than 2 m) at the toe of the Test Cell Dike. This could be related to the proximity to a heat source (the water in the Reservoir), a thicker shale fill thickness or the aspect/ slope angle of the cover. As stated previously, the tailings profile was assumed to be thawed within an area adjacent to the water in the contaminant loading model (CanZinco 2004). As such, the thick active layer observed at this location is not unexpected.

6.3.6 Toe of West Twin Dike Tailings Cover

Construction Details

A thermal cover was constructed over the tailings at the toe of the West Twin Dike in 2005. The thermal cover consists of a 1 m thick layer (minimum thickness) of granular shale overlain by a 0.25 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Mt. Fuji and Area 14 borrow areas (Figure 1). The armour material was sourced from the Twin Lakes Delta deposit (Figure 1). The rip rap was sourced from the dolostone outcrop at the south end of the West Twin Dike.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-12). The main observations are summarized by the following:

- No erosion of the cover was observed.
- One settlement area was observed near thermistor BGC05-26. The amount of settlement was approximately 0.3 m over an area of approximately 2 m^2.
- No erosion of the rip rap was observed.
- The rip rap along a portion of the shoreline appeared to be constructed to below the design elevation.

It was recommended that additional rip rap should be applied to the shoreline along the toe of the West Twin Dike (30 cm lift).

Monitoring Data

The tailings cover at the toe of the West Twin Dike is instrumented with two thermistors. The location of each of these instruments is provided on Figure 14. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figure 19. The graphs indicate the following:

- The subsurface profile is frozen throughout.

- The temperatures at depth measured by thermistor BGC05-26 are warmer than those observed at the same depth by thermistor BGC03-19. This is likely due to the fact that BGC05-26 was placed in the area where the decant water from the Surface Cell used to discharged. This was an area of consistent water cover (1 to 2 m deep) which likely resulted in a warmer geothermal profile at depth.
- The subsurface thermal regime is continuing to cool.

6.3.7 Landfill Cover

Construction Details

A thermal cover was constructed over the Nanisivik Landfill in 2005. The thermal cover consists of a 2 m thick layer (minimum thickness) of granular shale overlain by a 0.25 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Townsite shale borrow area. The armour material was sourced from the Twin Lakes Delta deposit. The face of the landfill is sloped at approximately 3H:1V.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-13). The main observations are summarized by the following:

- No erosion of the cover was observed, either on the upper portion or on the face of the Landfill.
- No seepage was observed at toe of cover during the time of the inspection.
- Some exposed shale was observed on the lower portion of the west face.
- The armour surface was observed to be very loose.
- No areas of significant settlement were observed in the cover.

The following maintenance items were recommended:

- Complete the spreading of the armour on the lower portion of the west face.
- Apply additional compaction to the armour surface.

Monitoring Data

The Landfill cover is instrumented with one thermistor and one frost gauge. The location of each of these instruments is provided on Figure 20. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figure 21. The graphs indicate the following:

- The landfill debris underlying the cover remained frozen throughout the year.
- The active layer thaw did not penetrate into the underlying waste material.

6.3.8 West Open Pit Waste Rock Cover

Construction Details

A thermal cover was constructed over the West Open Pit in 2006. The thermal cover consists of a 2 m thick layer (minimum thickness) of granular shale overlain by a 0.25 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Townsite Shale borrow area. The armour material was sourced from the local borrow source located along the road between the 09S portal and the 17 North Portal. The face of the West Open Pit cover is sloped at a maximum angle of approximately 3H:1V.

Inspection Conditions

The West Open Pit Waste Rock cover was inspected in August 2006. At that time, the final armour layer was in the process of being constructed. Select photos from the inspection are provided in Appendix II (Figure II-14). The main observations are summarized by the following:

- No erosion of the cover was observed.
- No seepage was noted at the toe of the cover.
- No significant areas of settlement were observed on the exposed portion of the shale cover.
- The armour material that had been spread was relatively loose and un-compact.

The following maintenance items were recommended:

- Complete the construction of the armour layer.
- Compact the armour surface.

Monitoring Data

The West Open Pit cover was completed in October 2006. As such, no instrumentation has been installed. Consideration should be given to installing frost gauges to monitor the active layer thaw and a thermistor to monitor the freezeback of the underlying waste rock.

6.3.9 East Open Pit Waste Rock Cover

Construction Details

A thermal cover was constructed over the East Open Pit in 2005. The thermal cover consists of a 2 m thick layer (minimum thickness) of granular shale overlain by a 0.35 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Shale Hill shale borrow area. The armour material was sourced from the local borrow source located along the road between the K-Baseline Portal and Kuhulu Lake. The face of the East Open Pit cover is sloped at a maximum angle of approximately 3H:1V.

Inspection Conditions

The East Open Pit Waste Rock cover was inspected in August 2006. Select photos from the inspection are provided in Appendix II (Figure II-15). The main observations are summarized by the following:

- No significant erosion of the cover was noted.
- Minor erosion was observed at the west edge of cover where the armour surface transitions into the re-sloped shale road. Note the slope at this location is approximately 3H:1V and is comprised of shale. This area is not within the thermal cover and no waste rock underlies the shale at this location.
- The exposed portion of the remaining highwall appears to be stable.
- No flowing seepage was observed at the toe of the cover but some standing water was noted.
- A wet area was observed on the cover at one of the slope breaks. It is possible that some surficial seepage occurs at this location earlier in the year.
- The water deflection berm at the toe of the cover was still to be armoured.

The following maintenance items were recommended:

- Complete the armouring at the toe at berm location.
- Additional armouring should be applied at the west edge of the cover where the erosion was noted.

Monitoring Data

The East Open Pit Waste Rock cover is instrumented with two thermistors and two frost gauges. The location of each of these instruments is provided on Figure 22. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figure 23. The graphs indicate the following:

- Thermistor BGC05-02, installed in the area with a thin layer of waste rock backfill (approximately 3 m thick), indicated freezeback of the underlying waste rock had occurred.
- The active layer thaw monitoring data from thermistor BGC05-02 indicated that the thaw depth did not exceed 2 m. The fact that the node at 2 m did not get warmer than 0°C may indicate that ice saturation may have occurred at the base of the cover, at this location.
- The active layer thaw depths interpreted from thermistor data collected from BGC05-02 is verified by frost gauge FG14, which was frozen into its casing for much of the year.
- Thermistor BGC05-03, installed in the area with a thick layer of waste rock backfill (approximately 9 m thick), indicated freezeback of the underlying waste rock and hydrocarbon contaminated soil had occurred.

- The active layer monitoring data from thermistor BGC05-03 indicated that the thaw depth reached approximately 5 m bgs, approximately 3 m into the underlying waste rock. This is likely related to the increased backfill thickness at this location. It is expected that the depth of active layer thaw will decrease over time as the underlying waste materials become ice saturated.
- The active layer thaw depths interpreted from data collected from BGC05-03 is verified by frost gauge FG13, which was installed nearby. The active layer thaw depth exceeded 2.5 m by early August, at which point it could no longer be measured from the frost gauge.

No water quality monitoring was conducted from seepage water directly at the toe of the East Open Pit cover in 2006. It is recommended that this occur in 2007 to properly assess cover performance. Currently, water quality monitoring is conducted at the East Adit Treatment Pond. Since the a significant portion of the water that collects in this pond comes from the area upslope and adjacent to the East Open Pit cover, the water quality results observed at this location are not considered an accurate assessment of cover performance.

6.3.10 East Trench Waste Rock Cover

Construction Details

A thermal cover was constructed over the East Trench in 2005. The thermal cover consists of a 2 m thick layer (minimum thickness) of granular shale overlain by a 0.35 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Shale Hill shale borrow area. The armour material was sourced from the local borrow source located along the road between the K-Baseline Portal and Kuhulu Lake. The face of the East Trench cover is sloped at an angle ranging between 4H:1V and 6H:1V.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-16). The main observations are summarized by the following:

- No significant erosion of the cover was noted.
- No flowing seepage was observed at the toe of cover.
- No areas of significant settlement were observed in the cover.

In general, the East Trench cover appears to be in satisfactory condition. As such, no maintenance was recommended.

6.3.11 Oceanview Pit Waste Rock Cover

Construction Details

A thermal cover was constructed over the Oceanview Open Pit in 2005. The thermal cover consists of a 2 m thick layer (minimum thickness) of granular shale overlain by a 0.35 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Shale Hill borrow area (Figure 1). The armour material was sourced from the Chris Creek "A" borrow area (Figure 1). The face of the Oceanview Open Pit cover is sloped at a maximum angle of approximately 3H:1V. The surface of the cover in the bottom of the pit slopes to the north at a grade of approximately 3%.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-17). The main observations are summarized by the following:

- Some cracking and minor erosion of the surface was occurring at the south end of the cover on the sloping face. This was attributed to surface water flow in the area. The surface water flow is likely occurring due to a low spot behind the upslope water deflection berm which ponded water allowing flow to occur beneath the berm onto the cover.
- Some seepage was observed at the toe of the cover.
- One minor sinkhole was observed. The sinkhole measured approximately 50 cm in diameter and 20 cm deep. No shale was observed to be exposed in the bottom of the sinkhole.
- Some staining was observed from surface water running onto east edge of cover from upslope.

The following maintenance items were recommended:

- Improve the grade in the low spot behind the surface water deflection berm.
- Backfill the observed surficial sinkhole with armour material.

Monitoring Data

The Oceanview Pit Waste Rock cover is instrumented with one thermistor and one frost gauge. The location of each of these instruments is provided on Figure 24. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figures 25. The graphs indicate the following:

- The waste rock underlying the cover has frozen back and remained completely frozen throughout 2006.

- The maximum active layer thaw depth indicated by the thermistor (BGC05-01) was estimated to be approximately 1.8 m bgs.
- The maximum active layer thaw depth indicated by the frost gauge (FG16) was measured to be approximately 1.25 m bgs.

It is recommended that the water quality upslope of the pit be monitored in 2007 to add to the interpretation of cover performance.

6.3.12 Area 14 Waste Rock Cover

Construction Details

Area 14 is a satellite ore body situated on a west-facing slope, approximately 1 km to the east of East Twin Lake (Figure 1). A waste rock pile was created outside the portal during mining operations. In 1988, the waste rock pile was flattened and a thermal cover waste constructed over the top of the waste rock pile, but the face was left exposed.

In 2005, the thermal cover at the Area 14 waste rock pile was completed by constructing a cover over the exposed face and armouring the entire surface of the cover. The thermal cover consists of a 2 m thick layer (minimum thickness) of granular shale overlain by a 0.35 m thick layer (minimum thickness) of armour material comprised of sand, gravel and cobbles. All shale was sourced from the Area 14 quarry (Figure 1). All armouring material was sourced from the hill side immediately north of the Area 14 portal.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-17). The main observations are summarized by the following:

- Some erosion was occurring at the north edge of the cover in an area that had yet to be armoured.
- No areas of significant settlement were observed in the cover.
- No seepage was noted at the toe of the cover.

The following maintenance items were recommended:

- Complete the armouring along the north edge of the cover.

Monitoring Data

The Area 14 Waste Rock cover is instrumented with one thermocouple and one frost gauge. The location of each of these instruments is provided on Figure 26. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figure 27. The graphs indicate the following:

- The underlying waste rock remained frozen throughout 2006.
- The active layer thaw did not penetrate into the underlying waste rock.

It should also be noted that the site staff has indicated that water quality monitoring data collected in Chris Creek, down gradient of the Area 14 waste rock pile, met regulatory criteria throughout 2006.

6.3.13 Upper Dump Pond Tailings Cover

Construction Details

The upper dump pond was a emergency tailings storage containment cell located between the water tank and the West Twin Disposal Area, as shown on Figure 1. A thermal cover was constructed over the tailings in the Upper Dump Pond in 2005. The thermal cover consists of a 2 m thick (minimal thickness) layer of granular shale overlain by a 0.25 m thick layer (minimal thickness) of armour material comprised of sand, gravel and cobbles. The shale was sourced from the Townsite shale borrow area (Figure 1). The armour material was sourced from the Twin Lakes Delta deposit (Figure 1).

Inspection Conditions

The main observations from the inspection are summarized by the following:

- No erosion of the surface of the cover was observed.
- No seepage was noted at the toe of the cover.
- No areas of significant settlement were observed.

In general, the Upper Dump Pond tailings cover appears to be in a satisfactory state. As such, no maintenance was recommended.

Monitoring Data

The Upper Dump Pond tailings cover is instrumented with one frost gauge. In 2006, the instruments were monitored bi-weekly between May and October. The data for each individual instrument is provided in graphical format in Appendix III. A summary of the importance of the data from each instrument is provided in Table AIII-1. Select plots providing the results of the monitoring are provided on Figure 28. The graph on Figure 28 illustrates that the active layer thaw did penetrate into the underlying tailings in August and September.

6.4 Mine Openings

6.4.1 00/01 Portals and Crown Pillar

Construction Details

00 Portal

The 00 Portal is located at the edge of the West Open Pit at western end of the mine, as illustrated on Figure 1. The 00 Portal was the principal access at the western extremity of the mine. The portal measured approximately 5 by 5 m in cross section. The brow immediately above the portal was approximately 4 to 5 m high.

In 2005, the portal was backfilled with waste rock. The backfill was placed to within 1 m of the top of the portal and into the portal approximately 5m from the entrance. The backfill extended outside the portal face and was sloped at an angle of approximately 3H:1V and graded into the overall backfill of the West Open Pit. A thermal cover was subsequently constructed over the waste rock as part of the West Open Pit thermal cover.

01 Portal

The 01 Portal was located at the western end of the mine, as shown on Figure 1. The 01 Portal housed the main ventilation fans during mining operations which were mounted in a plate steel bulkhead. The portal opening was approximately 22 m wide and 4 m high. The brow immediately above the portal was approximately 4 to 5 m high.

In 2005, the portal was backfilled with waste rock. The backfill was placed to within 1 m of the top of the portal and into the portal up to the face of the bulkhead. The backfill extended outside the portal face and was sloped at an angle of approximately 3H:1V and graded into the overall backfill of the West Open Pit. A thermal cover was subsequently constructed over the waste rock as part of the West Open Pit thermal cover.

00/01 Crown Pillar

A stope connecting the 00 and 01 portals was located approximately 5 m behind the West Open Pit highwall. A portion of the rock between the 00 and 01 portals, known as the 00/01 rib pillar, was removed during later stages of mine development as part of the pillar recovery program. After the recovery of a portion of the rib pillar, a crack developed in the crown pillar above the area that had been mined. In 2005, a fill pillar was constructed beneath the cracked portion of the crown pillar to provide additional support and prevent development of an opening into the mine workings if the pillar were to collapse. The pillar was constructed out of waste rock and was constructed to within 1 m of the top of the opening.

Inspection Conditions

The area of the West Open Pit cover where the portals had existed was inspected in August 2006. The observations are summarized by the following:

- No indications of surface deformation were observed.
- No indication of seepage from the mine workings was observed.

No maintenance of the portal plugs or the cover over the portal plugs was recommended.

The crown pillar was also inspected from surface. The observations are summarized by the following:

- No additional cracking was observed.
- Based on visual observations, the existing cracking did not seem to dilate further since 2005.
- No visually distinguishable deformation was observed in the crown pillar.

In general, the portal plugs constructed for the 00 and 01 portals appear to be in satisfactory condition. As such, no maintenance was recommended.

6.4.2 17 North Portal

Construction Details

The 17 North Portal was a culverted portal giving access to the Main Ore Zone. The location of the portal is illustrated on Figure 1. The 17 North Decline was approximately 5 by 5 m in cross section and the culvert was half round with a diameter of 5 m and a length of 28 m. The culvert was supported by a 0.25 m thick by 2 m high concrete wall on either side and extended 5 m inside the dolostone bedrock of the drift.

In 2005, the culvert was removed and the portal was backfilled with granular shale. The backfill was placed to within 1 m of the top of the portal and extended into the portal for approximately 4 m. The backfill extended outside the portal face and was sloped at an angle ranging between 4H:1V and 7H:1V and graded into the surrounding topography. A 0.35 m thick layer of armour material was then applied to the surface of the shale backfill.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-17). The main observations are summarized by the following:

- No indications of surface deformation or erosion were observed.
- No indication of seepage from the mine workings was observed.

In general, the 17 North portal plug appears to be in satisfactory condition. As such, no maintenance was recommended.

6.4.3 Oceanview Portal

Construction Details

The Oceanview Portal was a bare rock entrance into the north side of the Oceanview underground workings. The location of the portal is illustrated on Figure 1. The Oceanview decline had a cross section of approximately 5 by 5 m. The brow was approximately 5 m in height.

Prior to 2004, the portal had been backfilled with waste rock and covered over with locally derived overburden materials. In 2005, a thermal cover was constructed over the exiting portal plug. The cover consisted of a 2.0 m thick layer (minimum thickness) of granular shale overlain by a 0.35 m thick layer of armour material consisting of sand, gravel and cobbles. The shale was derived from the Shale Hill borrow area. The armour material was derived from the Chris Creek “A” deposit (Figure 1). The thermal cover was extended to the east and north of the portal entrance to cover an old ore stockpile area. Additionally, a water deflection berm was constructed upslope of the cover extension to prevent surface water from eroding the cover.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-20). The main observations are summarized by the following:

- Minor surficial erosion was observed the along east edge of portal cover. This was attributed to water collecting behind a low spot behind the water deflection berm and running along the edge of the portal cover.
- A small area of surficial settlement was observed near the southwest corner of the portal cover.
- No seepage was observed at the toe of the cover.

The following maintenance items were recommended:

- Improve the grade behind the drainage berm where it transitions into the portal cover to prevent ponding and subsequent erosion.
- Fix the area of settlement located in southwest corner of the portal cover by backfilling it with additional armour material.

6.4.4 K-Baseline Portal

Construction Details

The K-Baseline portal was a culverted entry used to access the K-Baseline orebody. The location of the portal is illustrated on Figure 1. The K-Baseline decline was approximately 5 by 5 m in cross section and the culvert was half round with a diameter of 5 m and a length of 28 m. The culvert was supported by two concrete pony walls, 1 m wide by 2.4 m high, on both sides. The concrete pony walls extended 3 m inside the dolostone bedrock of the drift.

In 2004, the culvert was removed and the portal was backfilled with waste rock. In 2005, a thermal cover was constructed over the waste rock portal plug. The cover consisted of a 2.0 m thick layer (minimum thickness) of granular shale overlain by a 0.35 m thick layer of armour material consisting of sand, gravel and cobbles. The shale was derived from the Shale Hill borrow area. The armour material was derived from the Chris Creek “A” deposit (Figure 1). An additional thermal cover was constructed over the area below the road immediately outside the portal where mineralized soils and additional waste rock were located.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-21). The main observations are summarized by the following:

- No erosion of the cover was observed.
- No seepage was noted at the toe of the cover.
- No areas of significant settlement were observed in the cover.

In general, the K-Baseline portal appears to be in satisfactory shape. As such, no maintenance was recommended.

6.4.5 Area 14 Portal

Construction Details

The Area 14 Portal was a bare rock portal that provided access to the Area 14 underground workings. Mining ceased in this area around 1987 and the portal was backfilled with waste. The waste was covered and contoured with shale in 1987 and 1988.

In 2005, armour material was transported to the portal cover for construction of the final armour layer. The materials remained stockpiled and had not been applied in 2006.

Inspection Conditions

The portal area was inspected in August 2006. At that time, the armour material was still stockpiled and waiting to be spread over the portal area. It was recommended that this activity be completed in late 2006 or 2007.

6.4.6 09 South Portal

Construction Details

The 09 South Portal is located at the western end of the mine, as shown on Figure 2. The 09 South Portal is a culverted entry giving access to the Main Ore Zone. The 09 South drift is approximately 5 by 5 m in cross section. The culvert is round with a diameter of 5 m and a length of 28 m. The bottom of the culvert is filled with rockfill to provide a smooth floor. The culvert extends 13 m inside the shale bedrock of 09 south drift, leaving 15 m exposed on surface, a portion of which is covered with talus from the slope above.

Presently, the 09 South Portal remains open to provide access to the underground workings for disposal of contaminated soils and demolition waste materials. The 09 South Portal is expected to remain open until the contaminated soils and underground waste disposal program are complete, likely sometime in 2007.

6.4.7 Lower Adit

Construction Details

The Lower Adit is located at the western end of the mine near the mill site, as illustrated on Figure 2. The Lower Adit provided the main access into the underground crusher and fine ore bin, as well as secondary access to the Main Ore Zone.

Presently, the Lower Adit remains open to provide ventilation to the underground mine workings. The Lower Adit is expected to remain open until the underground waste disposal program is complete, likely sometime in 2007.

6.4.8 Shale Hill Raise

Construction Details

The Shale Hill Raise provided ventilation for the underground workings in the Shale Hill area. The location of the raise is illustrated on Figure 1. The 3 m diameter raise was approximately 47 m deep. During mining operations, the raise was sealed with a 3 m diameter steel tank with the bottom cut out and with two adaptors in the top for 36 inch ventilation fans. The tank was fixed to a cemented collar at the top of the raise.

Prior to 2005, the surface structure was removed and the Shale Hill raise was backfilled with waste rock. A mound of shale was constructed at surface with side slopes of approximately 3H:1V. In 2005, a 0.35 m thick layer of armour material was applied to the surface of the mound to complete the remediation of this raise.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-22). During the inspection, the armour surface appeared to be stable with no visual indications of erosion or surface deformation. As such, no maintenance was recommended.

6.4.9 Oceanview East Raise

Construction Details

The Oceanview East Raise was situated at the extreme east end of the Oceanview underground workings. The location of the raise is illustrated on Figure 1. The 4 by 4 m raise was approximately 10 m deep and provided ventilation for the underground workings in the Oceanview area. During mining operations, the raise was covered with a wooden wind deflector with a locked door.

In 2002, the wooden deflector was removed and the raise was backfilled with waste rock as part of the progressive reclamation of the mine site. During backfilling, it was noted that an ice plug was present in the raise at a depth of approximately 1.5 m below ground surface. As such, waste rock was placed only to this depth. A 3 m high mound was placed on top of the raise to accommodate for possible future settlement of the ice plug.

Inspection Conditions

The Oceanview East Raise could not be located during the 2006 inspection. It is recommended that the raise be located by the Mine Supervisor in 2007 and identified to the inspector during the 2007 annual geotechnical inspection.

6.4.10 Oceanview West Raise

Construction Details

The Oceanview West raise was located near the west end of the Oceanview underground workings, as shown on Figure 1. The 3 m diameter raise is approximately 26 m deep and provided ventilation for the underground workings. The raise was covered by a steel enclosure with a locked wooden cover.

In 2002, the steel enclosure was removed and the raise was backfilled with waste rock as part of the progressive reclamation of the mine site. During backfilling, it was noted that an ice plug was present in the raise at a depth of approximately 1.5 m below ground surface. As such, waste rock was placed only to this depth. A 3 m mound was placed on top of the raise to accommodate for possible future settlement of the ice plug. The mound was constructed of shale and surfaced with coarse rock.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-22). During the inspection, the armour surface appeared to be stable with no visual indications of erosion or surface deformation. As such, no maintenance was recommended.

6.4.11 Area 14 Raise

Construction Details

The location of the Area 14 Raise is illustrated on Figure 1. The raise had a cross section of 5 by 5 m and an approximate depth of 8 m. Mining ceased in this area around 1987 and the raise was completely backfilled to the floor of the underground workings.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-22). During the inspection, it was observed that no surficial mound had been constructed. It was recommended that the surface mound be constructed when equipment is in the vicinity to finish armouring the nearby Area 14 Portal.

6.5 Shale and Armour Borrow Areas

6.5.1 Shale Borrow Areas

Several shale borrow areas were developed during the reclamation process to provide material for construction of the thermal covers. The borrow areas include the following:

- Mt. Fuji
- Area 14
- West Twin
- East Twin
- Shale Hill
- Townsite

The borrow areas were reclaimed once no longer required. The reclamation efforts included regarding of slopes for stability and sufficient grading of the floor of each borrow area to ensure surface water would not pond.

Select photos from the inspection are provided in Appendix II (Figure II-24). The main observations are summarized by the following:

- Mt. Fuji
  - The benches are beginning to fill in from the ravelling of the remaining bench faces.
  - The instability at the crest observed in 2005 does not appear to be retrogressing further up slope.
  - Only minor ponding was observed in the floor. The floor is considered well drained.
  - No issues requiring maintenance were observed.
- Area 14
  - In general, the re-graded pit walls appear to be stable.
  - One area of erosion is occurring at the north end of the borrow area where natural surface water discharge occurs into the pit. At this location, the overburden material has been eroded down to the top of the bedrock and has been deposited into the floor of the pit.
  - No ponding of water was observed at the time of the inspection, but there has been significant thermokarsting at the entrance to the pit. As such, it is likely that this impedes drainage at some point in the year. The material is sufficiently fractured that the ponded water likely drains when the ground thaws.
  - The surface water drainage should be reviewed in spring 2007, during run-off, to determine if any additional maintenance is required.

- West Twin
  - In general, the re-graded pit walls appear to be stable.
  - No ponding was observed in the floor of the pit.
  - No issues requiring maintenance were observed.
- East Twin
  - In general, the re-graded pit walls appear to be stable.
  - No ponding was observed in the floor of the pit.
  - No issues requiring maintenance were observed.
- Shale Hill
  - In general, the re-graded pit walls appear to be stable.
  - No ponding was observed in the floor of the pit.
  - No issues requiring maintenance were observed.
- Townsite
  - The upper portion of the pit walls remain to be re-sloped.
  - The re-graded portion of the pit walls appear to be stable.
  - Some stockpiled shale remains in the bottom of the pit.
  - No ponding was observed in the floor of the pit.
  - It was recommended that the upper portion of the pit be re-sloped and the bottom of the pit floor be graded once the stockpiled shale is removed.

6.5.2 Armour Borrow Areas

Several armour borrow areas were developed during the reclamation process to provide material for construction of the thermal covers. The borrow areas include the following:

- Twin Lakes Delta deposit
- Chris Creek “A” and “B” deposits
- Kuhulu Lake Road deposit
- 09S/17N Road deposit

The borrow areas were reclaimed once they were no longer required. The reclamation efforts included sufficient grading of the floor of each borrow area to ensure surface water would not pond.

Select photos from the inspection are provided in Appendix II (Figure II-25). The main observations are summarized by the following:

- Twin Lakes Delta deposit
  - The floor of the quarry was, in general, well drained. The surface water flows to the north edge of the quarry and then proceeds to flow west to the Reservoir.
  - Only isolated thermokarsting was observed in the floor of the quarry.
  - No issues requiring maintenance were observed.

- Chris Creek "A" and "B" deposits
  - The floor of the quarry was observed to be well drained.
  - No thermokarsting was observed in the floor of the quarry.
  - No issues requiring maintenance were observed.
- Kuhulu Lake Road deposit
  - Significant thermokarsting was observed within the quarry floor. The thermokarsting was resulting in ponded water accumulating in isolated areas of the quarry floor. The floor of the quarry was regraded with a D8 dozer during the inspection. No further maintenance was required but an additional inspection should be conducted in 2007 to ensure drainage is occurring.
- 09S/17N deposit
  - The face of the quarry did not exhibit any indications of erosion or thermokarsting.
  - No issues requiring maintenance were observed.

6.6 Industrial Complex

6.6.1 Mill Foundation

Construction Details

The Mill building was demolished in 2006 as part of mine reclamation activities. As such, the foundation of the building was exposed during the time of the August inspection. The foundation is comprised of several cells constructed at different elevations. The cells are separated by concrete walls and contain concrete floors. The reclamation plan for the Mill Foundation is to backfill the foundation with contaminated soil and construct a thermal cover over the entire foundation (CanZinco 2004).

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-26). The main observations made during the inspection are summarized by the following:

- The condition of the concrete walls and floor were observed to be good, with no significant cracking observed.
- Initial backfilling of the mill foundation with contaminated soils was observed to be proceeding as required in GLL (2004b).

Since fill placement and cover construction had not yet been completed, no maintenance recommendations could be made. It was recommended that fill placement occur as required in the Waste Rock and Open Pits Reclamation Plan (GLL 2004b) and that appropriate compaction be applied during backfilling. It is anticipated that completion of backfilling and construction of the thermal cover will occur in 2007.

6.6.2 Portal to Mill Foundation

Construction Details

A portal was driven beneath the Mill building in 1980 as part of emergency repair operations for the Mill. The portal is located approximately 70 m south of the Mill, adjacent to Twin Lakes Creek. The portal provided access to an ice lens which was present beneath the mill building. As part of the repair operations, the ice lens was mined out and concrete pillars were constructed to provide additional support for the Mill. After the repair operations were complete, the portal was plugged with shale rock fill.

Inspection Conditions

Select photos from the inspection are provided in Appendix II (Figure II-26). The main inspection observations are summarized by the following:

- No erosion of the shale portal plug was observed.
- No seepage was noted at the toe of the portal plug.

In general, the portal plug appears to be physically stable. It is recommended that the surface of the portal plug be armoured with appropriate material. This could be completed during the armouring of the Mill Foundation cover which is anticipated to occur in 2007. The face of the portal plug, once armoured, should be no steeper that 3H:1V.

6.7 Summary of Maintenance Recommendations

The maintenance items recommended throughout Section 6 are summarized in Table 8.

Table 8 - Recommended Maintenance Items

Inspection Item	Recommended Maintenance
West Twin Dike	• No maintenance required.
East Twin Creek Diversion Dike	• No maintenance required.
East Adit Treatment Facility Dikes	• No maintenance required.
Day Tank Farm spill containment berm	• No maintenance required. (Cover exposed areas of liner if berm required beyond 2007).
Main Tank Farm spill containment berm	• Repair the area affected during the hydrocarbon soils excavation. • Cover areas of exposed liner.
West Twin Outlet Structure	• Place some additional large rip rap in plunge pool • Inspect wall for further cracking. • Monitor water level upstream of the wall to assess leakage.

Table 8 - Recommended Maintenance Items Continued

Inspection Item	Recommended Maintenance
West Twin Dike Spillway	• Level bottom of spillway. • Remove slide debris. • Repair thermokarst near outlet with rockfill. • Rip rap left side of spillway down gradient of access ramp. • Re-slope/ repair area where debris falls into spillway. • Re-level access road. • Re-grade/ fix up area near deflection berms.
Surface Cell	• No maintenance required.
Test Cell/ Test Cell Dike	• Rip rap the bottom of the outlet trench. • Rip rap the shoreline at the outlet. • Apply additional compactive effort along north-south arm of Test Cell Dike.
Toe of West Twin Dike/ Toe of Test Cell Dike	• Add rip rap to shoreline at Toe of West Twin Dike (30 cm lift).
Landfill	• Complete spreading of armour on west face. • Compact the armour surface.
• West Open Pit	• Additional compaction of armour material.
East Open Pit/ East Trench	• Complete armouring at toe at berm location • Additional armouring at west edge of cover.
Oceanview Pit	• Improve gradient behind water deflection berm. • Backfill small sinkhole.
Area 14	• Complete armouring of the portal. • Complete armouring along north edge of waste rock cover.
00/01 Portals and crown pillar	• No maintenance required.
17 N Portal	• No maintenance required.
Oceanview Portal	• Improve drainage berm where it meets the portal cover. • Repair settlement in SW corner.
K-Baseline Portal	• No maintenance required.
9S Portal	• No maintenance required.
Lower Adit	• No maintenance required.
Shale Hill Raise	• No maintenance required.
Oceanview East and West Raises	• The East Raise is to be identified and inspected in 2007.
Area 14 Raise	• Construct surface mound.
Mt. Fuji Shale Borrow Area	• No maintenance required.
West Twin Shale Borrow Area	• No maintenance required.

Table 8 - Recommended Maintenance Items Continued

Inspection Item	Recommended Maintenance
East Twin Shale Borrow Area	• No maintenance required.
Area 14 Shale Borrow Area	• Monitor during freshet to assess maintenance requirements.
Townsite Shale Borrow Area	• Knock down berms at crest of slope. • Re-slope crest of pit (portion which remain near vertical). • Level floor of pit when material removal complete.
Shale Hill Shale Borrow Area	• No maintenance required.
Twin Lakes Armour Borrow Area	• No maintenance required.
Kuhulu Lake Road Borrow Area	• Re-grade floor of borrow area to ensure drainage not impeded.
Chris Creek Armour Borrow Area	• No maintenance required.
Mill Foundation	• No maintenance required.
Former Portal to Mill Foundation	• No maintenance required.

It is recommended that these maintenance items be completed in 2007 while man power and equipment are available on-site. A record of how and when the maintenance was completed should be kept for inclusion within the subsequent annual geotechnical report.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Embankments

The affected area of the Main Tank Farm Spill Containment Berm should be repaired in 2007. The repair may simply consist of minor regrading and fill placement. The repair should be completed to ensure the liner does not get damaged and the affected side slope does not experience erosion. The East Twin Creek Diversion berm is performing as anticipated and is considered fully remediated. The Day Tank Farm Spill Containment Berm and East Adit Dikes are expected to be removed in 2007. As such, no maintenance was recommended at these locations.

Hydraulic Structures

The West Twin Dike Spillway is functioning as designed and only minor deformation in the base and side slopes of the spillway has occurred. Maintenance was expected to be required for the spillway during the initial years following construction given the ground conditions encountered during construction. The recommended maintenance items should be completed in 2007.

A small head pond develops in the Surface Cell cover at the spillway inlet. Since the majority of the water flow in the Surface Cell occurs sub-surface, the pond could be eliminated with the addition of more armour material in the area of ponding. The presence of the head pond is not considered to negatively affect the overall cover performance hence the elimination of the head pond is not considered necessary.

The West Twin Outlet Channel may require additional design modifications to perform as intended. The degradation of the concrete wall and the apparent seepage losses through the foundation may result in a lower than desired Reservoir level during periods of low inflows. As such, a seepage control element such as geo-composite liner (GCL) may need to be applied upstream of the concrete wall. Consideration should be given to preparing this design modification and applying the revised design in 2007, while man power and equipment are available on-site.

Thermal Covers

The thermal covers appear to be physically stable with only minor erosion observed in isolated areas. The thermal performance of the covers was as expected, for the first year following construction. The active layer thaw migrated through the covers into the underlying tailings or waste rock during the later portion of the summer. For the most part, the thaw front only migrated marginally into the underlying mine wastes, often confined to within 0.5 m of the cover/waste interface. It should also be noted that at the Landfill and Oceanview Pit covers, the thaw front was confined within the thermal covers.

It is anticipated that, over time, the ice saturation will occur within the underlying mine wastes and at the base of the cover. As this occurs, the thermal performance of the covers will improve, confining the active layer thaw within the cover. It should be reiterated that the covers faced adverse climatic conditions at an early stage in their existence. Tables 2 and 3 demonstrated that 2005 was a very warm year, and the first three quarters of 2006 were even warmer. The geothermal performance of the covers would likely have been improved had climatic conditions in 2005 and/or 2006 been closer to average. It is recommended that in 2007, a test pitting program be conducted in some of the covers to observe the development of ice saturation within the covers.

Talik freezeback

Talik freezeback is occurring as anticipated in the Surface Cell. Cooling of the subsurface profile is continuing, with the upper 10 to 20 m being frozen back. The ground temperatures in the middle of the talik appear to be warming slightly, in response to heat flow from the freezeback of the surrounding soils. The pore pressures in the talik continue to increase, but have been shown to be lowest near the dike and highest in the centre of the talik. The water quality in the talik appears to be changing with time as solute concentrations increase in response to freezeback of the tailings, as anticipated.

Talik freezeback in the Test Cell appears to be occurring, but will be better defined with additional data that will be collected in 2007. The subsurface profile beneath the old Test Cell dike appears to be frozen back down to a depth of approximately 20 m. The piezometers in the Test Cell have demonstrated that the Test Cell talik and Reservoir are hydraulically connected. This was expected based on the available information on the Test Cell talik (BGC 2004a) and was assumed during the development of the contaminant loading model (CanZinco 2004).

Mine Openings, Crown Pillars and Raises

The covers constructed over the mine openings appear to be physically stable. Minor maintenance recommendations were made at the Oceanview Portal. The Area 14 portal remains to be armoured and the Area 14 raise still required a surface mound to be constructed. The 09 South and Lower Adit portal plugs have yet to be constructed, but it anticipate that this will occur in 2007.

Shale and Armour Borrow Areas

In general, the shale and armour borrow areas appear to be physically stable and are not causing any significant ponding to occur. Minor maintenance issues were recommended at the Kuhulu Lake Road borrow area. The Area 14 borrow area may require minor regrading pending additional observations in 2007.

Industrial Complex

It is currently anticipated that the mill foundation will be backfilled in 2007 and a thermal cover will be constructed in 2007. The portal plug for the mill foundation portal appears to be stable and no seepage is originating from the portal plug. CanZinco may wish to consider armouring the face of the portal plug during construction of the thermal cover for the Mill Foundation.

8.0 CLOSURE

This report provides a performance assessment of numerous structures at the Nanisivik Mine, based on a one-time visual observation and a review of monitoring instrumentation for some of the dikes and thermal covers.

We trust the information provided herein meets your present requirements. Thank you for allowing BGC to be of service, once again, to Nanisivik Mine. If you have any questions or require additional details, please contact the undersigned.

Respectfully submitted,
BGC Engineering Inc.

Geoff Claypool, P.Eng. (AB)
Geological Engineer

James W. Cassie, M.Sc., P.Eng.
Specialist Geotechnical Engineer

REFERENCES

BGC Engineering Inc. 2004a. Assessment of Surface Cell and Test Cell Taliks. Submitted to CanZinco Ltd. February 6, 2004.

BGC Engineering Inc. 2004b. Engineering Design of Surface Reclamation Covers. Submitted to CanZinco Ltd. February 6, 2004.

BGC Engineering Inc. 2005. 2005 Geotechnical Inspection, Waste Containment Dikes – Nanisivik Mine, NU. Submitted to CanZinco Ltd. October 20, 2005.

CanZinco Ltd. 2004. 2004 Reclamation and Closure Plan. Submitted to Nunavut Water Board. March 2004.

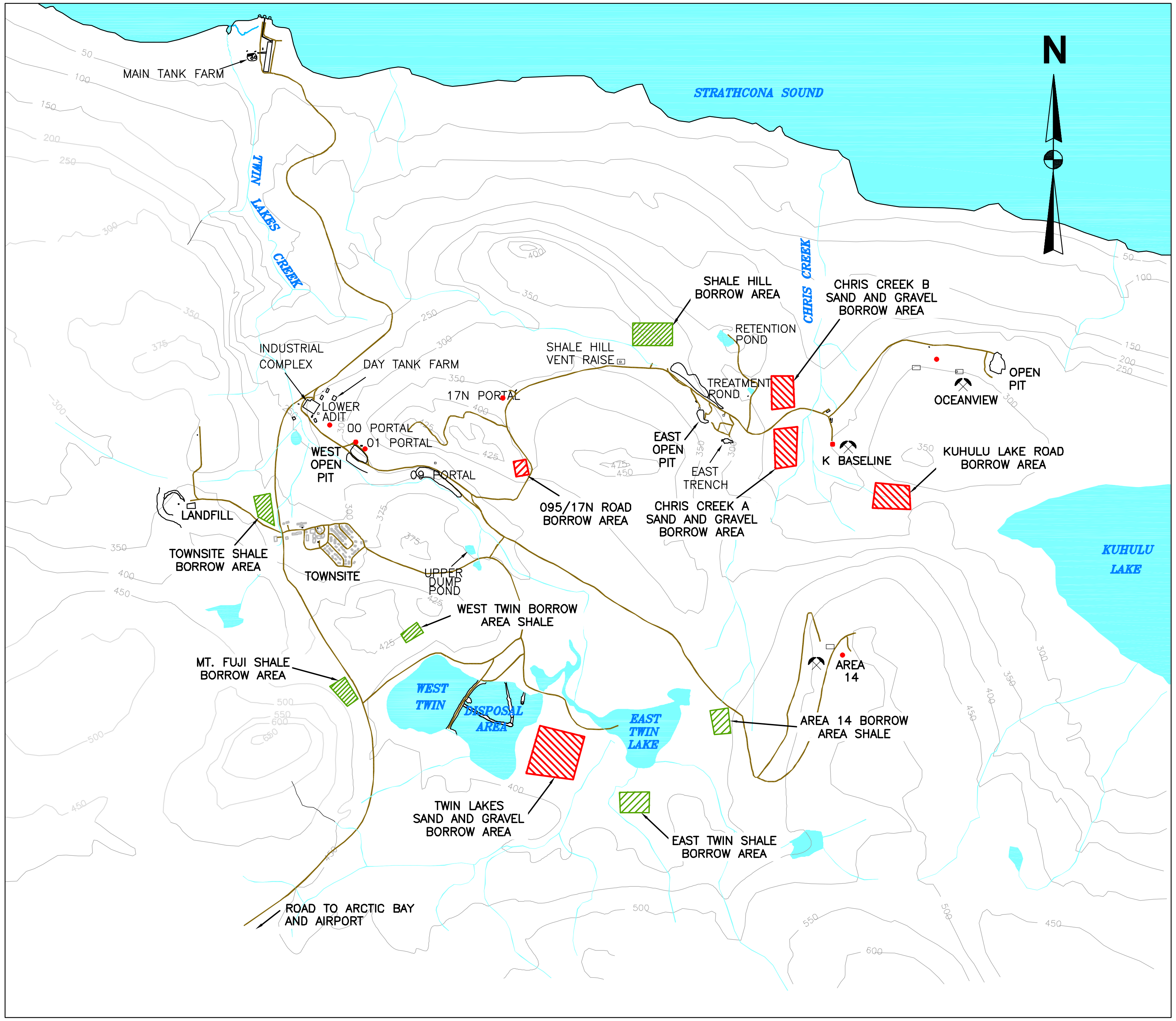
Gartner Lee Ltd. 2004a. Nanisivik Mine Reclamation and Closure Monitoring Plan. Report submitted to Nanisivik Mine, a Division of CanZinco Ltd., Project No.: 23-625, February 2004.

Gartner Lee Ltd. 2004b. Nanisivik Mine Rock Piles and Open Pits Closure Plan. Report submitted to Nanisivik Mine, a Division of CanZinco Ltd., Project No.: 23-625, February 2004.

Golder Associates Ltd. 1998. 1998 Geotechnical Inspection of Waste Containment Dykes, Nanisivik Mine, Baffin Island, NWT. Report submitted to Nanisivik Mine, a Division of CanZinco Ltd., Project No.: 982-2432.5100, October, 1998, 27 pages plus figures.

Nunavut Water Board 2004. Nunavut Water Board's Letter of Approval for Terms and Conditions Applying to the Nanisivik Mine 2004 Reclamation Plan and Closure Plan. Memorandum addressed to Breakwater Resources Ltd. July 6, 2004.

FIGURES



LEGEND

- ROAD
- GROUND CONTOUR (50 m INTERVAL)
- CREEKS, DRAINAGE, STREAMS, SHORELINE
- RAISE
- PORTAL

Scale 1:40000

800 0 800 1600 2400

metres

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PROJECT:
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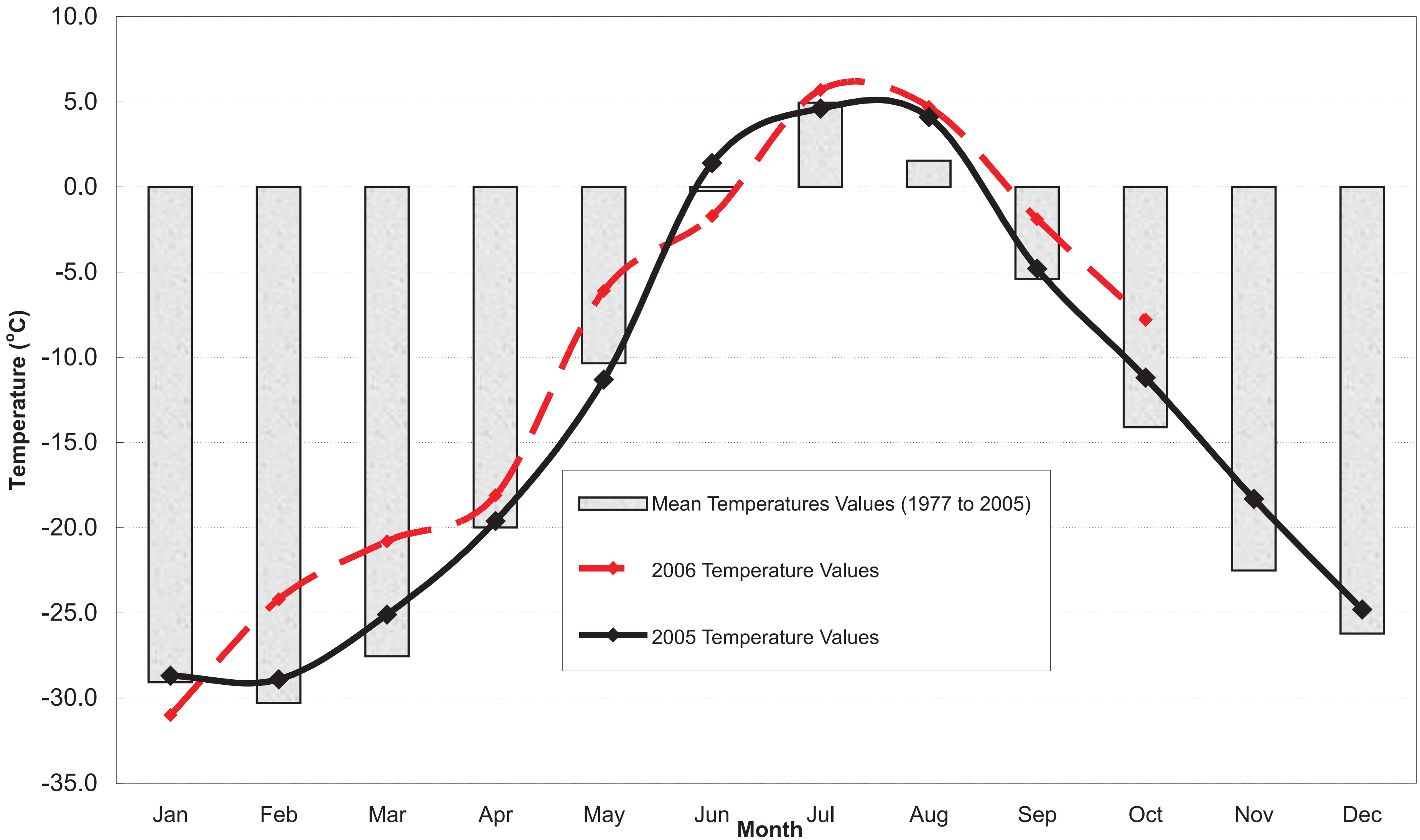
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE:
SITE LOCATION PLAN

PROJECT No.: 0255-013-08
FIGRUE No. 1
REV.:



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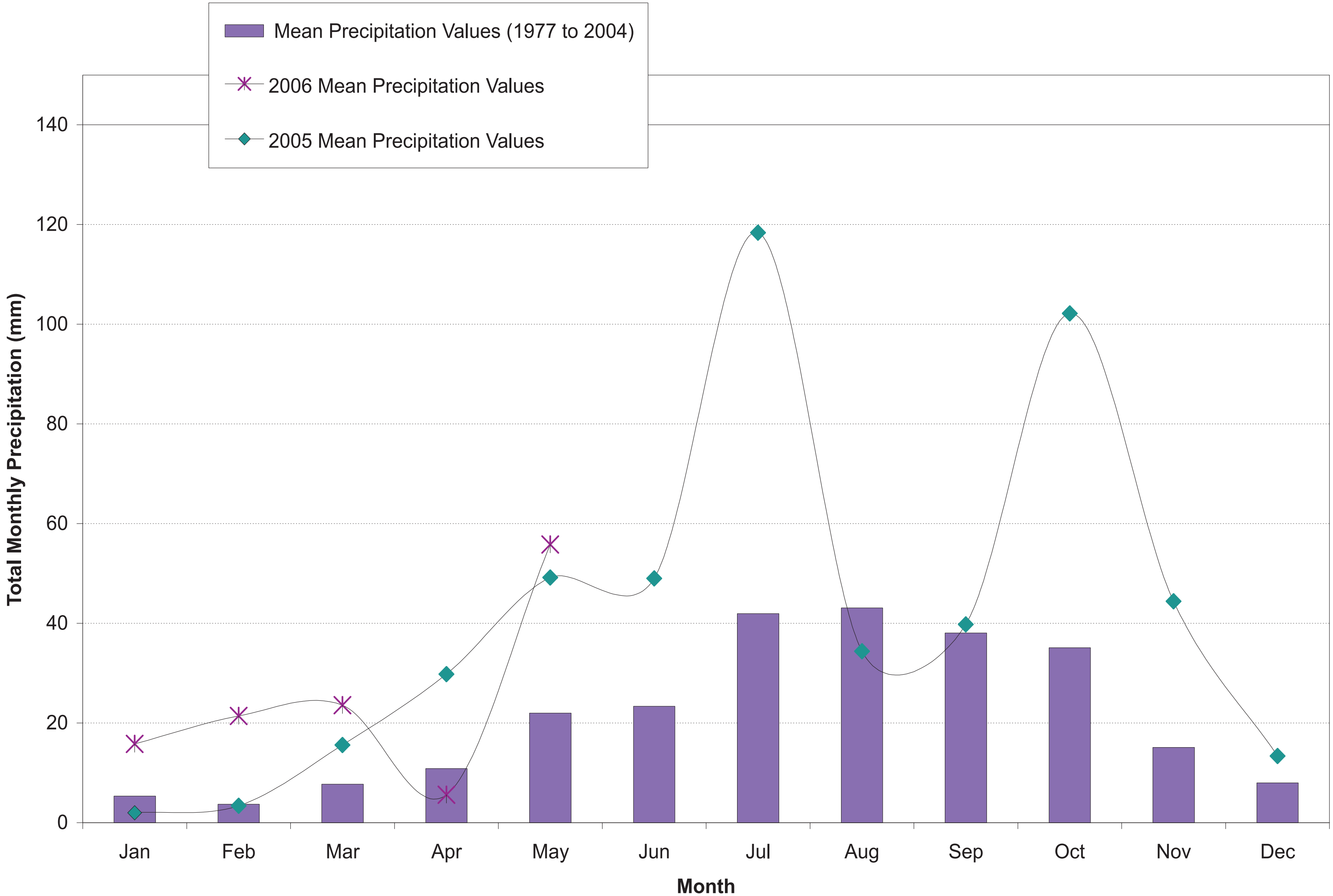
TITLE COMPARISON OF MEAN
MONTHLY AIR TEMPERATURE DATA

PROJECT No. 0255-013-08

FIGURE No. 2

REV. 0



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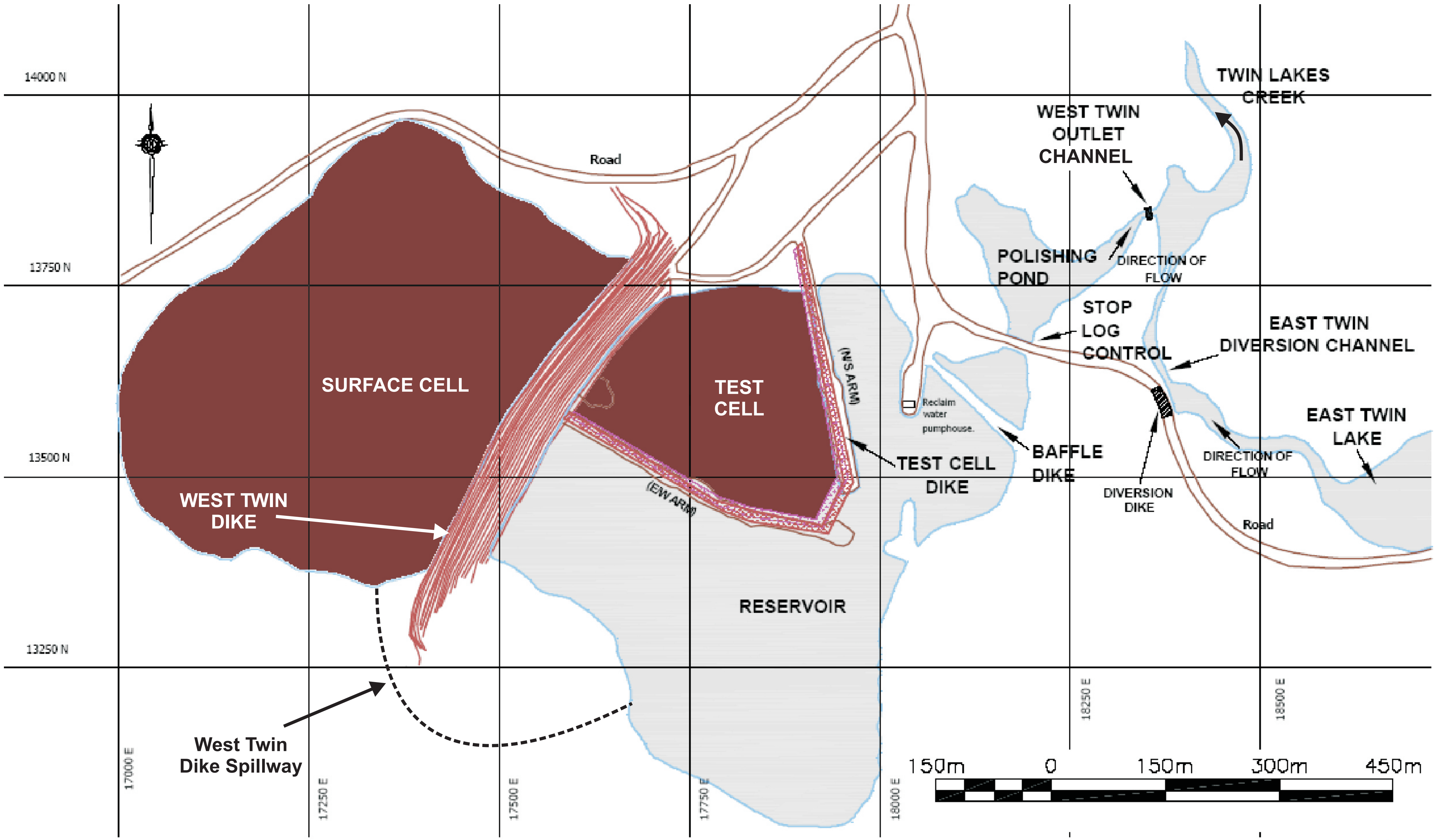
PROJECT NANISIVIK MINE 2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE COMPARISON OF MEAN MONTHLY PRECIPITATION DATA

PROJECT No. 0255-013-08

FIGURE No. 3

REV. 0



CLIENT:

BREAKWATER RESOURCES LTD.

REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT: NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE: COMPONENTS OF WEST TWIN DISPOSAL AREA

PROJECT No.	FIGURE No.	REV.
0255-013-08	4	0

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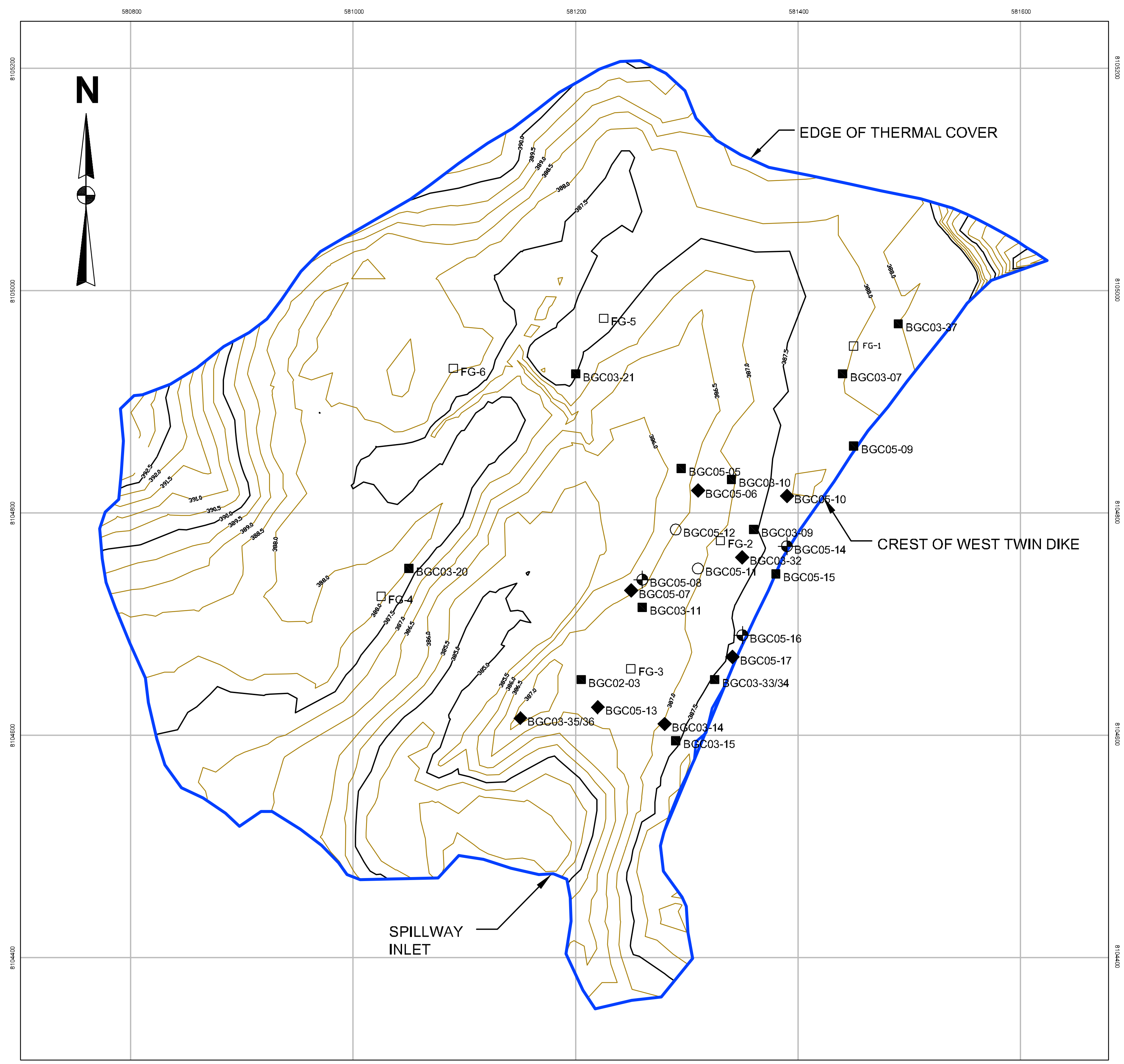
LEGEND:

- CONTINGENCY BOREHOLE
- THERMISTOR/ THERMOCOUPLE
- FROST GAUGE
- MONITORING WELL
- VW PIEZOMETER



NOTES:

1. GRID BASED ON UTM NAD 83, ZONE 16 COORDINATES.
2. ELEVATIONS ARE IN METRES.
3. CONTOUR INTERVAL IS = 0.5 m.
4. SCALE IS APPROXIMATE.

Scale 1:4500

90 0 90 180 270

metres

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	AS SHOWN
DATE:	JANUARY 2007
DRAWN:	REM
DESIGNED:	KFM
CHECKED:	GKC
APPROVED:	GKC

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

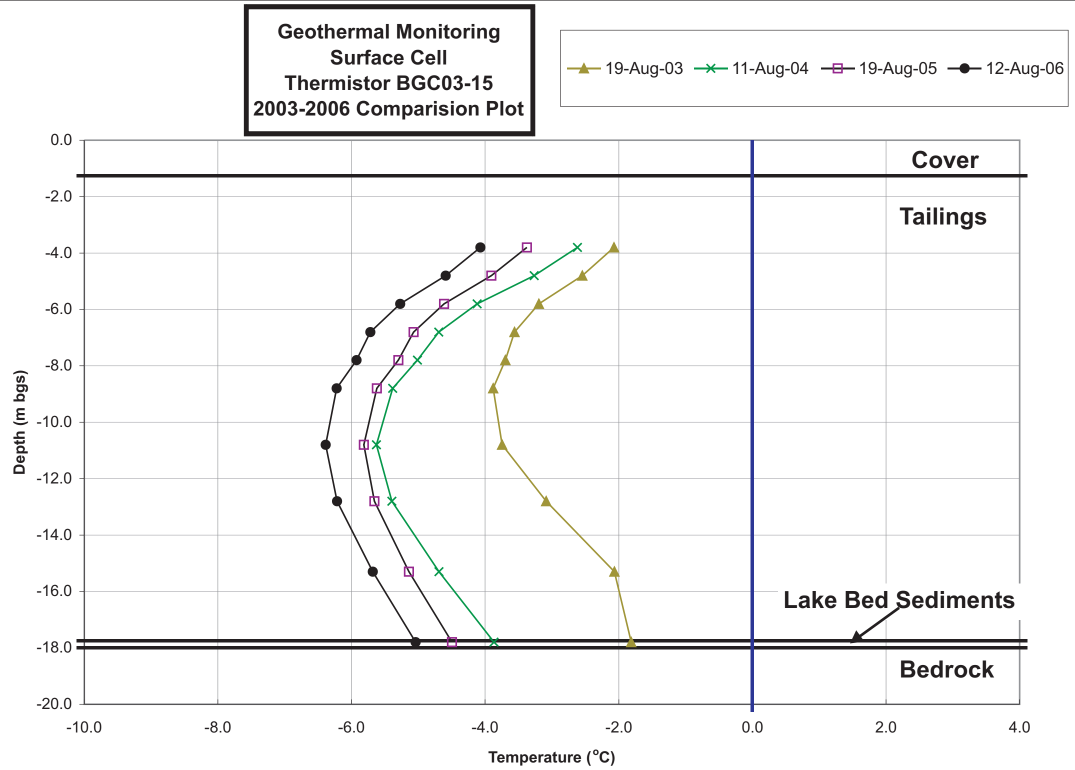
CLIENT: BREAKWATER RESOURCES LTD.

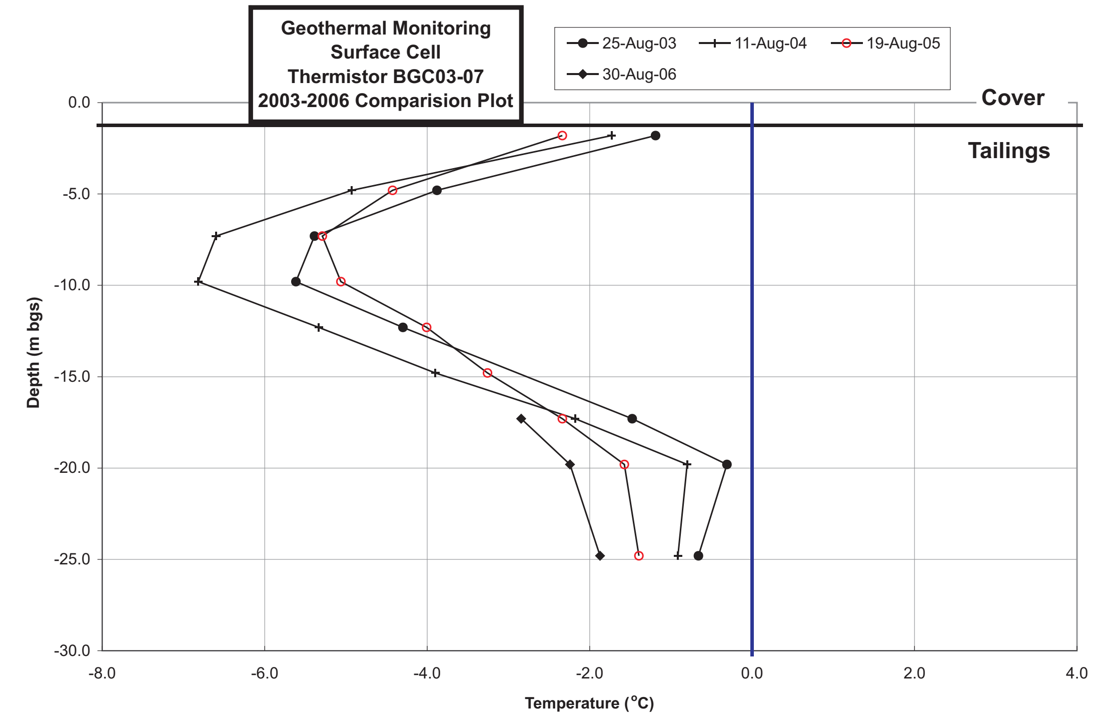
PROJECT: NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

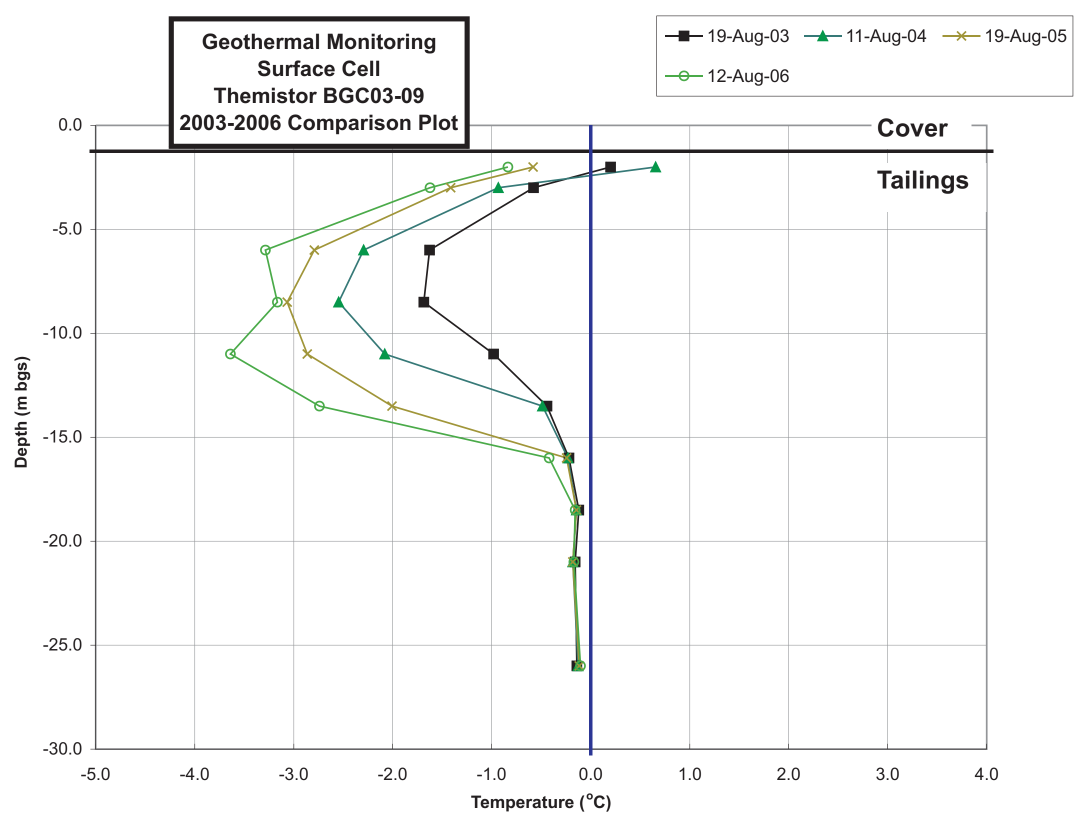
TITLE: SURFACE CELL TAILINGS COVER

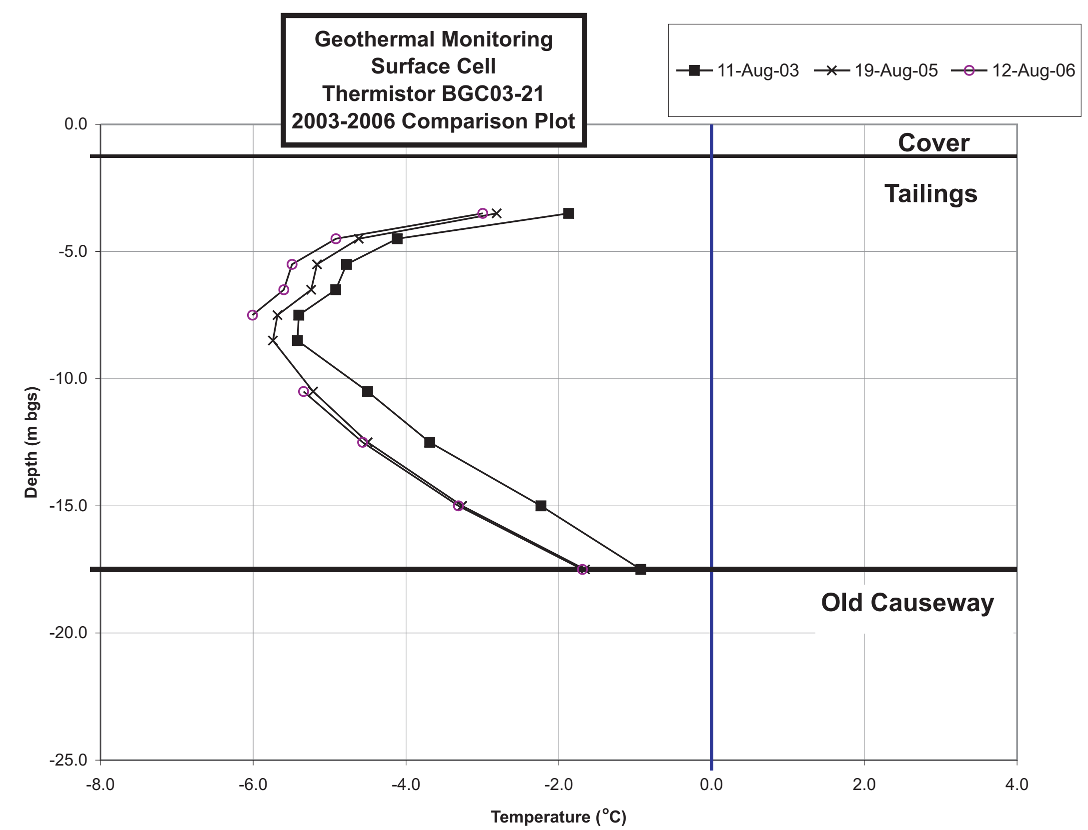
PROJECT No.:	FIGURE No.	REV.:
0255-013-08	5	

K:\Projects\0255 CanZinco\013 2006 Planning\08 2006 Annual Inspection\Graphics\Drawings\0255-013-08 Figure 5.dwg Layout: Figure 5 Plot Date: Jan 3 07 Time: 9:04 AM









CLIENT:

BREAKWATER RESOURCES LTD.

REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE: N/A
DATE: JANUARY 2007
DRAWN: SLF
DESIGNED: GKC
CHECKED: GKC
APPROVED: JWC

PROJECT: NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE: SURFACE CELL TAILINGS COVER
GEOTECHNICAL MONITORING DATA 1

PROJECT No. 0255-013-08
FIGURE No. 6
REV. 0

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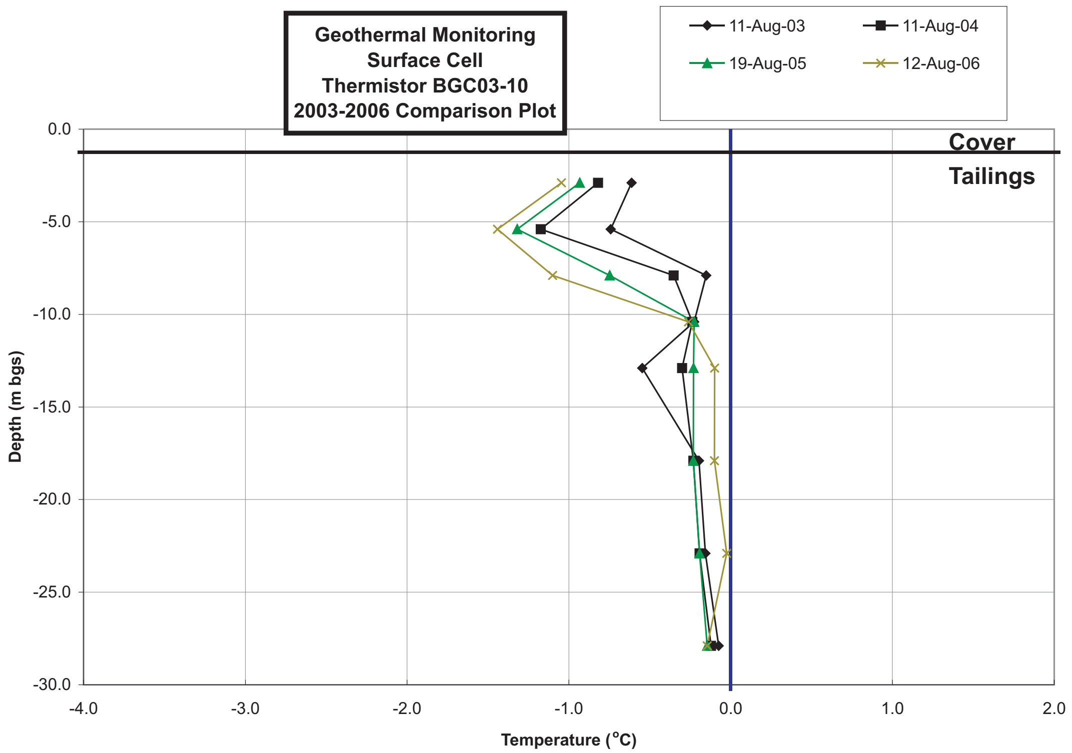

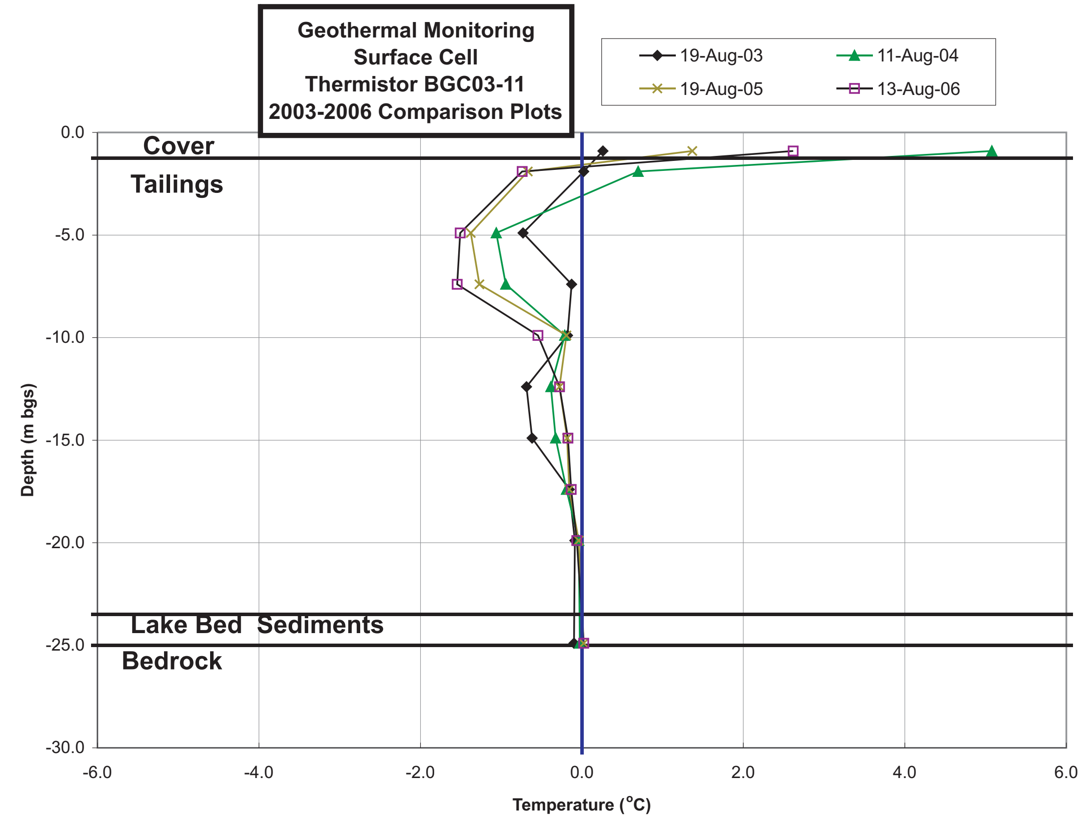

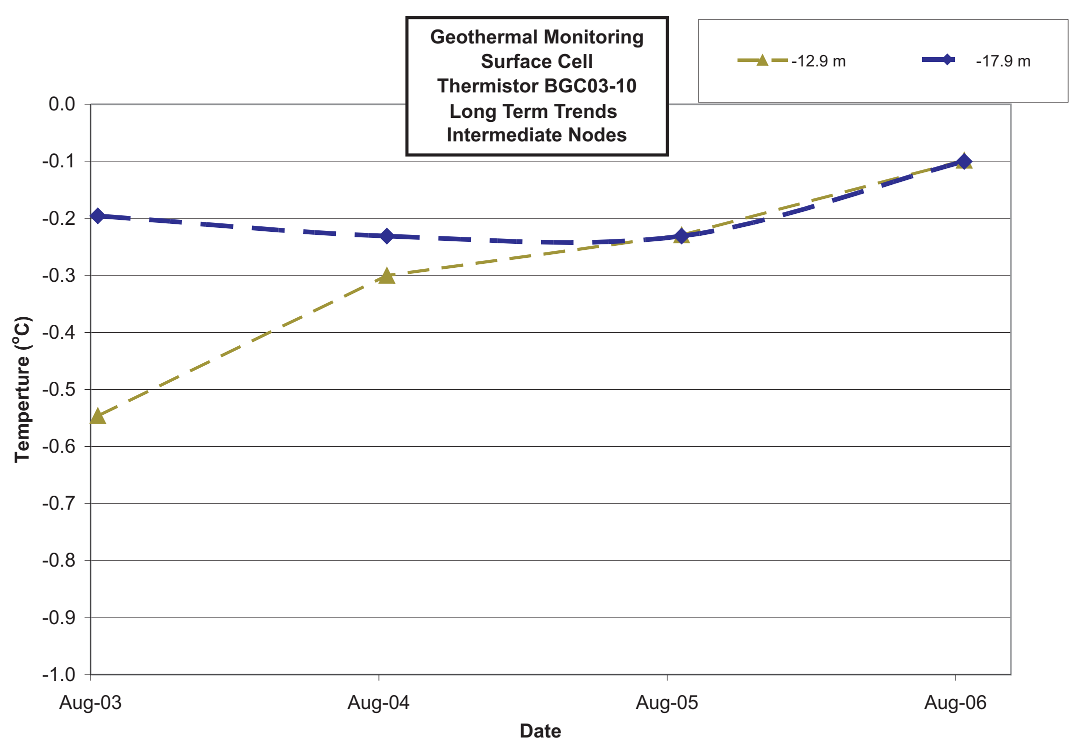

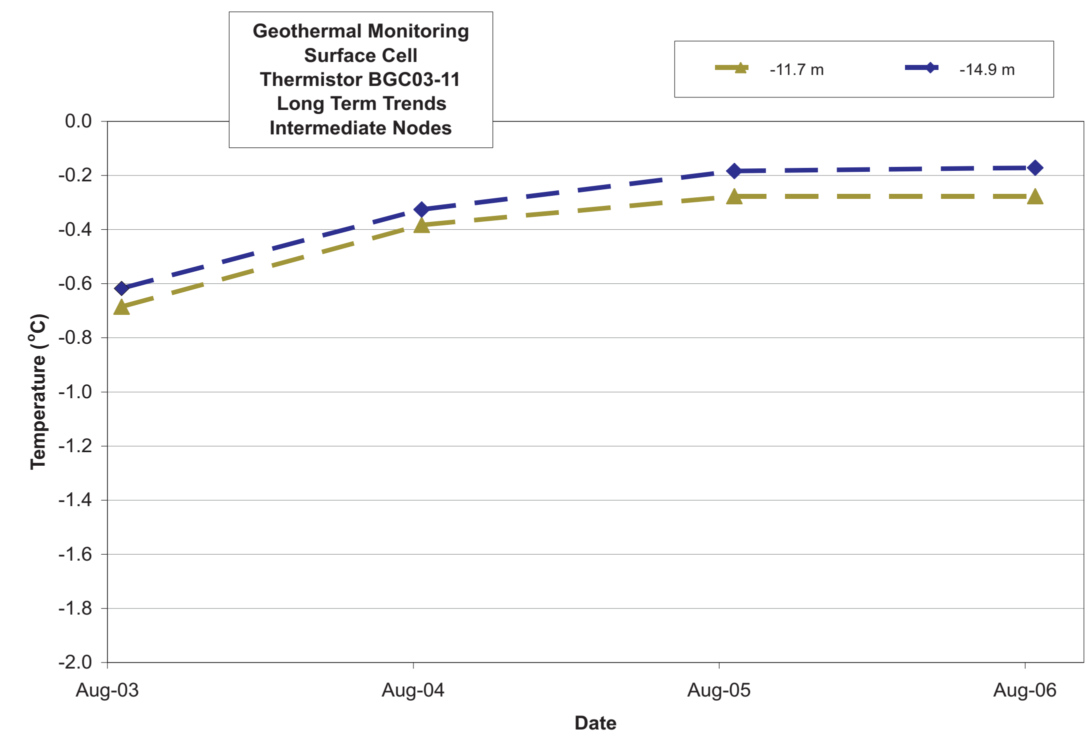

CLIENT:

BREAKWATER RESOURCES LTD.

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
SURFACE CELL TAILINGS COVER
GEOTECHNICAL MONITORING DATA 2

PROJECT No.	FIGURE No.	REV.
0255-013-08	7	0

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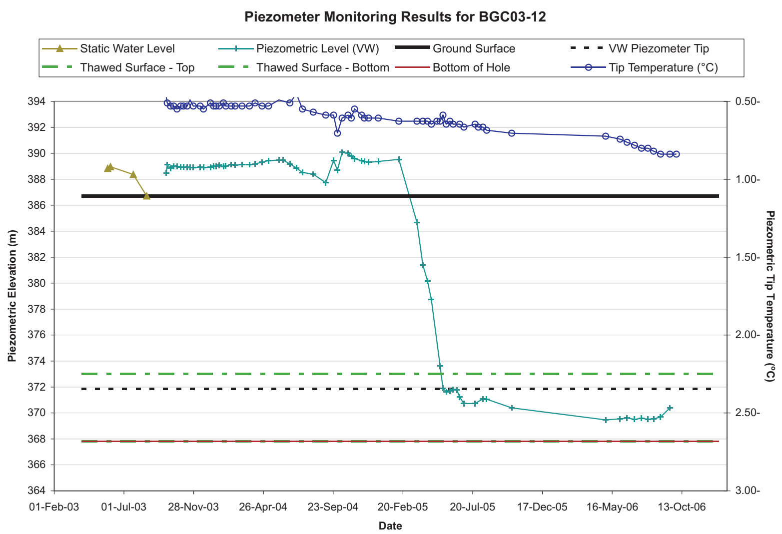

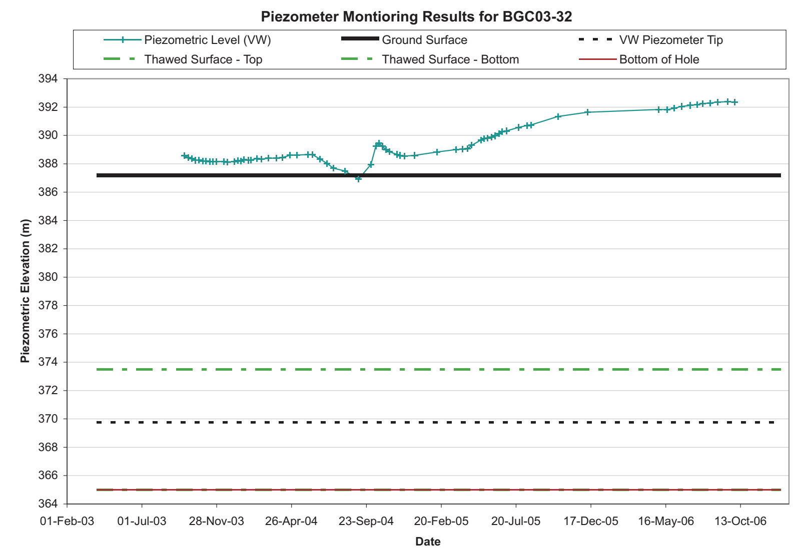

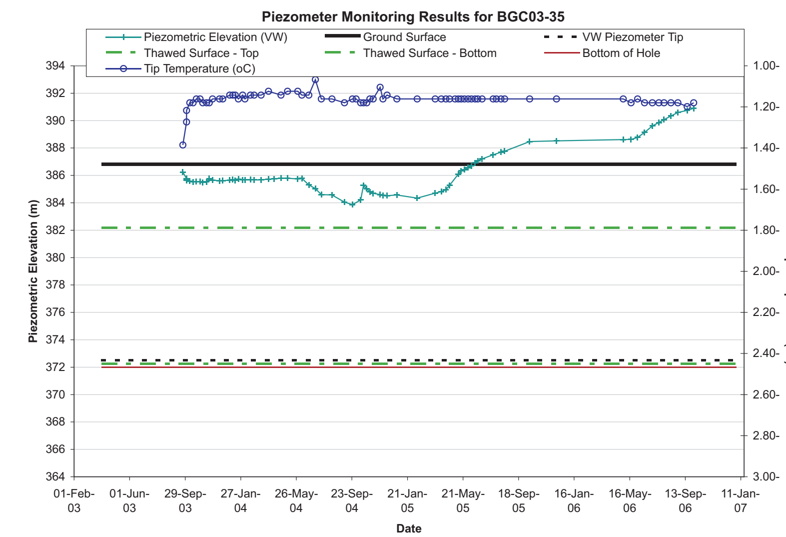

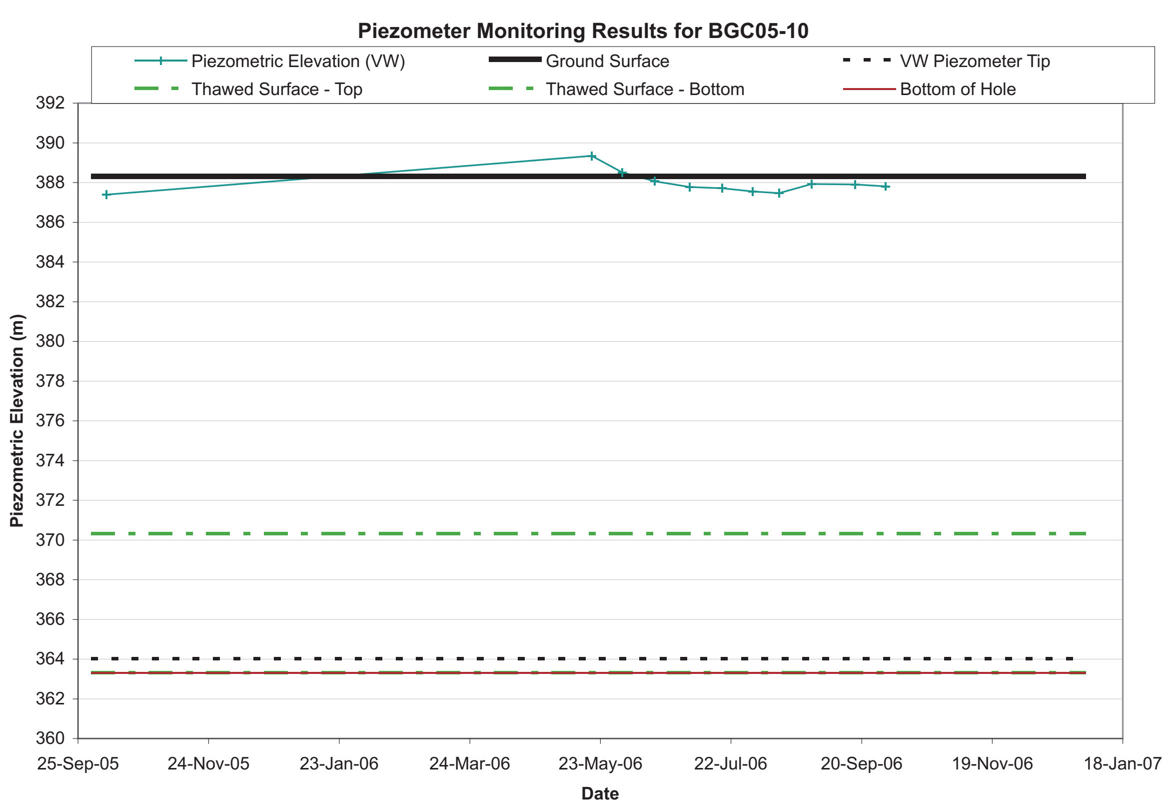

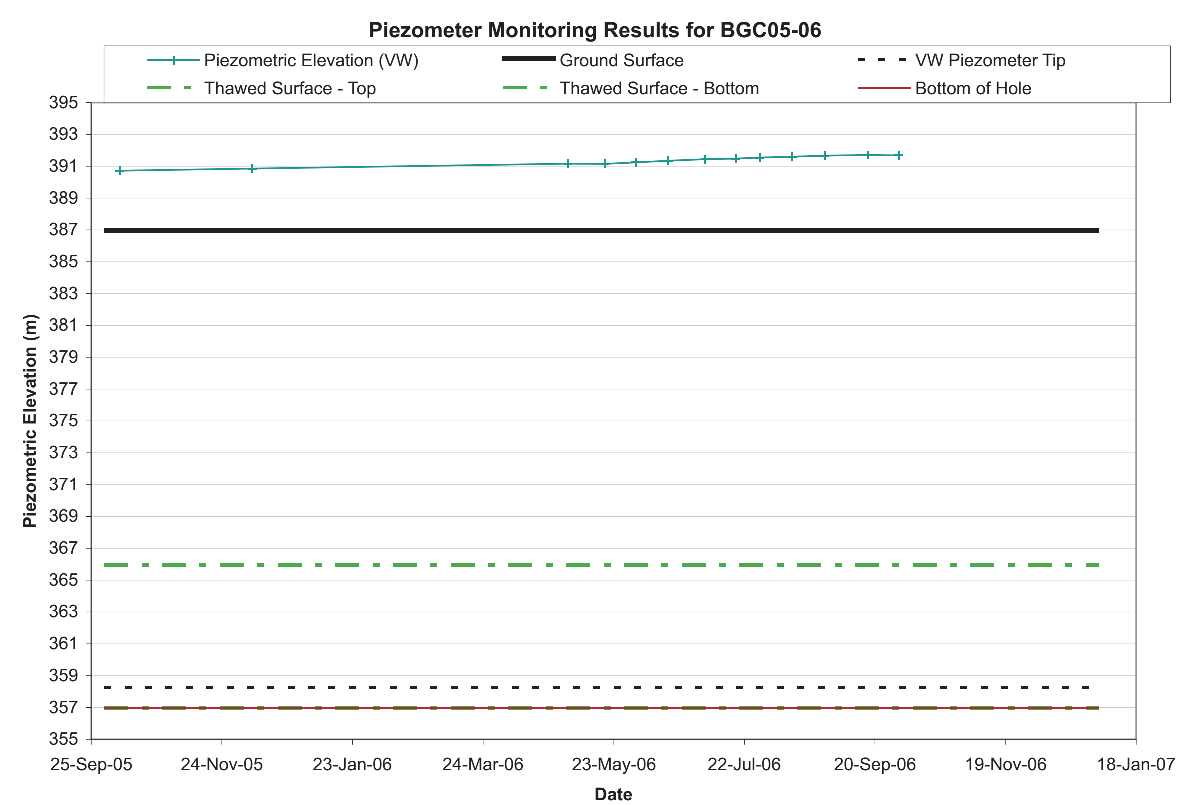

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BREAKWATER RESOURCES LTD.

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
SURFACE CELL TAILINGS COVER
GEOTECHNICAL MONITORING DATA 3

PROJECT No.	FIGURE No.	REV.
0255-013-08	8	0

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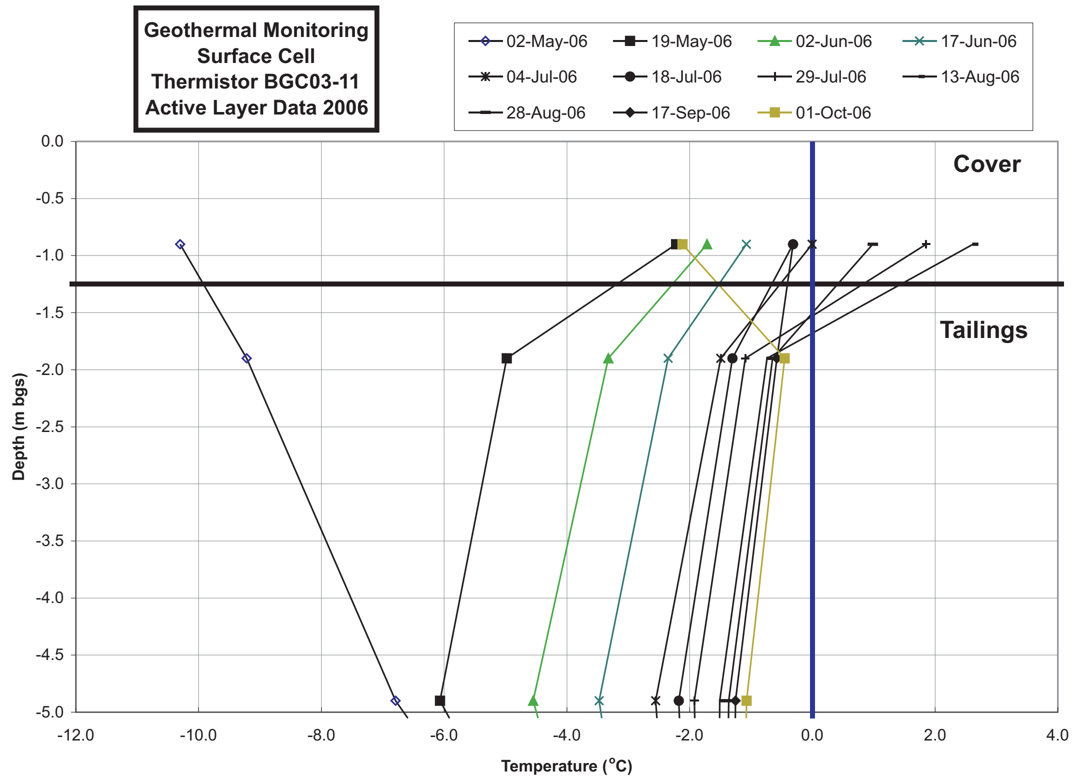

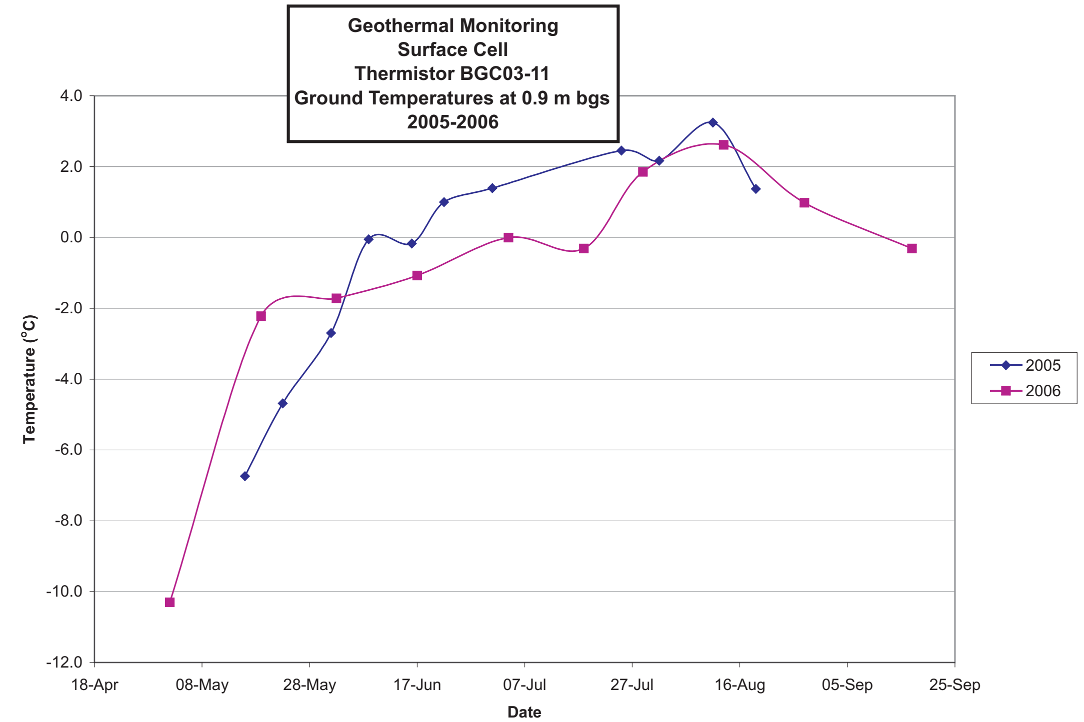

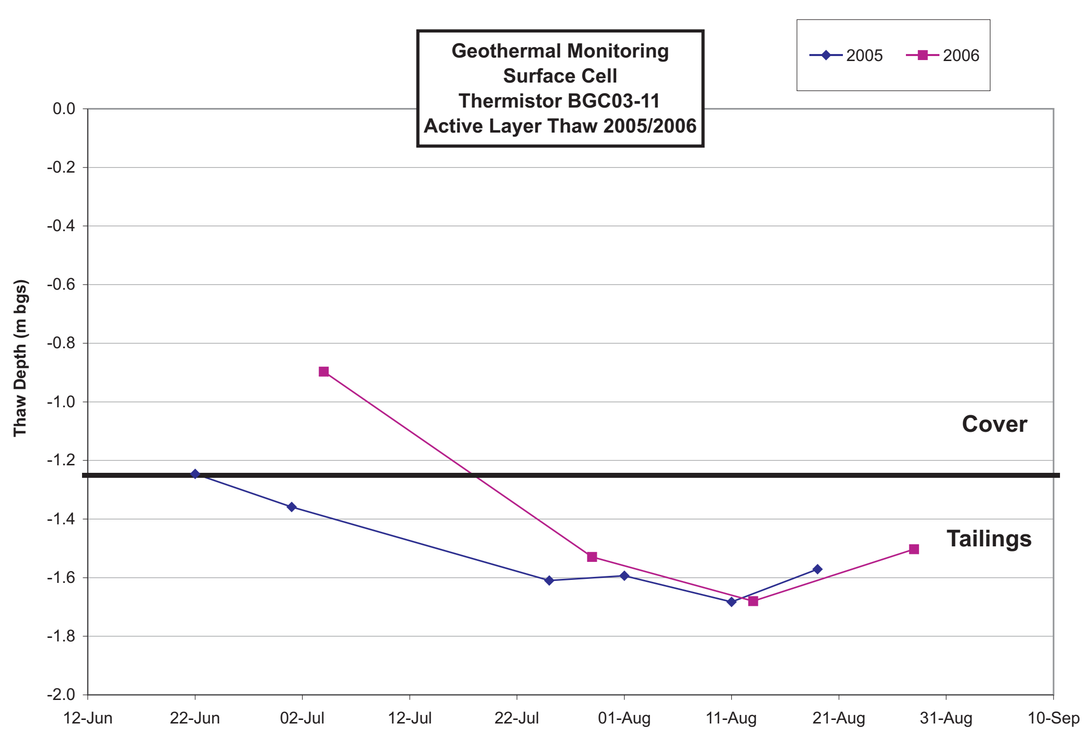

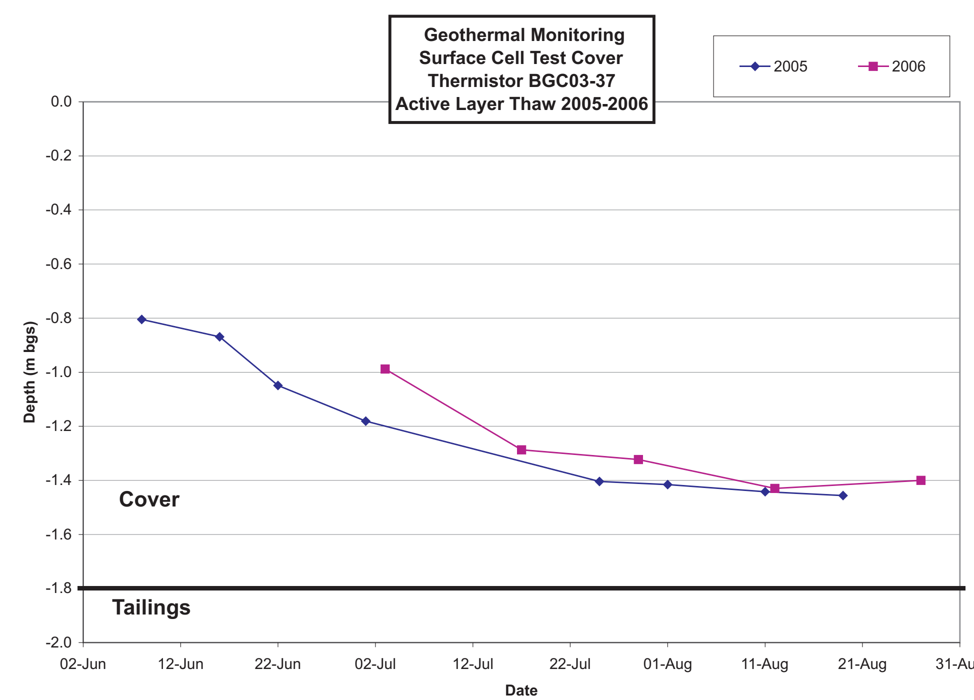

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BREAKWATER RESOURCES LTD.

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
SURFACE CELL TAILINGS COVER
GEOTECHNICAL MONITORING DATA 4

PROJECT No.	FIGURE No.	REV.
0255-013-08	9	0

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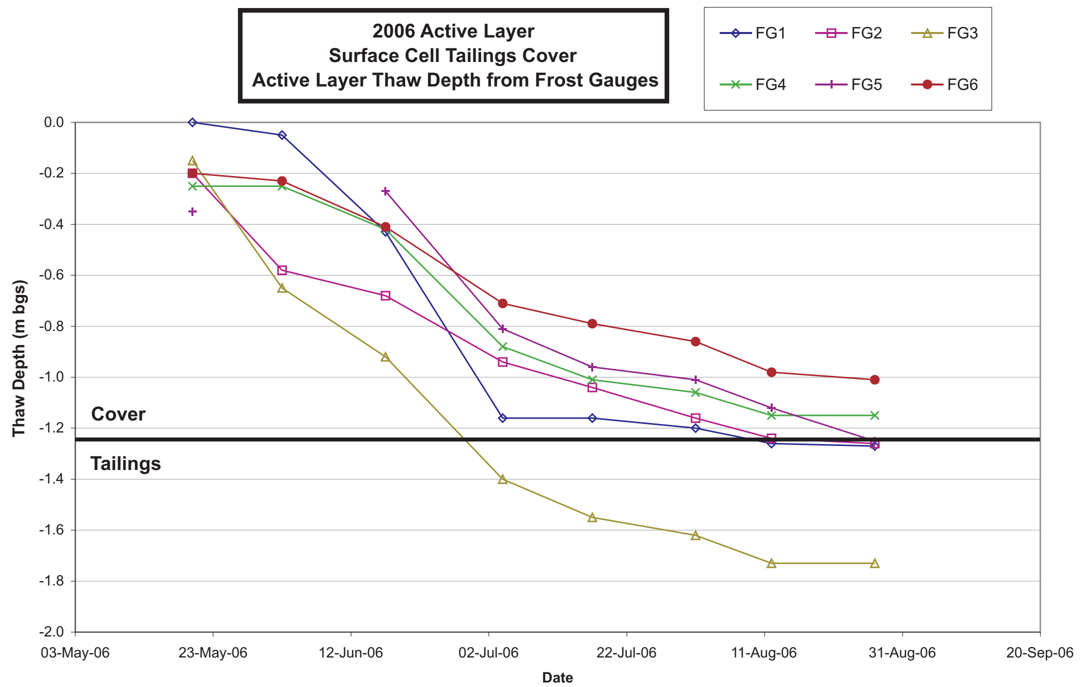

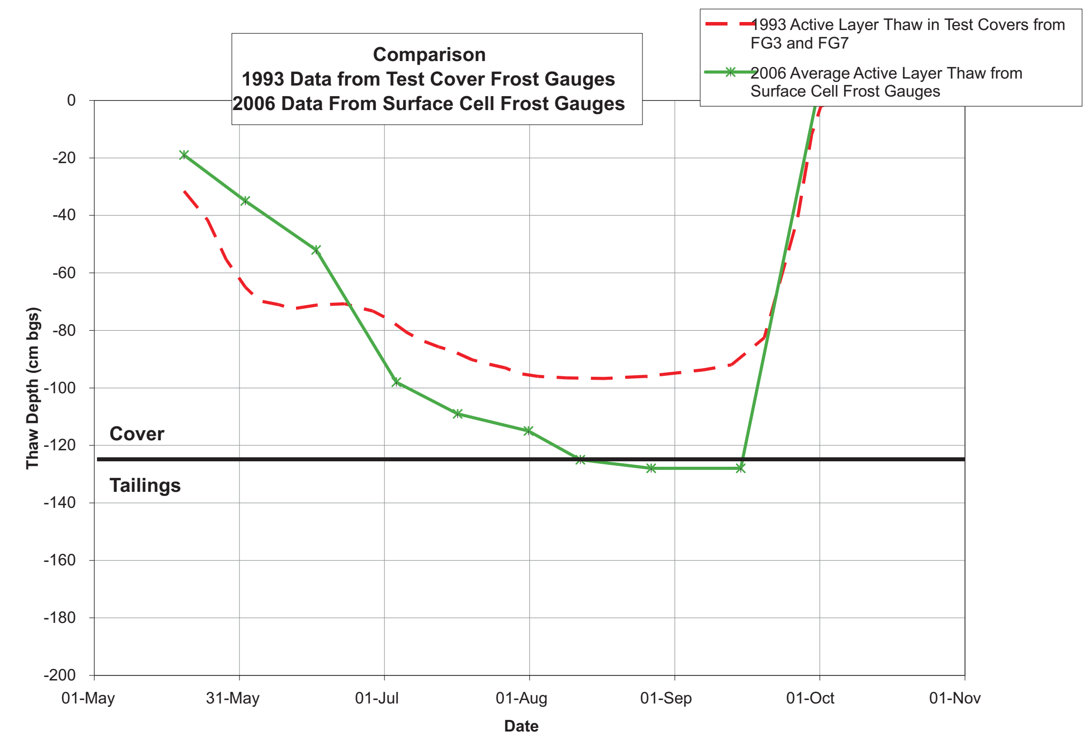

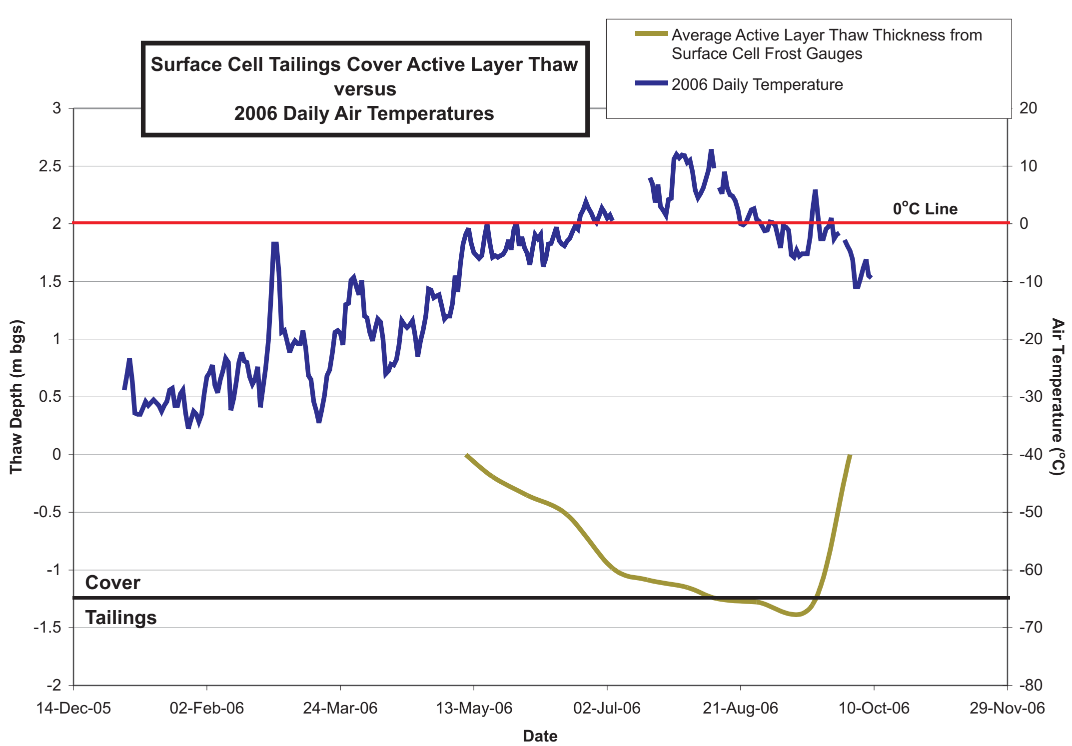

CLIENT:

BREAKWATER RESOURCES LTD.

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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED

SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
SURFACE CELL TAILINGS COVER
GEOTECHNICAL MONITORING DATA 5

PROJECT No.	FIGURE No.	REV.
0255-013-08	10	0

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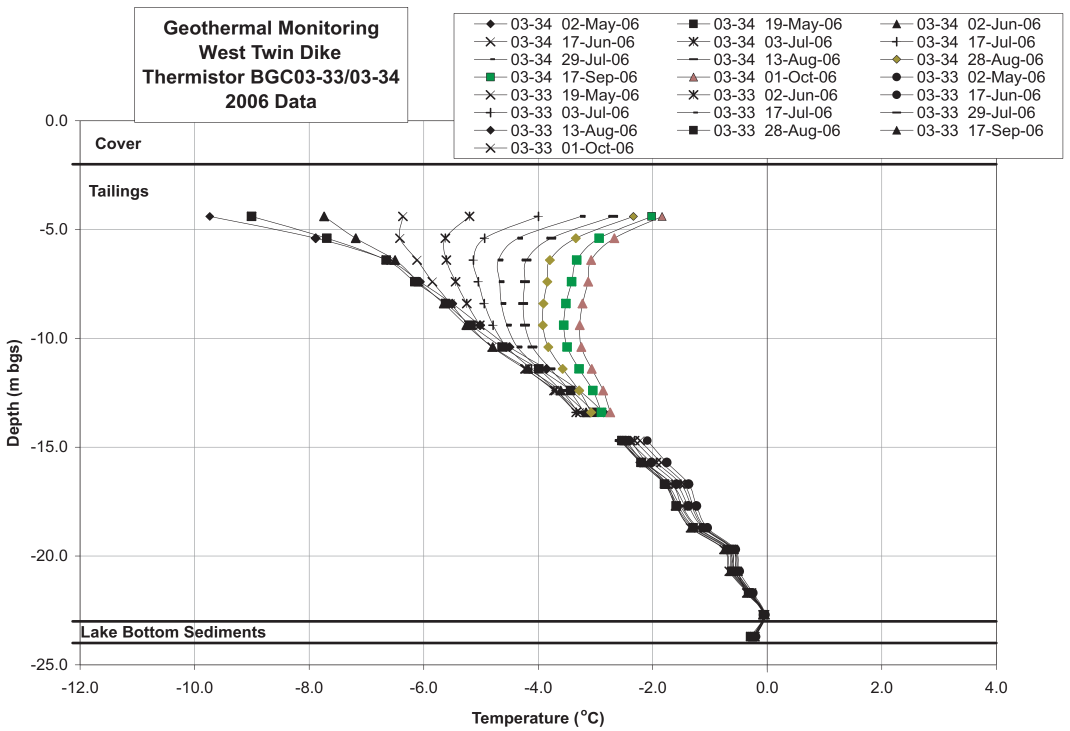

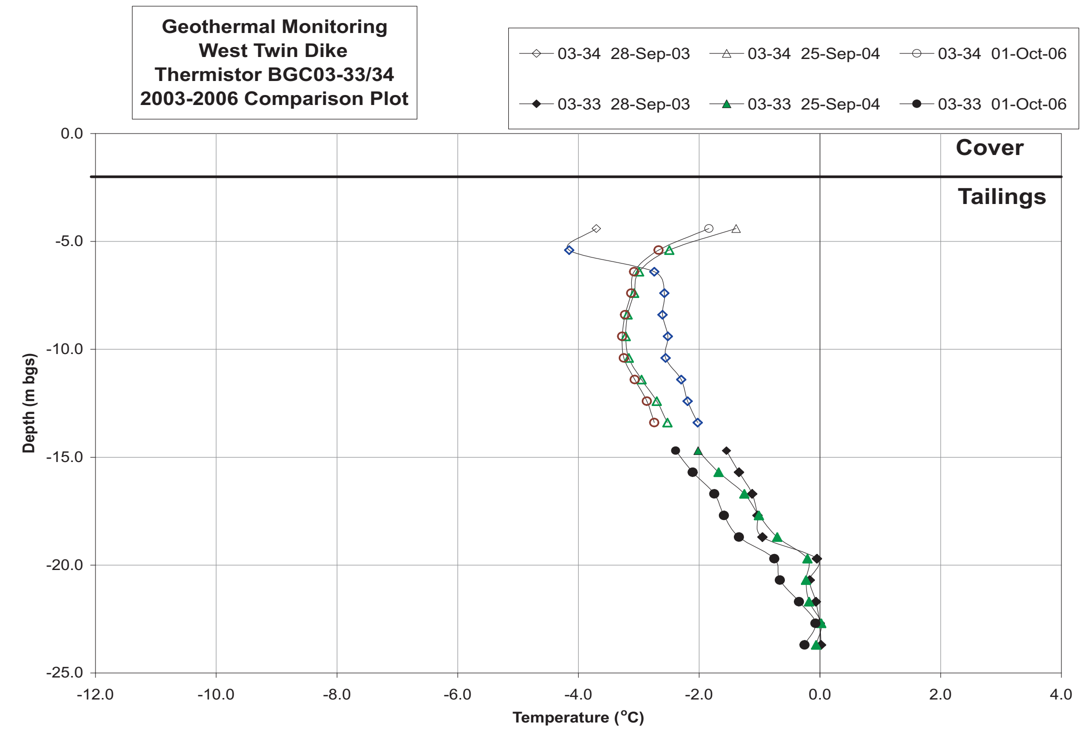

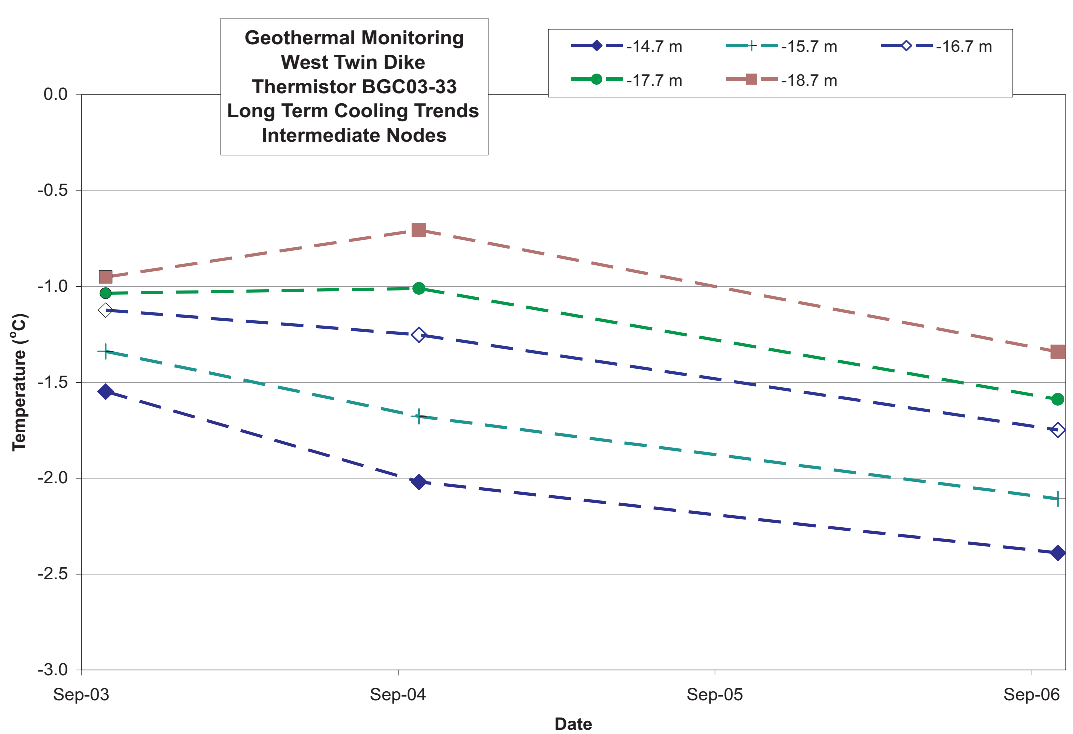

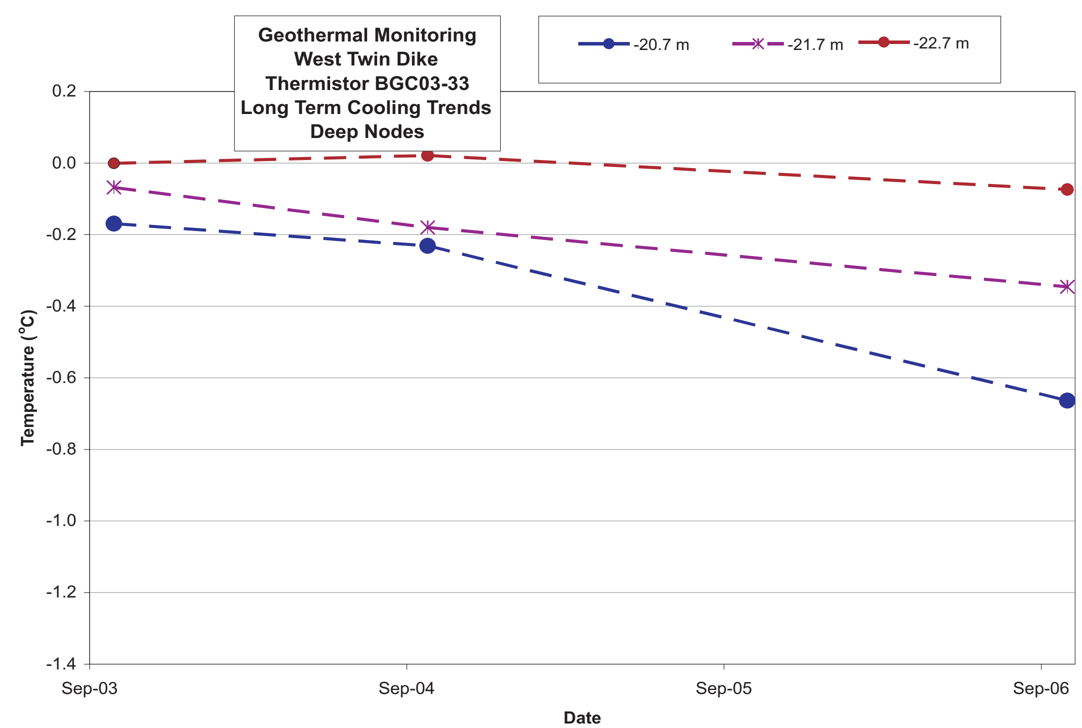

CLIENT:

BREAKWATER RESOURCES LTD.

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
WEST TWIN DIKE
GEOTECHNICAL MONITORING DATA 1

PROJECT No.	FIGURE No.	REV.
0255-013-08	11	0

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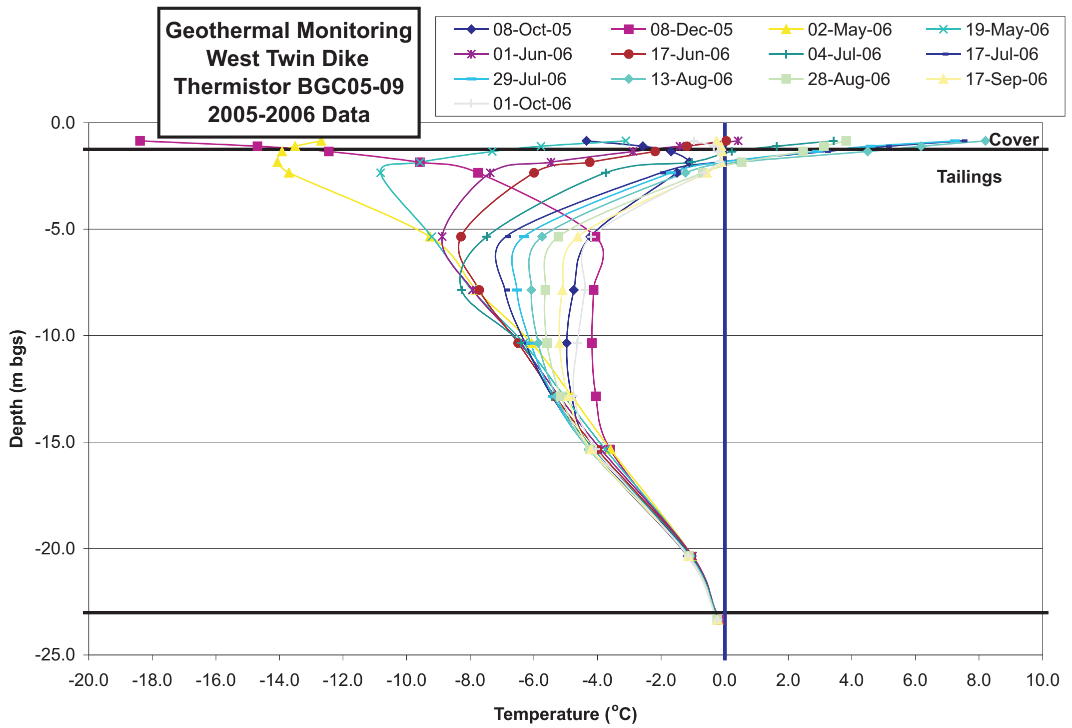

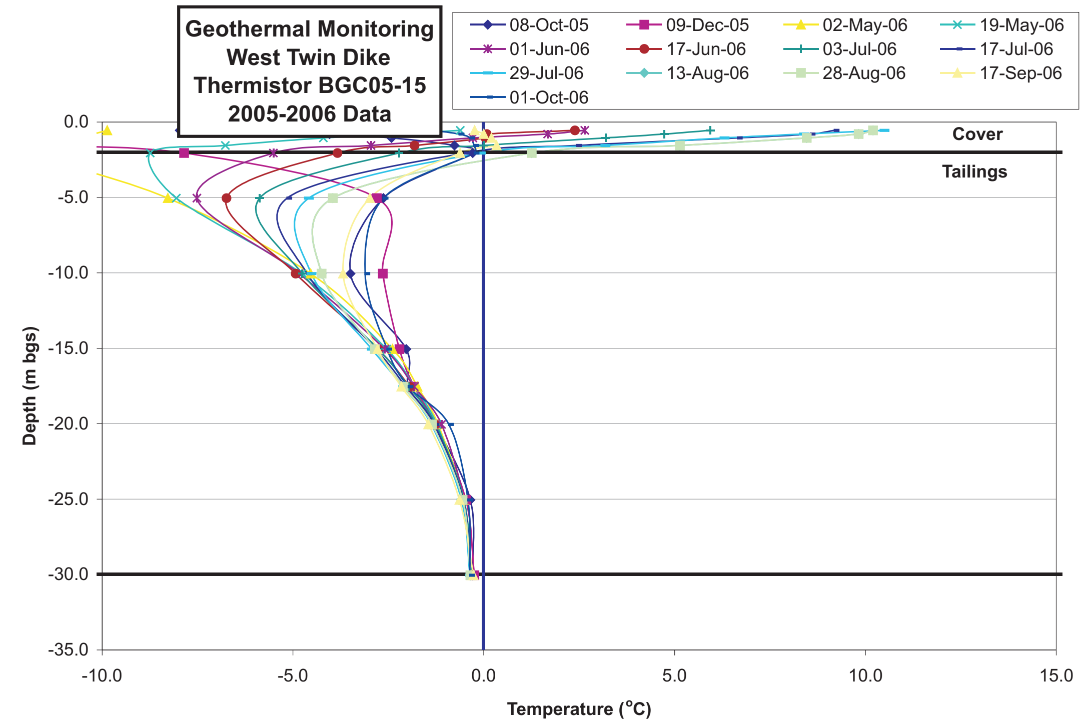

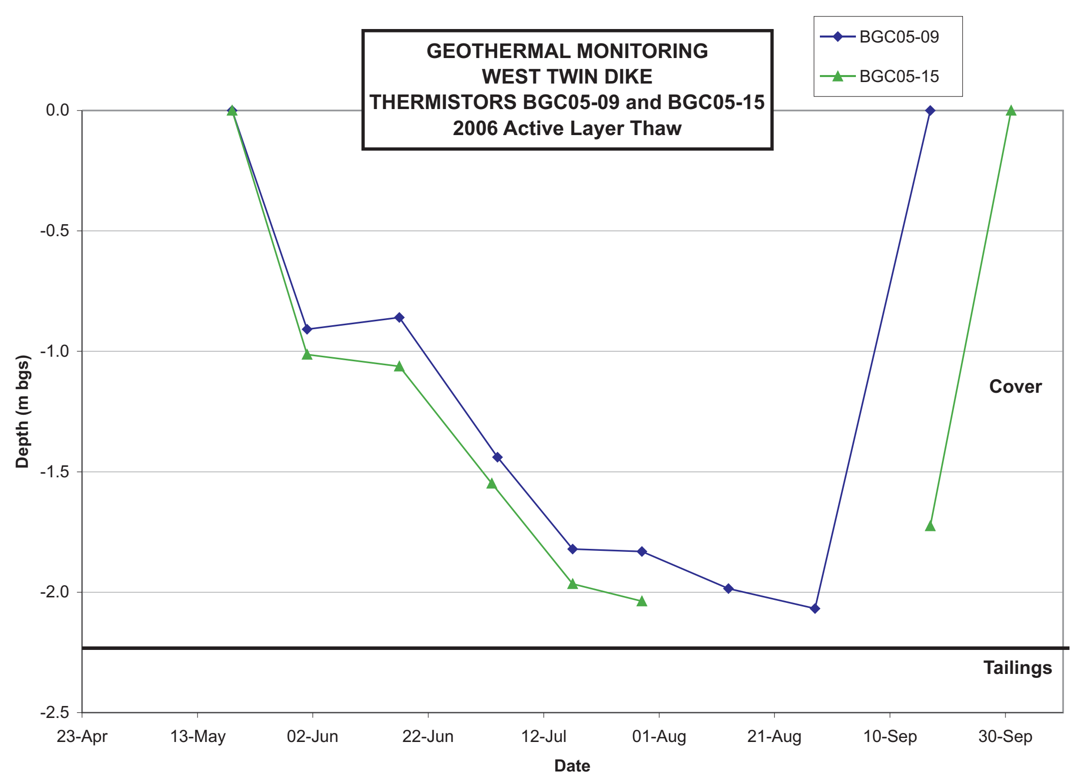

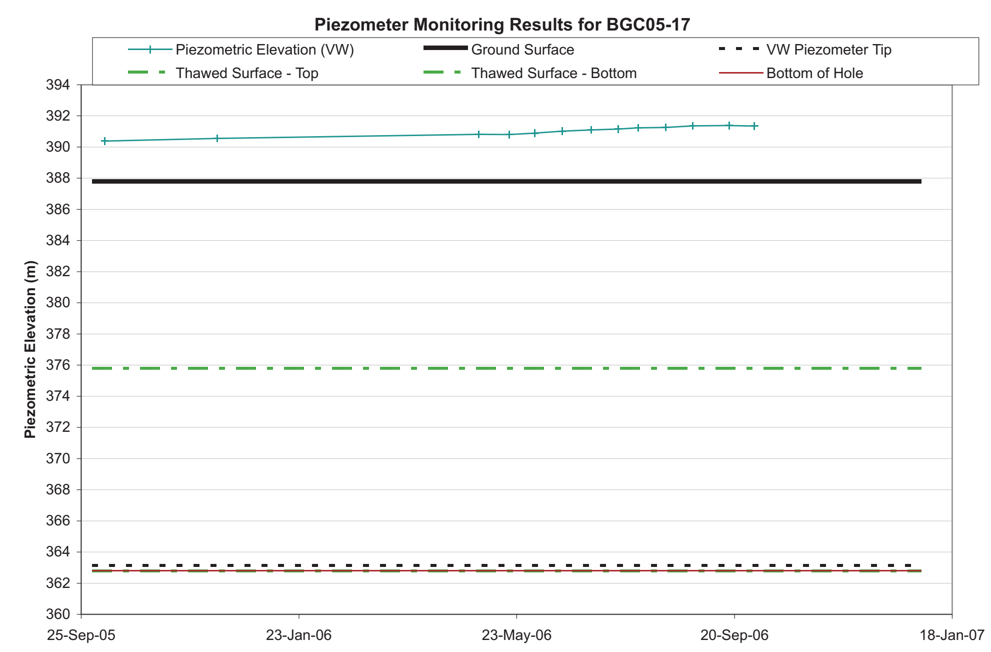

CLIENT:

BREAKWATER RESOURCES LTD.

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
WEST TWIN DIKE
GEOTECHNICAL MONITORING DATA 2

PROJECT No.	FIGURE No.	REV.
0255-013-08	12	0

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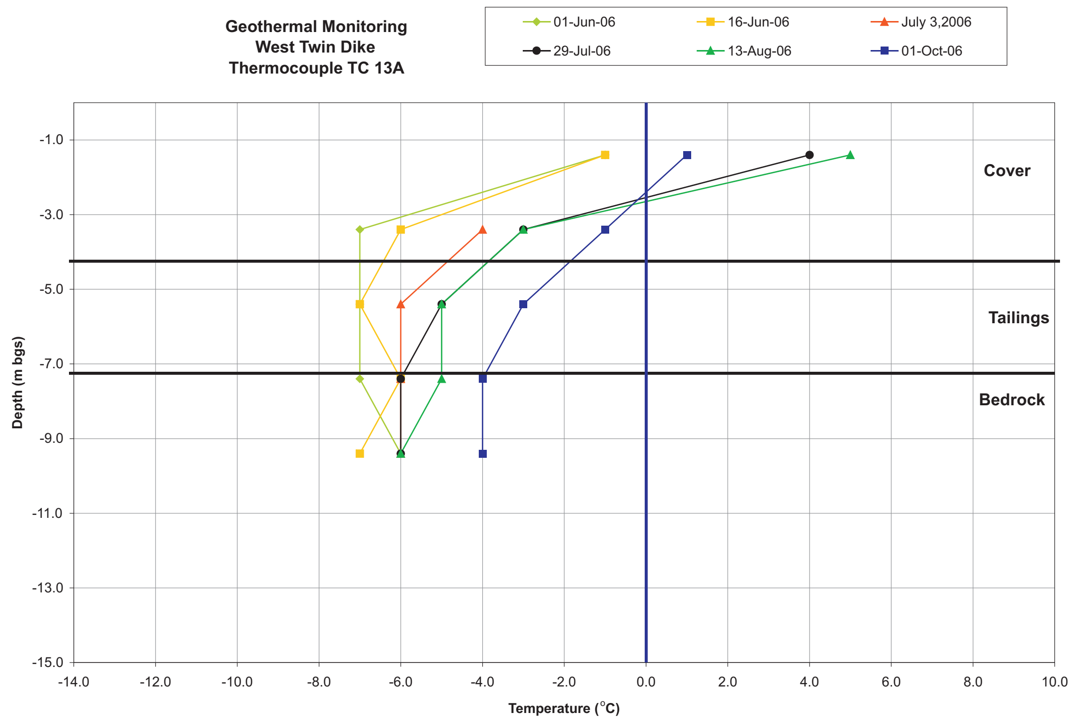
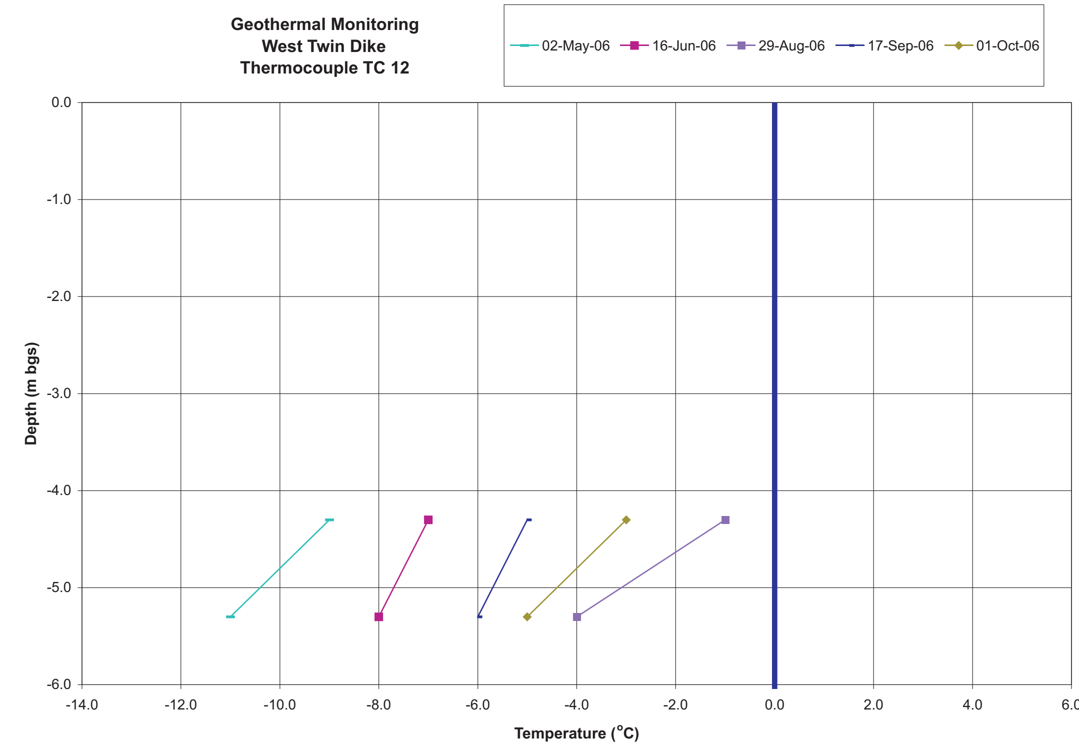
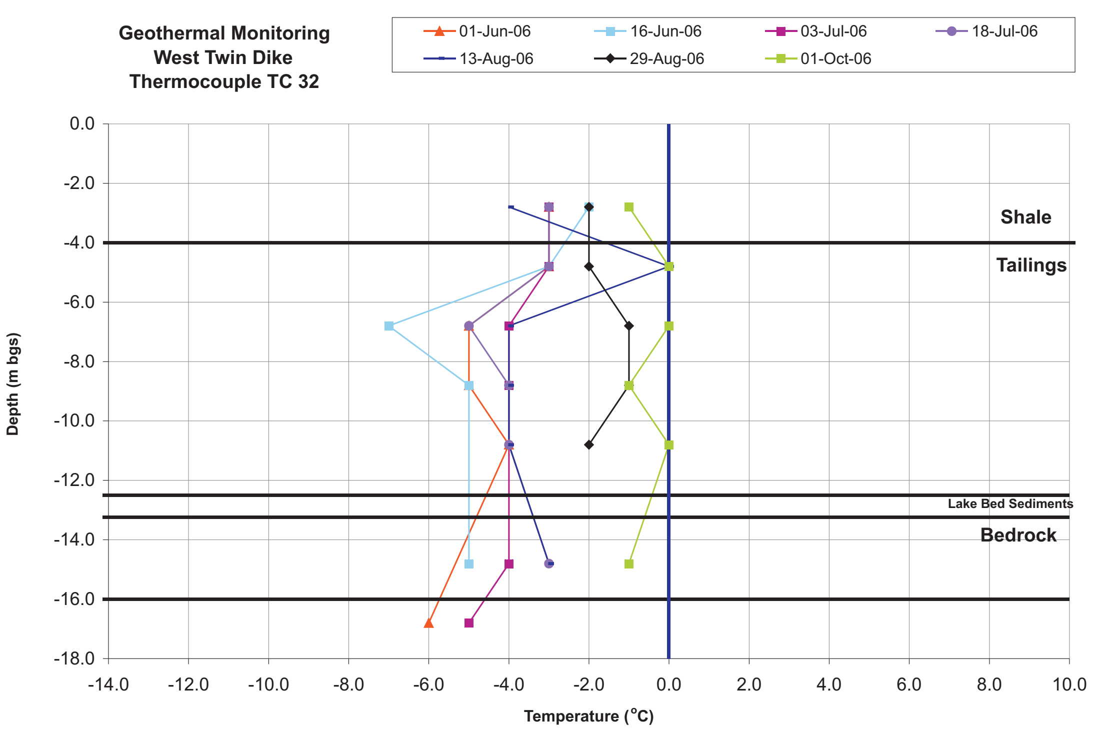
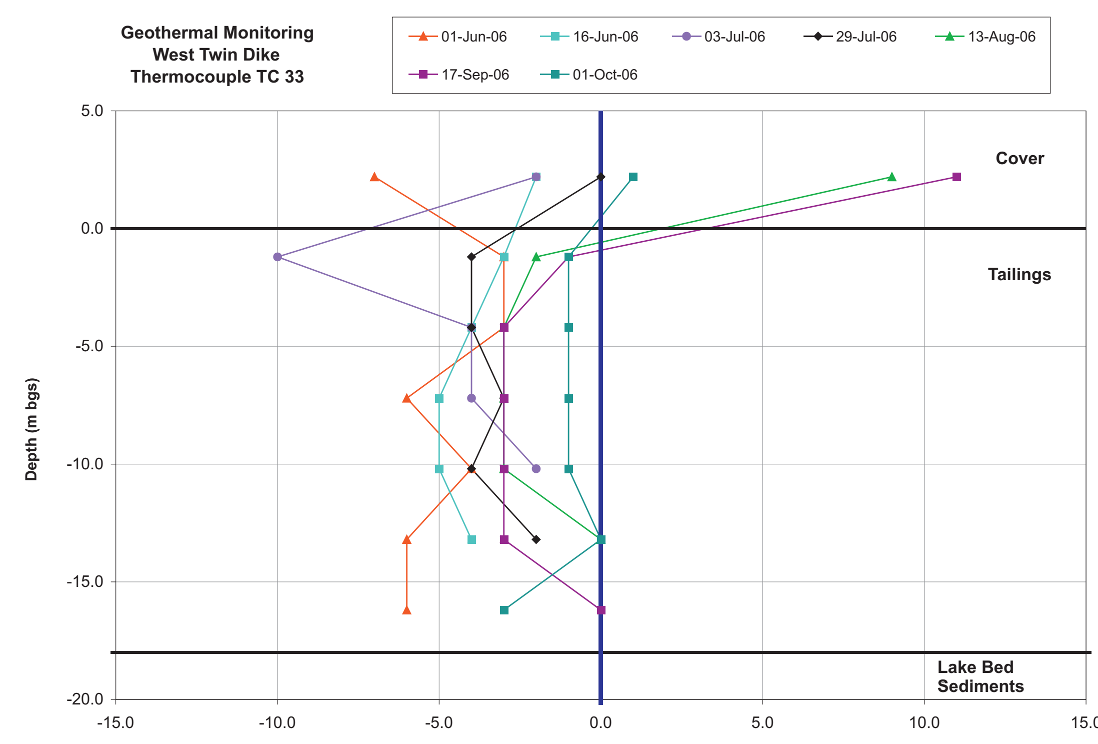
Calgary Alberta
Phone: (403) 250-5185









CLIENT:

BREAKWATER RESOURCES LTD.

REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
WEST TWIN DIKE
GEOTECHNICAL MONITORING DATA 3

PROJECT No.	FIGURE No.	REV.
0255-013-08	13	0

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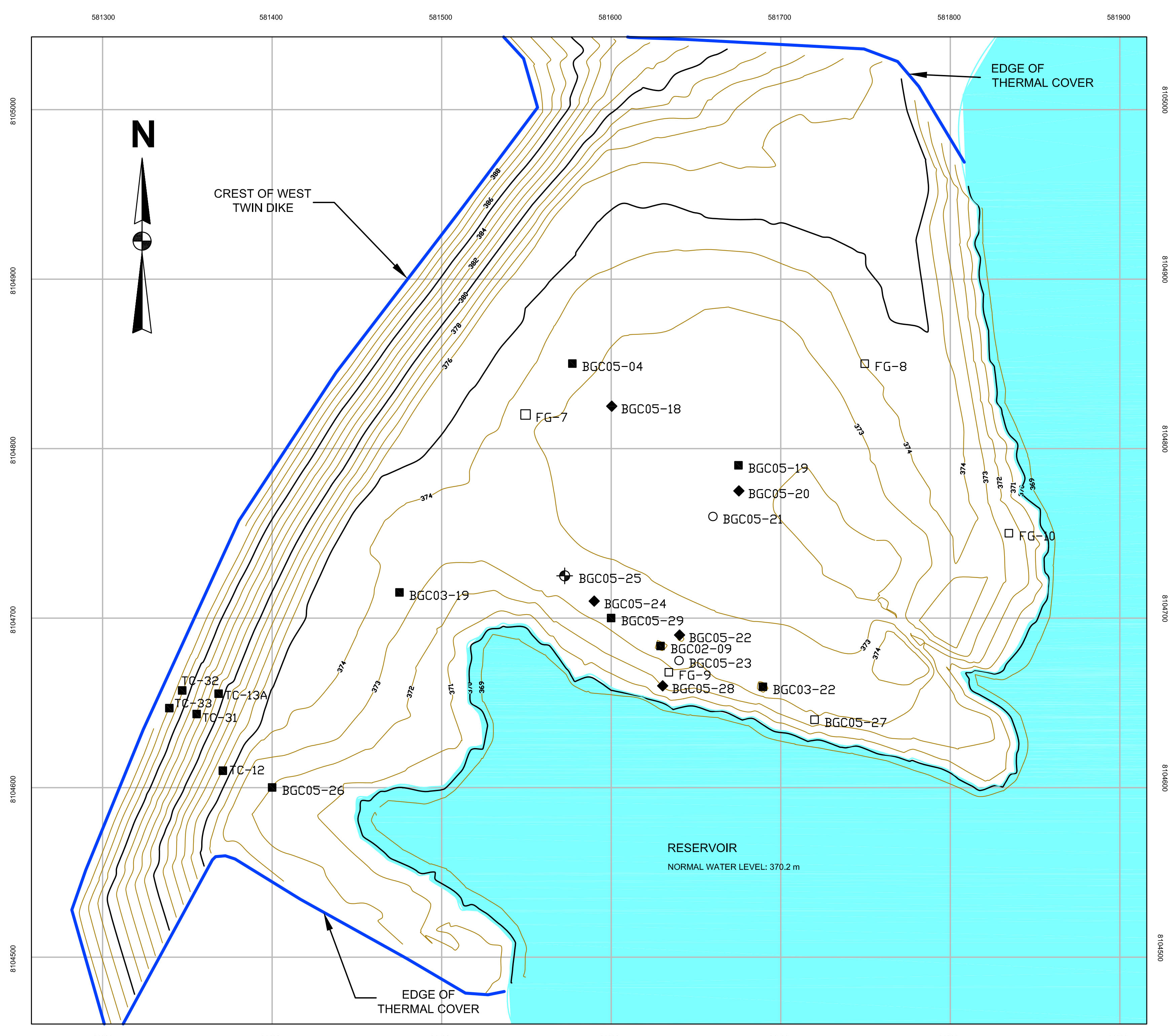
LEGEND:

- CONTINGENCY BOREHOLE
- THERMISTOR/ THERMOCOUPLE
- FROST GAUGE
- MONITORING WELL
- VW PIEZOMETER



NOTES:

1. GRID BASED ON UTM NAD 83, ZONE 16 COORDINATES.
2. ELEVATIONS ARE IN METRES.
3. CONTOUR INTERVAL IS = 1.0 m.
4. SCALE IS APPROXIMATE.
5. THERMOCOUPLE LOCATIONS ARE APPROXIMATE.

Scale 1:3000

60 0 60 120 180

metres

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	AS SHOWN
DATE:	JANUARY 2007
DRAWN:	REM
DESIGNED:	KFM
CHECKED:	GKC
APPROVED:	GKC

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

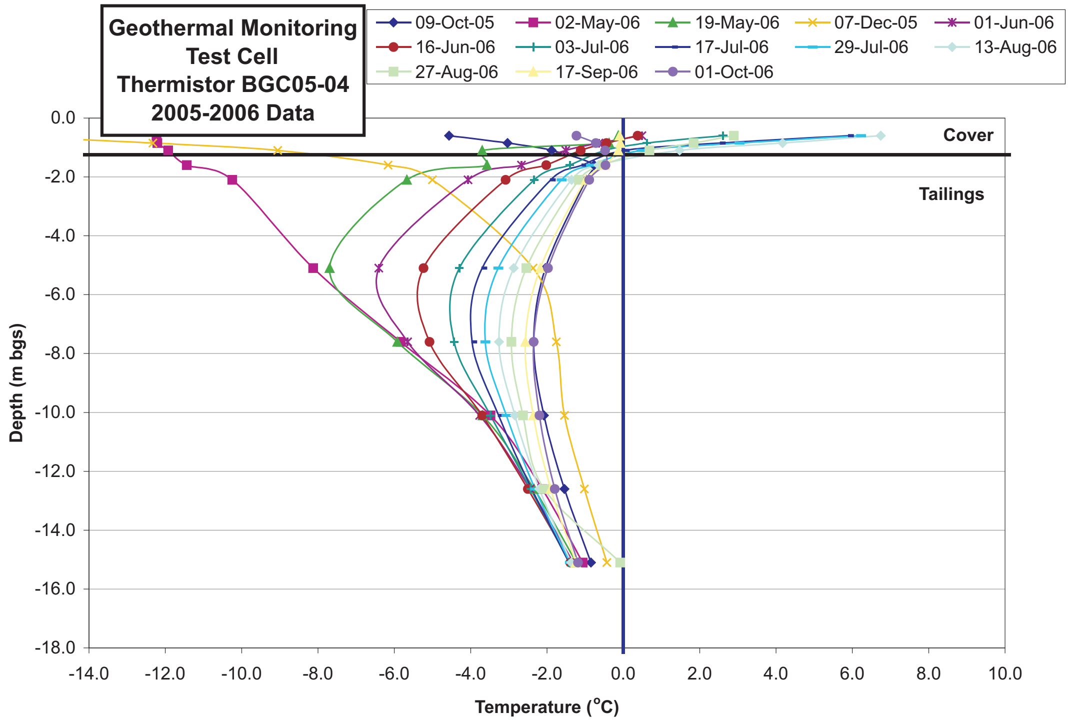
CLIENT:
BREAKWATER RESOURCES LTD.

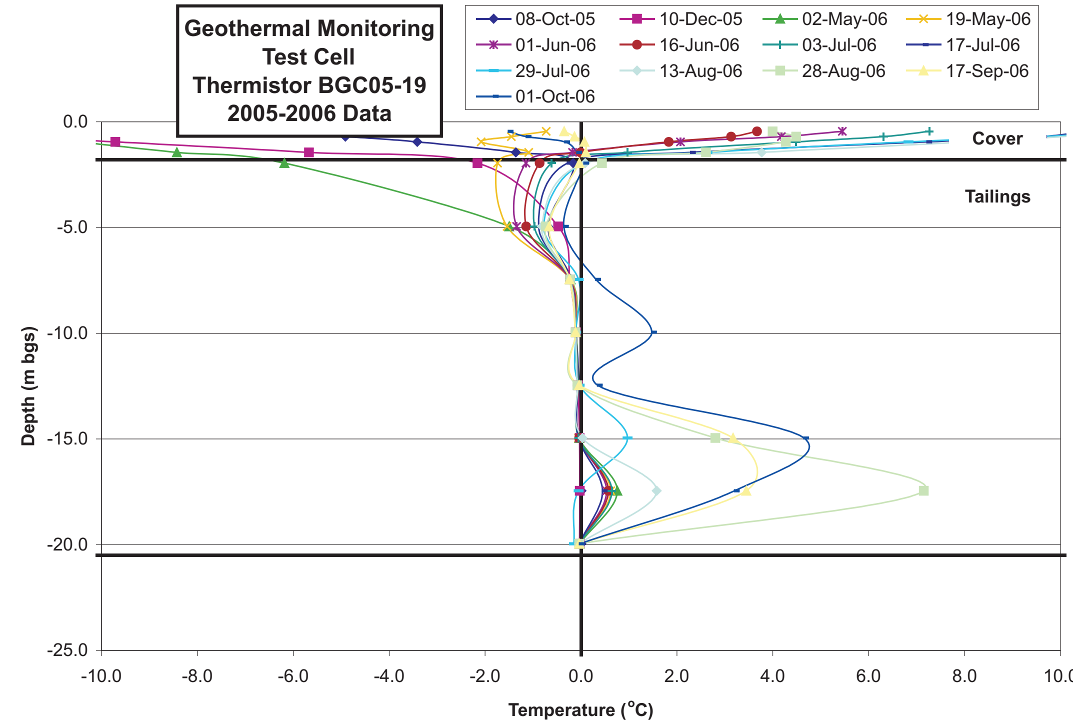
PROJECT:
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

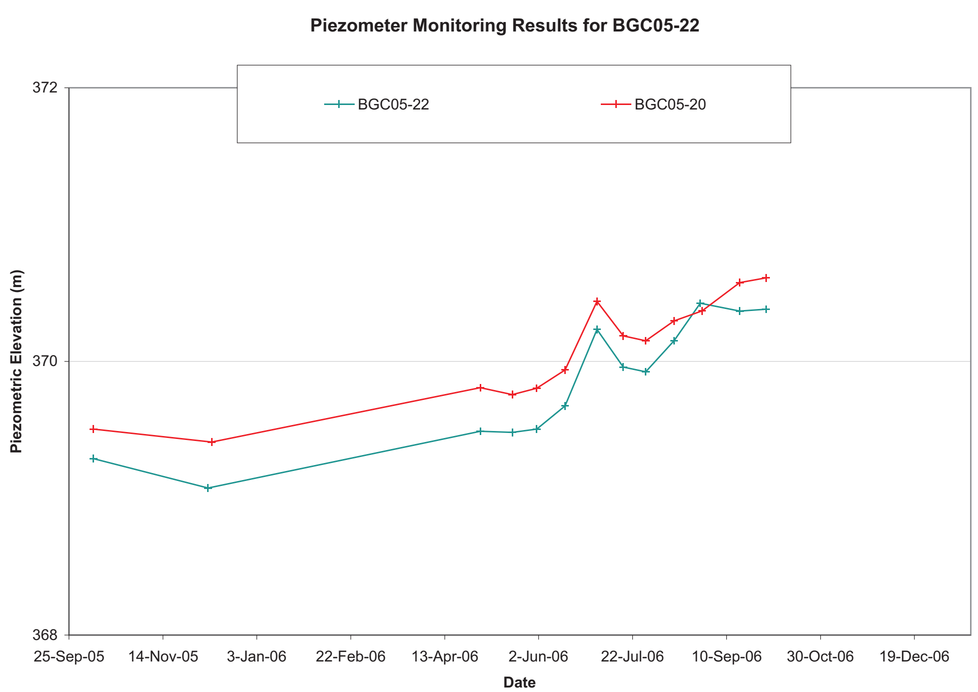
TITLE:
TEST CELL TAILINGS COVER

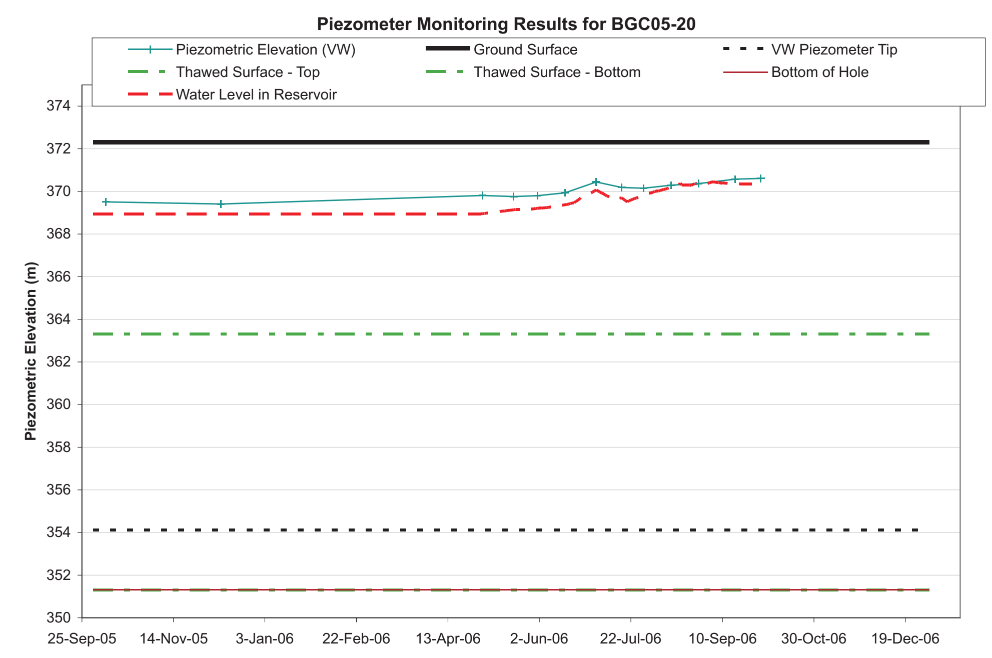
PROJECT No.:	FIGURE No.	REV.:
0255-013-08	14	

K:\Projects\0255 CanZinco\013 2006 Planning\08 2006 Annual Inspection\Graphics\Drawings\0255-013-08 Figure 14.dwg Layout: Figure 14 Plot Date Jan 3 07 Time: 9:10 AM









CLIENT:

BREAKWATER RESOURCES LTD.

REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
TEST CELL TAILINGS COVER
GEOTECHNICAL MONITORING DATA 1

PROJECT No.	FIGURE No.	REV.
0255-013-08	15	0

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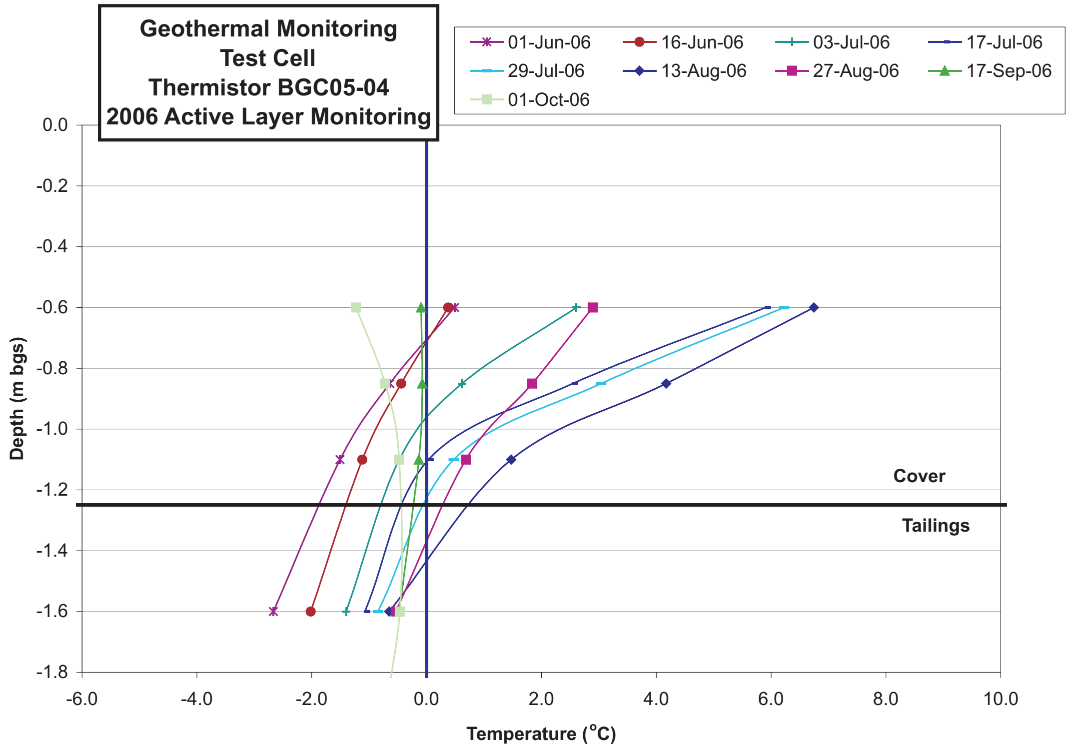

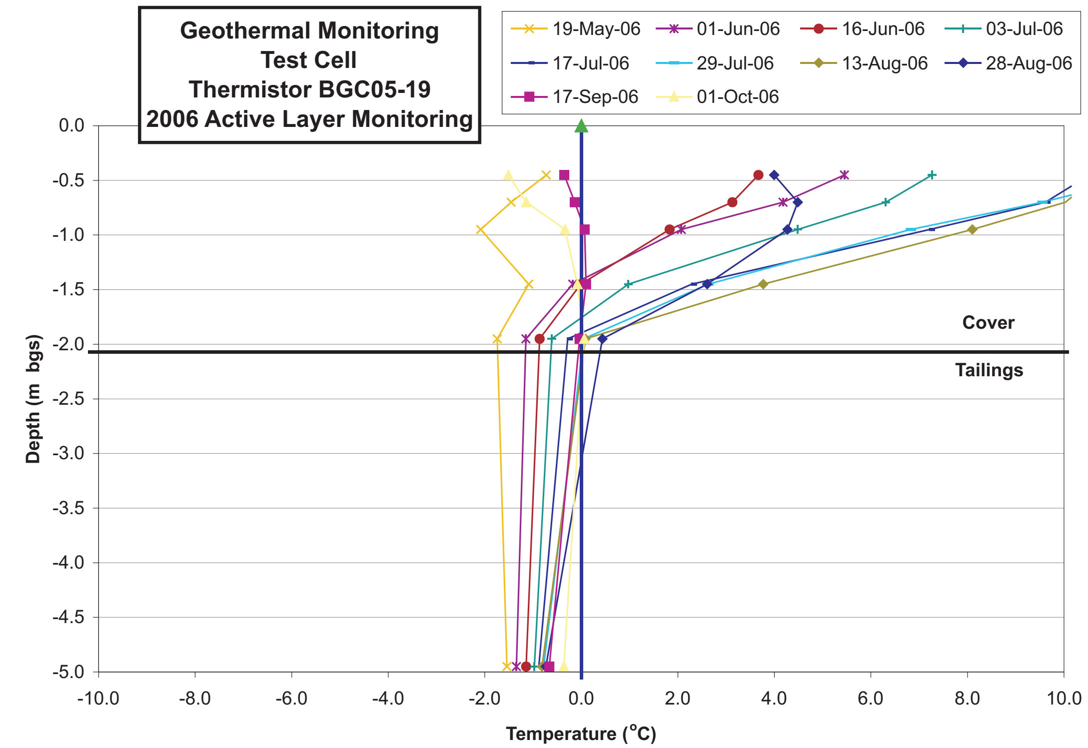

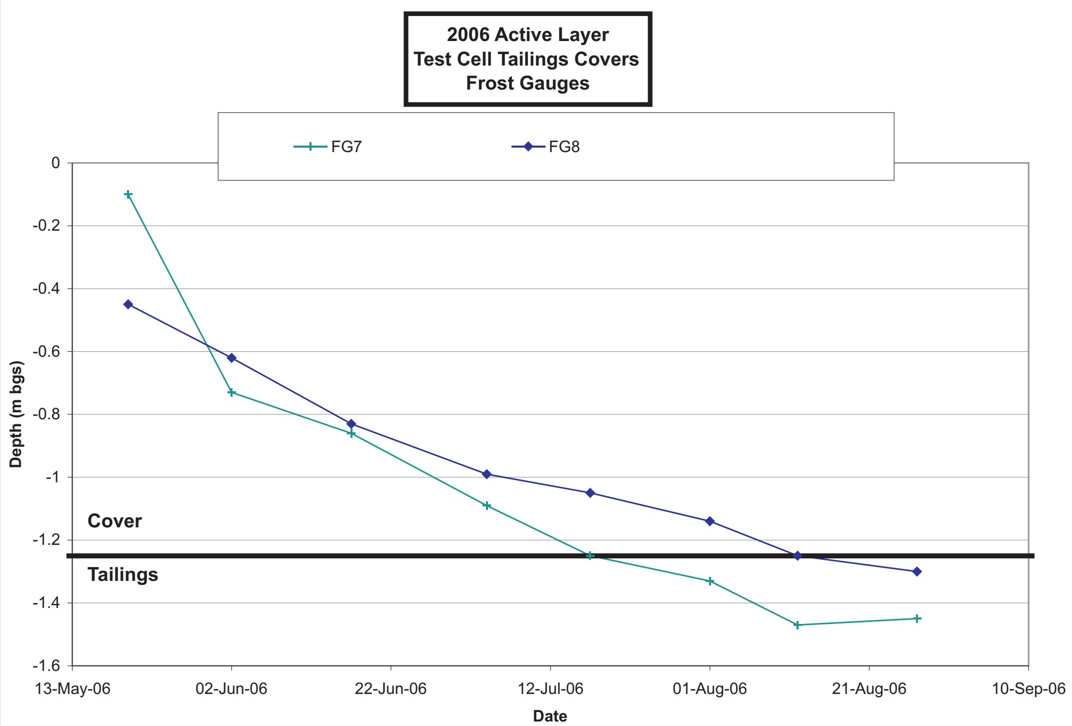

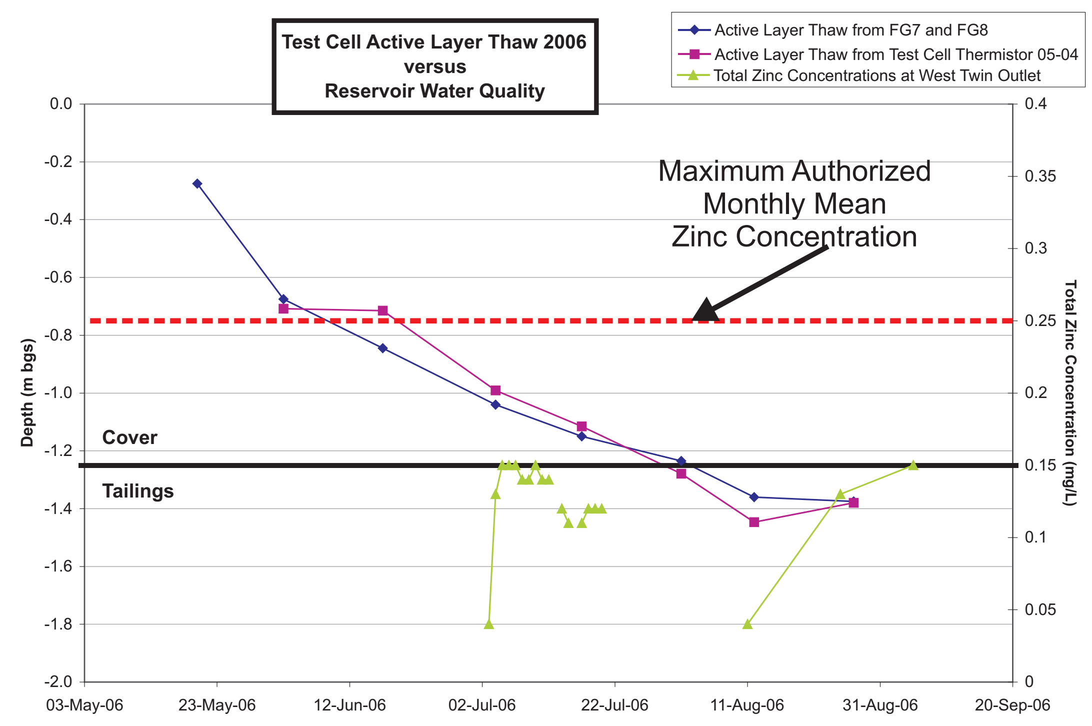

CLIENT:

BREAKWATER RESOURCES LTD.

REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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-	-	- -	-	-	-

SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
TEST CELL TAILINGS COVER
GEOTECHNICAL MONITORING DATA 2

PROJECT No.	FIGURE No.	REV.
0255-013-08	16	0

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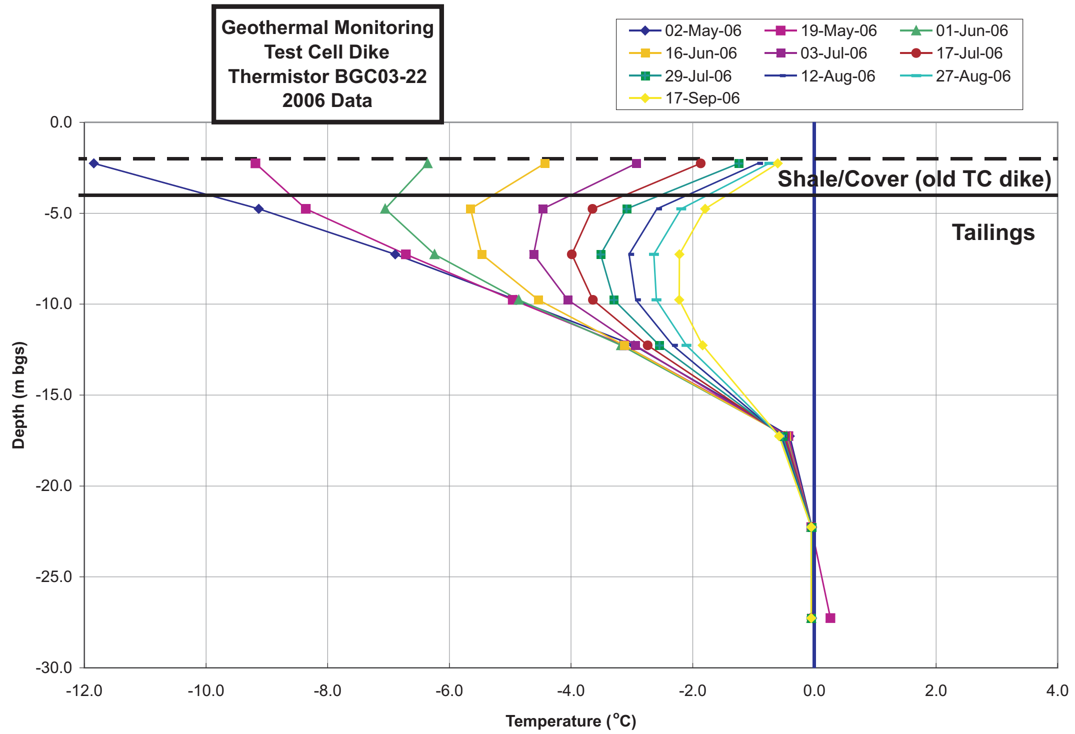
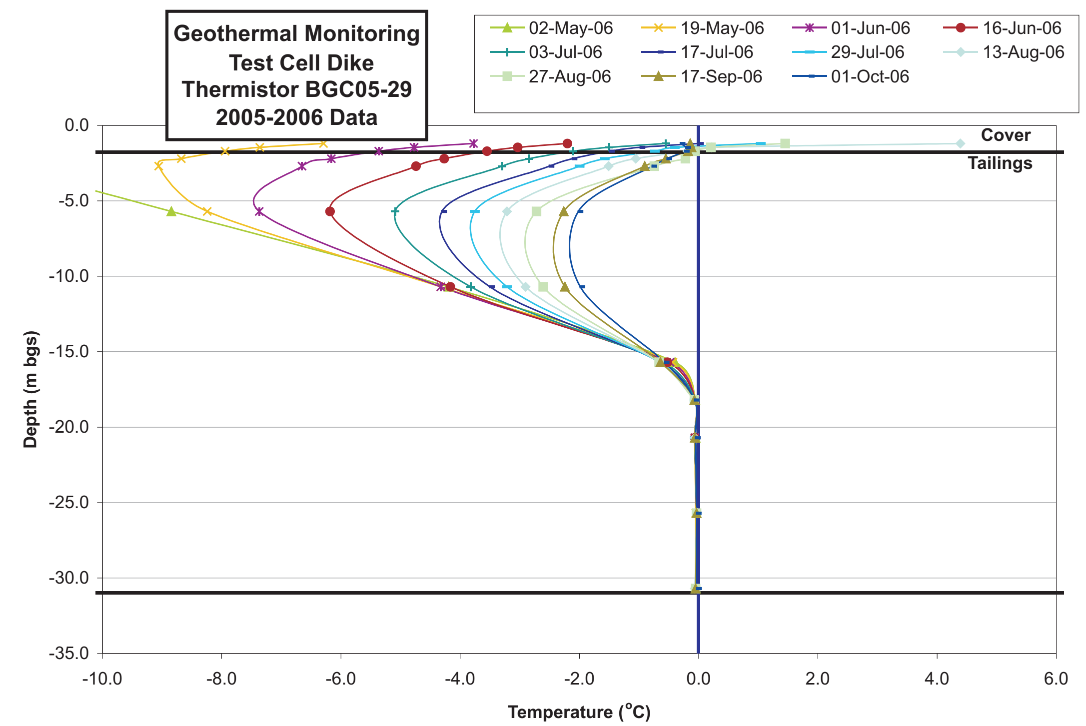
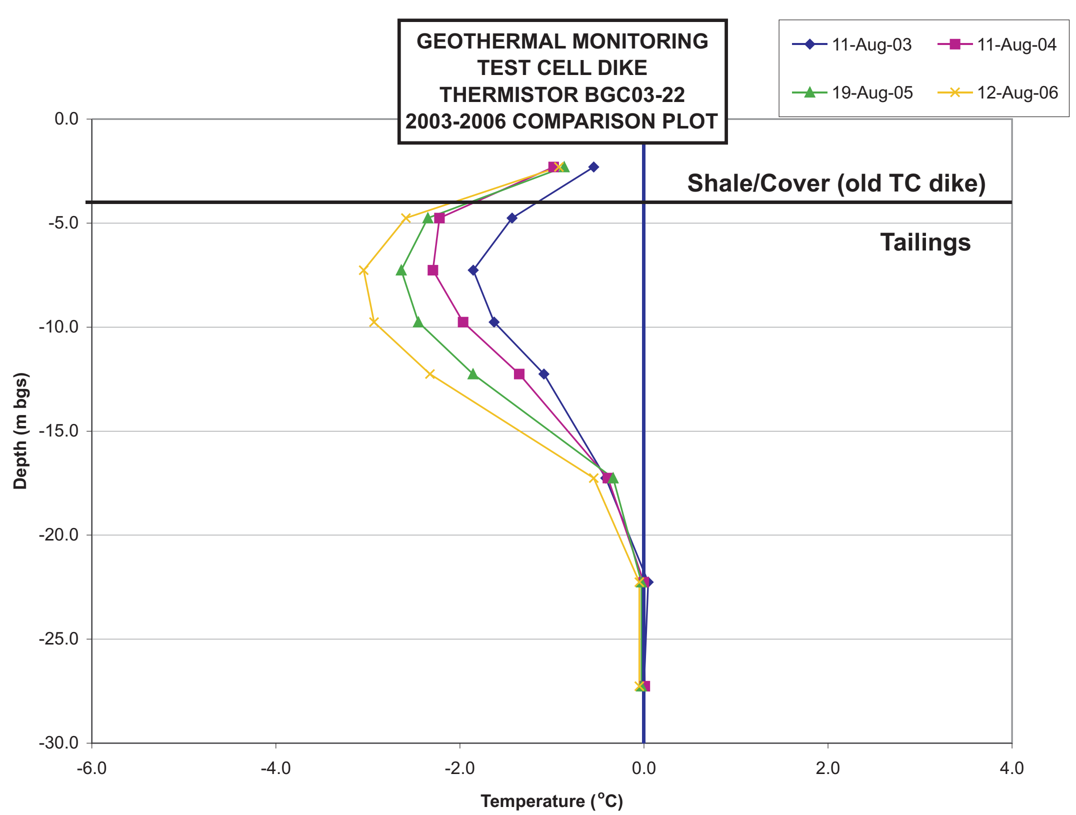
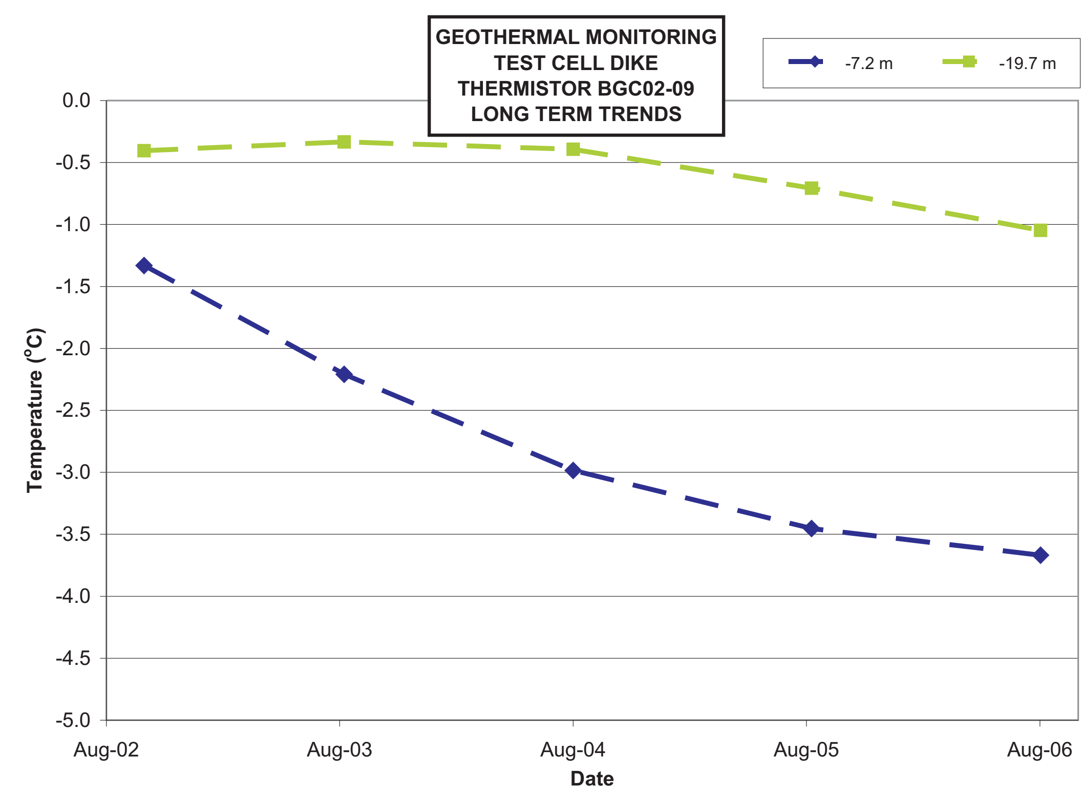
Calgary Alberta
Phone: (403) 250-5185









CLIENT:

BREAKWATER RESOURCES LTD.

REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
TEST CELL DIKE
GEOTECHNICAL MONITORING DATA

PROJECT No.	FIGURE No.	REV.
0255-013-08	17	0

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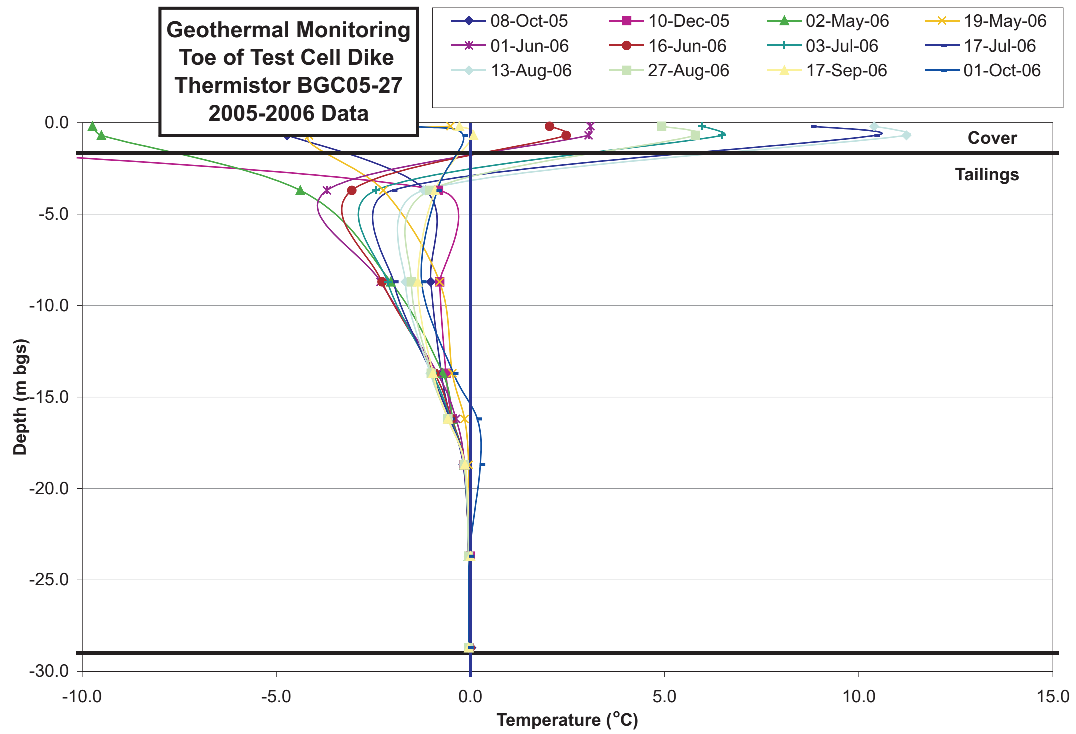

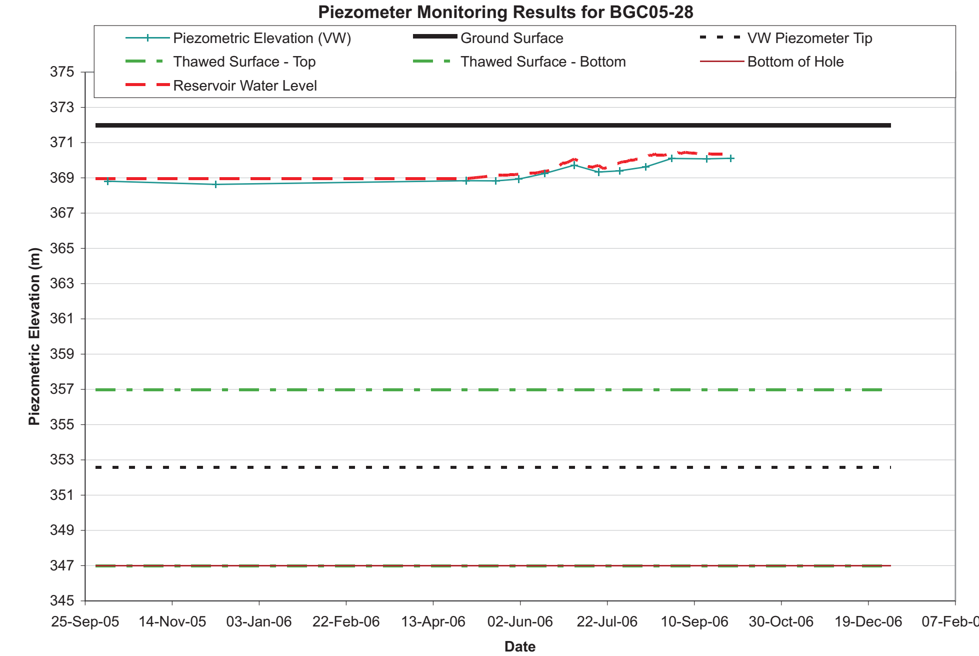

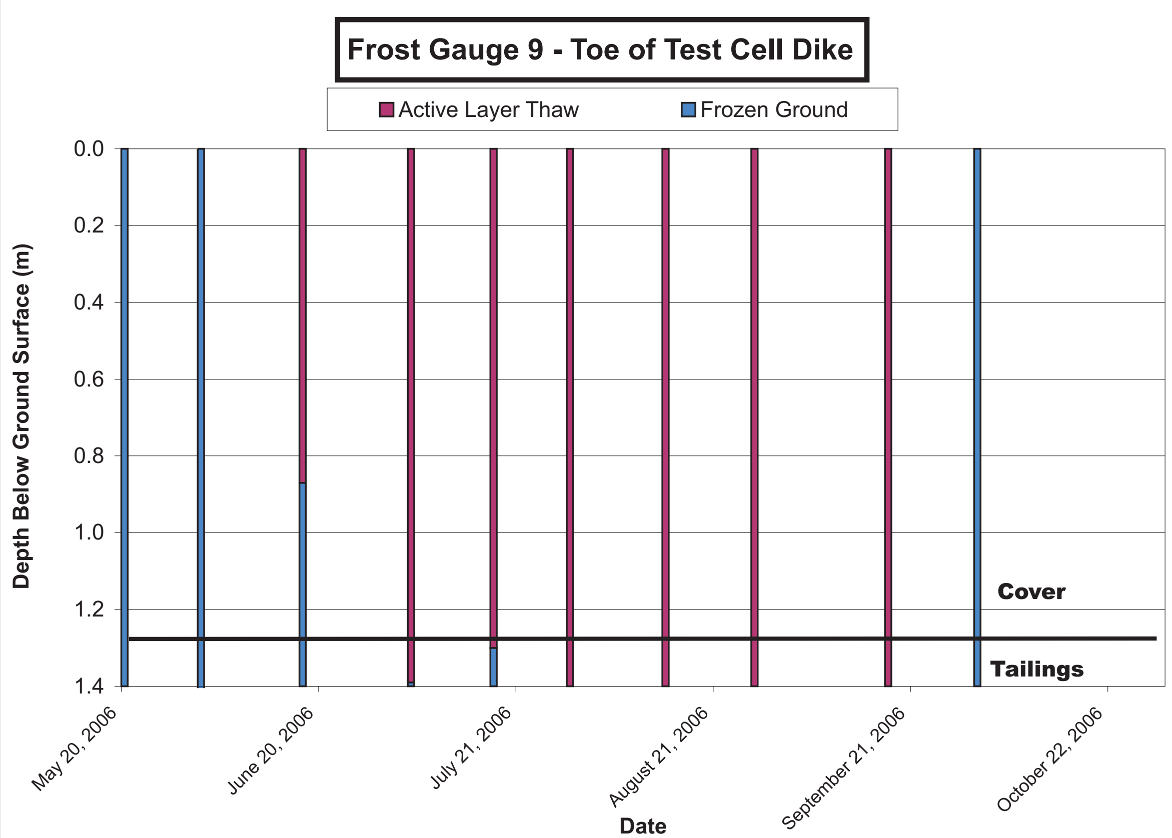

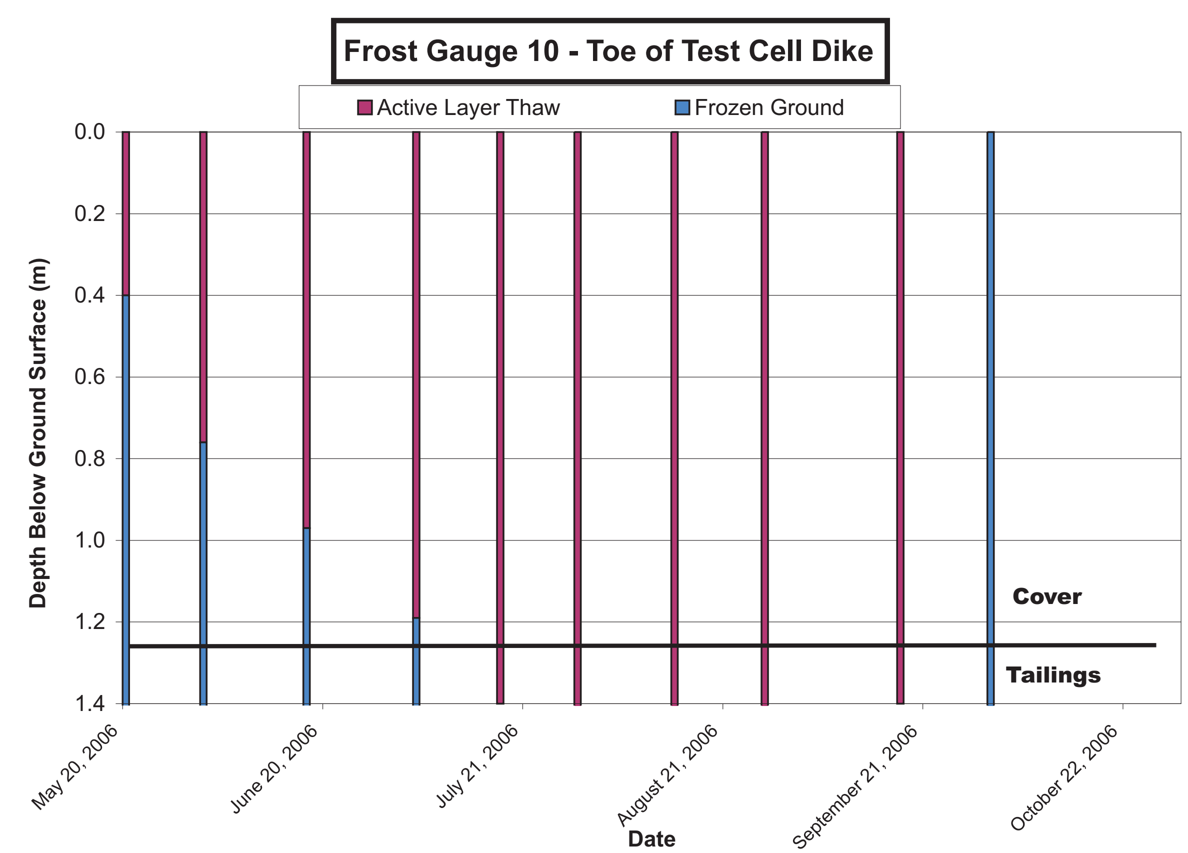

CLIENT:

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
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APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
TOE OF TEST CELL DIKE TAILINGS COVER
GEOTECHNICAL MONITORING DATA

PROJECT No.	FIGURE No.	REV.
0255-013-08	18	0

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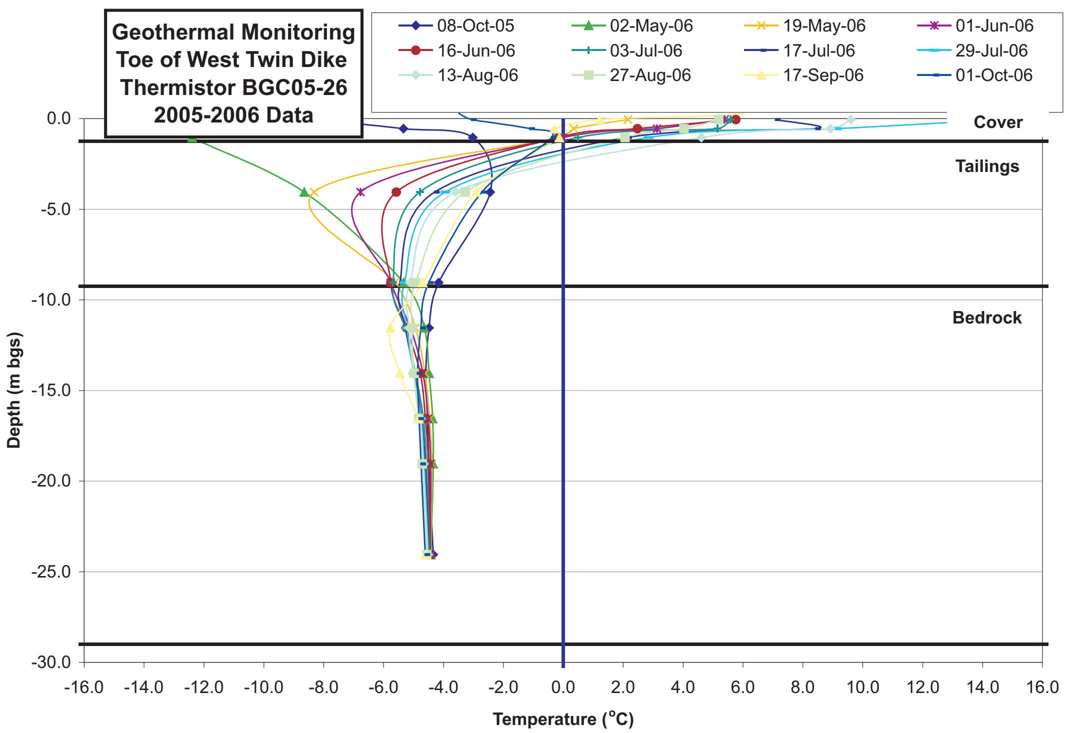

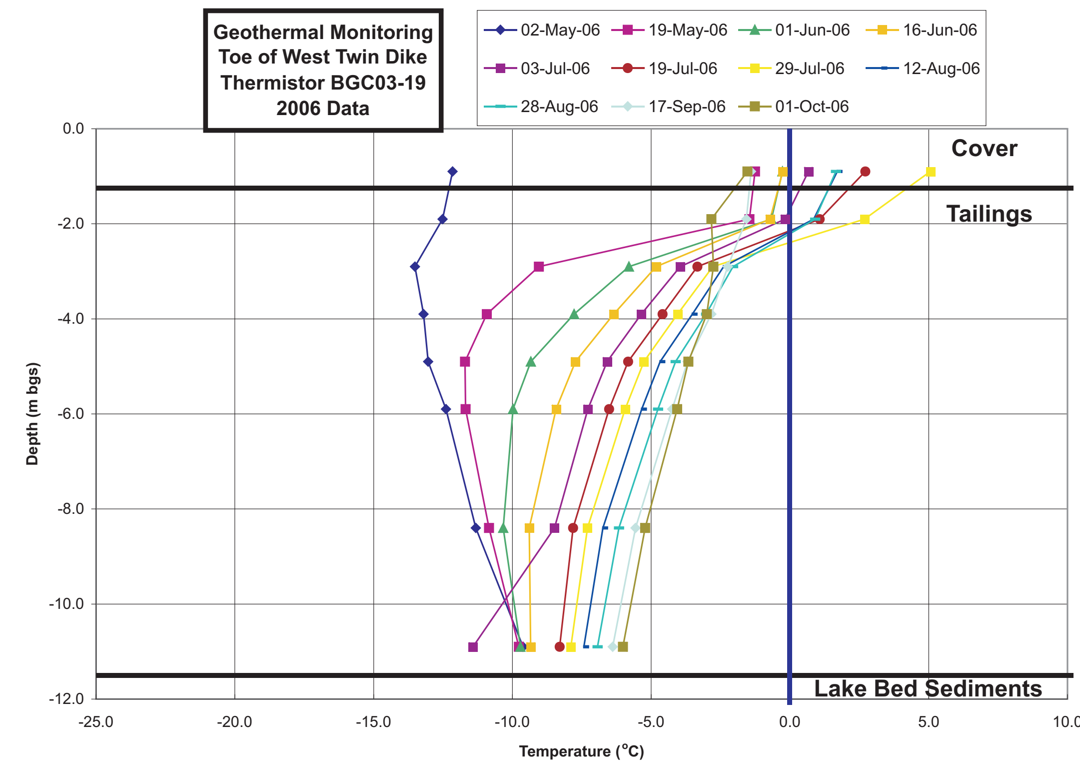

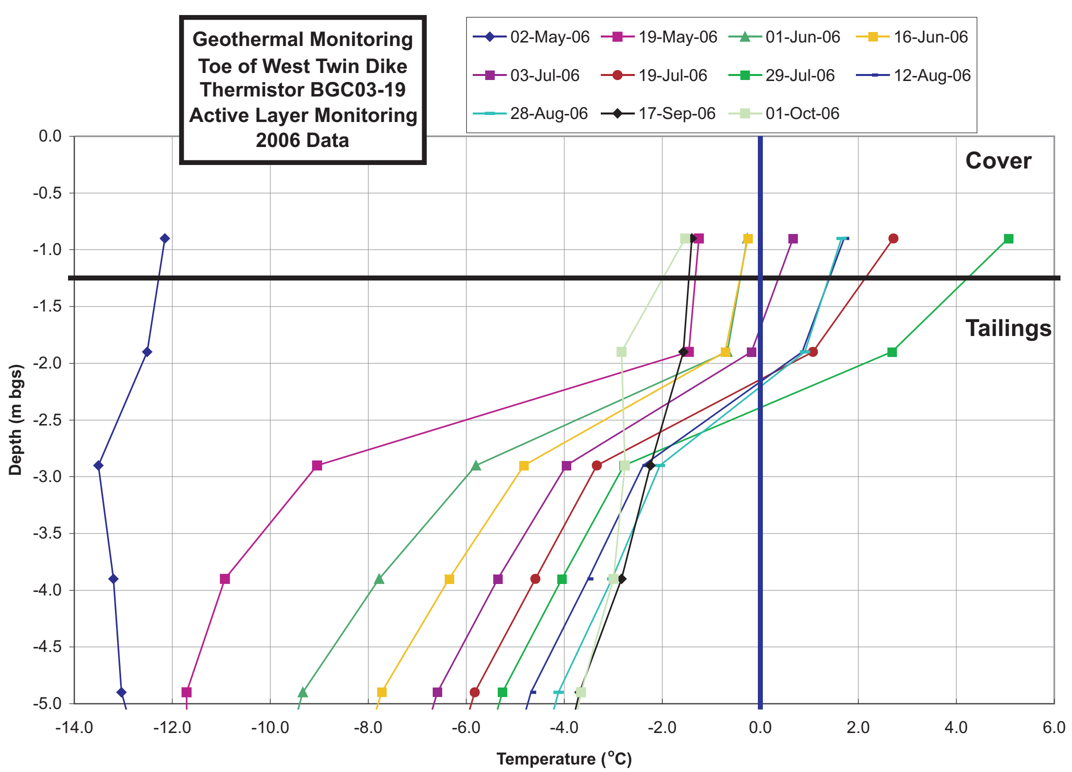

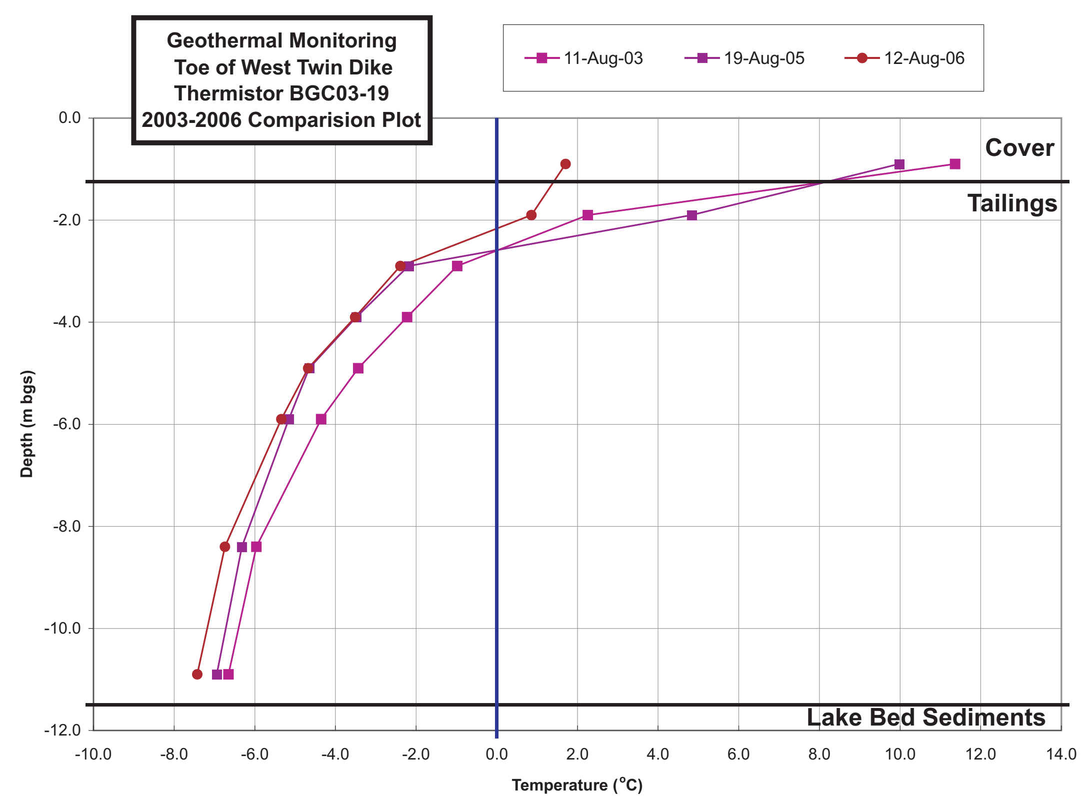

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
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PROJECT NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE TOE OF WEST TWIN DIKE TAILINGS COVER
GEOTECHNICAL MONITORING DATA

PROJECT No.	FIGURE No.	REV.
0255-013-08	19	0

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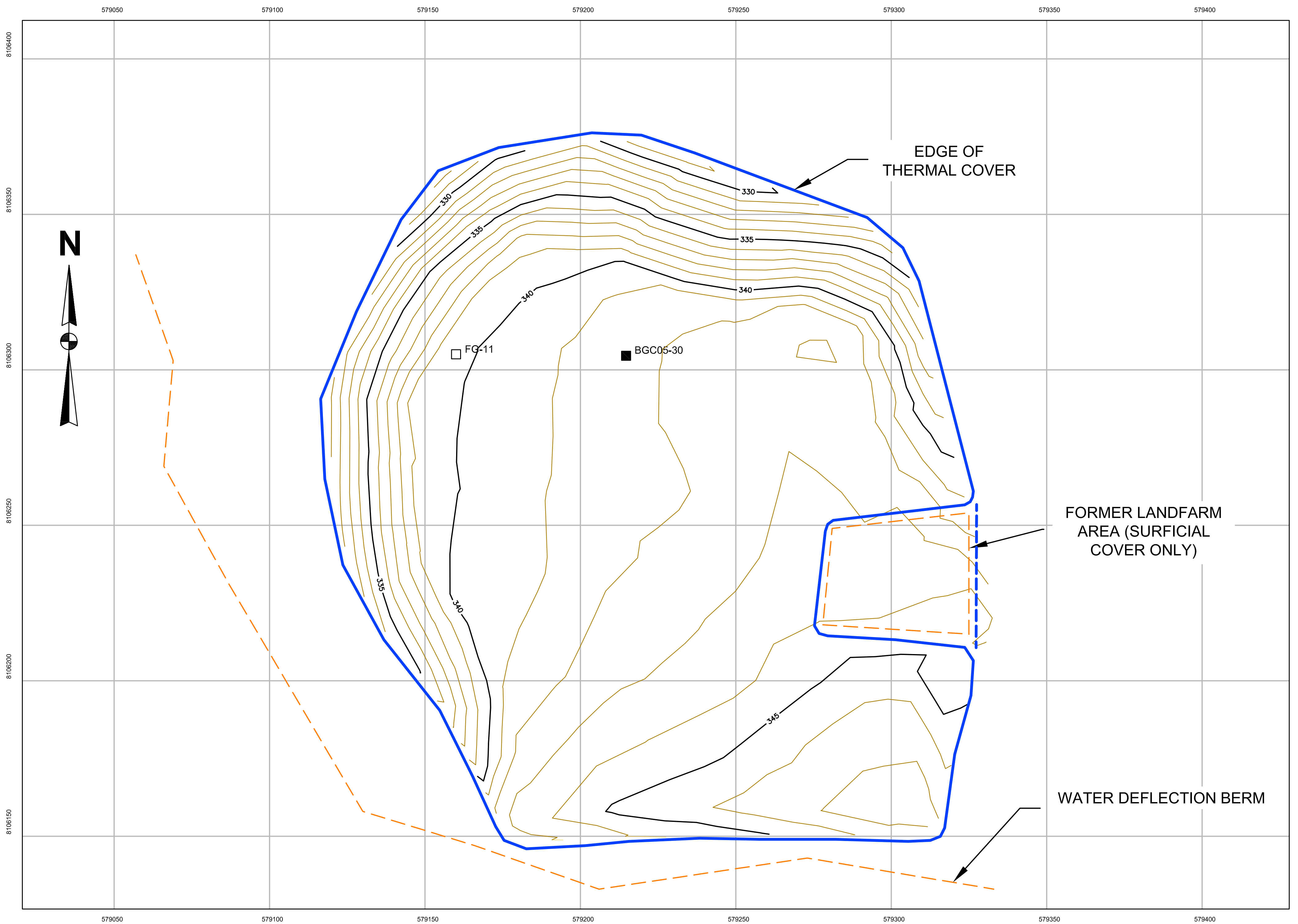

NOTES:

1. GRID BASED ON UTM NAD 83, ZONE 16 COORDINATES.
2. ELEVATIONS ARE IN METRES.
3. CONTOUR INTERVAL IS = 1.0 m.
4. SCALE IS APPROXIMATE.

LEGEND:

■ THERMISTOR

□ FROST GAUGE

Scale 1:1500

30 0 30 60 90

metres

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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	AS SHOWN
DATE:	JANUARY 2007
DRAWN:	REM
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CHECKED:	GKC
APPROVED:	GKC

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CLIENT: BREAKWATER RESOURCES LTD.

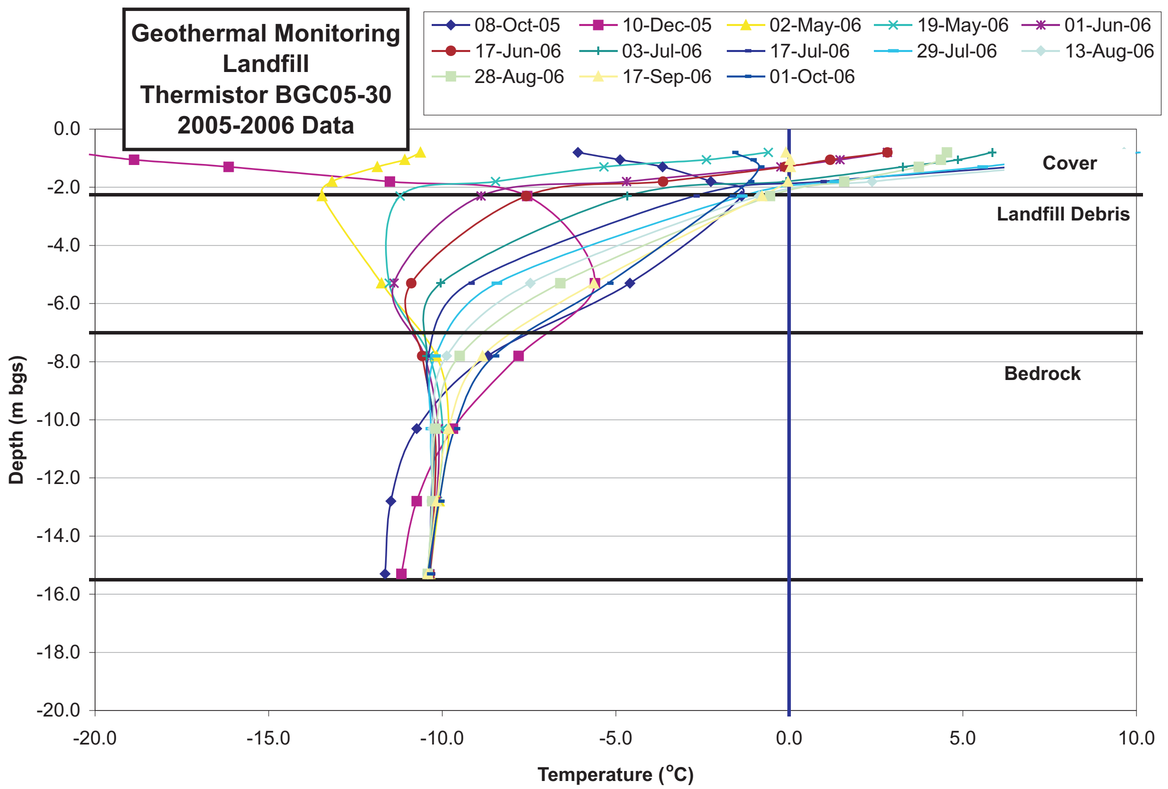
PROJECT: NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

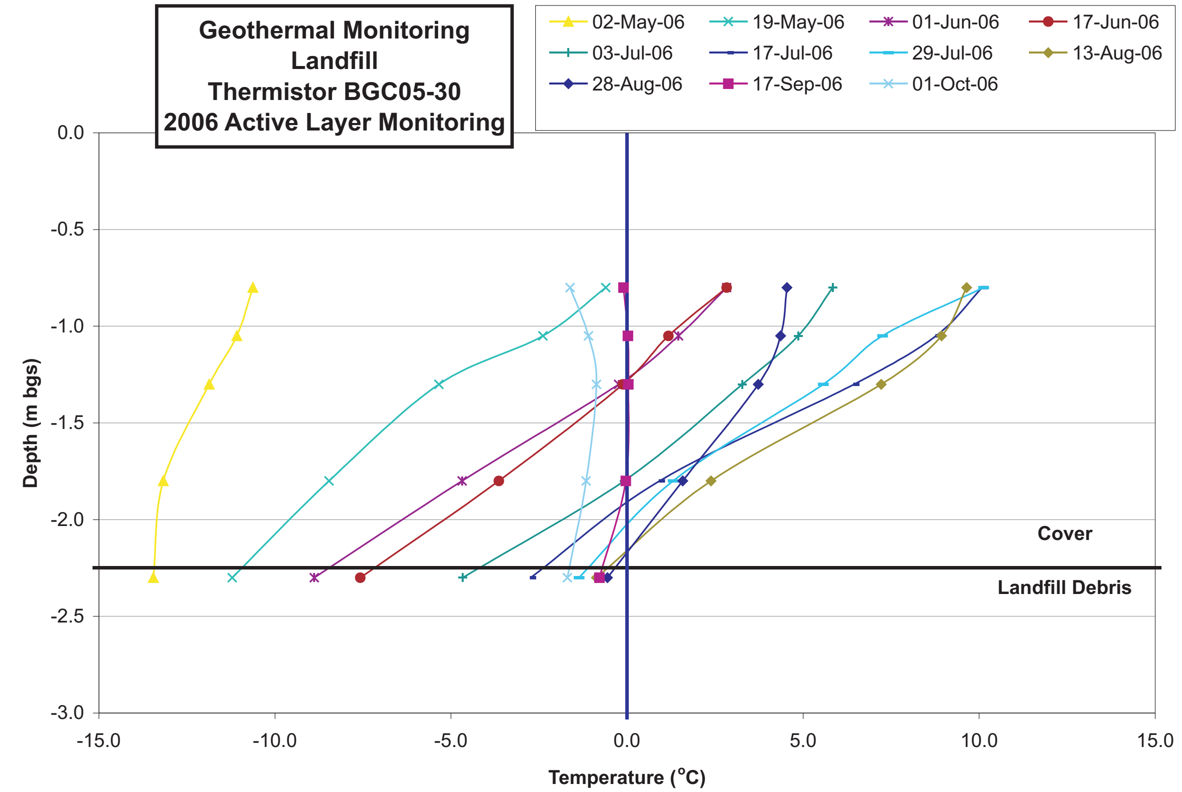
TITLE: LANDFILL COVER

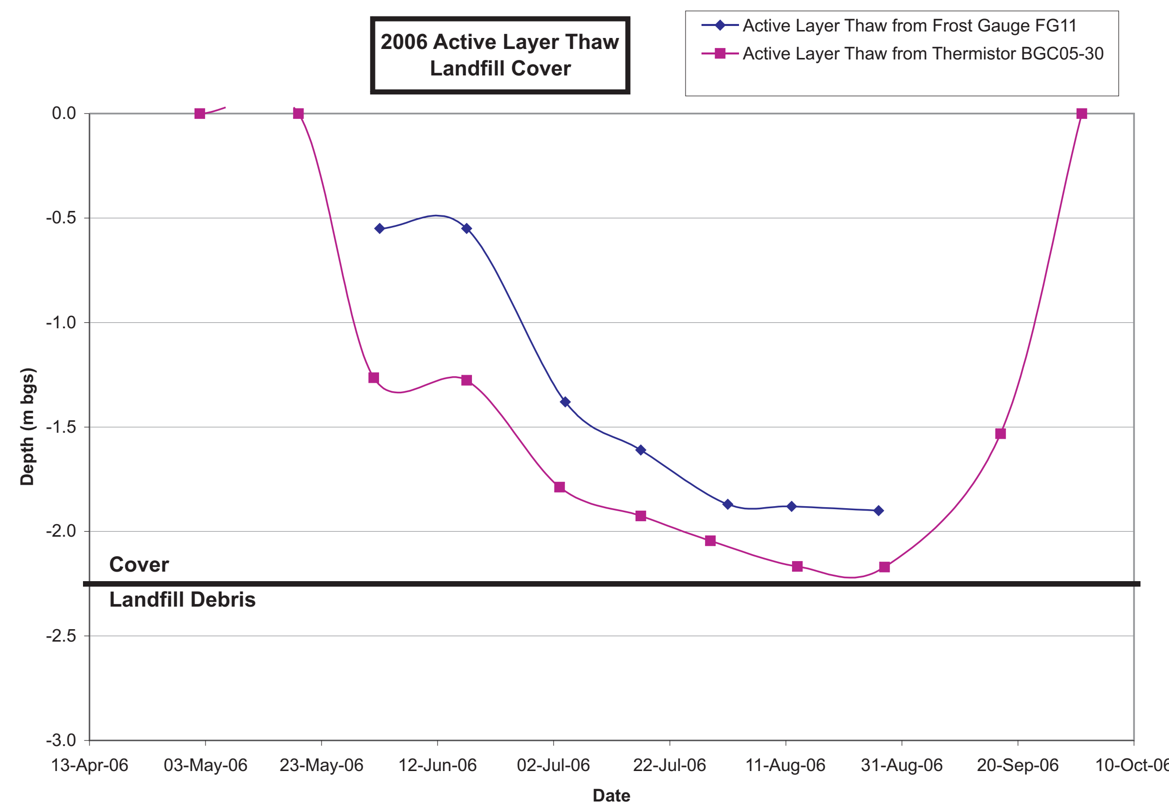
PROJECT No.: 0255-013-08

FIGURE No. 20

REV.:







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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
LANDFILL COVER
GEOTECHNICAL MONITORING DATA

PROJECT No.	FIGURE No.	REV.
0255-013-08	21	0

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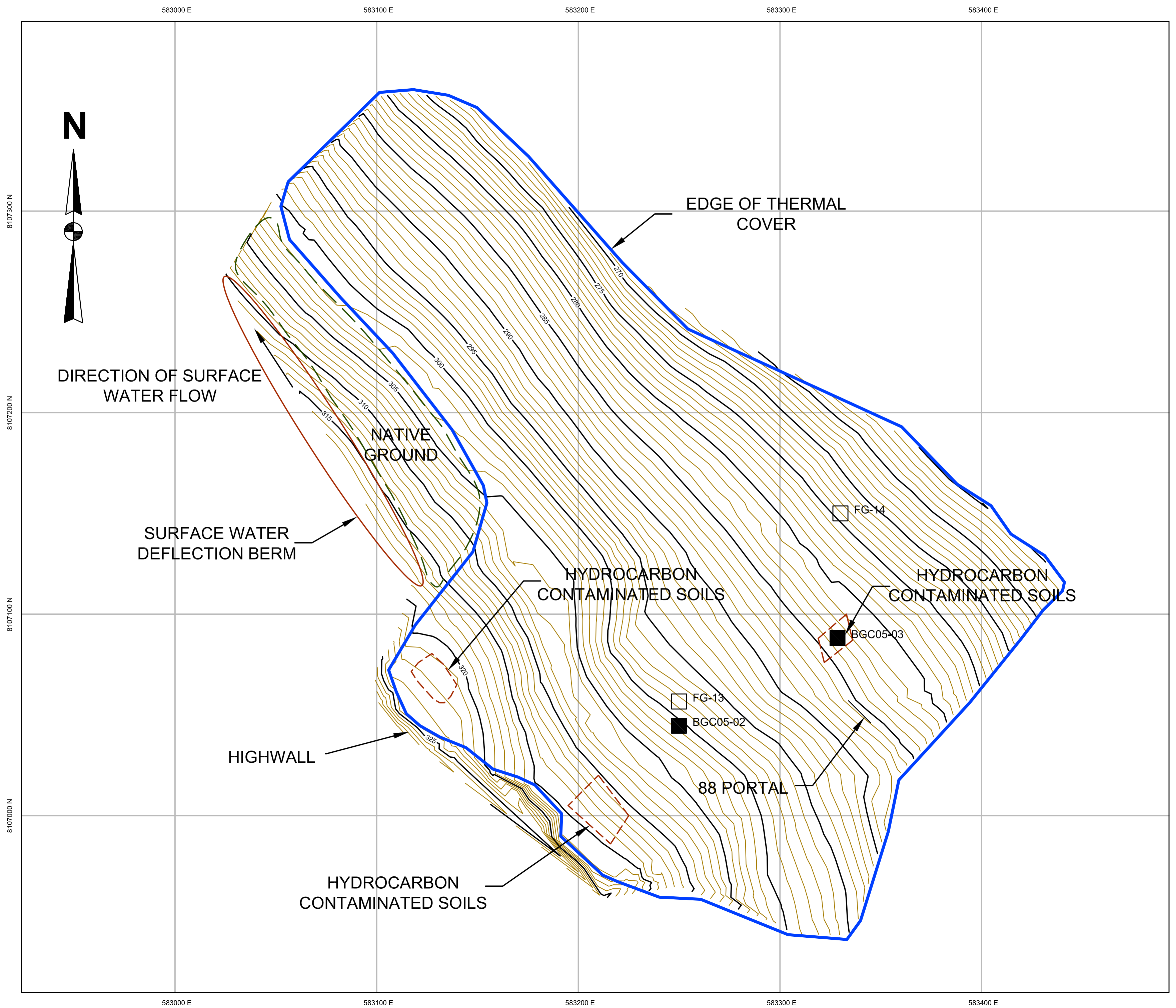

NOTES:

1. GRID BASED ON UTM NAD 83, ZONE 16 COORDINATES.
2. ELEVATIONS ARE IN METRES.
3. CONTOUR INTERVAL IS = 1.0 m.
4. SCALE IS APPROXIMATE.

LEGEND:

■ THERMISTOR

□ FROST GAUGE

Scale 1:2500

50 0 50 100 150

metres

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CLIENT: BREAKWATER RESOURCES LTD.

PROJECT: NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE: EAST OPEN PIT WASTE ROCK COVER

PROJECT No.:	FIGRUE No.	REV.:
0255-013-08	22	

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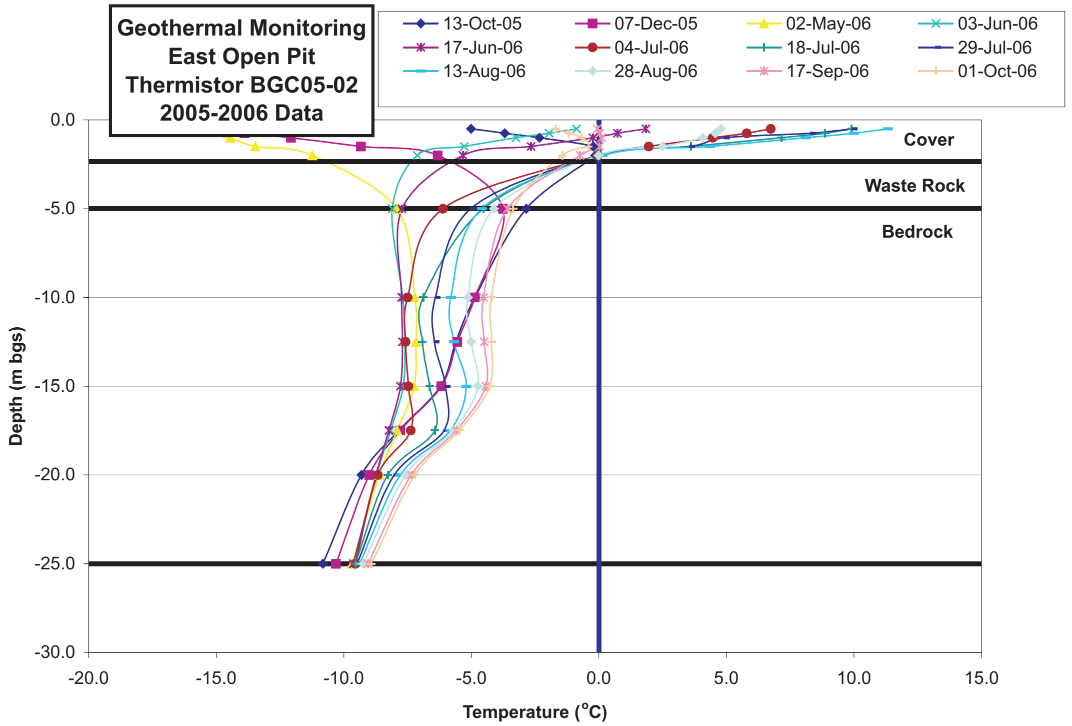

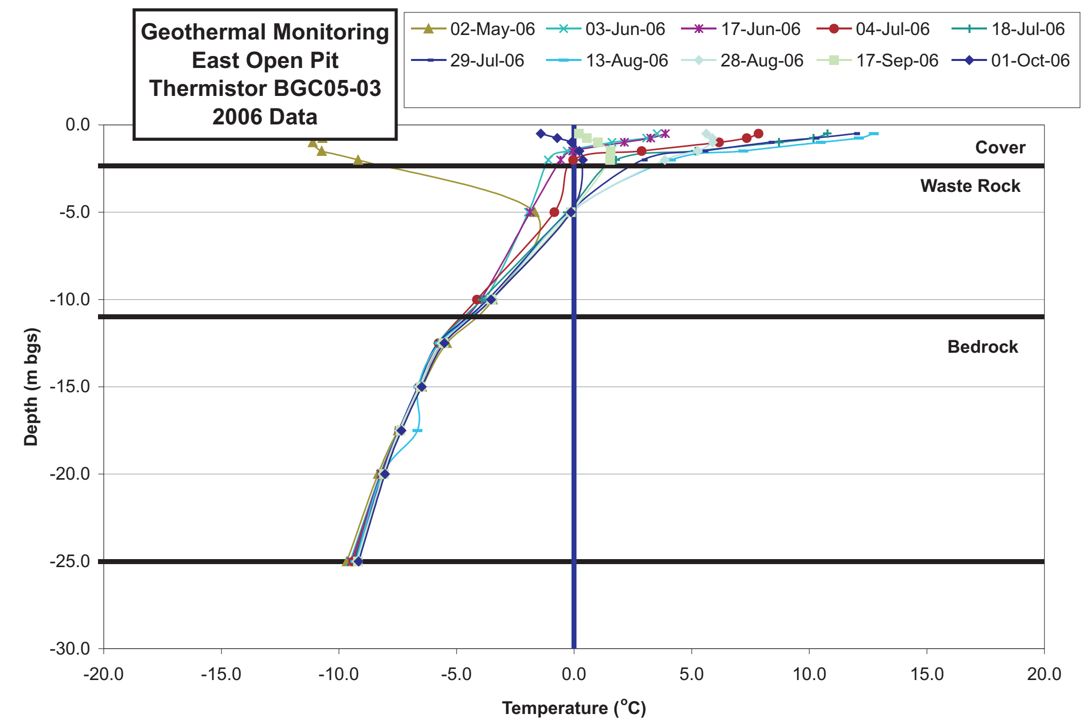

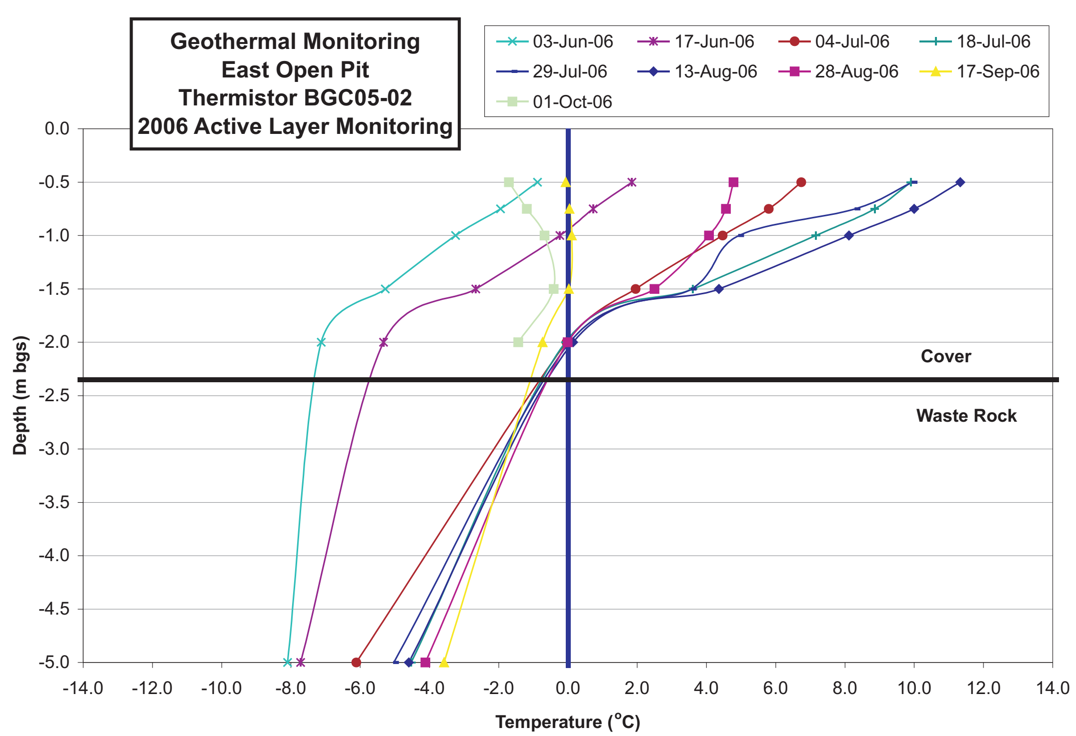

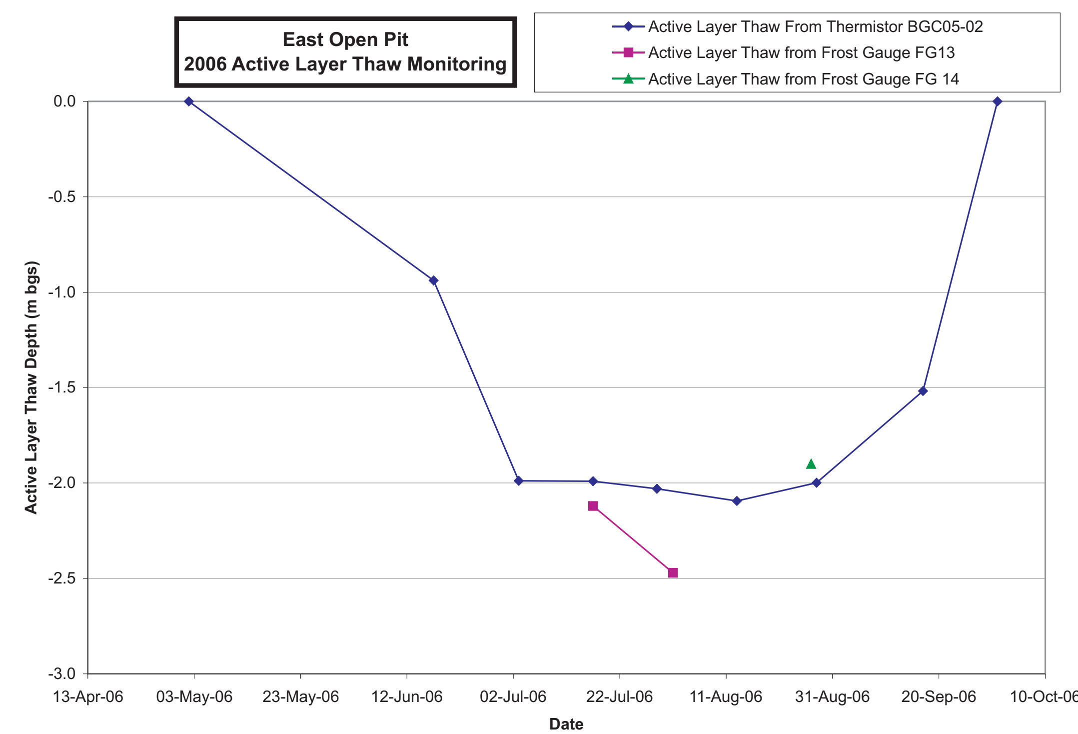

CLIENT:

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
EAST OPEN PIT WASTE ROCK COVER
GEOTECHNICAL MONITORING DATA

PROJECT No.	FIGURE No.	REV.
0255-013-08	23	0

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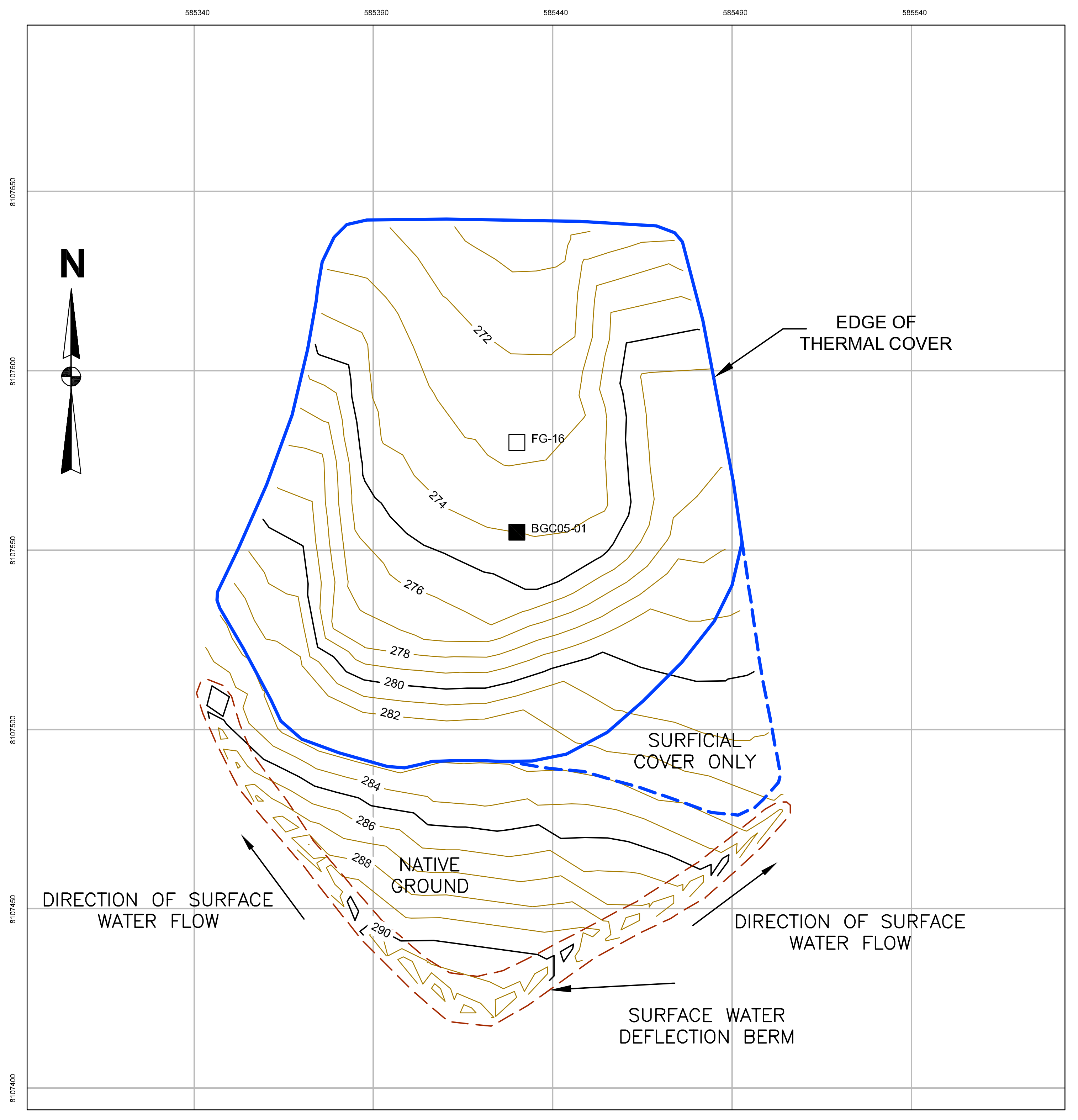
LEGEND:

■ THERMISTOR

□ FROST GAUGE



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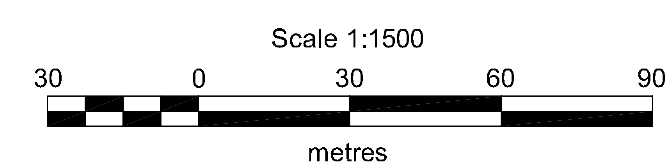
2. ELEVATIONS ARE IN METRES.
3. CONTOUR INTERVAL IS = 1.0 m.
4. SCALE IS APPROXIMATE.



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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE: AS SHOWN
DATE: JANUARY 2007
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APPROVED: GKC

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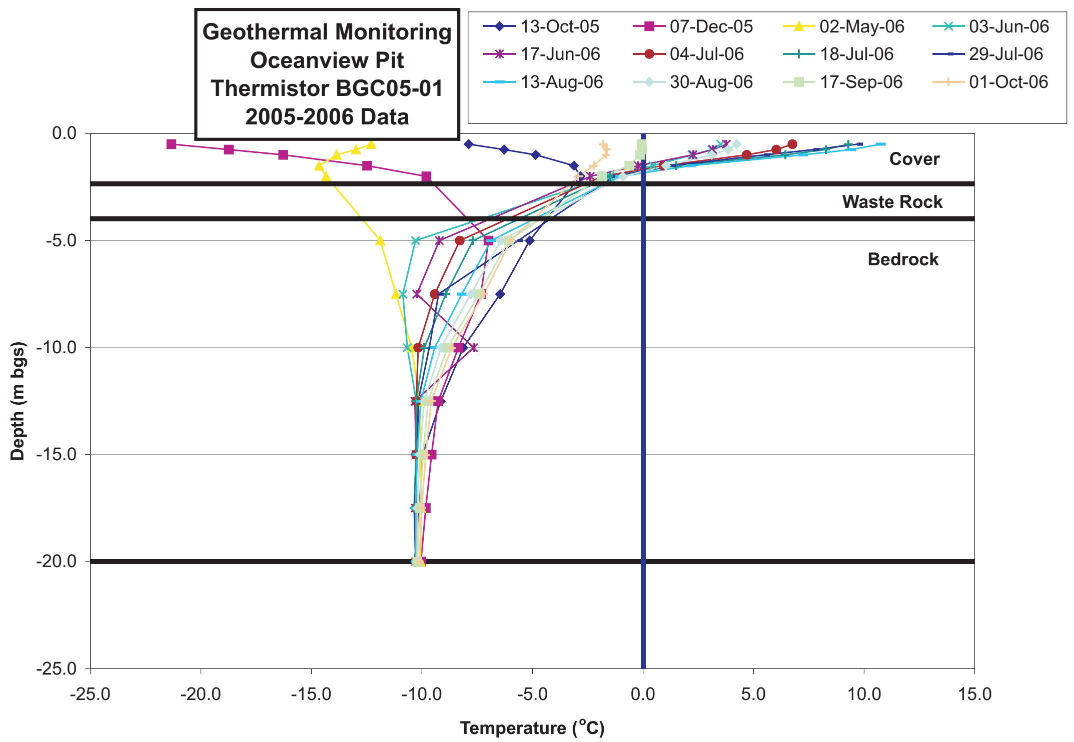
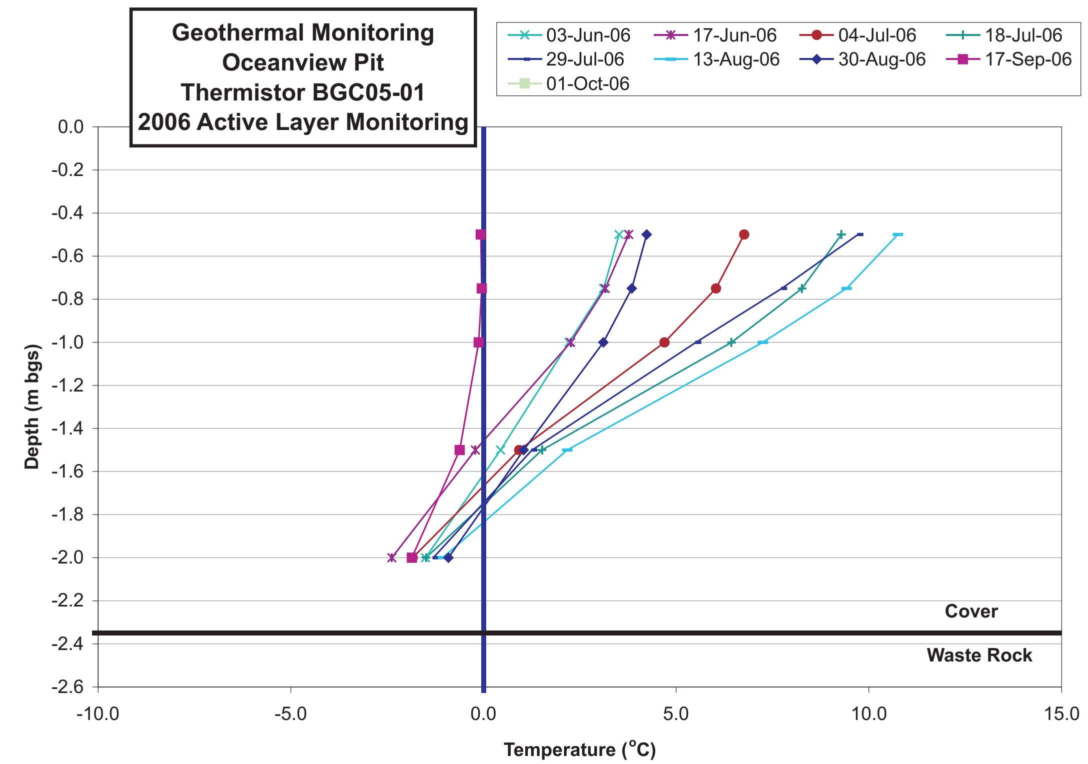
CLIENT: BREAKWATER RESOURCES LTD.

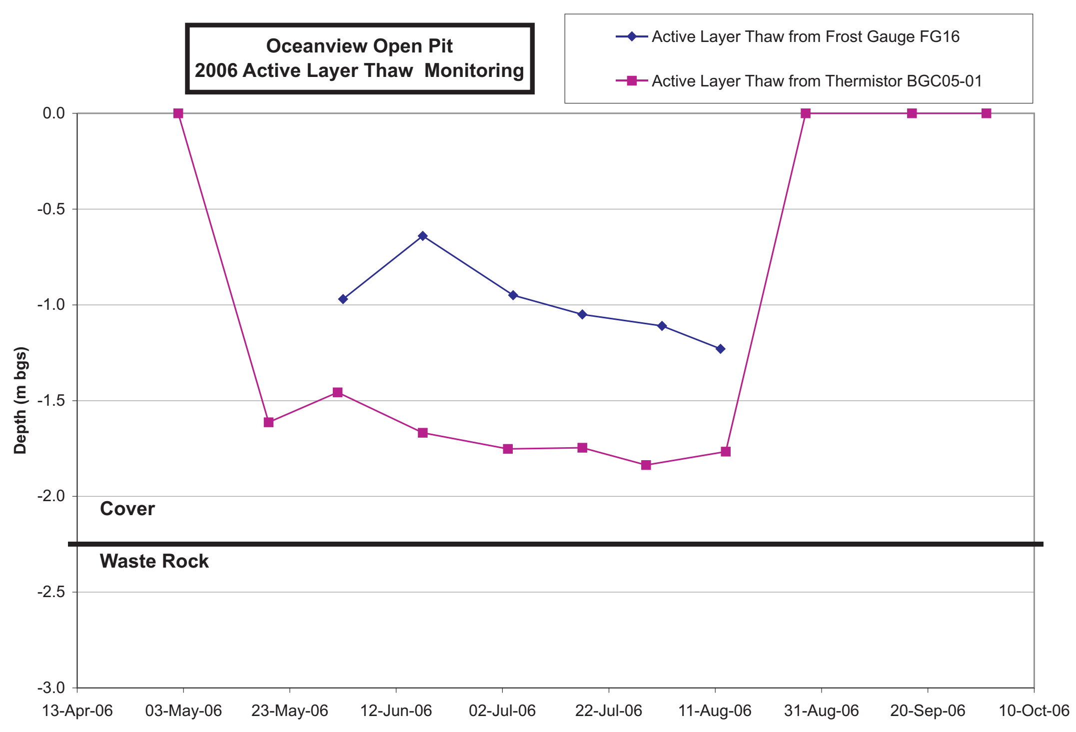
PROJECT: NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE: OCEANVIEW PIT WASTE ROCK COVER

PROJECT No.: 0255-013-08
FIGURE No. 24
REV.:







CLIENT:

BREAKWATER RESOURCES LTD.

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SCALE:	N/A
DATE:	JANUARY 2007
DRAWN:	SLF
DESIGNED:	GKC
CHECKED:	GKC
APPROVED:	JWC

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
OCEANVIEW OPEN PIT WASTE ROCK COVER GEOTECHNICAL MONITORING DATA

PROJECT No.	FIGURE No.	REV.
0255-013-08	25	0

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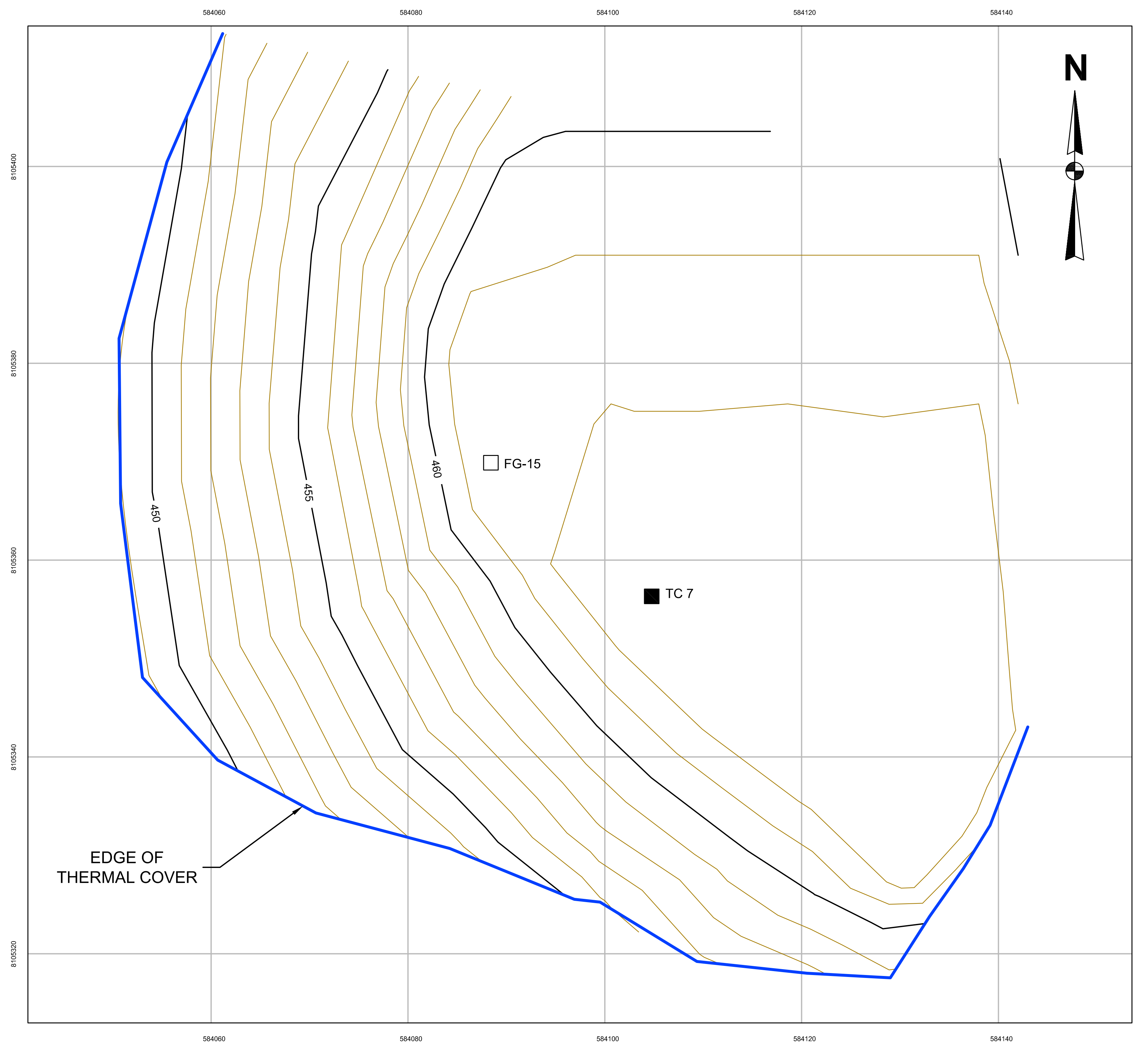
LEGEND:

■ THERMISTOR

□ FROST GAUGE



NOTES:

1. GRID BASED ON UTM NAD 83, ZONE 16 COORDINATES.
2. ELEVATIONS ARE IN METRES.
3. CONTOUR INTERVAL IS = 1.0 m.
4. SCALE IS APPROXIMATE.

Scale 1:500

10 0 10 20 30

metres

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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	AS SHOWN
DATE:	JANUARY 2007
DRAWN:	REM
DESIGNED:	KFM
CHECKED:	GKC
APPROVED:	GKC

PROFESSIONAL SEAL:

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CLIENT: BREAKWATER RESOURCES LTD

PROJECT: NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE: AREA 14 WASTE ROCK COVER

PROJECT No.:	FIGURE No.	REV.:
0255-013-08	26	

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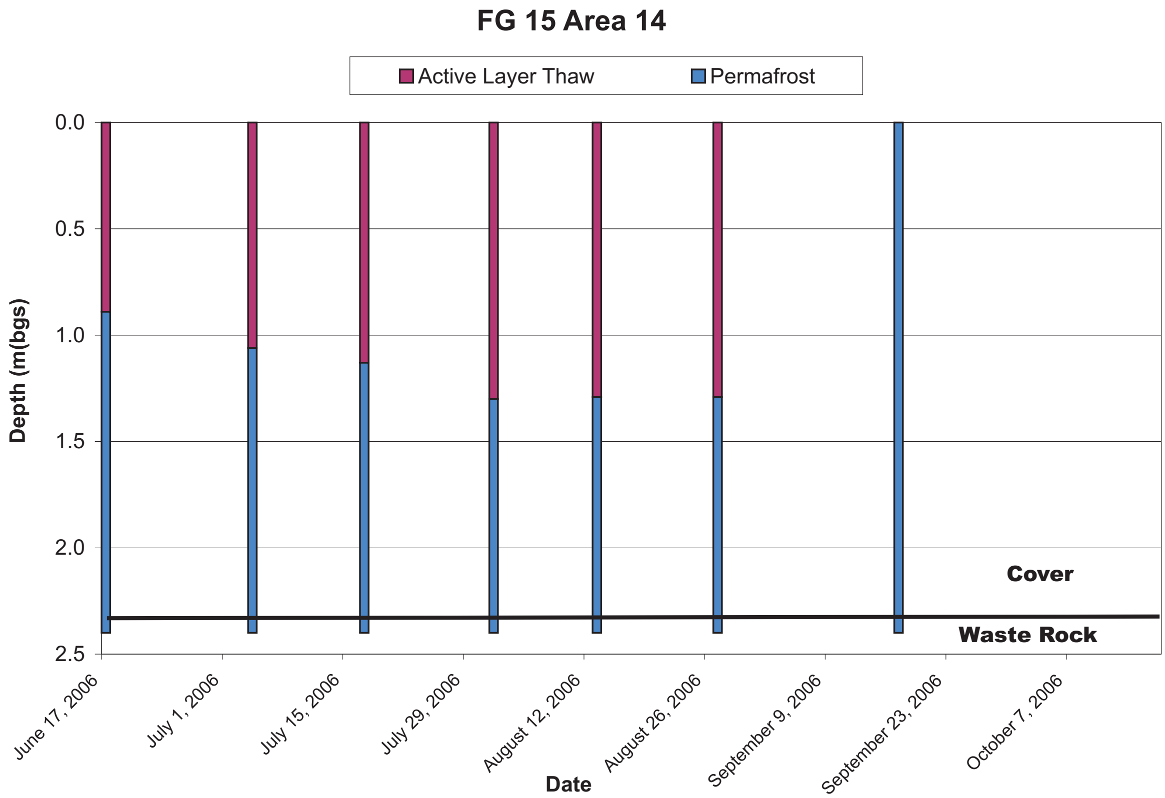

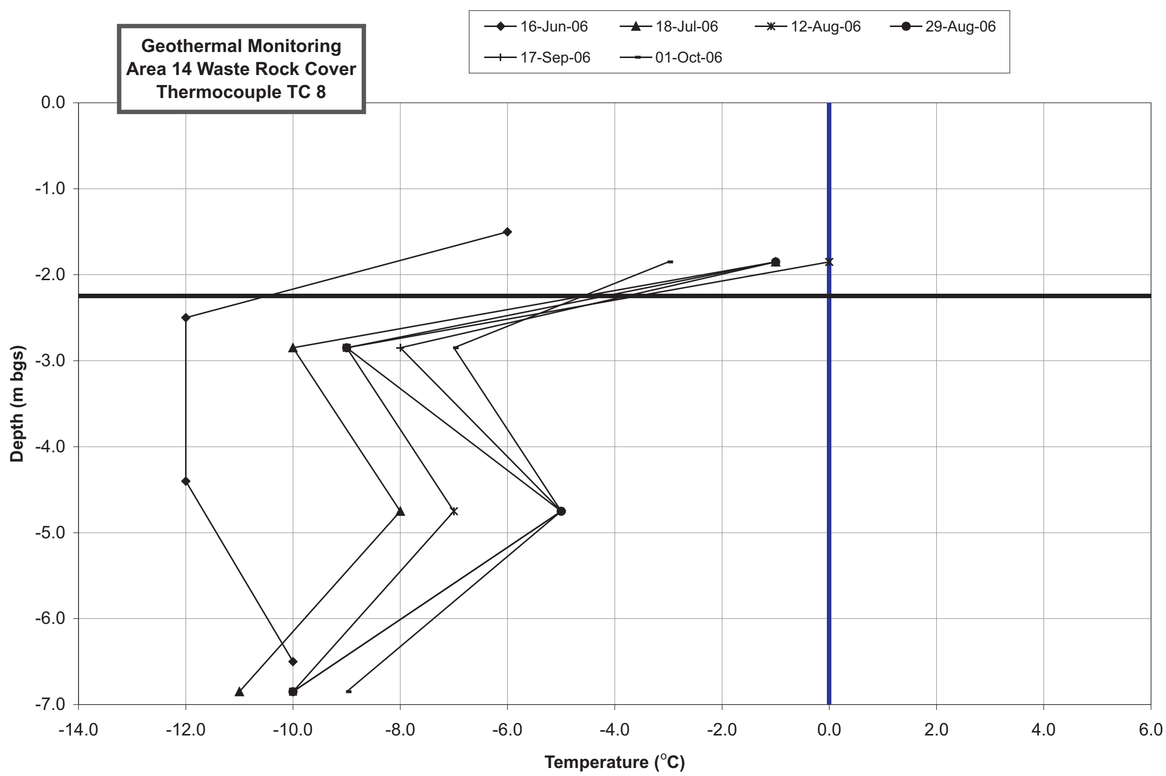

SCALE:	N/A	DESIGNED:	GKC
DATE:	JANUARY 2007	CHECKED:	GKC
DRAWN:	SLF	APPROVED:	JWC

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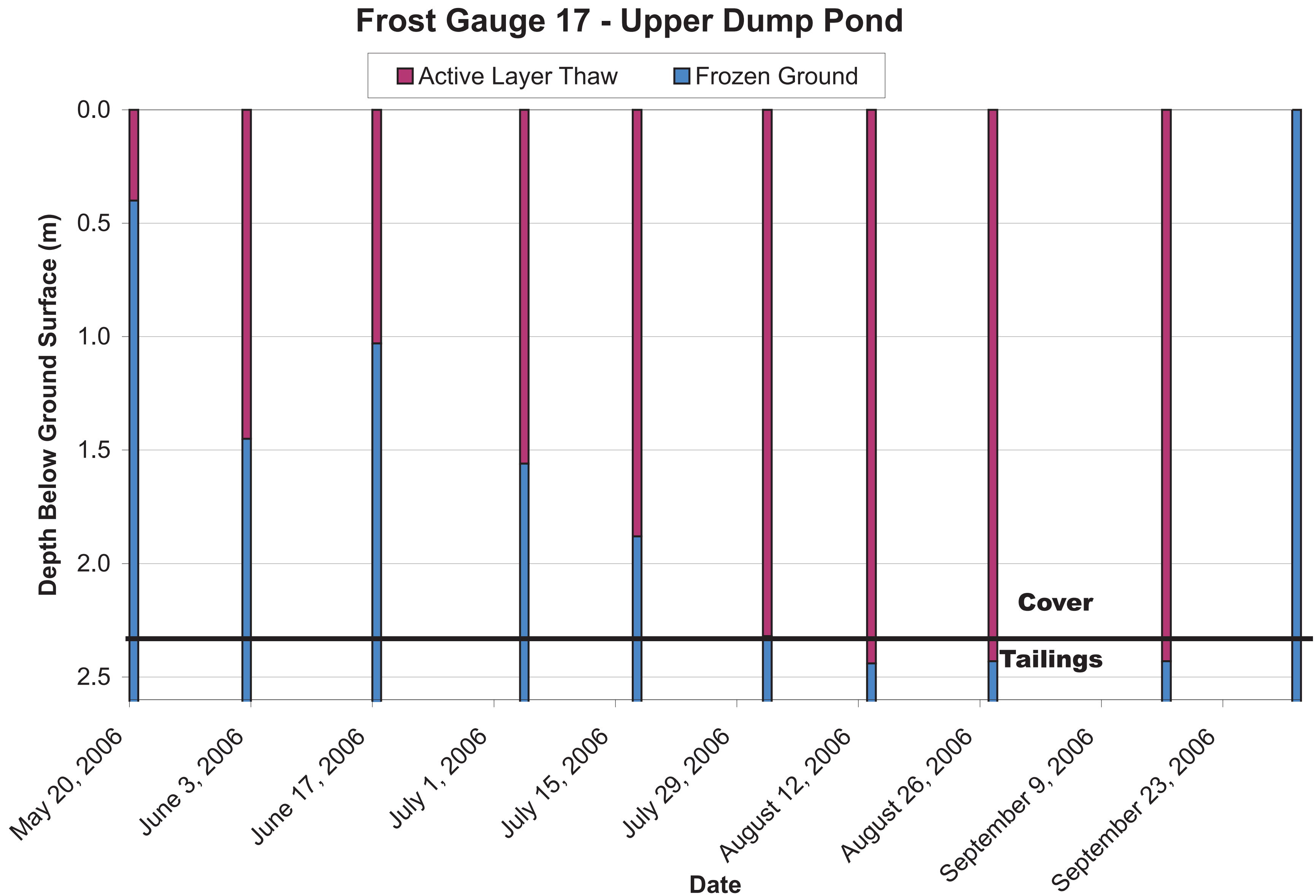
Calgary, Alberta. Phone: (403) 250-5185

PROJECT
NANISIVIK MINE
2006 ANNUAL GEOTECHNICAL INSPECTION

TITLE
AREA 14 WASTE ROCK COVER
GEOTECHNICAL MONITORING DATA

PROJECT No.	FIGURE No.	REV.
0255-013-08	27	0



DATE: JAN 2007	DRAWN SLF	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY Calgary, Alberta Phone: (403) 250-5185	PROJECT NANISIVIK MINE 2006 ANNUAL GEOTECHNICAL INSPECTION
REFERENCED DRAWING DESCRIPTION			TITLE UPPER DUMP POND TAILINGS COVER GEOTECHNICAL MONITORING DATA
		CLIENT BREAKWATER RESOURCES LTD.	PROJECT No. 0255-013-08 / FIGURE No. 28 / REV. 0

APPENDIX I - INSPECTION MEMO

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
1605, 840 – 7 Avenue S.W. , Calgary, Alberta, Canada. T2P 3G2
Phone (403) 250-5185 Fax (403) 250-5330

PROJECT MEMORANDUM

To:	**Nanisivik Mine**	**Fax No.:**	**Via email**
Attention:	**Murray Markle**	**CC:**	
From:	**Geoff Claypool (Ext. 104)**	**Date:**	**August 28, 2006**
Subject:	**Nanisivik Mine Geotechnical Inspection – August 2006**		
No. of Pages (including this page): 6		**Project No:**	**0255-013-08**

BGC completed the annual geotechnical inspection of waste containment facilities and reclamation covers at Nanisivik Mine between August 22 and 28, 2006. The significant observations and maintenance recommendations for each site are summarized below.

Oceanview Open Pit

Observations:

- no surface erosion noted
- some seepage at toe of cover
- one sinkhole observed
- some staining observed running onto edge of cover from upslope

Recommended Maintenance:

- improve low spot in drainage berm
- fill in sinkhole

Oceanview Portal

Observations:

- minor surficial erosion along east edge of portal cover
- sinkhole observed along west edge of cover near south corner
- no seepage observed

Recommended Maintenance:

- improve drainage berm where it meets the portal cover
- fix sinkhole in SW corner

K Baseline Portal
Observations:
- no erosion observed
- no seepage noted

Recommended Maintenance:
- no maintenance required

Kuhulu Lake Borrow Area
Observations:
- significant thermokarst features observed in floor of borrow area
- no ponding observed

Recommended Maintenance:
- re-grade floor of borrow area to ensure drainage not impeded

Chris Creek Borrow Area
Observations:
- no significant degradation of floor of borrow area

Recommended Maintenance:
- no maintenance required

East Trench
Observations:
- no significant erosion observed
- no seepage observed at toe of cover

Recommended Maintenance:
- no maintenance required

East Open Pit
Observations:
- no significant erosion noted on cover
- minor erosion at west edge of cover
- no flowing seepage at toe of cover but some standing water noted
- toe berm on cover still to be armoured

Recommended Maintenance:
- complete armouring at toe at berm location
- additional armouring at west edge of cover at toe

East Adit Treatment Pond Dike
Observations:
- dike to be breached shortly no significant observations of dike noted

Recommended Maintenance:
- no maintenance recommended

East Adit Retention Pond Dike

Observations:

- dike to be breached shortly no significant observations of dike noted

Recommended Maintenance:

- no maintenance recommended

Shale Hill Quarry

Observations:

- no erosion of regraded slopes noted
- minor thermokarsting in quarry floor, no ponding observed

Recommended Maintenance:

- no maintenance required

Shale Hill Raise

Observations:

- no erosion or deformation of cover noted

Recommended Maintenance:

- no maintenance required

17 N Portal

Observations:

- no significant erosion observed
- no seepage observed at toe of cover

Recommended Maintenance:

- no maintenance required

Upper Dump Pond

Observations:

- no significant erosion observed
- no seepage observed at toe of cover

Recommended Maintenance:

- no maintenance required

West Open Pit

Observations:

- no erosion of shale cover observed
- no seepage noted near pit
- armouring still being completed
- some additional shale to be applied in toe area

Recommended Maintenance:

- additional shale at toe of pit below road
- additional compaction of armour

Test Cell

Observations:
- no erosion of cover observed
- cover very undulating along north south arm of test cell dike
- outlet of test cell remains unarmoured

Recommended Maintenance:
- rip rap bottom of outlet
- rip rap shoreline at outlet
- re-compact north-south arm of test cell dike

Surface Cell

Observations:
- some cracking and settlement of cover in east/west trench
- one are near north end of cover was not rolled during construction
- small head pond at spillway inlet (approx. 20 cm deep)

Recommended Maintenance:
- roll unrolled area if possible

Reservoir Shoreline

Observations:
- no erosion of rip rap observed
- rip rap at toe of WT Dike appears to be to thin

Recommended Maintenance:
- add rip rap to shoreline at toe of West Twin Dike (30 cm lift)

Reservoir Breaches

Observations:
- water depth in breaches measured to range between 0.3 and 0.4 m below current water surface

Recommended Maintenance:
- lower bottom of breach by approx. 0.3 m.

West Twin Outlet

Observations:
- no erosion of rip rap observed
- some cracking of concrete observed
- water level behind wall appears to decrease with reduced inflows, may indicate seepage beneath or around dike
- rip rap in plunge pool appears to be undersized

Recommended Maintenance:
- place some additional large rip rap in plunge pool
- inspect wall for further cracking/leaks
- monitor water level on pond side of wall to assess leakage

TL Creek Diversion Berm

Observations:
- no erosion of rip rap observed

Recommended Maintenance:
- no maintenance required

TL sand and gravel quarry

Observations:
- some minor thermokarsting of quarry floor observed
- quarry appears to be draining into Reservoir

Recommended Maintenance:
- no maintenance required

Area 14

Observations:
- no erosion of cover noted
- some armouring of area still required (stockpiles there need to be spread and compacted)
- no armour yet applied to raise

Recommended Maintenance:
- complete armouring of portal
- complete armouring in nw corner along face

Area 14 Quarry

Observations:
- thermokarsting of quarry entrance is continuing
- erosion of highwall continues at northeast corner where ephemeral flow occurs into pit

Recommended Maintenance:
- construct ditch upslope of quarry to prevent further erosion of quarry face
- re-grade outlet of quarry to prevent ponding

Spillway

Observations:
- small pond at inlet, not exceeding 20 cm deep
- some staining on rocks near inlet
- some organic materials growing on rocks at inlet
- bottom of spillway very undulating downslope of access ramp
- thermokarst in spillway side wall near outlet
- some debris continues to fall into spillway in diabase section
- some erosion of access ramp occurring on southwest side
- north side of spillway still needs to be rip rapped

Recommended Maintenance:

- one pass with dozer in bottom of spillway to level and remove debris
- fix thermokarst near outlet with rip rap
- rip rap left side of spillway between flagged areas
- re-slope/ fix area where debris falls into spillway
- one pass with dozer on access road
- re-grade/ fix up area near deflection berms

Landfill

Observations:

- no erosion observed
- no seepage at toe of cover
- armour at surface very loose and un-compact

Recommended Maintenance:

- complete spreading of armour on west face
- compact armour surface

Landfill Quarry

Observations:

- no significant ponding
- no erosion observed

Recommended Maintenance:

- knock down berms at crest of slope into quarry
- re-slope crest of quarry (portion which remain near vertical).
- Level floor of quarry when material removal complete

Mt. Fuji Quarry

Observations:

- no significant ponding in bottom
- benches beginning to fill in

Recommended Maintenance:

- no maintenance required

APPENDIX II - INSPECTION PHOTOS

Photo 1
East Adit Treatment Pond and Dike. Note the low water level in the pond.

Photo 2
East Adit Retention Pond and Dike. Note the low water level as well.

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PROJECT
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TITLE
EAST ADIT TREATMENT FACILITY DIKES

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-1	0

Photo 3
Day tank farm and seepage collection berm.

Photo 4
Day tank farm seepage collection berm. Note there is no water in the cell and the disturbed liner in the corner.

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TITLE
DAY TANK FARM SPILL CONTAINMENT BERM

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-2	0

Photo 5
Main tank farm seepage collection berm on the downhill side.

Photo 6
Main tank farm seepage collection berm. Note exposed liner.

Photo 7
Water in seepage collection pond.

Photo 8
Seepage collection berm. Note a portion has been excavated during removal of hydrocarbon contaminated soils, and exposed the underlying GCL.

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PROJECT
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TITLE
MAIN TANK FARM SPILL CONTAINMENT BERM

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-3	0

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Photo 9
Water running in spillway between inlet and access ramp.

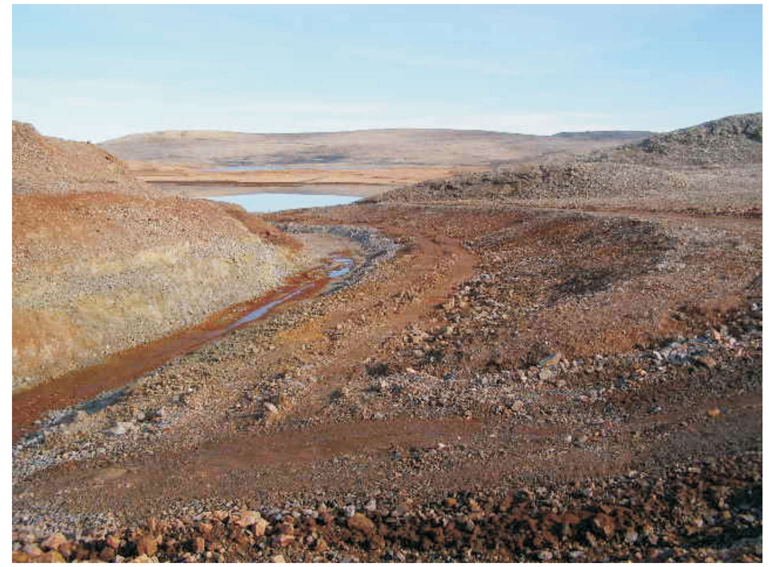

Photo 10
Spillway downstream of access ramp.

Photo 11
Benched area above spillway.

Photo 12
Spillway outlet. Note thermokarsting (circled) along right bank.

Photo 13
Undulating spillway bottom downstream of access ramp. View looking up gradient.

Photo 14
Weathered diabase debris cone in spillway bottom.

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PROJECT
NANISIVIK MINE
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TITLE
WEST TWIN DIKE SPILLWAY

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-4	0

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Photo 15
Concrete wall at West Twin Outlet Channel.

Photo 16
Plunge pool at West Twin Outlet Channel.

Photo 17
West Twin Outlet Channel as seen from high point east of wall.

Photo 18
Crack in concrete wall in West Twin Outlet Channel.

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SCALE:	N/A
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PROJECT
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TITLE
WEST TWIN LAKE OUTLET CHANNEL

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-5	0

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Photo 19
Riprapped face along East Twin Creek Diversion Berm. View looking upstream.

Photo 20
Riprapped face along East Twin Creek Diversion Berm. View looking downstream.

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TITLE
EAST TWIN LAKE CREEK DIVERSION BERM

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-6	0

Photo 21
Surface Cell and Test Cell covers as seen from Mt. Fuji. Note small head pond (in circle) at spillway inlet.

Photo 22
East/West drainage swale at Surface Cell. Note cracking along slopes.

Photo 23
Pond at spillway inlet. Note water depth is less than 0.3 m.

Photo 24
Drainage Swale “B” at Surface Cell.

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SCALE:	N/A
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DRAWN:	SLF
DESIGNED:	GKC
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PROJECT
NANISIVIK MINE
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TITLE
SURFACE CELL TAILINGS COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-7	0

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Photo II-25
Face of West Twin Dike. View looking north.

Photo 26
West Twin Dike as seen from Test Cell.

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DATE:	JANUARY 2007	CHECKED:	GKC
DRAWN:	SLF	APPROVED:	JWC

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TITLE
WEST TWIN DIKE

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-8	0

Photo 27
Test Cell cover with instruments in background.

Photo 28
Test Cell and Toe of West Twin Dike tailings cover.

Photo 29
Trench at Test Cell outlet.

Photo 30
Surface Cell and Test Cell covers. Note breach of rockfill baffle and haul road (in circle).

Photo 31
Test Cell tailings cover at toe of West Twin Dike.

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	-	- -	-	-	-
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SCALE:	N/A
DATE:	JANUARY 2007
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PROJECT
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TITLE
TEST CELL TAILINGS COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-9	0

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Photo 32
Surface of crest of north/south arm of Test Cell Dike. Note undulations.

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PROJECT
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TITLE
TEST CELL DIKE

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-10	0

Photo 33
Riprap along shoreline at toe of Test Cell Dike.

Photo 34
Riprap along shoreline at toe of Test Cell Dike.

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DATE:	JANUARY 2007	CHECKED:	GKC
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TITLE
TOE OF TEST CELL DIKE TAILINGS COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-11	0

Photo 35
Riprap along shoreline at toe of West Twin Dike.

Photo 36
Shoreline at toe of West Twin Dike.

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TITLE
TOE OF WEST TWIN DIKE TAILINGS COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-12	0

Photo 37
Toe of Landfill cover on west face. Note uncovered shale at toe.

Photo 38
Surface of Landfill cover. Note undulations and loose surface.

Photo 39
Landfill cover as seen from Stol Port . View looking south.

Photo 40
Landfill cover (in circle). View looking north.

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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
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PROJECT
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TITLE
LANDFILL COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-13	0

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Photo 41
West Open Pit waste rock cover as seen from Stol Port. View looking east. Note armouring still in progress.

Photo 42
Armour thickness at West Open Pit waste rock cover (~25 cm thick).

Photo 43
Armouring at West Open Pit.

Photo 44
West Open Pit waste rock cover. View looking northwest.

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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
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PROJECT
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TITLE
WEST OPEN PIT WASTE ROCK COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-14	0

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Photo 45
East Open Pit cover as seen from road to Oceanview.

Photo 46
Armour rock along base of remnant highwall of East Open Pit.

Photo 47
Erosion occurring at west end of East Open Pit cover where armour surface transitions into re-sloped shale surface below road.

Photo 48
Surface of East Open Pit cover.

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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
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PROJECT
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TITLE
EAST OPEN PIT WASTE ROCK COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-15	0

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Photo 49
East Trench cover (in circle) as seen from road to Oceanview.

Photo 50
East Trench cover armour surface.

SCALE:	N/A	DESIGNED:	GKC
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TITLE
EAST TRENCH WASTE ROCK COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-16	0

Photo 51
View of bottom of Oceanview Open Pit Waste Rock cover.

Photo 52
Seepage at toe of Oceanview Open Pit Waste Rock cover.

Photo 53
ARD running along east edge of Oceanview Open Pit Waste Rock cover. Note source is upslope of pit.

Photo 54
Sinkhole located near north end of Oceanview Open Pit Waste Rock cover.

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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
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PROJECT
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TITLE
OCEANVIEW PIT WASTE ROCK COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-17	0

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Photo 55
Area 14 waste rock cover.

Photo 56
Face of Area 14 waste rock cover. Note location of frost gauge and proximity to edge of cover.

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TITLE
AREA 14 WASTE ROCK COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-18	0

Photo 57
17 North Portal cover.

Photo 58
Seepage area at northeast corner of 17 North Portal cover.

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TITLE
17 NORTH PORTAL COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-19	0

Photo 59
Oceanview Portal cover. Note cover extension at the road and the water deflection berm.

Photo 60
Oceanview Portal cover as seen from road.

Photo 61
Sinkhole (in oval) at southwest corner of Oceanview Portal cover.

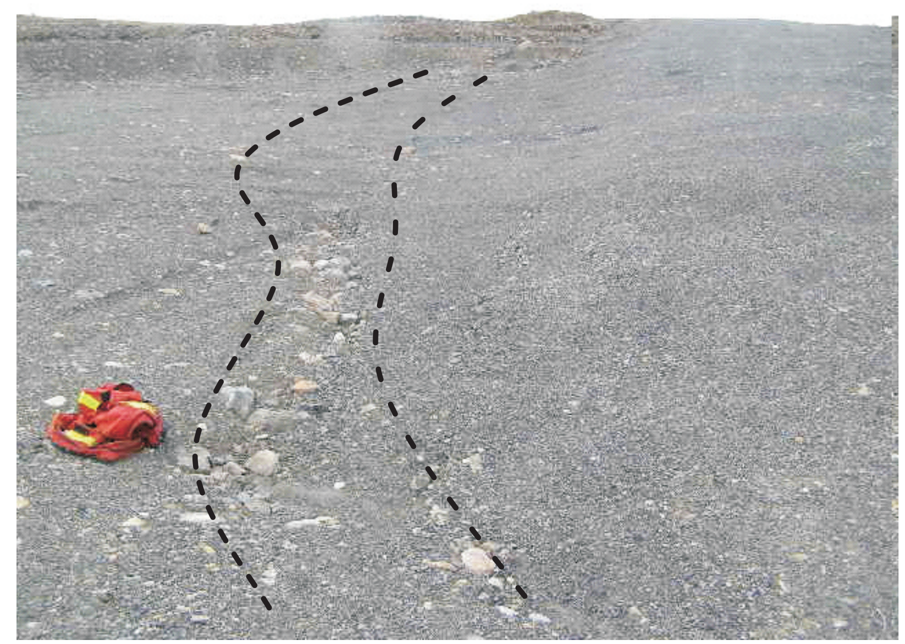

Photo 62
Edge of Oceanview Portal cover. Note minor erosional channel beginning to develop along edge of portal cover.

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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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SCALE:	N/A
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TITLE
OCEANVIEW PORTAL COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-20	0

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Photo 63
K-Baseline Portal cover as seen from Shale Hill.

Photo 64
Surface of K-Baseline Portal cover.

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TITLE
K-BASELINE PORTAL COVER

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-21	0

Photo 65
Shale Hill Raise cover.

Photo 66
Area 14 Raise.

Photo 67
Oceanview West Raise cover.

Photo 68
Area 14 Raise.

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SCALE:	N/A
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PROJECT
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TITLE
MINE RAISE COVERS

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-22	0

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Photo 69
Benches in Mt. Fuji borrow area. Note ravelling occurring onto benches creating a sloping surface.

Photo 70
Erosion occurring at north end of Area 14 borrow area.

Photo 71
Re-sloped face of Shale Hill borrow area.

Photo 72
Town site borrow area as seen from road to Mill. Note upper portion of slope still to be re-sloped.

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SCALE:	N/A
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PROJECT
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TITLE
SHALE BORROW AREAS

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-23	0

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Photo 73
Floor of Twin Lakes sand and gravel deposit.

Photo 74
Aerial view of Twin Lakes sand and gravel deposit. Note drainage into Reservoir.

Photo 75
D8 dozer at Kuhulu Lake Road deposit. Note thermokarsting on the right.

Photo 76
Surface of Chris Creek "A" sand and gravel deposit.

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SCALE:	N/A
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PROJECT
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TITLE
ARMOUR BORROW AREAS

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-24	0

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Photo 77
Mill foundation as seen from Stol Port.

Photo 78
Mill foundation. Note soil backfill being placed.

Photo 79
Mill foundation as seen from upslope of Mill area.

Photo 80
Plug for portal beneath Mill.

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SCALE:	N/A
DATE:	JANUARY 2007
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PROJECT
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TITLE
INDUSTRIAL COMPLEX

PROJECT No.	FIGURE No.	REV.
0255-013-08	II-25	0

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APPENDIX III – GEOTECHNICAL MONITORING DATA

Table 1 - Instrumention Program and Monitoring Requirements

Summary of Instrument Readings Requirements									
Instrument Label	Instrument Type	Location	Easting	Northing	Thawed Interval (warmer than -0.5°C)	Max. Active Layer Thickness	Pore Pressures	Comments	Recommended 2007 Monitoring Frequency
West Twin Dike									
TC12	Thermocouple	Dike Face	N/A	N/A	NONE	N/A	N/A	Dike remained frozen throughout 2006.	Quarterly
TC13A	Thermocouple	Dike Face	N/A	N/A	NONE	N/A	N/A	Dike remained frozen throughout 2006.	Quarterly
TC31	Thermocouple	Dike Face	N/A	N/A	NONE	N/A	N/A	Dike remained frozen throughout 2006.	Quarterly
TC32	Thermocouple	Dike Face	N/A	N/A	NONE	N/A	N/A	Dike remained frozen throughout 2006.	Quarterly
TC33	Thermocouple	Dike Face	N/A	N/A	NONE	N/A	N/A	Dike remained frozen throughout 2006.	Quarterly
BGC03-33	Thermistor	Dike Crest	581325	8104650	>21 m	N/A	N/A	Continued cooling throughout profile in 2006. May remain thawed between 21 and 24 m bgs.	Quarterly
BGC03-34	Thermistor	Dike Crest	581325	8104650	NONE	N/A	N/A	Frozen profile observed in 2006. Continued cooling observed throughout profile.	Quarterly
BGC05-09	Thermistor	Dike Crest	581450	8104860	> 20 m	2.1 m	N/A	Profile below 20 m appears to be frozen.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-15	Thermistor	Dike Crest	581390	8104770	> 20 m	2.8 m	N/A	Profile below 20 m appears to be frozen.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-17	VW Piezo.	Dike Crest	581350	8104690	N/A	N/A	+3.5 m	Approximately 3.5 m artesian, but stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
Surface Cell									
BGC02-03	Thermistor	Surface Cell	581205	8104650	> 11 m	N/A	N/A	Not many functioning nodes. Temperatures between 11 and 14 m stabilized.	Quarterly
BGC03-07	Thermistor	Surface Cell	581440	8104925	NONE	N/A	N/A	Frozen profile observed in 2005. Not monitored much in 2006 due to cable end frozen into ground. Freed late in year using CaCl. Continued cooling observed at depth (20 - 25 m).	Quarterly
BGC03-09	Thermistor	Surface Cell	581360	8104785	> 16 m	N/A	N/A	Appears to remain thawed below 16 m. Freezing front migrated from 14 m in 2004/2005 to 16 m in 2005/2006.	Quarterly
BGC03-10	Thermistor	Surface Cell	581340	8104830	> 9 m	N/A	N/A	Cooling of ground temperatures to 8 m bgs observed. Warming of ground temperatures observed between 11 and 23 m. Temperatures below 25 m stable near 0°C.	Quarterly
BGC03-11	Thermistor	Surface Cell	581260	8104720	> 10 m	1.7 m	N/A	Provides active layer data from 2005 and 2006. Thawed to same depth in 2006 as in 2005. Temperature at 0.9 m bgs cooler in 2006 than 2005. Cooling of ground temperatures to 10 m bgs observed in 2006. Warming of ground temperatures occuring between 11 and 17 m bgs, though seem to have stabilized between 2005 and 2006. Continued cooling observed at depth (20 - 25 m).	Quarterly Bi-weekly June 1 - Sept 30
BGC03-14	Vibrating Wire Piezometer	Surface Cell	581280	8104610	N/A	N/A	NONE	Piezometer tip freezing in.	Quarterly Bi-weekly June 1 - Sept 30
BGC03-15	Thermistor	Surface Cell	581290	8104600	16 - 19 m	N/A	N/A	Frozen profile observed in 2006. Continued cooling observed at depth (18 m and below). Some permafrost aggradation from below also appears to be occuring.	Quarterly
BGC03-20	Thermistor	Surface Cell	581050	8104750	> 20 m	1.4 m	N/A	Profile between 16 and 19 m bgs remains thawed but shows cooling. Some permafrost aggradation from below appears to be occuring.	Quarterly Bi-weekly June 1 - Sept 30
BGC03-21	Thermistor	Surface Cell	581200	8104925	NONE	N/A	N/A	Frozen profile observed in 2006. May remain thawed below 20 m, beyond depth of instrument. Ground temperatures between 0 and 10 m are frozen and cooling. Ground temperatures between 10 and 20 m frozen and stable.	Quarterly
BGC03-32	Vibrating Wire Piezometer	Surface Cell	581350	8104760	N/A	N/A	+5 m	Approximately 5 m artesian, but stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC03-35	Vibrating Wire Piezometer	Surface Cell	581150	8104615	N/A	N/A	+4 m	Approximately 4 m artesian, and increasing.	Quarterly Bi-weekly June 1 - Sept 30
BGC03-36	Thermocouple	Surface Cell	581150	8104615	NO DATA	N/A	N/A	No data collected in 2006.	Quarterly
BGC03-37	Thermistor	Surface Cell	581490	8104970	NONE	1.4 m	N/A	Provides active layer data from 2005 and 2006. Thawed to same depth in 2006 as in 2005.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-05	Thermistor	Surface Cell	581295	8104840	unknown	2.4 m	N/A	Instrument malfunctioning.	Quarterly
BGC05-06	VW Piezo.	Surface Cell	581310	8104820	N/A	N/A	+5 m	Approximately 5 m artesian, but stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-07	VW Piezo.	Surface Cell	581250	8104730	N/A	N/A	+5 m	Approximately 5 m artesian, but stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-08	Contingency	Surface Cell	581260	8104740	N/A	N/A	N/A	No instrument installed.	None at this time.

Table 1 - Instrumention Program and Monitoring Requirements

Summary of Instrument Readings Requirements									
Instrument Label	Instrument Type	Location	Easting	Northing	Thawed Interval (warmer than -0.5°C)	Max. Active Layer Thickness	Pore Pressures	Comments	Recommended 2007 Monitoring Frequency
Surface Cell									
BGC05-10	VW Piezo.	Surface Cell	581390	8104815	N/A	N/A	+0.5 m	Approximately 0.5 m artesian, but stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-11	Monitoring Well	Surface Cell	581290	8104785	N/A	N/A	N/A	0.08 mg/L Zn, 0.058 mg/L Pb	Once per summer.
BGC05-12	Monitoring Well	Surface Cell	581320	8104760	N/A	N/A	N/A	0.29 mg/L Zn, 0.208 mg/L Pb	Once per summer.
BGC05-13	VW Piezo.	Surface Cell	581220	8104625	N/A	N/A	+2.5 m	Approximately 2.5 m artesian, but stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-14	Contingency	Surface Cell	581390	8104770	N/A	N/A	N/A		None at this time.
BGC05-16	Contingency	Surface Cell	581350	8104690	N/A	N/A	N/A		None at this time.
FG-1	Frost Gauge	Surface Cell	518450	8104950	N/A	1.3 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
FG-2	Frost Gauge	Surface Cell	581330	8104775	N/A	1.3 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
FG-3	Frost Gauge	Surface Cell	581250	8104650	N/A	>1.5 m	N/A	Thaw front migrated through cover between late July and Late August.	Bi-weekly (June 1 - Sept 15)
FG-4	Frost Gauge	Surface Cell	581025	8104725	N/A	1.2 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
FG-5	Frost Gauge	Surface Cell	581225	8104975	N/A	1.3 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
FG-6	Frost Gauge	Surface Cell	581090	8104930	N/A	1.0 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)

Notes:
Quarterly readings to be taken during December, Late April, Early July, Late August.
Frost Gauges to be read weekly between June 1 and Sept. 1

Table 1 - Instrumention Program and Monitoring Requirements

Summary of Instrument Readings Requirements									
Instrument Label	Instrument Type	Location	Easting	Northing	Thawed Interval (warmer than -0.5°C)	Max. Active Layer Thickness	Pore Pressures	Comments	Recommended Monitoring Frequency
Toe of West Twin Dike									
BGC03-18	Thermocouple	Toe of West Twin Dike	581440	8104660	NONE	N/A	N/A	No data in 2006.	Quarterly
BGC03-19	Thermistor	Toe of West Twin Dike	581475	8104715		2.4 m	N/A	Entire profile frozen. Temperatures at depth still cooling. Temperatures near surface appear to have stabilized.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-26	Thermistor	Toe of West Twin Dike	581400	8104600	NONE	2.8 m	N/A	Entire profile frozen. Near surface thermistors nodes not placed appropraitely for accurate monitoring of active layer thaw.	Quarterly Bi-weekly June 1 - Sept 30
Test Cell									
BGC05-04	Thermistor	Test Cell	581575	8104850	NONE	1.5 m	N/A	Entire profile frozen. Profile maybe thawed below 18 m, below depth of instrument.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-18	VW Piezo.	Test Cell	581600	8104825	N/A	N/A	-2 m bgs	Approximately 2 m bgs, and stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-19	Thermistor	Test Cell	581675	8104790	> 7 m	2.3 m	N/A	Ground profile appears to be thawed below 7 m.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-20	VW Piezo.	Test Cell	581675	8104775	N/A	N/A	-2 m bgs	Approximately 2 m bgs, and stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-21	Monitoring Well	Test Cell	581660	8104760	N/A	N/A	N/A	0.95 mg/L Zn, 0.501 mg/L Pb	Once per summer.
BGC05-22	VW Piezo.	Test Cell	581640	8104690	N/A	N/A	-4 m bgs	Approximately 4 m bgs, and stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-23	Monitoring Well	Test Cell	581640	8104675	N/A	N/A	N/A	1.01 mg/L Zn, 0.150 mg/L Pb	Once per summer.
BGC05-24	VW Piezo.	Test Cell	581590	8104710	N/A	N/A	-2 m bgs	Approximately 2 m bgs, and stabilizing.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-25	Contingency	Test Cell	581575	8104725	N/A	N/A	N/A		None at this time.
FG-7	Frost Gauge	Test Cell	581550	8104820	N/A	>1.5 m	N/A	Thaw front migrated through cover between late July and Late August.	Bi-weekly (June 1 - Sept 15)
FG-8	Frost Gauge	Test Cell	581750	8104850	N/A	1.3 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
Test Cell Dike									
BGC02-09	Thermistor	Test Cell Dike	581600	8104680	> 20 m	N/A	N/A	Cooling of ground temperatures at depth (8 m bgs) observed. Profile probably still thawed below 23 m.	Quarterly
BGC03-22	Thermistor	Test Cell Dike	581660	8104650	> 18 m	N/A	N/A	Ground profile appears to be thawed below 18 m. Cooling observed between 18 and 27 m.	Quarterly
BGC05-29	Thermistor	Test Cell Dike	581600	8104700	> 15 m	1.7 m	N/A	Frozen to approximately 16 m.	Quarterly Bi-weekly June 1 - Sept 33
Toe of Test Cell Dike									
BGC05-26	Thermistor	Toe of Test Cell Dike	581400	8104600	NONE	2.8 m	N/A	Entire profile frozen. Near surface thermistors nodes not placed appropraitely for accurate monitoring of active layer thaw.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-27	Thermistor	Toe of Test Cell Dike	581720	8104640	> 15 m	3.4 m	N/A	Profile frozen to approximately 15 m bgs. Near surface thermistors nodes not placed appropraitely for accurate monitoring of active layer thaw.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-28	VW Piezo.	Toe of Test Cell Dike	581630	8104660	N/A	N/A	-2 m bgs	Approximately 2 m bgs, some increase observed in 2006.	Quarterly Bi-weekly June 1 - Sept 30
FG-9	Frost Gauge	Toe of Test Cell Dike	581600	8104685	N/A	>1.4 m	N/A	Thaw front migrated through cover between late July and Late August.	Bi-weekly (June 1 - Sept 15)
FG-10	Frost Gauge	Toe of Test Cell Dike	581835	8104750	N/A	>1.6 m	N/A	Thaw front migrated through cover between late July and Late August.	Bi-weekly (June 1 - Sept 15)

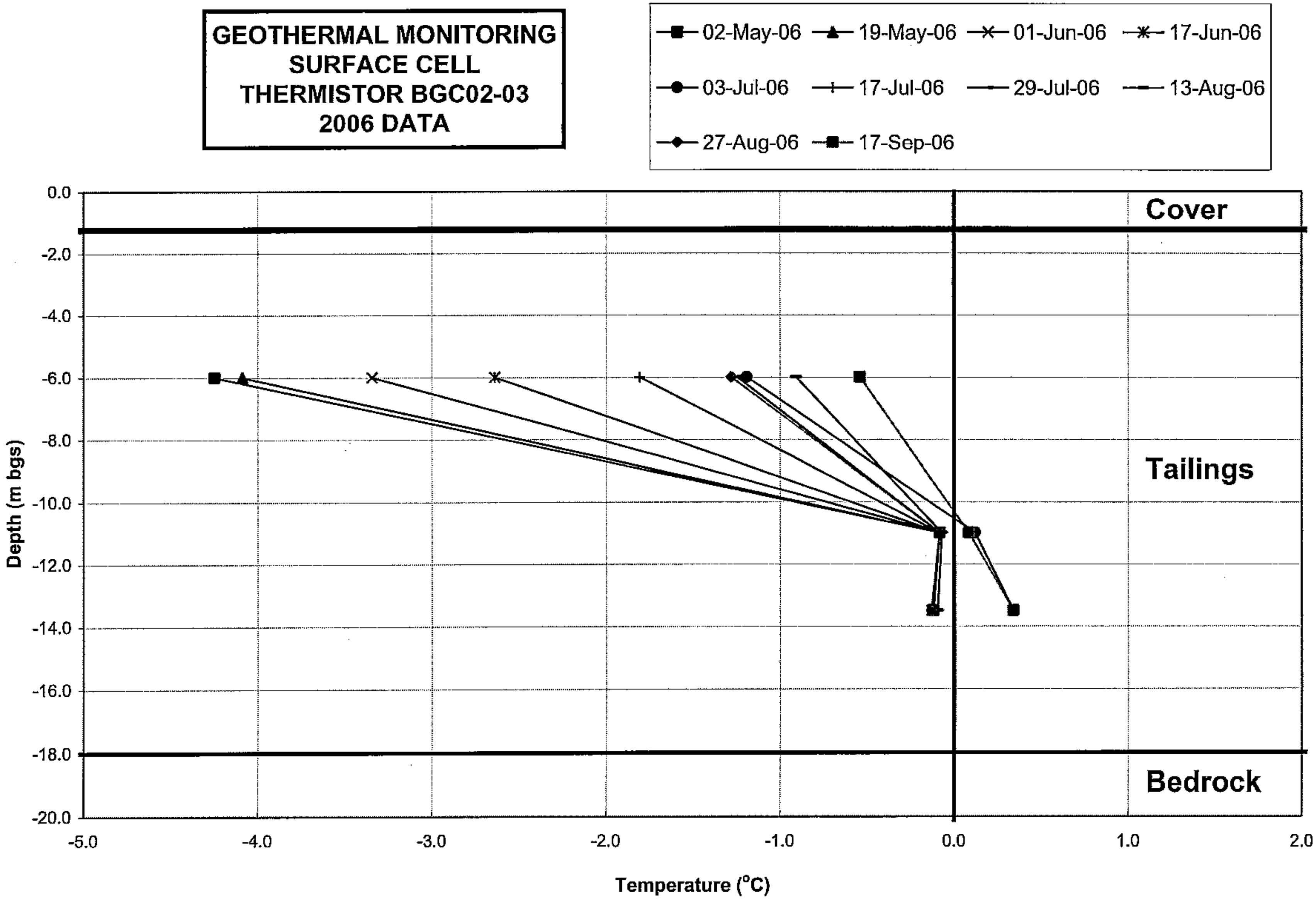
Table 1 - Instrumention Program and Monitoring Requirements

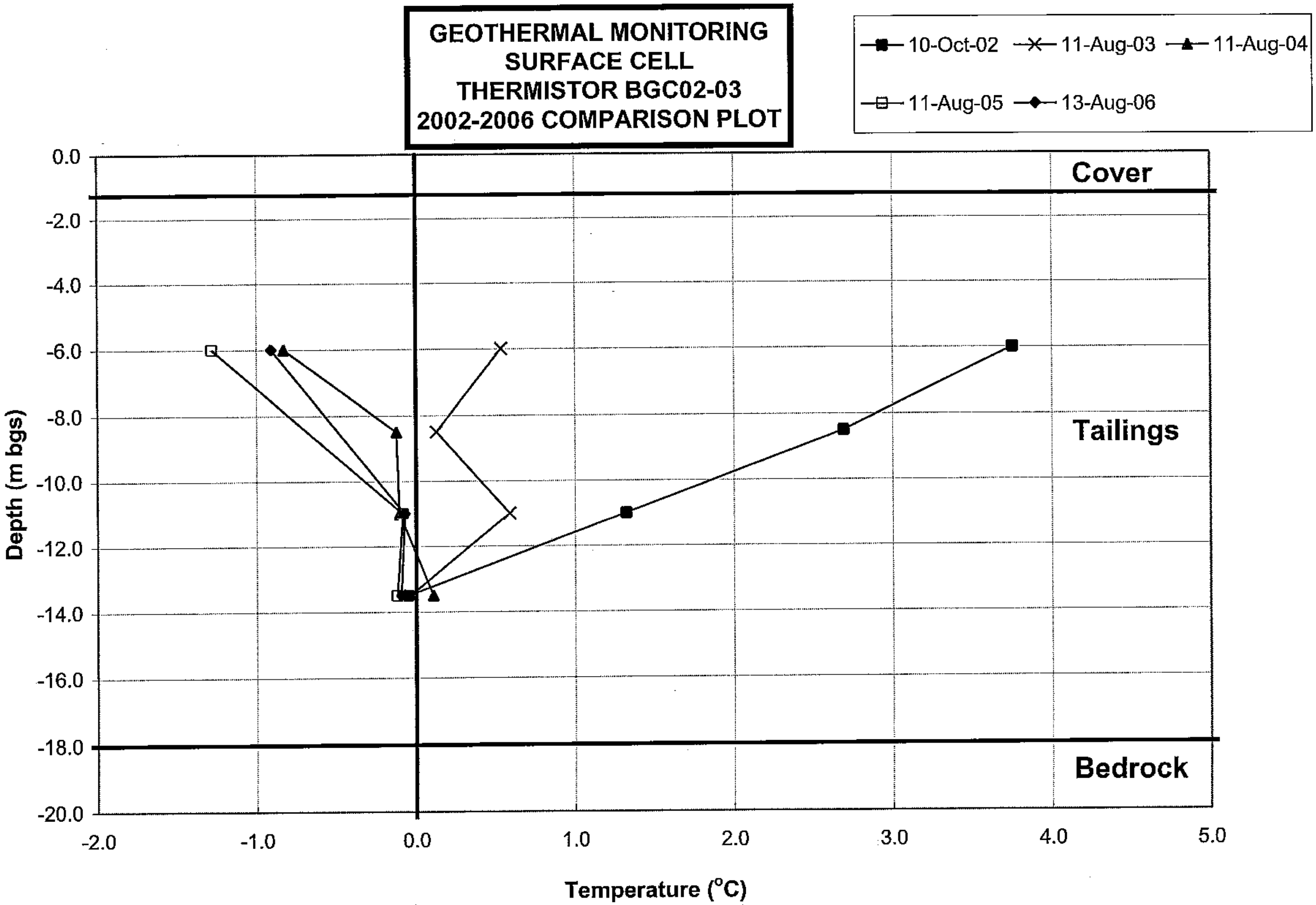
Summary of Instrument Readings Requirements									
Instrument Label	Instrument Type	Location	Easting	Northing	Thawed Interval (warmer than -0.5°C)	Max. Active Layer Thickness	Pore Pressures	Comments	Recommended Monitoring Frequency
Oceanview Pit									
BGC05-01	Thermistor	Oceanview Pit	579250	8106310	NONE	1.9 m	N/A	Active layer contained within cover throughout 2006, waste rock backfill remained frozen throughout 2006.	Quarterly Bi-weekly June 1 - Sept 30
FG-16	Frost Gauge	Oceanview Pit	585440	8107580	N/A	1.3 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
East Open Pit									
BGC05-02	Thermistor	East Open Pit	583250	8107045	NONE	2.1 m	N/A	Active layer contained within cover throughout 2006, waste rock backfill remained frozen throughout 2006.	Quarterly Bi-weekly June 1 - Sept 30
BGC05-03	Thermistor	East Open Pit	583320	8107090	2 - 5 m	4.9 m	N/A	Some thaw into underlying waste rock, performance probably related to thickness of underlying fill (> 10 m).	Quarterly Bi-weekly June 1 - Sept 30
FG-13	Frost Gauge	East Open Pit	583250	8107050	N/A	>2.5 m	N/A	Thaw front migrated through cover between late July and Late August.	Bi-weekly (June 1 - Sept 15)
FG-14	Frost Gauge	East Open Pit	583330	8107150	N/A	1.9 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
Landfill									
BGC05-30	Thermistor	Landfill	579165	8106300	NONE	2.2 m	N/A	Active layer contained within cover throughout 2006, landfill debris remained frozen throughout 2006.	Quarterly Bi-weekly June 1 - Sept 30
FG-11	Frost Gauge	Landfill	579253	8106323	N/A	1.9 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
FG-12	NOT INSTALLED								
Area 14									
TC7	Thermocouple	Area 14				N/A	N/A		Quarterly
FG-15	Frost Gauge	Area 14	584130	8105360	N/A	1.3 m	N/A	Thaw contained within cover throughout 2006.	Bi-weekly (June 1 - Sept 15)
Upper Dump Pond									
FG-17	Frost Gauge	U. Dump Pond			N/A	2.4 m	N/A	Thaw front migrated through cover between late July and Late August.	Bi-weekly (June 1 - Sept 15)

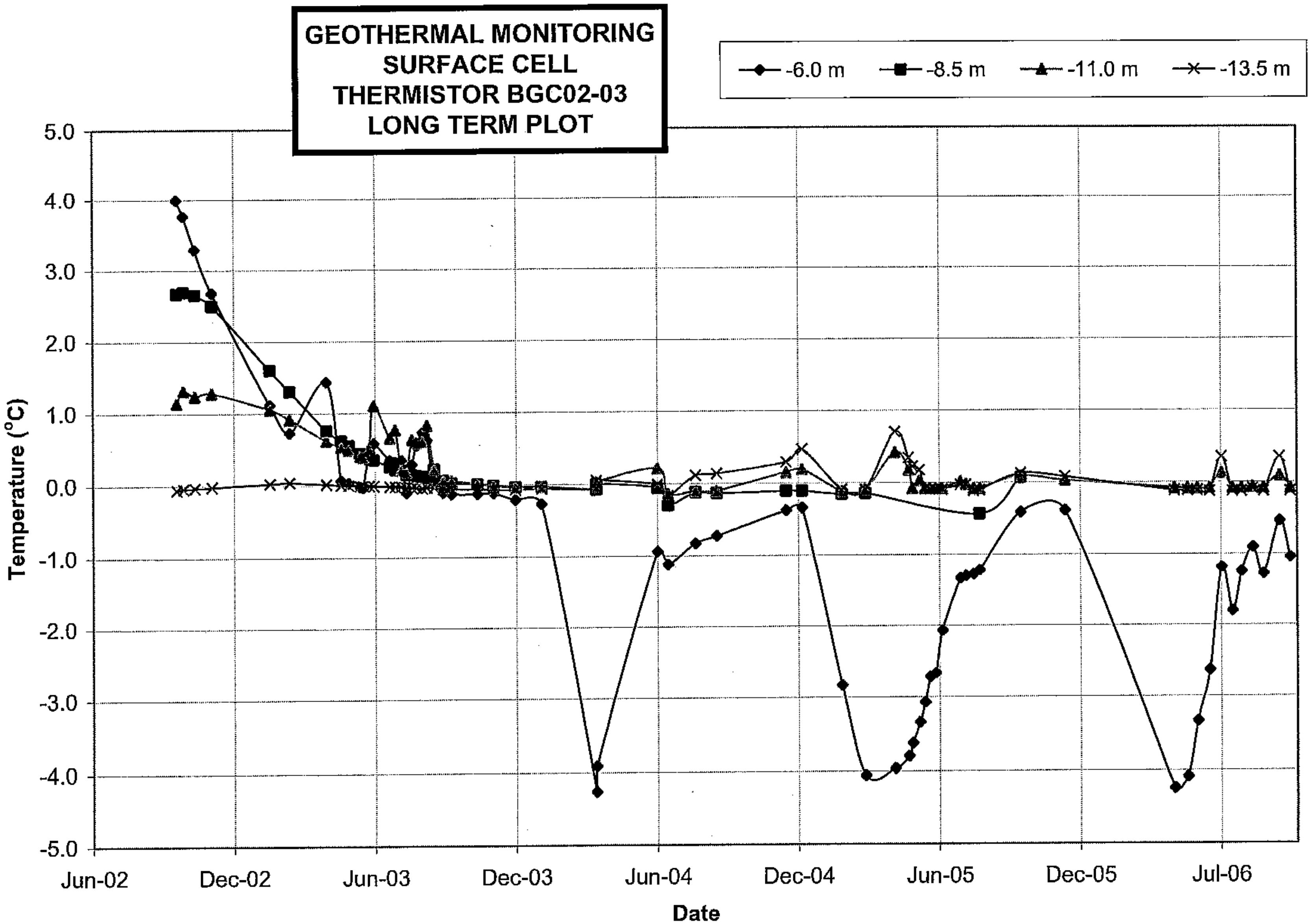
Notes:
Quarterly readings to be taken during December, Late April, Early July, Late August.
Frost Gauges to be read weekly between June 1 and Sept. 15.

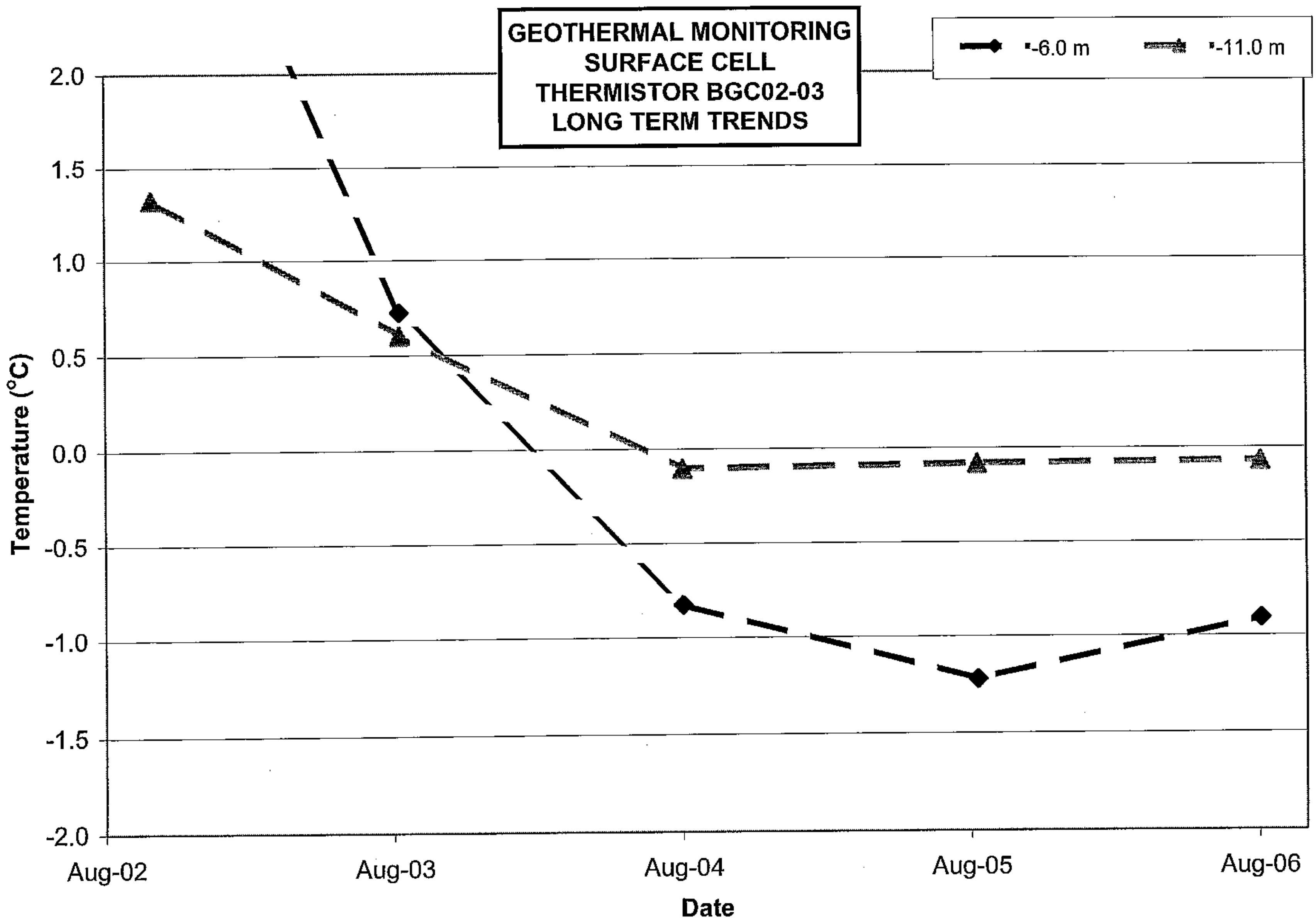
SURFACE CELL

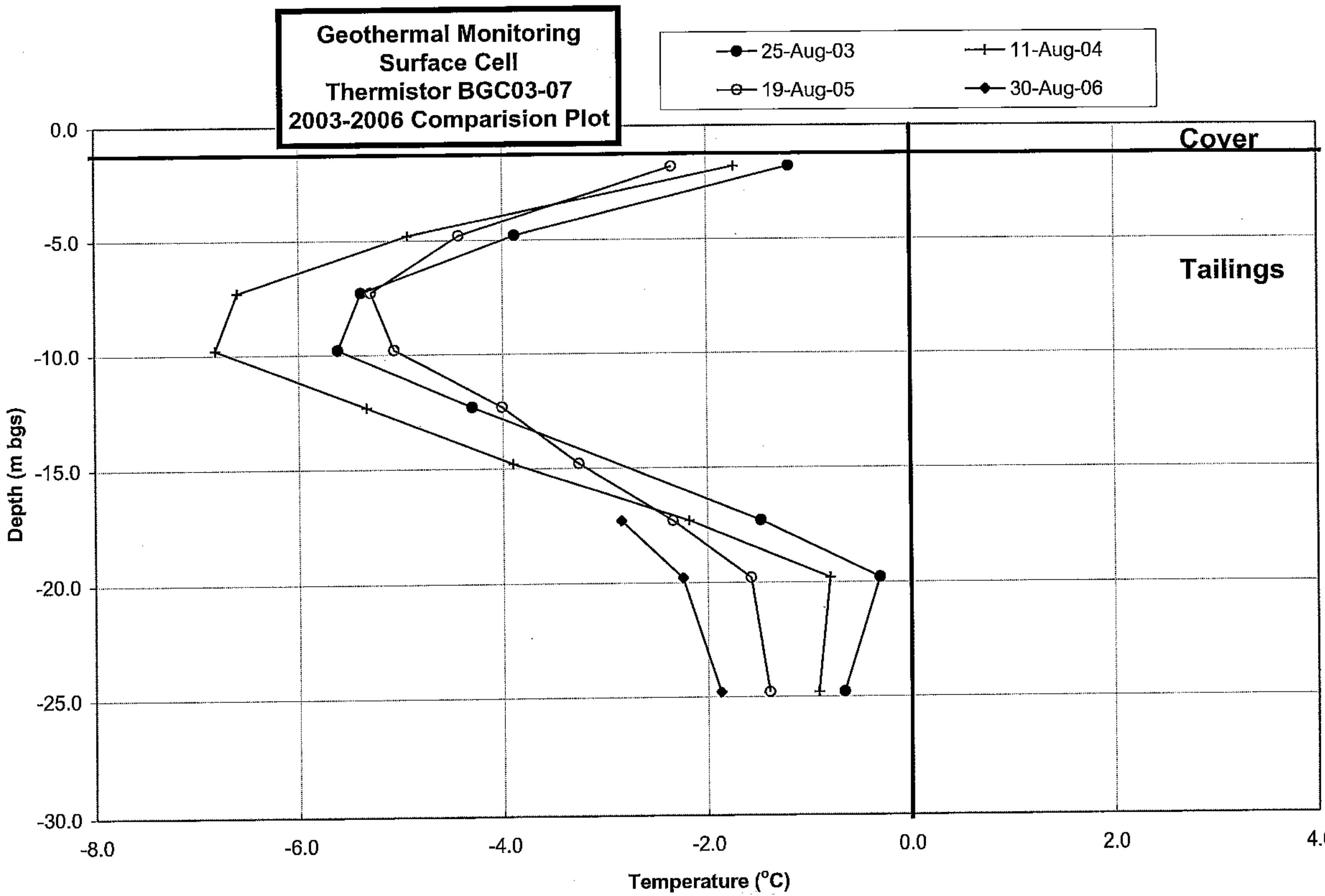
GEOTHERMAL MONITORING
SURFACE CELL
THERMISTOR BGC02-03
2006 DATA

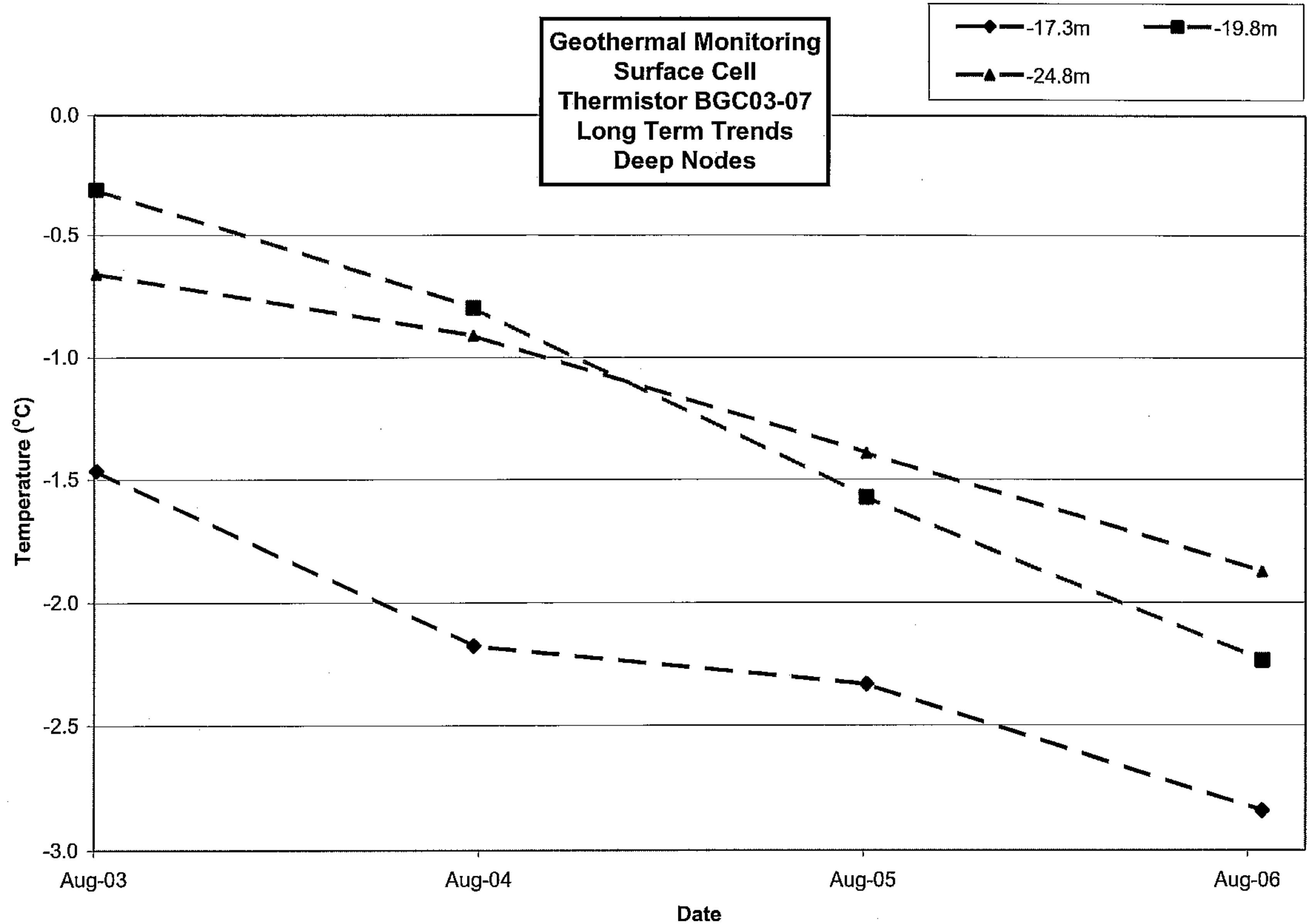


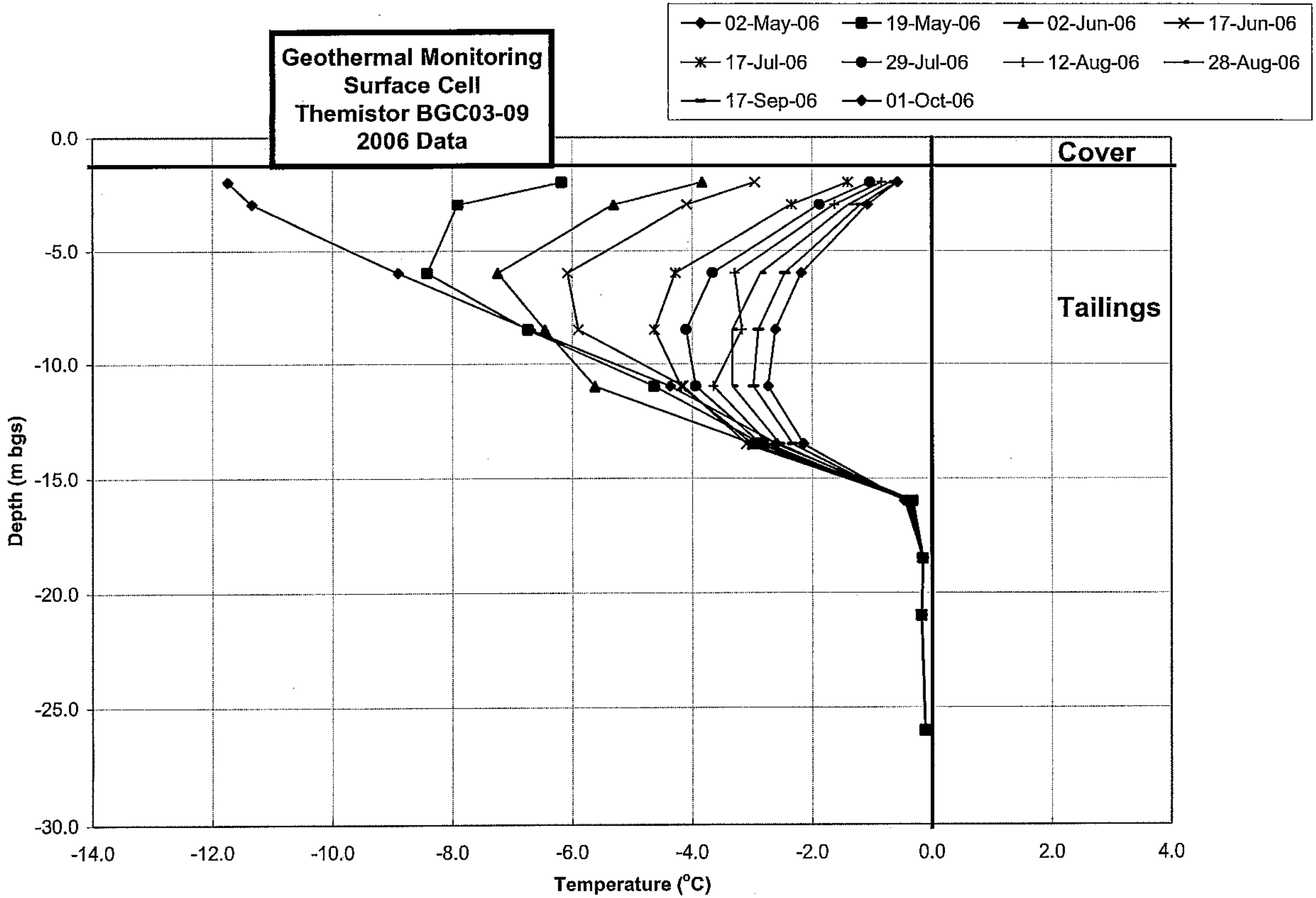

GEOTHERMAL MONITORING
SURFACE CELL
THERMISTOR BGC02-03
2002-2006 COMPARISON PLOT
10-Oct-02
11-Aug-03
11-Aug-04
11-Aug-05
13-Aug-06
Cover
Tailings
Bedrock
Depth (m bgs)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
-20.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Temperature (°C)

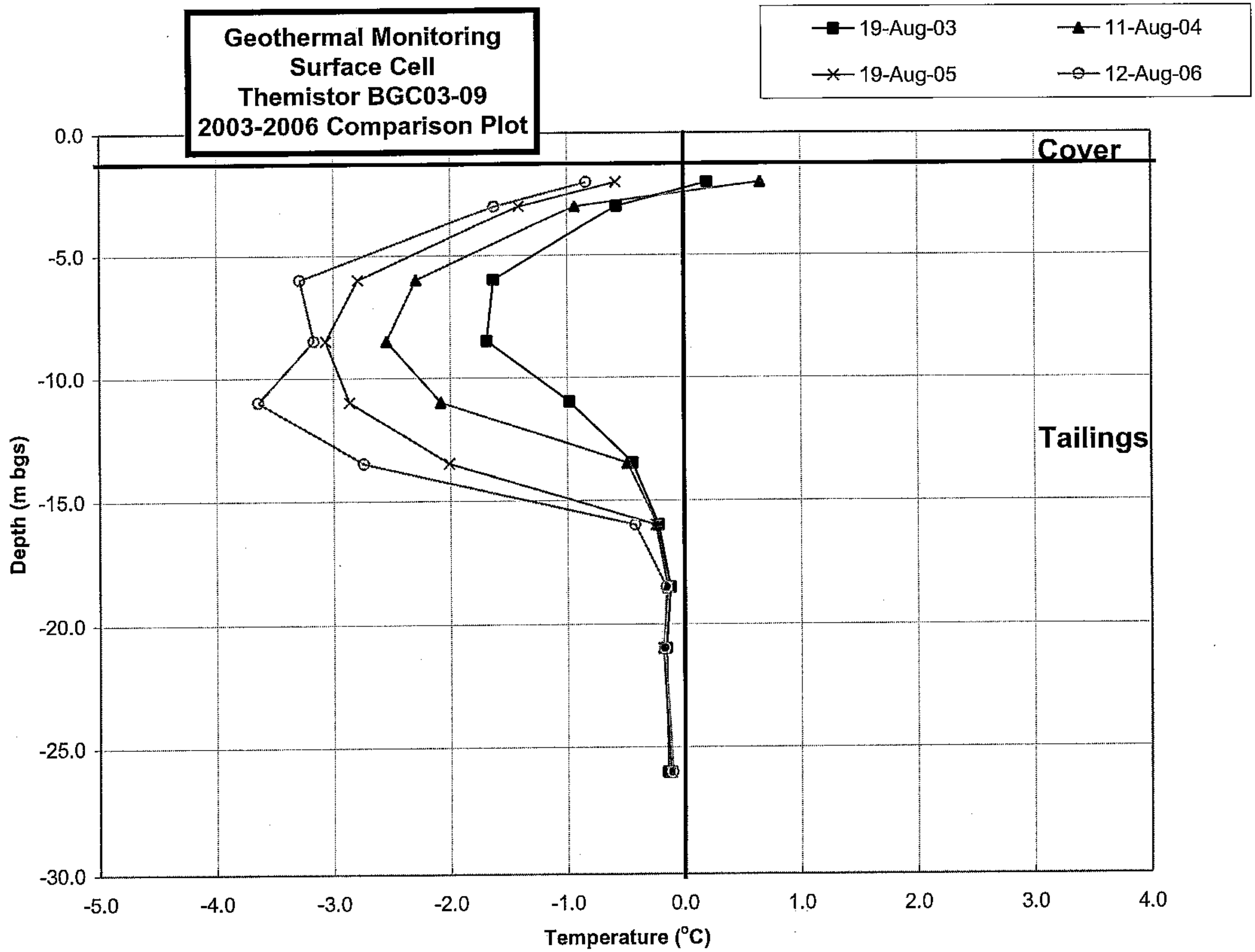

GEOTHERMAL MONITORING
SURFACE CELL
THERMISTOR BGC02-03
LONG TERM PLOT
-6.0 m
-8.5 m
-11.0 m
-13.5 m
Temperature (°C)
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
Jun-02
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jul-06
Date

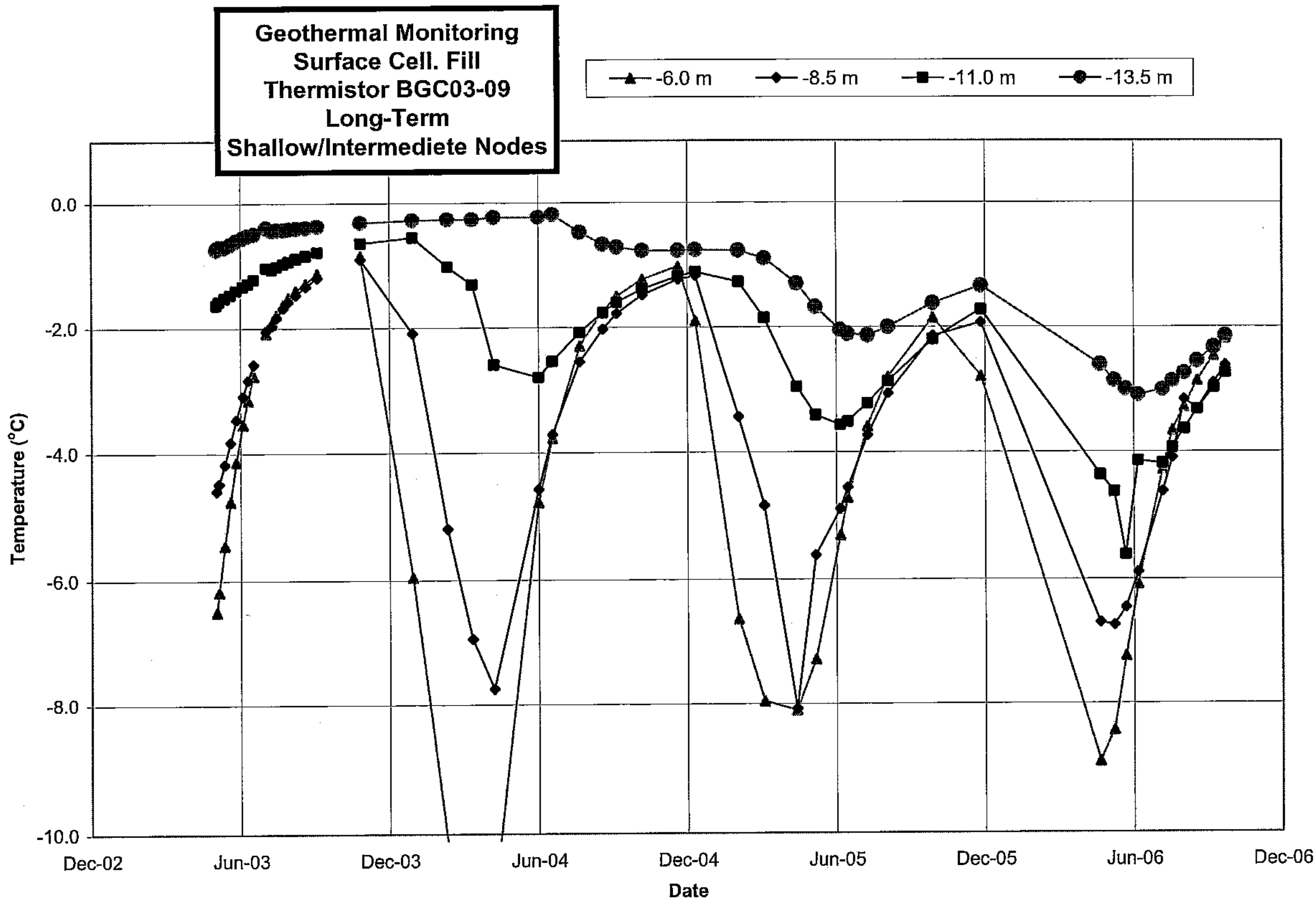

GEOTHERMAL MONITORING
SURFACE CELL
THERMISTOR BGC02-03
LONG TERM TRENDS
-6.0 m
-11.0 m
Temperature (°C)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Date

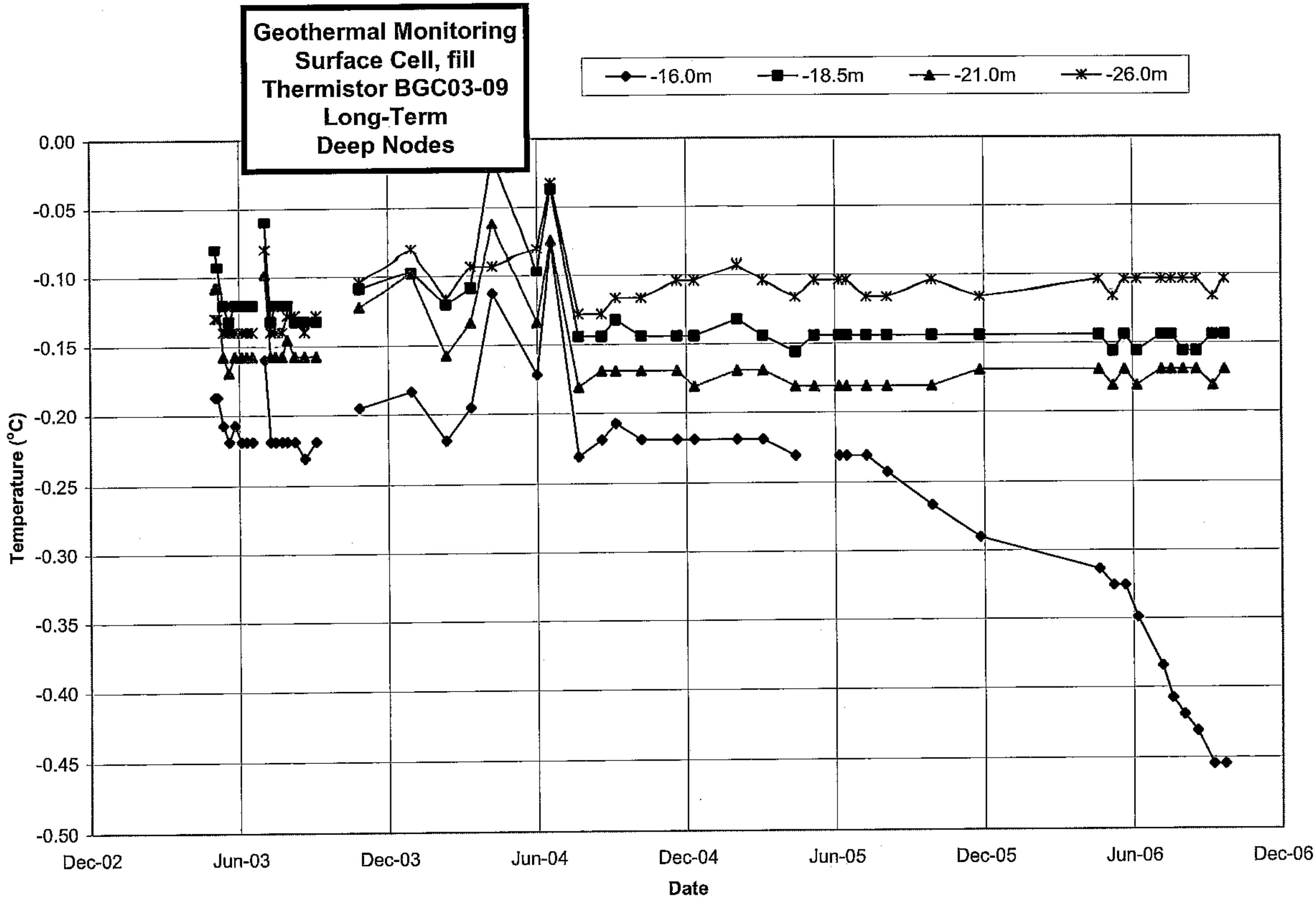

Geothermal Monitoring
Surface Cell
Thermistor BGC03-07
2003-2006 Comparision Plot
25-Aug-03
11-Aug-04
19-Aug-05
30-Aug-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

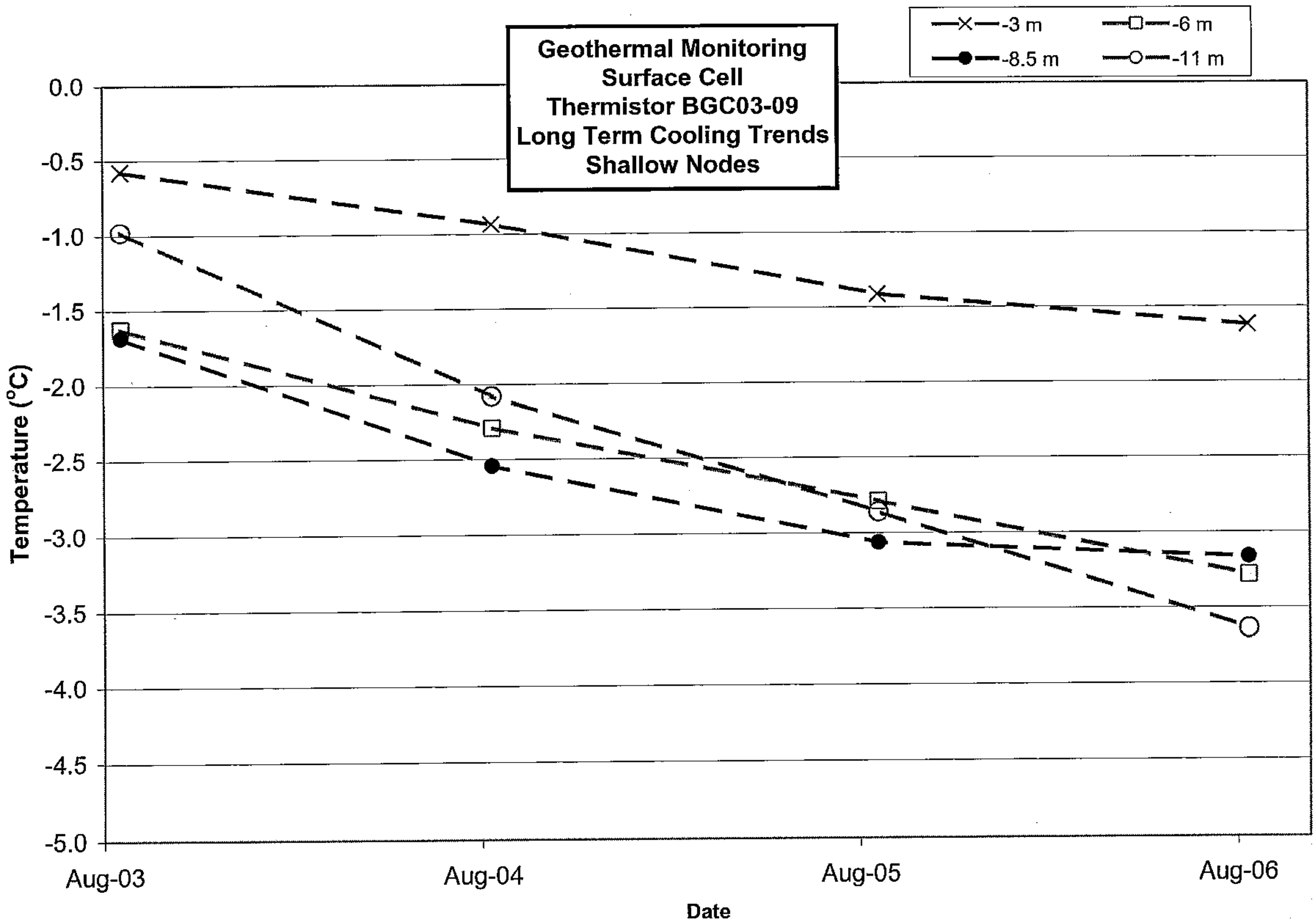

Geothermal Monitoring
Surface Cell
Thermistor BGC03-07
Long Term Trends
Deep Nodes
-17.3m
-19.8m
-24.8m
Temperature (°C)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
Aug-03
Aug-04
Aug-05
Aug-06
Date

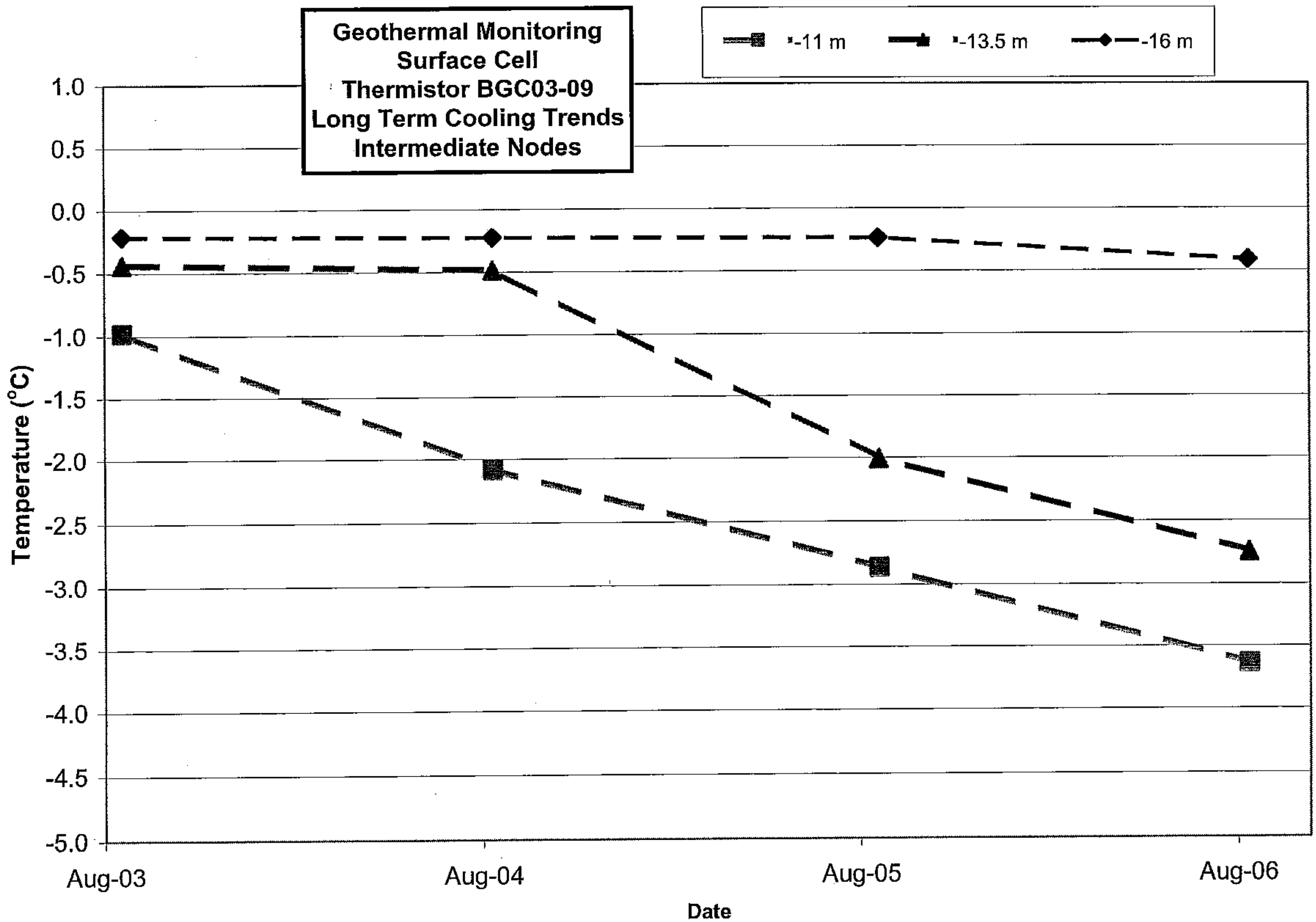

Geothermal Monitoring
Surface Cell
Themistor BGC03-09
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
17-Jul-06
29-Jul-06
12-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

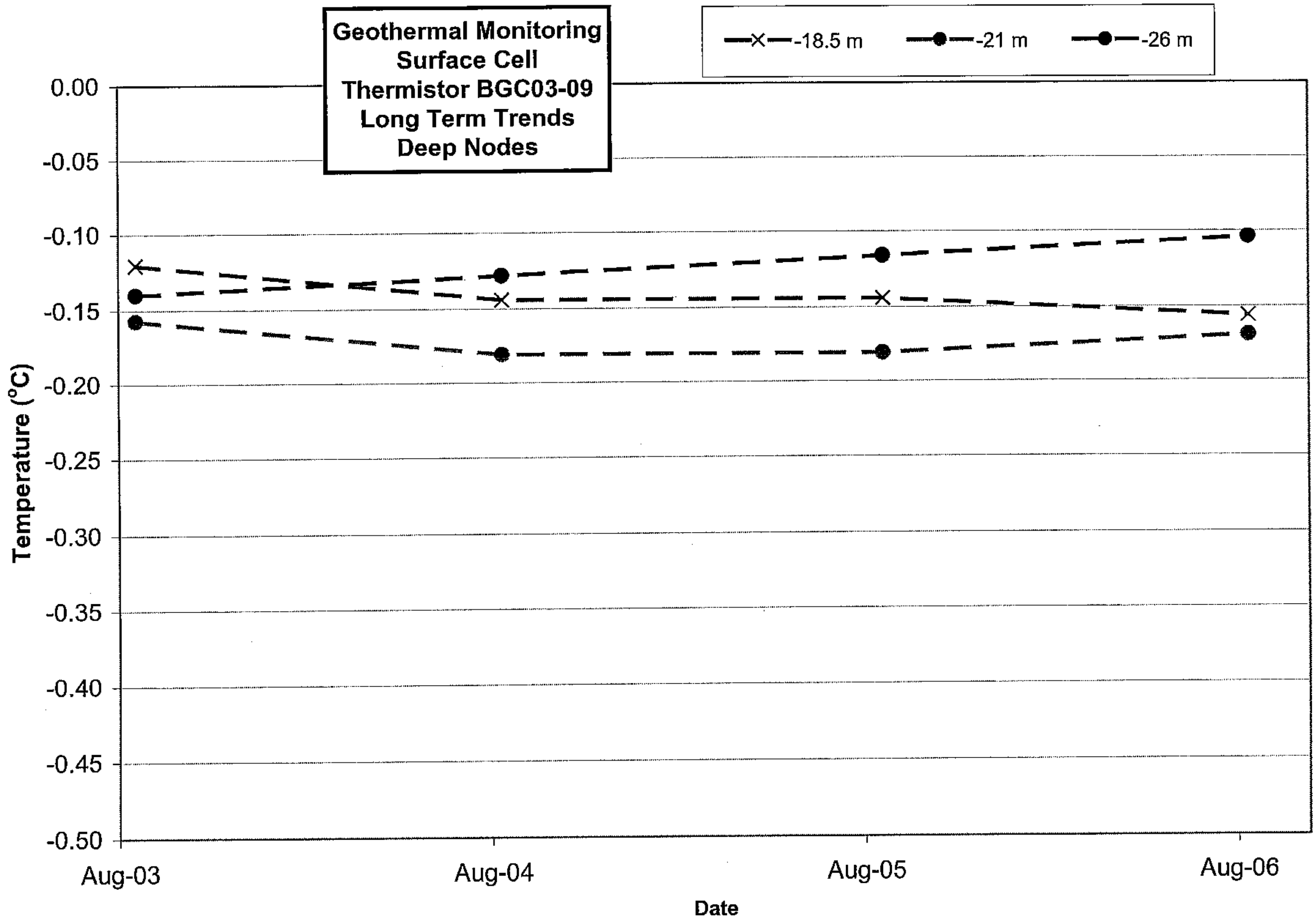

Geothermal Monitoring
Surface Cell
Themistor BGC03-09
2003-2006 Comparison Plot
19-Aug-03
11-Aug-04
19-Aug-05
12-Aug-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Temperature (°C)

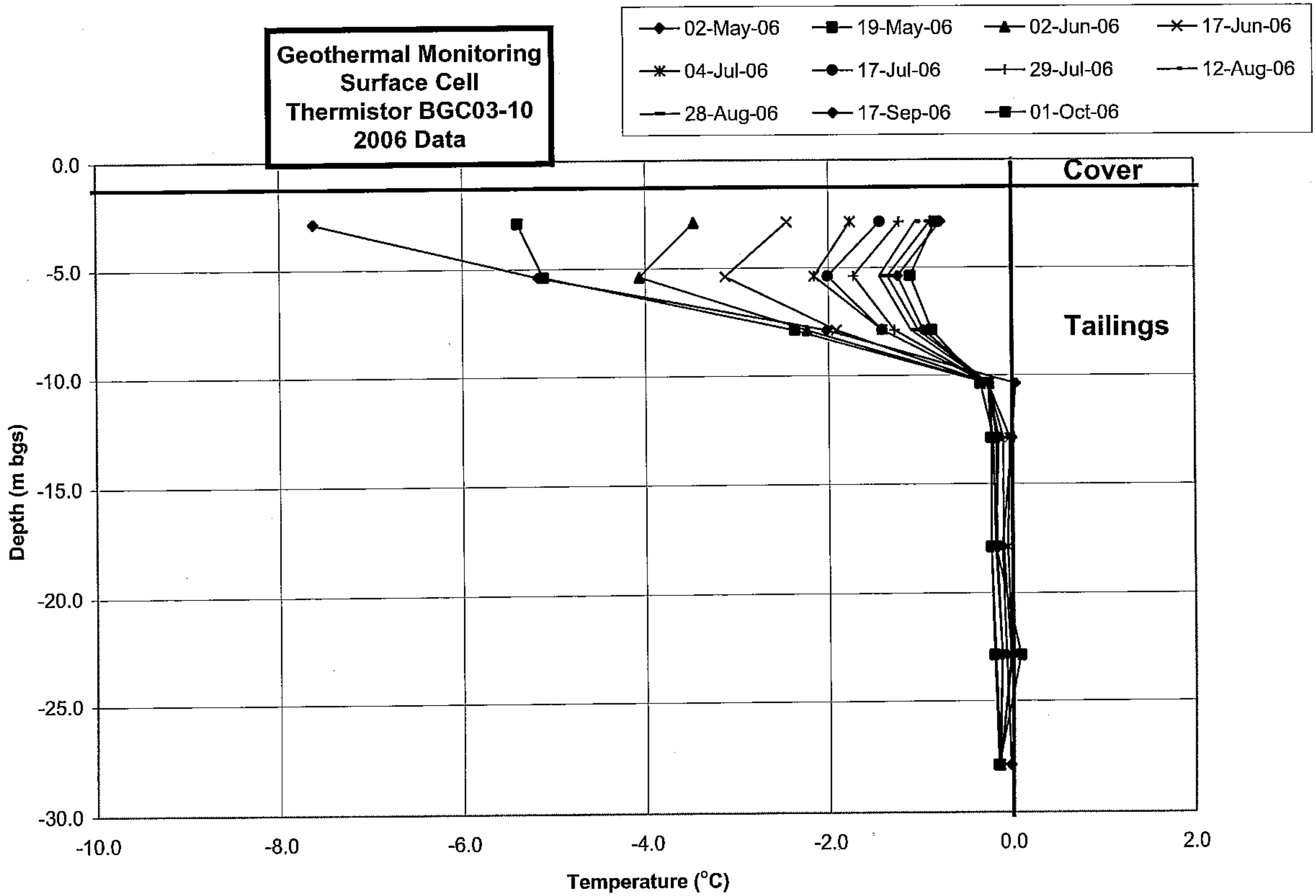

Geothermal Monitoring
Surface Cell. Fill
Thermistor BGC03-09
Long-Term
Shallow/Intermediete Nodes
-6.0 m
-8.5 m
-11.0 m
-13.5 m
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
Temperature (°C)
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Date

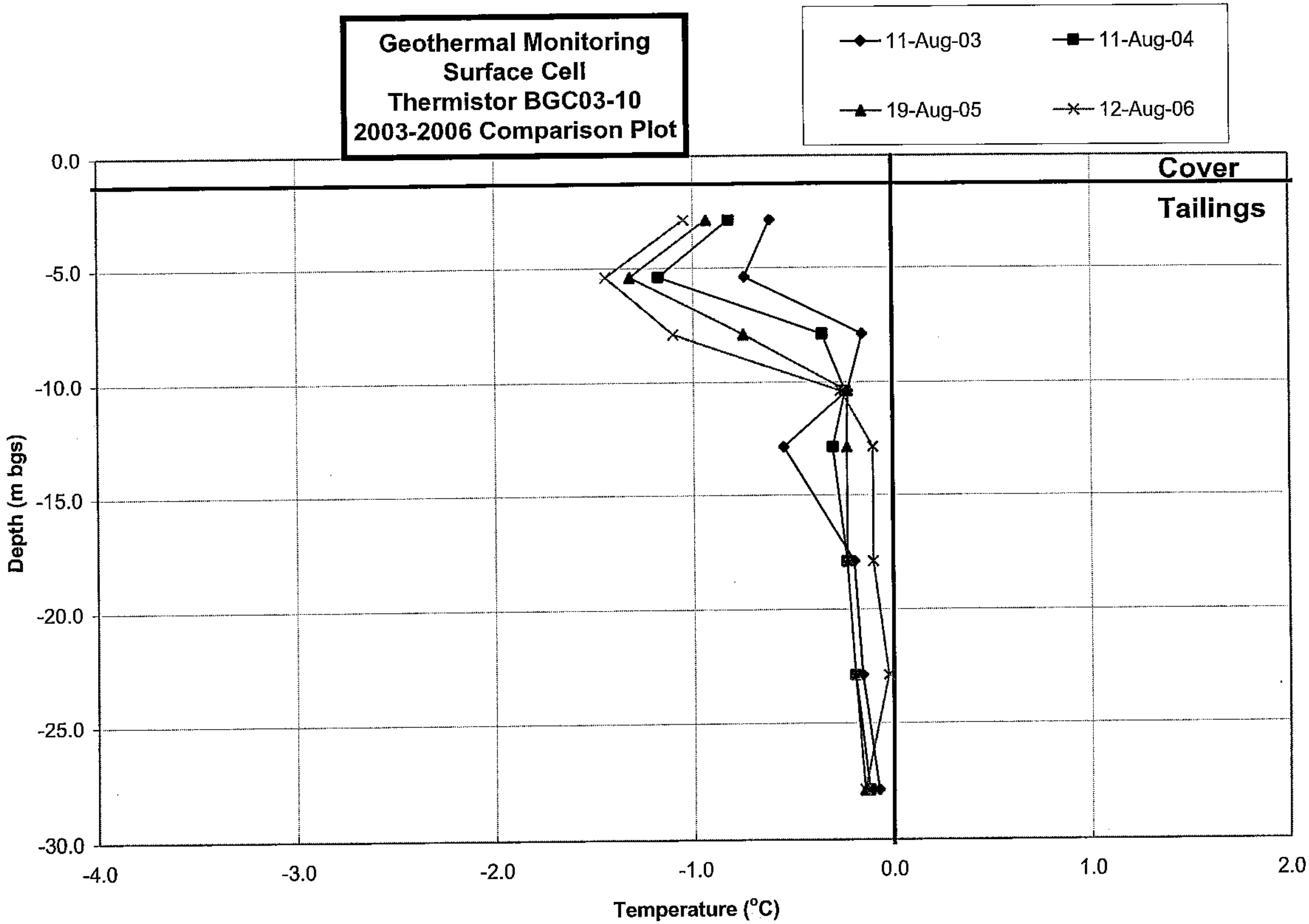

Geothermal Monitoring
Surface Cell, fill
Thermistor BGC03-09
Long-Term
Deep Nodes
-16.0m
-18.5m
-21.0m
-26.0m
Temperature (°C)
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
-0.40
-0.45
-0.50
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Date

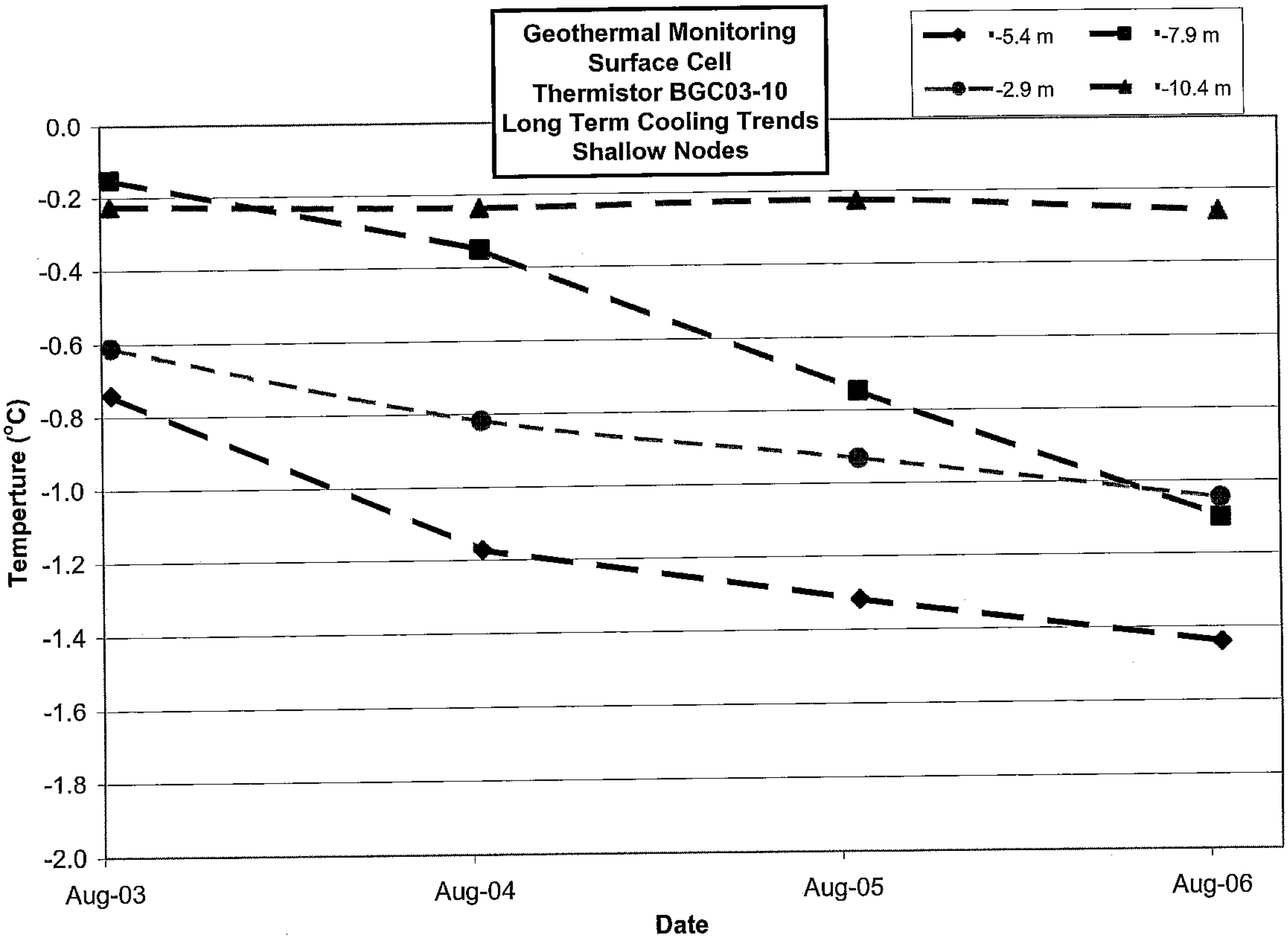

Geothermal Monitoring
Surface Cell
Thermistor BGC03-09
Long Term Cooling Trends
Shallow Nodes
-3 m
-6 m
-8.5 m
-11 m
Temperature (°C)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
Aug-03
Aug-04
Aug-05
Aug-06
Date

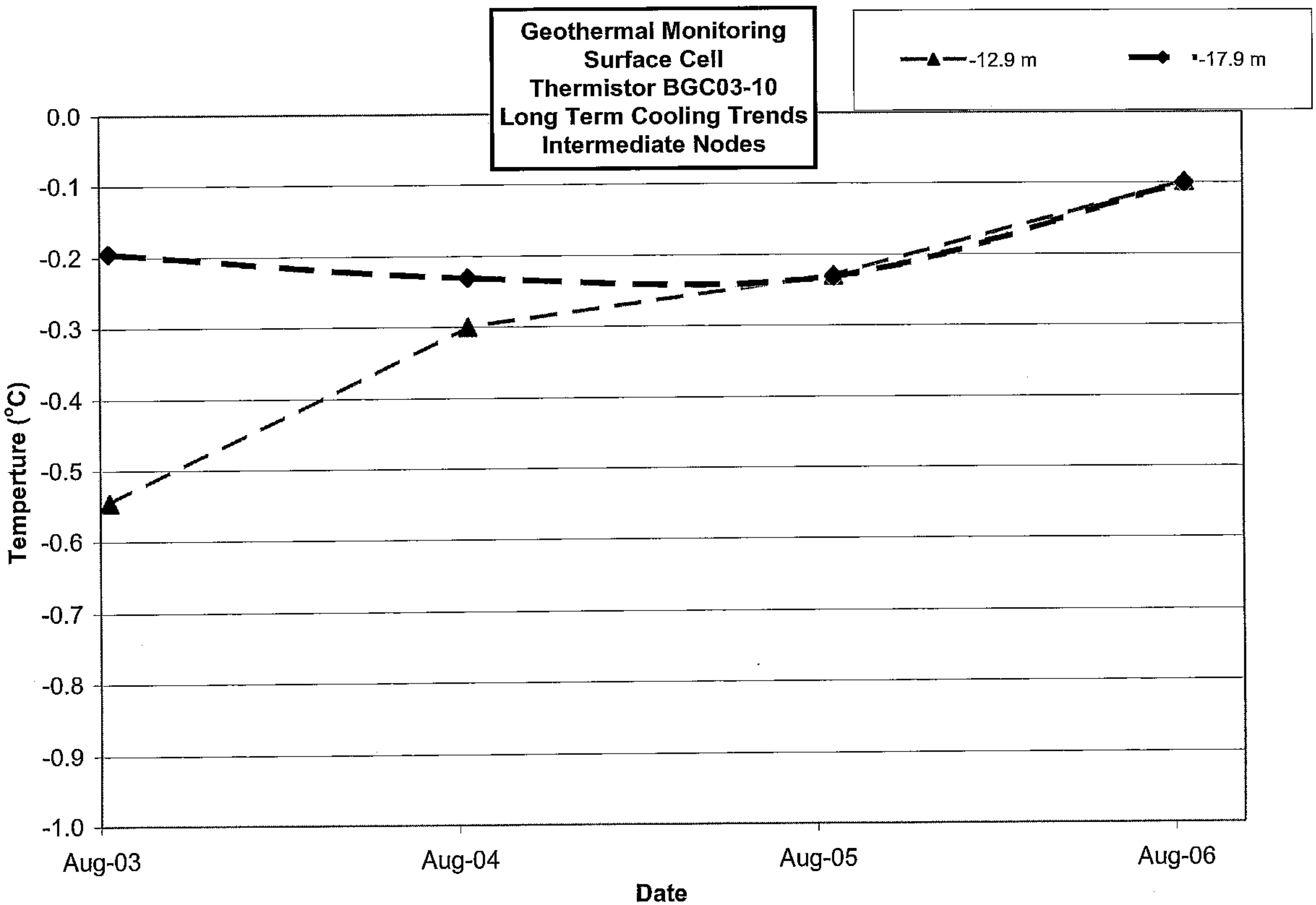

Geothermal Monitoring
Surface Cell
Thermistor BGC03-09
Long Term Cooling Trends
Intermediate Nodes
-11 m
-13.5 m
-16 m
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

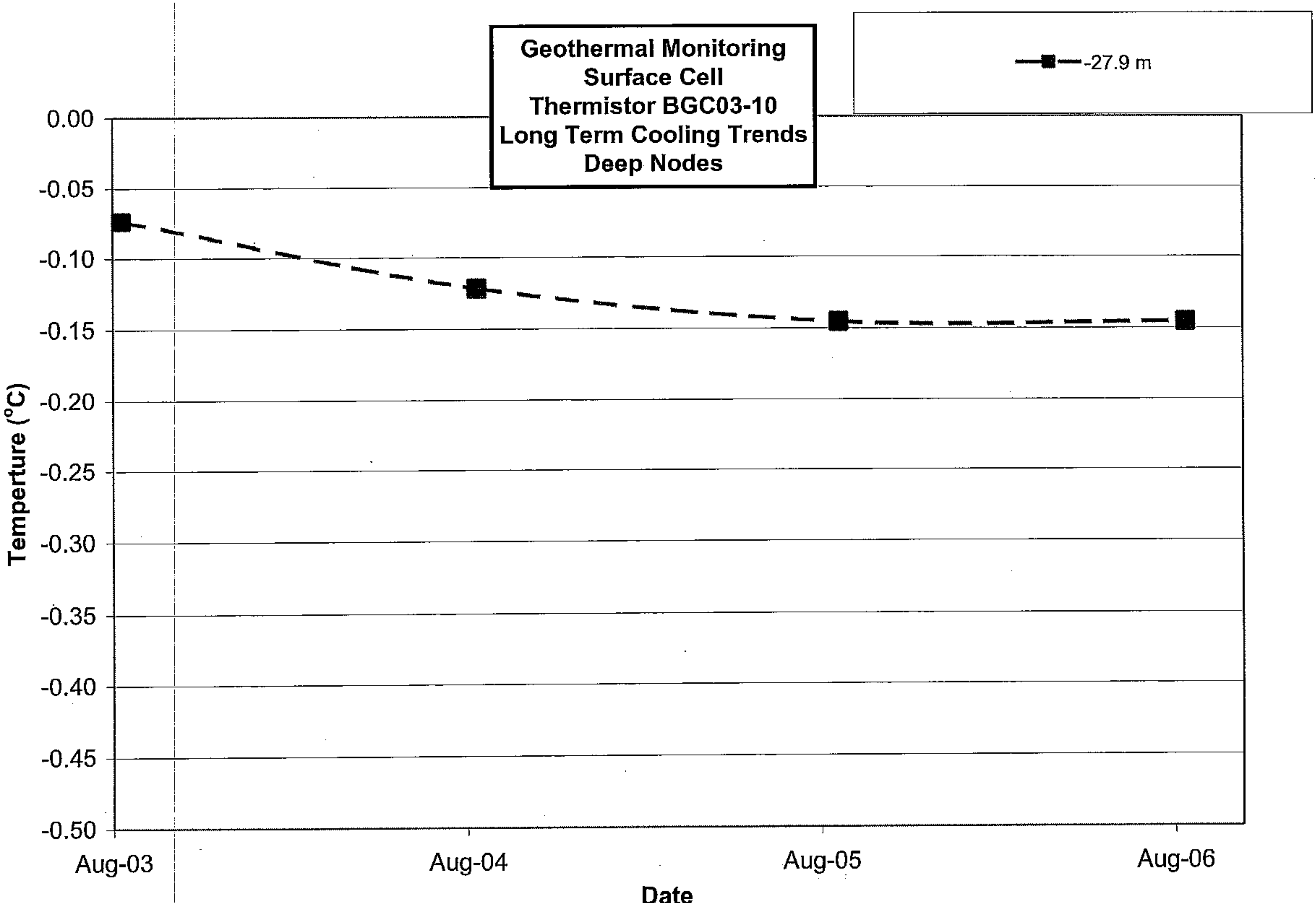

Geothermal Monitoring
Surface Cell
Thermistor BGC03-09
Long Term Trends
Deep Nodes
-18.5 m
-21 m
-26 m
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
-0.40
-0.45
-0.50
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

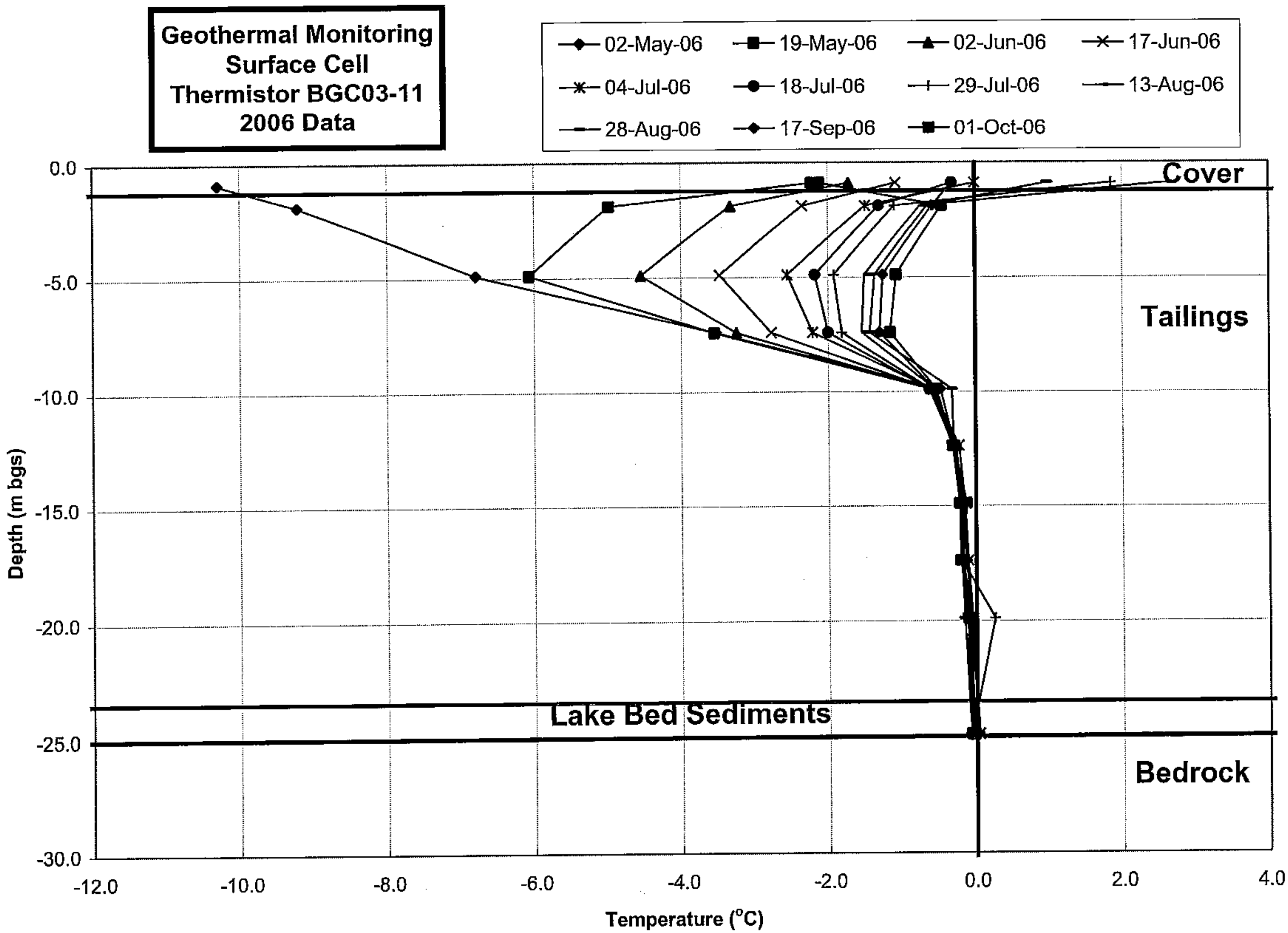

Geothermal Monitoring
Surface Cell
Thermistor BGC03-10
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
04-Jul-06
17-Jul-06
29-Jul-06
12-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
Temperature (°C)

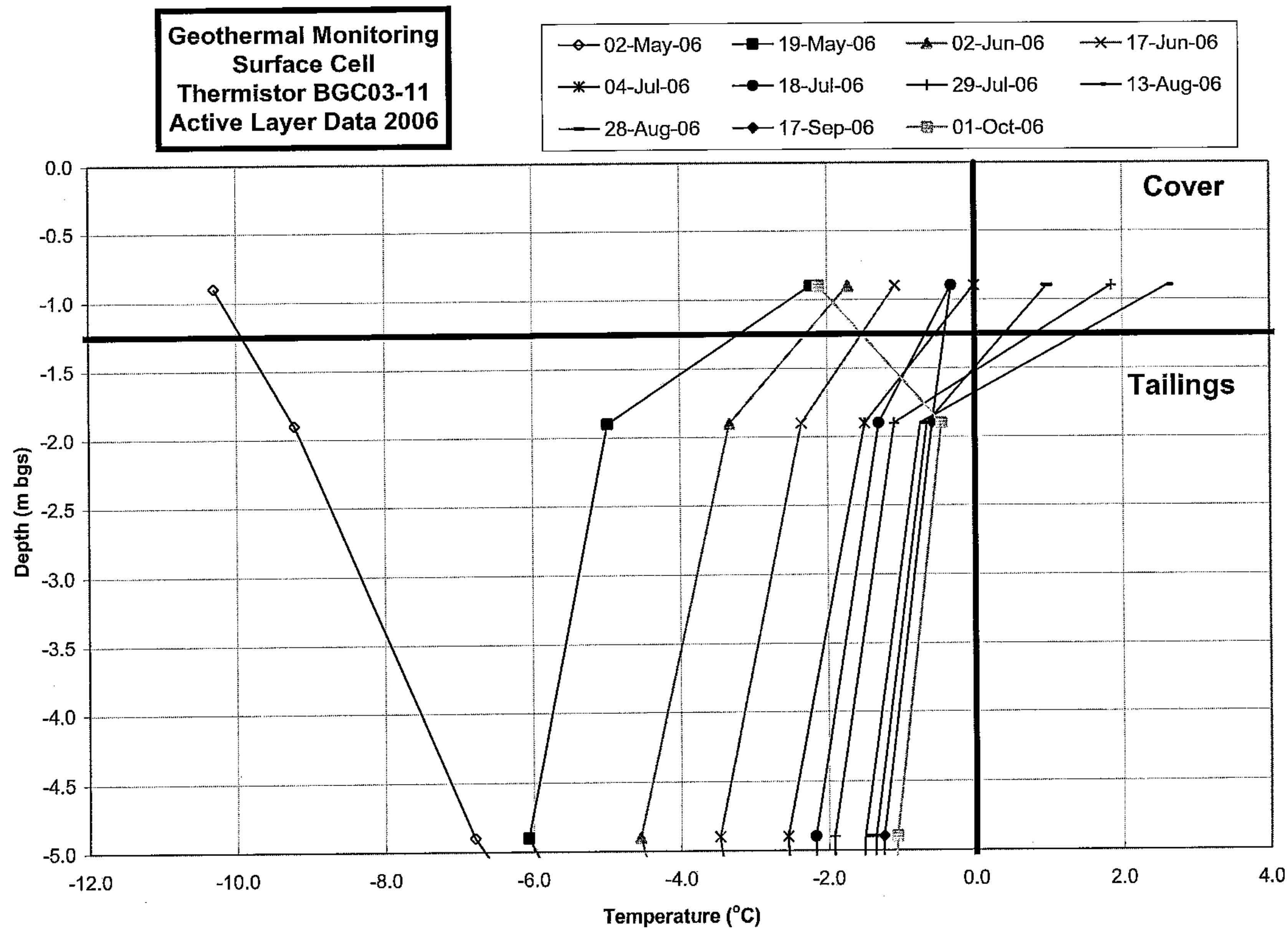

Geothermal Monitoring
Surface Cell
Thermistor BGC03-10
2003-2006 Comparison Plot
11-Aug-03
11-Aug-04
19-Aug-05
12-Aug-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
Temperature (°C)

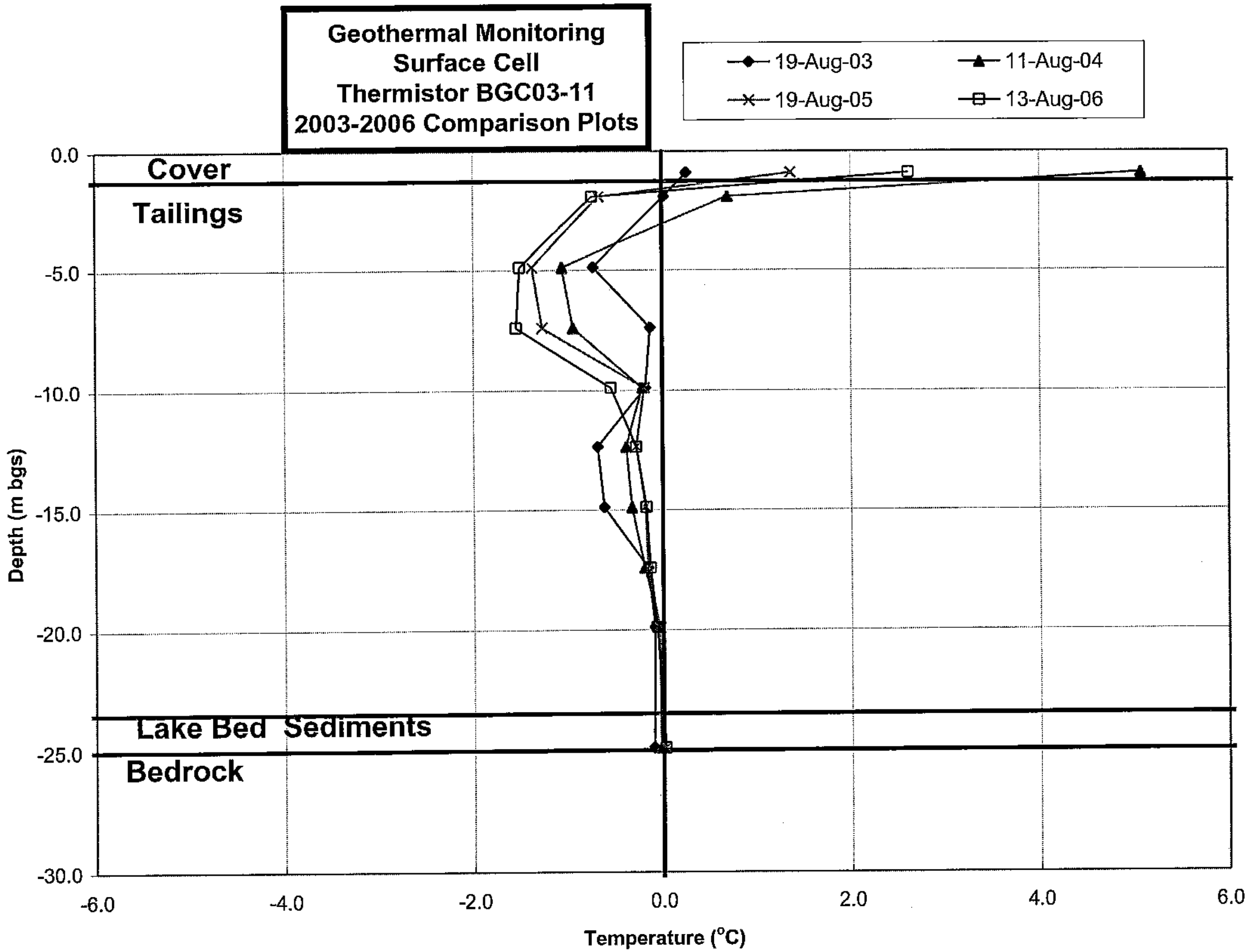

Geothermal Monitoring
Surface Cell
Thermistor BGC03-10
Long Term Cooling Trends
Shallow Nodes
-5.4 m
-7.9 m
-2.9 m
-10.4 m
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
Temperture (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

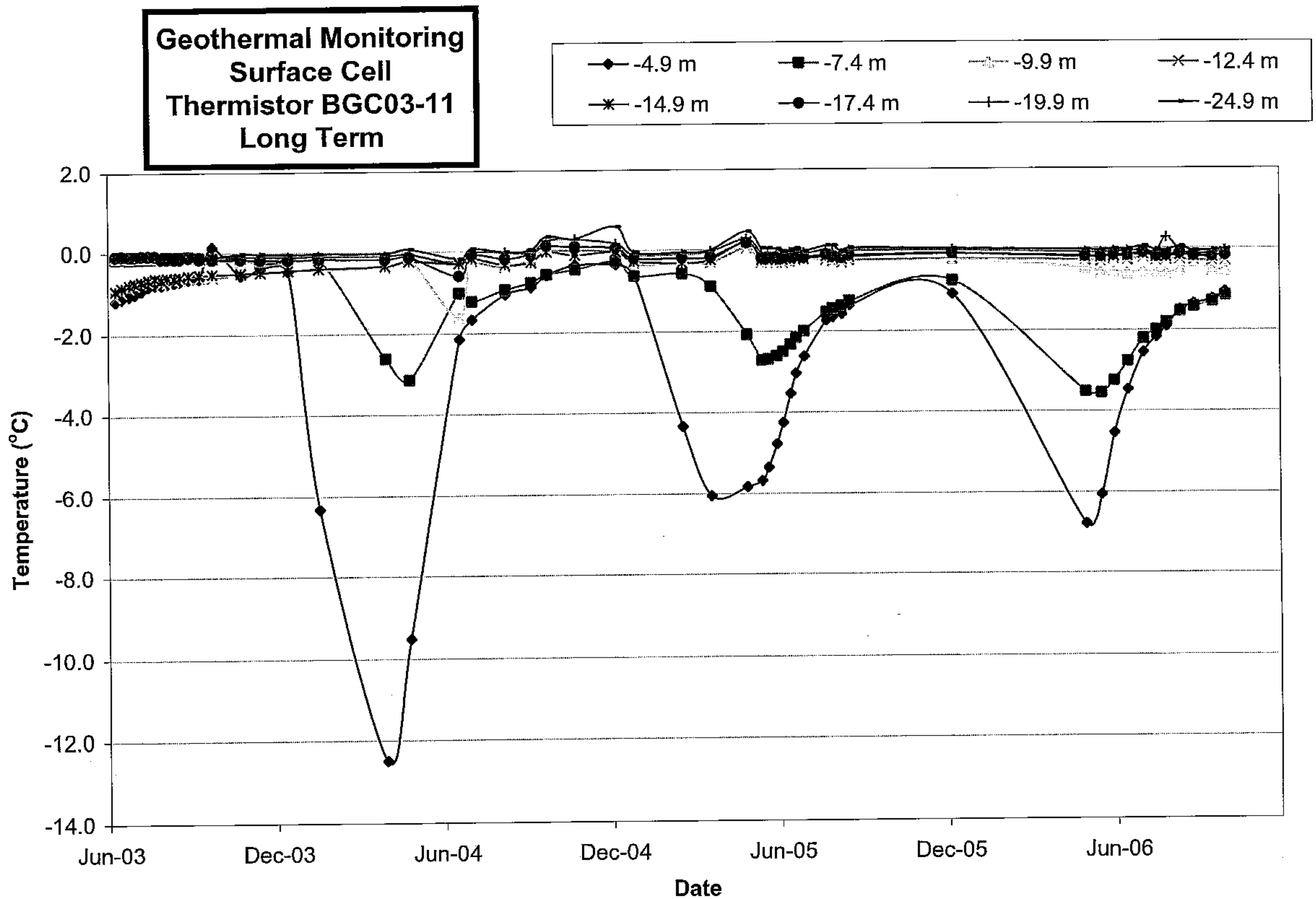

Geothermal Monitoring
Surface Cell
Thermistor BGC03-10
Long Term Cooling Trends
Intermediate Nodes
-12.9 m
-17.9 m
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
Temperture (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

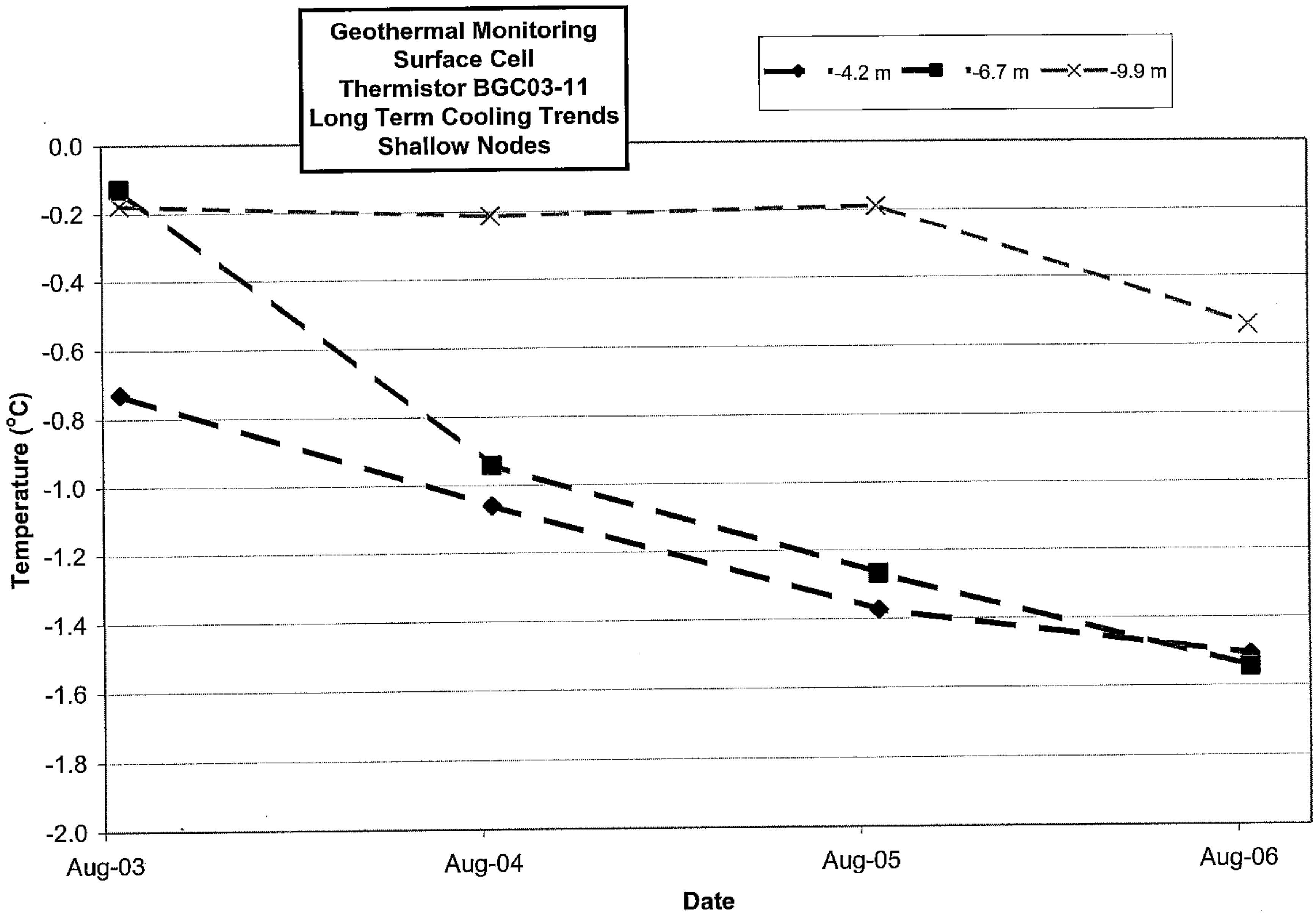

Geothermal Monitoring
Surface Cell
Thermistor BGC03-10
Long Term Cooling Trends
Deep Nodes
-27.9 m
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
-0.40
-0.45
-0.50
Temperture (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

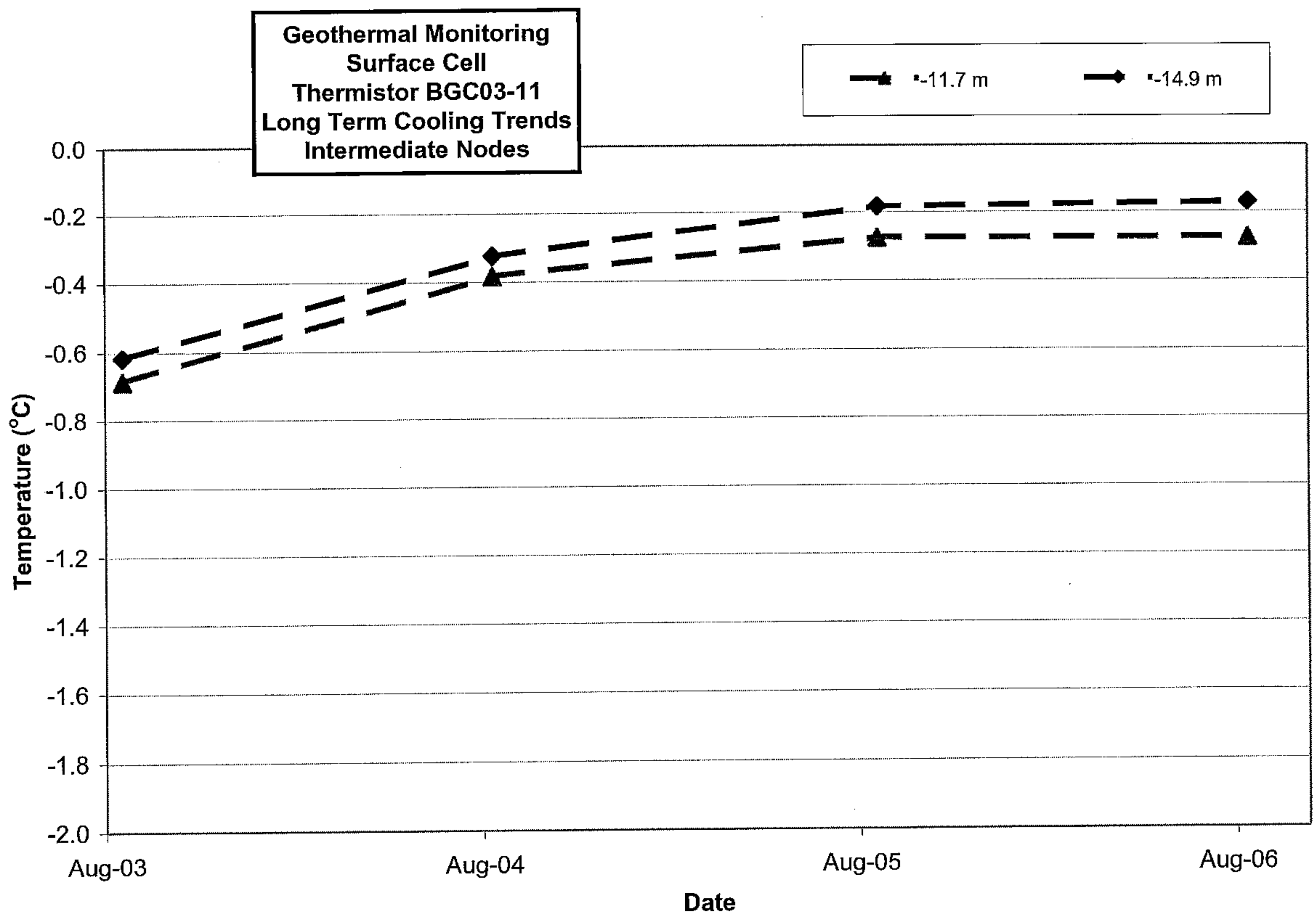

Geothermal Monitoring
Surface Cell
Thermistor BGC03-11
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Lake Bed Sediments
Bedrock
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

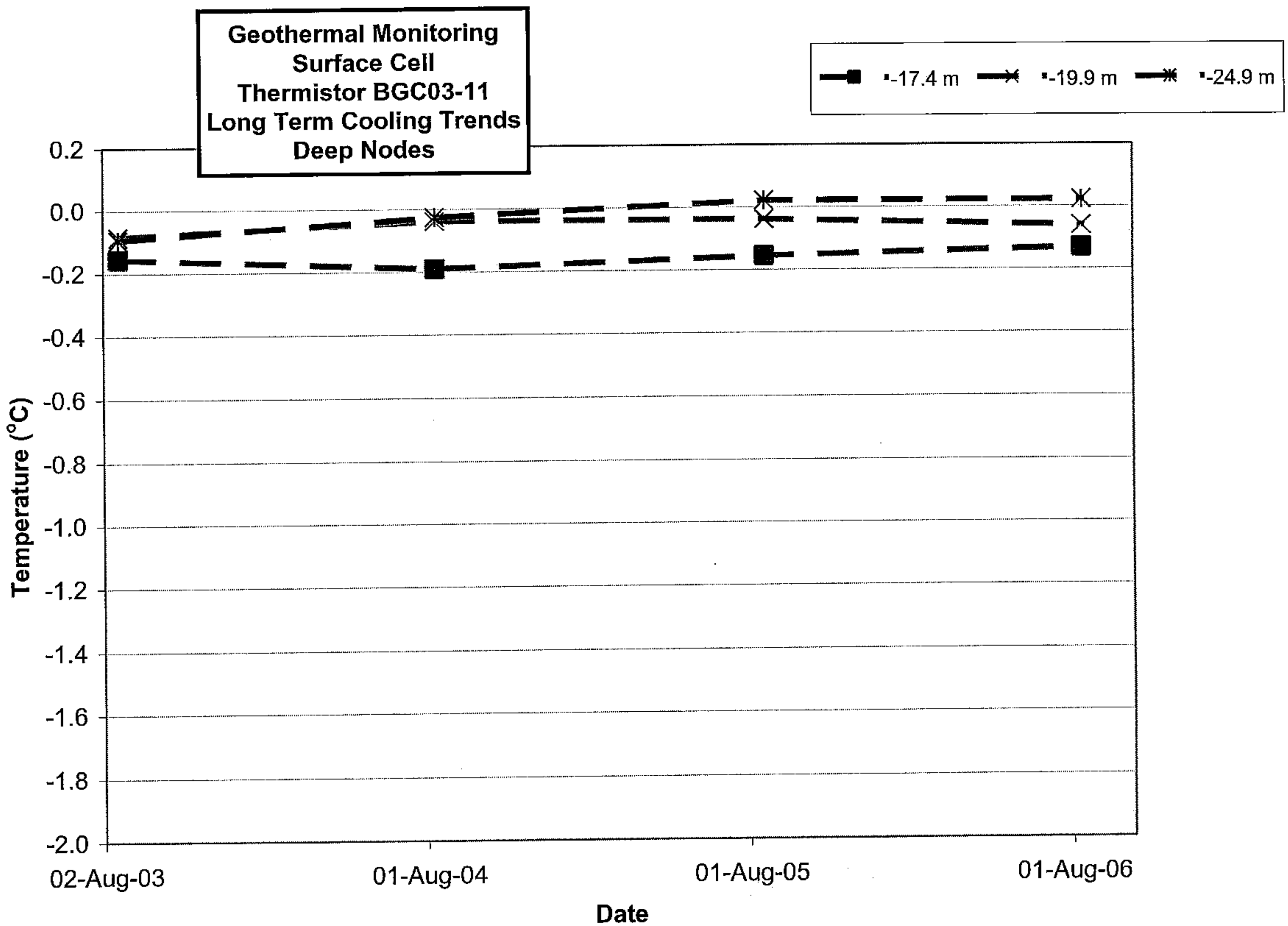

Geothermal Monitoring
Surface Cell
Thermistor BGC03-11
Active Layer Data 2006
02-May-06
19-May-06
02-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
Temperature (°C)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0

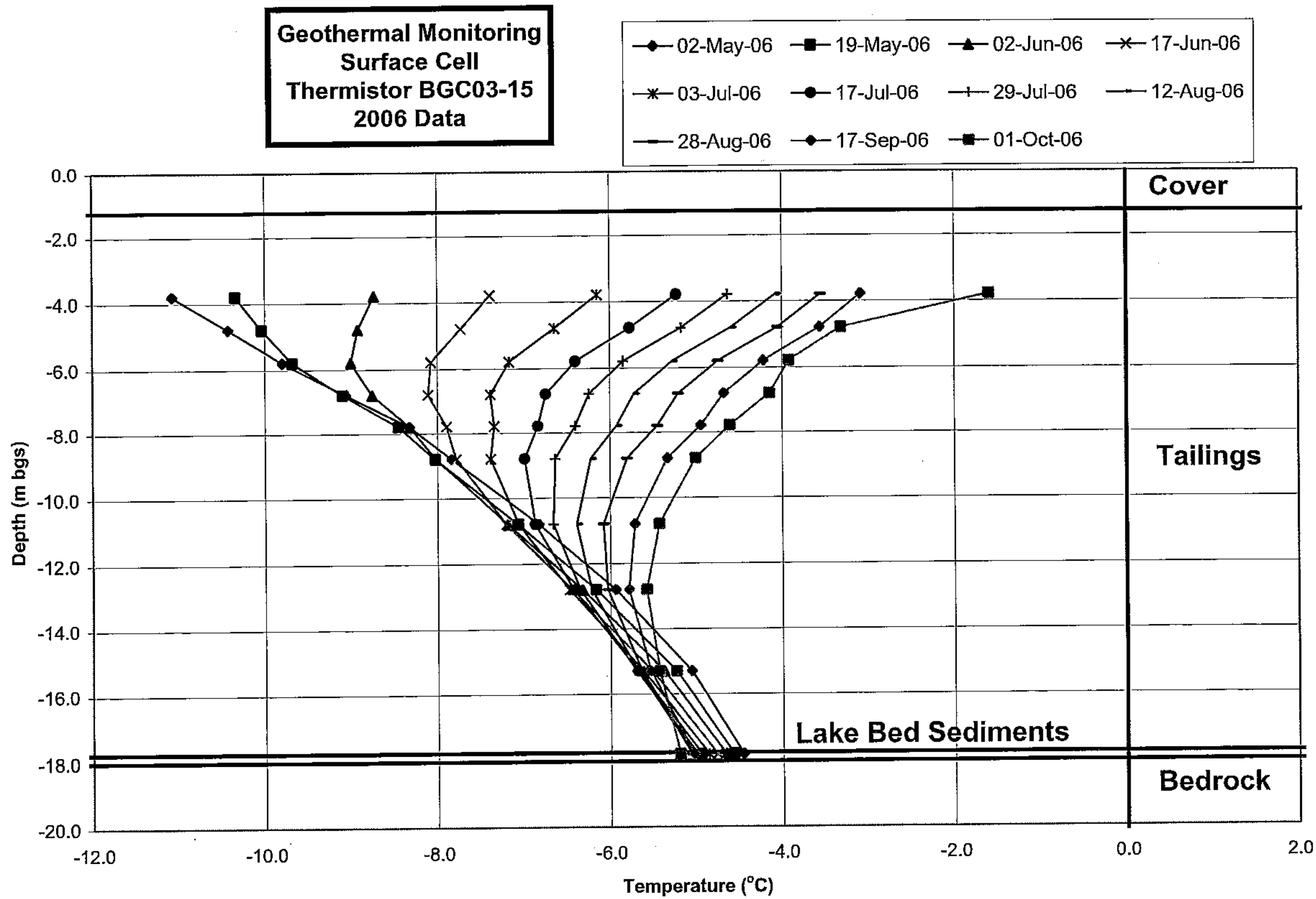

Geothermal Monitoring
Surface Cell
Thermistor BGC03-11
2003-2006 Comparison Plots
19-Aug-03
11-Aug-04
19-Aug-05
13-Aug-06
Cover
Tailings
Lake Bed Sediments
Bedrock
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
Temperature (°C)


Geothermal Monitoring
Surface Cell
Thermistor BGC03-11
Long Term
-4.9 m
-7.4 m
-9.9 m
-12.4 m
-14.9 m
-17.4 m
-19.9 m
-24.9 m
Temperature (°C)
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Date

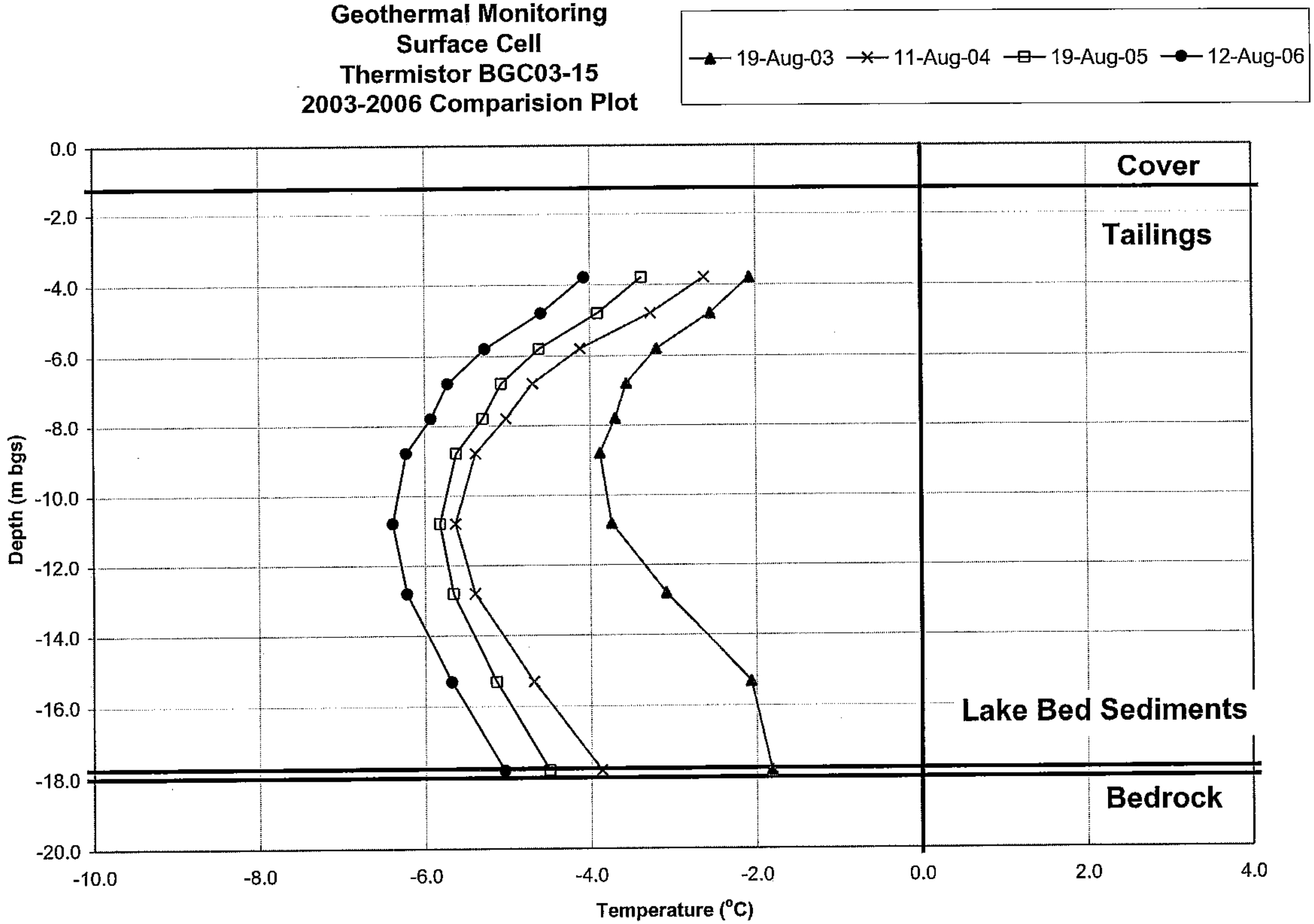

Geothermal Monitoring
Surface Cell
Thermistor BGC03-11
Long Term Cooling Trends
Shallow Nodes
-4.2 m
-6.7 m
-9.9 m
Temperature (°C)
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
Aug-03
Aug-04
Aug-05
Aug-06
Date

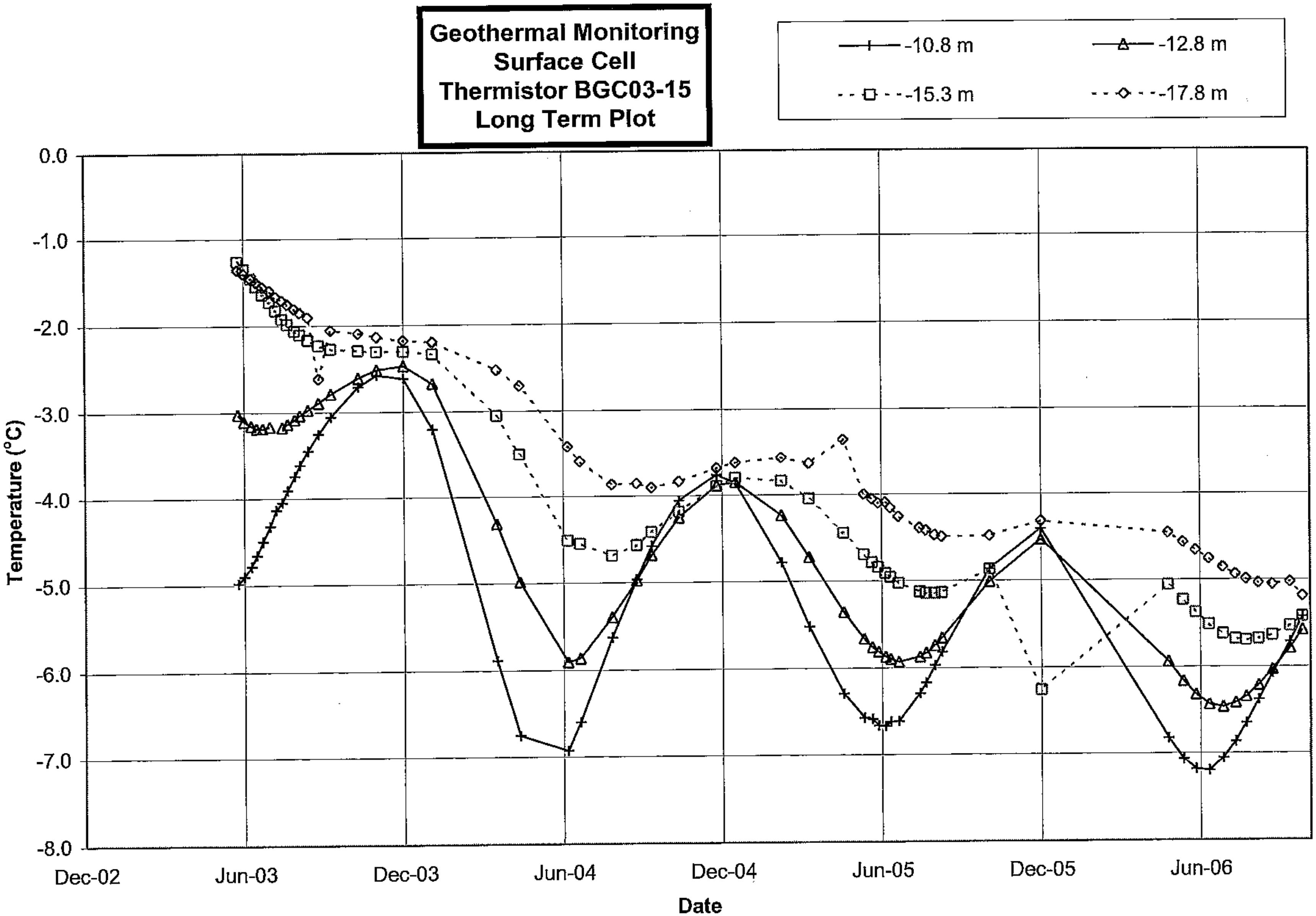

Geothermal Monitoring
Surface Cell
Thermistor BGC03-11
Long Term Cooling Trends
Intermediate Nodes
-11.7 m
-14.9 m
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

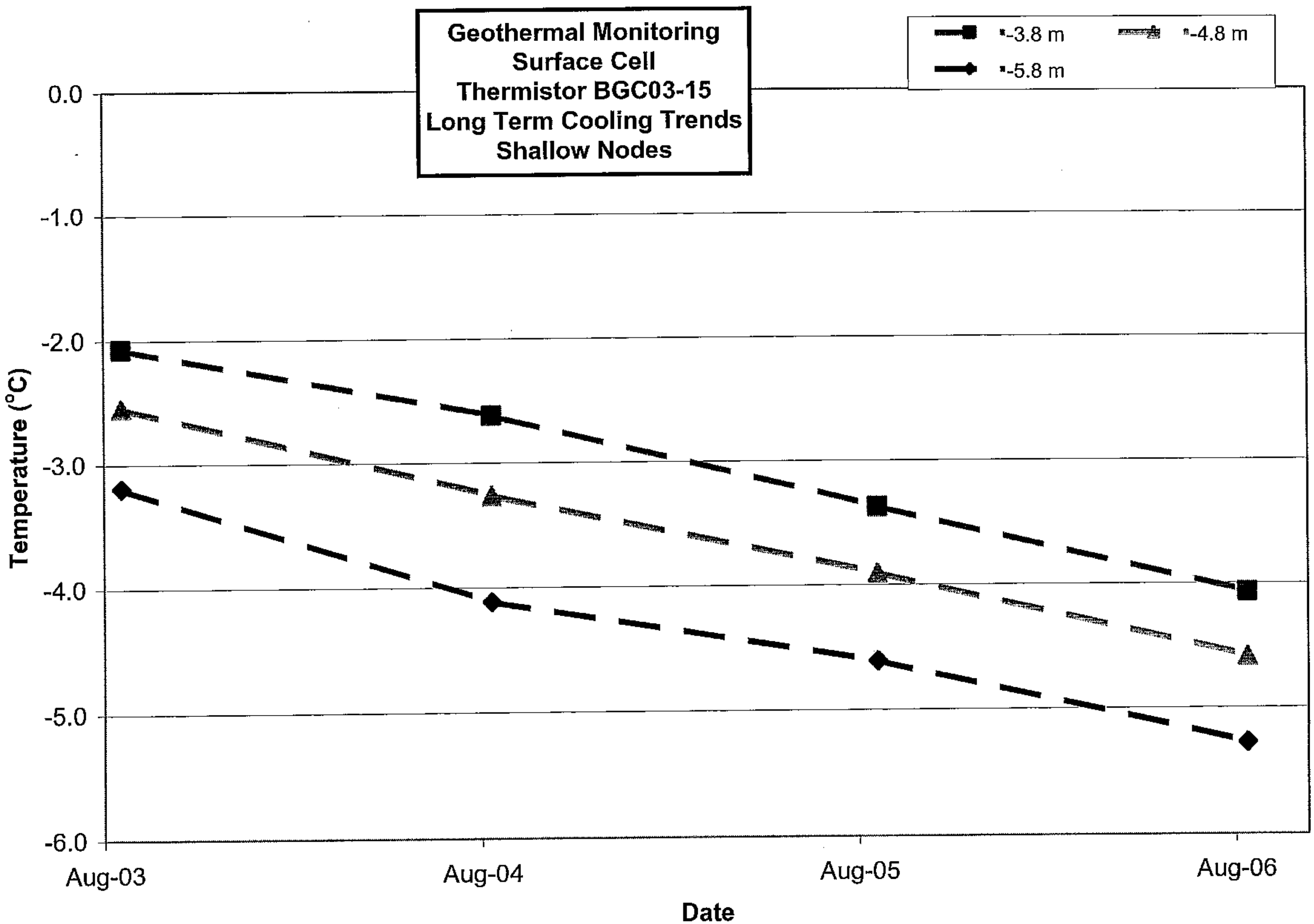

Geothermal Monitoring
Surface Cell
Thermistor BGC03-11
Long Term Cooling Trends
Deep Nodes
-17.4 m
-19.9 m
-24.9 m
Temperature (°C)
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
02-Aug-03
01-Aug-04
01-Aug-05
01-Aug-06
Date

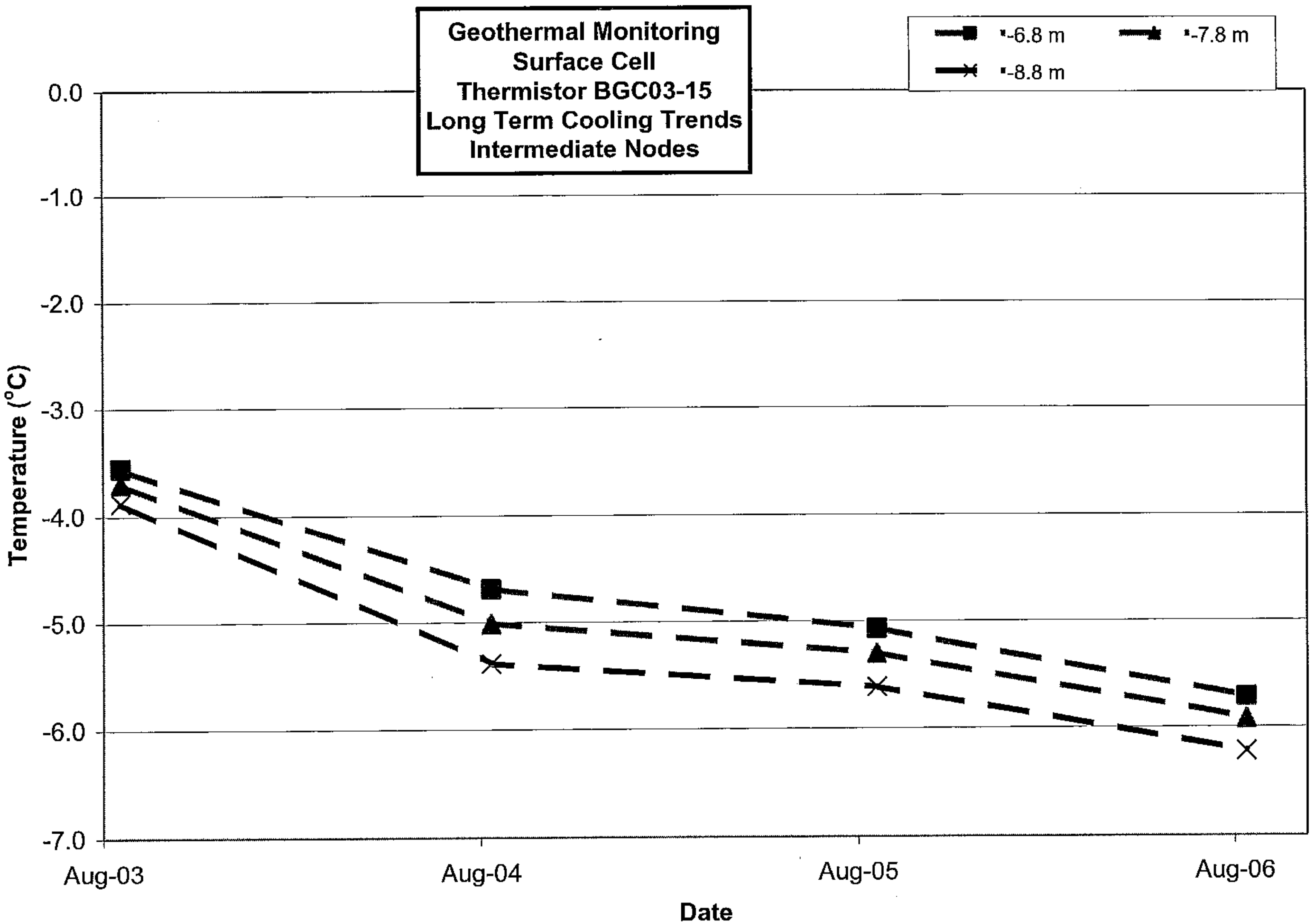

Geothermal Monitoring
Surface Cell
Thermistor BGC03-15
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
12-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Lake Bed Sediments
Bedrock
Depth (m bgs)
Temperature (°C)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
-20.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0

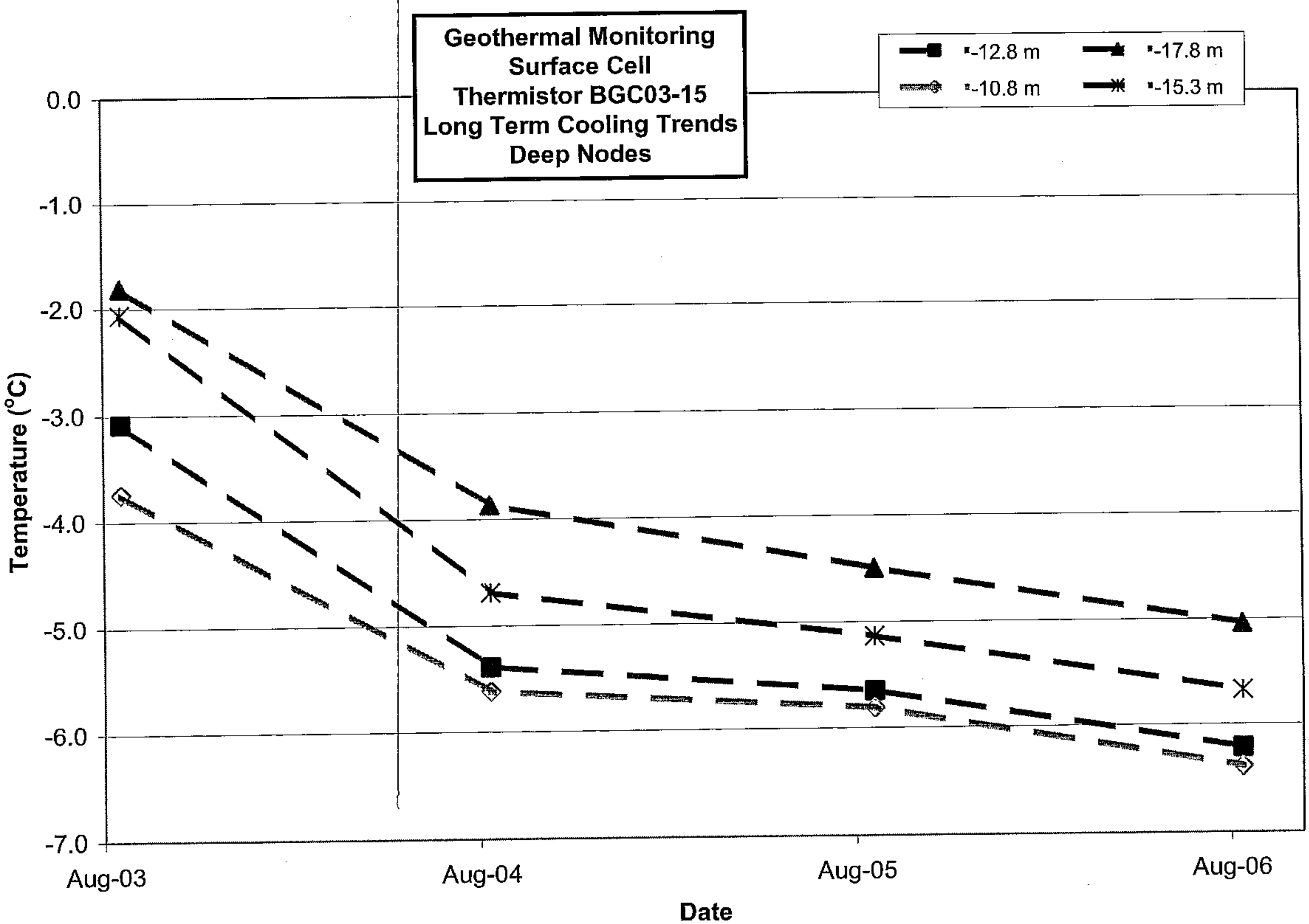
Geothermal Monitoring
Surface Cell
Thermistor BGC03-15
2003-2006 Comparision Plot

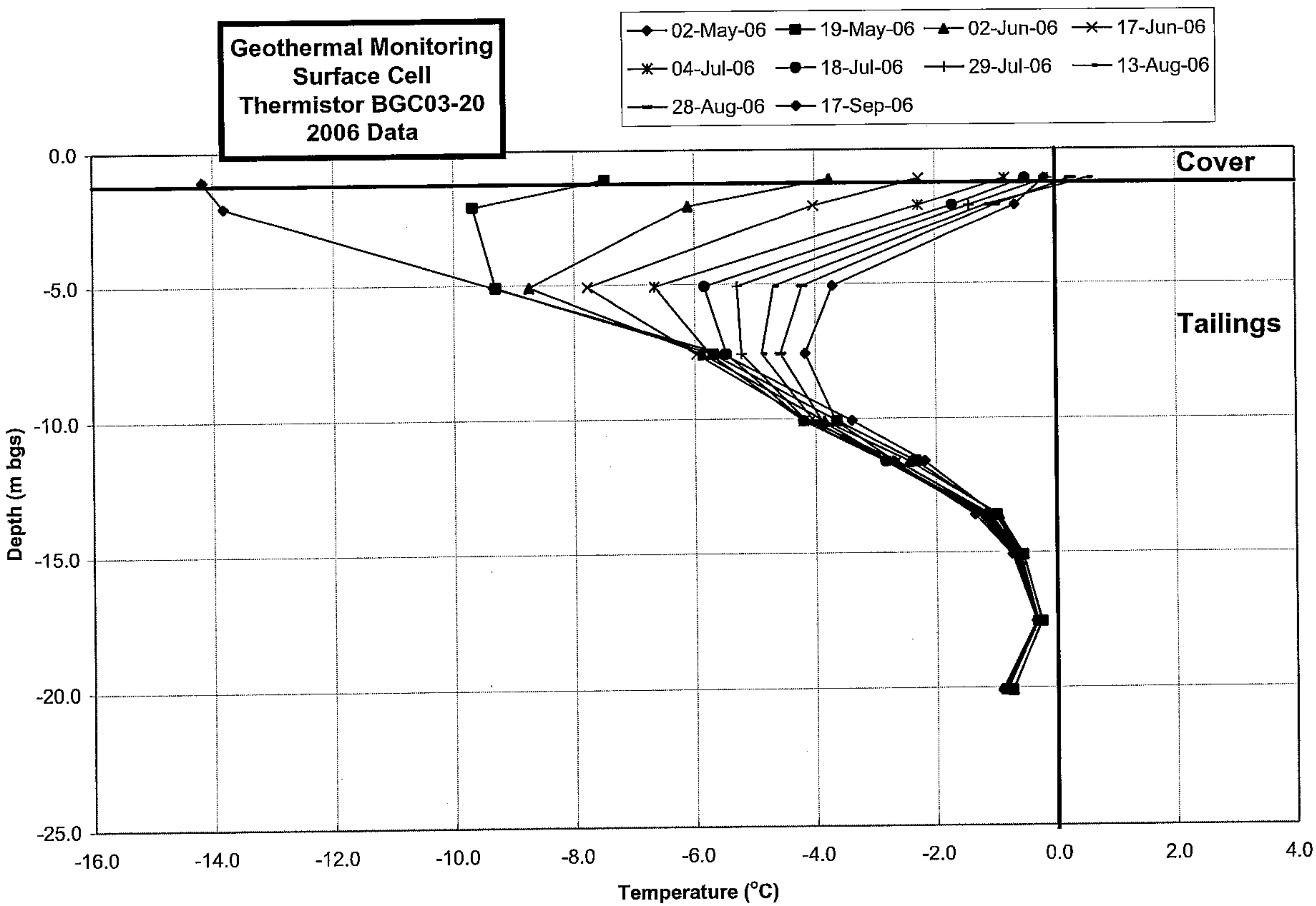


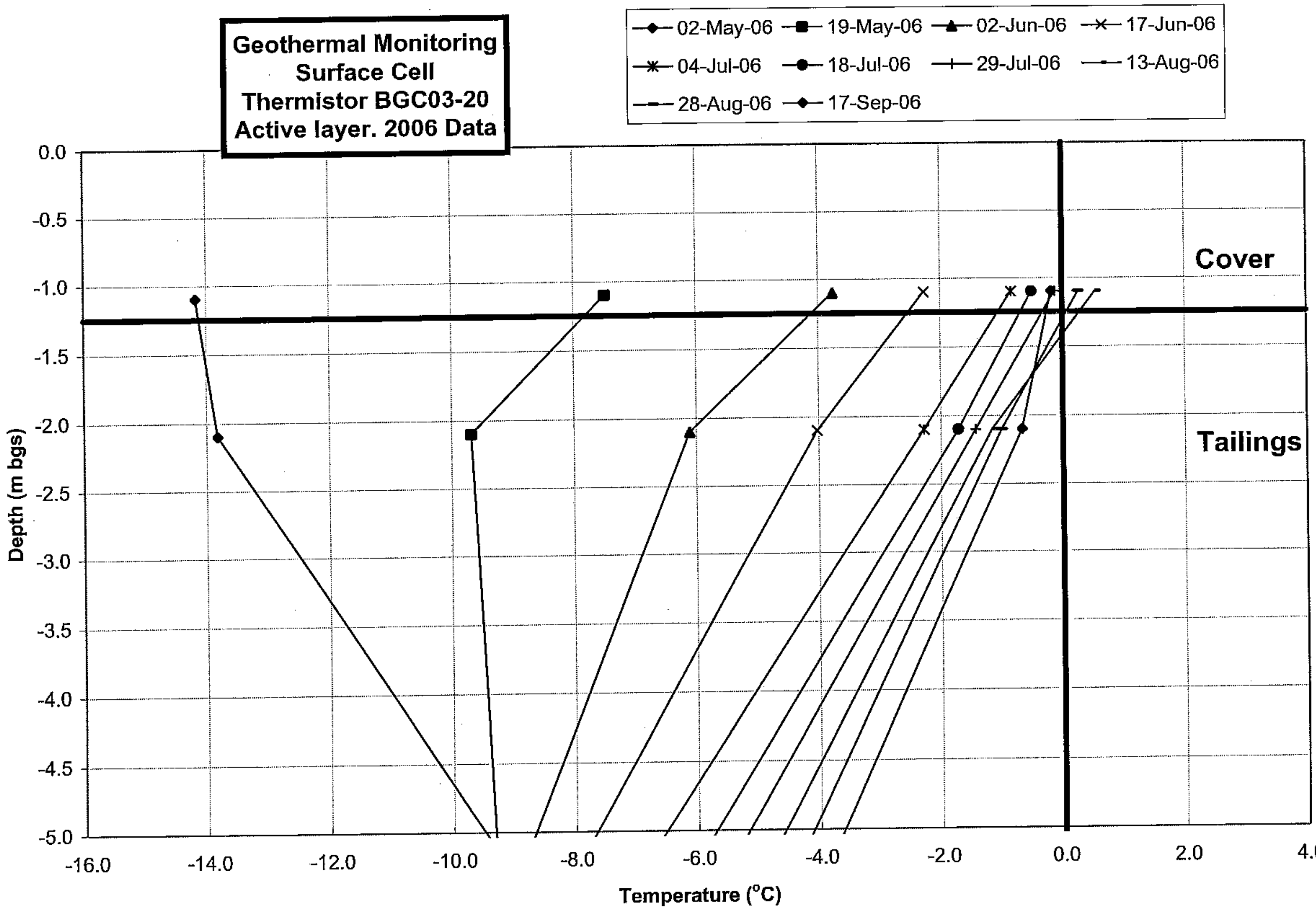

Geothermal Monitoring
Surface Cell
Thermistor BGC03-15
Long Term Plot
-10.8 m
-12.8 m
-15.3 m
-17.8 m
Temperature (°C)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Date

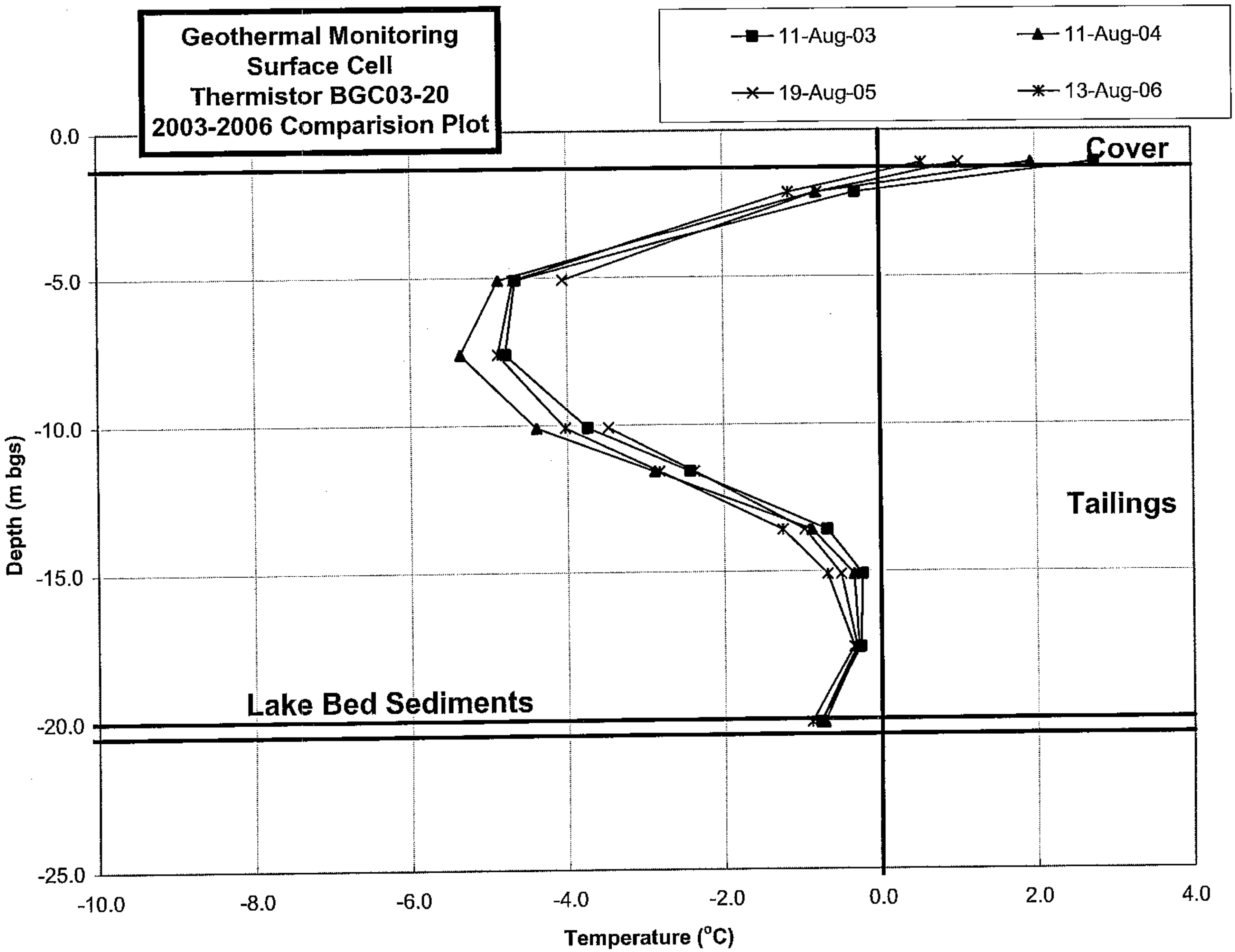

Geothermal Monitoring
Surface Cell
Thermistor BGC03-15
Long Term Cooling Trends
Shallow Nodes
-3.8 m
-4.8 m
-5.8 m
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

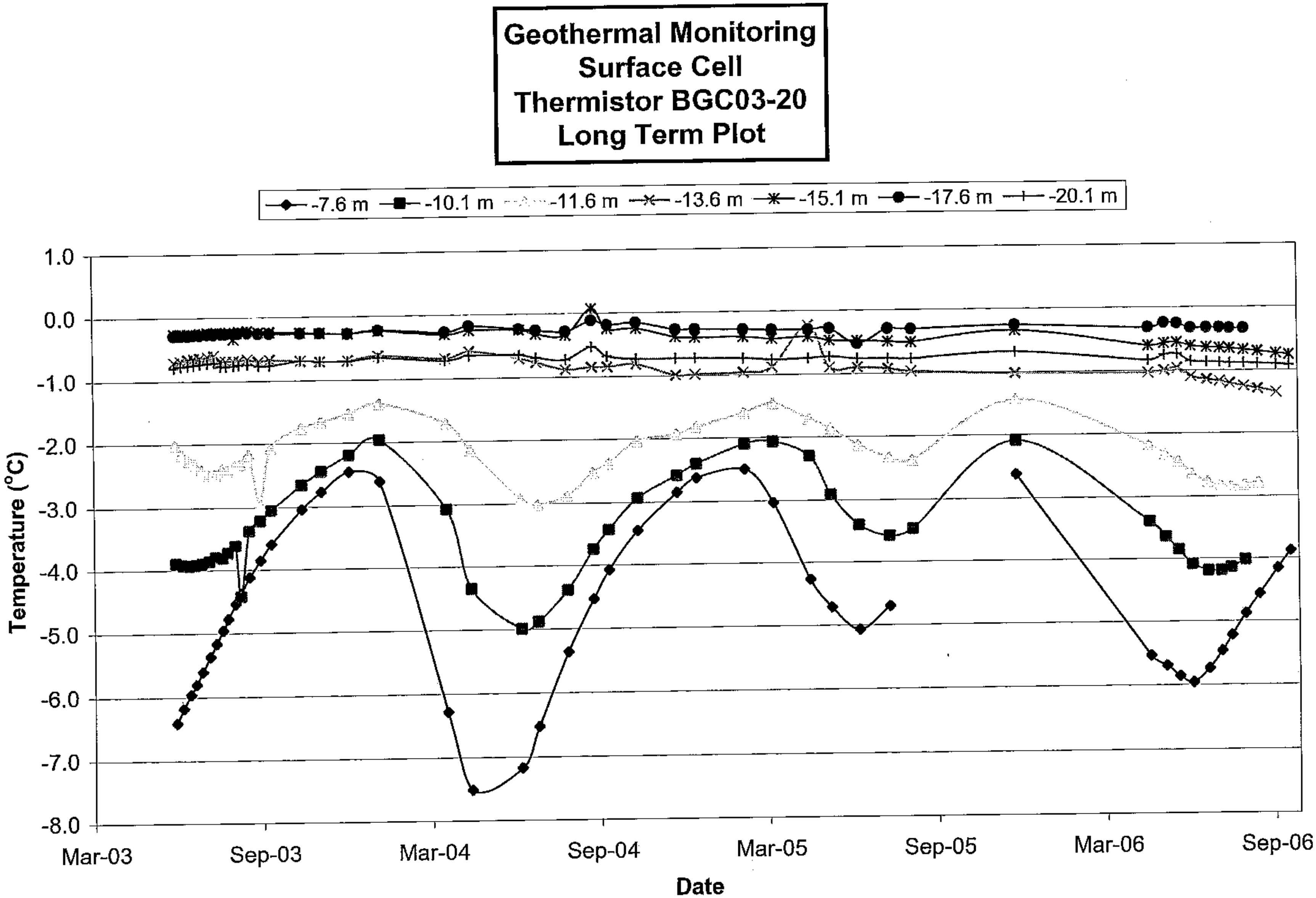

Geothermal Monitoring
Surface Cell
Thermistor BGC03-15
Long Term Cooling Trends
Intermediate Nodes
-6.8 m
-7.8 m
-8.8 m
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

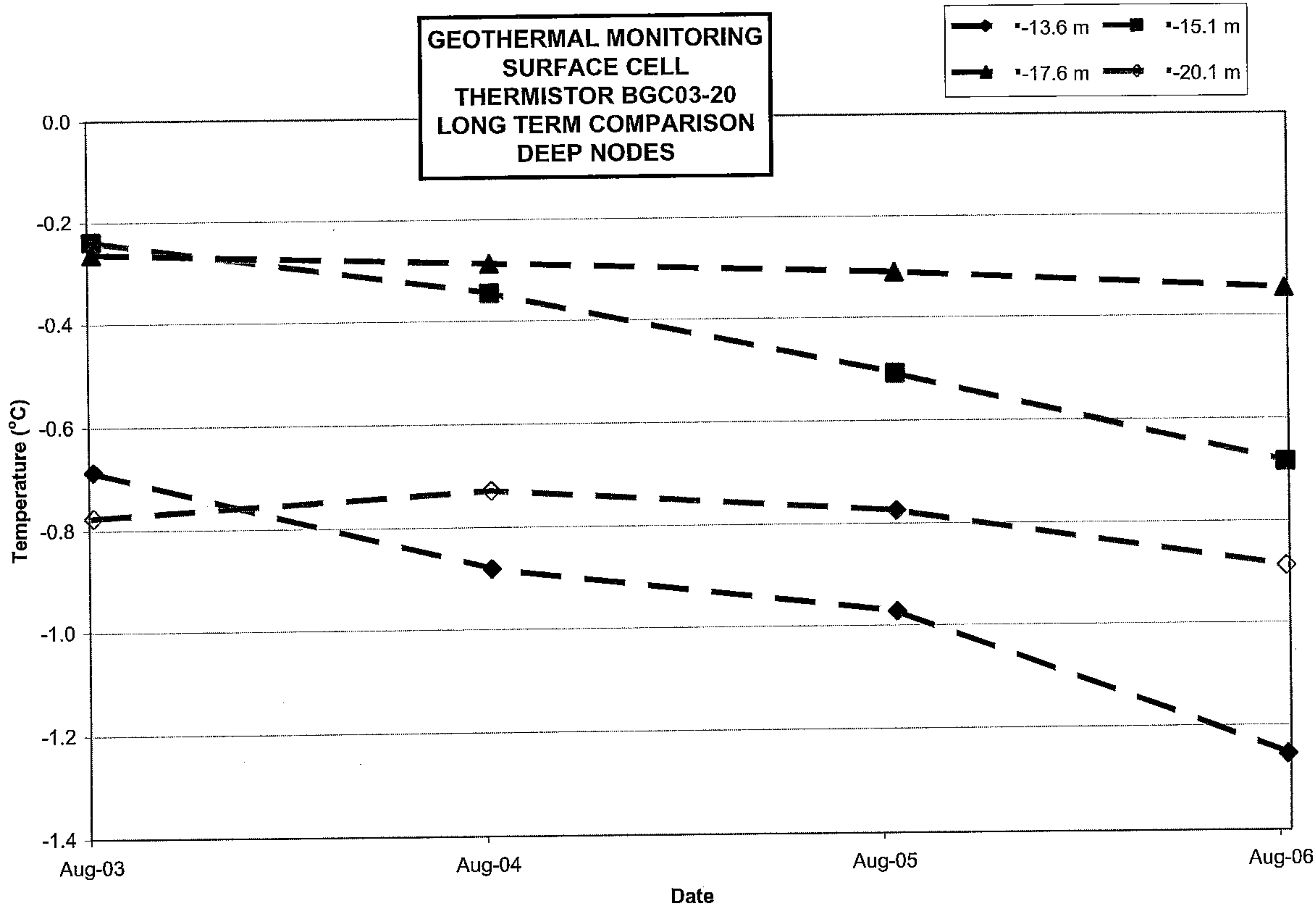

Geothermal Monitoring
Surface Cell
Thermistor BGC03-15
Long Term Cooling Trends
Deep Nodes
-12.8 m
-17.8 m
-10.8 m
-15.3 m
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

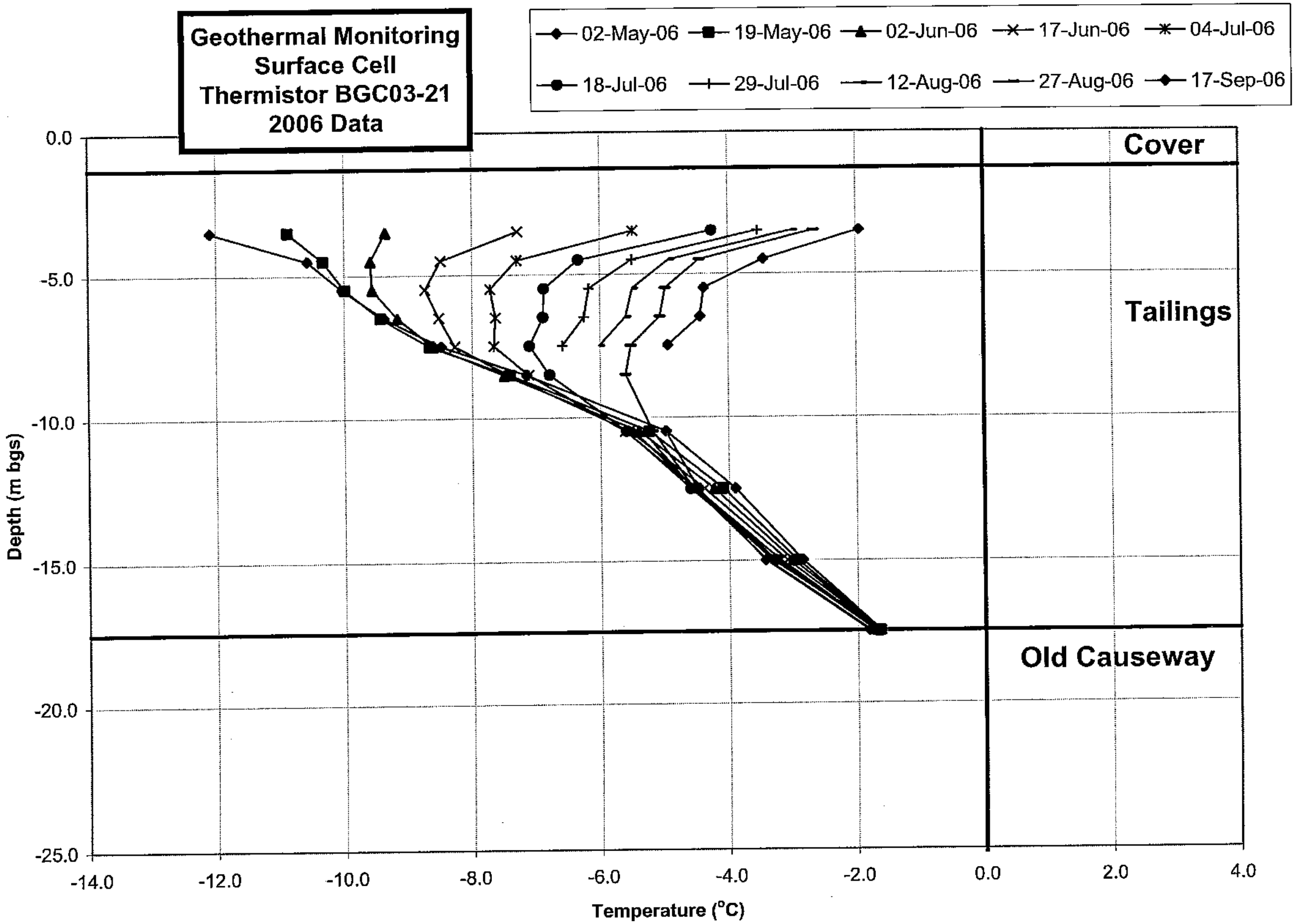

Geothermal Monitoring
Surface Cell
Thermistor BGC03-20
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-16.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

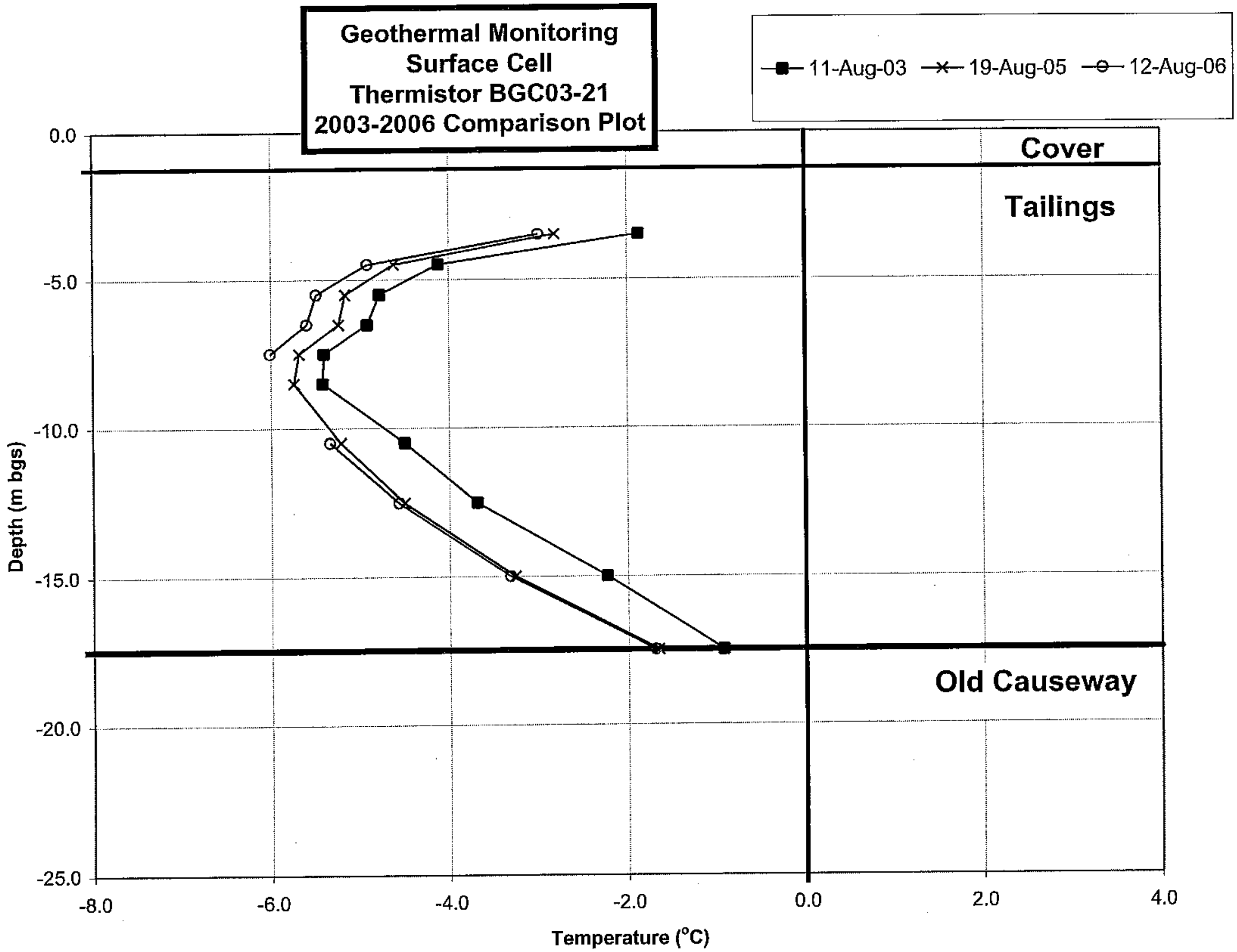

Geothermal Monitoring
Surface Cell
Thermistor BGC03-20
Active layer. 2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
Cover
Tailings
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-16.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)


Geothermal Monitoring
Surface Cell
Thermistor BGC03-20
2003-2006 Comparision Plot
11-Aug-03
11-Aug-04
19-Aug-05
13-Aug-06
Cover
Tailings
Lake Bed Sediments
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Depth (m bgs)
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

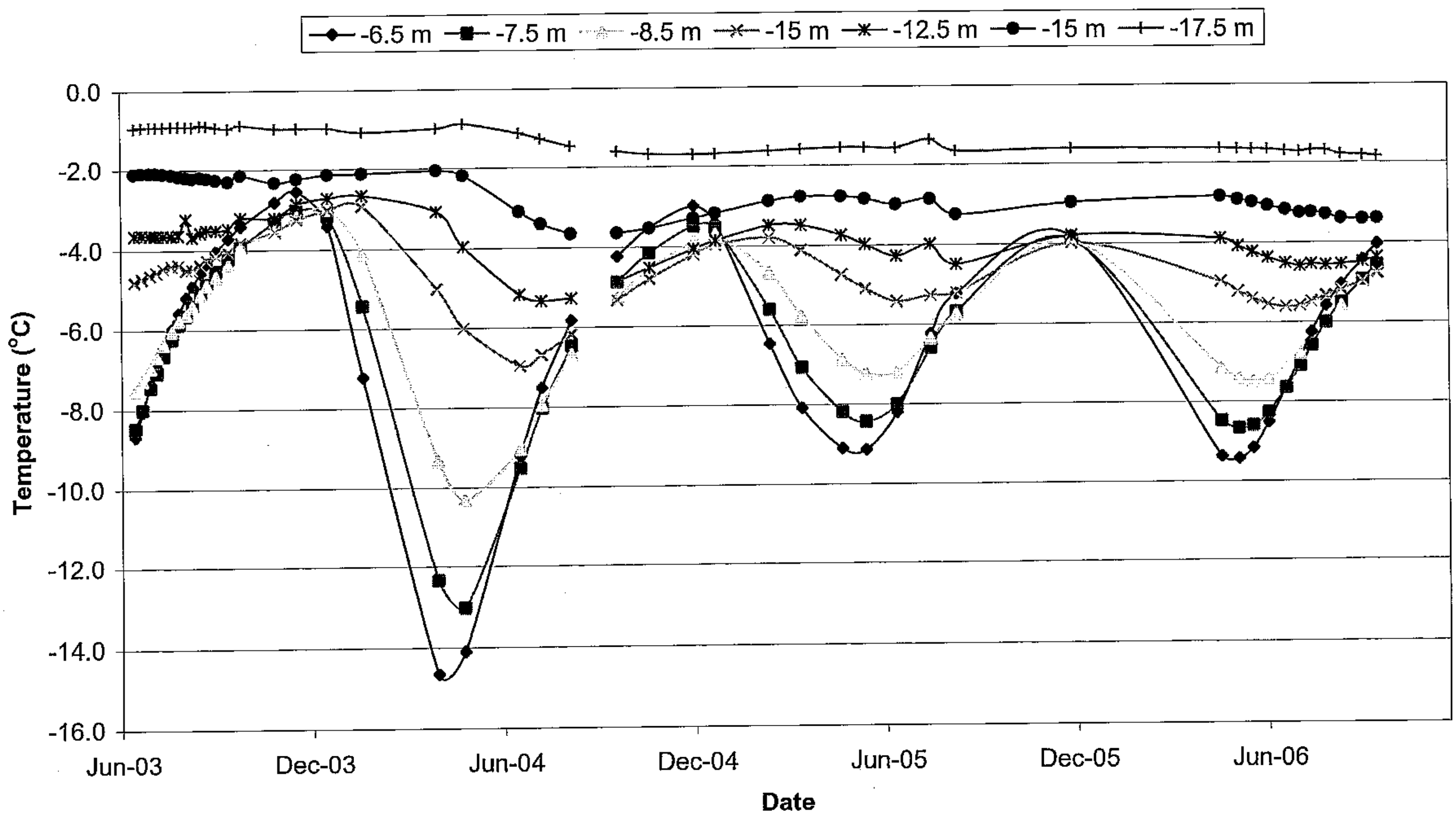

Geothermal Monitoring
Surface Cell
Thermistor BGC03-20
Long Term Plot
-7.6 m
-10.1 m
-11.6 m
-13.6 m
-15.1 m
-17.6 m
-20.1 m
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
Temperature (°C)
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Date

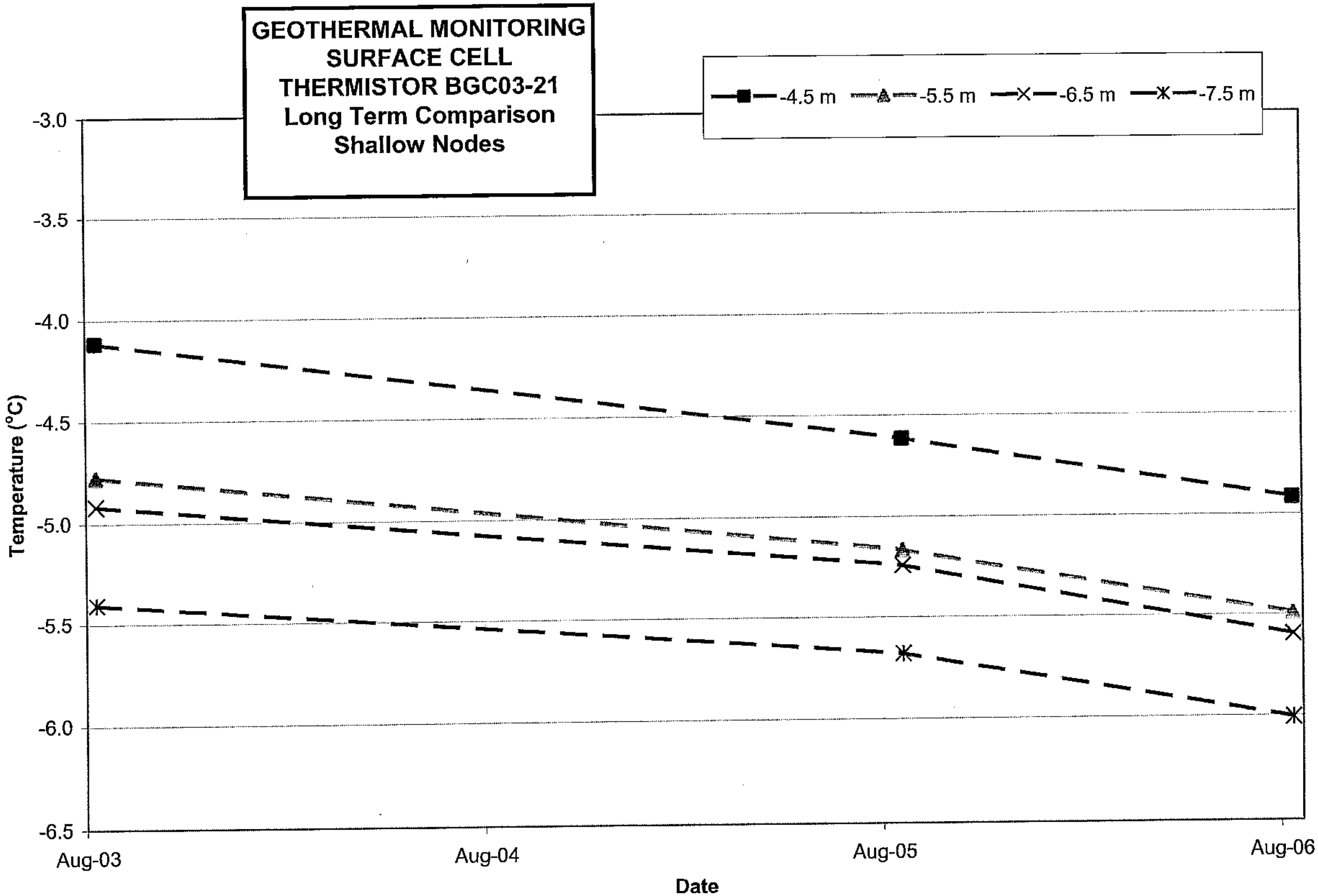

GEOTHERMAL MONITORING
SURFACE CELL
THERMISTOR BGC03-20
LONG TERM COMPARISON
DEEP NODES
-13.6 m
-15.1 m
-17.6 m
-20.1 m
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

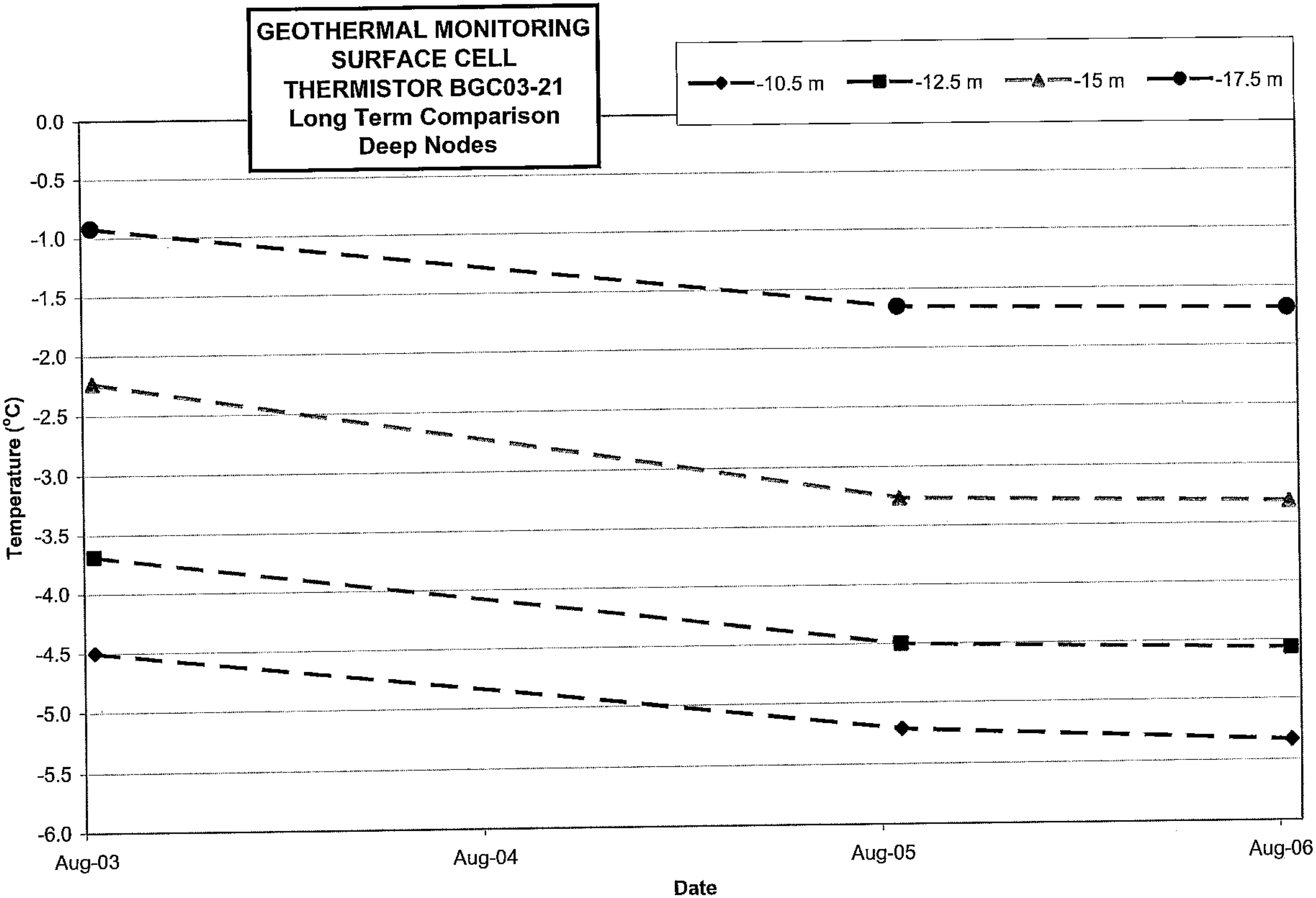

Geothermal Monitoring
Surface Cell
Thermistor BGC03-21
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
12-Aug-06
27-Aug-06
17-Sep-06
Cover
Tailings
Old Causeway
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

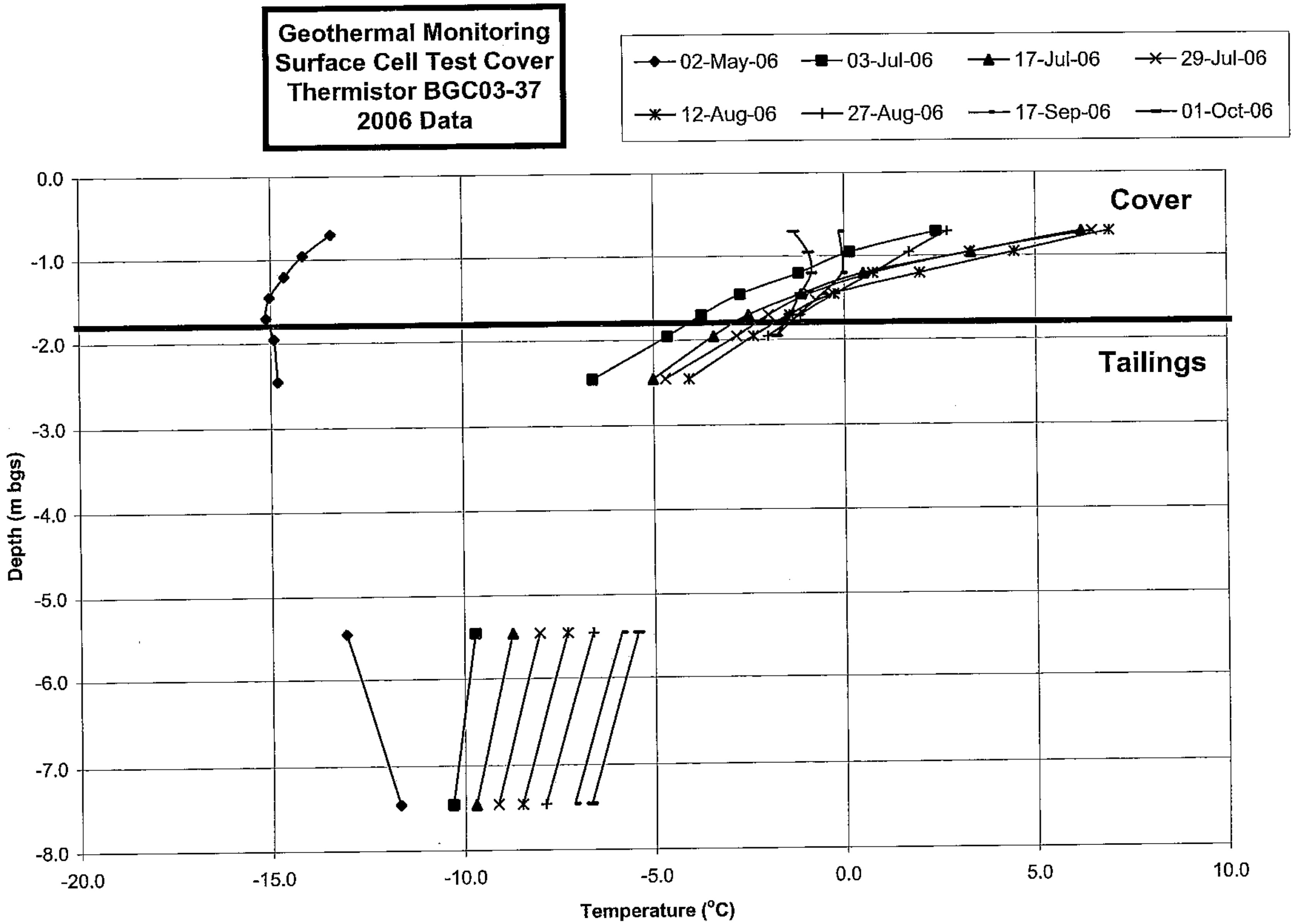

Geothermal Monitoring
Surface Cell
Thermistor BGC03-21
2003-2006 Comparison Plot
11-Aug-03
19-Aug-05
12-Aug-06
Cover
Tailings
Old Causeway
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Depth (m bgs)
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

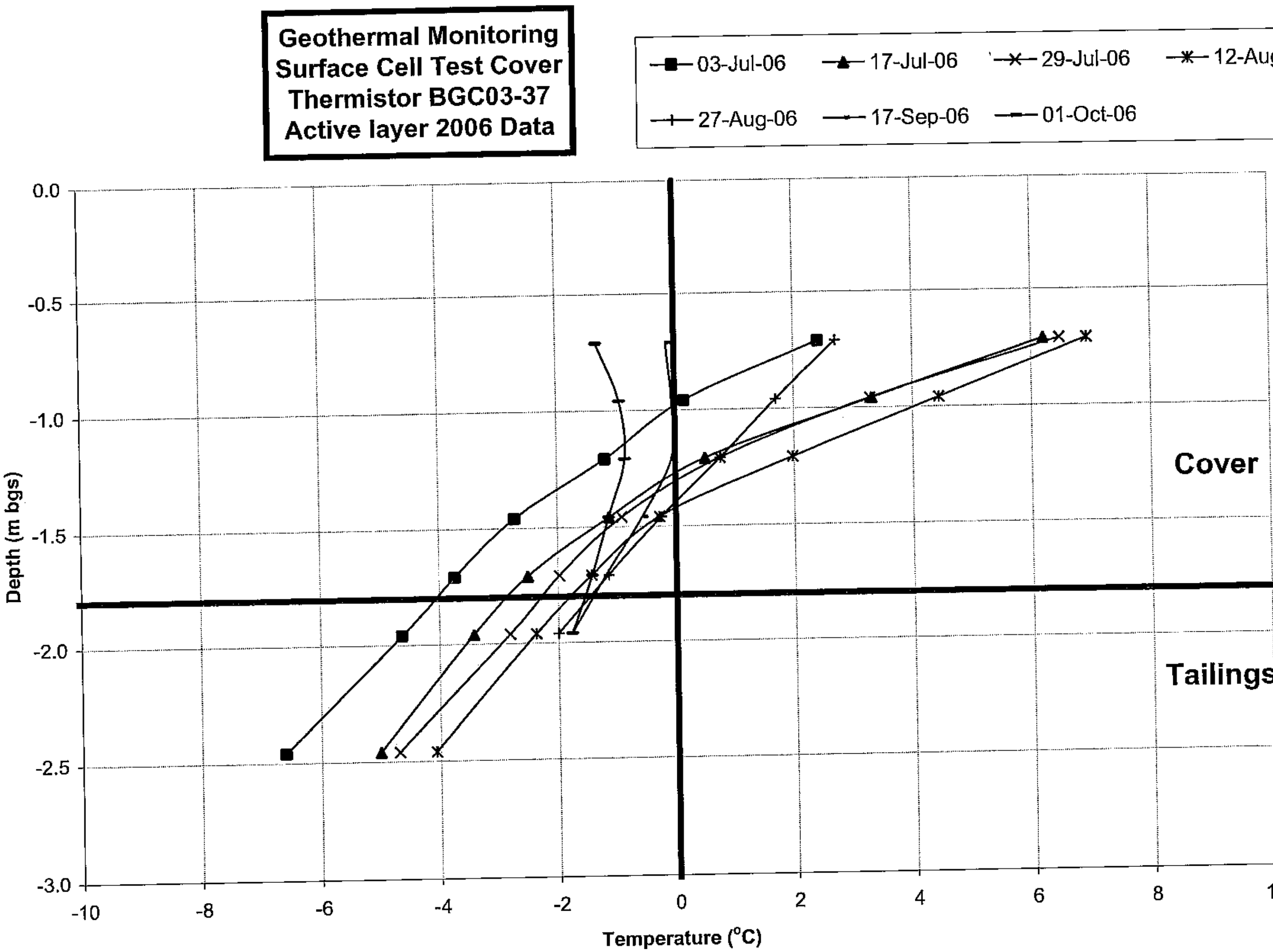
Geothermal Monitoring Surface Cell Thermistor BGC03-21 Long Term Plot

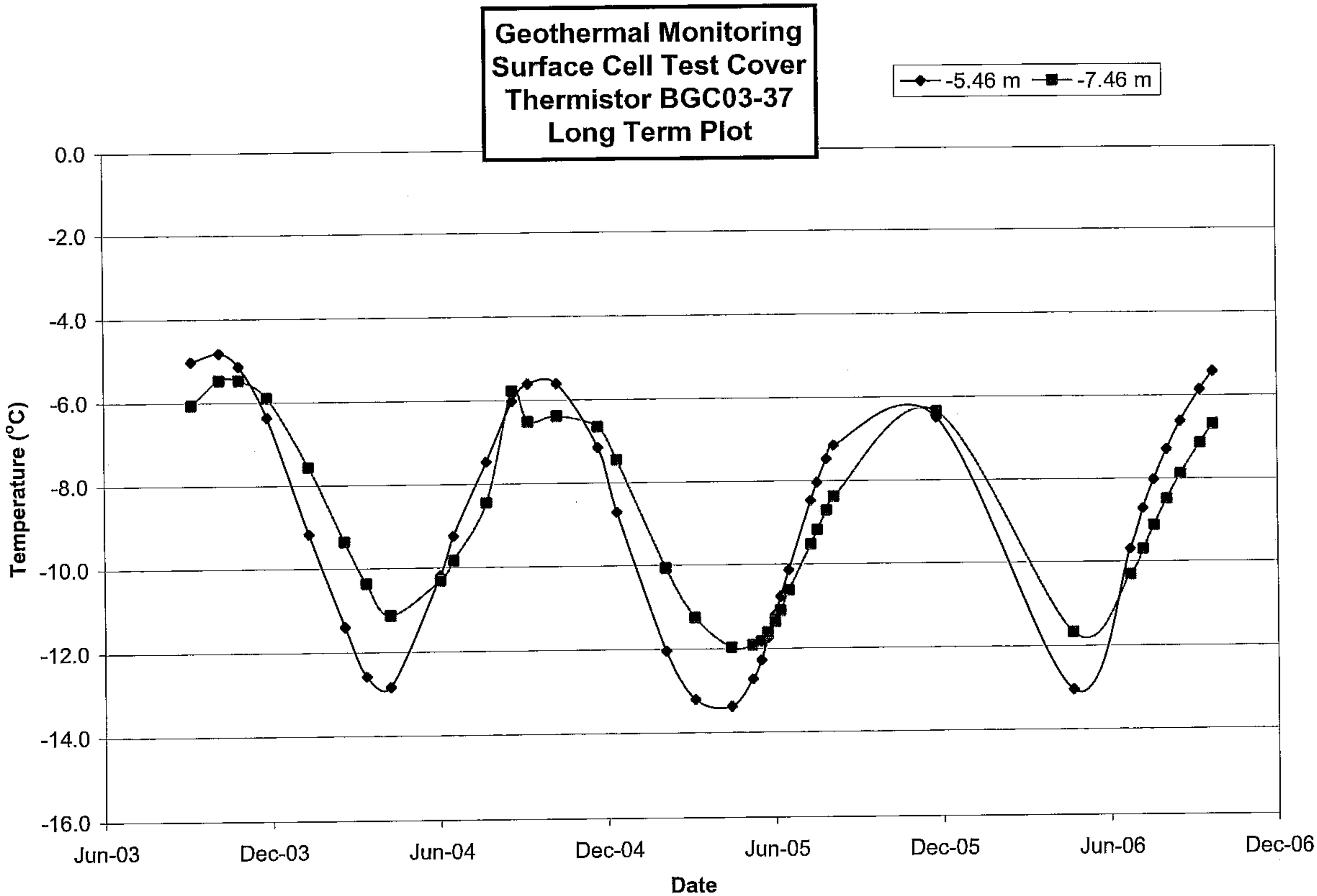


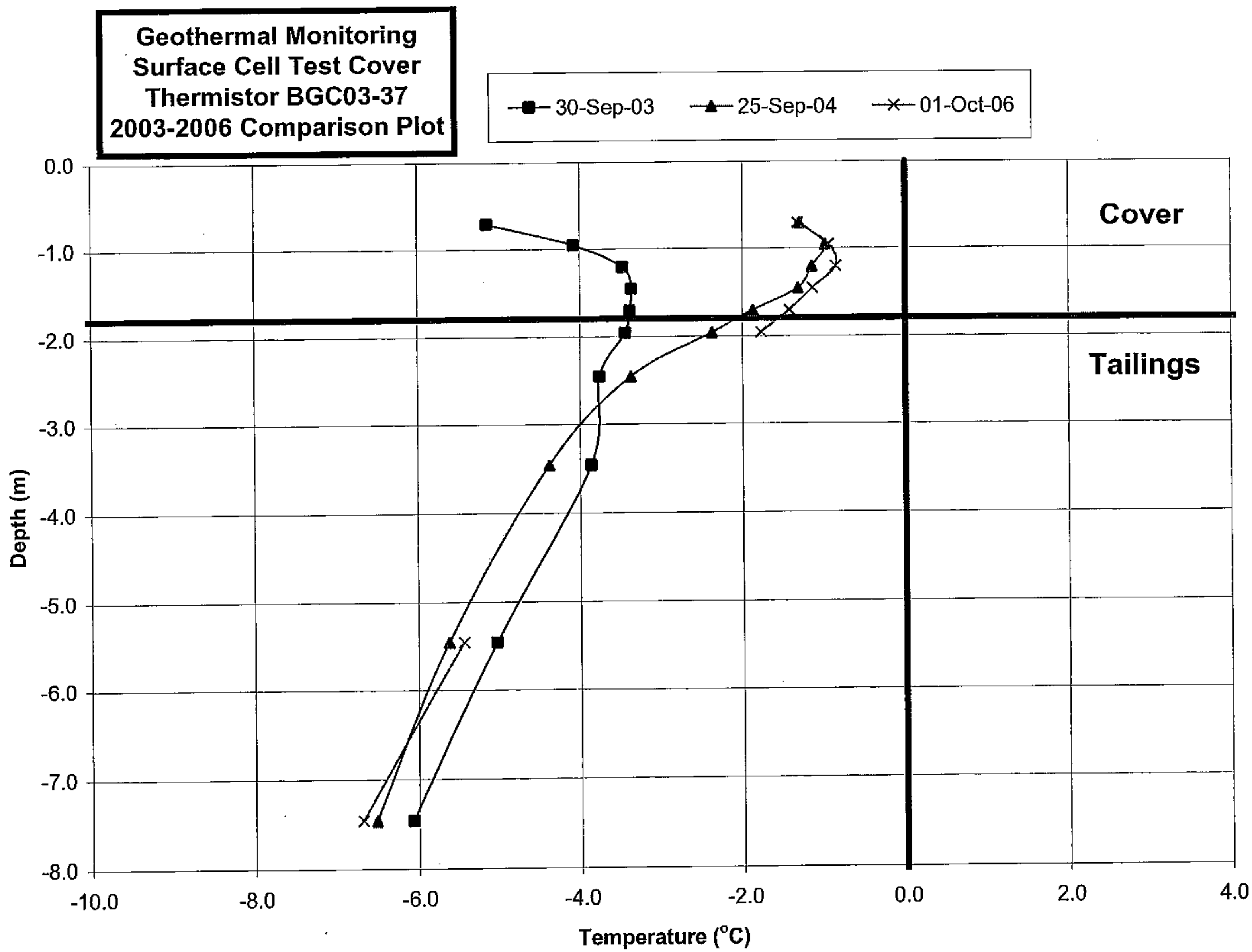

GEOTHERMAL MONITORING
SURFACE CELL
THERMISTOR BGC03-21
Long Term Comparison
Shallow Nodes
-4.5 m
-5.5 m
-6.5 m
-7.5 m
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-6.0
-6.5
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

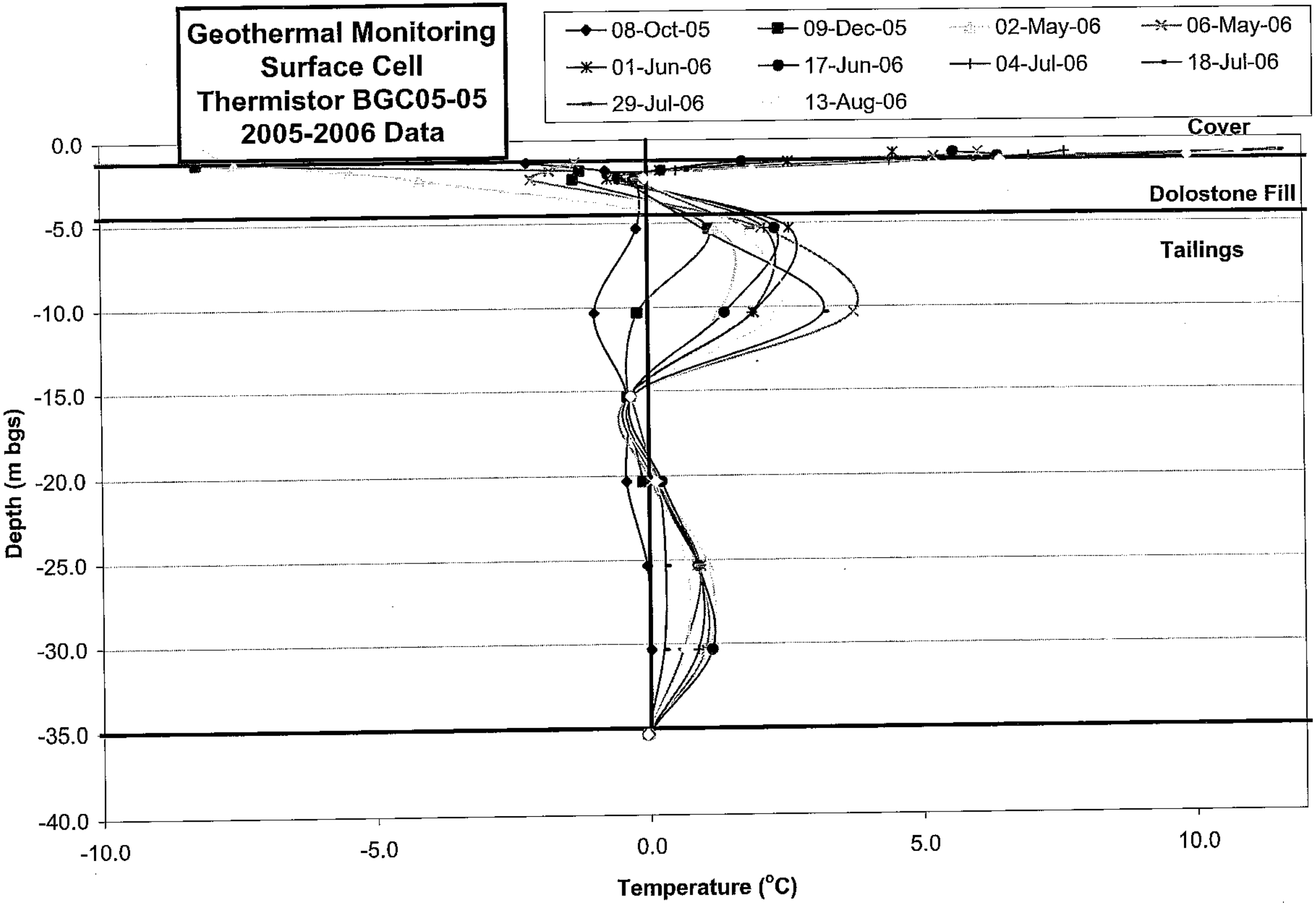

GEOTHERMAL MONITORING
SURFACE CELL
THERMISTOR BGC03-21
Long Term Comparison
Deep Nodes
-10.5 m
-12.5 m
-15 m
-17.5 m
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-6.0
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

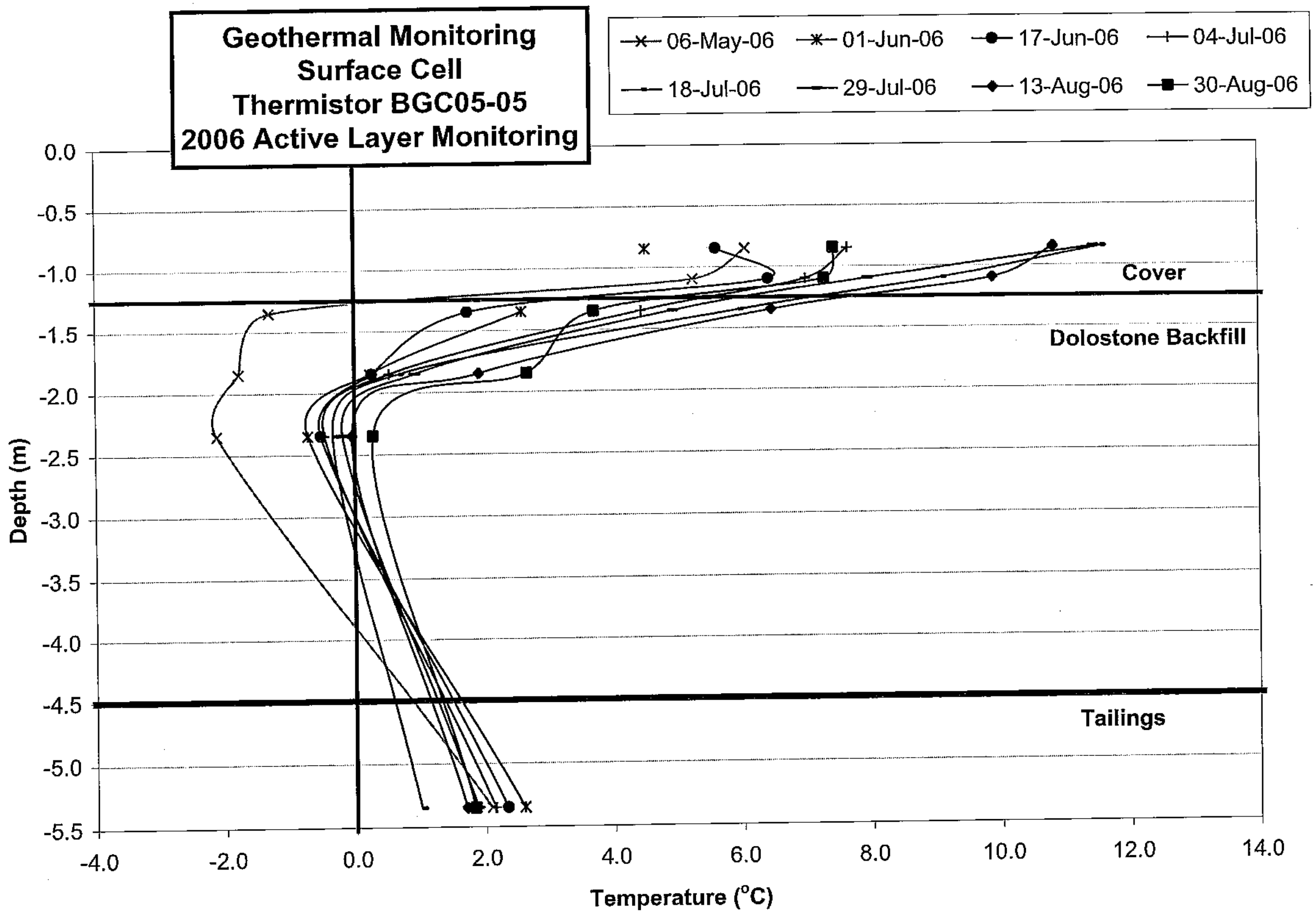

Geothermal Monitoring
Surface Cell Test Cover
Thermistor BGC03-37
2006 Data
02-May-06
03-Jul-06
17-Jul-06
29-Jul-06
12-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
Temperature (°C)


Geothermal Monitoring
Surface Cell Test Cover
Thermistor BGC03-37
Active layer 2006 Data
03-Jul-06
17-Jul-06
29-Jul-06
12-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
Temperature (°C)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-10
-8
-6
-4
-2
0
2
4
6
8
10

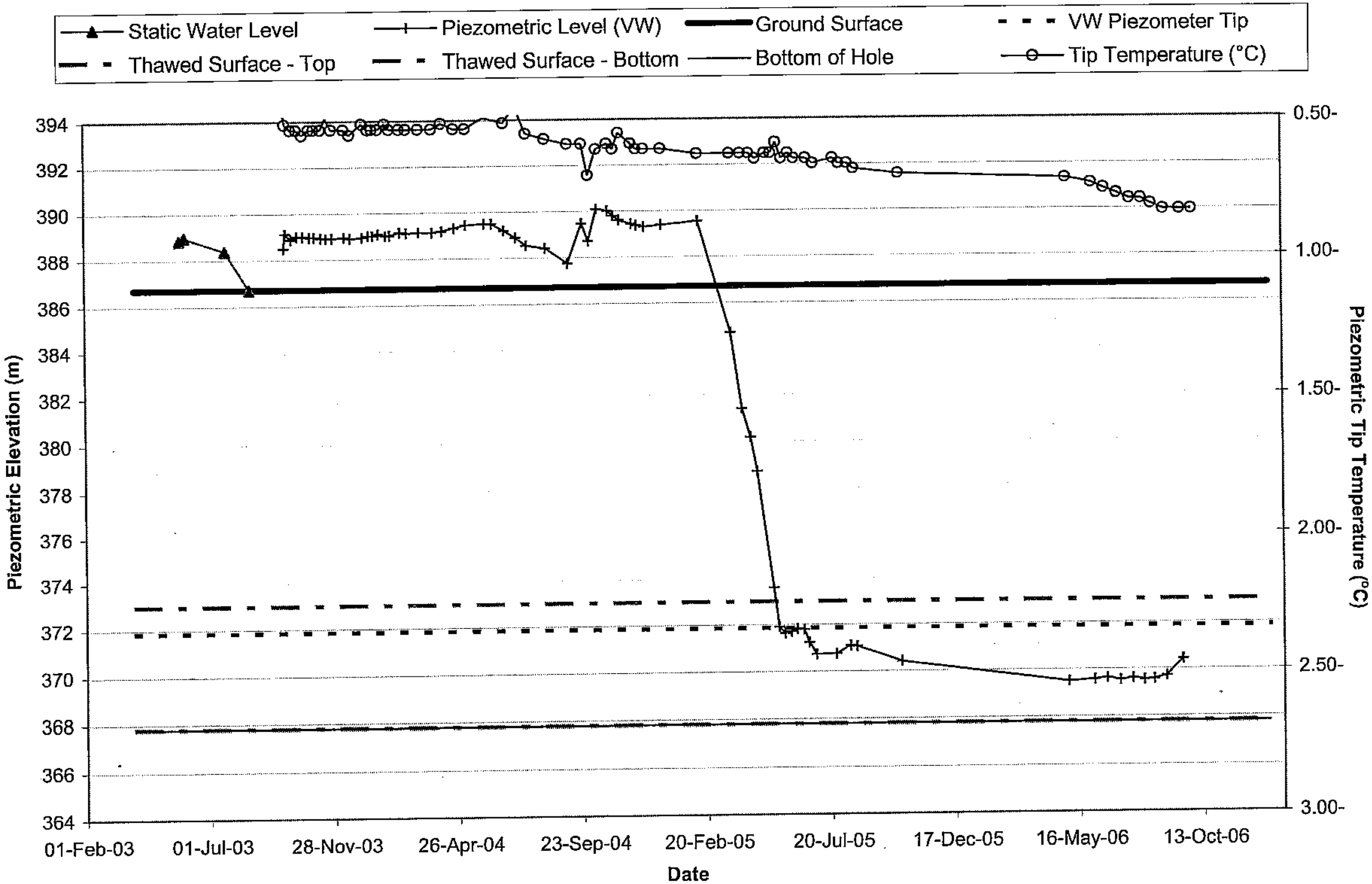

Geothermal Monitoring
Surface Cell Test Cover
Thermistor BGC03-37
Long Term Plot
-5.46 m
-7.46 m
Temperature (°C)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Date


Geothermal Monitoring
Surface Cell Test Cover
Thermistor BGC03-37
2003-2006 Comparison Plot
30-Sep-03
25-Sep-04
01-Oct-06
Cover
Tailings
Depth (m)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

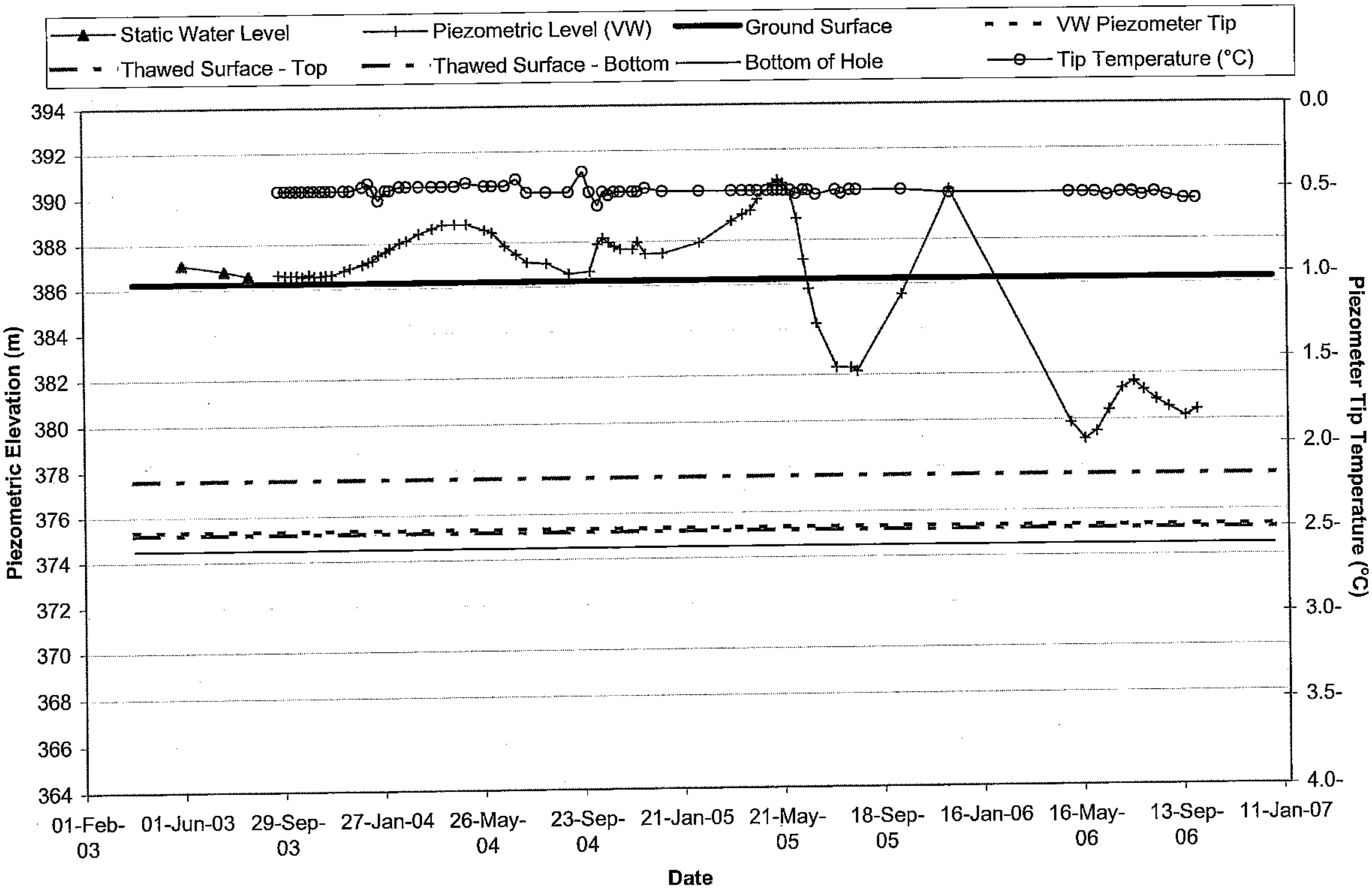

Geothermal Monitoring
Surface Cell
Thermistor BGC05-05
2005-2006 Data
08-Oct-05
09-Dec-05
02-May-06
06-May-06
01-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
Cover
Dolostone Fill
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-10.0
-5.0
0.0
5.0
10.0
Temperature (°C)


Geothermal Monitoring
Surface Cell
Thermistor BGC05-05
2006 Active Layer Monitoring
06-May-06
01-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
30-Aug-06
Cover
Dolostone Backfill
Tailings
Depth (m)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Temperature (°C)

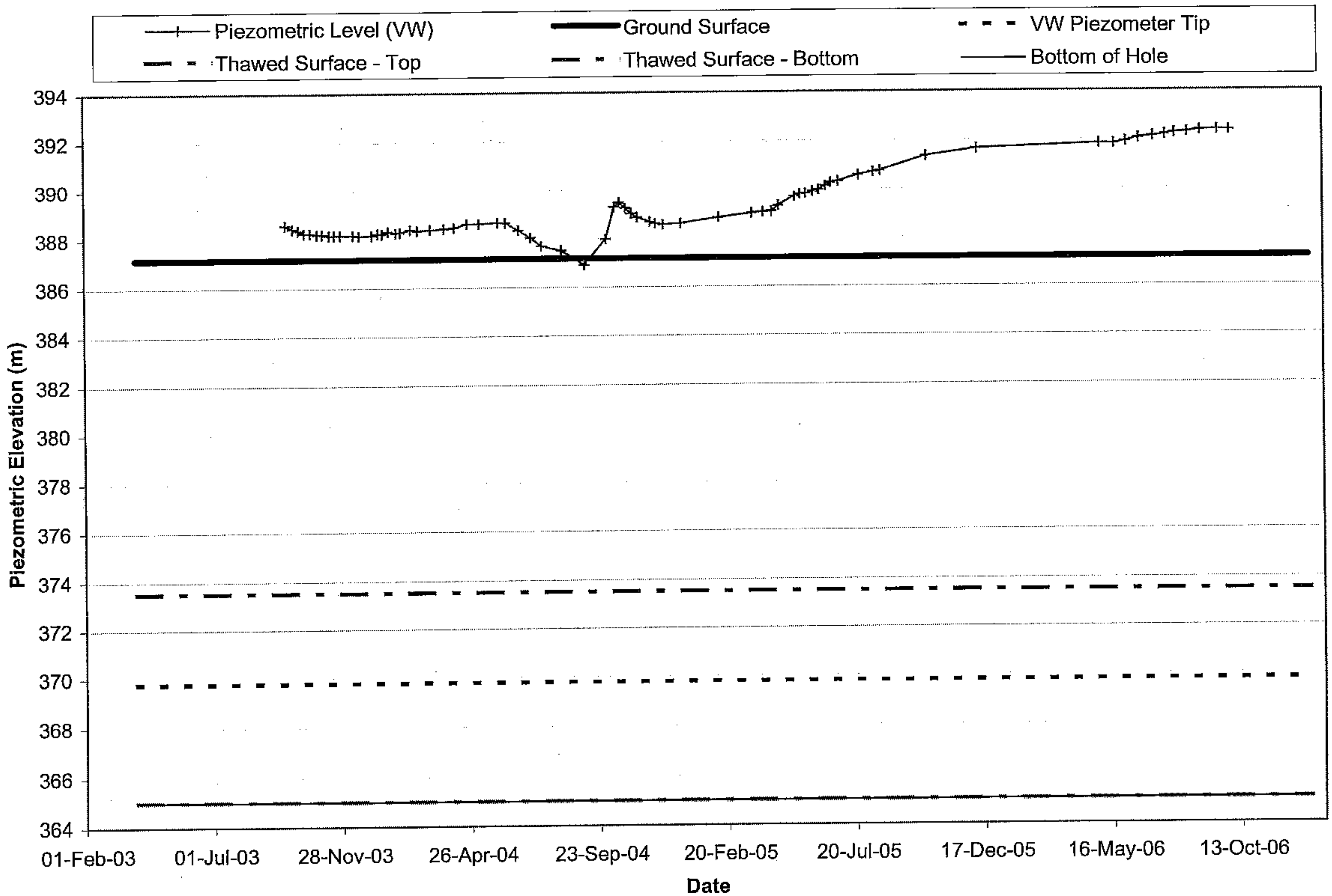
Piezometer Monitoring Results for BGC03-12



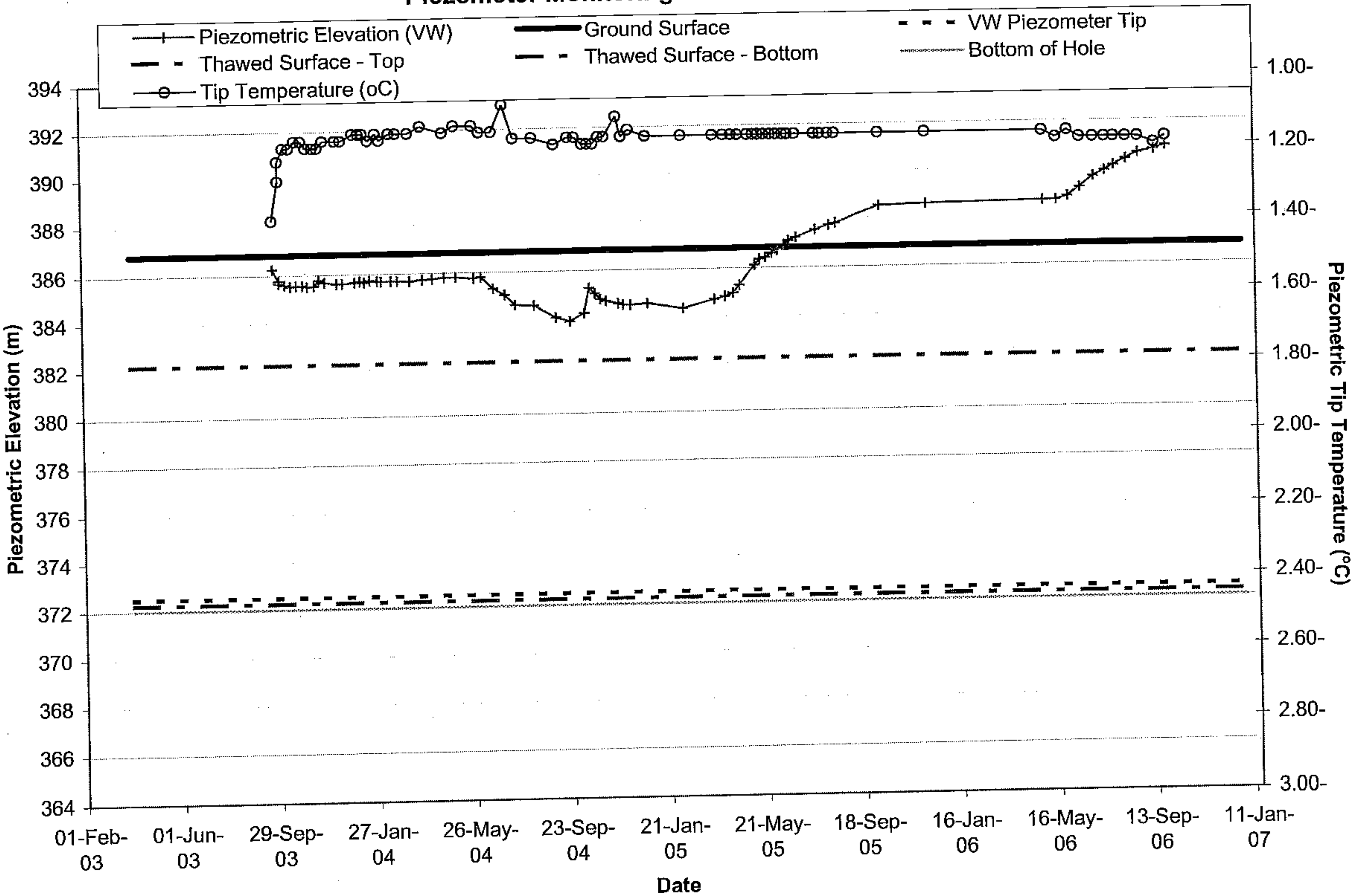
Piezometer Monitoring Results for BGC03-14



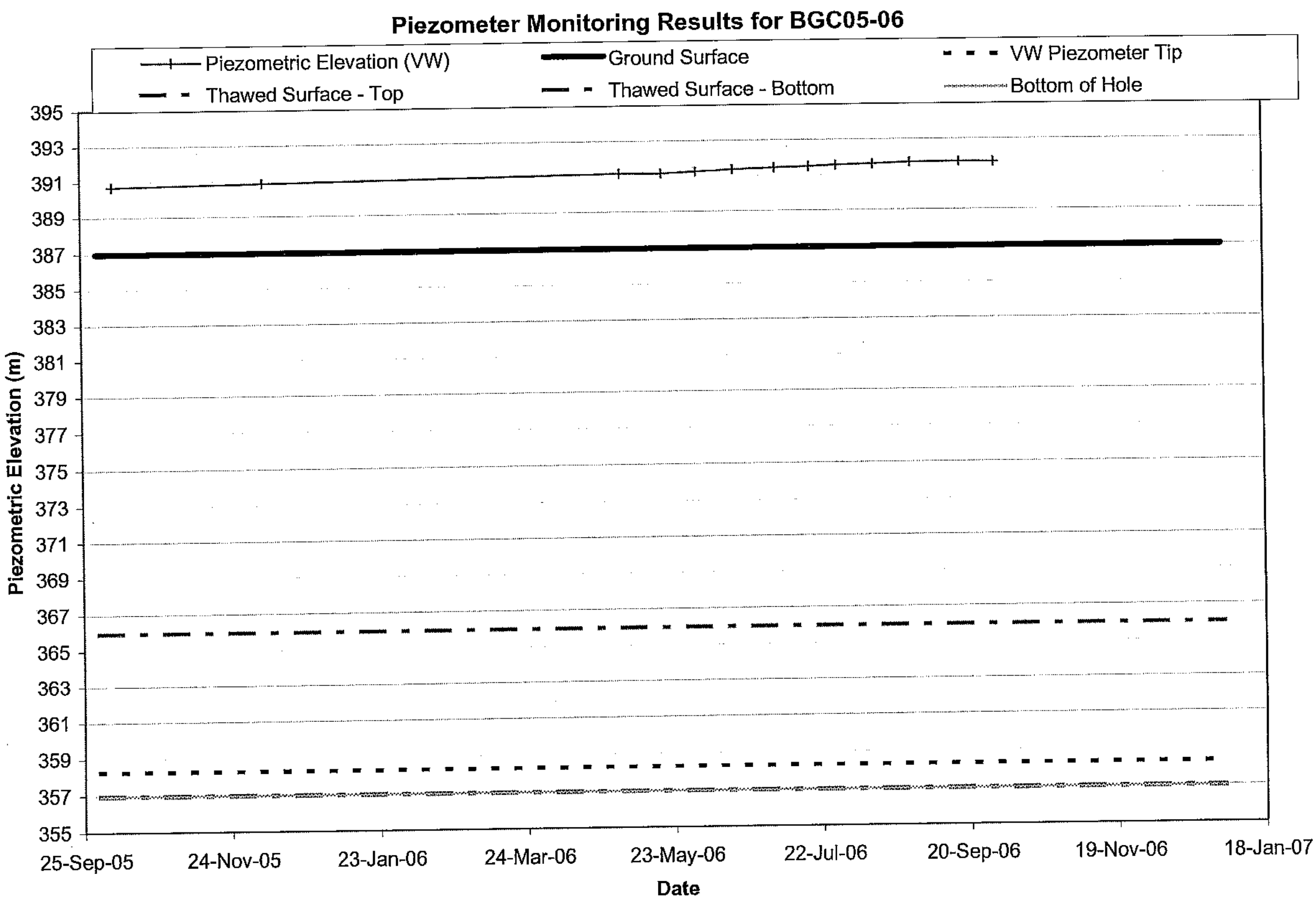
Piezometer Montioring Results for BGC03-32



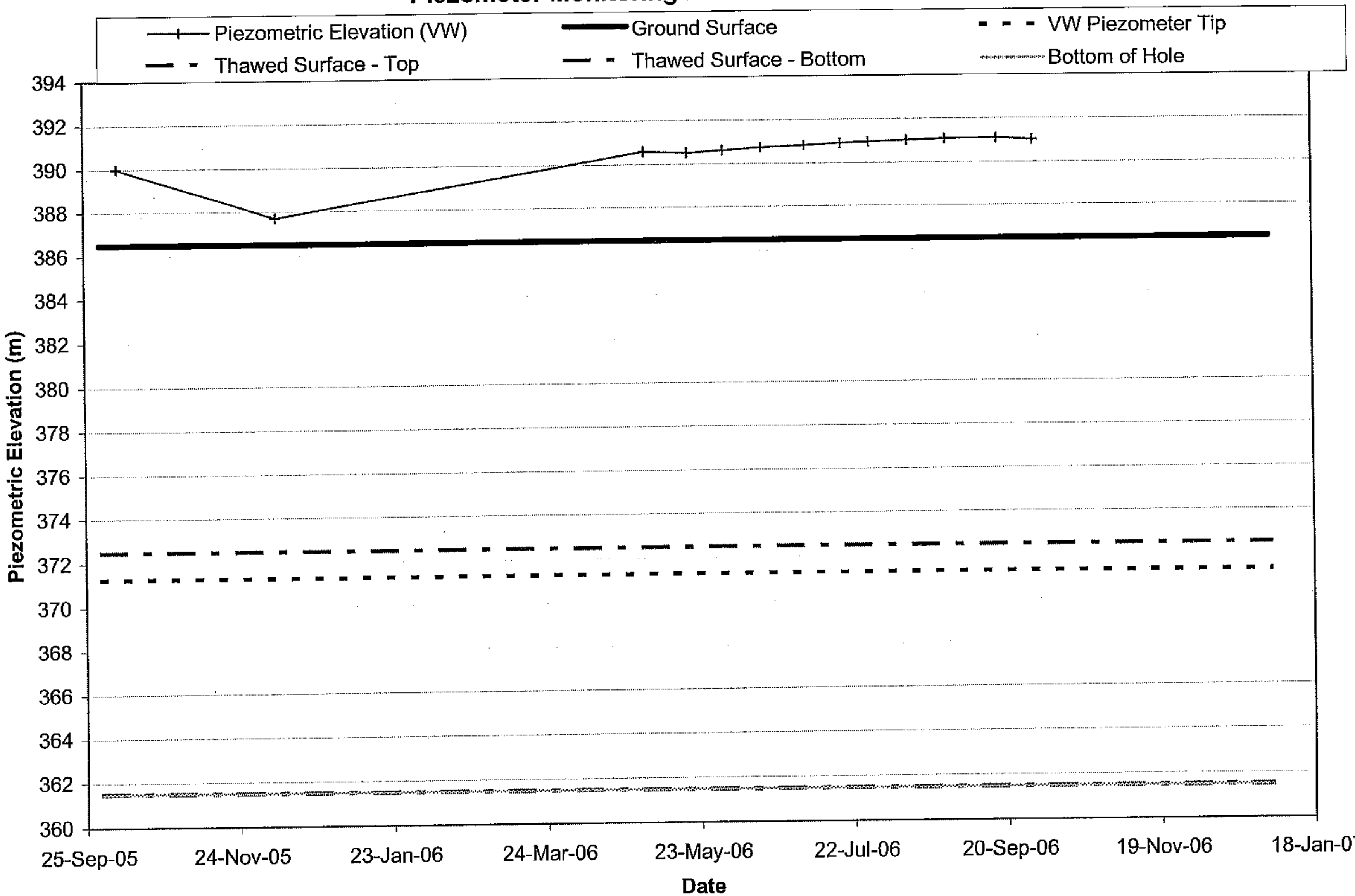
Piezometer Monitoring Results for BGC03-35



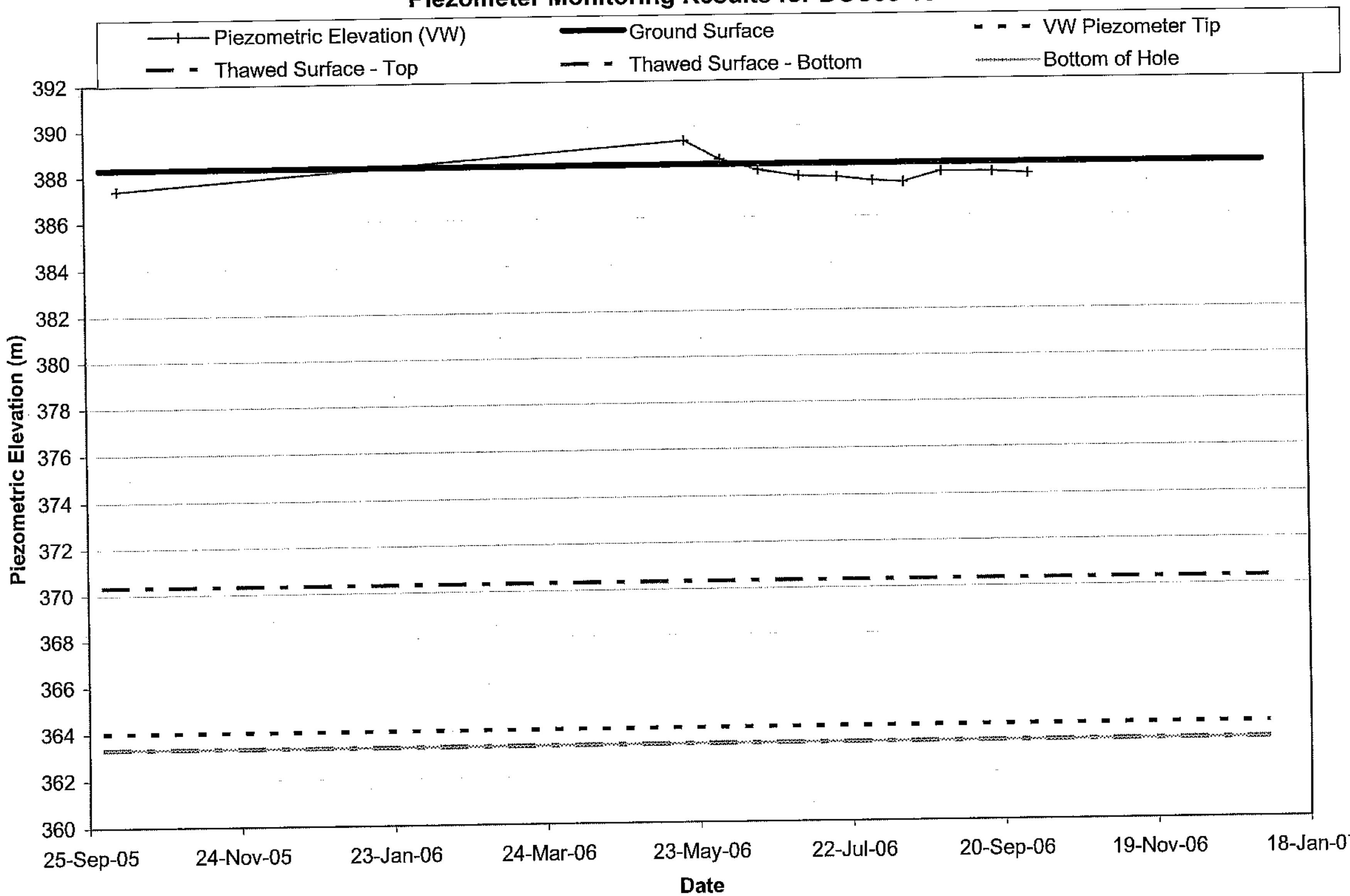
* VW Piezometer Tip Elevation portrayed 0.33 m higher than actual value

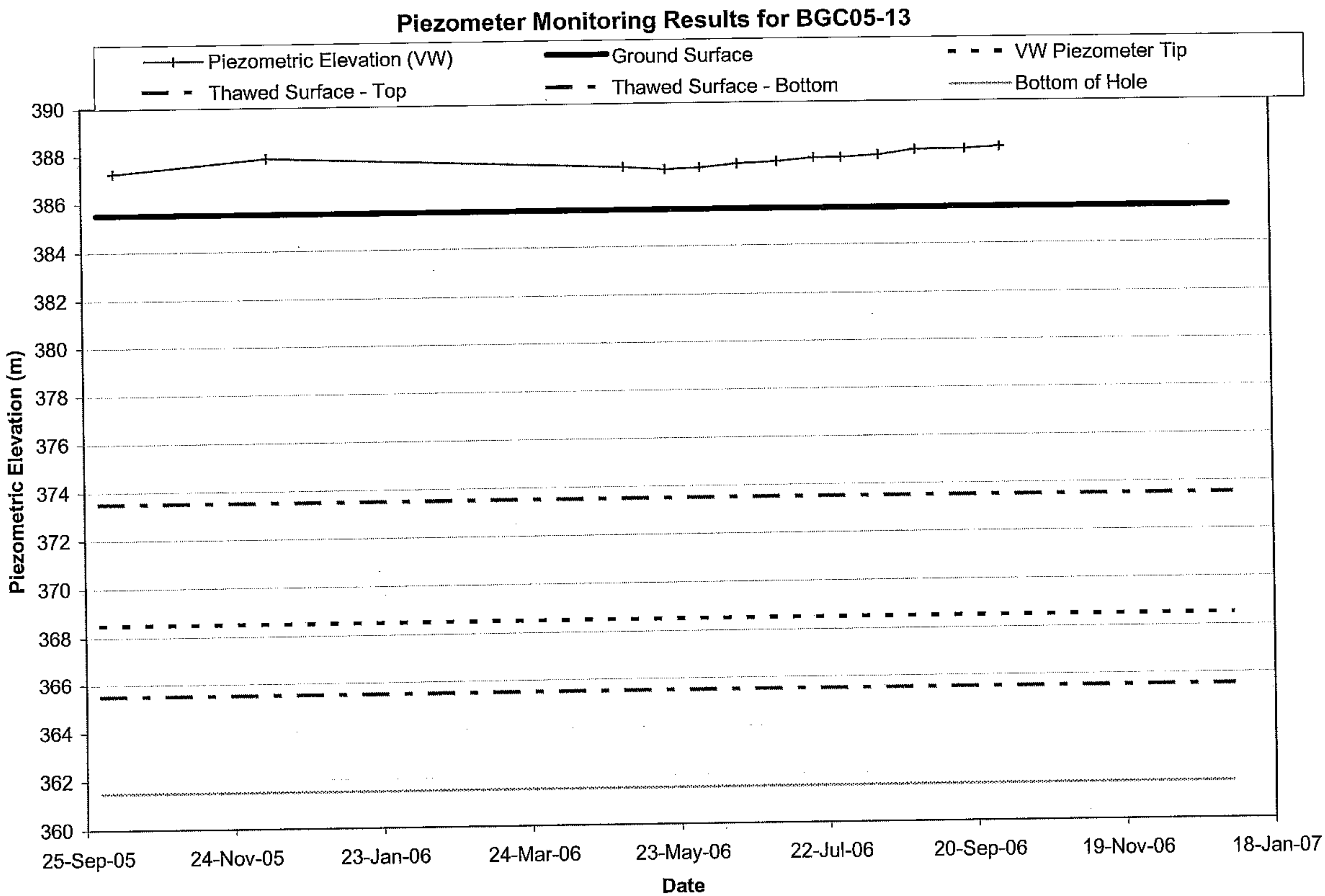

Piezometer Monitoring Results for BGC05-06
Piezometric Elevation (VW)
Ground Surface
VW Piezometer Tip
Thawed Surface - Top
Thawed Surface - Bottom
Bottom of Hole
Piezometric Elevation (m)
395
393
391
389
387
385
383
381
379
377
375
373
371
369
367
365
363
361
359
357
355
25-Sep-05
24-Nov-05
23-Jan-06
24-Mar-06
23-May-06
22-Jul-06
20-Sep-06
19-Nov-06
18-Jan-07
Date

Piezometer Monitoring Results for BGC05-07

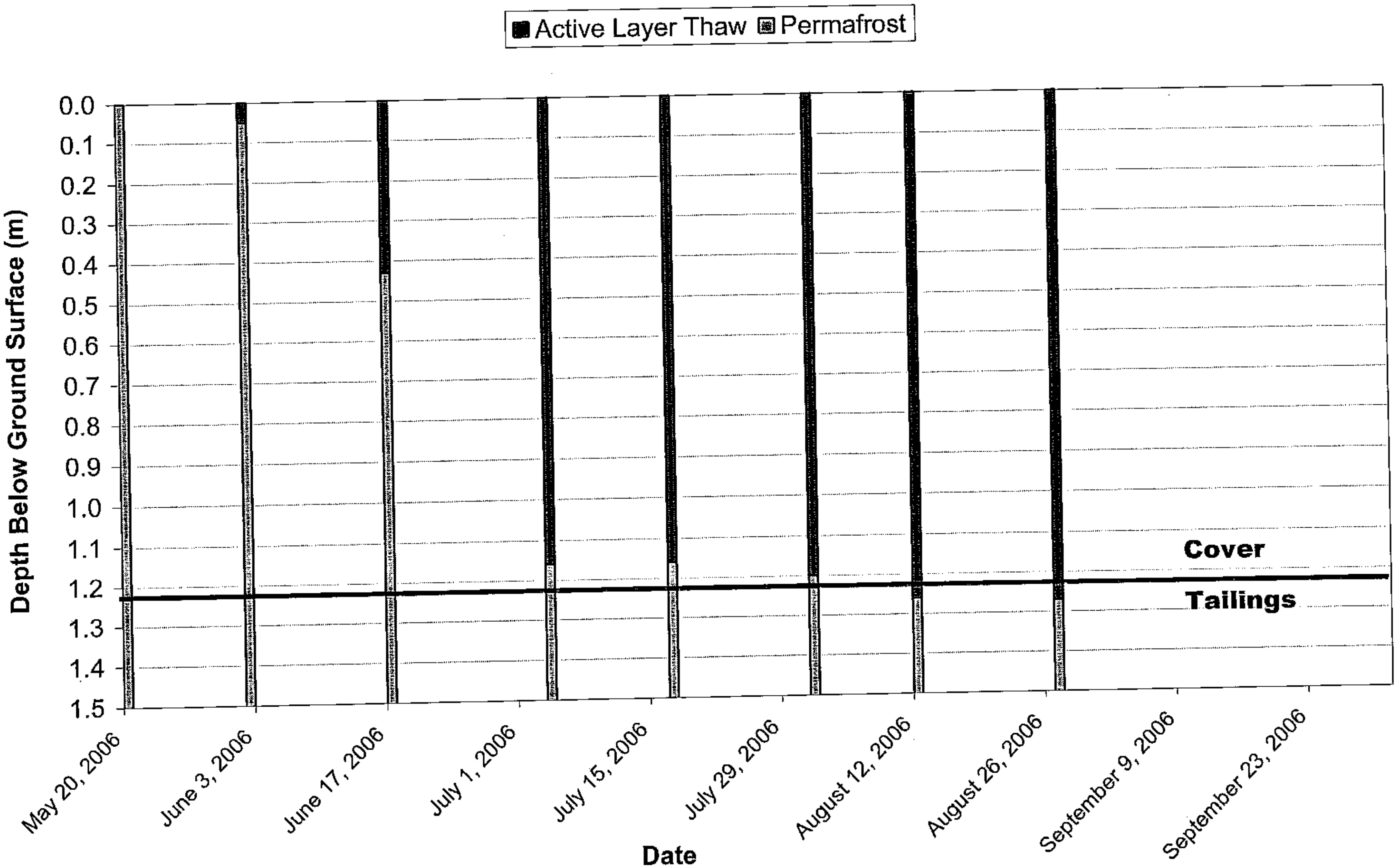


Piezometer Monitoring Results for BGC05-10

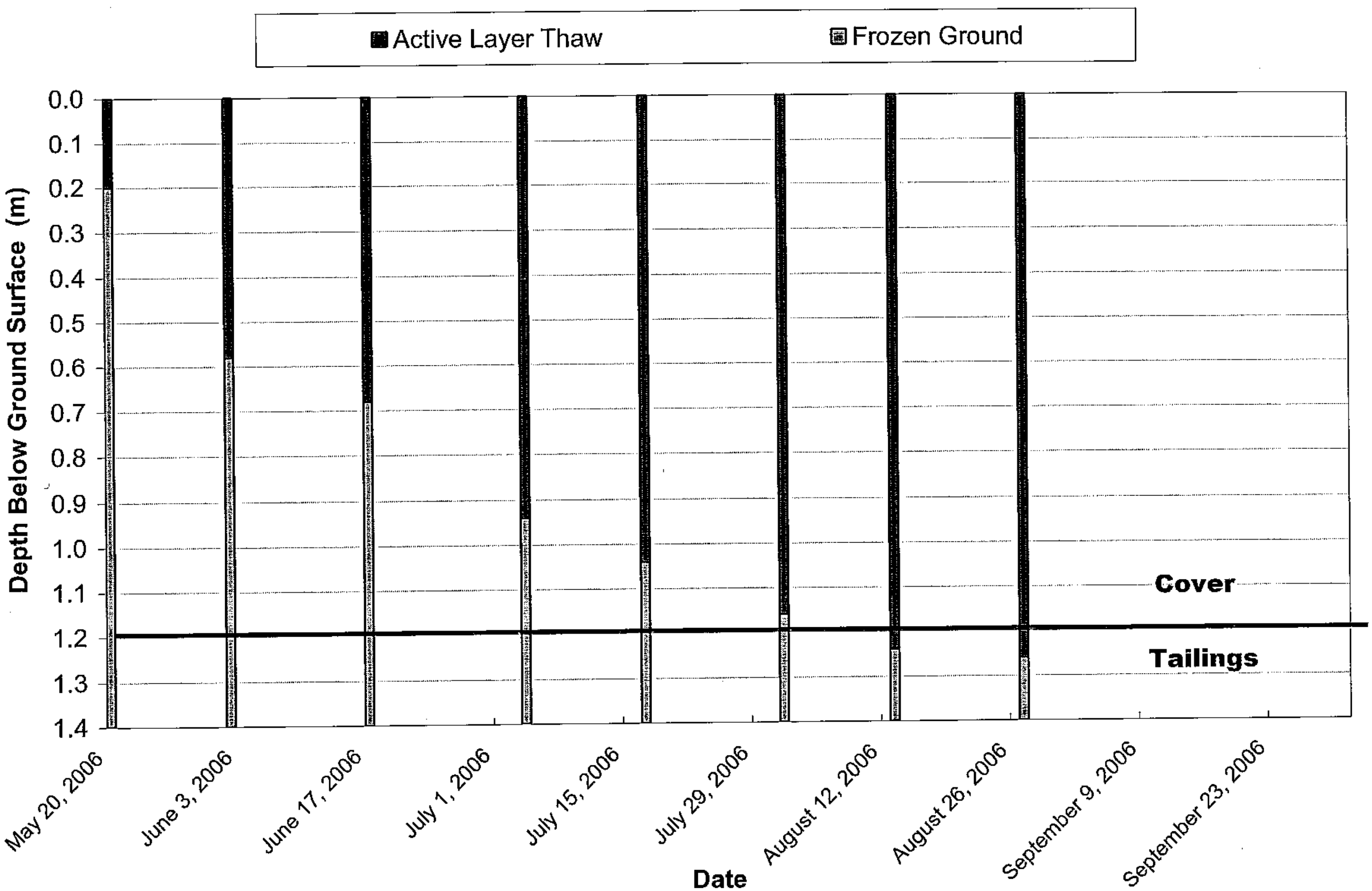


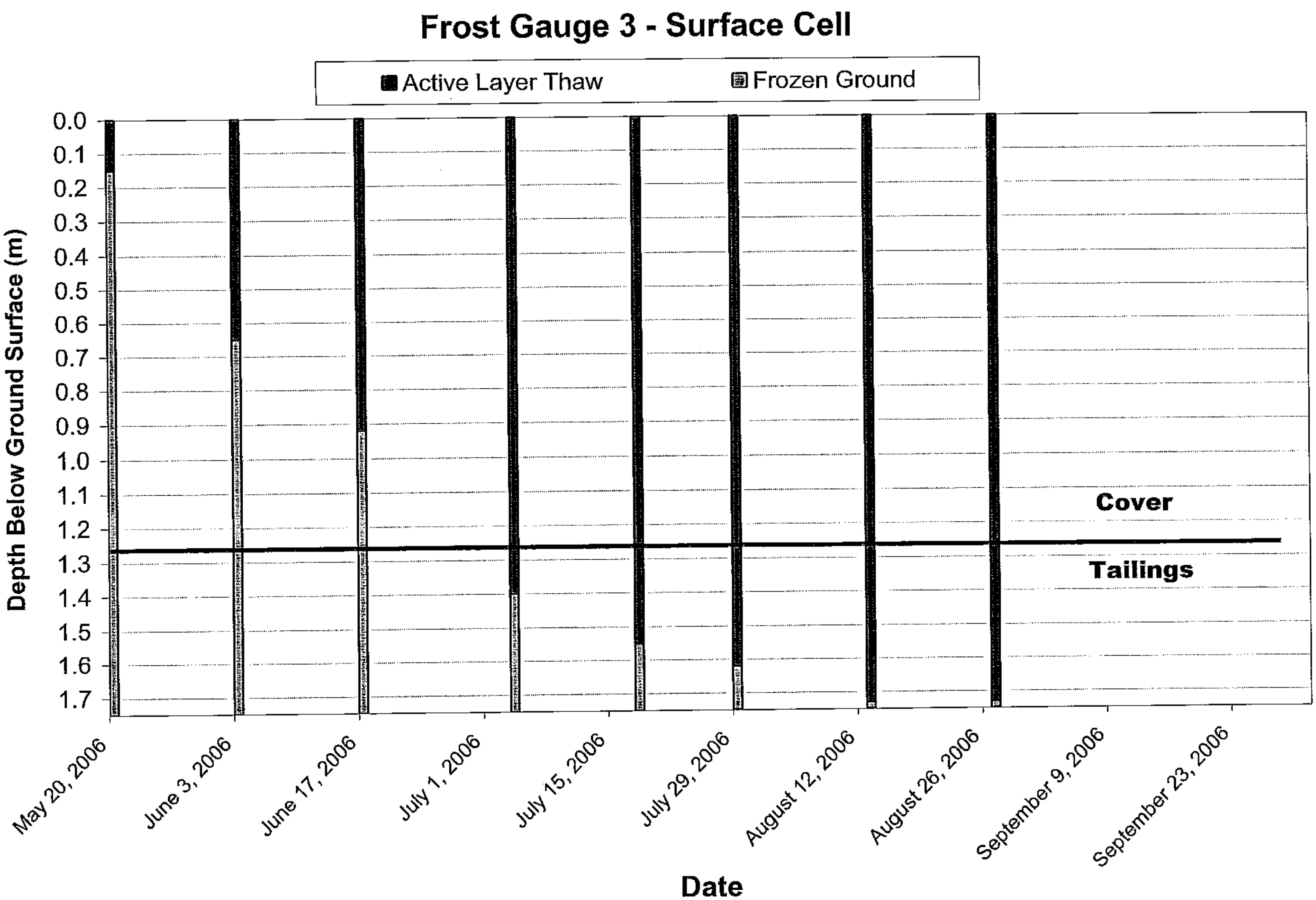

Piezometer Monitoring Results for BGC05-13
Piezometric Elevation (VW)
Ground Surface
VW Piezometer Tip
Thawed Surface - Top
Thawed Surface - Bottom
Bottom of Hole
390
388
386
384
382
380
378
376
374
372
370
368
366
364
362
360
Piezometric Elevation (m)
25-Sep-05
24-Nov-05
23-Jan-06
24-Mar-06
23-May-06
22-Jul-06
20-Sep-06
19-Nov-06
18-Jan-07
Date

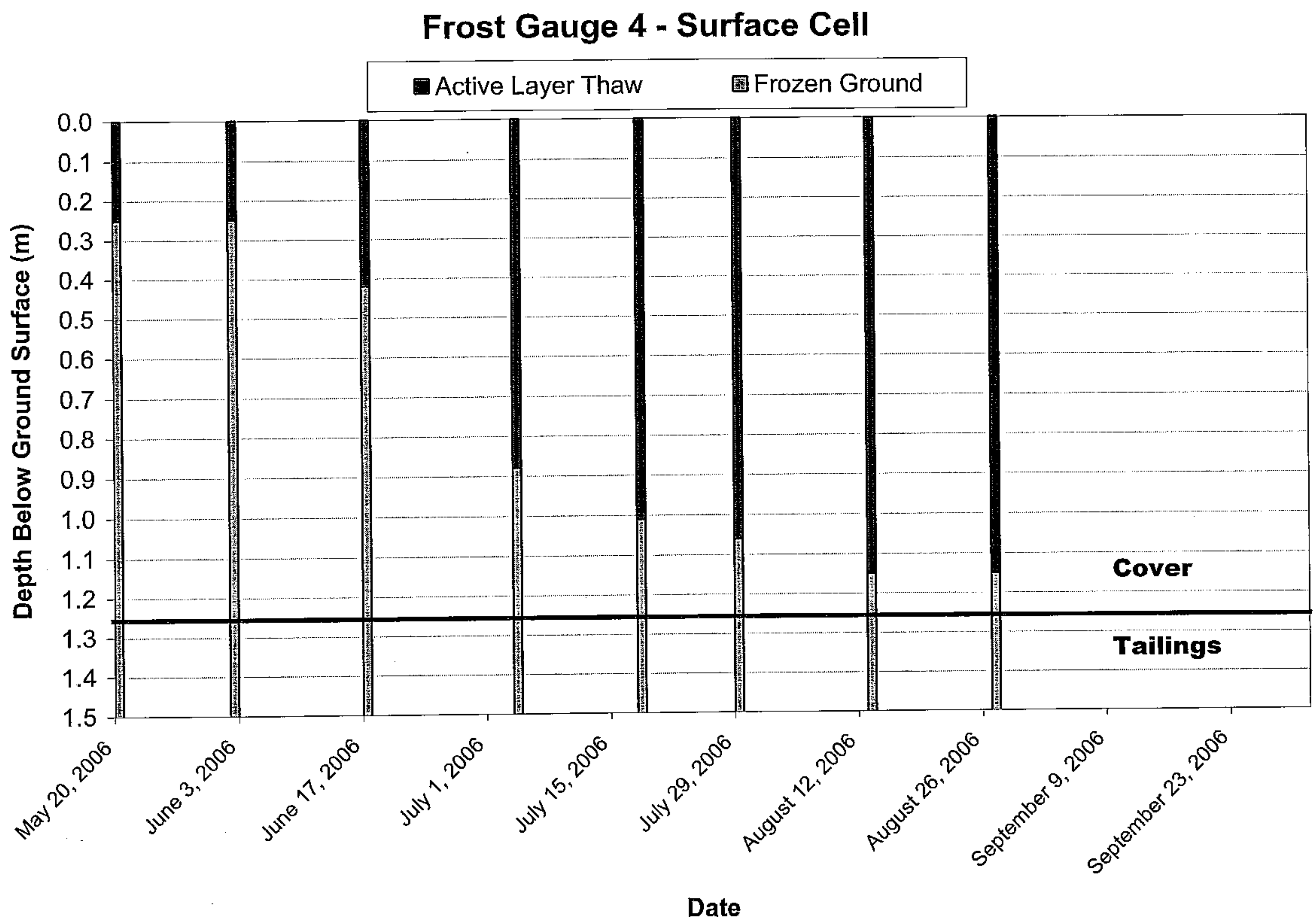
Frost Gauge 1 - Surface Cell

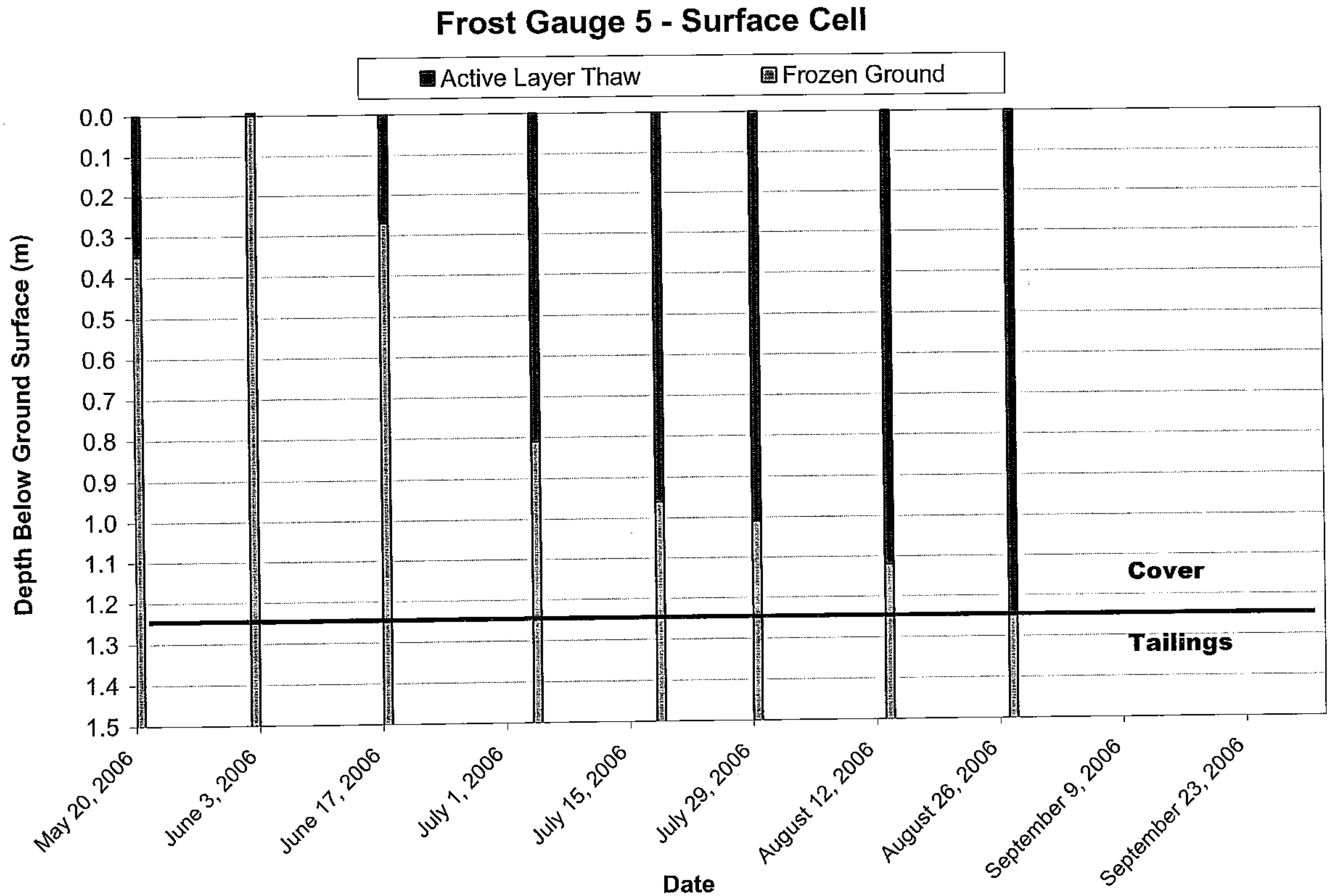


Frost Gauge 2 - Surface Cell

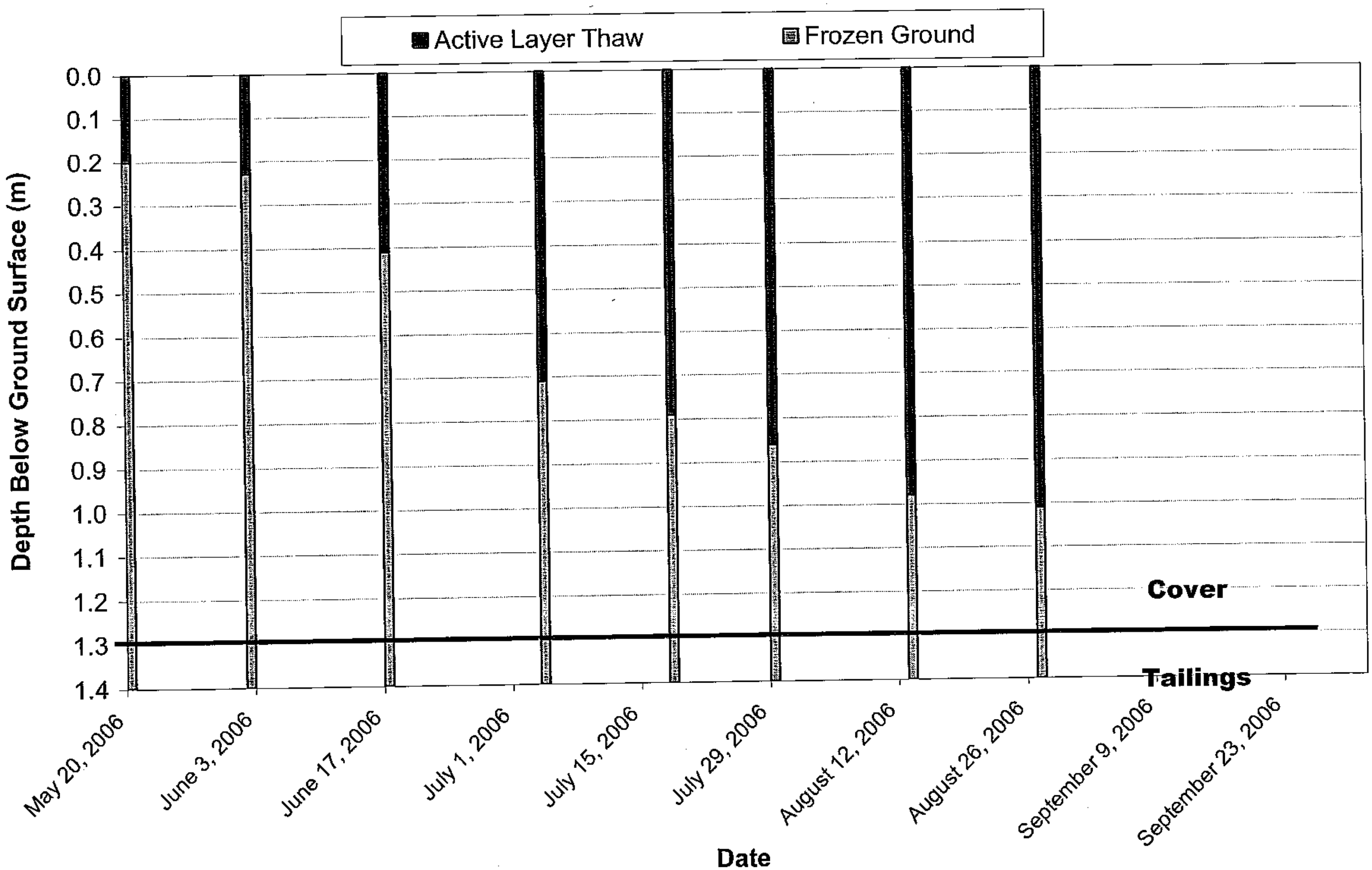


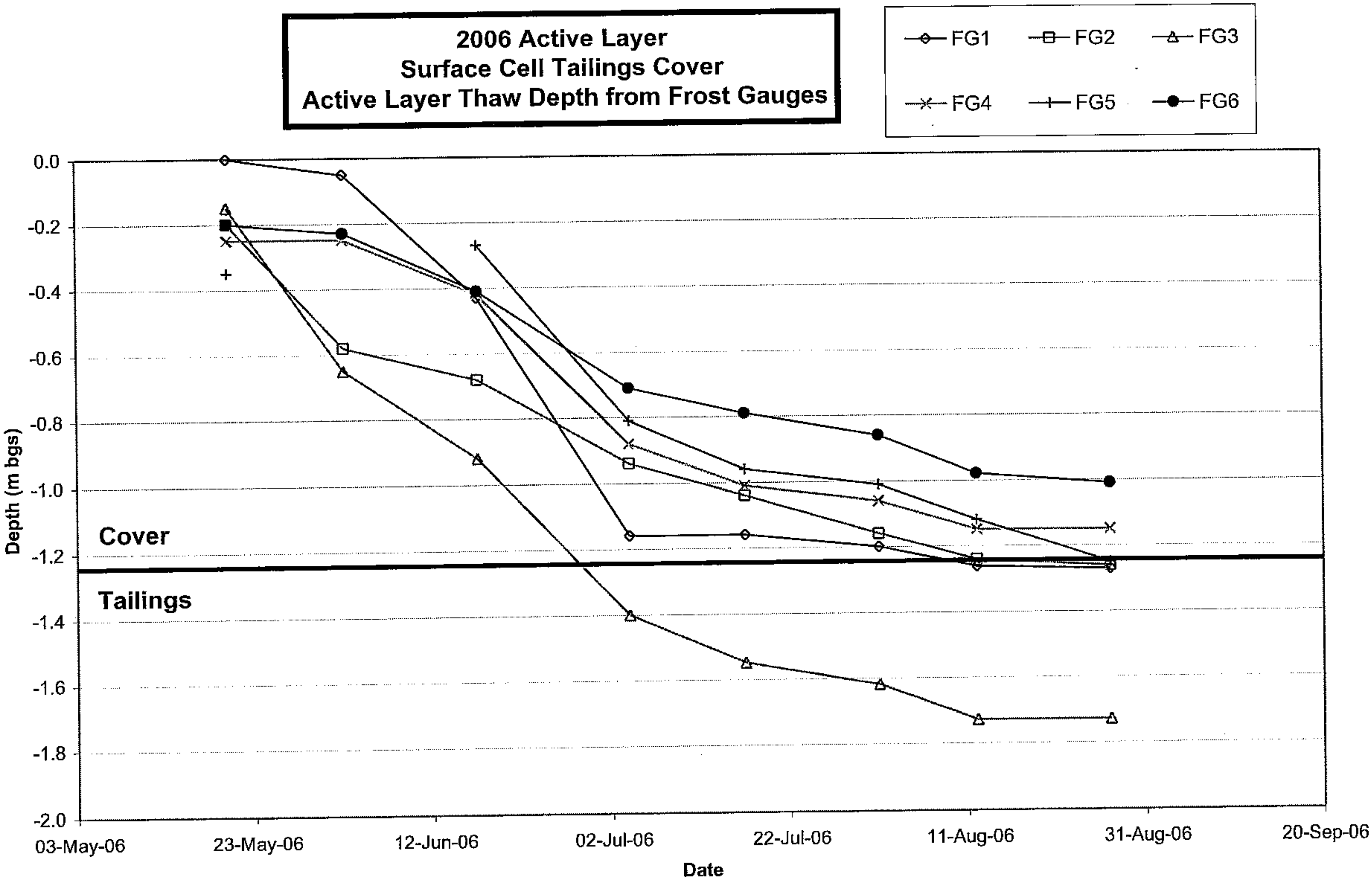

Frost Gauge 3 - Surface Cell
Active Layer Thaw
Frozen Ground
Depth Below Ground Surface (m)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
Cover
Tailings
May 20, 2006
June 3, 2006
June 17, 2006
July 1, 2006
July 15, 2006
July 29, 2006
August 12, 2006
August 26, 2006
September 9, 2006
September 23, 2006
Date


Frost Gauge 4 - Surface Cell
Active Layer Thaw
Frozen Ground
Depth Below Ground Surface (m)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
Cover
Tailings
May 20, 2006
June 3, 2006
June 17, 2006
July 1, 2006
July 15, 2006
July 29, 2006
August 12, 2006
August 26, 2006
September 9, 2006
September 23, 2006
Date

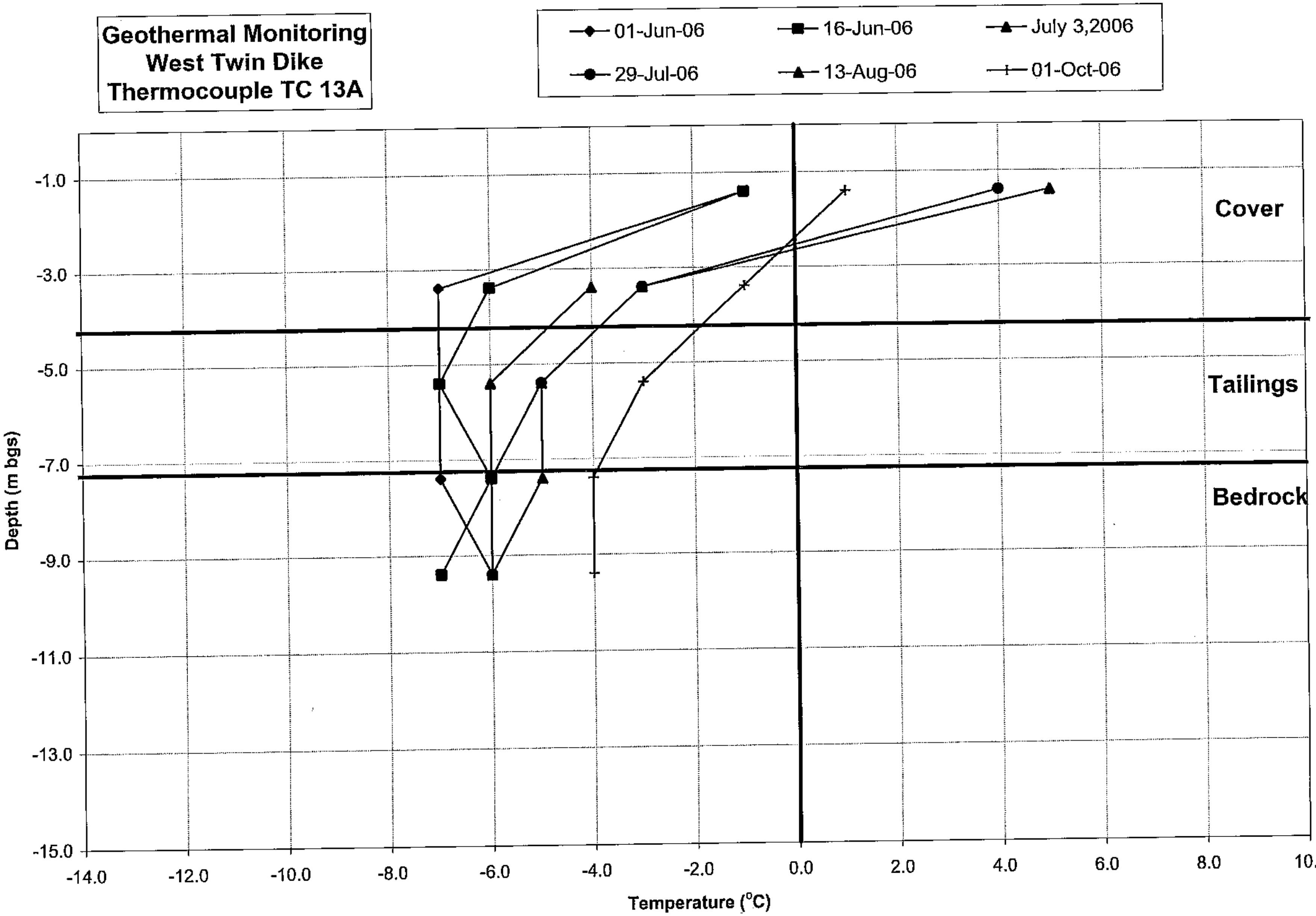

Frost Gauge 5 - Surface Cell
Active Layer Thaw
Frozen Ground
Depth Below Ground Surface (m)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
Cover
Tailings
May 20, 2006
June 3, 2006
June 17, 2006
July 1, 2006
July 15, 2006
July 29, 2006
August 12, 2006
August 26, 2006
September 9, 2006
September 23, 2006
Date

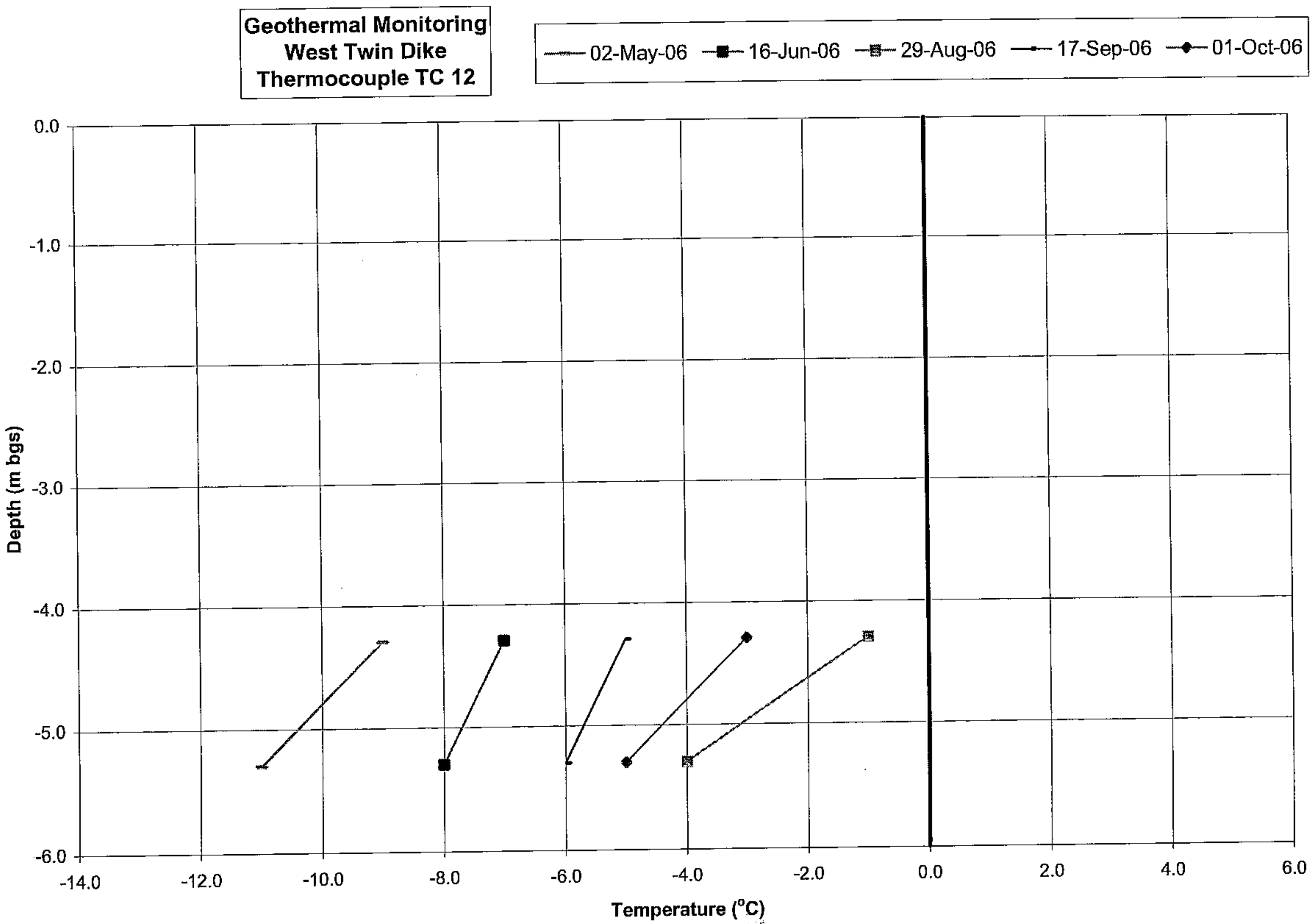
Frost Gauge 6 - Surface Cell

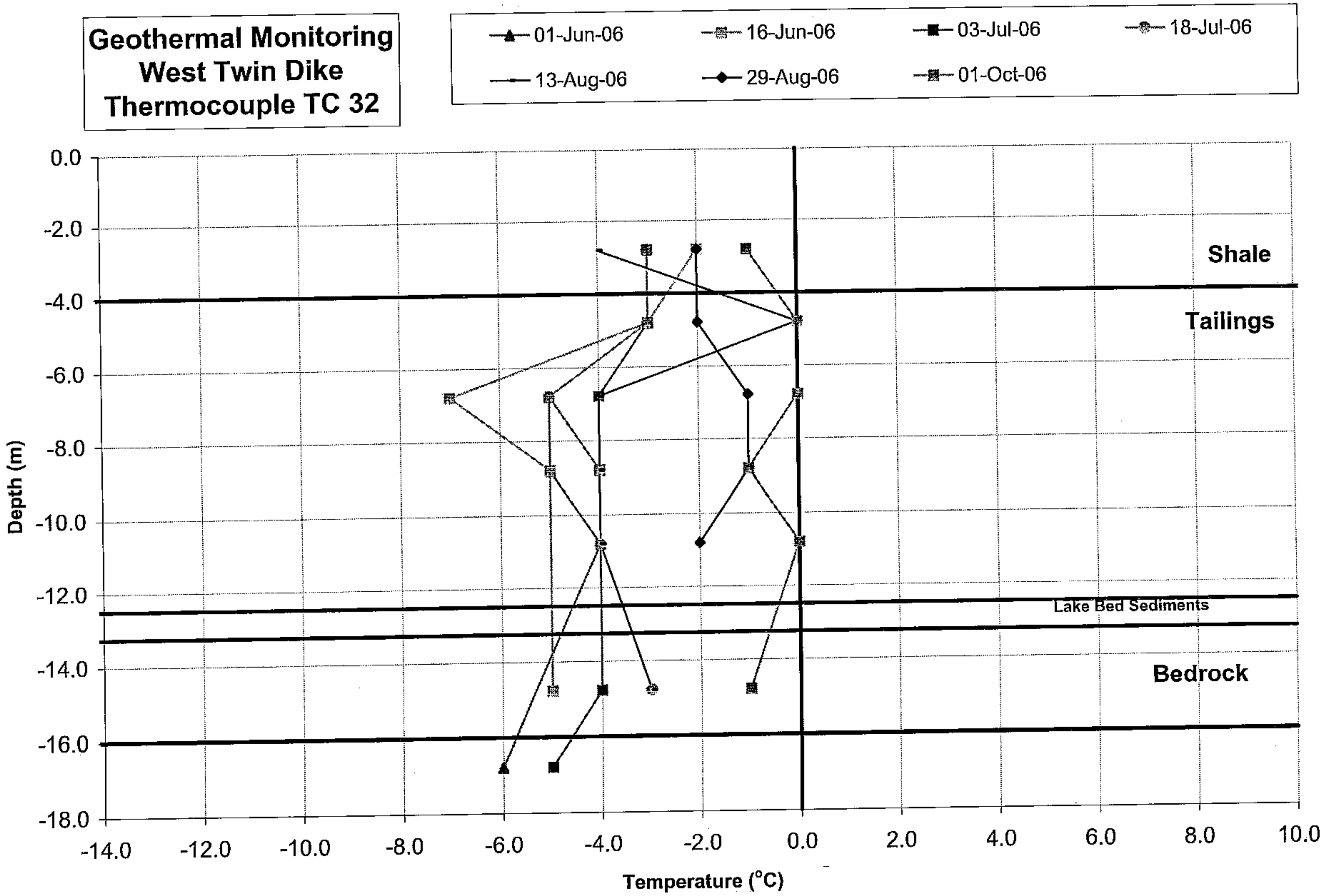


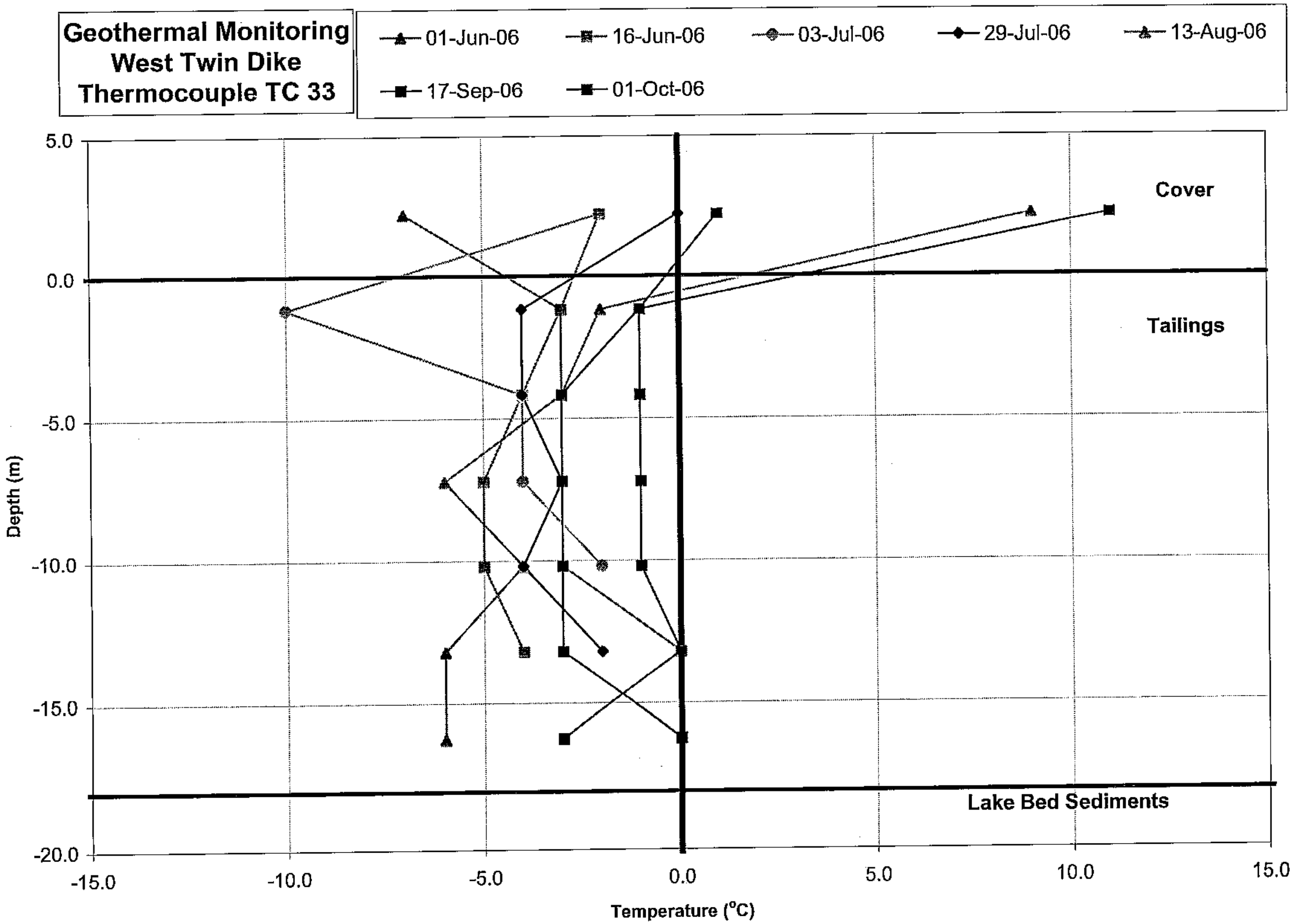

2006 Active Layer
Surface Cell Tailings Cover
Active Layer Thaw Depth from Frost Gauges
FG1
FG2
FG3
FG4
FG5
FG6
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
Depth (m bgs)
Cover
Tailings
03-May-06
23-May-06
12-Jun-06
02-Jul-06
22-Jul-06
11-Aug-06
31-Aug-06
20-Sep-06
Date

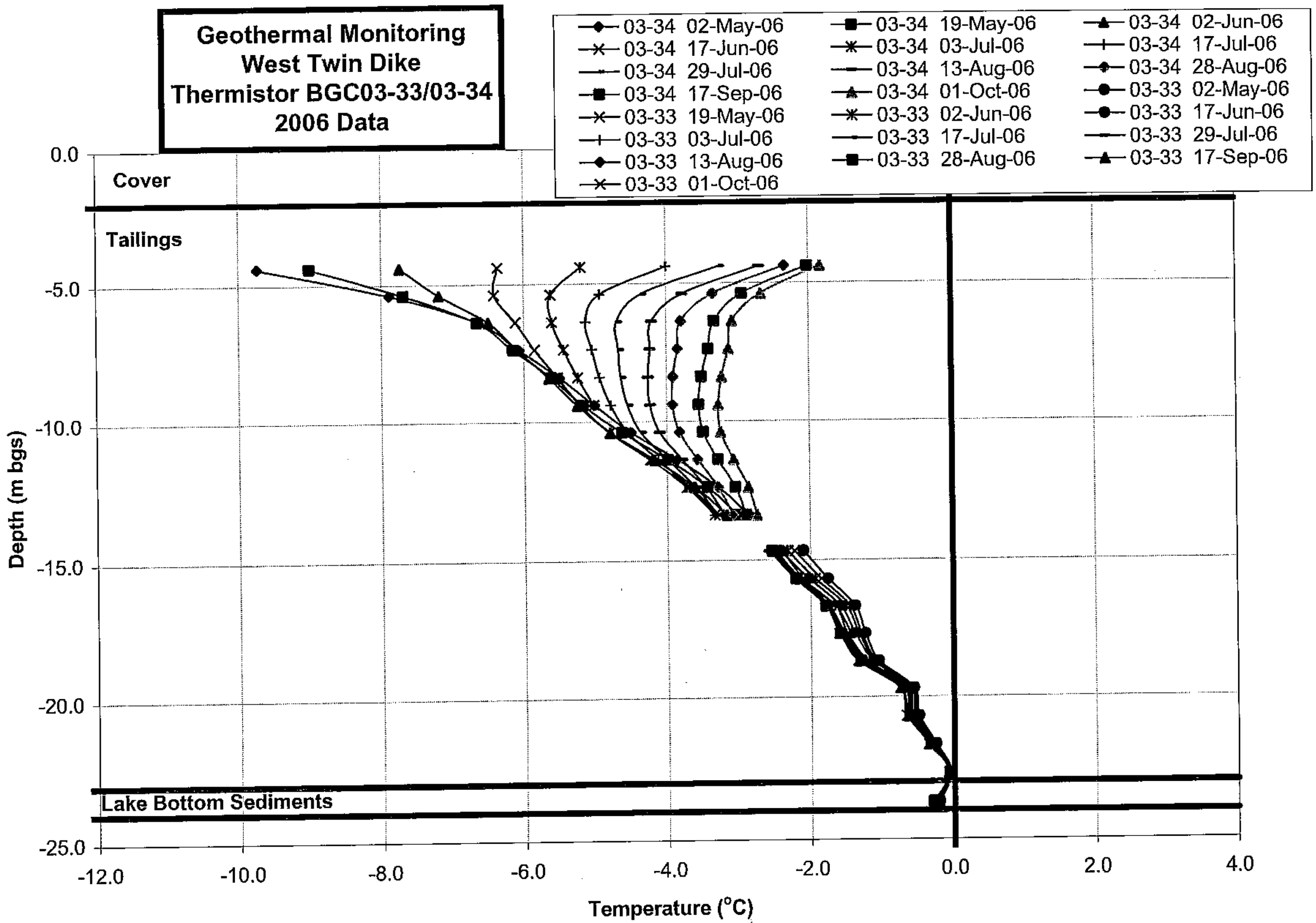
WEST TWIN DIKE


Geothermal Monitoring
West Twin Dike
Thermocouple TC 13A
01-Jun-06
16-Jun-06
July 3,2006
29-Jul-06
13-Aug-06
01-Oct-06
Cover
Tailings
Bedrock
Depth (m bgs)
-1.0
-3.0
-5.0
-7.0
-9.0
-11.0
-13.0
-15.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
Temperature (°C)

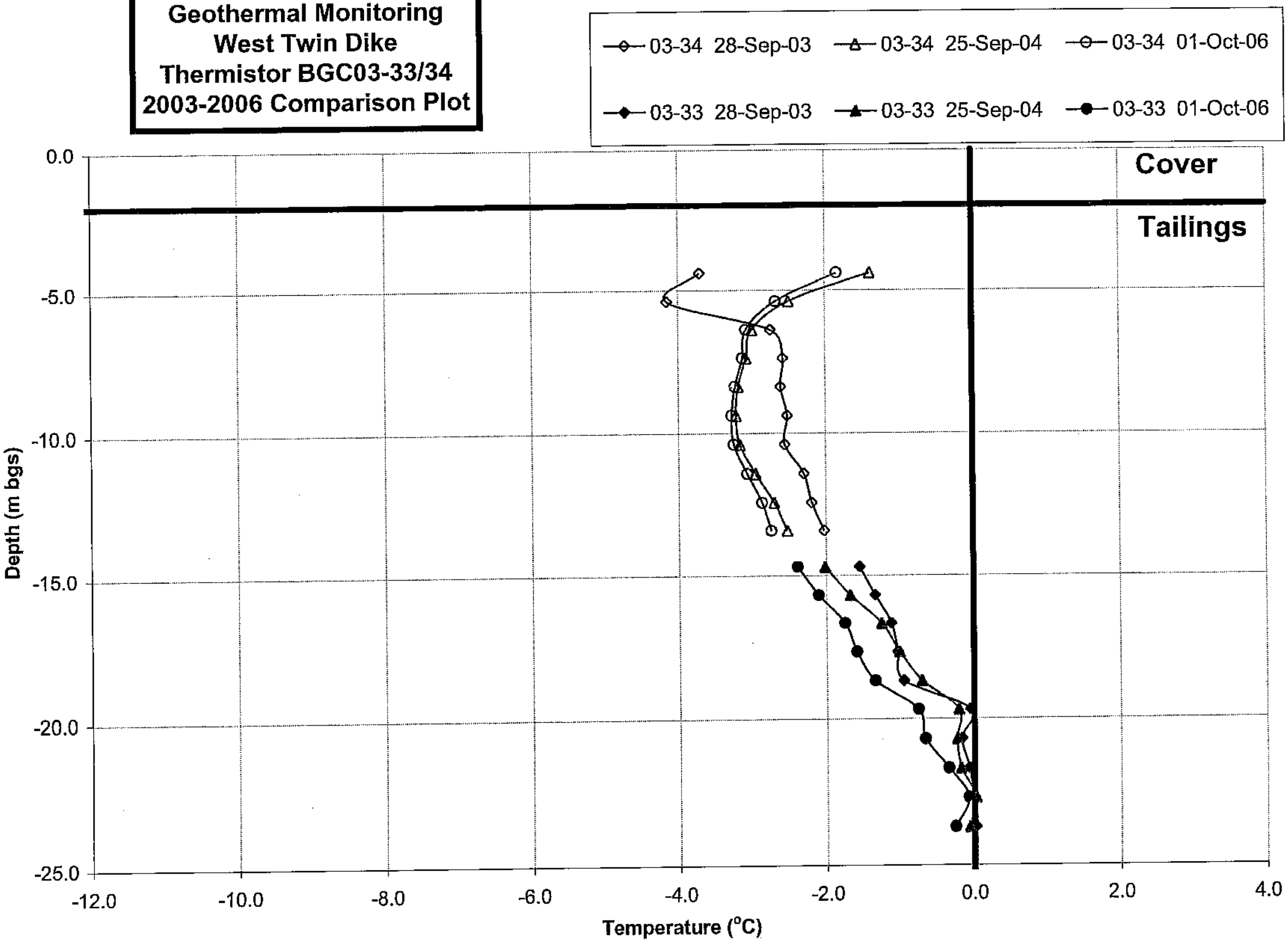

Geothermal Monitoring
West Twin Dike
Thermocouple TC 12
02-May-06
16-Jun-06
29-Aug-06
17-Sep-06
01-Oct-06
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
Depth (m bgs)
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
Temperature (°C)

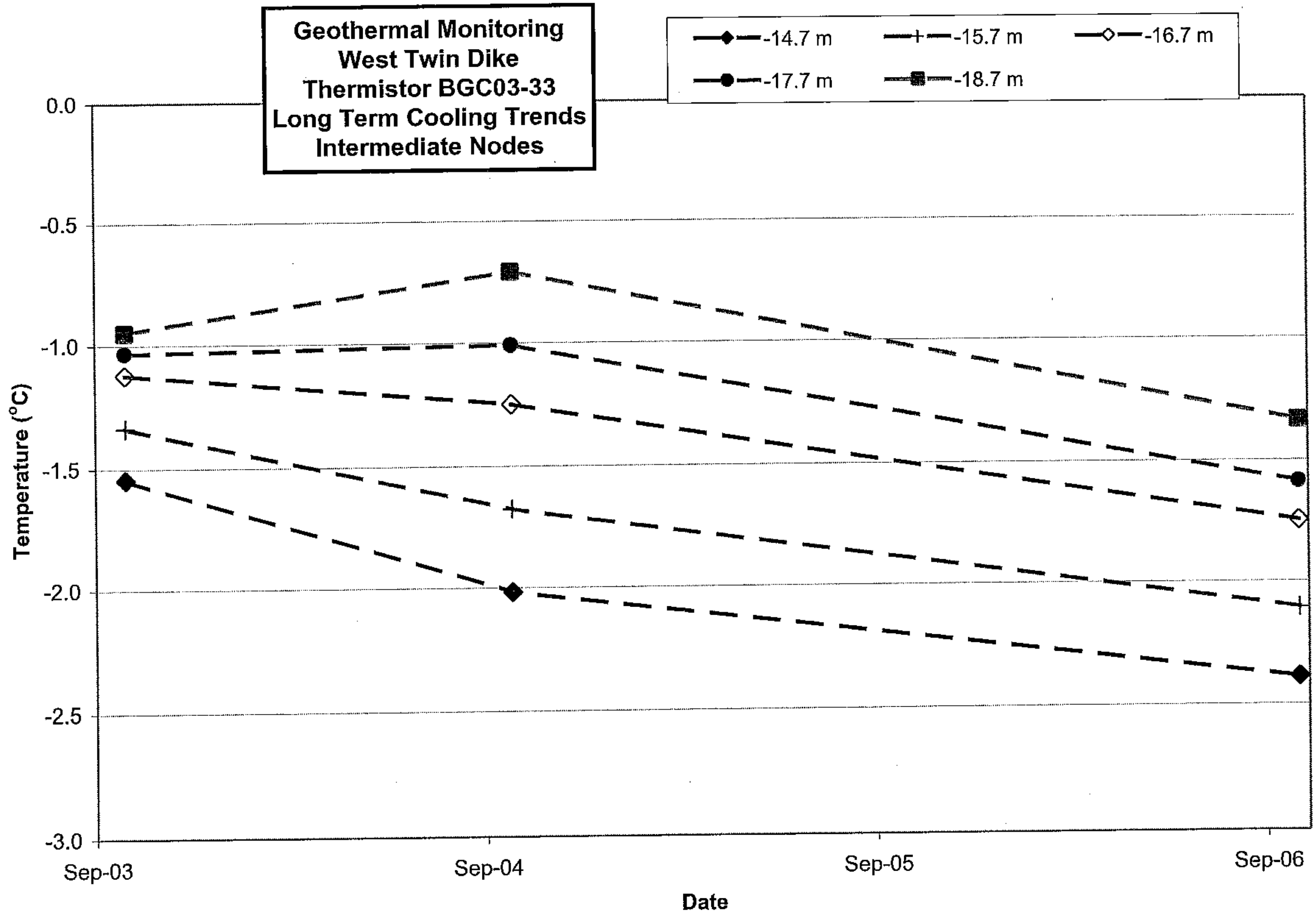

Geothermal Monitoring
West Twin Dike
Thermocouple TC 32
01-Jun-06
16-Jun-06
03-Jul-06
18-Jul-06
13-Aug-06
29-Aug-06
01-Oct-06
Shale
Tailings
Lake Bed Sediments
Bedrock
Depth (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
Temperature (°C)

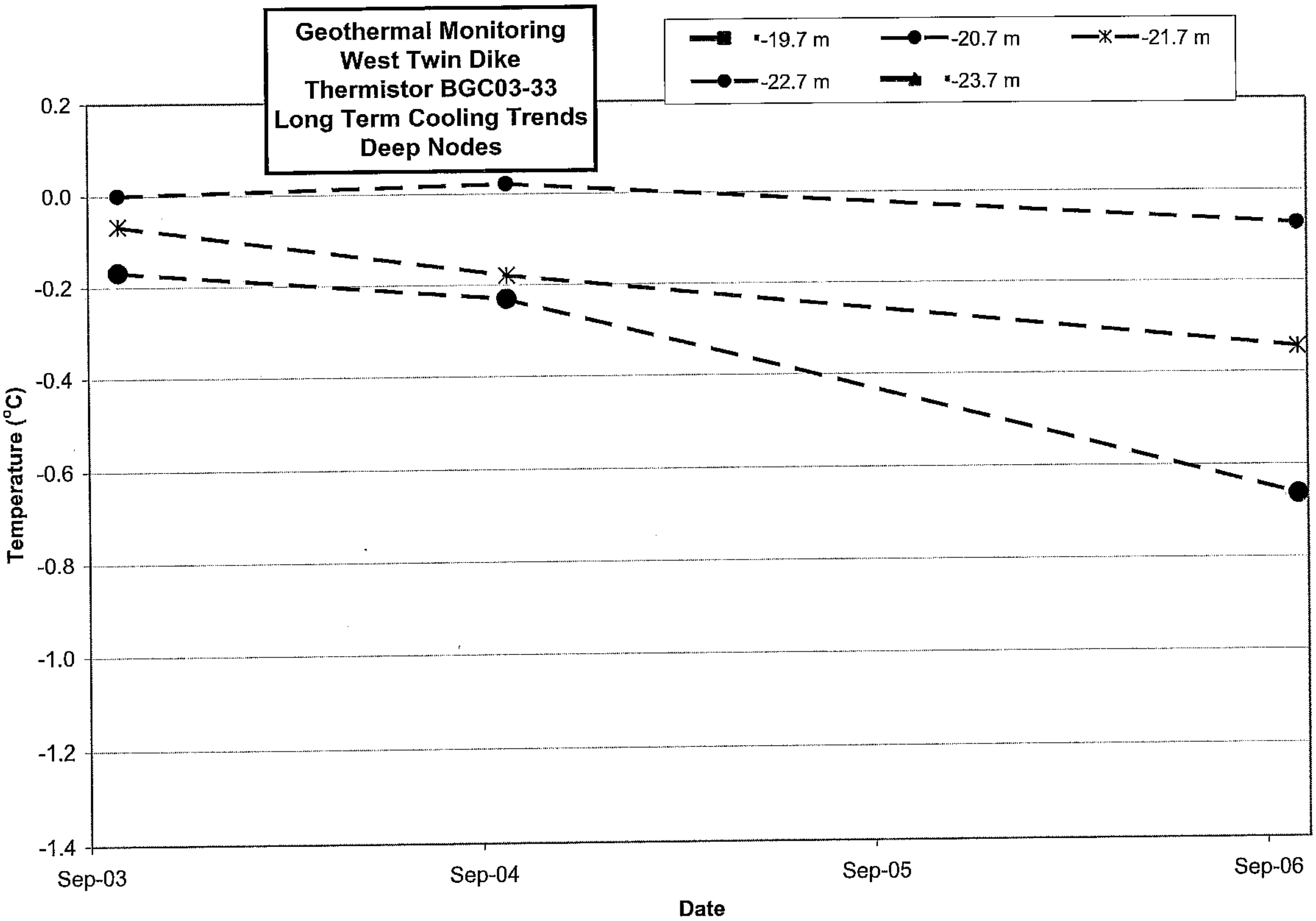

Geothermal Monitoring
West Twin Dike
Thermocouple TC 33
01-Jun-06
16-Jun-06
03-Jul-06
29-Jul-06
13-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Lake Bed Sediments
Depth (m)
Temperature (°C)
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0

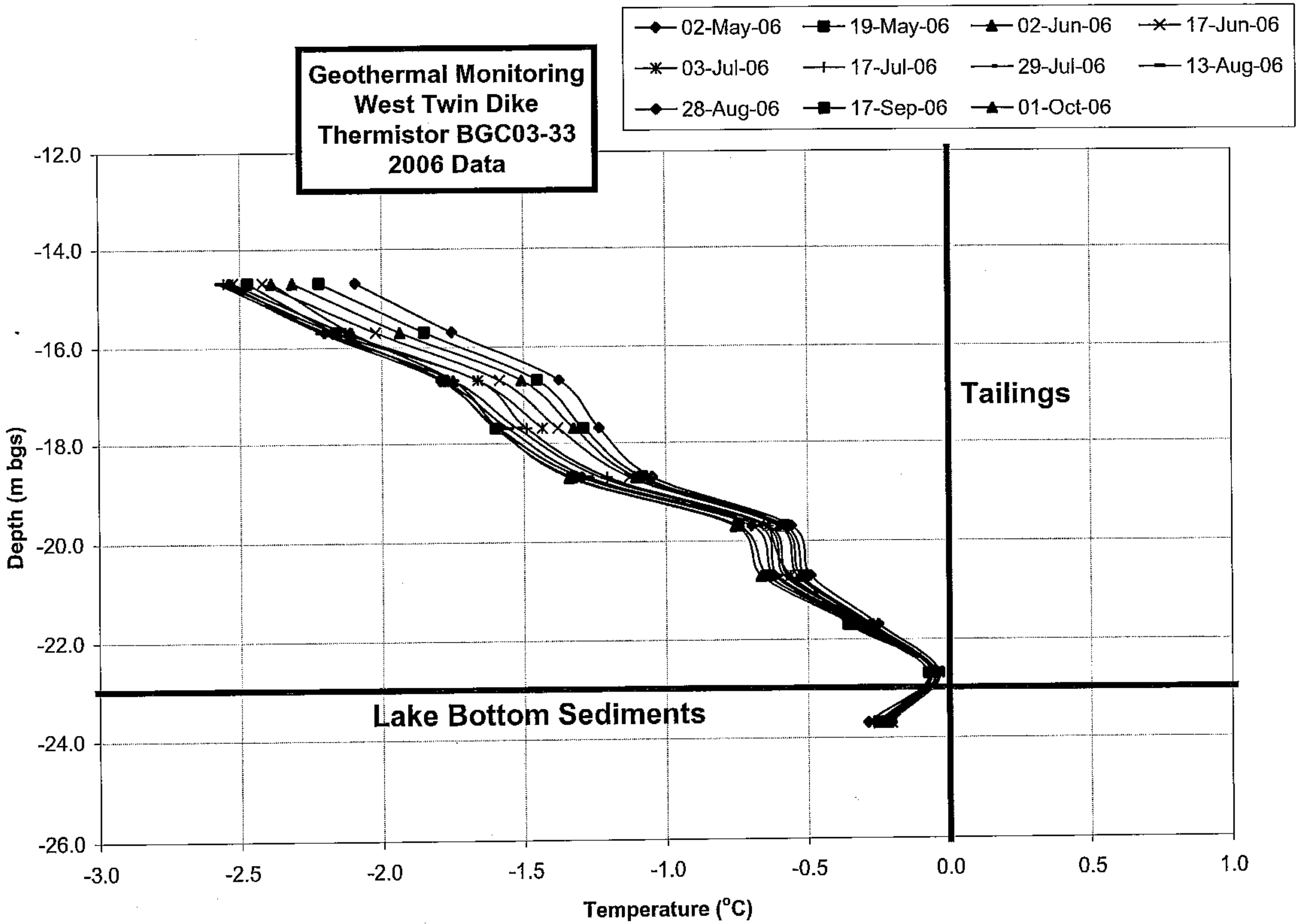

Geothermal Monitoring
West Twin Dike
Thermistor BGC03-33/03-34
2006 Data
03-34 02-May-06
03-34 17-Jun-06
03-34 29-Jul-06
03-34 17-Sep-06
03-33 19-May-06
03-33 03-Jul-06
03-33 13-Aug-06
03-33 01-Oct-06
03-34 19-May-06
03-34 03-Jul-06
03-34 13-Aug-06
03-34 01-Oct-06
03-33 02-Jun-06
03-33 17-Jul-06
03-33 28-Aug-06
03-34 02-Jun-06
03-34 17-Jul-06
03-34 28-Aug-06
03-33 02-May-06
03-33 17-Jun-06
03-33 29-Jul-06
03-33 17-Sep-06
Cover
Tailings
Lake Bottom Sediments
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

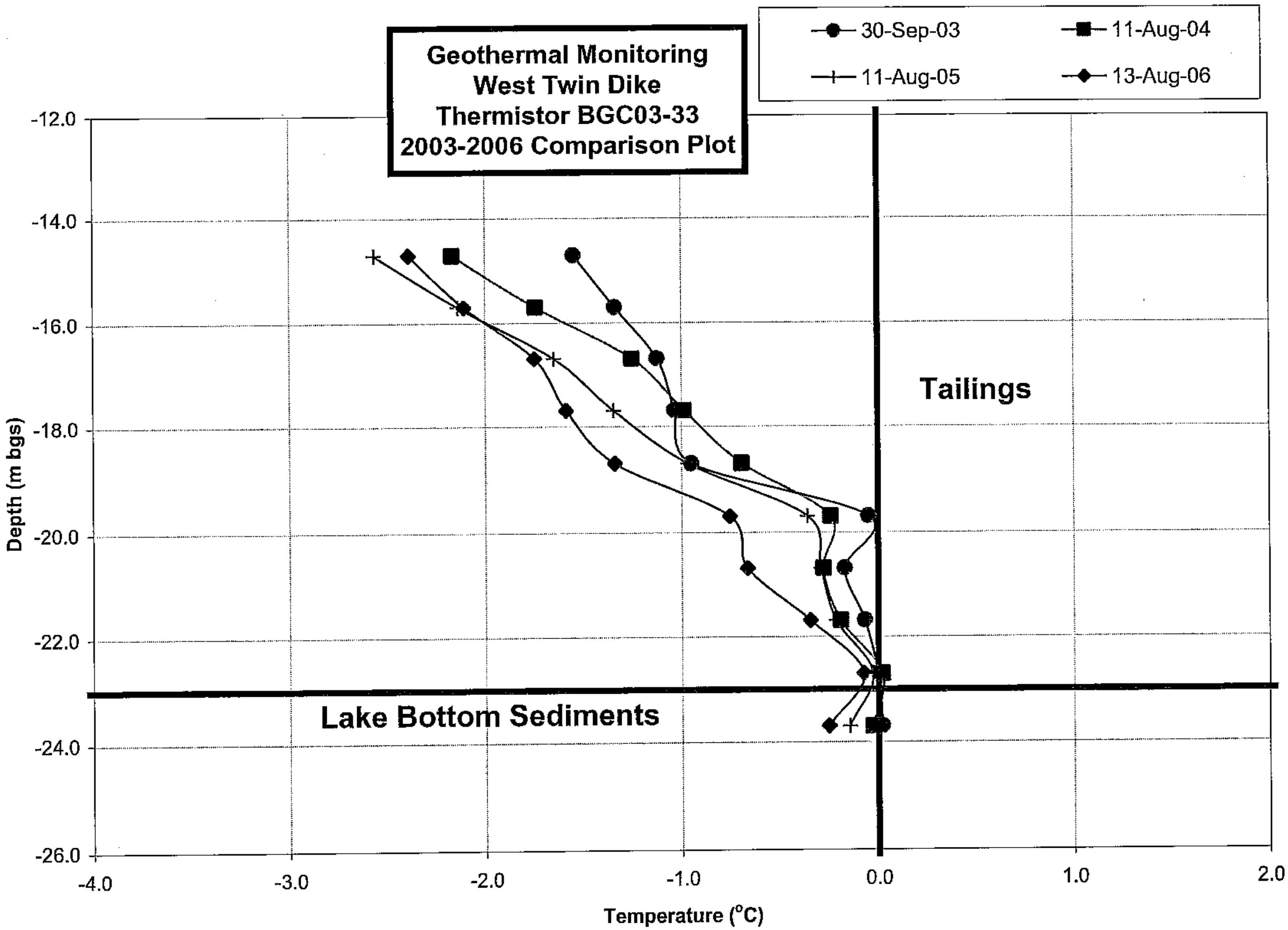
**Geothermal Monitoring
West Twin Dike
Thermistor BGC03-33/34
2003-2006 Comparison Plot**

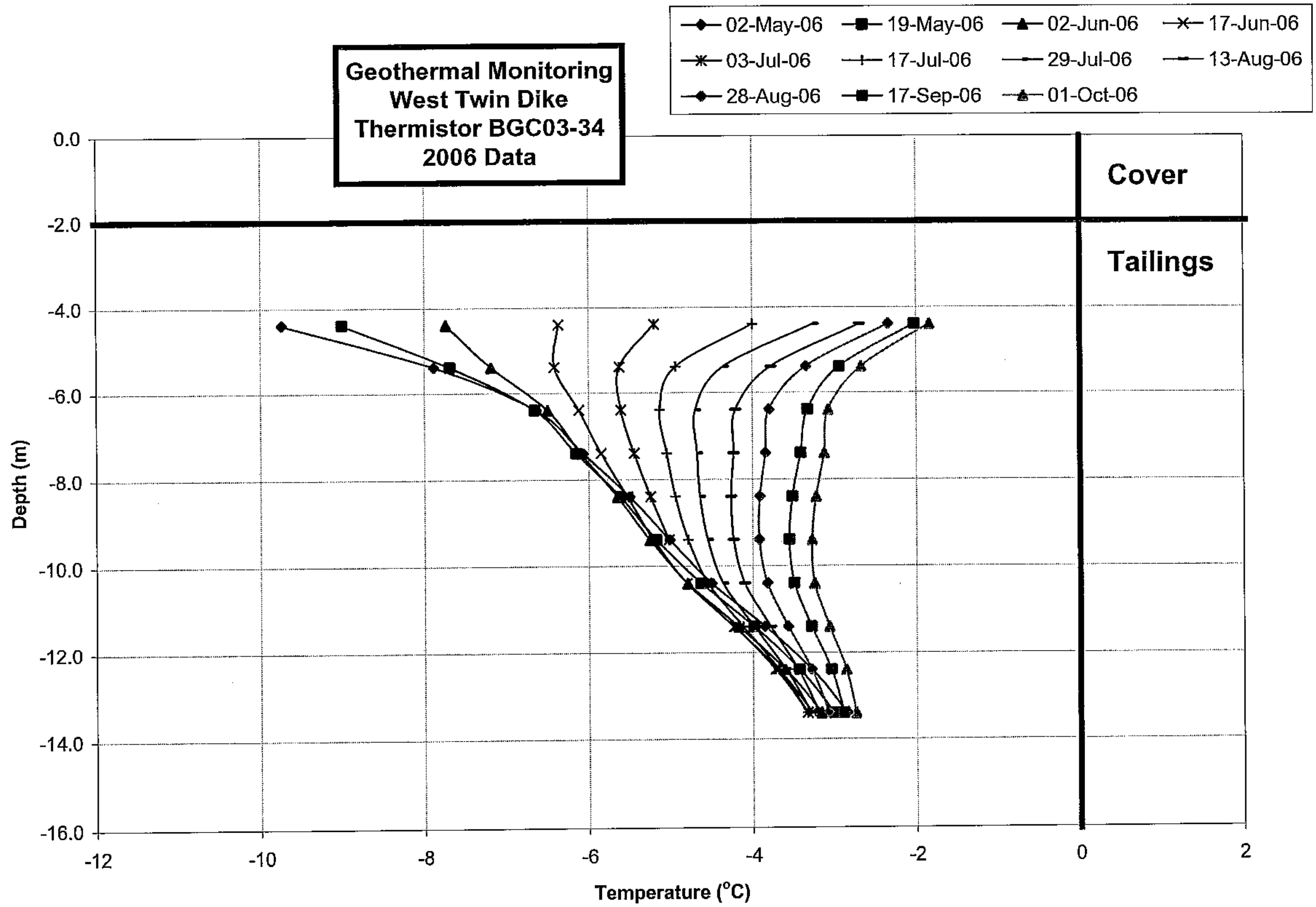


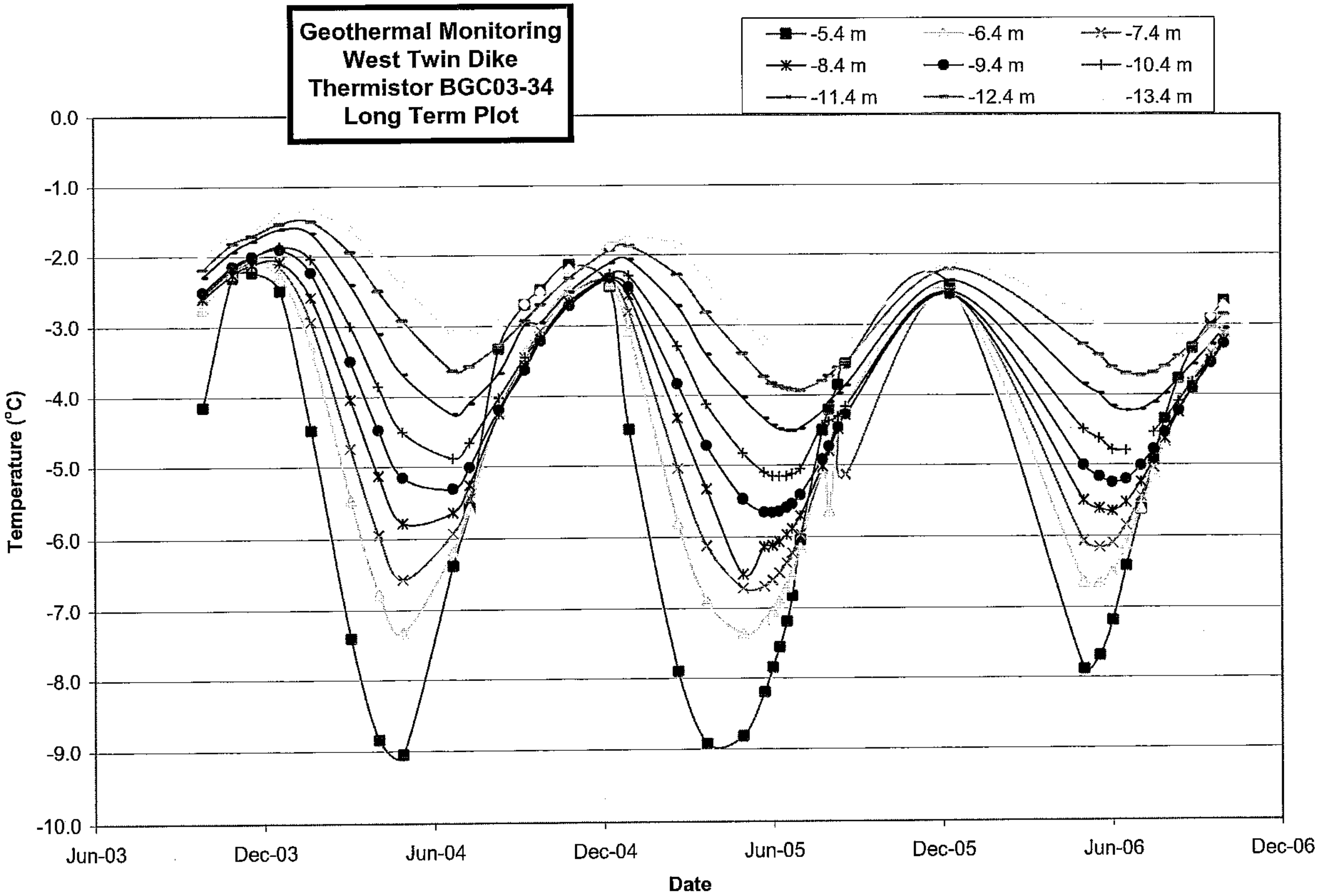

Geothermal Monitoring
West Twin Dike
Thermistor BGC03-33
Long Term Cooling Trends
Intermediate Nodes
-14.7 m
-15.7 m
-16.7 m
-17.7 m
-18.7 m
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
Temperature (°C)
Sep-03
Sep-04
Sep-05
Sep-06
Date

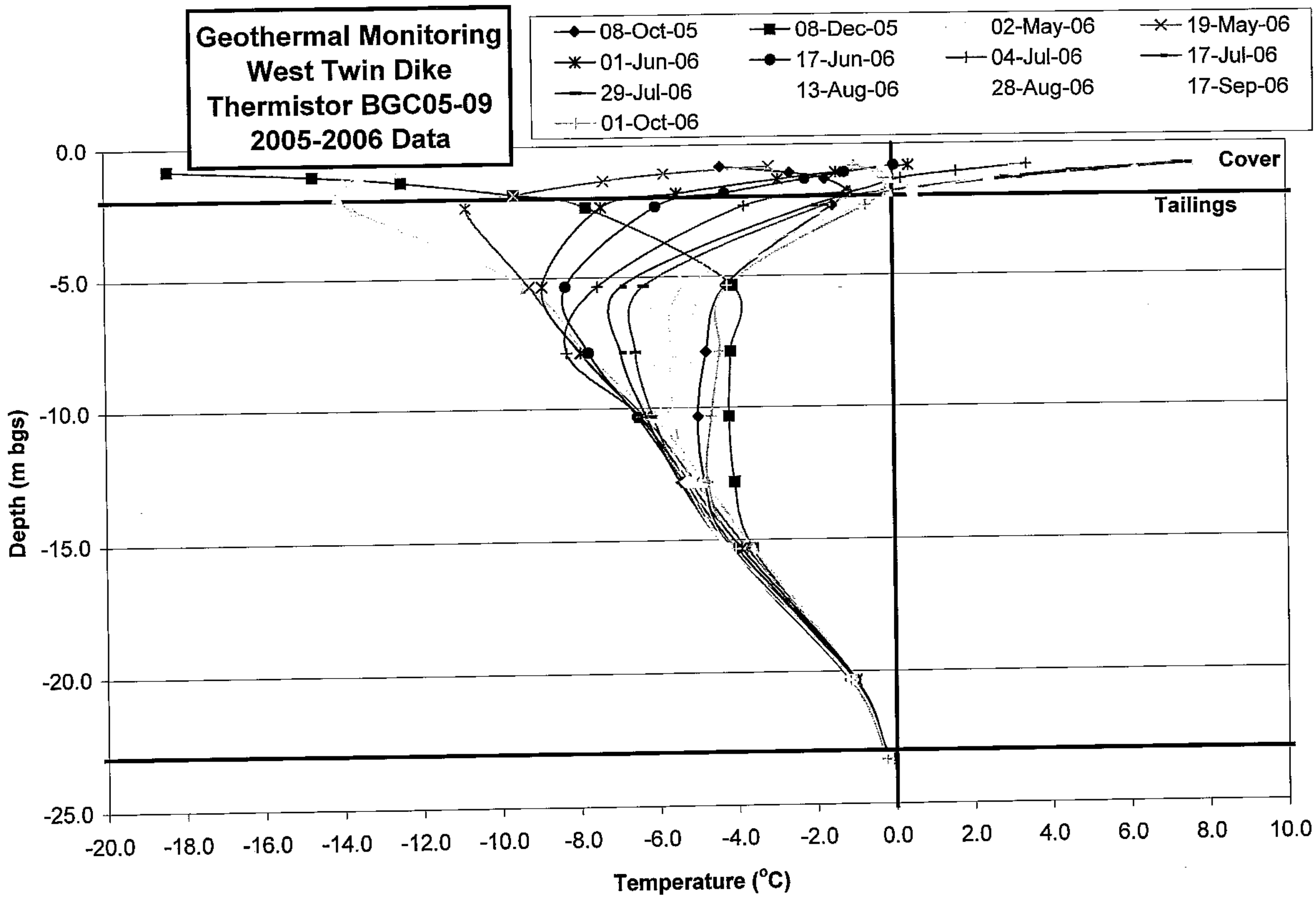

Geothermal Monitoring
West Twin Dike
Thermistor BGC03-33
Long Term Cooling Trends
Deep Nodes
-19.7 m
-20.7 m
-21.7 m
-22.7 m
-23.7 m
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
Temperature (°C)
Sep-03
Sep-04
Sep-05
Sep-06
Date

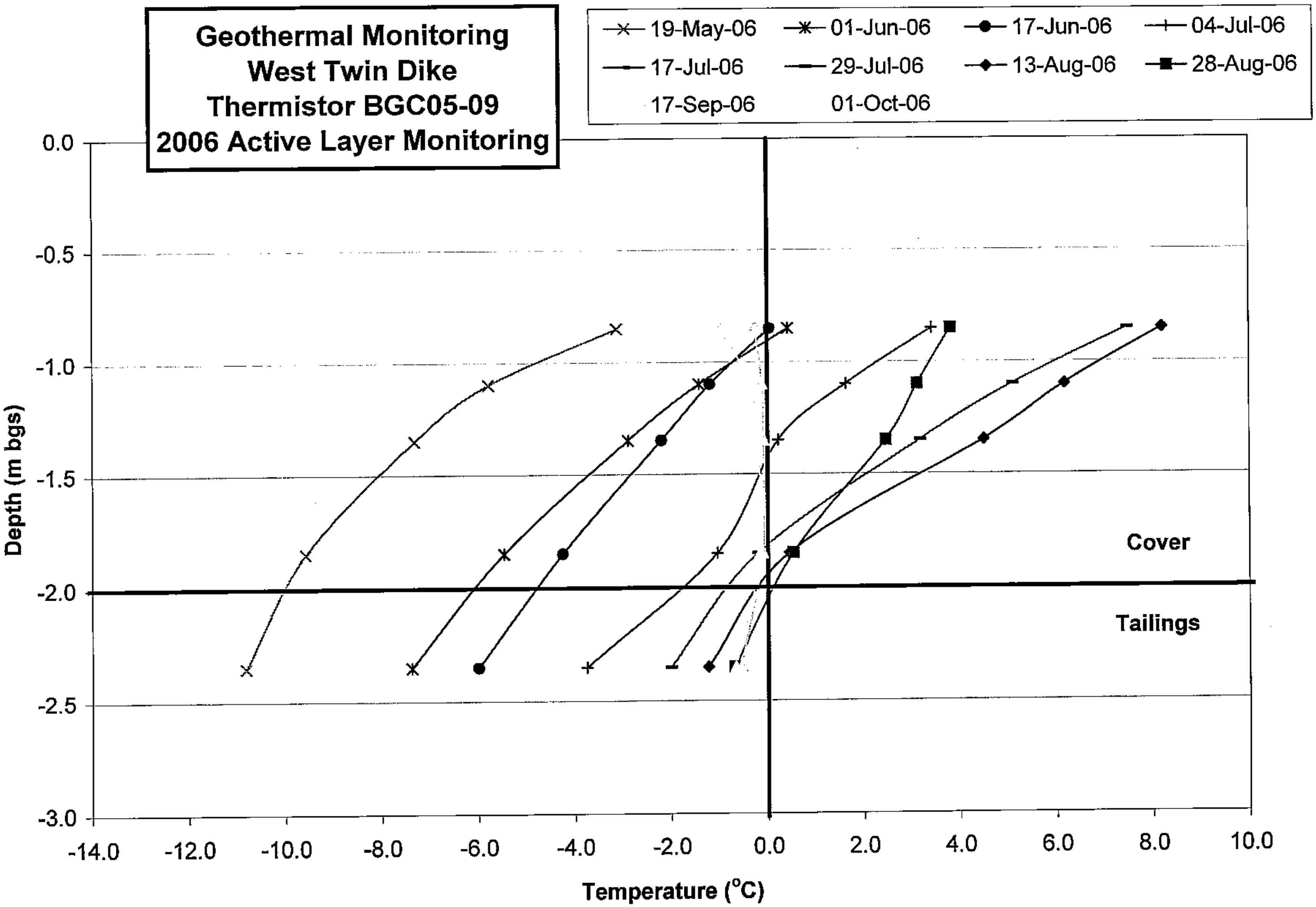

Geothermal Monitoring
West Twin Dike
Thermistor BGC03-33
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Tailings
Lake Bottom Sediments
Depth (m bgs)
-12.0
-14.0
-16.0
-18.0
-20.0
-22.0
-24.0
-26.0
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
Temperature (°C)

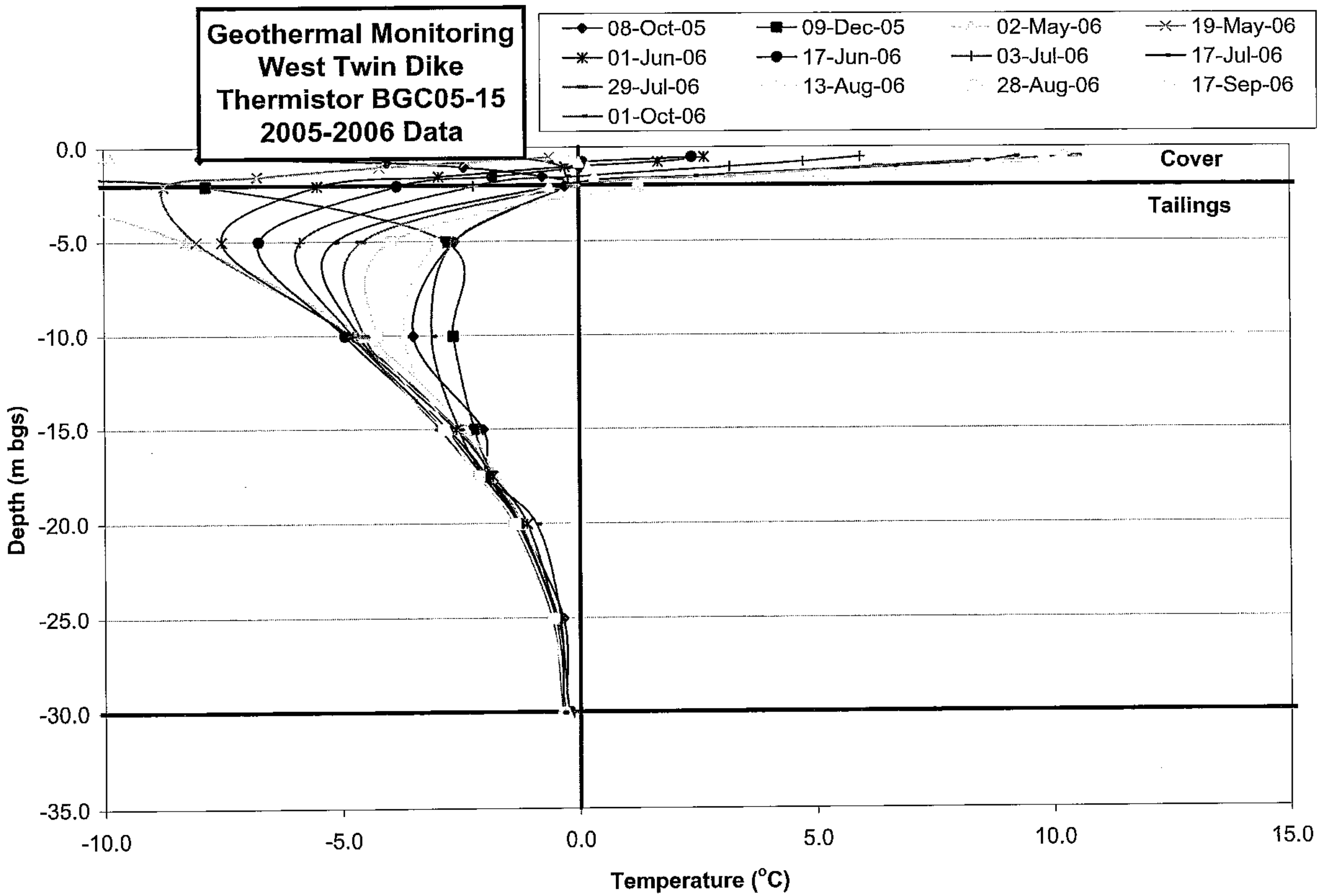

Geothermal Monitoring
West Twin Dike
Thermistor BGC03-33
2003-2006 Comparison Plot
30-Sep-03
11-Aug-04
11-Aug-05
13-Aug-06
Tailings
Lake Bottom Sediments
Depth (m bgs)
-12.0
-14.0
-16.0
-18.0
-20.0
-22.0
-24.0
-26.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
Temperature (°C)

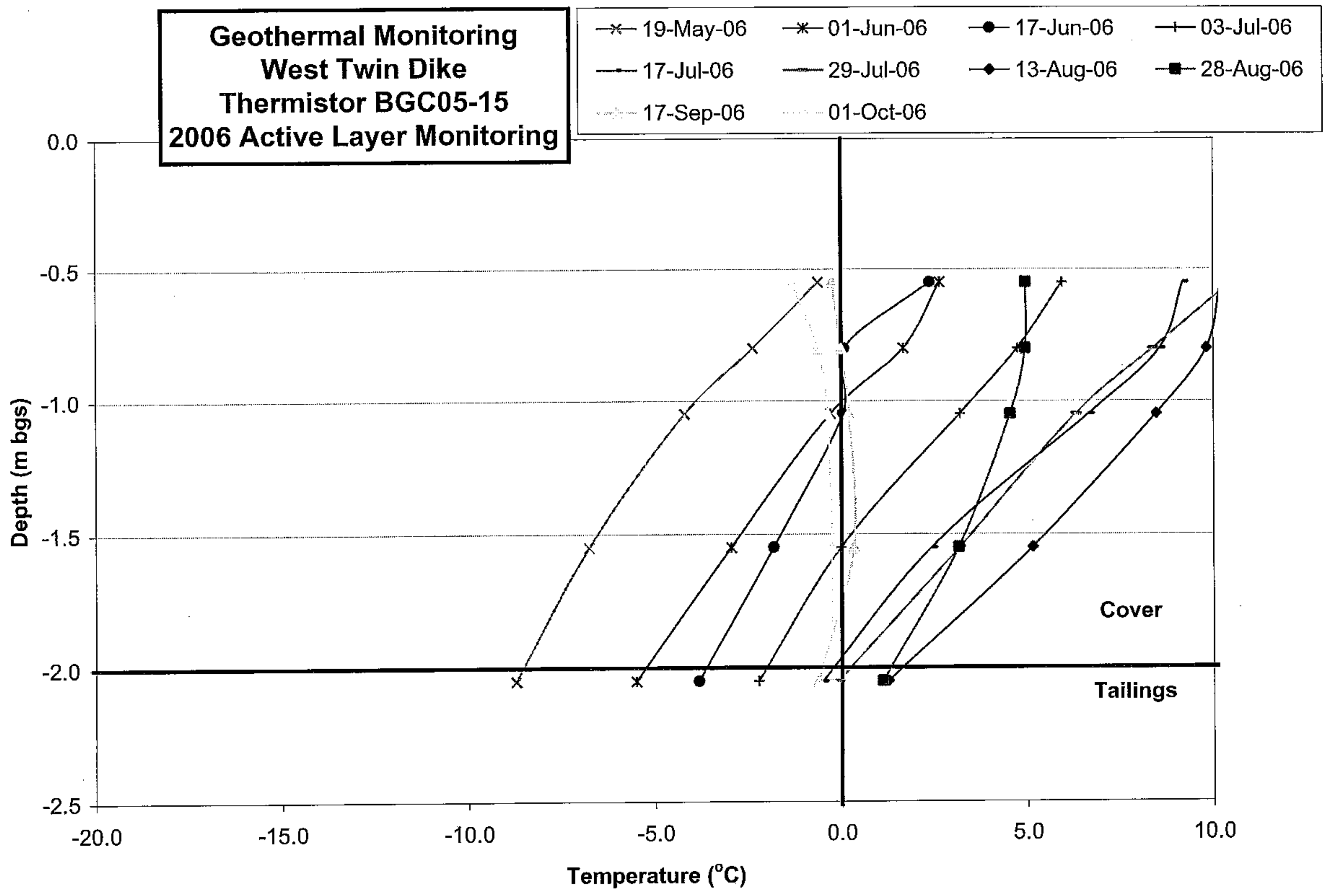

Geothermal Monitoring
West Twin Dike
Thermistor BGC03-34
2006 Data
02-May-06
19-May-06
02-Jun-06
17-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-12
-10
-8
-6
-4
-2
0
2
Temperature (°C)


Geothermal Monitoring
West Twin Dike
Thermistor BGC03-34
Long Term Plot
-5.4 m
-6.4 m
-7.4 m
-8.4 m
-9.4 m
-10.4 m
-11.4 m
-12.4 m
-13.4 m
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10.0
Temperature (°C)
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Date

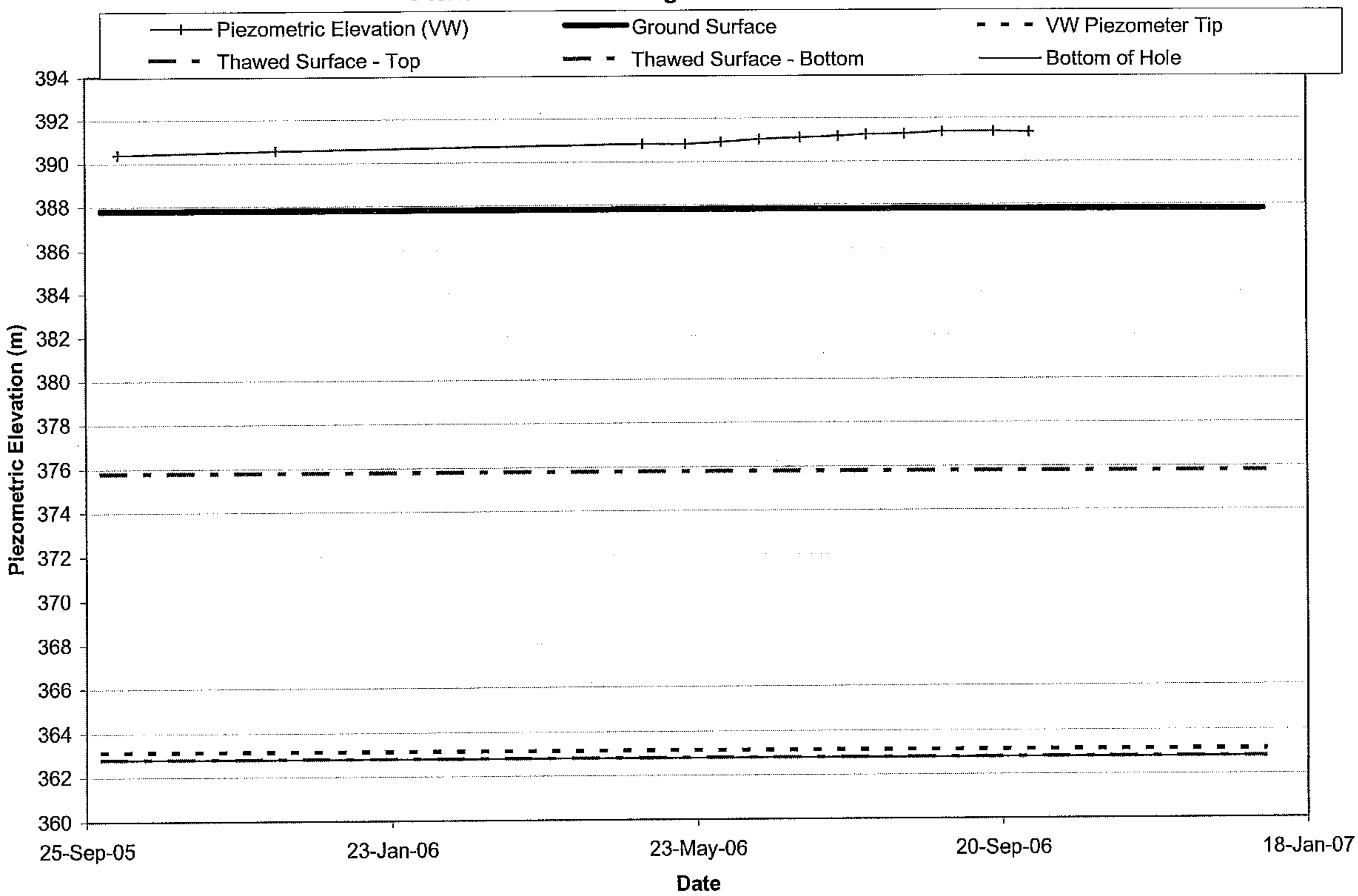

Geothermal Monitoring
West Twin Dike
Thermistor BGC05-09
2005-2006 Data
08-Oct-05
08-Dec-05
02-May-06
19-May-06
01-Jun-06
17-Jun-06
04-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-20.0
-18.0
-16.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
Temperature (°C)


Geothermal Monitoring
West Twin Dike
Thermistor BGC05-09
2006 Active Layer Monitoring
19-May-06
01-Jun-06
17-Jun-06
04-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
Cover
Tailings
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
Temperature (°C)

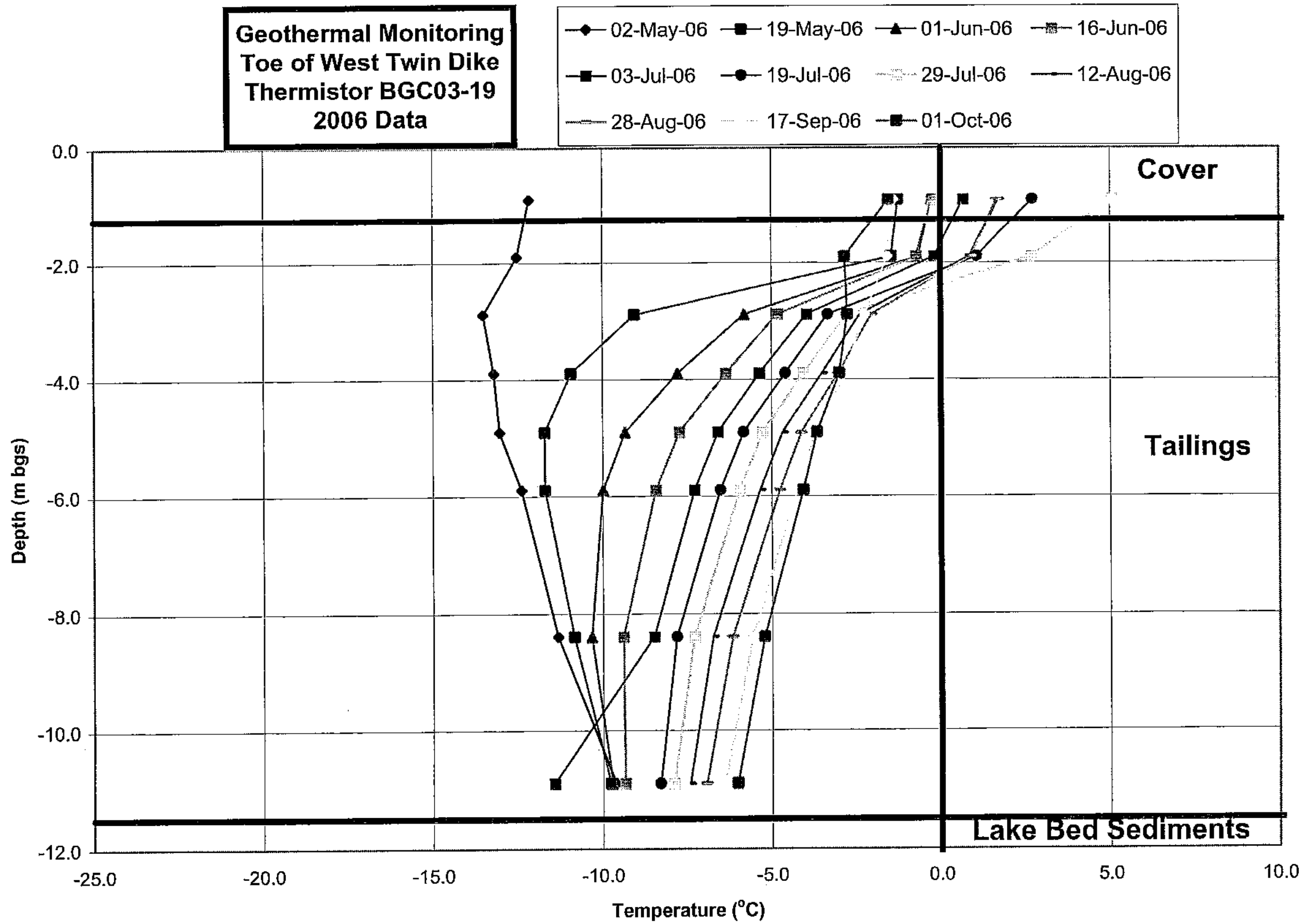

Geothermal Monitoring
West Twin Dike
Thermistor BGC05-15
2005-2006 Data
08-Oct-05
09-Dec-05
02-May-06
19-May-06
01-Jun-06
17-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Temperature (°C)

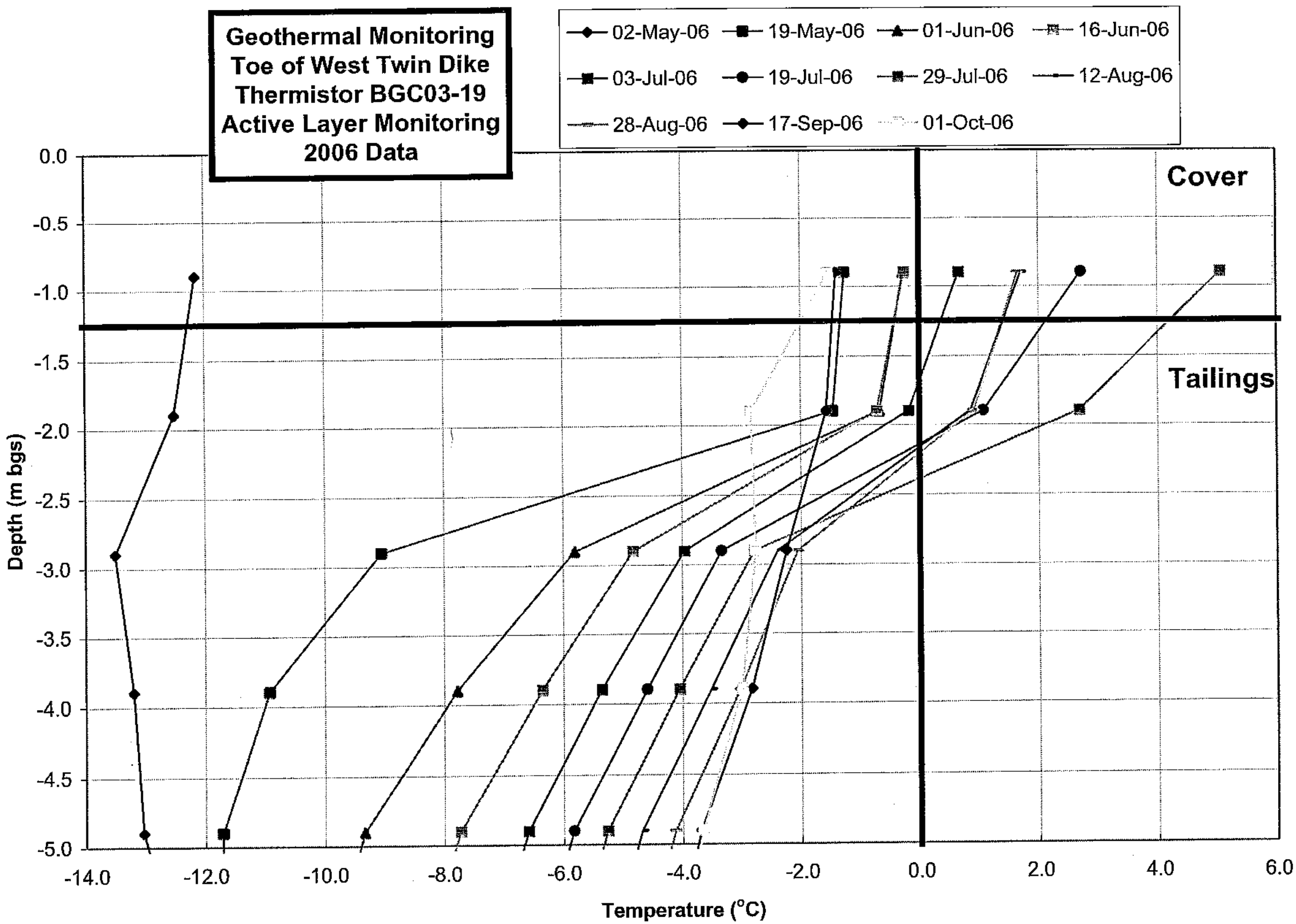

Geothermal Monitoring
West Twin Dike
Thermistor BGC05-15
2006 Active Layer Monitoring
19-May-06
01-Jun-06
17-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
Depth (m bgs)
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
Temperature (°C)
Cover
Tailings

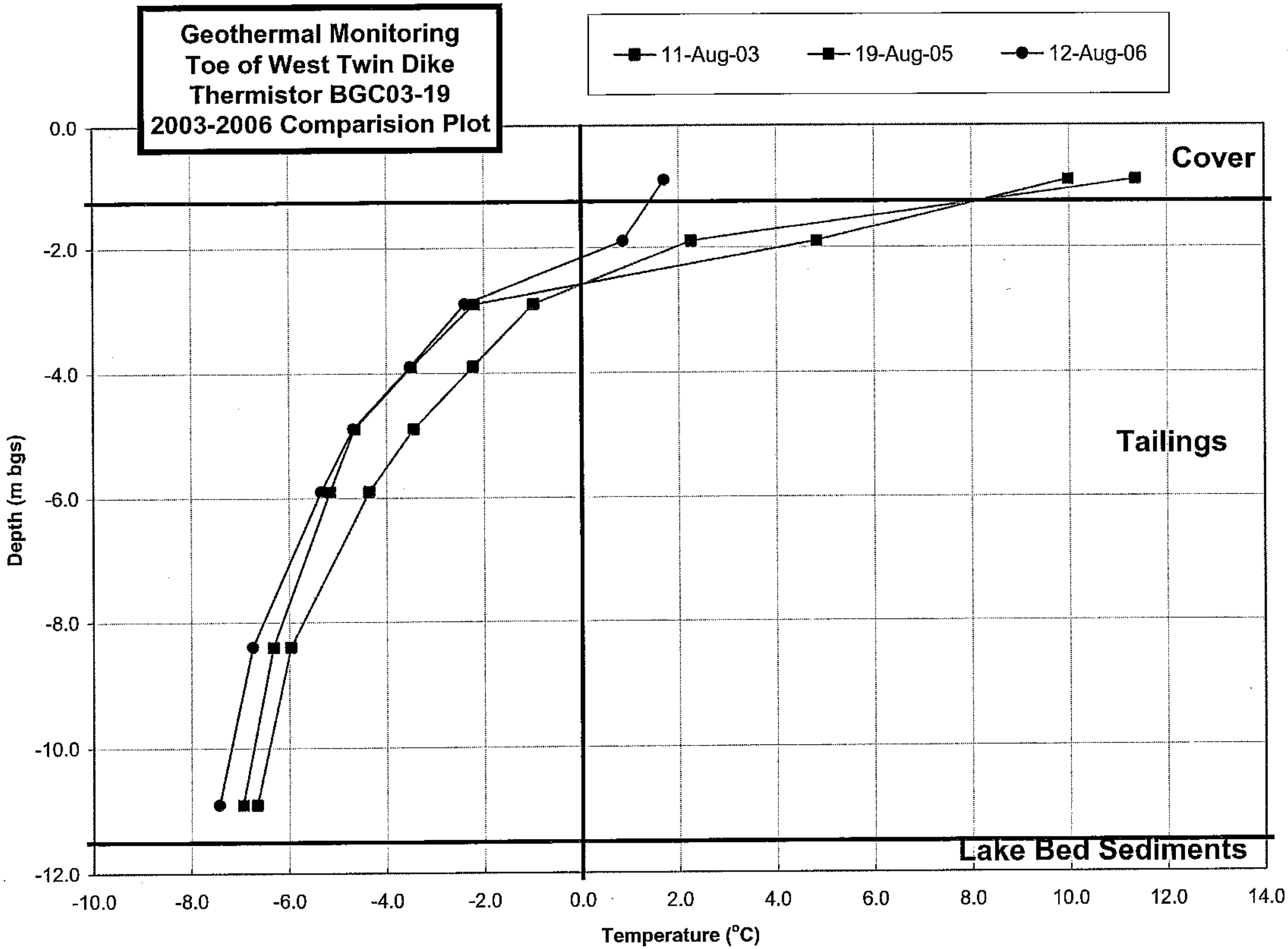
Piezometer Monitoring Results for BGC05-17

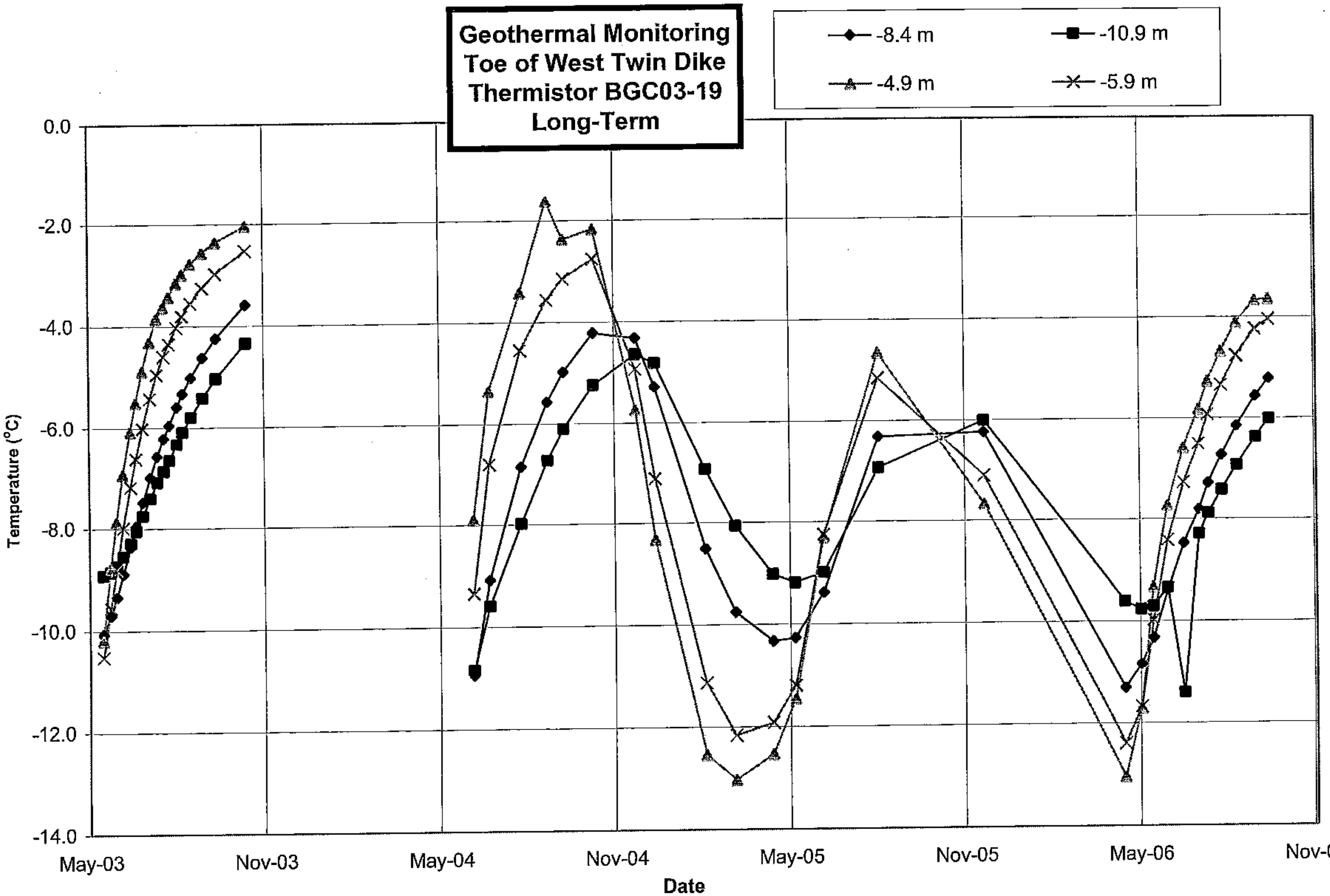


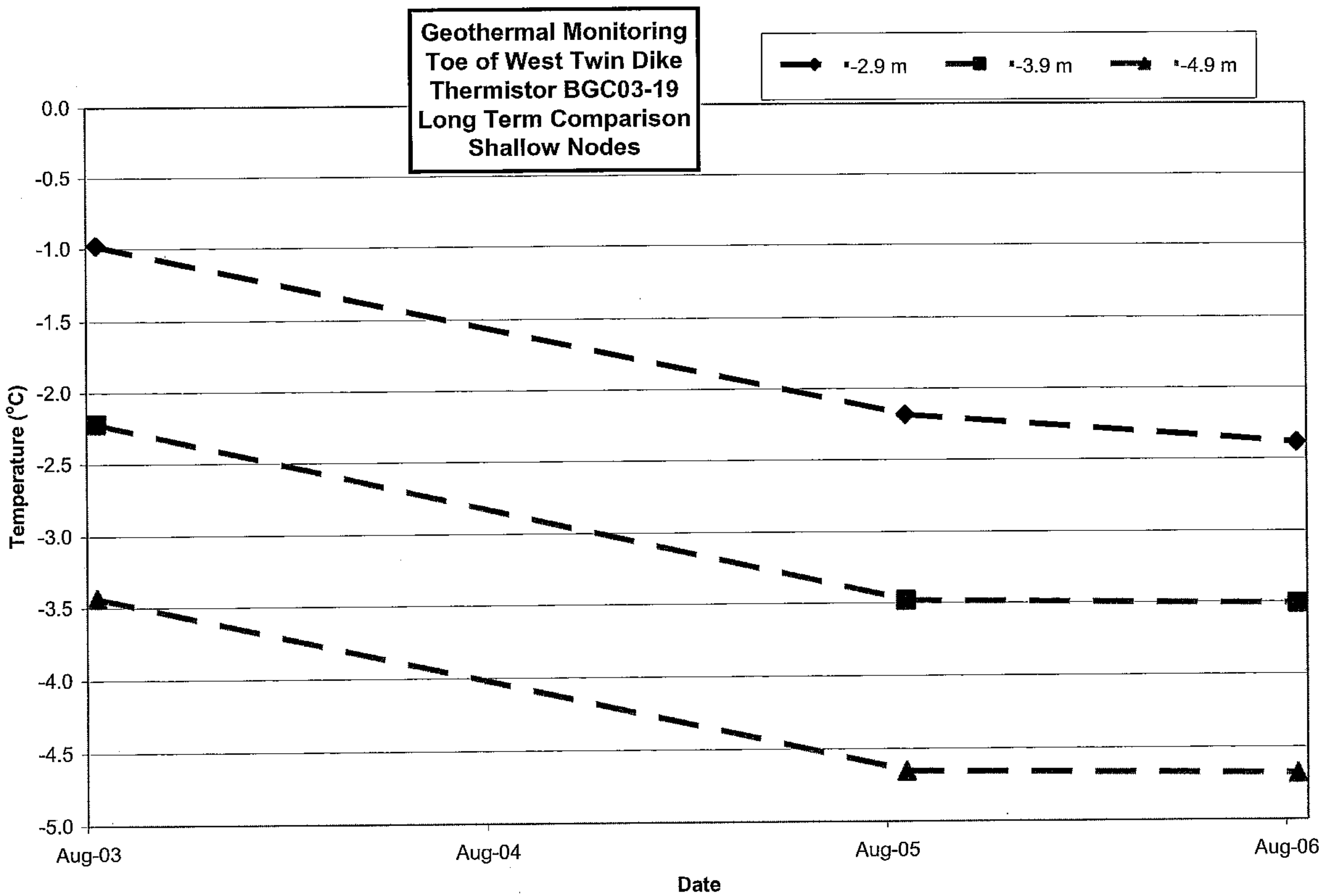
TOE OF WEST TWIN DIKE

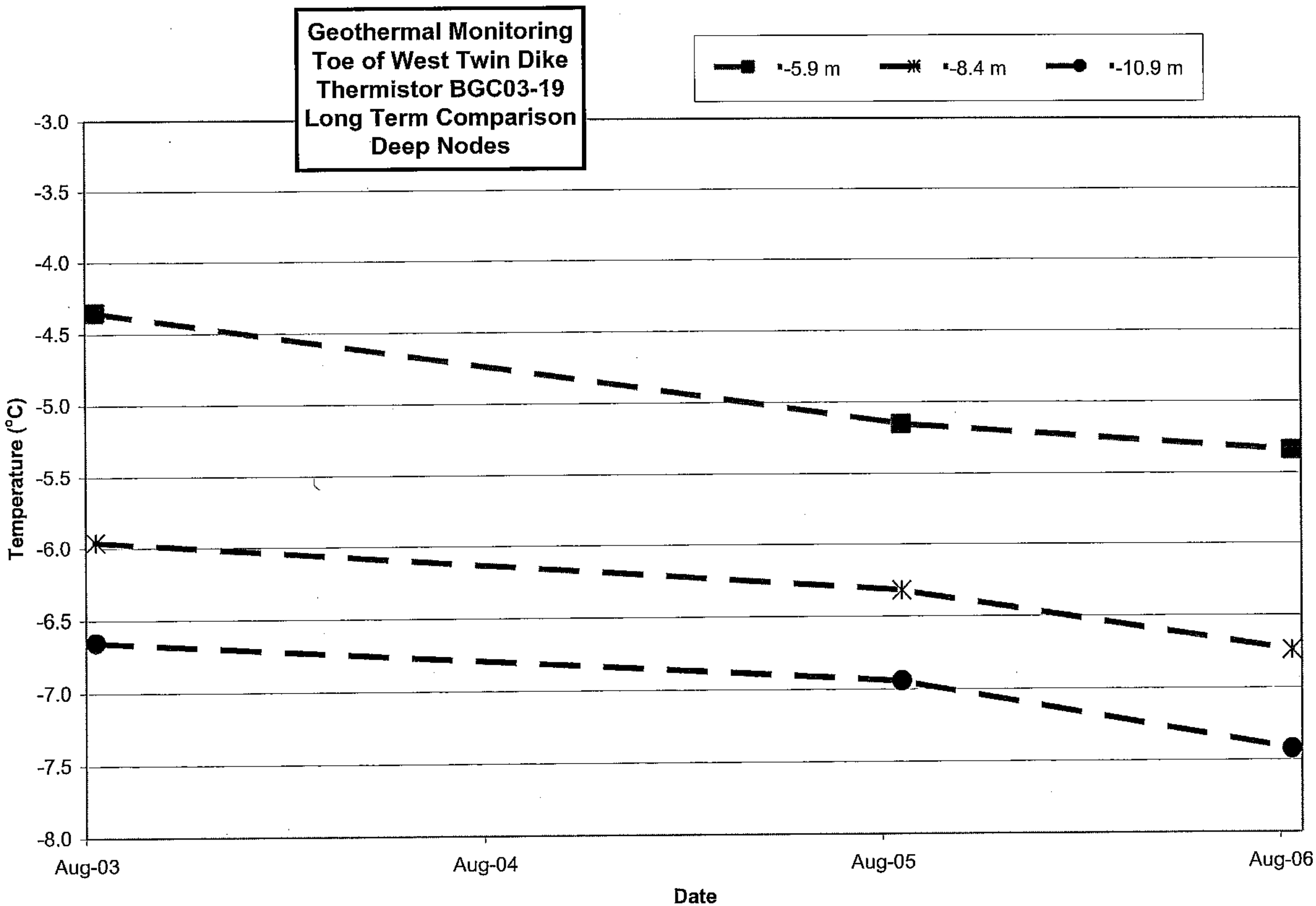

Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC03-19
2006 Data
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
19-Jul-06
29-Jul-06
12-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Lake Bed Sediments
Depth (m bgs)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
Temperature (°C)

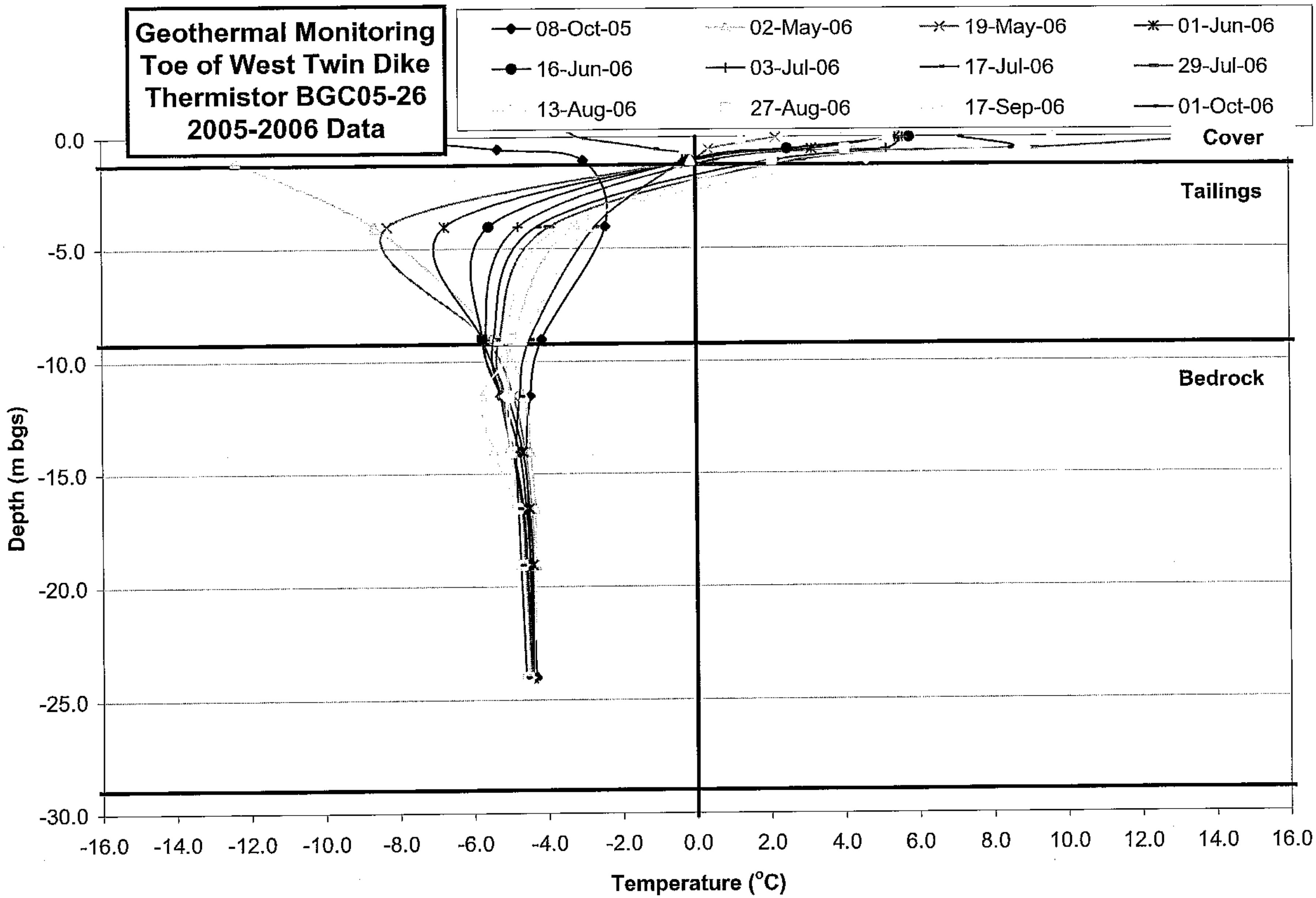

Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC03-19
Active Layer Monitoring
2006 Data
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
19-Jul-06
29-Jul-06
12-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
Temperature (°C)

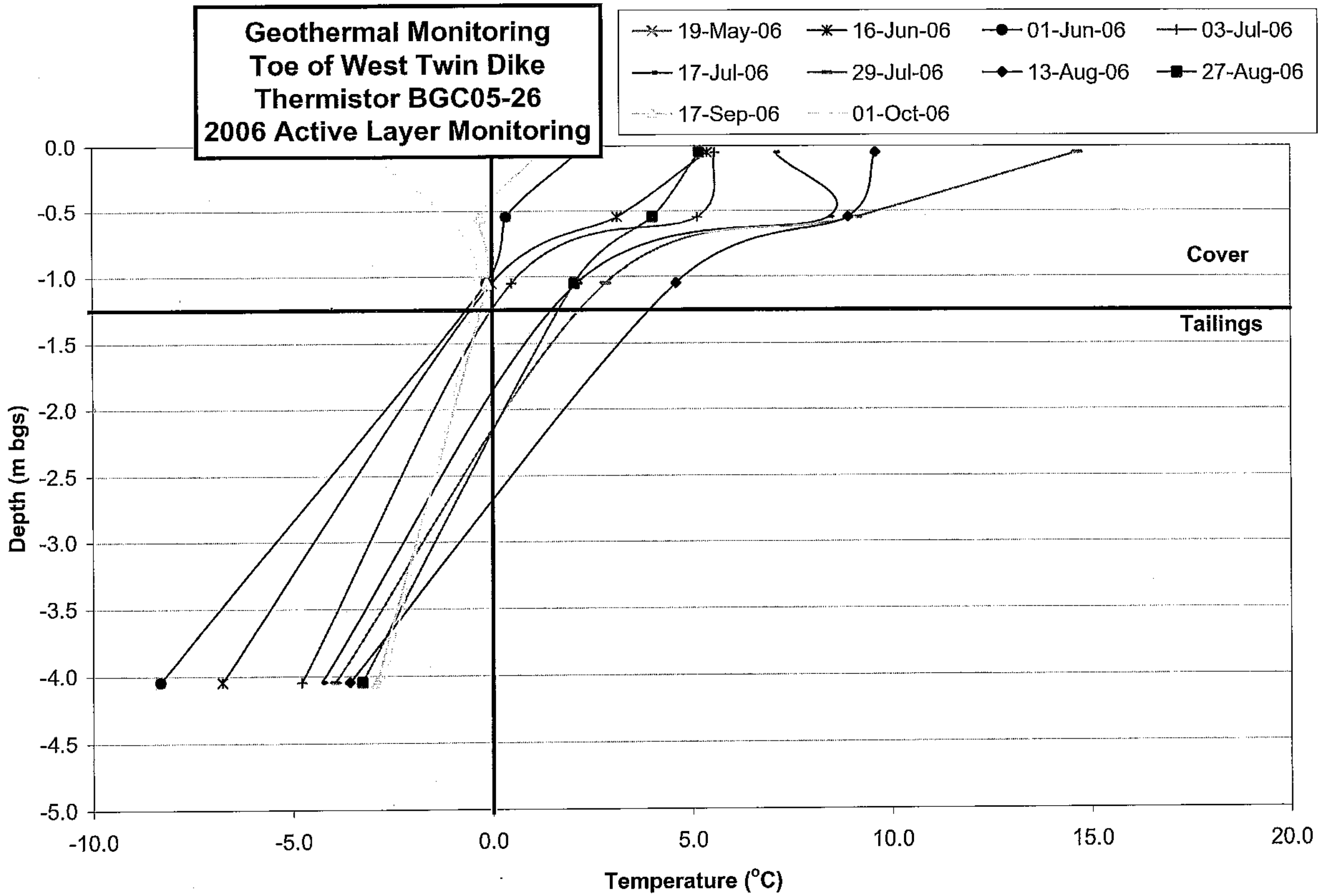

Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC03-19
2003-2006 Comparision Plot
11-Aug-03
19-Aug-05
12-Aug-06
Cover
Tailings
Lake Bed Sediments
Depth (m bgs)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Temperature (°C)


Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC03-19
Long-Term
-8.4 m
-10.9 m
-4.9 m
-5.9 m
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
Temperature (°C)
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
Date

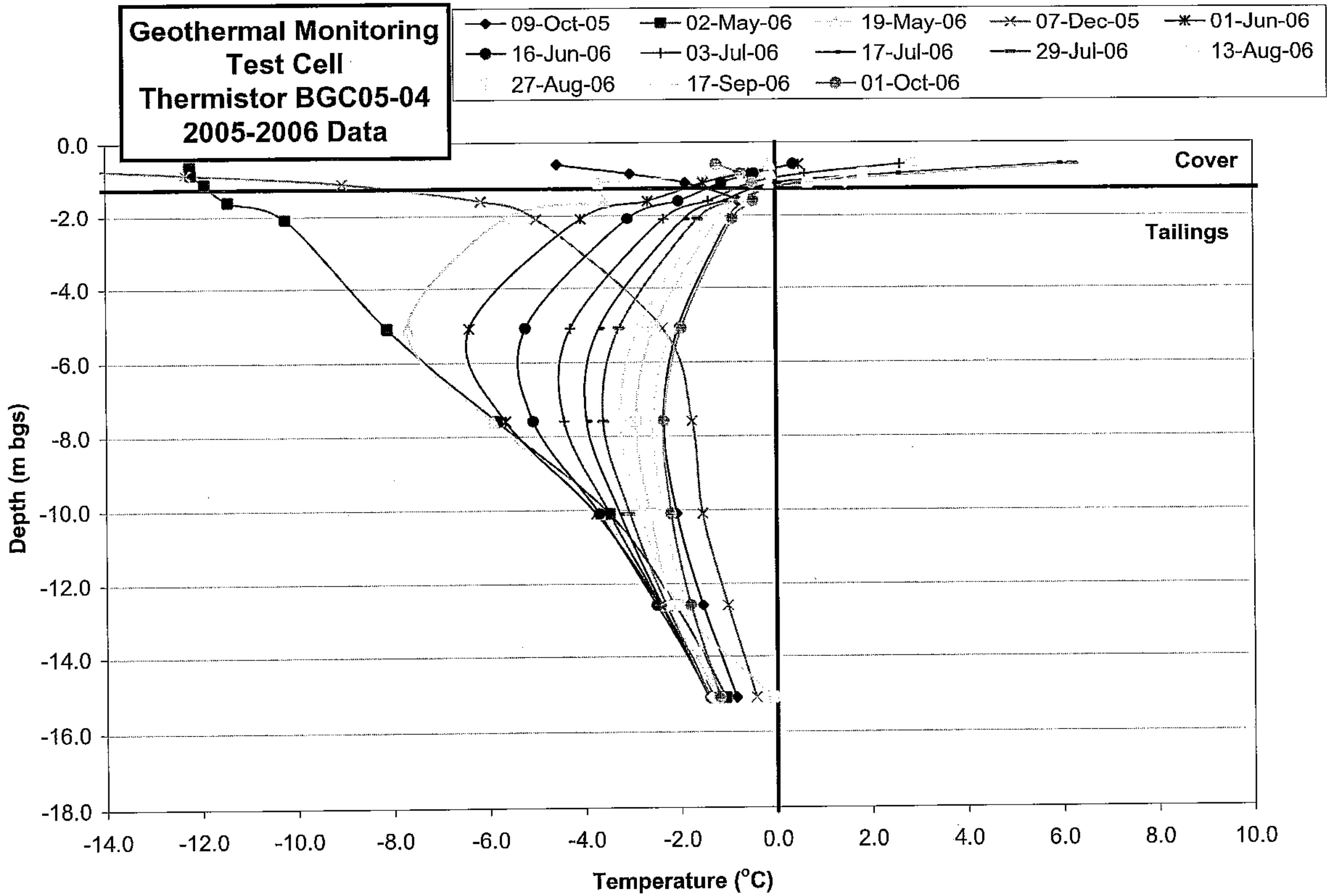

Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC03-19
Long Term Comparison
Shallow Nodes
-2.9 m
-3.9 m
-4.9 m
Temperature (°C)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
Aug-03
Aug-04
Aug-05
Aug-06
Date

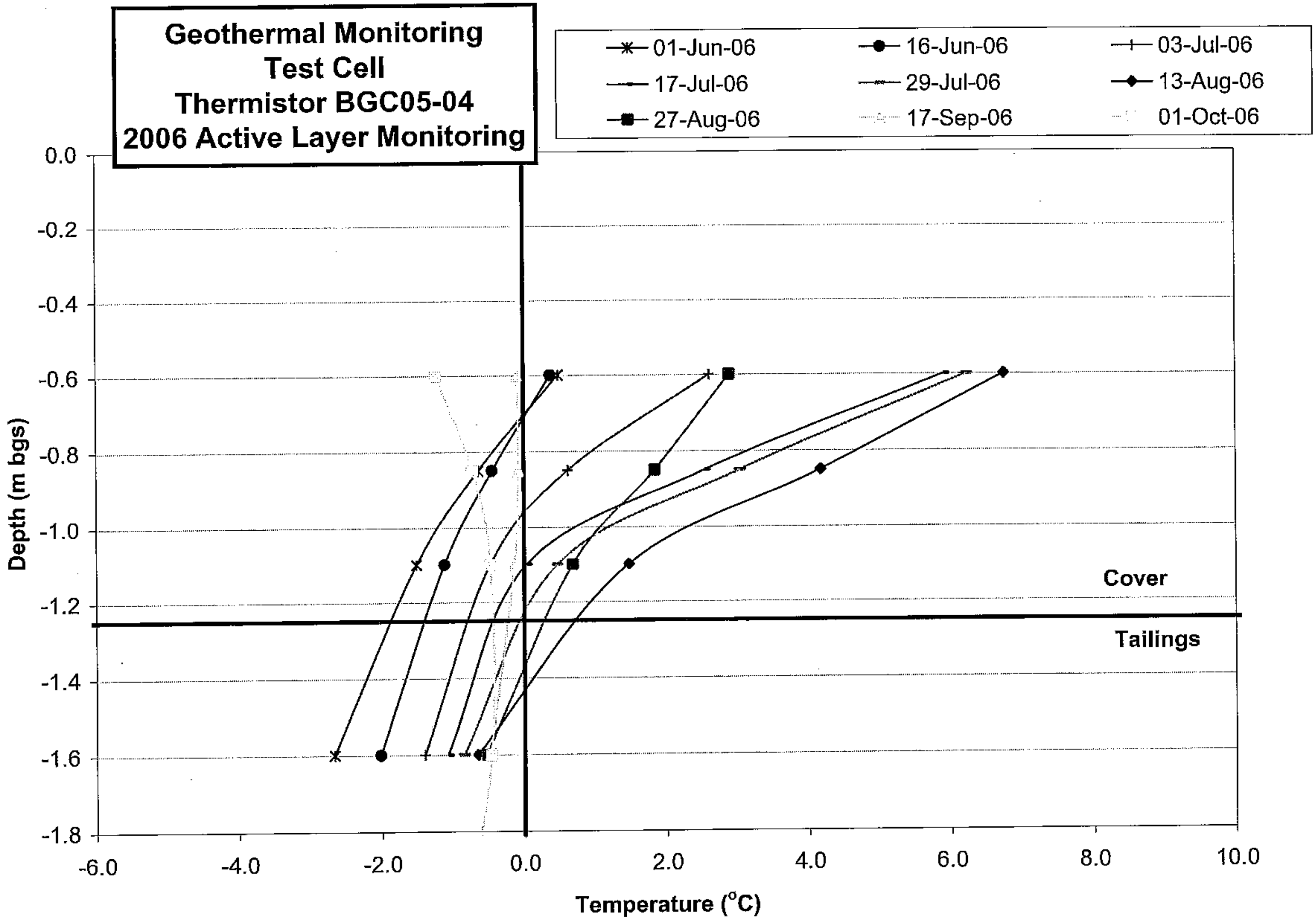

Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC03-19
Long Term Comparison
Deep Nodes
-5.9 m
-8.4 m
-10.9 m
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-6.0
-6.5
-7.0
-7.5
-8.0
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

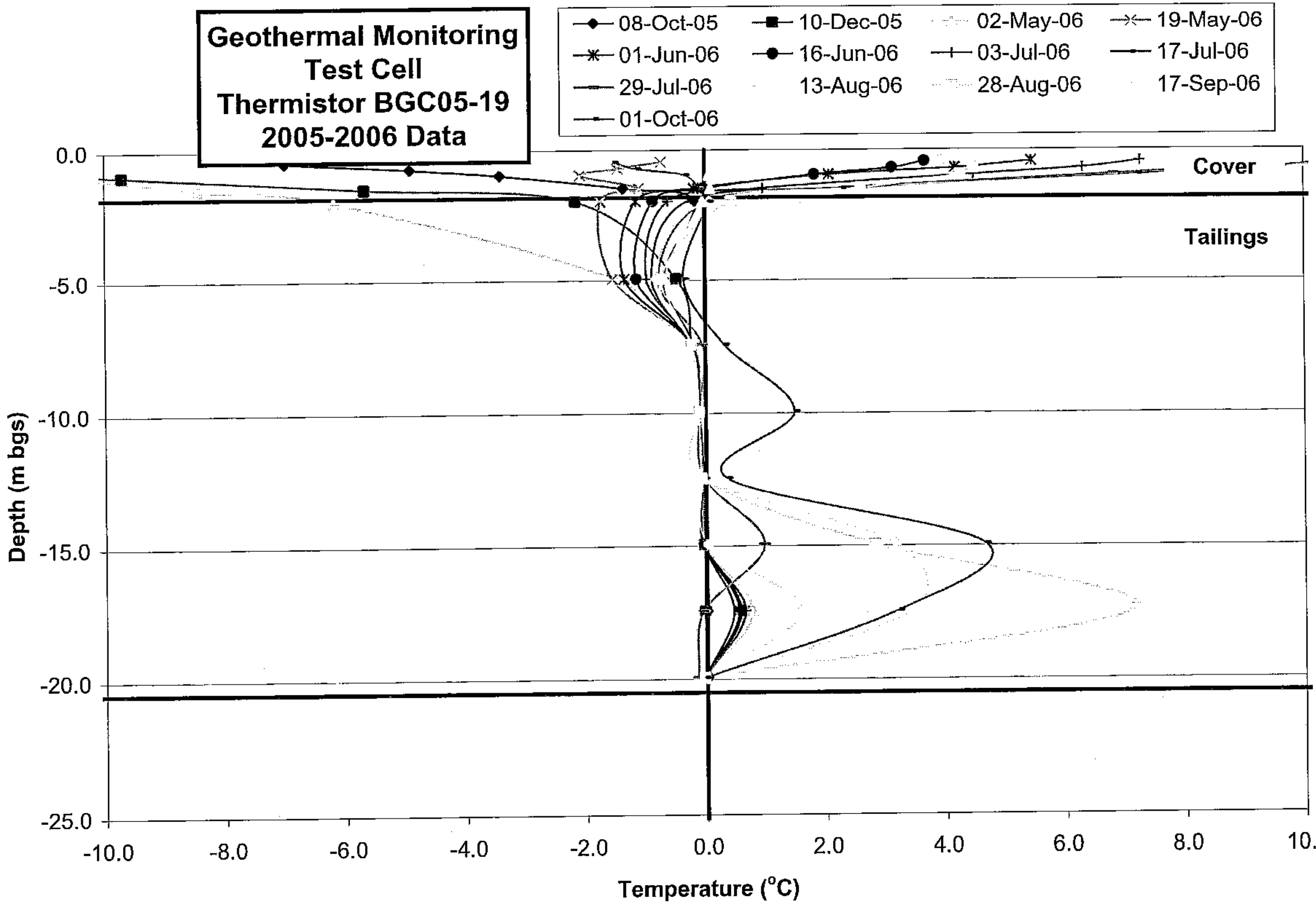

Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC05-26
2005-2006 Data
08-Oct-05
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Bedrock
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-16.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
Temperature (°C)

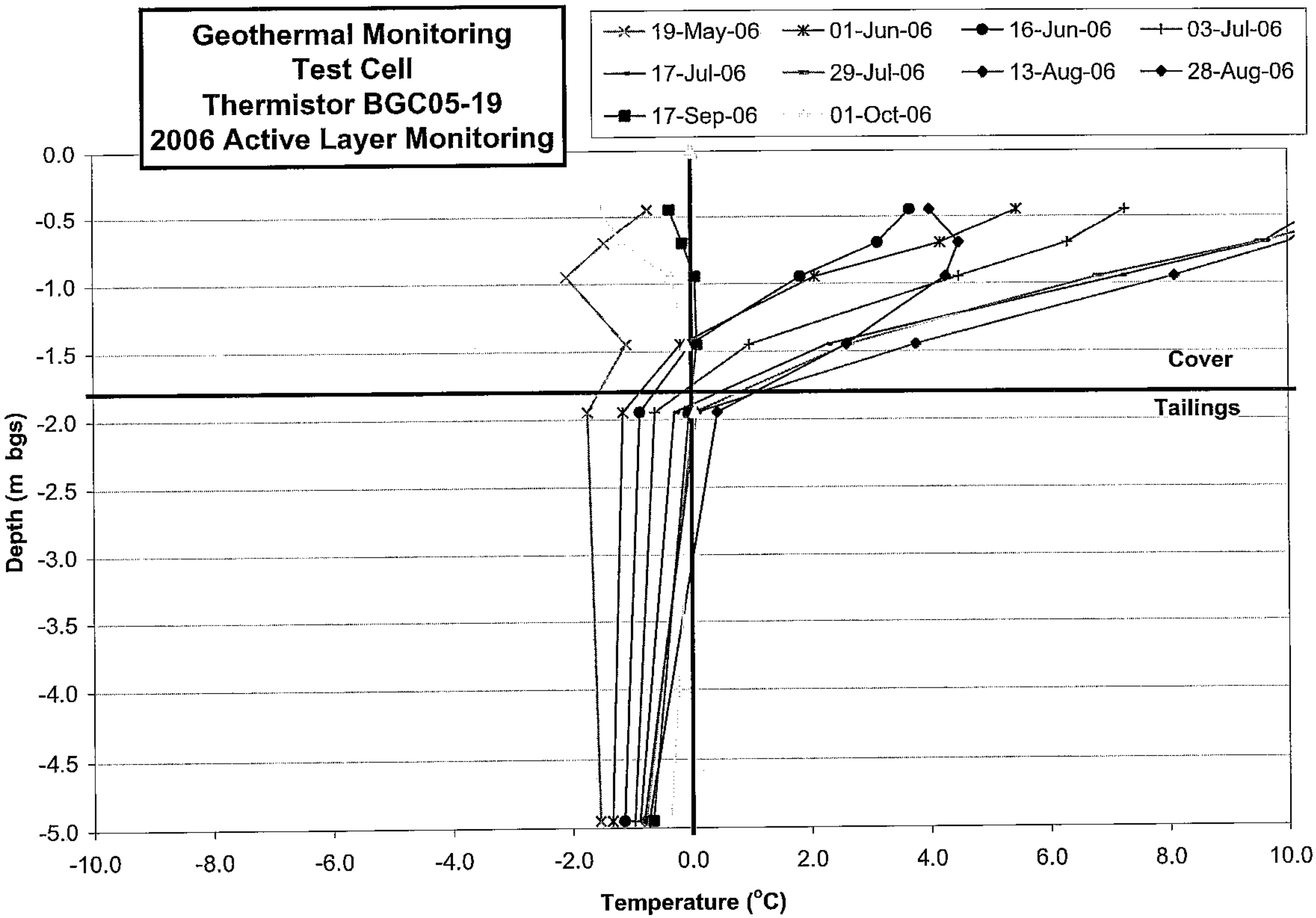

Geothermal Monitoring
Toe of West Twin Dike
Thermistor BGC05-26
2006 Active Layer Monitoring
19-May-06
16-Jun-06
01-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
Temperature (°C)

TEST CELL

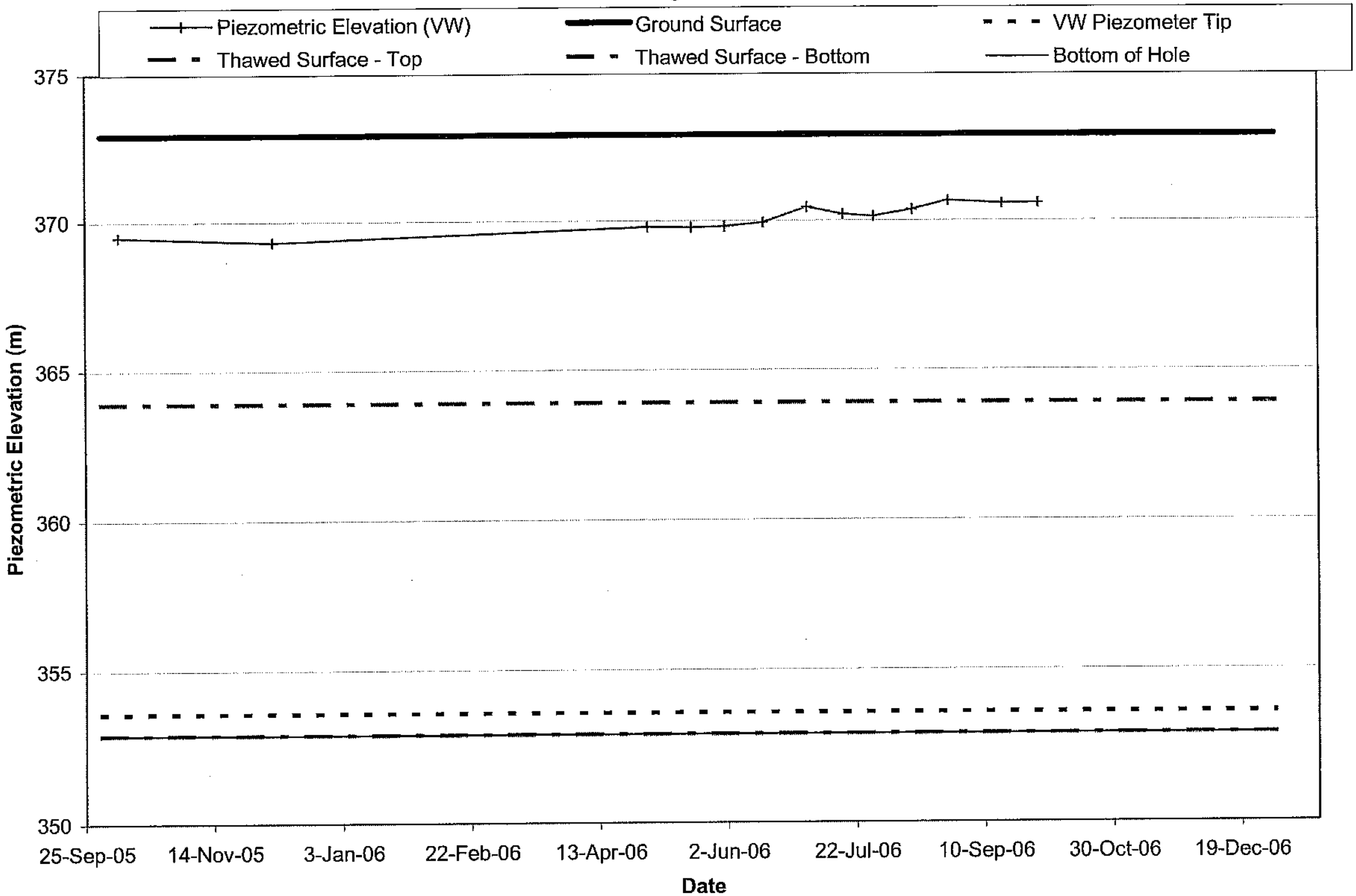

Geothermal Monitoring
Test Cell
Thermistor BGC05-04
2005-2006 Data
09-Oct-05
02-May-06
19-May-06
07-Dec-05
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
Temperature (°C)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0


Geothermal Monitoring
Test Cell
Thermistor BGC05-04
2006 Active Layer Monitoring
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Depth (m bgs)
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
Temperature (°C)
Cover
Tailings

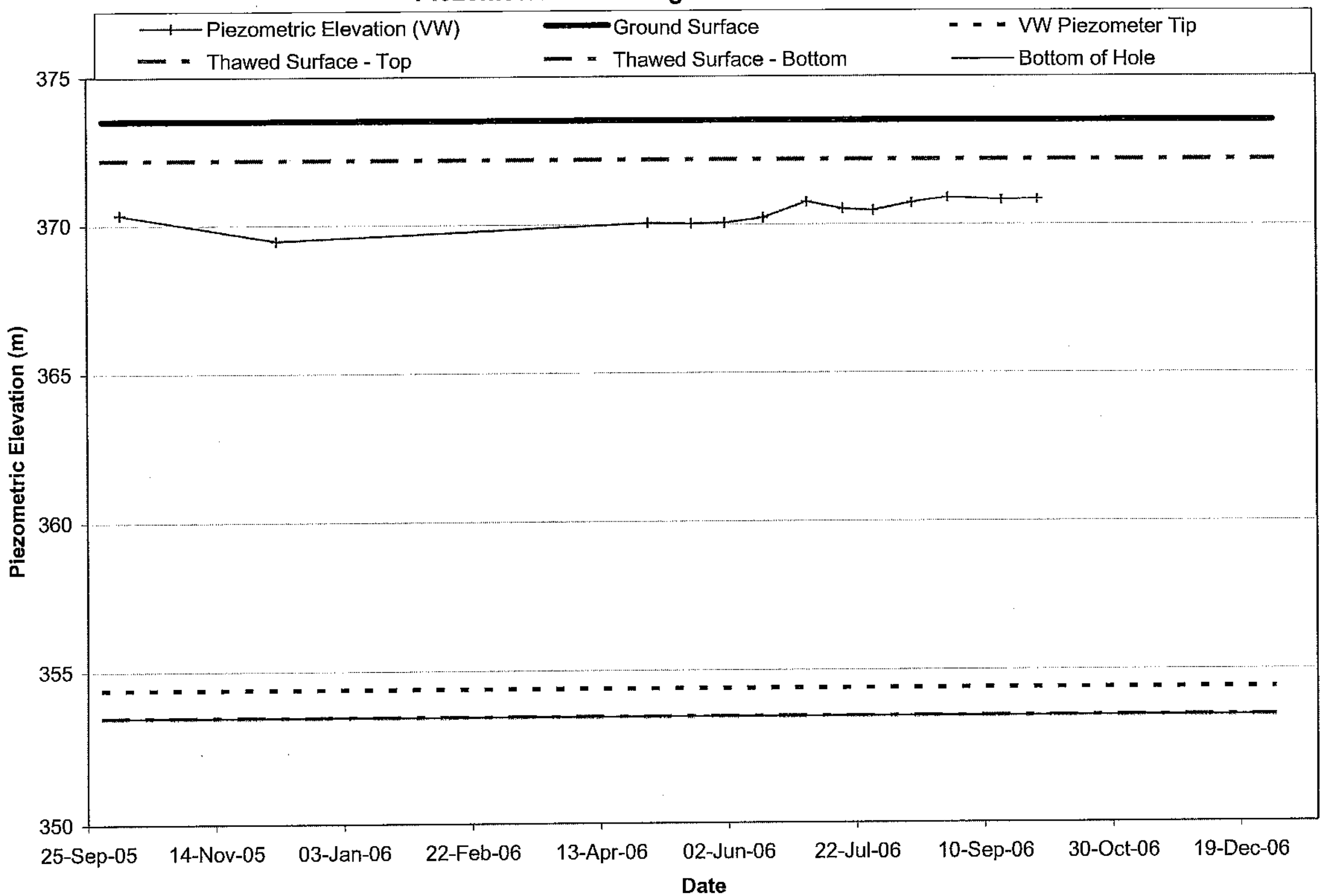

Geothermal Monitoring
Test Cell
Thermistor BGC05-19
2005-2006 Data
08-Oct-05
10-Dec-05
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Depth (m bgs)
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
Temperature (°C)

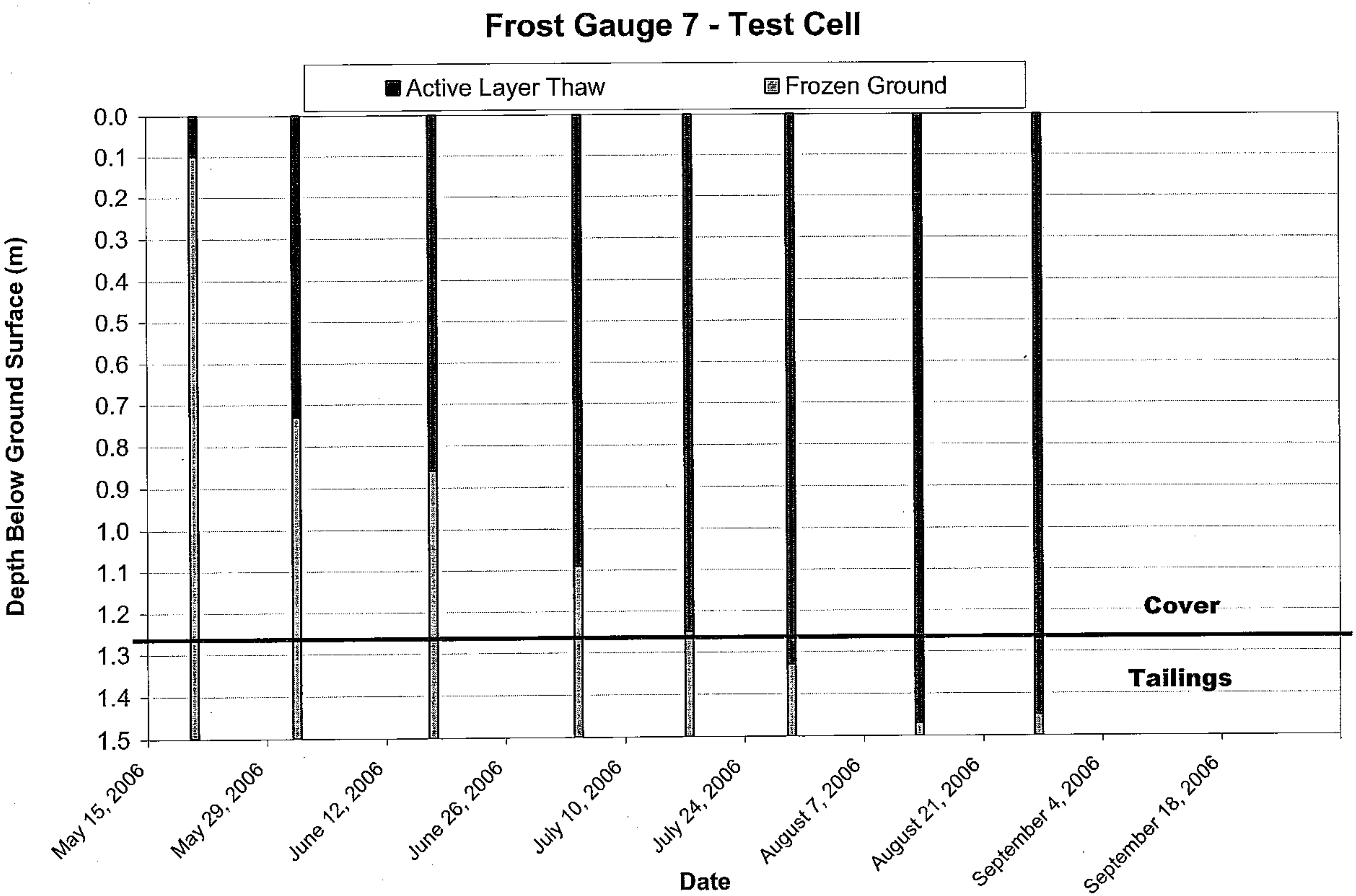

Geothermal Monitoring
Test Cell
Thermistor BGC05-19
2006 Active Layer Monitoring
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
Temperature (°C)

Piezometer Monitoring Results for BGC05-18

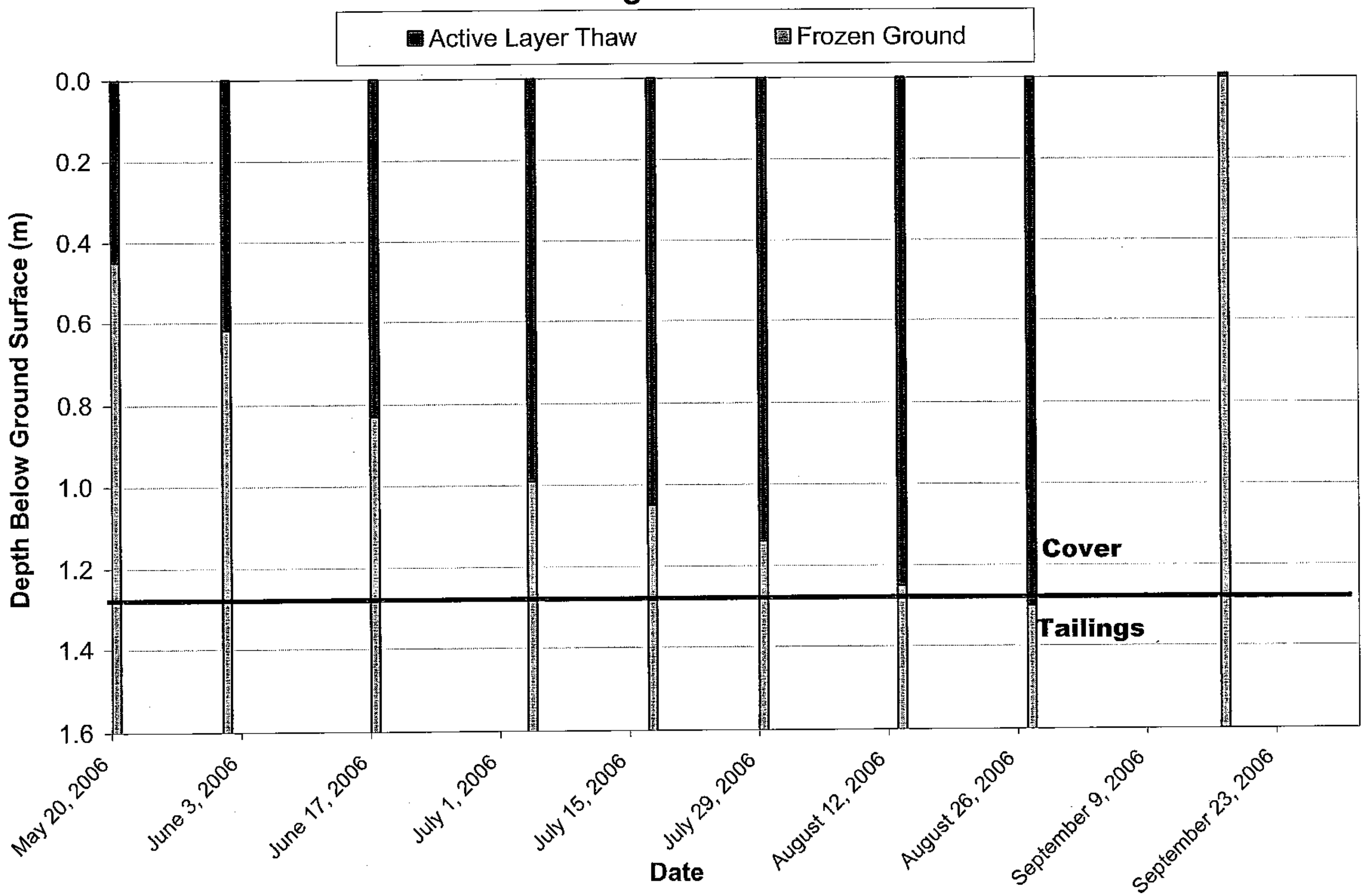


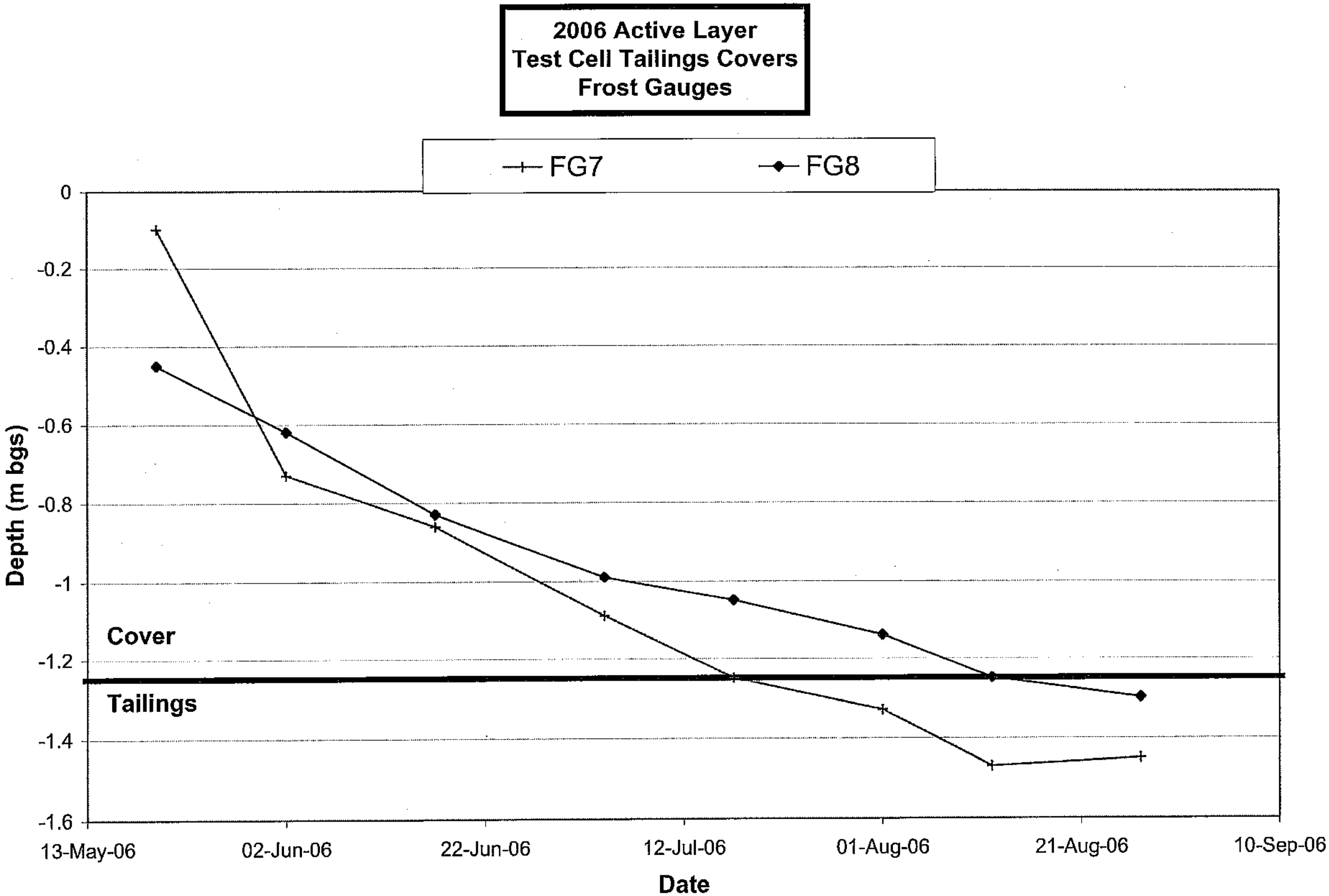
Piezometer Monitoring Results for BGC05-24



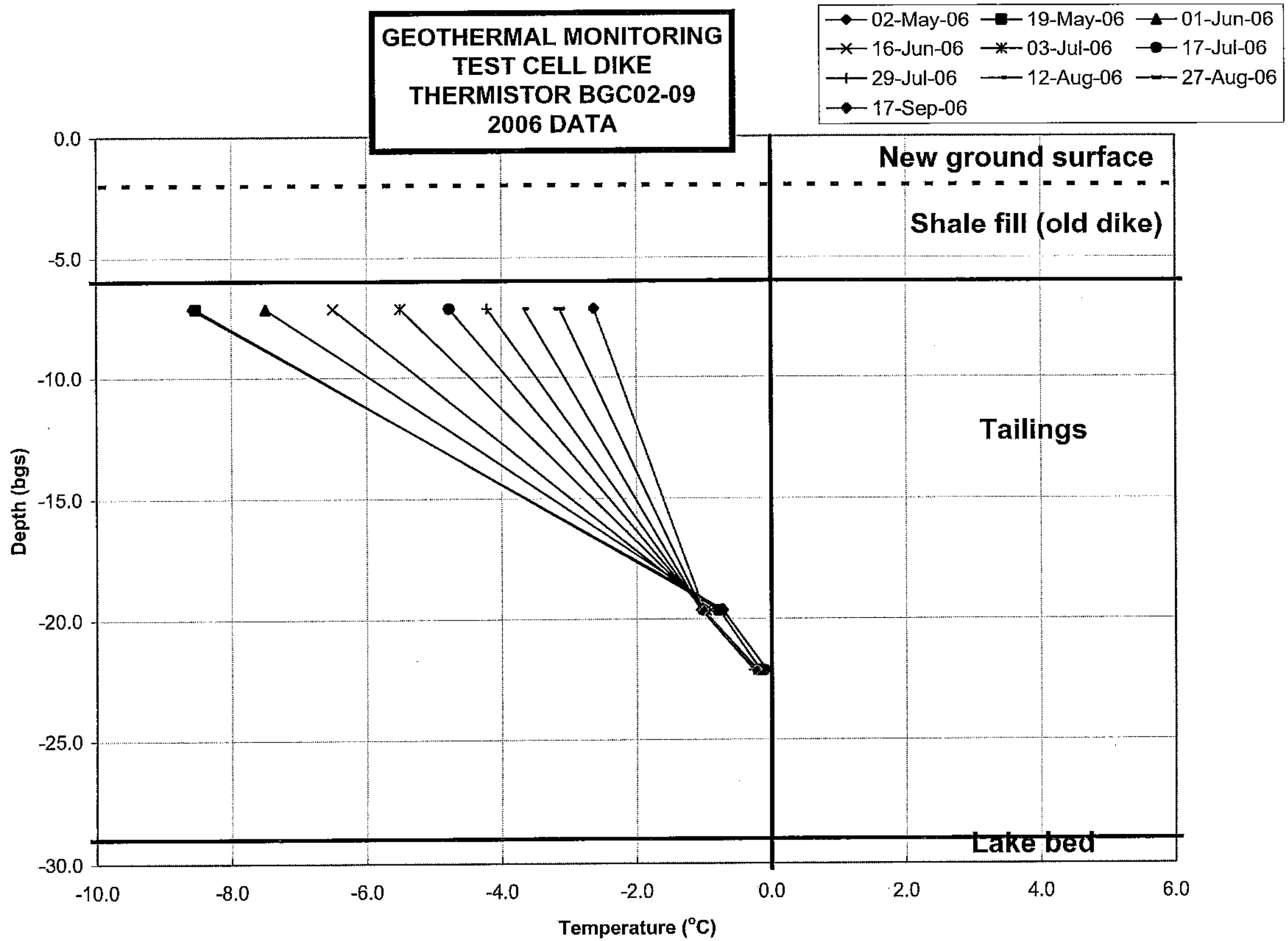

Frost Gauge 7 - Test Cell
Active Layer Thaw
Frozen Ground
Depth Below Ground Surface (m)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
Cover
Tailings
May 15, 2006
May 29, 2006
June 12, 2006
June 26, 2006
July 10, 2006
July 24, 2006
August 7, 2006
August 21, 2006
September 4, 2006
September 18, 2006
Date

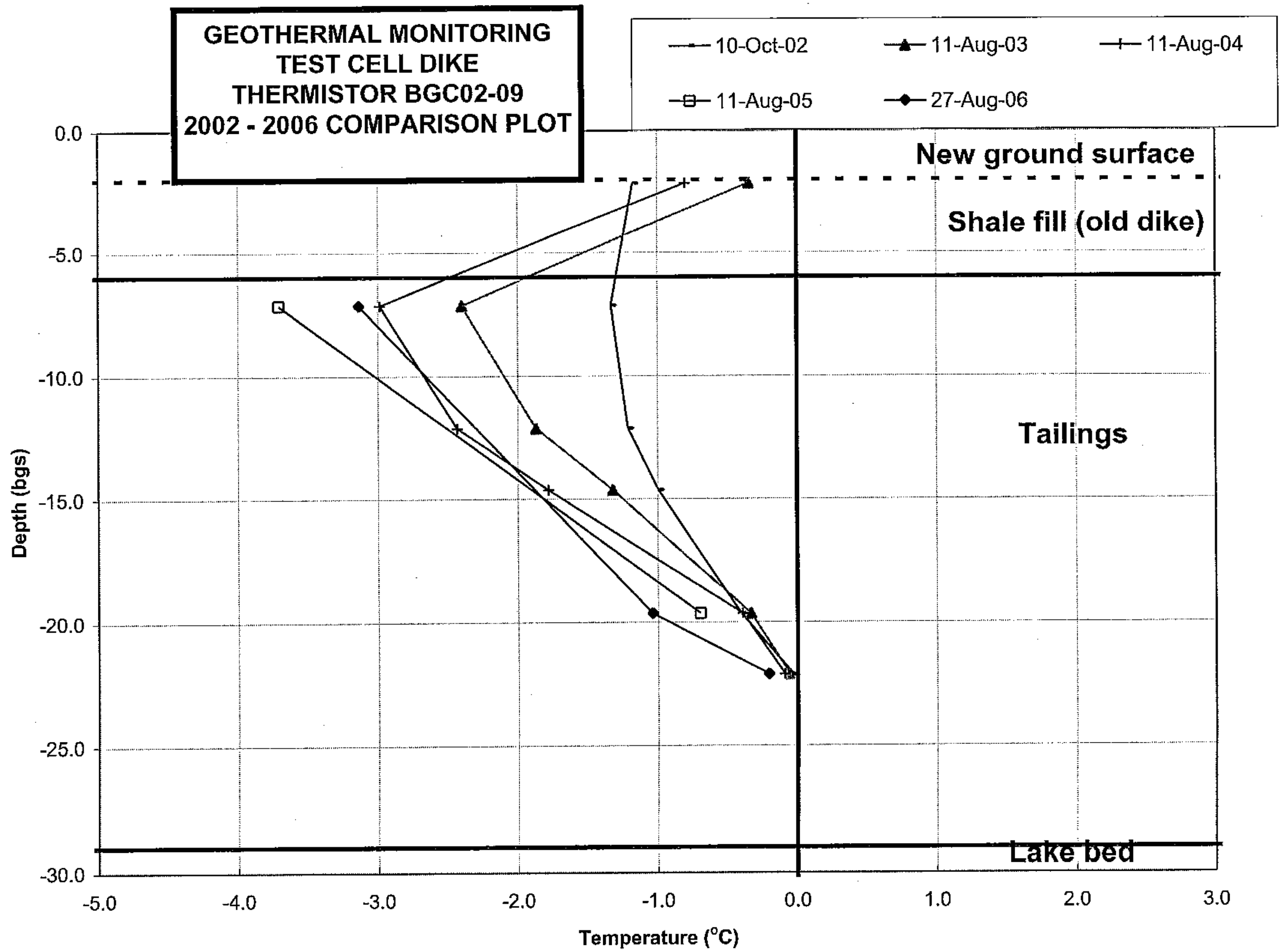
Frost Gauge 8 - Test Cell

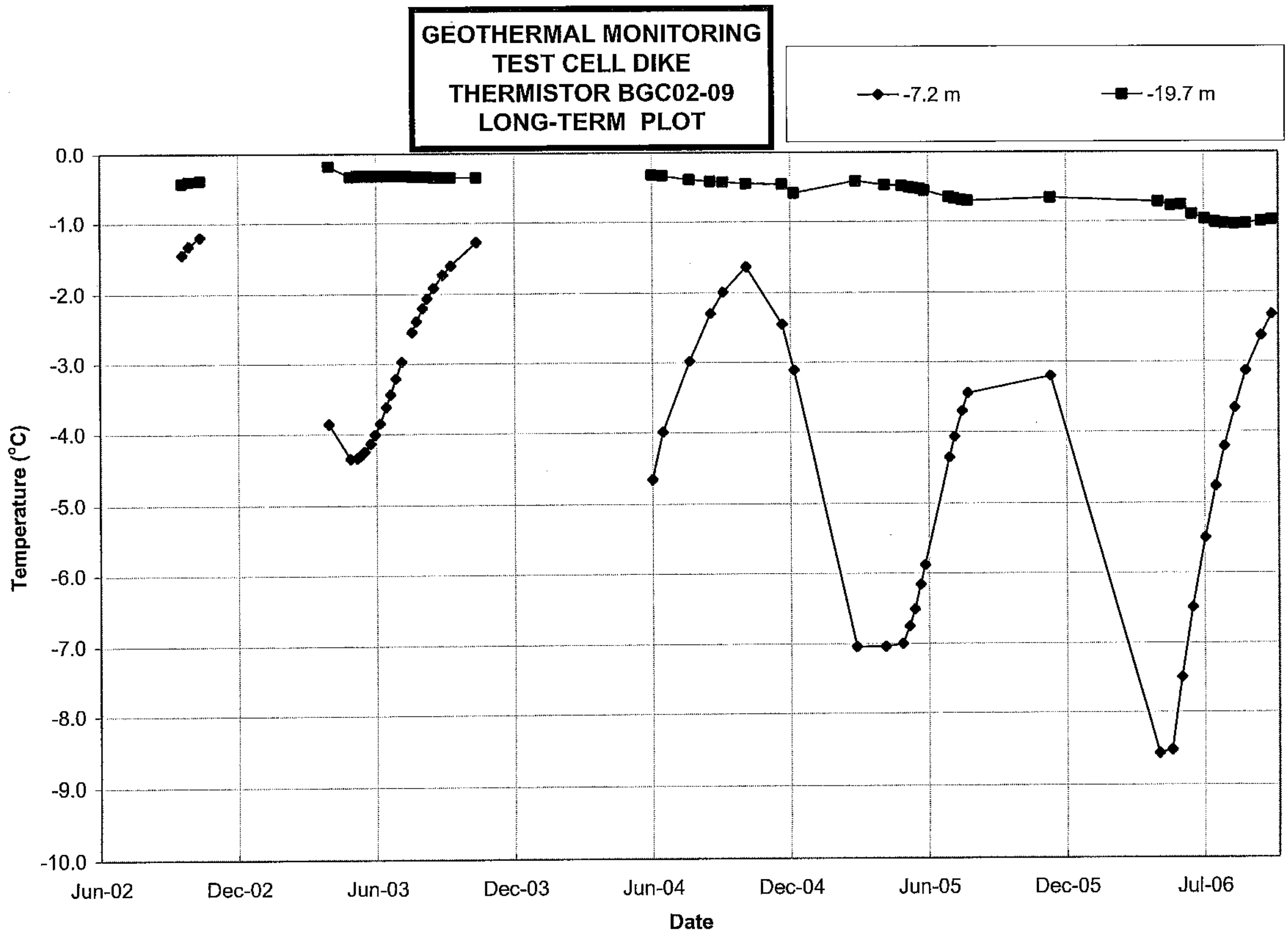


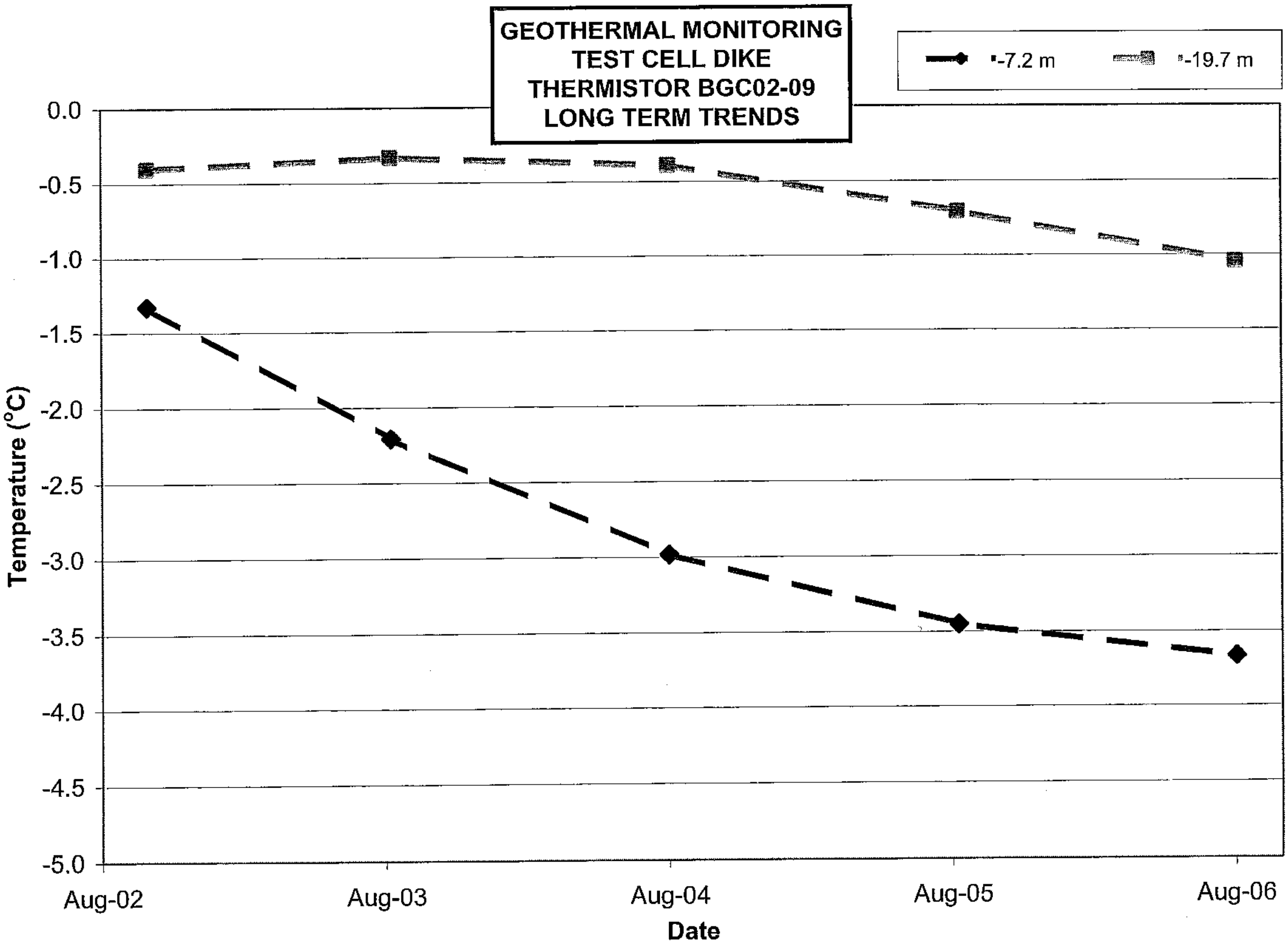

2006 Active Layer
Test Cell Tailings Covers
Frost Gauges
FG7
FG8
Depth (m bgs)
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
Cover
Tailings
13-May-06
02-Jun-06
22-Jun-06
12-Jul-06
01-Aug-06
21-Aug-06
10-Sep-06
Date

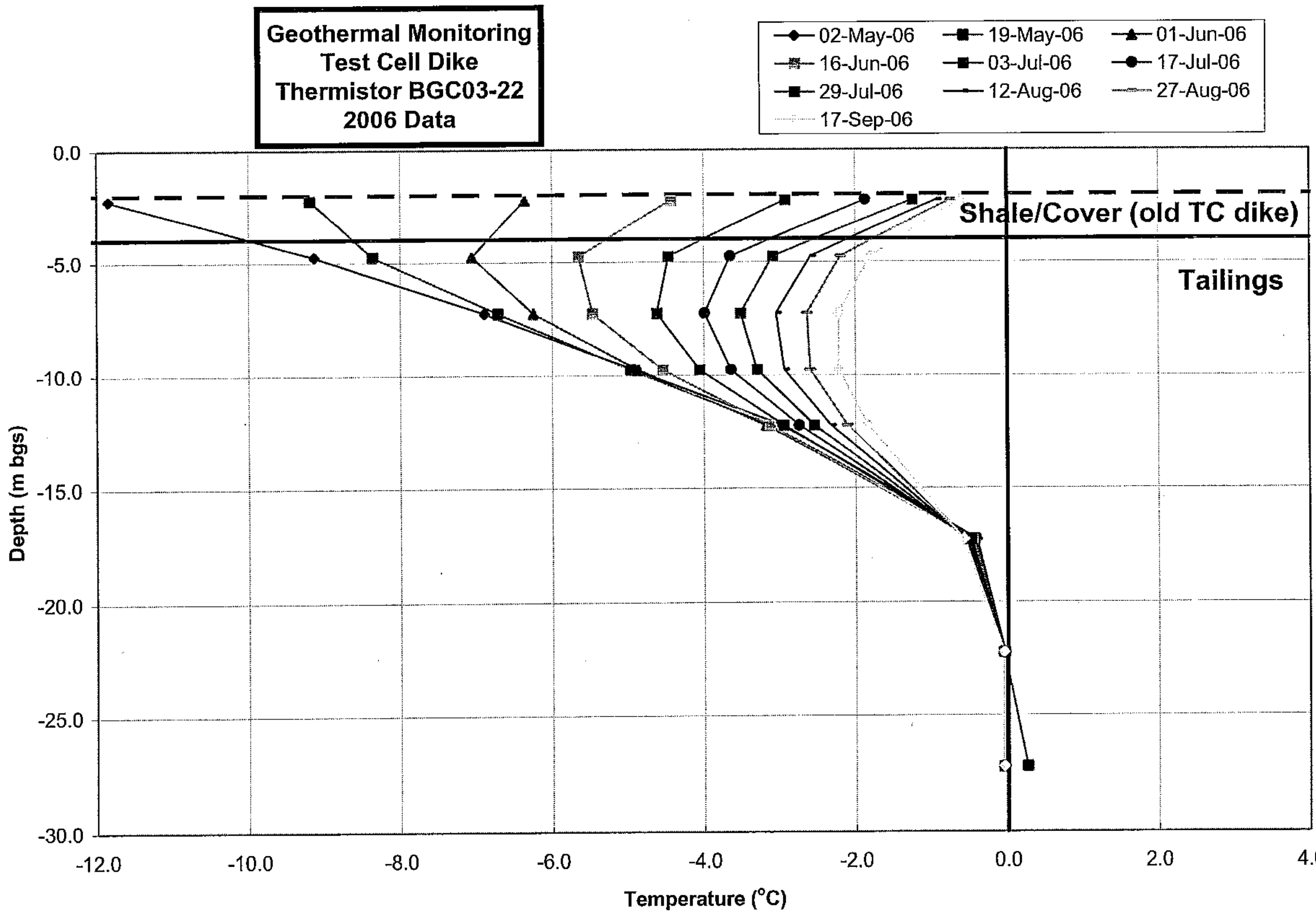
TEST CELL DIKE

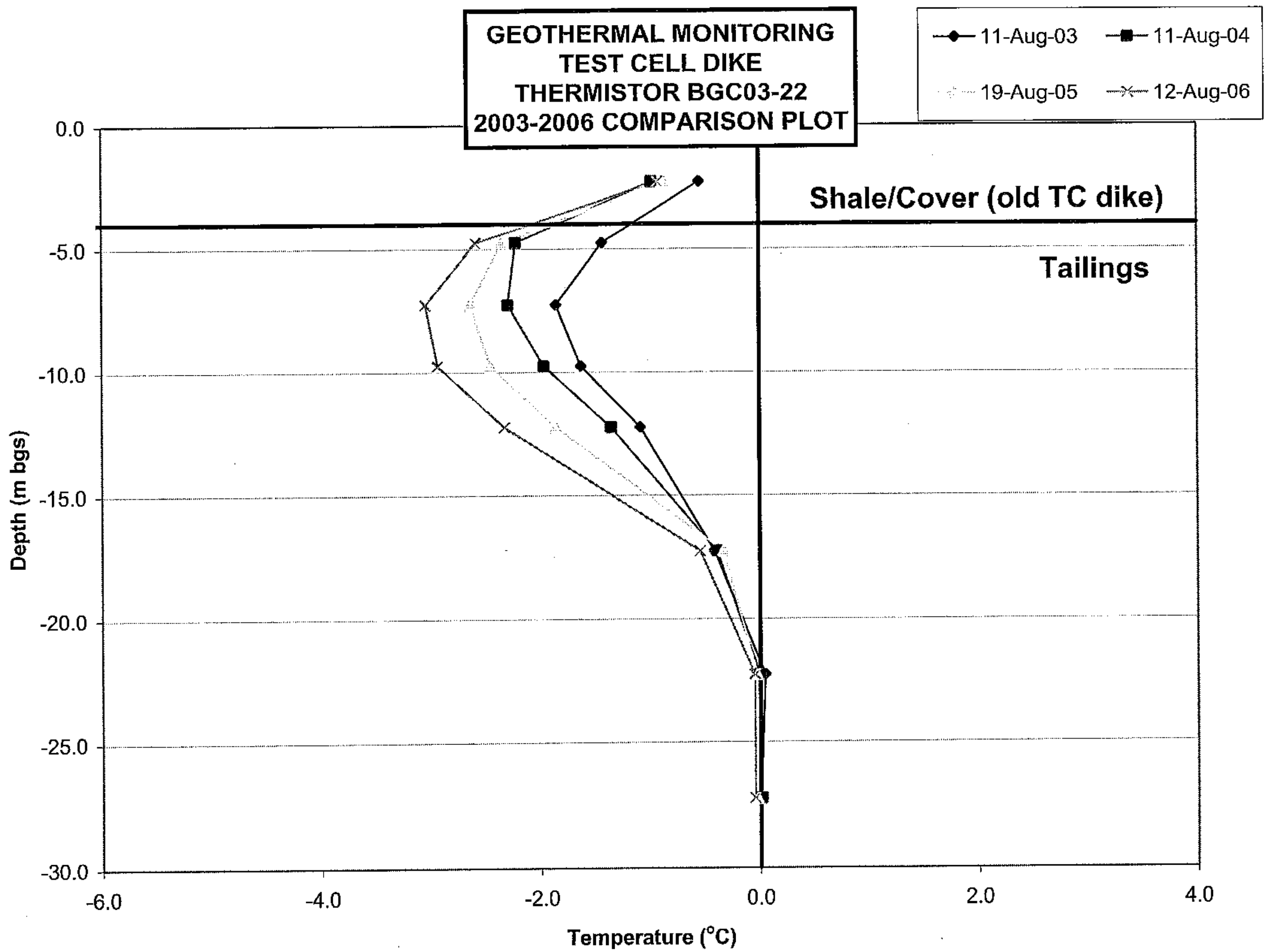

GEOTHERMAL MONITORING
TEST CELL DIKE
THERMISTOR BGC02-09
2006 DATA
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
12-Aug-06
27-Aug-06
17-Sep-06
New ground surface
Shale fill (old dike)
Tailings
Lake bed
Depth (bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
Temperature (°C)


GEOTHERMAL MONITORING
TEST CELL DIKE
THERMISTOR BGC02-09
2002 - 2006 COMPARISON PLOT
10-Oct-02
11-Aug-03
11-Aug-04
11-Aug-05
27-Aug-06
New ground surface
Shale fill (old dike)
Tailings
Lake bed
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
Depth (bgs)
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
Temperature (°C)


GEOTHERMAL MONITORING
TEST CELL DIKE
THERMISTOR BGC02-09
LONG-TERM PLOT
-7.2 m
-19.7 m
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10.0
Temperature (°C)
Jun-02
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jul-06
Date

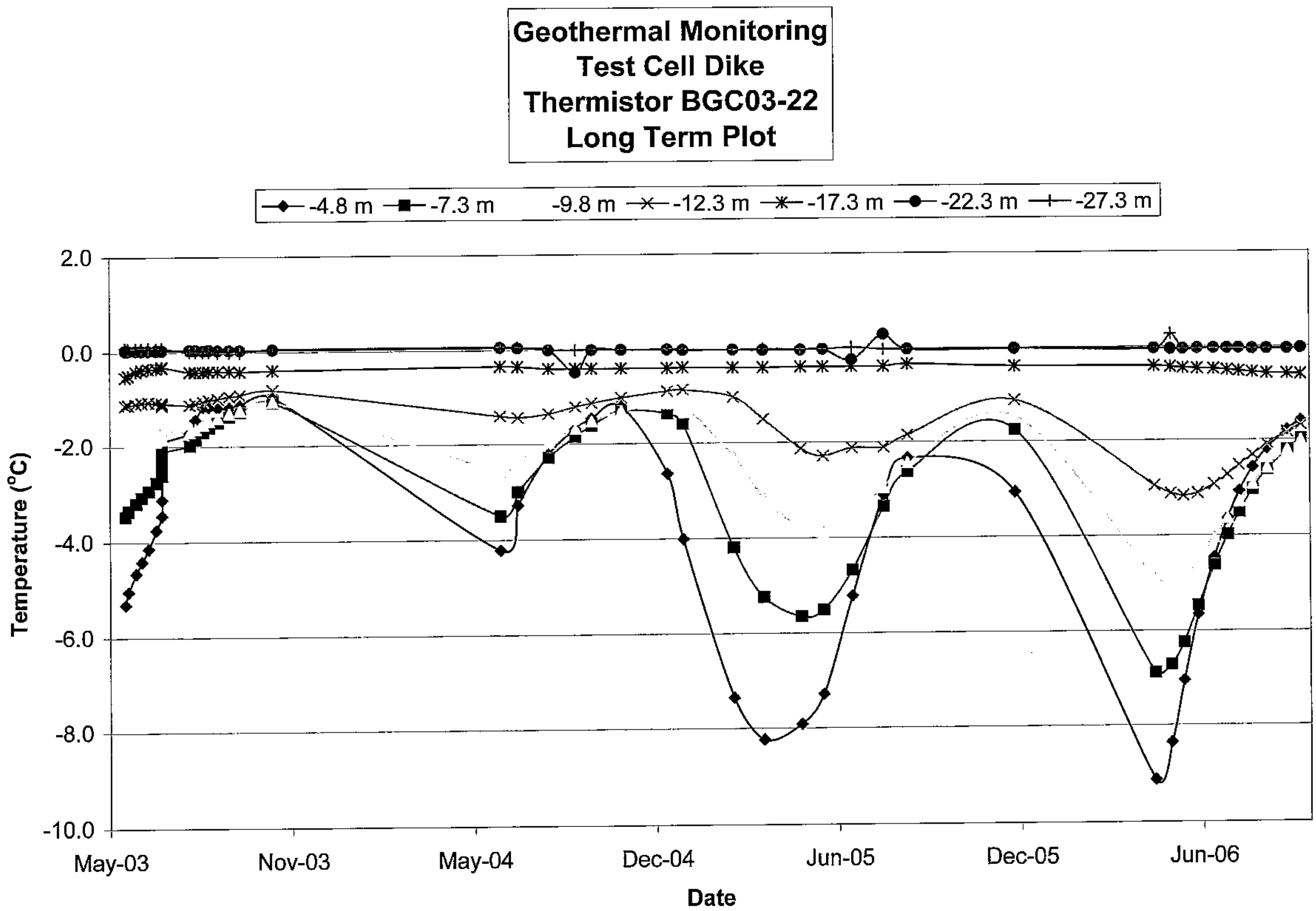

GEOTHERMAL MONITORING
TEST CELL DIKE
THERMISTOR BGC02-09
LONG TERM TRENDS
-7.2 m
-19.7 m
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
Temperature (°C)
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Date


Geothermal Monitoring
Test Cell Dike
Thermistor BGC03-22
2006 Data
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
12-Aug-06
27-Aug-06
17-Sep-06
Shale/Cover (old TC dike)
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)


GEOTHERMAL MONITORING
TEST CELL DIKE
THERMISTOR BGC03-22
2003-2006 COMPARISON PLOT
11-Aug-03
11-Aug-04
19-Aug-05
12-Aug-06
Shale/Cover (old TC dike)
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

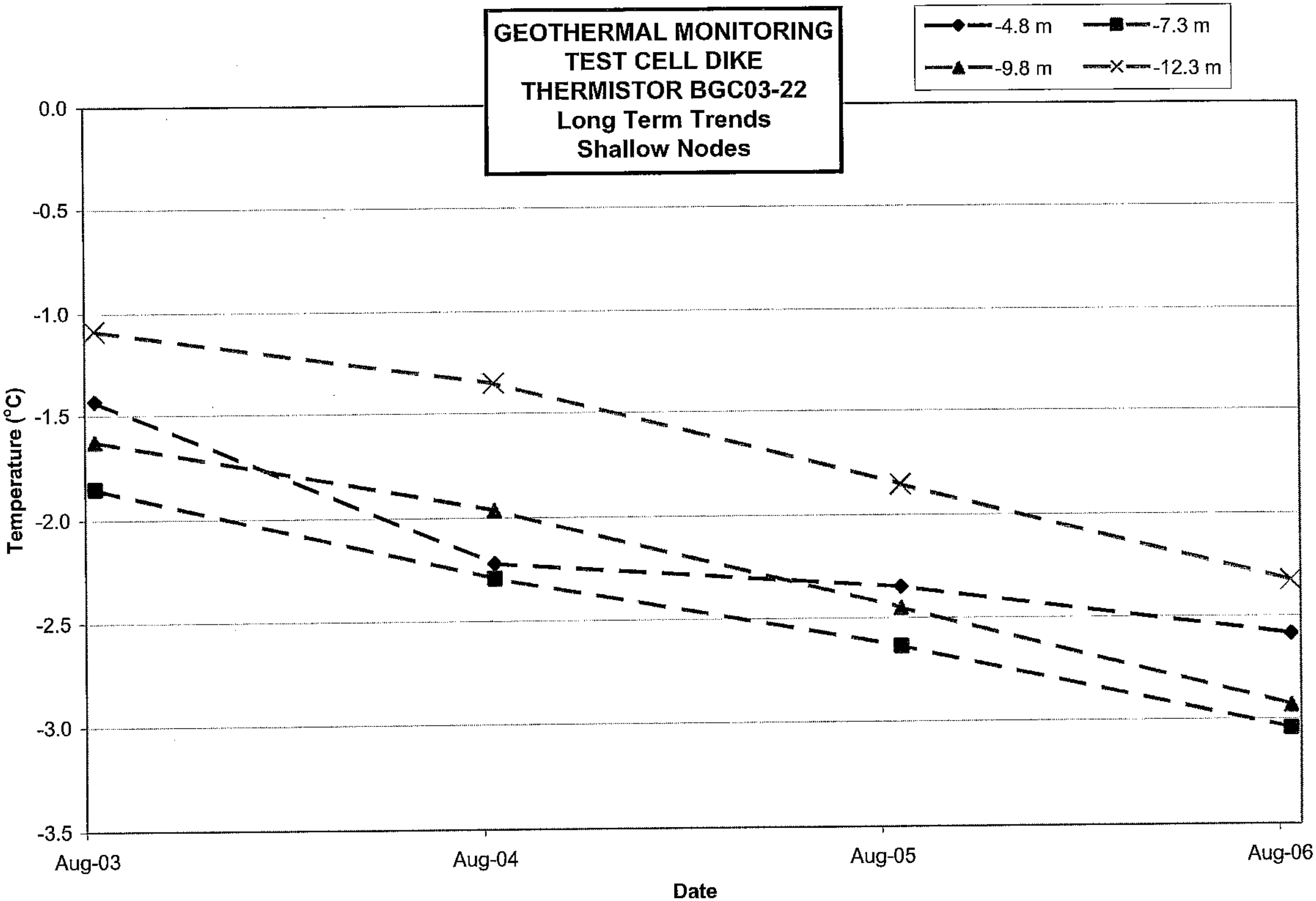
Nanisivik Mine, a Division of CanZinco Ltd.

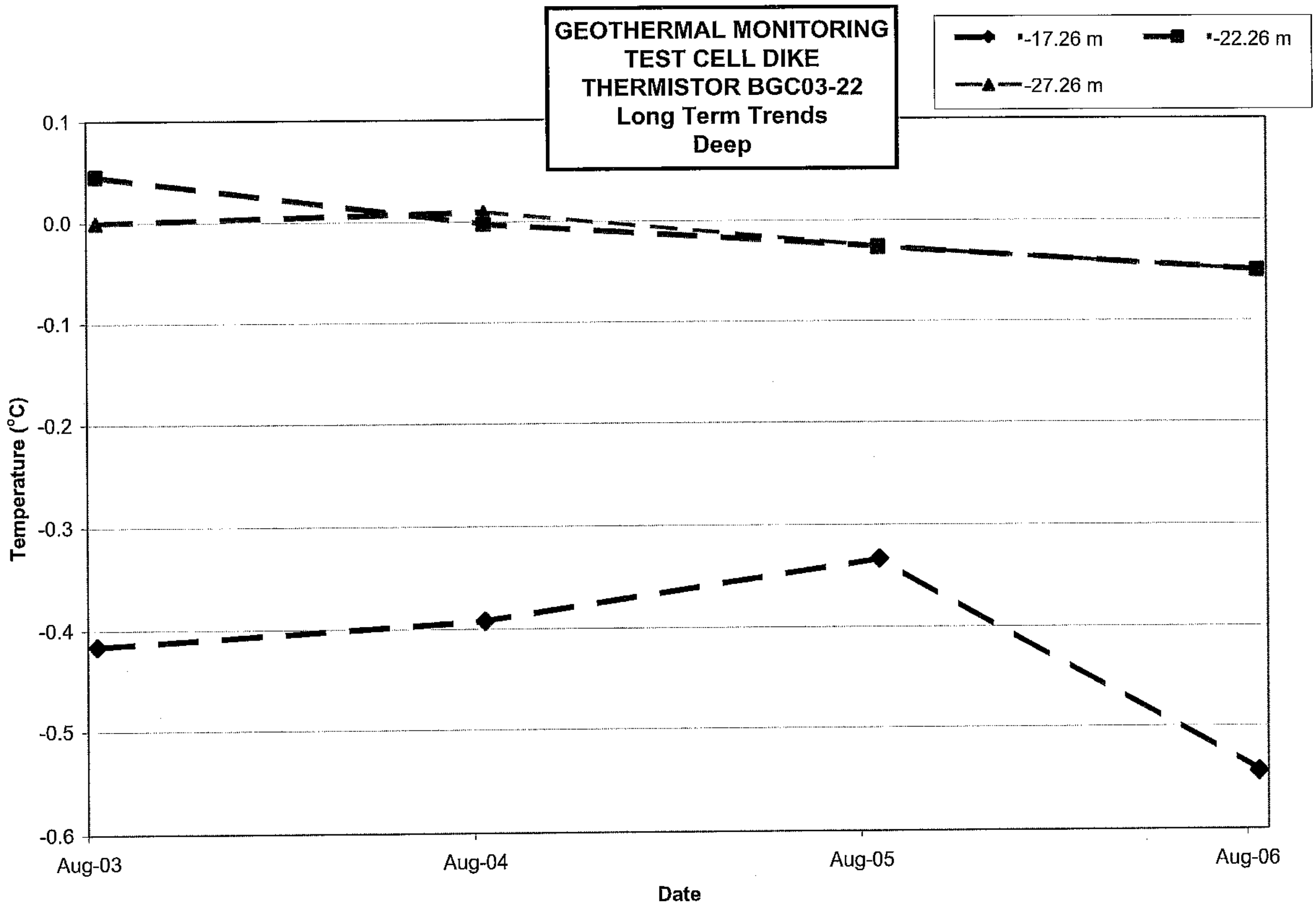
03/11/2006
0255-013-08

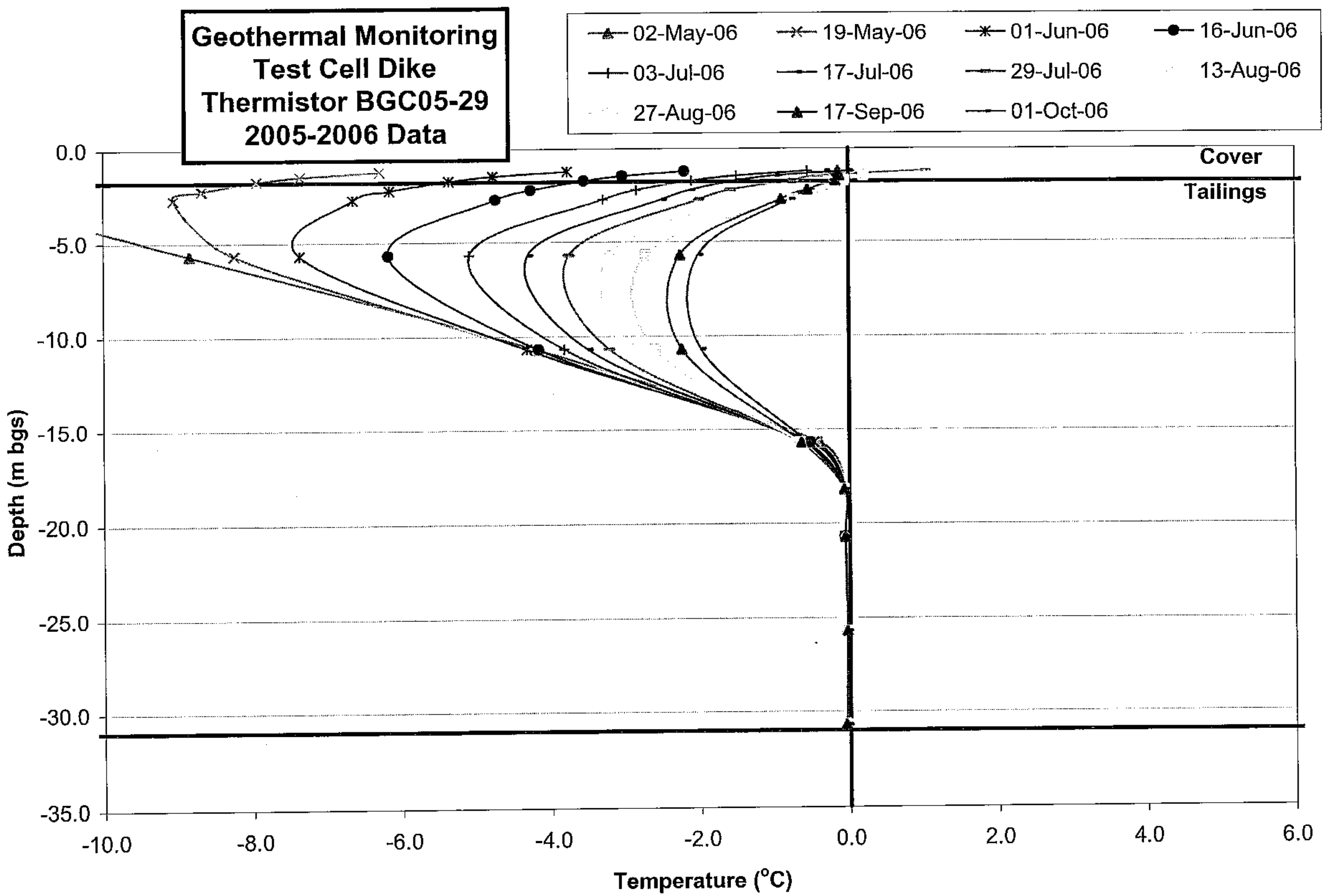


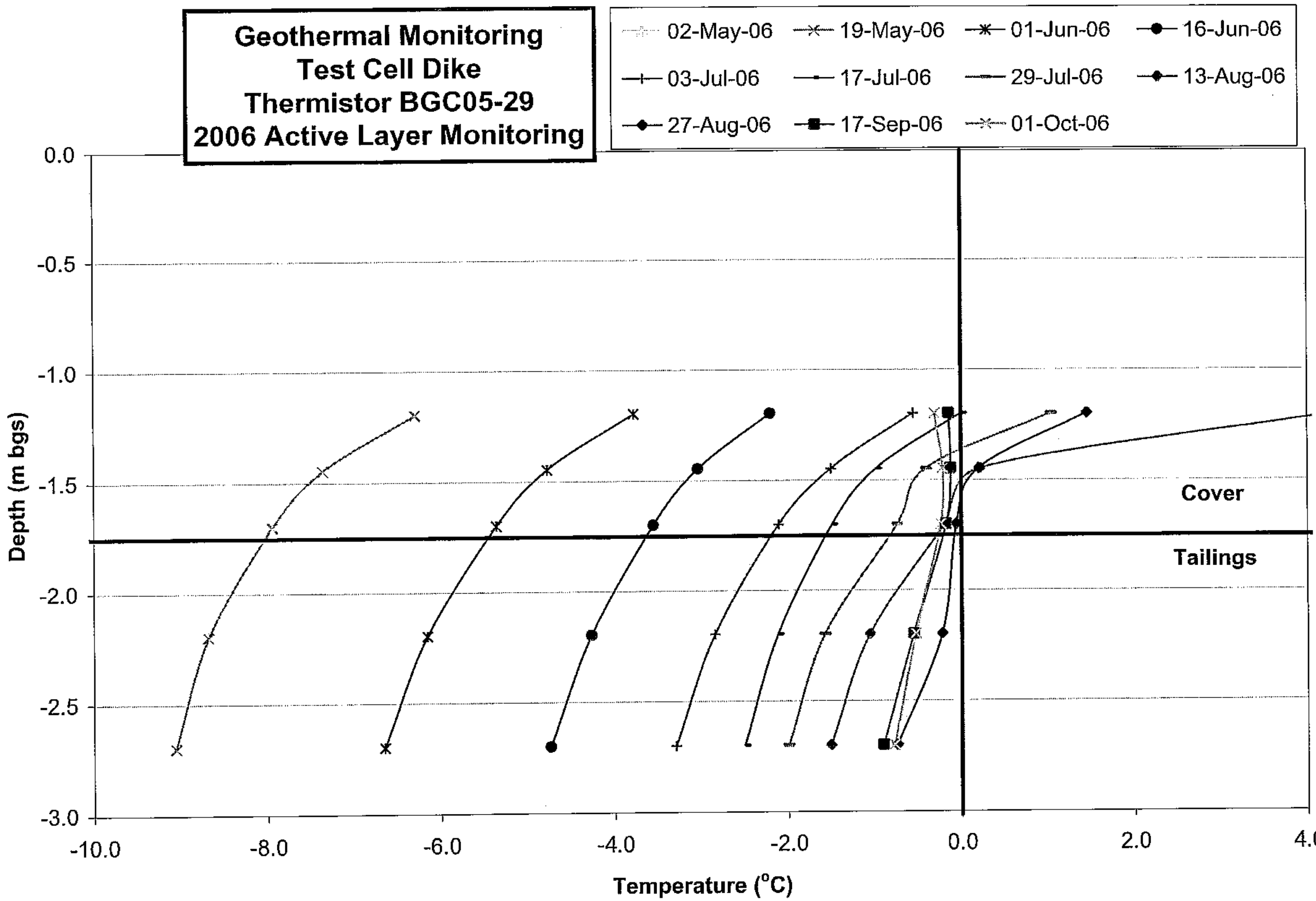
02-03 Thermistors Aug_2006b
03-22 LT All

BGC Engineering Inc.

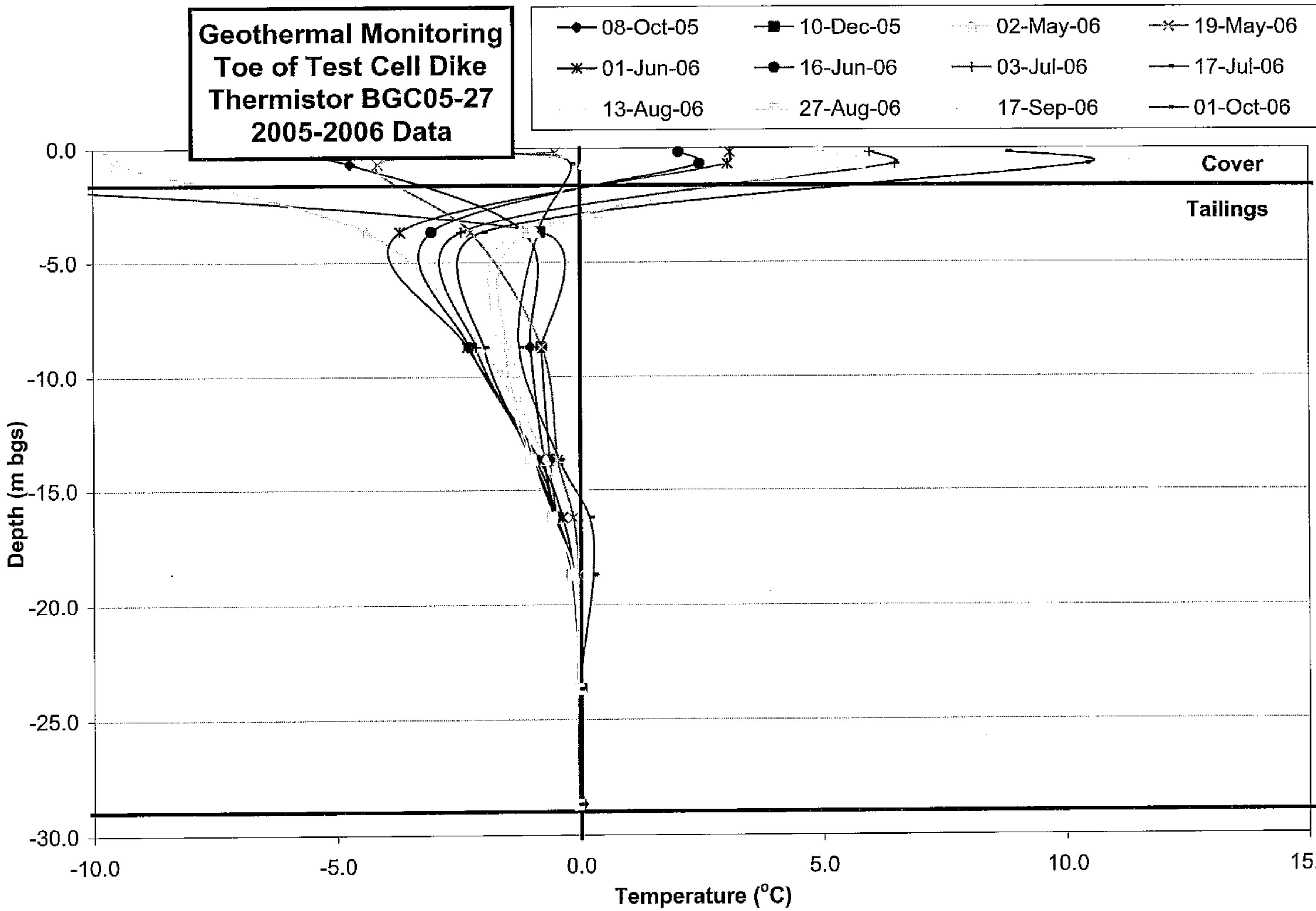

GEOTHERMAL MONITORING
TEST CELL DIKE
THERMISTOR BGC03-22
Long Term Trends
Shallow Nodes
-4.8 m
-7.3 m
-9.8 m
-12.3 m
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
Temperature (°C)
Aug-03
Aug-04
Aug-05
Aug-06
Date

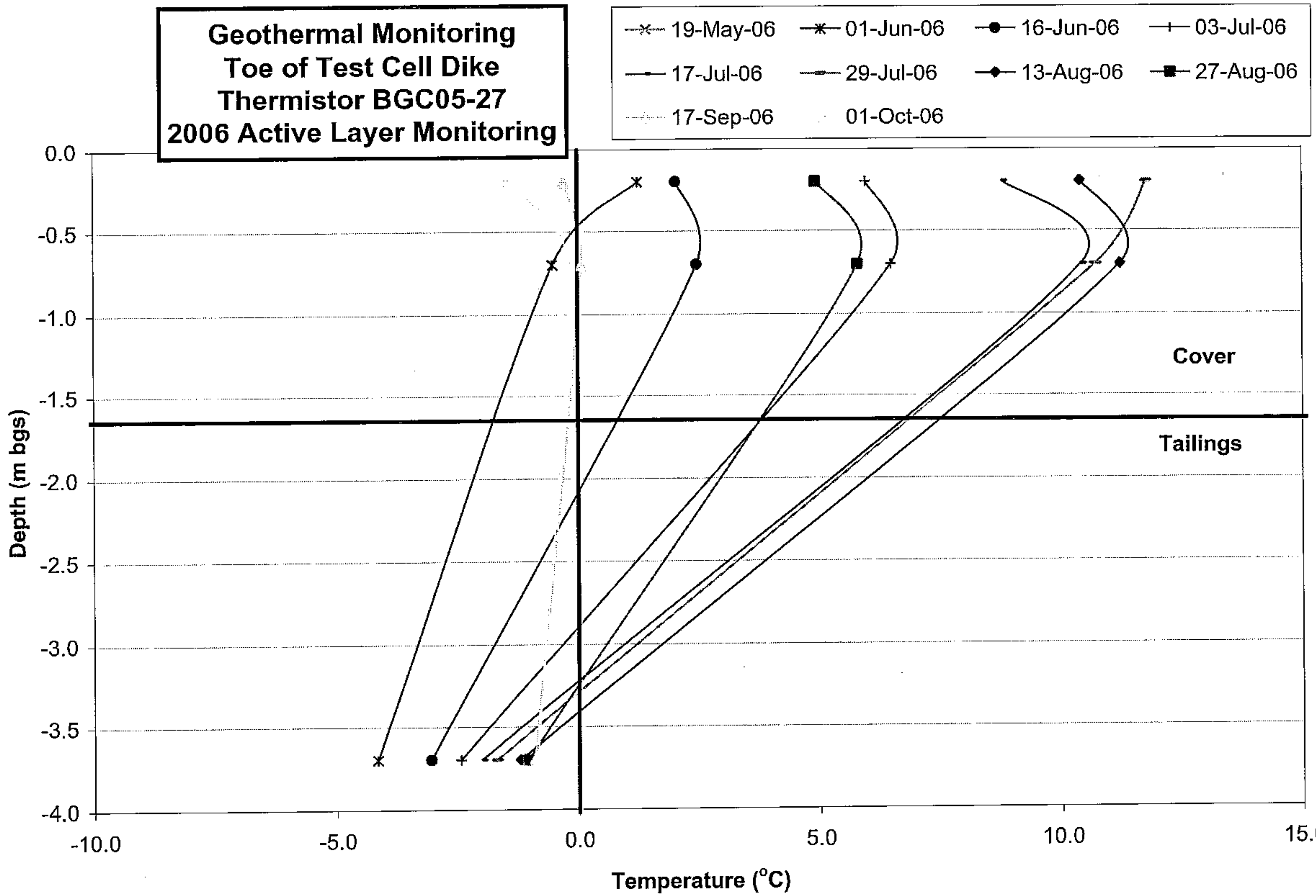

GEOTHERMAL MONITORING
TEST CELL DIKE
THERMISTOR BGC03-22
Long Term Trends
Deep
-17.26 m
-22.26 m
-27.26 m
Temperature (°C)
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
Aug-03
Aug-04
Aug-05
Aug-06
Date

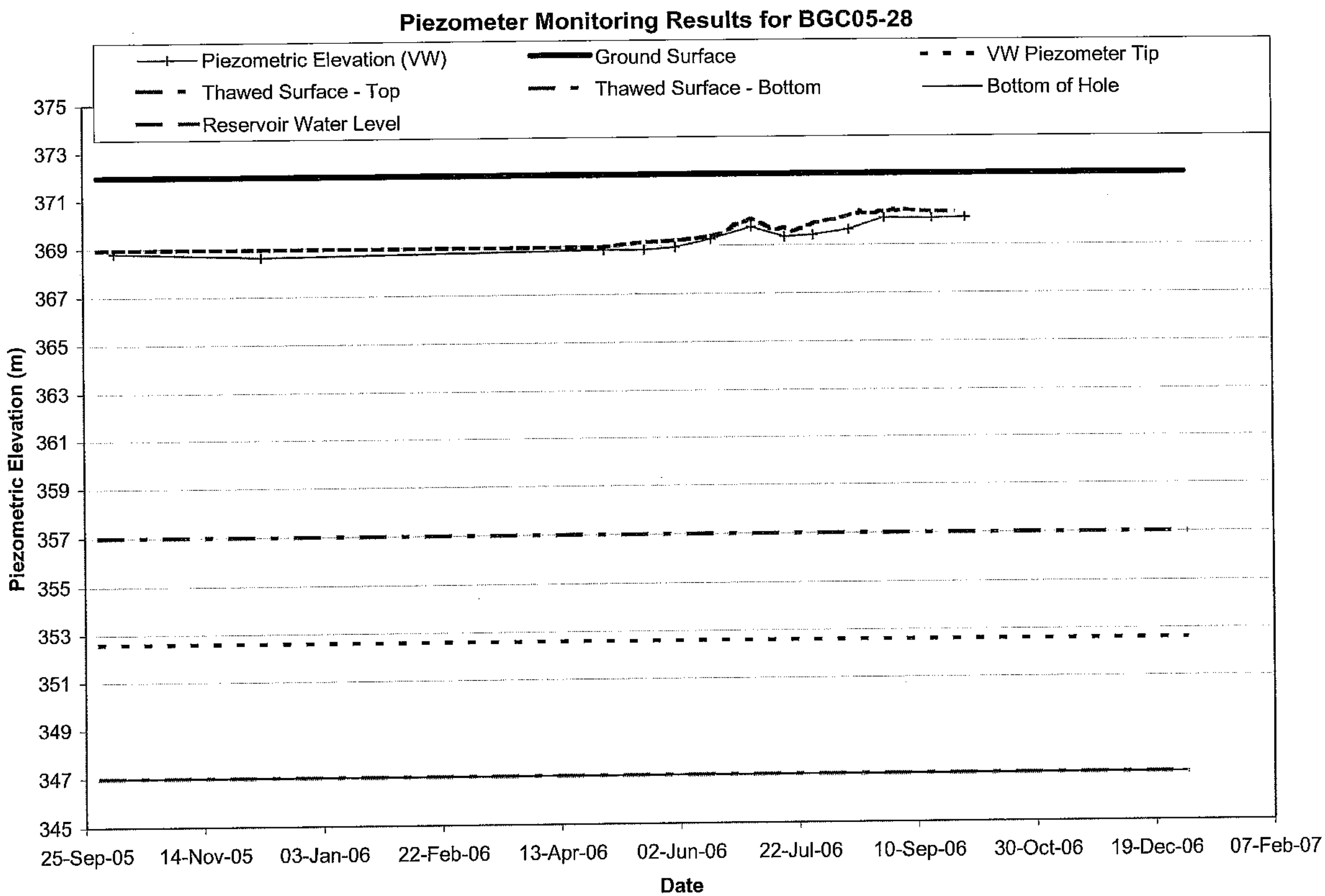

Geothermal Monitoring
Test Cell Dike
Thermistor BGC05-29
2005-2006 Data
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
Depth (m bgs)
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
Temperature (°C)

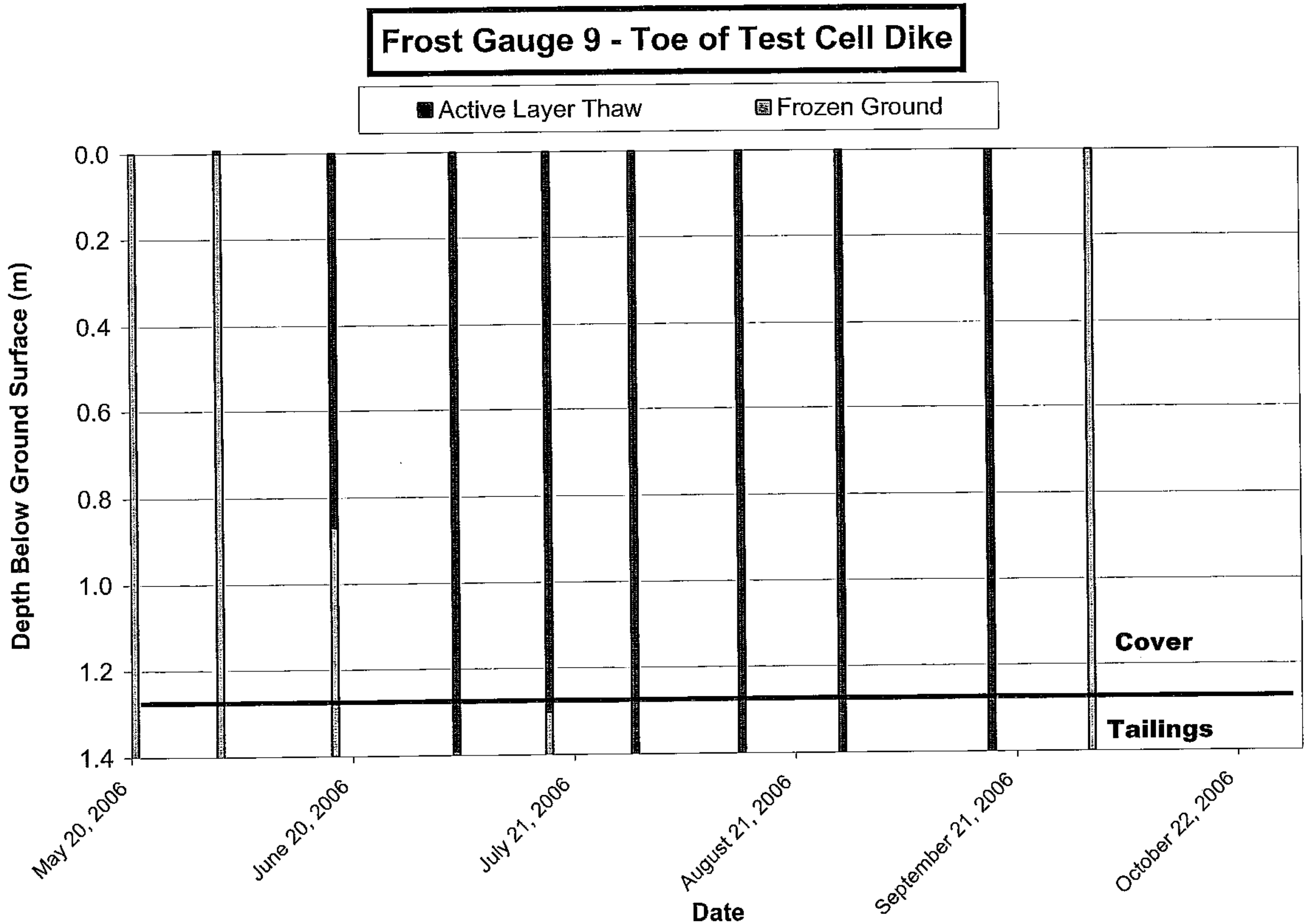

Geothermal Monitoring
Test Cell Dike
Thermistor BGC05-29
2006 Active Layer Monitoring
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
Cover
Tailings
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
Temperature (°C)

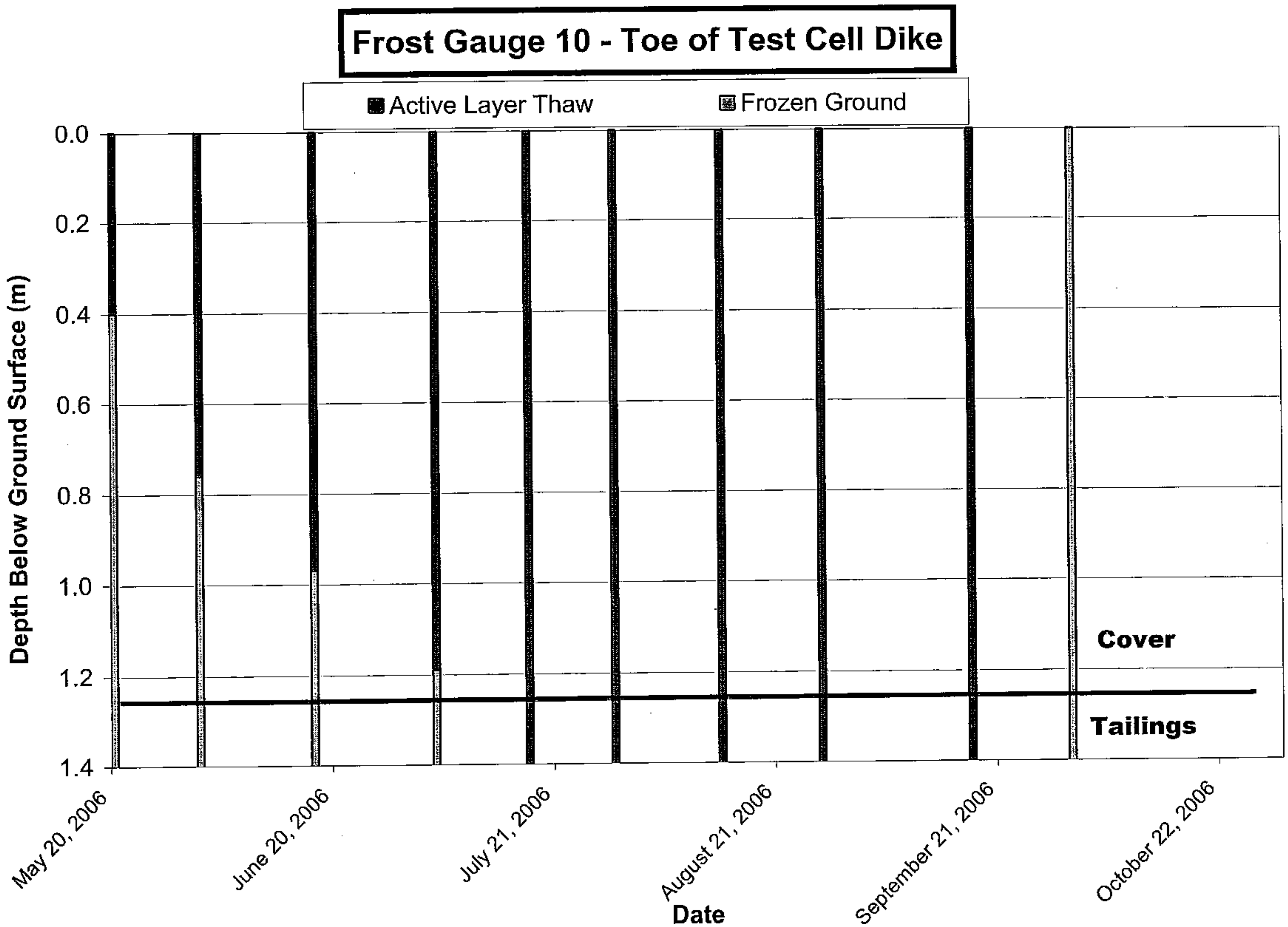
TOE OF TEST CELL DIKE


Geothermal Monitoring
Toe of Test Cell Dike
Thermistor BGC05-27
2005-2006 Data
08-Oct-05
10-Dec-05
02-May-06
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Temperature (°C)

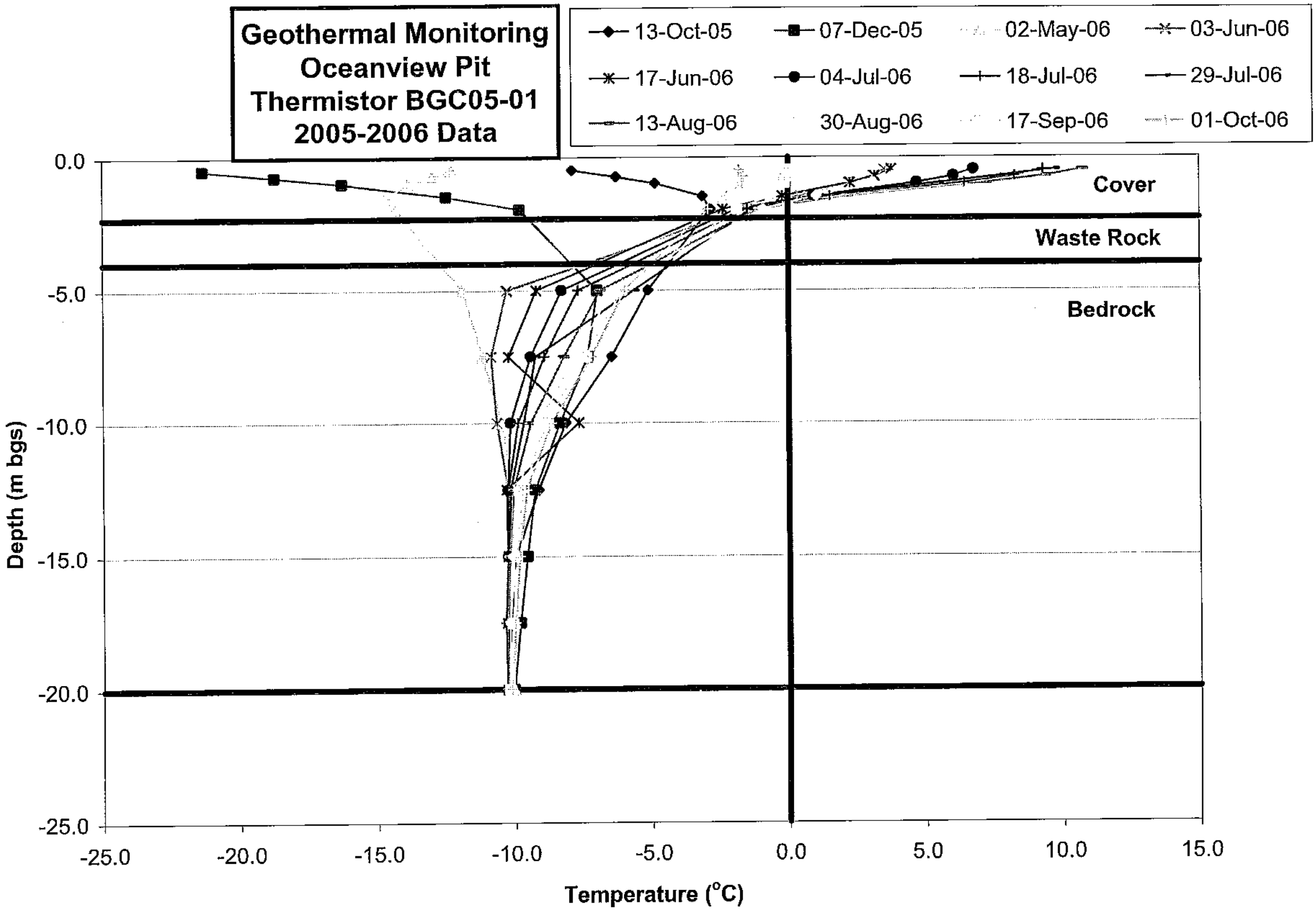

Geothermal Monitoring
Toe of Test Cell Dike
Thermistor BGC05-27
2006 Active Layer Monitoring
19-May-06
01-Jun-06
16-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
27-Aug-06
17-Sep-06
01-Oct-06
Cover
Tailings
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Temperature (°C)

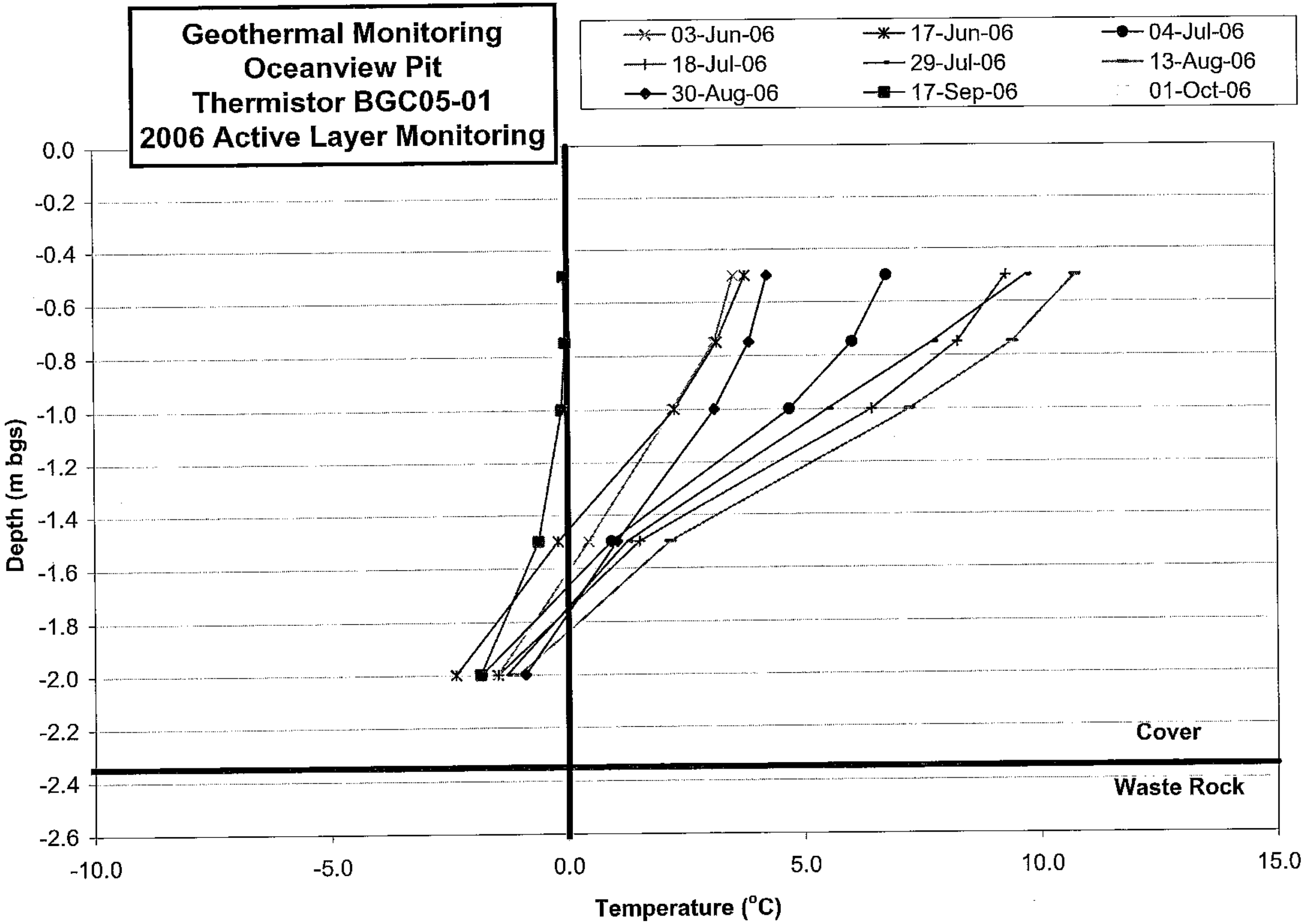

Piezometer Monitoring Results for BGC05-28
Piezometric Elevation (VW)
Ground Surface
VW Piezometer Tip
Thawed Surface - Top
Thawed Surface - Bottom
Bottom of Hole
Reservoir Water Level
Piezometric Elevation (m)
375
373
371
369
367
365
363
361
359
357
355
353
351
349
347
345
25-Sep-05
14-Nov-05
03-Jan-06
22-Feb-06
13-Apr-06
02-Jun-06
22-Jul-06
10-Sep-06
30-Oct-06
19-Dec-06
07-Feb-07
Date


Frost Gauge 9 - Toe of Test Cell Dike
Active Layer Thaw
Frozen Ground
Depth Below Ground Surface (m)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Cover
Tailings
May 20, 2006
June 20, 2006
July 21, 2006
August 21, 2006
September 21, 2006
October 22, 2006
Date

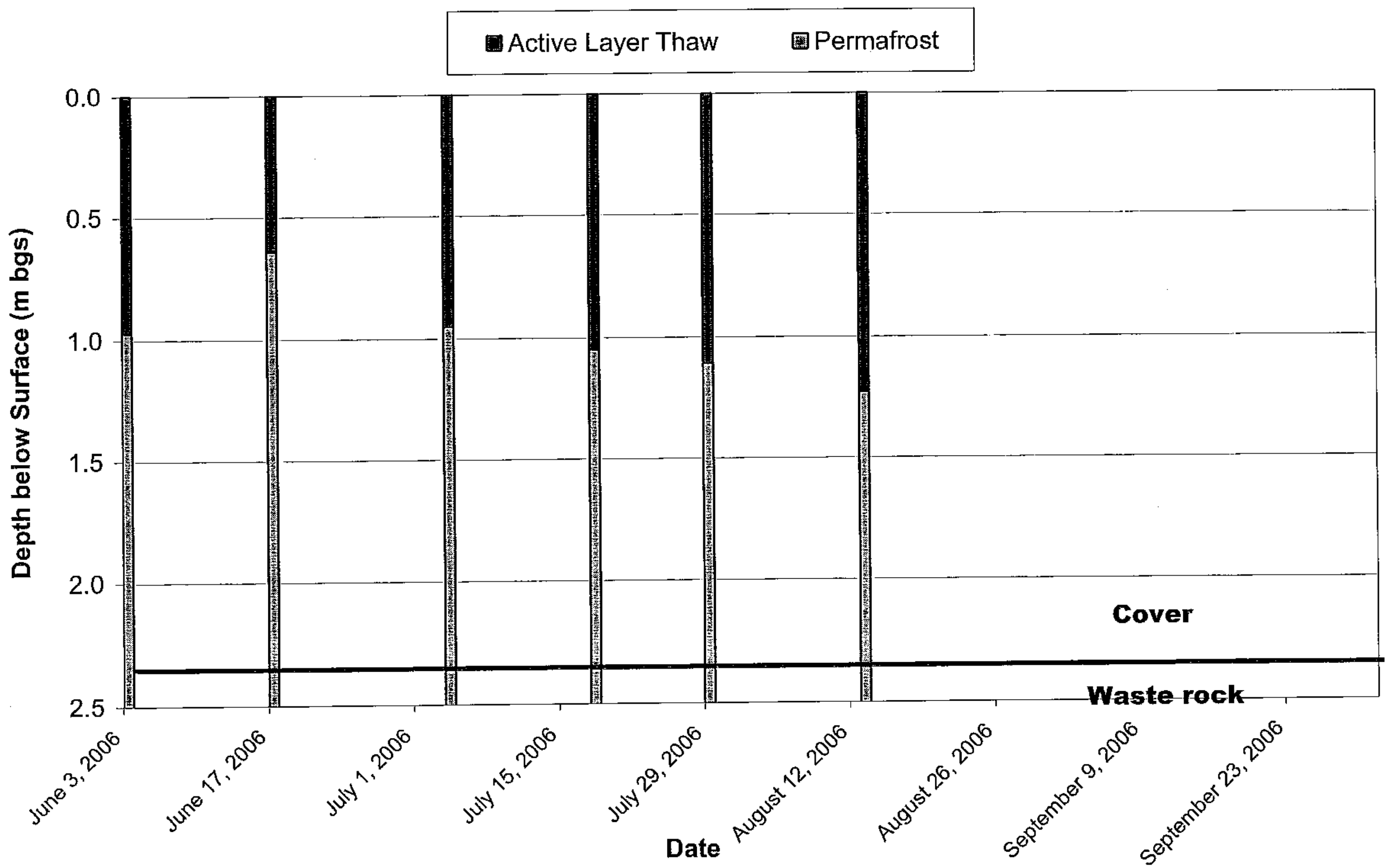

Frost Gauge 10 - Toe of Test Cell Dike
Active Layer Thaw
Frozen Ground
Depth Below Ground Surface (m)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Cover
Tailings
May 20, 2006
June 20, 2006
July 21, 2006
August 21, 2006
September 21, 2006
October 22, 2006
Date

OCEANVIEW OPEN PIT

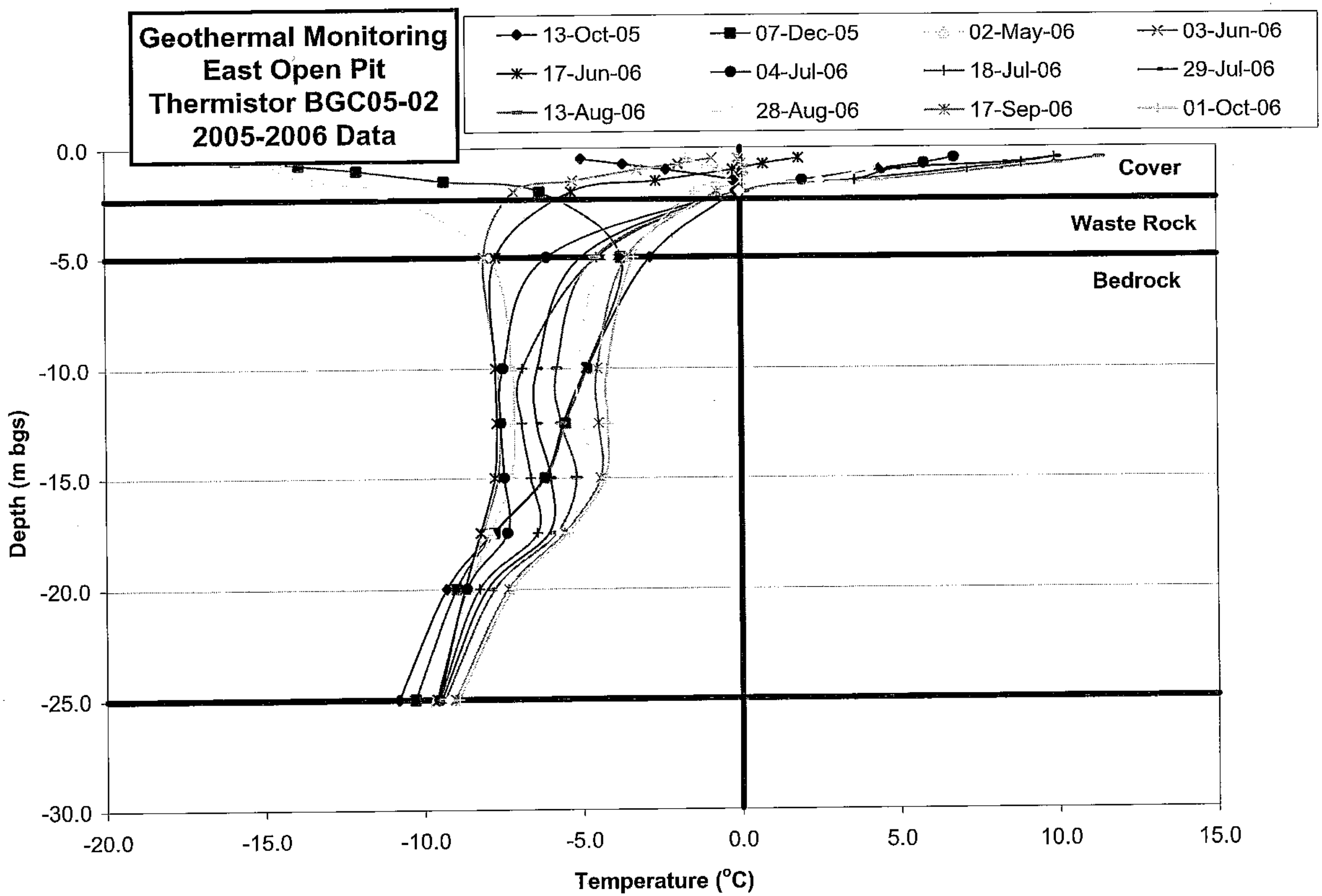

Geothermal Monitoring
Oceanview Pit
Thermistor BGC05-01
2005-2006 Data
13-Oct-05
07-Dec-05
02-May-06
03-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
30-Aug-06
17-Sep-06
01-Oct-06
Cover
Waste Rock
Bedrock
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Temperature (°C)

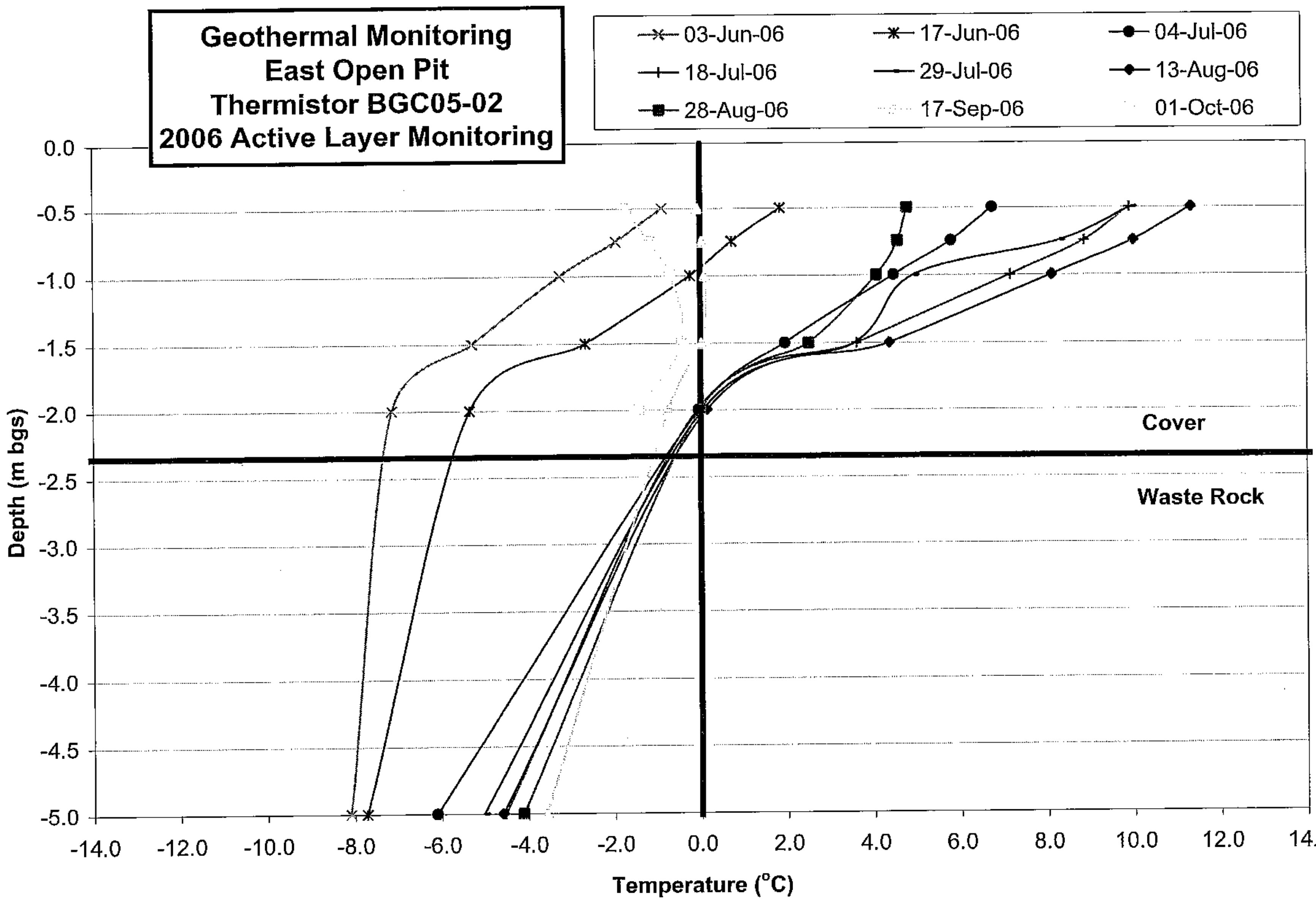

Geothermal Monitoring
Oceanview Pit
Thermistor BGC05-01
2006 Active Layer Monitoring
03-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
30-Aug-06
17-Sep-06
01-Oct-06
Depth (m bgs)
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
-2.2
-2.4
-2.6
Cover
Waste Rock
-10.0
-5.0
0.0
5.0
10.0
15.0
Temperature (°C)

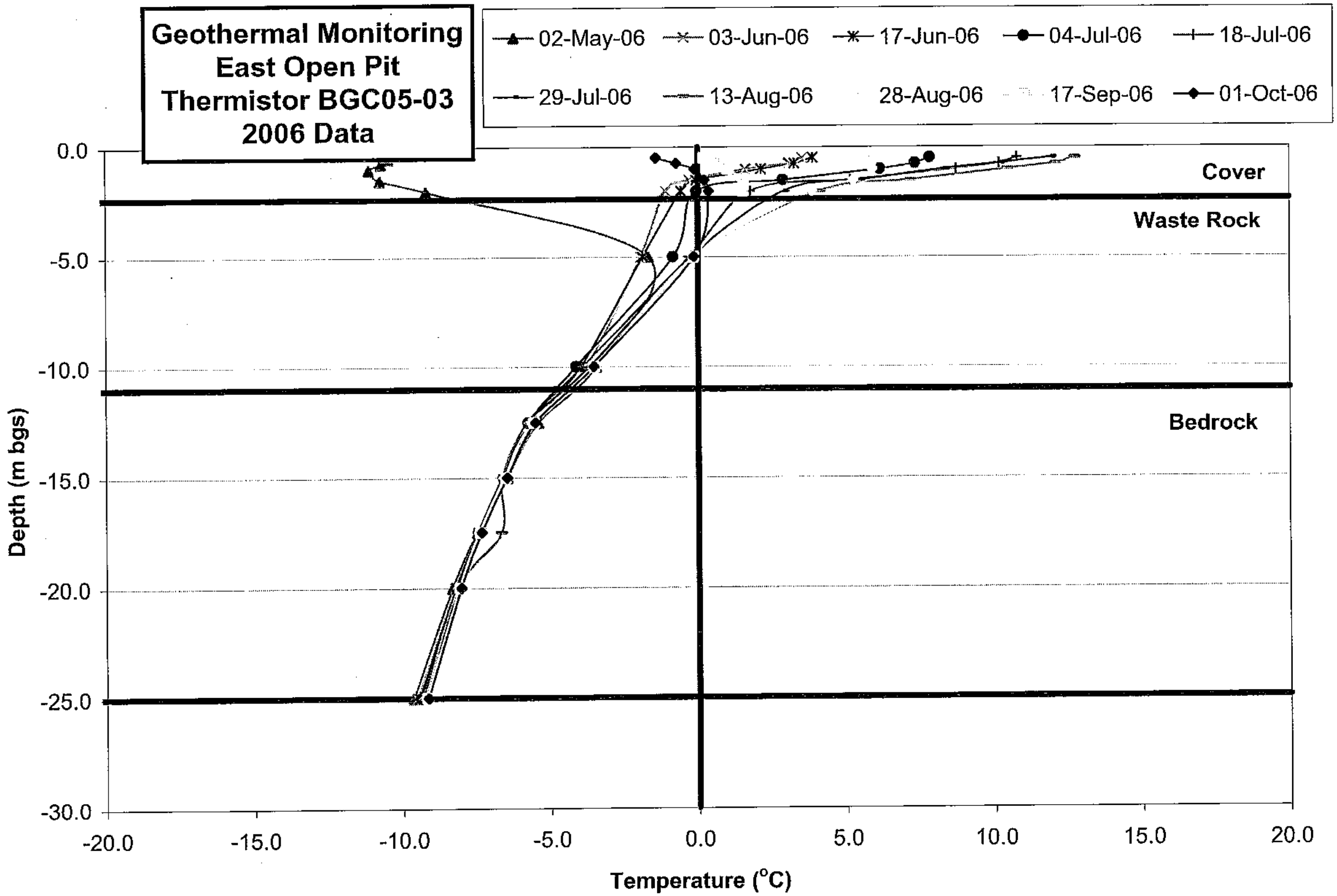
Frost Gauge 16 Oceanview Pit

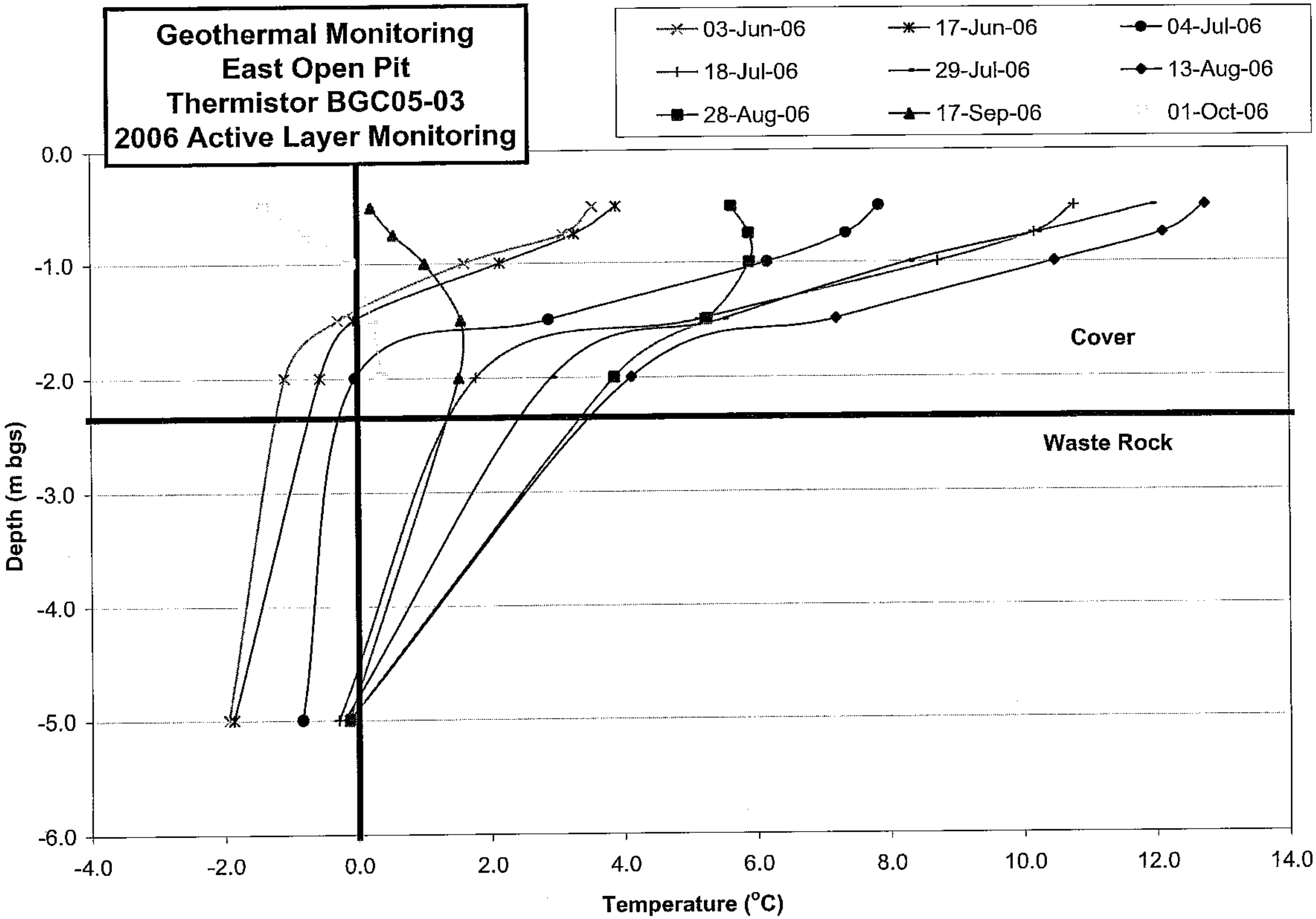


EAST OPEN PIT

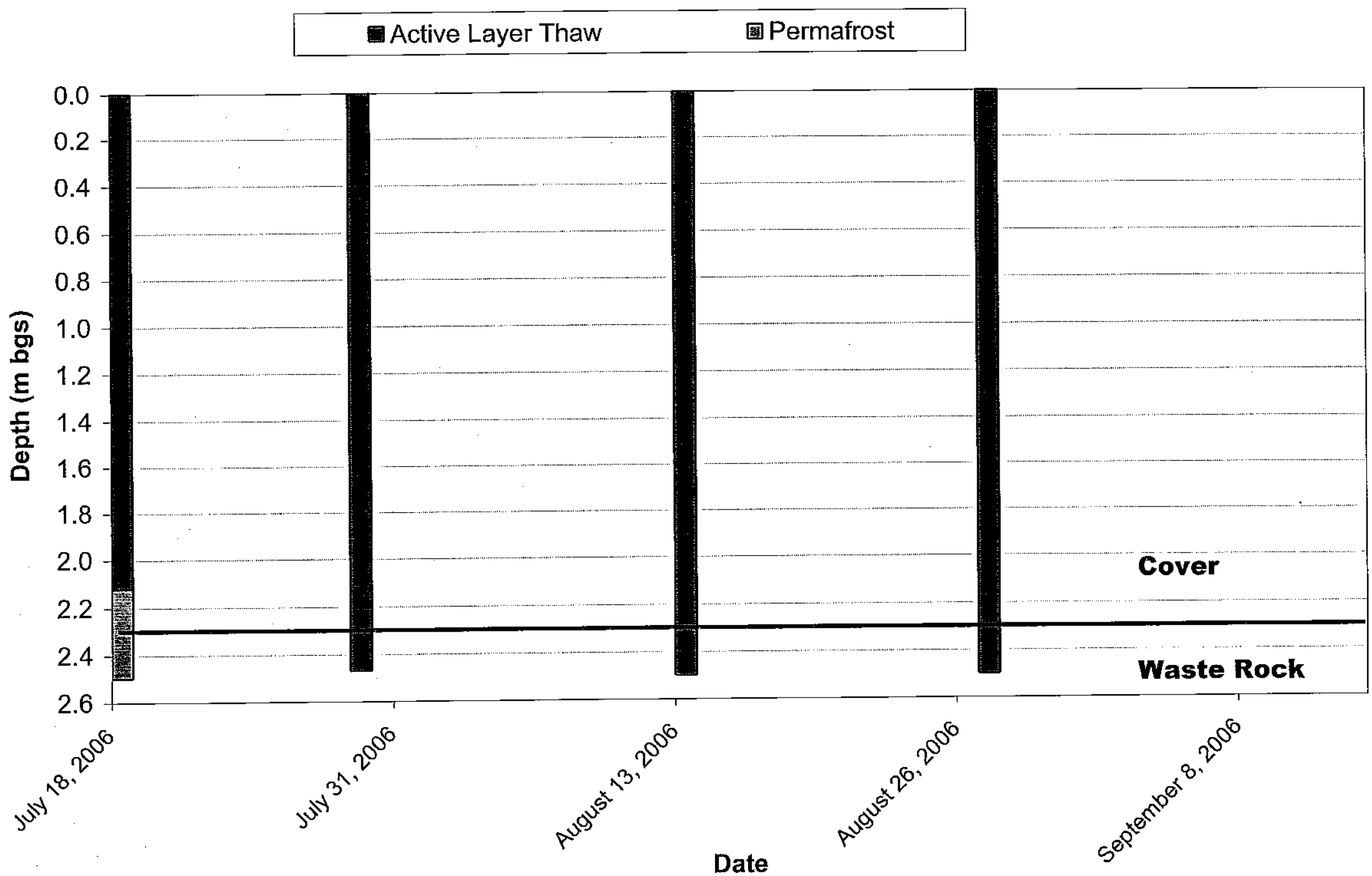

Geothermal Monitoring
East Open Pit
Thermistor BGC05-02
2005-2006 Data
13-Oct-05
07-Dec-05
02-May-06
03-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Waste Rock
Bedrock
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Temperature (°C)


Geothermal Monitoring
East Open Pit
Thermistor BGC05-02
2006 Active Layer Monitoring
03-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Depth (m bgs)
Temperature (°C)
Cover
Waste Rock
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0

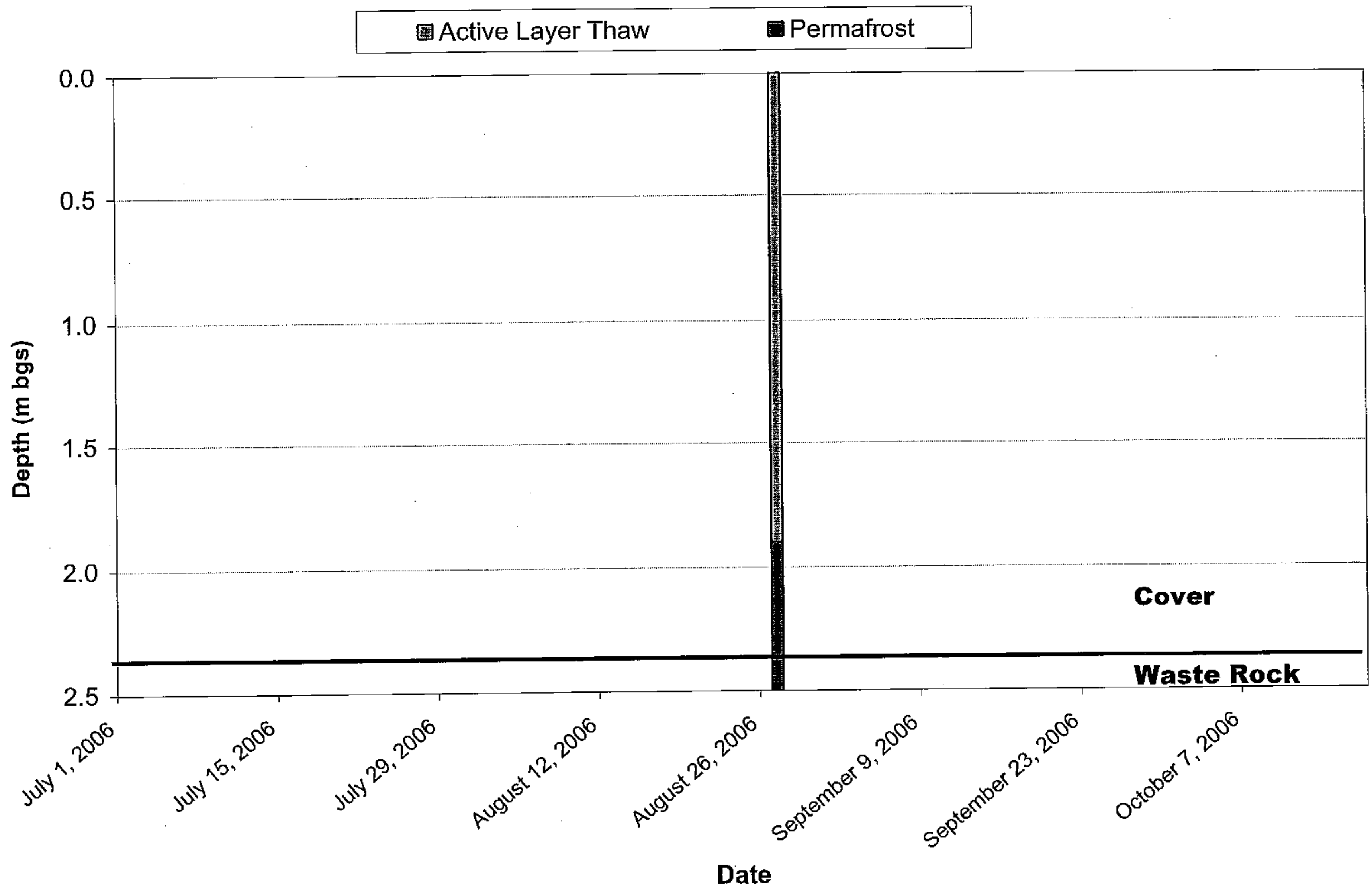

Geothermal Monitoring
East Open Pit
Thermistor BGC05-03
2006 Data
02-May-06
03-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Waste Rock
Bedrock
Depth (m bgs)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
Temperature (°C)


Geothermal Monitoring
East Open Pit
Thermistor BGC05-03
2006 Active Layer Monitoring
03-Jun-06
17-Jun-06
04-Jul-06
18-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Waste Rock
Depth (m bgs)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Temperature (°C)

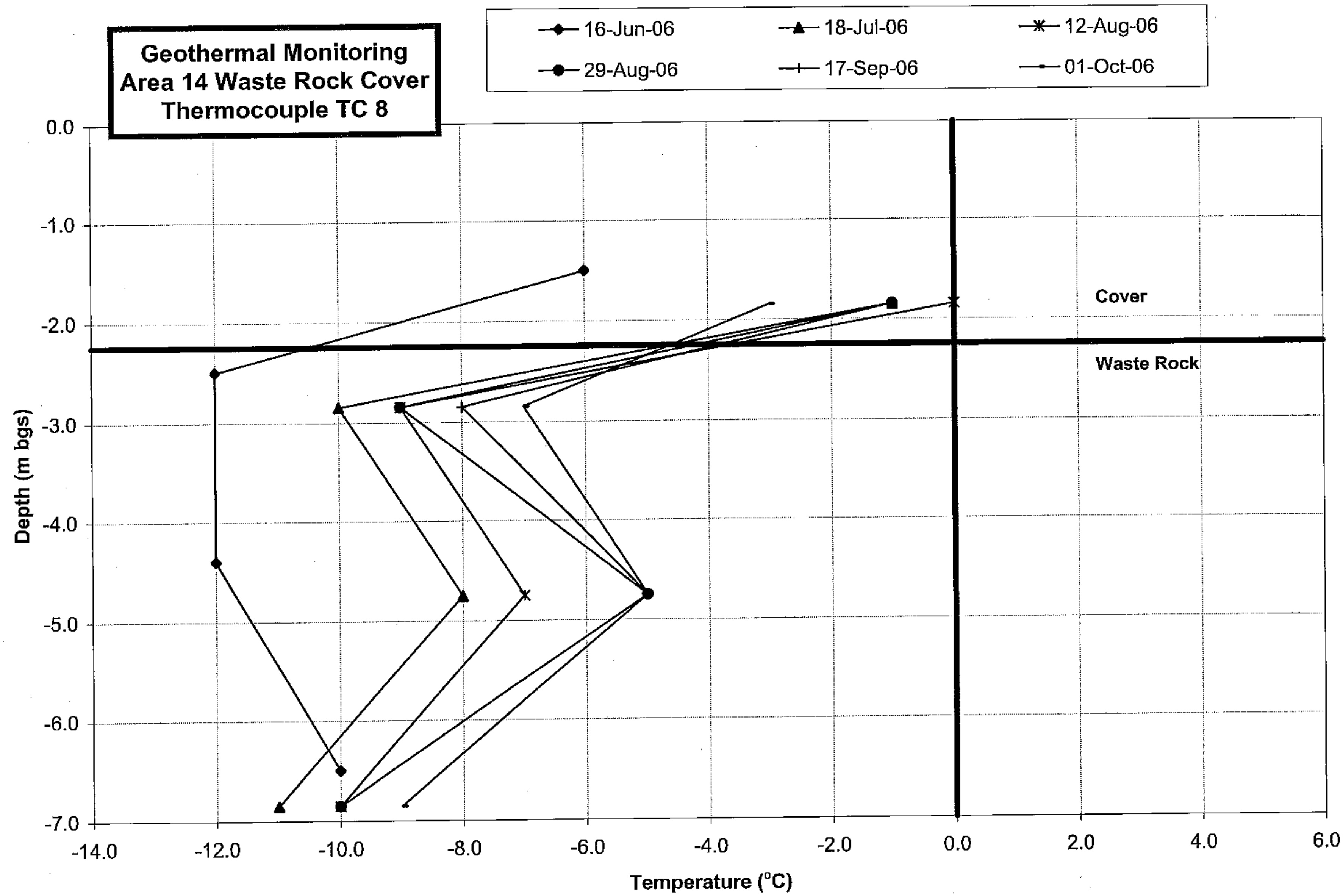
FG 13 East Open Pit



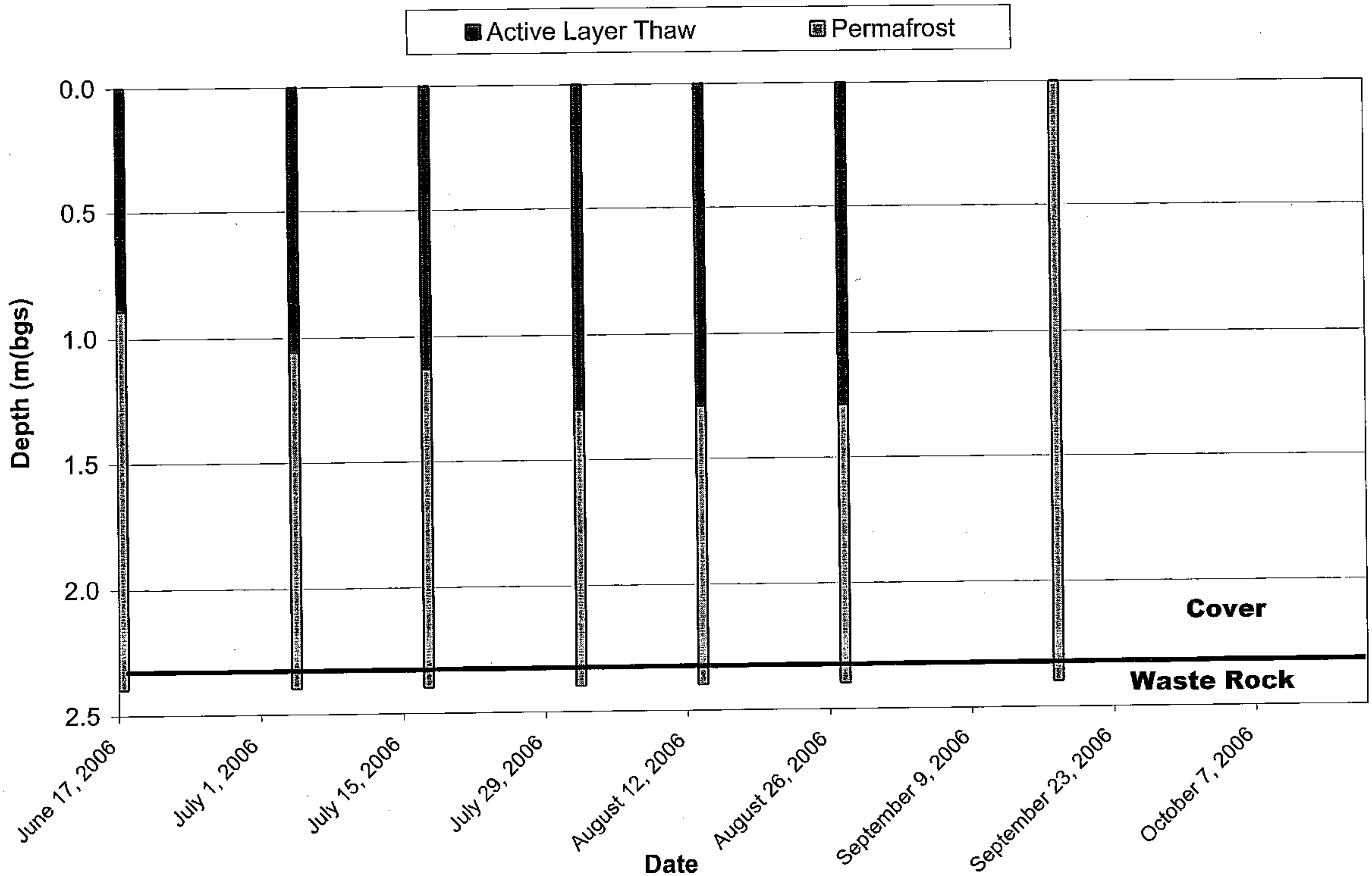
FG 14 East Open Pit



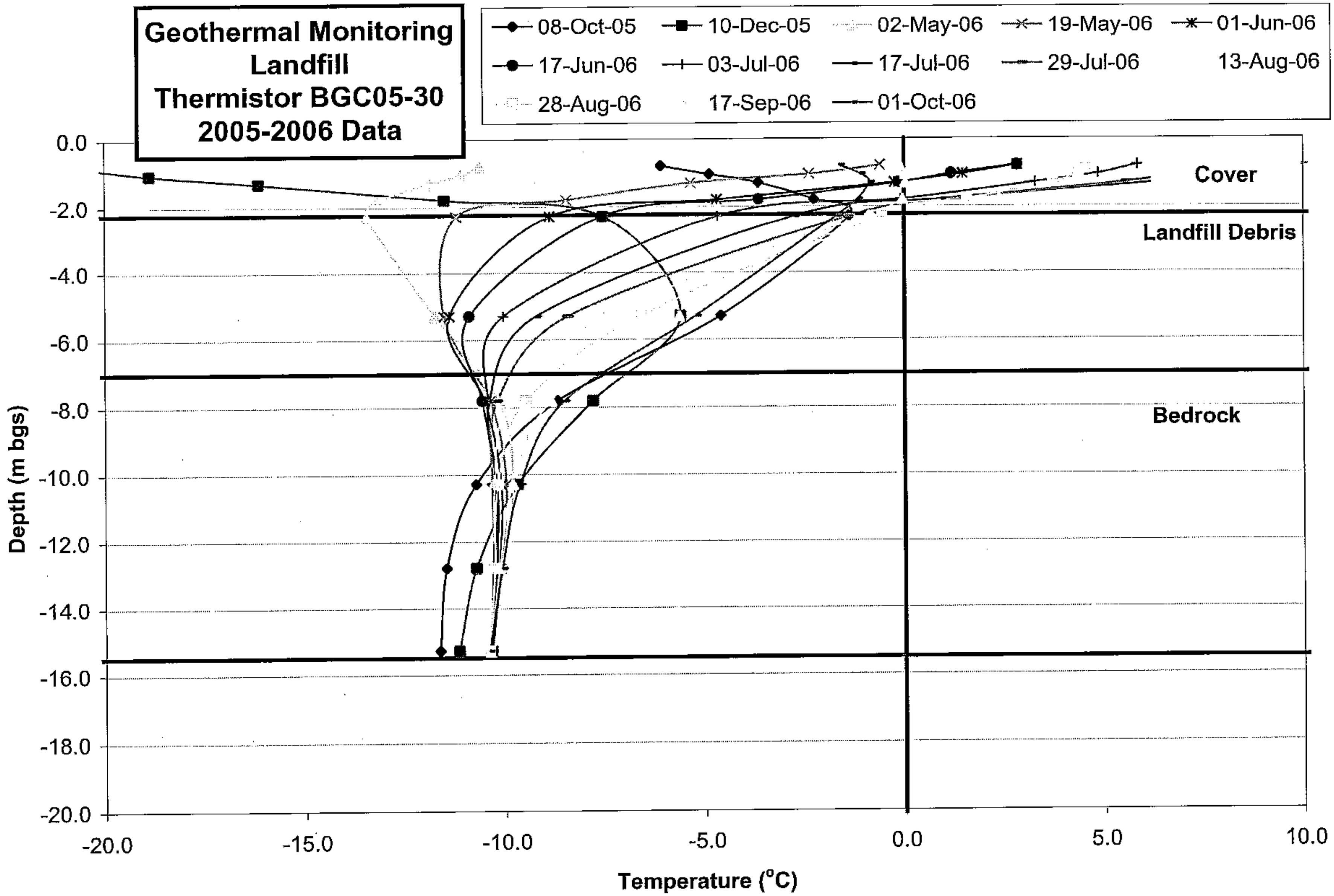
AREA 14

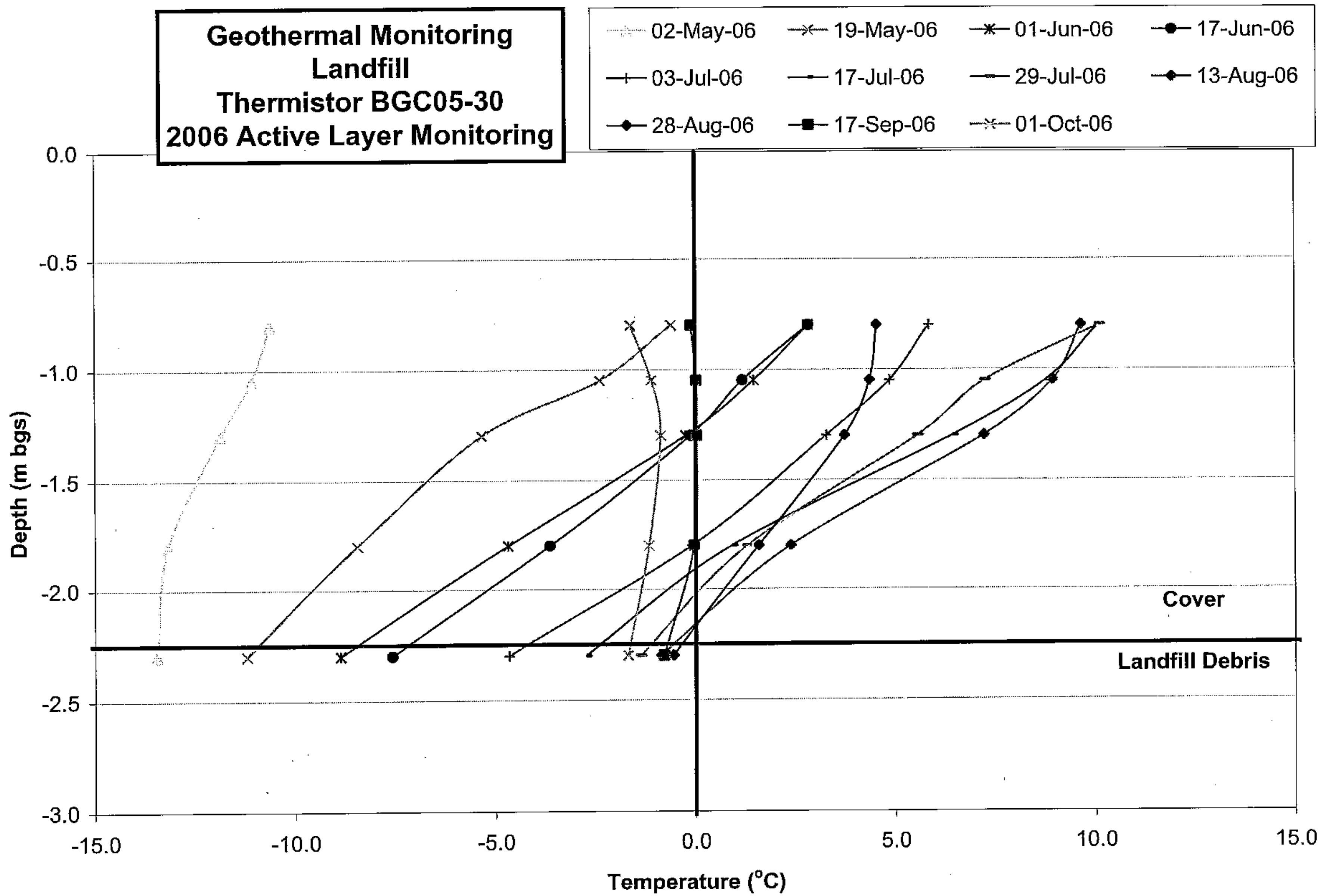

Geothermal Monitoring
Area 14 Waste Rock Cover
Thermocouple TC 8
16-Jun-06
18-Jul-06
12-Aug-06
29-Aug-06
17-Sep-06
01-Oct-06
Cover
Waste Rock
Depth (m bgs)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
Temperature (°C)

FG 15 Area 14

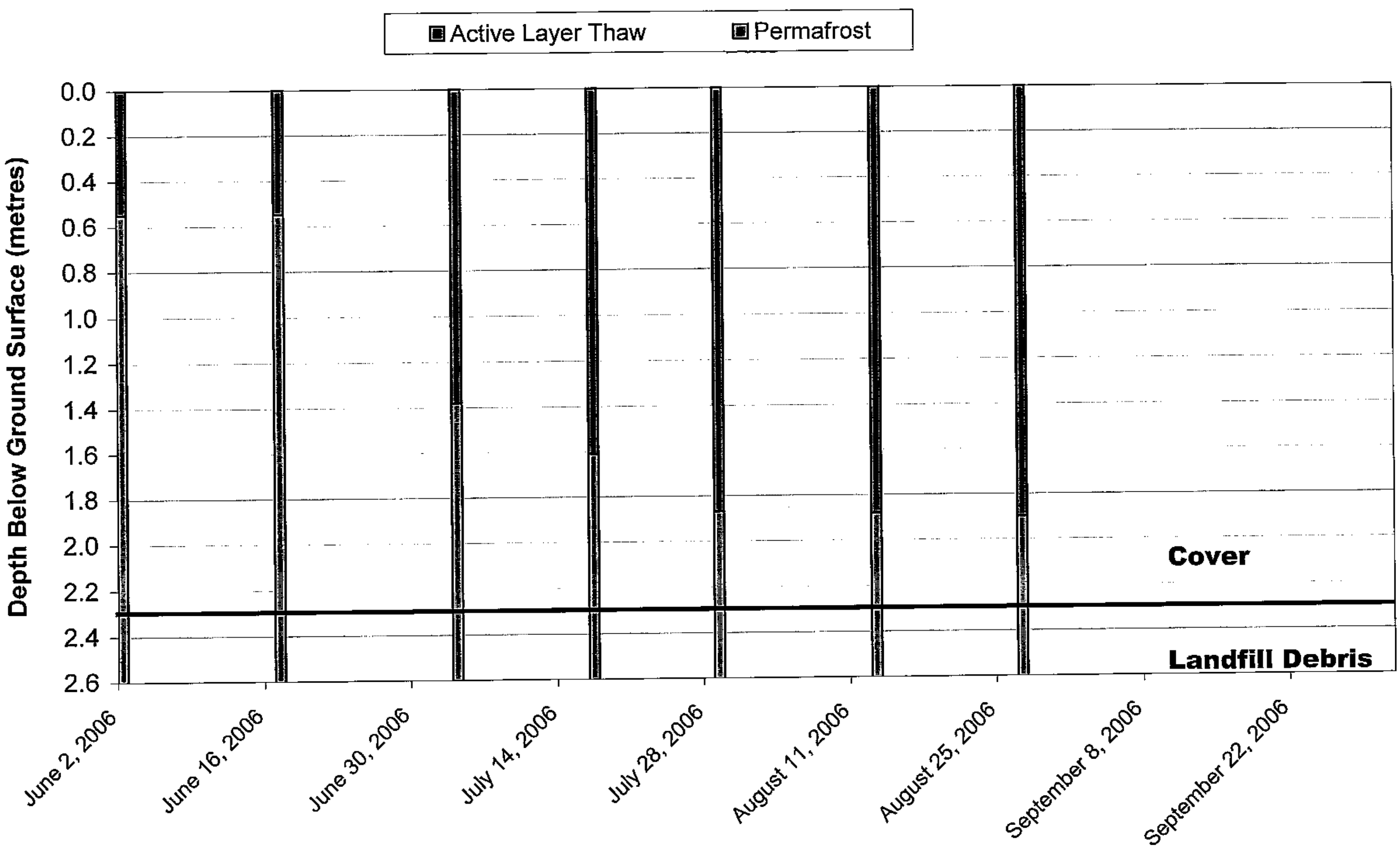

Active Layer Thaw
Permafrost
Depth (m(bgs)
0.0
0.5
1.0
1.5
2.0
2.5
Cover
Waste Rock
June 17, 2006
July 1, 2006
July 15, 2006
July 29, 2006
August 12, 2006
August 26, 2006
September 9, 2006
September 23, 2006
October 7, 2006
Date

LANDFILL


Geothermal Monitoring
Landfill
Thermistor BGC05-30
2005-2006 Data
08-Oct-05
10-Dec-05
02-May-06
19-May-06
01-Jun-06
17-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Cover
Landfill Debris
Bedrock
Depth (m bgs)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
-20.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
Temperature (°C)


Geothermal Monitoring
Landfill
Thermistor BGC05-30
2006 Active Layer Monitoring
02-May-06
19-May-06
01-Jun-06
17-Jun-06
03-Jul-06
17-Jul-06
29-Jul-06
13-Aug-06
28-Aug-06
17-Sep-06
01-Oct-06
Depth (m bgs)
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Temperature (°C)
Cover
Landfill Debris

Frost Gauge Landfill



UPPER DUMP POND

Frost Gauge 17 - Upper Dump Pond