

APPENDIX 1

INSPECTION MEMO OF SEPTEMBER 11, 2003



BGC ENGINEERING INC.

AN APPLIED EARTH SCIENCES COMPANY

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PROJECT MEMORANDUM

To:	Nanisivik Mine, a Div. of CanZinco Ltd.	Fax No.:	n/a
Attention:	Mr. Murray Markle, Site Manager	CC:	
From:	Mr. Gerry Ferris, P.Eng.	Date:	September 11, 2003
Subject:	Inspection Visit relative to Waste Containment Dikes and Berms Summary of Site Observations and Commentary		
No. of Pages (including this page):	4 Pages	Project No:	0255-008-05

Mr. Gerry Ferris, of BGC Engineering Inc. (BGC), inspected the various waste containment dikes and berms at Nanisivik Mine on portions of the following three days; Saturday, August 30, Sunday, August 31 and Monday, September 1, 2003. Two significant events occurred between this and the last annual inspection visit of July 2002; the closure of the mine in September 2002 and a large rainstorm event in August 2003.

Briefly, the majority of the issues and comments provided below are of a minor nature. The three more significant issues are related to the West Twin Lake outflow structure, the water levels at the East Adit Catchment pond and issues related to the talik in the surface cell. The following memo provides a summary of the observations, along with recommended maintenance items and monitoring items for these structures.

West Twin Lake Dike

1. Three transverse cracks noted on the 386 and 384 lifts in the area where the bench crests are still visible (close to the decant pipes). A small sinkhole was noted in the surface of the dike above the location of these cracks. The cracks and sinkhole should be graded over to prevent further infiltration by surface water and the area visually monitored for any additional settlement.
2. A small erosional gully (noted in previous annual inspections) exists at the toe of the dike, directly at the first contact (south side) with the Reservoir pond. The gully should be backfilled with riprap material to prevent further erosion.
3. Only one transverse crack was noted on the downstream edge of the dike crest at the north abutment corner (into the north abutment "dogleg"). This area appears to have been graded since the previous inspection, and the cracks encountered previously did not re-appear. This area should be visually monitored for signs of settlement or the cracks re-appearing.

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4. The crest should be graded to prevent the ponding of any water on the surface. This is especially relevant to areas of the crest near the decant pipes.
5. Based on drilling investigations and instrument monitoring a talik has been shown to exist within the tailings. The talik is larger near the former location of the deep pond, but it exists extensively throughout the surface cell at depth. With respect to the talik, two main options are available for the coming winter season: 1. maintain a minimum pond depth of 3 m in the surface cell, or 2. complete removal of the pond on the surface cell, monitoring of the pressures in the talik with the provisions for pressure relief if they become excessive. These options both relate to the draining of the pressures generated within the freezing talik, with the first option it is thought that with the maintenance of the pond the water will have an outlet to relieve generated pressures, and in the second option provisions should be made to drain pressures if they rise to excessive levels. Further details will be developed for the contingency for draining pressures, if that option is undertaken.

Test Cell Dike

6. Two small sinkholes noted in the crest; both of these should be graded over to prevent water ingress. Monitor for any additional settlement.
7. Crest edge cracking is occurring on the both the internal and the external faces of the dike. The cracks are of a very minor nature on the majority of the structure, but are more significant within the newer fill placed to connect the two arms of the test cell dike. These cracks have no real significance for overall dike stability, but the new fill section of the dike should be graded to prevent inflow of water into the dike and worsen the situation.

West Twin Lake Polishing Pond

8. It appears that seepage has occurred around the left abutment of the polishing pond dam. This appears to be related both to the lack of erosion protection at this abutment and the soil material used to construct/repair this area of the dike. This section of the dike should be repaired and erosion protection (rip rap) added at this location.

East Twin Diversion Dike and Channel

9. Some significant erosion of the upstream side of the diversion dike (that transitions into the diversion channel) has occurred. As a result, some significant cracking is occurring on the upstream edge. The sloughed area needs to be removed and the upstream slope backfilled to prevent further the sloughing and limit erosion. Following that, some riprap needs to be placed to prevent any further erosion.

Upper Dump Pond Berm

10. No maintenance required at the current time.

Mill (Lower) Dump Pond Berm

11. The large storm event that occurred in the summer of 2003 caused extensive erosion in sections of Twin Lake Creek, this area adjacent to the creek is no exception. The road heading to this dump pond has been eroded away, making the road inaccessible. Additionally, one corner of the berm surrounding the dump pond has been eroded, and given time will induce failure of this corner of the liner. Since the mine is no longer in operation, no tailings discharge into this pond will occur and the stability of the dike is not of major significance. A small amount of tailings is currently located within the pond. If the tailings in the pond are removed, then no maintenance is required. If the tailings are

not removed, the corner of the berm should be repaired. The repair should consist of replacement of the soil that was eroded, and placement to rip rap to limit further erosion.

Main Tank Farm Berm

12. An as-built survey of the (2001/2002) berm addition should be undertaken and combined with previous survey of the berms.
13. The liner is exposed in several locations and should be covered to prevent further damage from occurring (ensure any cuts in the liner are repaired before backfilling).

Day Tank Farm Berm

14. The liner is exposed in several locations and should be covered to prevent further damage from occurring (ensure any cuts in the liner are repaired before backfilling).

East Adit Catchment Pond Dike

15. Some sloughing and cracking of portions of both the upstream and downstream sides of the dike is occurring. This slough sections should be repaired.
16. New high water level marks are in evidence at this pond, water was flowing through the two "spillway" metal pipes.
17. Evidence of two main erosion areas was noted. The first is a 5 to 6 m wide zone on the crest of the dike at the north abutment, and the second is at the dike toe located at the highest section of the dike.
18. Based on discussion with site staff the water level was high enough that it flowed over the surface of the dike near the north abutment, causing the erosion currently visible. Fill has been placed on the crest and downstream side of the dike in this area. The water levels in this pond should be managed to ensure that overtopping does not occur in the future, as overtopping would typically lead to a breach forming through the dike. Alternatively, larger spillway pipes could be installed at this dike to ensure that overtopping does not occur.
19. Erosion below the maximum section of the dike appears to have multiple sources, all located approximately at the downstream toe of the dike. These multiple sources for water all join together downstream and had enough water flow to form about a 2 m wide, 250 mm deep channel. This is indicative of seepage through the dike, likely due to overtopping of the core of the dike. The pond should be maintained at a low level (similar to that seen in the annual inspection) or install proper water conveyance method to ensure that the pond level does not rise to these high levels. Water control could be either a new spillway or a decant system.

East Adit Retention Pond Dike

20. Extensive cracking and sloughing of the downstream slope has occurred. The downstream slope needs to be repaired.
21. Numerous panels (and some of the joints) of geocomposite liner (GCL) on the upstream slope have been displaced, possibly due to wind. Gaps are evident showing exposed soil between the panels of the GCL. These panels need to be re-installed properly, including powdered bentonite on the joints and some soil cover to prevent movement again.
22. It appears that the high water mark is higher than the highest edge of the liner. Ensure that any liner placed is high enough and that it is covered with material to ensure tight overlapping joints.

Any recommended work should be undertaken before constant freezing temperatures resume at site.

A number of instruments have been installed by mine staff and BGC engineering staff at various locations at the mine. The data is currently being collected by site staff and forwarded to BGC for plotting and interpretation. A new monitoring schedule is under preparation for the winter season and will be forwarded to the mine staff shortly.

Please contact the undersigned should you have any comments or questions.

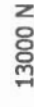
Respectfully submitted,
BGC ENGINEERING INC.

Gerry Ferris, M.Sc., P.Eng.
Geotechnical Engineer

APPENDIX 2

SUMMARY OF WEST TWIN DIKE AND TEST CELL DIKES MONITORING DATA

1. RESERVOIR AND TEST CELL BATHYMETRY DERIVED FROM DRAWING 2000 BATHYMETRICS V14.DWG SUPPLIED BY NML (ASSUMED TO REPRESENT BATHYMETRY OF SURFACE CELL IN 2000).
2. SURFACE CELL BATHYMETRY DERIVED FROM DRAWING WTDA V14.DWG (ASSUMED TO REPRESENT 2000 BATHYMETRY)
3. BOREHOLE LOCATIONS ARE APPROXIMATE.



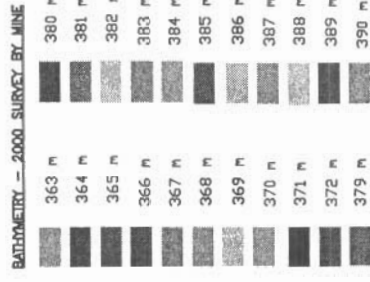
Scale = 1:5,000

○	2002/2003 BOC BOREHOLE (MONITORING WELL)
●	2002/2003 BOC BOREHOLE (THERMOCOUPLE INSTALLED)
⊕	2002/2003 BOC BOREHOLE (THERMISTOR INSTALLED)
●	2002/2003 BOC BOREHOLE (NO INSTALLATION)
⊕	2002/2003 BOC TEST PIT
⊕	2002 MINE STAFF BOREHOLE

ORIGINAL LAKE OUTLINE
(APPROXIMATE)

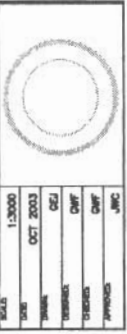
● SYMBOL DENOTES
THERMOCOUPLE LOCATION

● SYMBOL DENOTES
FROST GAUGE LOCATION



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A Division of CANZINGO LTD.

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[illegible]

PROJECT	2003 GEOTECHNICAL INSPECTIONS		
TITLE	WTDA BOREHOLES AND THERMAL INSTRUMENTS		
PROJECT No.	0225-006-05	DWG. No.	FIGURE A1
		REV.	0

BGC **BGC ENGINEERING INC.**
AN APPLIED EARTH SCIENCES COMPANY
Calgary, AB Phone: (403) 240 5185

Table A2-1: Summary of Thermocouple/Thermistor Readings in West Twin and Test Cell Dikes

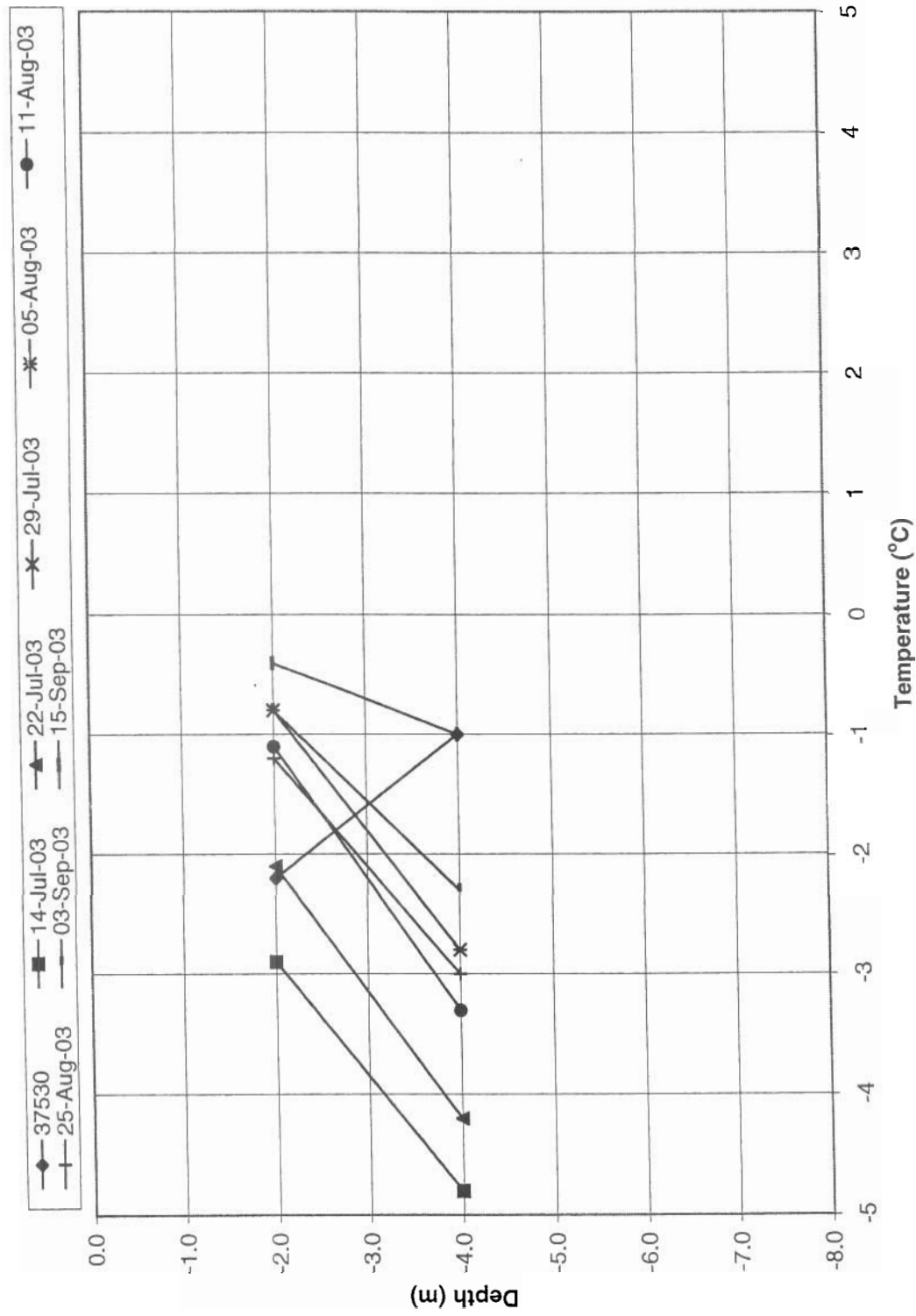
Instrument	Instrument type	Location	Station	Surface Elevation	Location of thawed ground (>-1°C) below active layer	Additional comments
1	T/C	Dike face	00+75	376 m	N/A	No warming trend. 9 readings in 2003.
2	T/C	Dike face	3+25	376 m	N/A	Warming below 14 m, but not warm enough to indicate thawed conditions. 4 readings in 2003.
12	T/C	Dike face	1+30	376 m	N/A	No warming trends. 15 readings in 2003.
13A	T/C	Dike face	1+15	376 m	N/A	No warming trends. 15 readings in 2003.
14	T/C	Dike face	2+25	376 m	N/A	No warming trends. 12 readings in 2003.
15	T/C	Dike face	2+88	376 m	N/A	No warming trends. 7 readings in 2003.
15A	T/C	Dike face	3+00	377 m	N/A	No warming trends. 6 readings in 2003.
16	T/C	Dike face	3+75	376 m	9 to 11 m	Measured temperature at 10 m depth rises to -1°C, other depths exhibit warming, but not to this high of temperature. 12 readings in 2003.
17	T/C	Dike face	4+25	376 m	N/A	Potential warming trend at a depth of 6 m. 4 readings in 2003.
17A	T/C	Dike face	4+50	376 m	N/A	No warming trends. 7 readings in 2003.
18	T/C	Dike face	4+75	376 m	N/A	No warming trends. 7 readings in 2003.
28	T/C	Dike face	2+25	384 m	N/A	No warming trends. 15 readings in 2003.
29	T/C	Dike face	4+50	385 m	N/A	No warming trends. 15 readings in 2003.
31	T/C	Dike face	1+50	378 m	N/A	No warming trends. 15 readings in 2003.
32	T/C	Dike face	1+50	382 m	N/A	Potential thawed zone at a depth of 16 m, within the bedrock. 17 readings in 2003.
33	T/C	Dike face	1+50	386 m	13 to 16 m.	Thawed conditions below a depth of 13 m. 17 readings in 2003.
34	T/C	Dike face	4+75	385 m	N/A	No warming trends. 15 readings in 2003.
35	T/C	Dike Crest	00+75	388 m	10 to 16 m.	Thawed conditions below a depth of 10 m. 8 readings in 2003.
BGC02-08	T/C	Dike Toe		373 m	N/A	No warming trends, 8 readings in 2003
BGC02-10	T/C	Dike Toe		373 m	N/A	No warming trends, 15 readings in 2003
BGC02-11	T/C	SC		387 m	10 to 25 m	Thawed conditions below 10 m to the end of the hole. 19 readings in 2003
BGC02-13	T/C	SC		387 m	10 to 30 m	Thawed conditions below 10 m to the end of the hole. 21 readings in 2003
BGC03-07	TM	SC		387 m	18 to 25 m	Thawed conditions below 18 m to the end of the hole. 17 readings in 2003
BGC03-09	TM	SC		387 m	13 to 25 m	Thawed conditions below 13 m to the end of the hole. 15 readings in 2004

Nanisivik Mine - Annual Geotechnical Inspection of Dikes
Nanisivik Mine, a division of Canzinc

BGC03-15	TM	SC		387 m	14 to 17 m	Thawed conditions between 13 and 17 m depth (temperature on the boundary of thawed/frozen). 13 readings in 2003.
BGC03-18	T/C	Dike Toe		374 m	N/A	No warming trends. 7 readings in 2003.
BGC03-19	TM	Dike Toe		374 m	N/A	No warming trends. 15 readings in 2003.
BGC03-33	TM	Dike Crest		388 m	18 to 23 m	Thawed conditions below 18 m to the end of the hole. 1 reading in 2003.
BGC03-34	TM	Dike Crest		388 m	N/A	BGC03-33 and BGC03-33 are adjacent to one another, measuring upper and lower zones, treat as one installation.
36	T/C	Test Cell		376 m	5 to 10 m	Thawed zone below a depth of 5 m to the end of the hole. 14 readings in 2003.
BGC02-09	TM	Test Cell		377 m	15 to 22 m	Thawed conditions below 15 m to the end of the hole. 20 readings in 2003.
BGC03-22	TM	Test Cell		378 m	13 to 27 m	Thawed conditions below 13 m to the end of the hole. 16 readings in 2003.

SC - Surface Cell
T/C - Thermocouple
TM - Thermistor
MW - Monitoring Well

Geothermal Monitoring
South Toe of Dike
Thermocouple BGC02-08

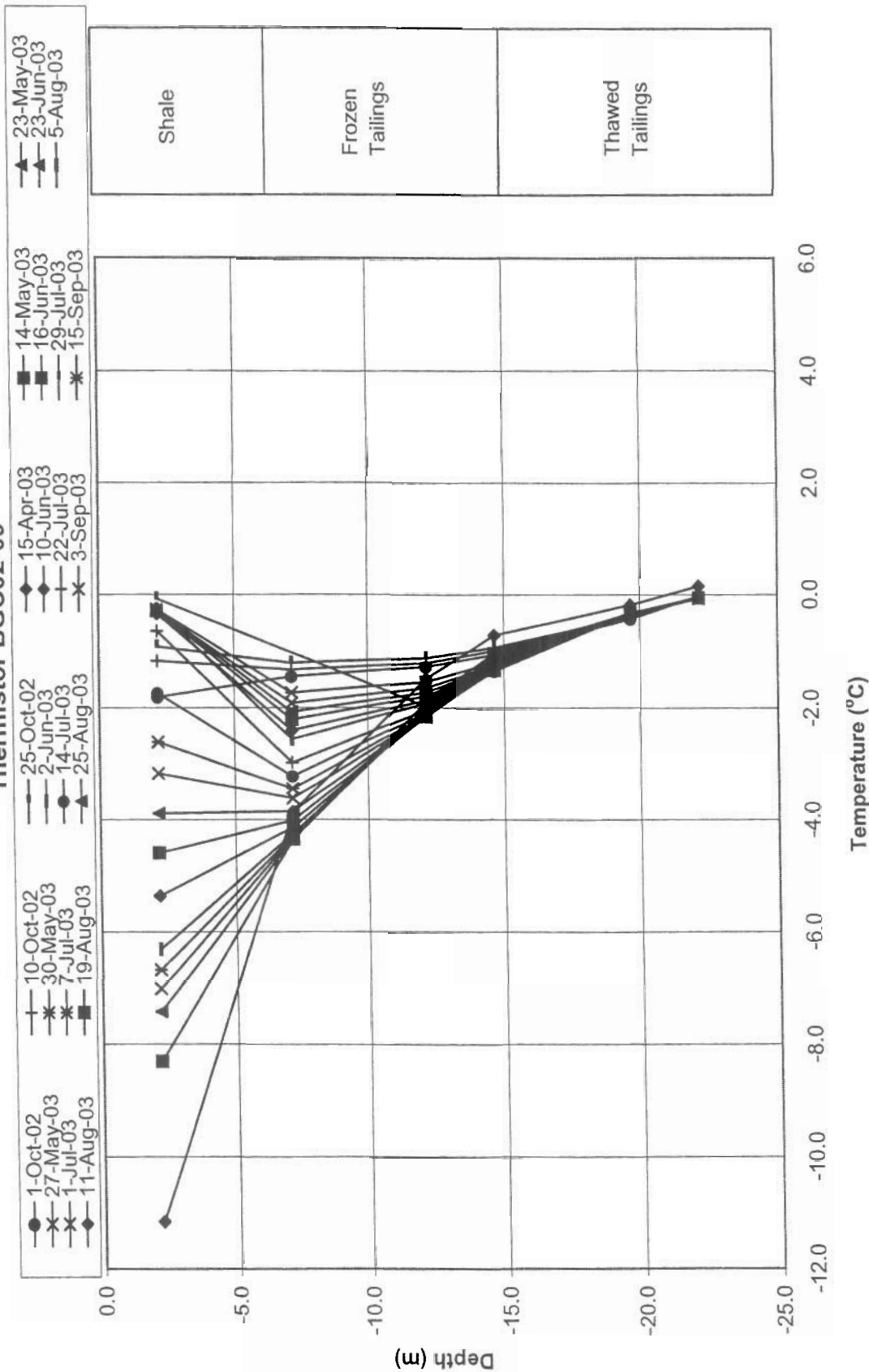


Talings Frozen Well Bonded
Lake Bed Sediments and Frost Shattered Bedrock
Bedrock

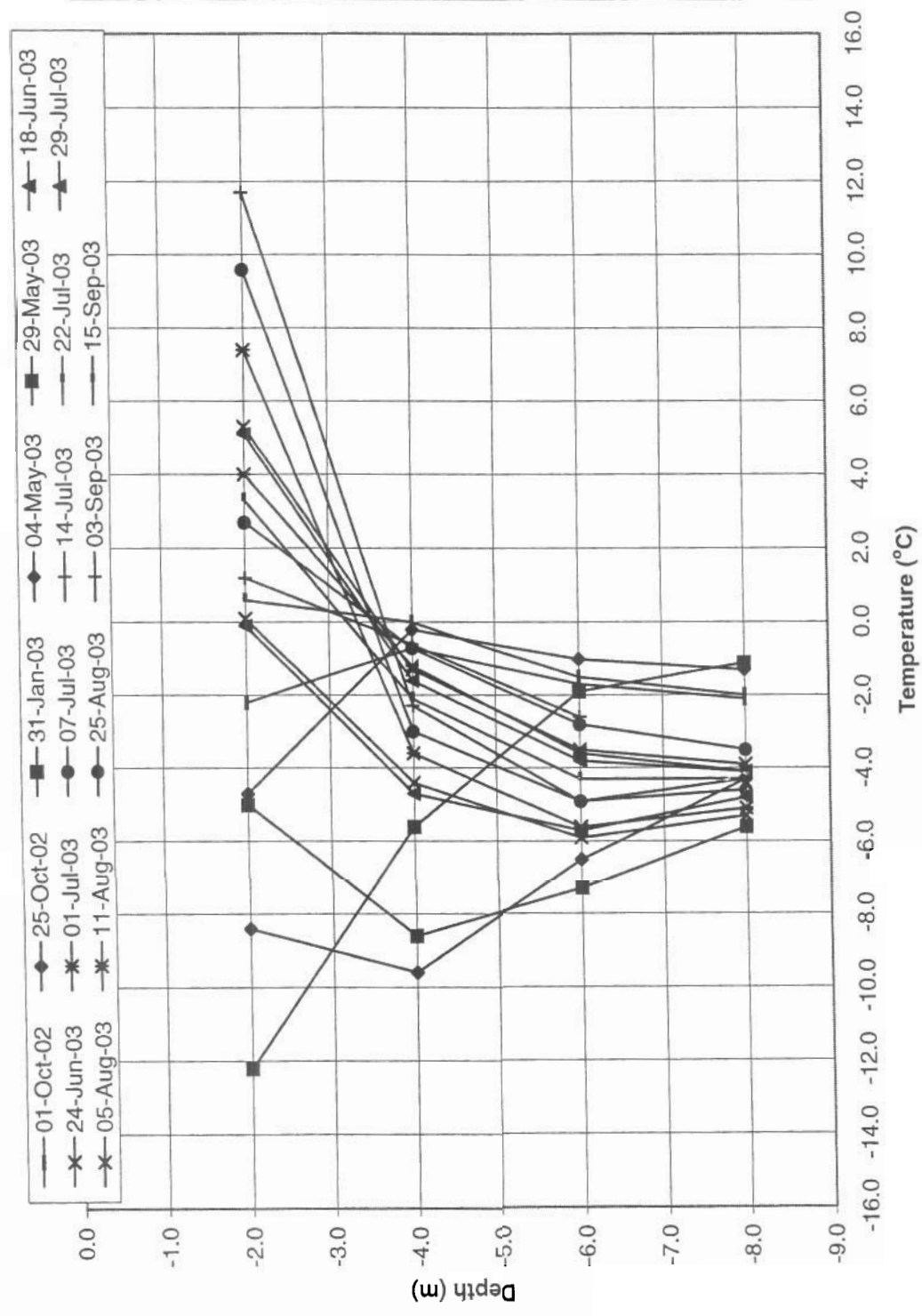
Geothermal Monitoring

Test Cell Dike

Thermistor BGC02-09



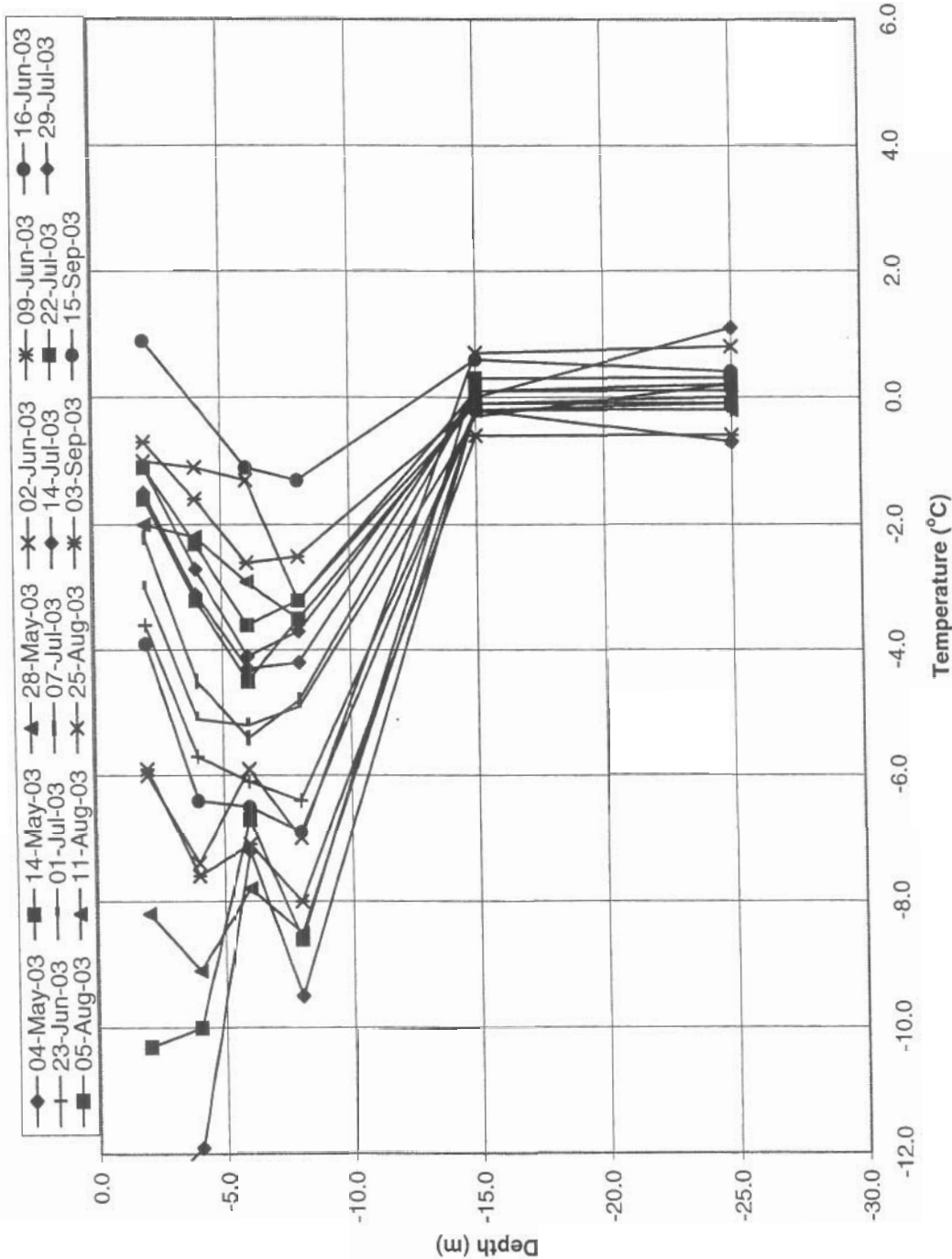
Geothermal Monitoring
Toe of WTD
Thermocouple BGC02-10



Geothermal Monitoring

Surface Cell

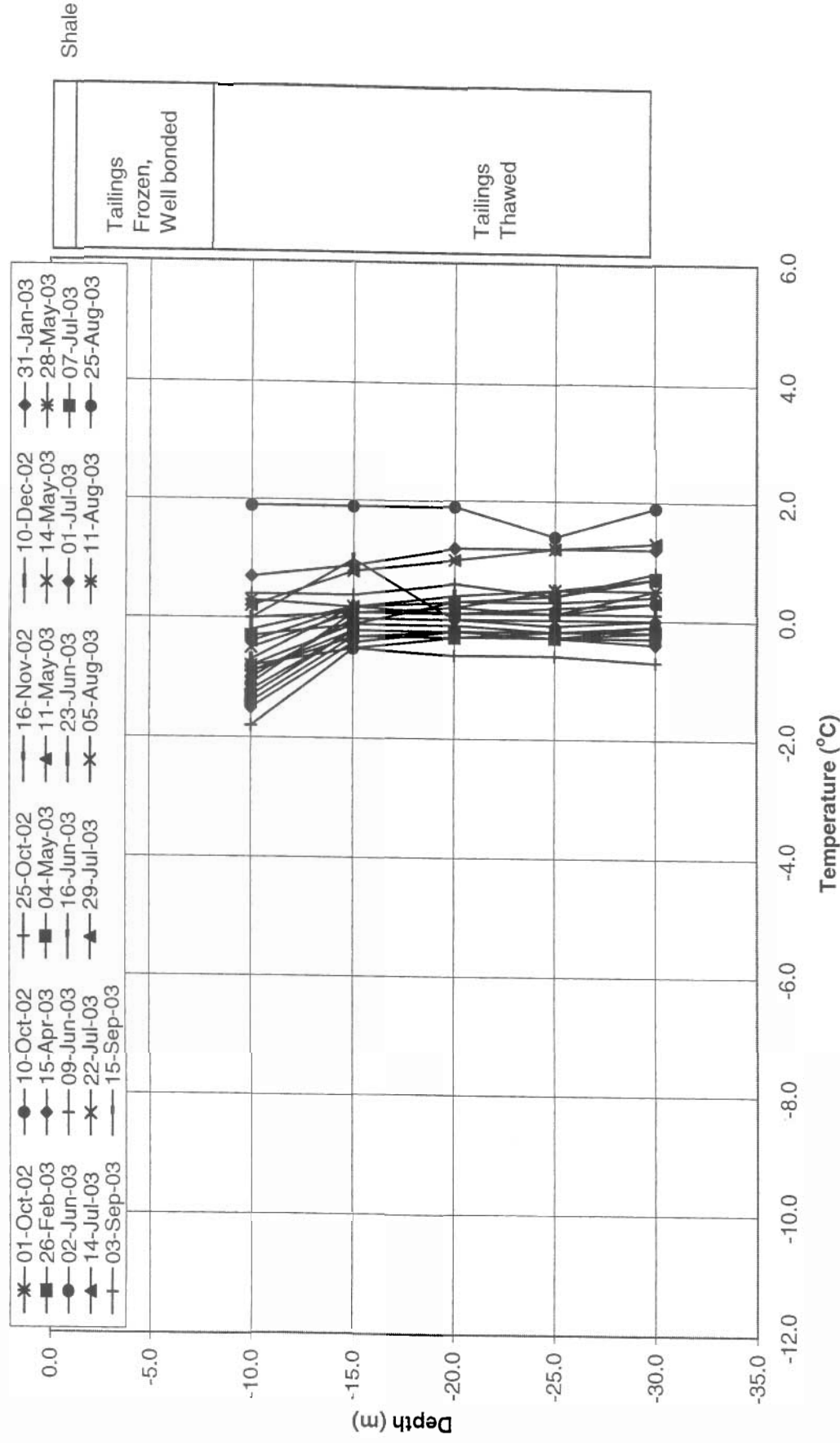
Thermocouple BGC02-11



Shale

Tailings Frozen, Well bonded
Tailings Thawed
Bedrock

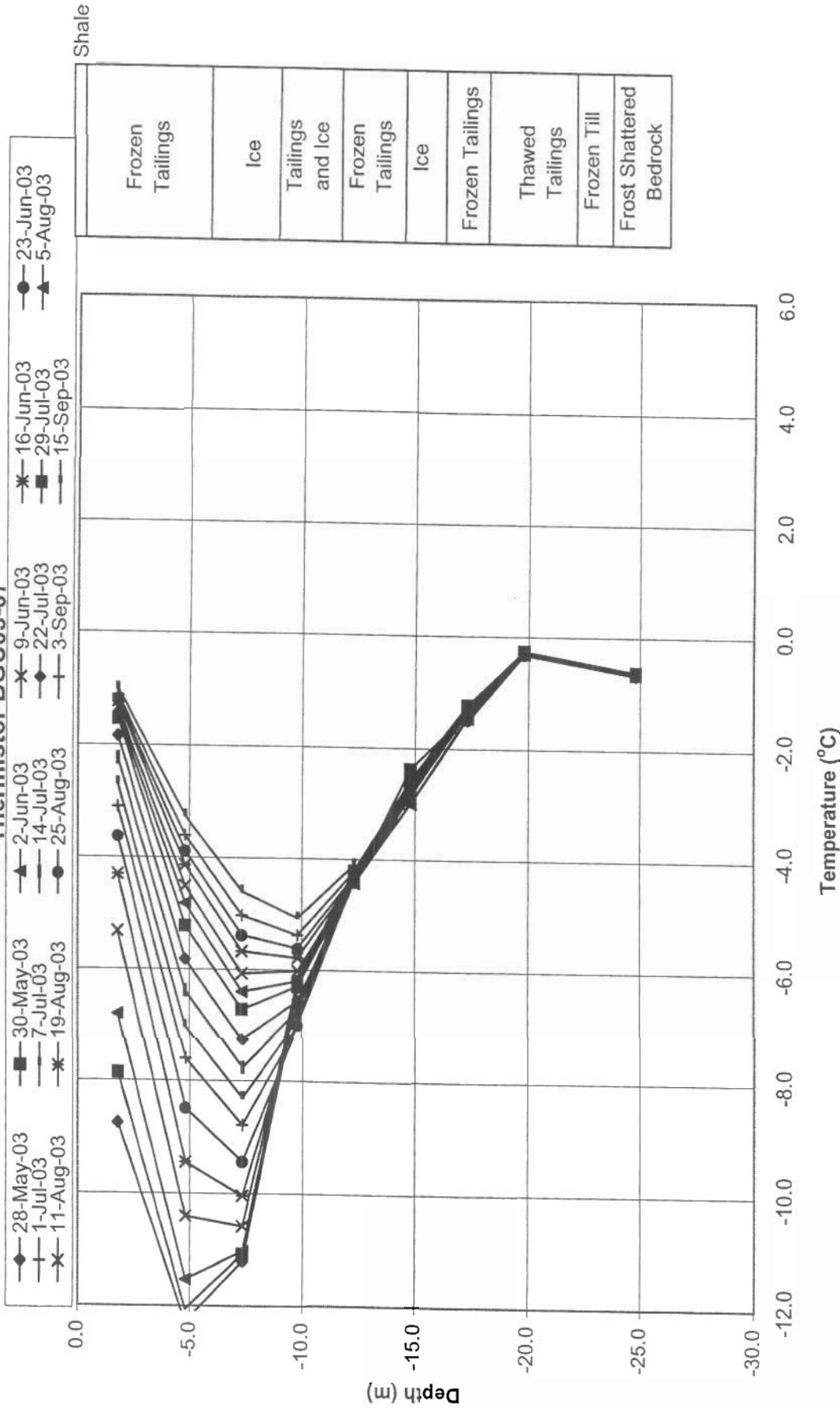
Geothermal Monitoring Surface Cell Thermocouple BGC02-13



Geothermal Monitoring

Surface Cell

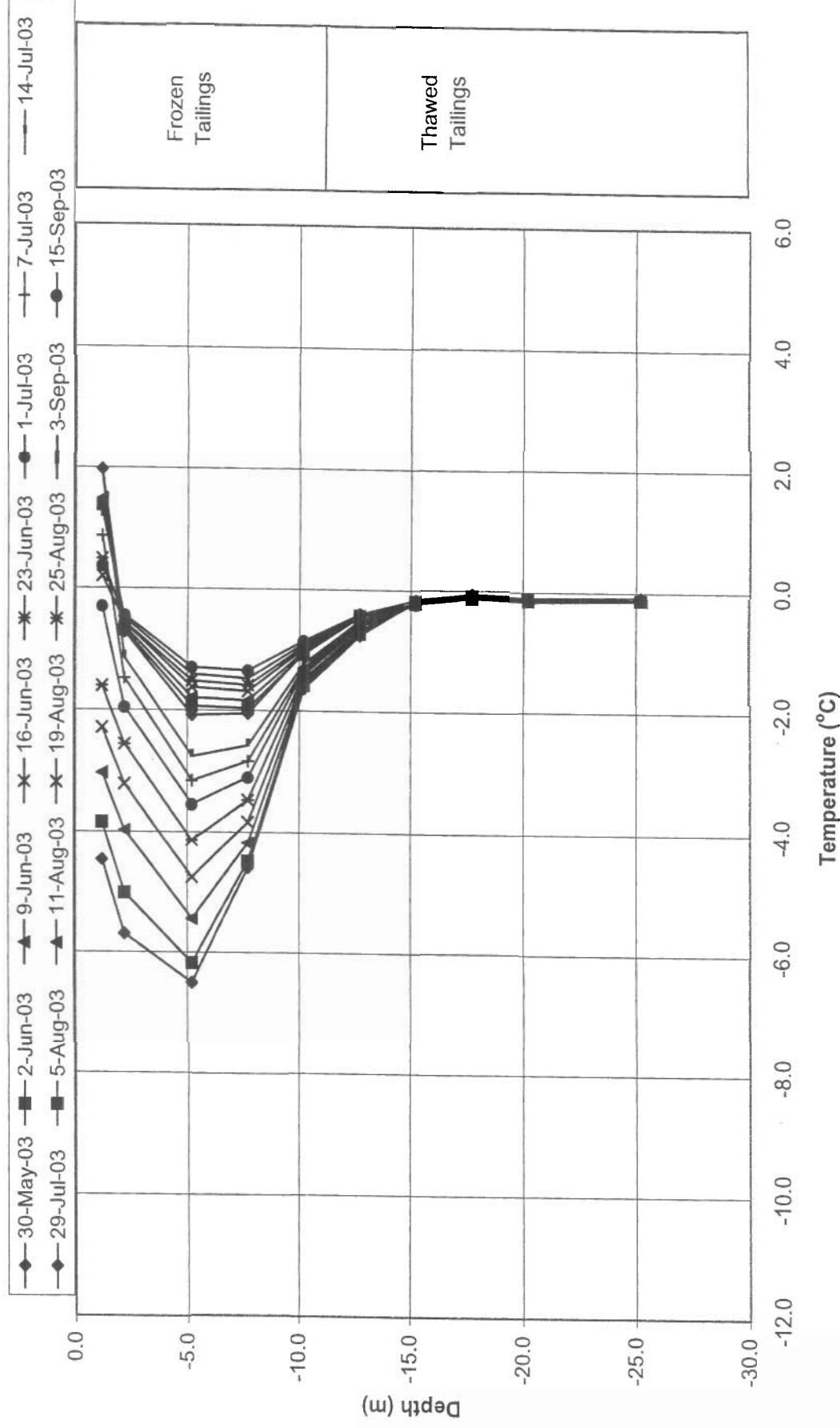
Thermistor BGC03-07



Geothermal Monitoring

Surface Cell

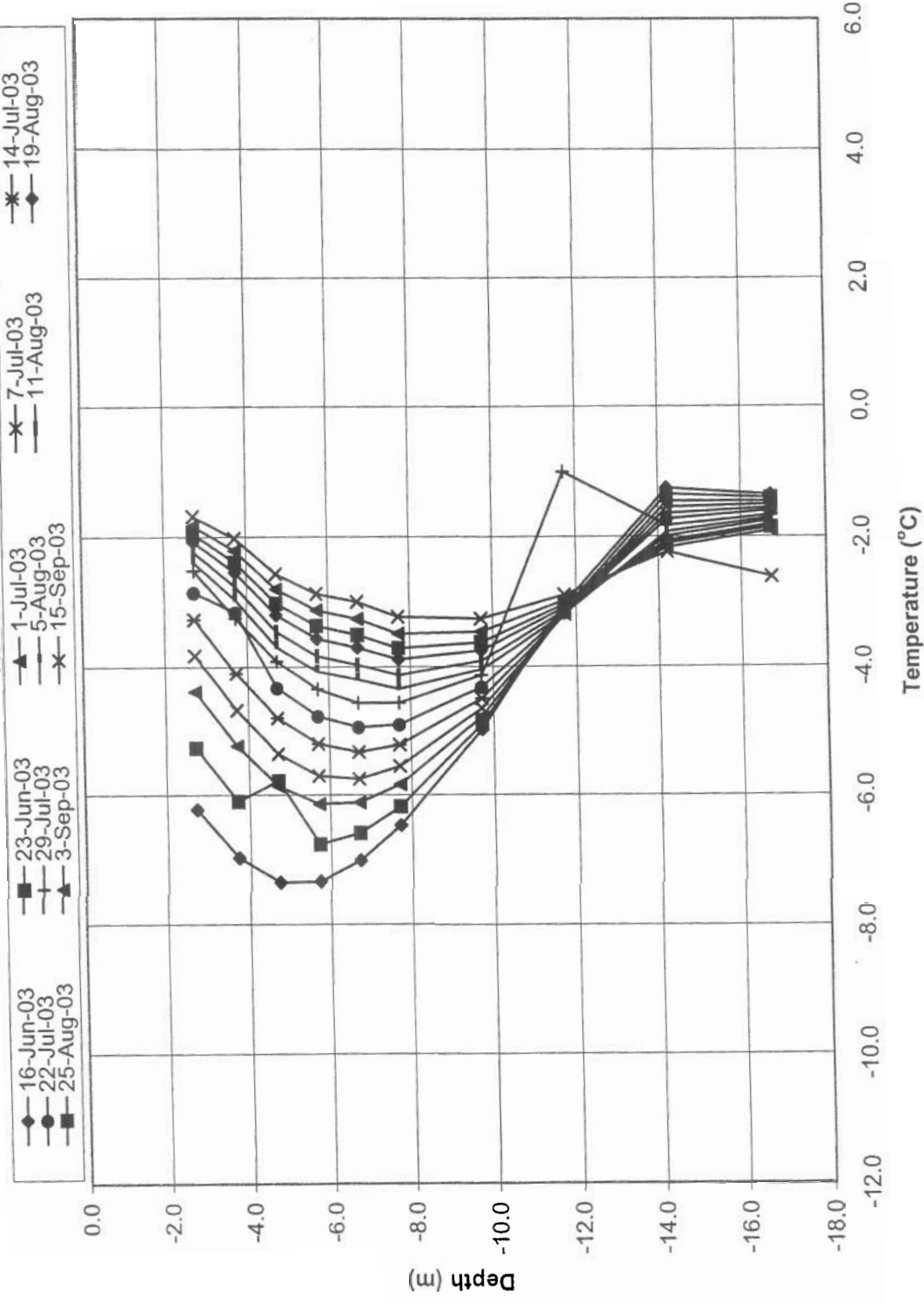
Thermistor BGC03-09



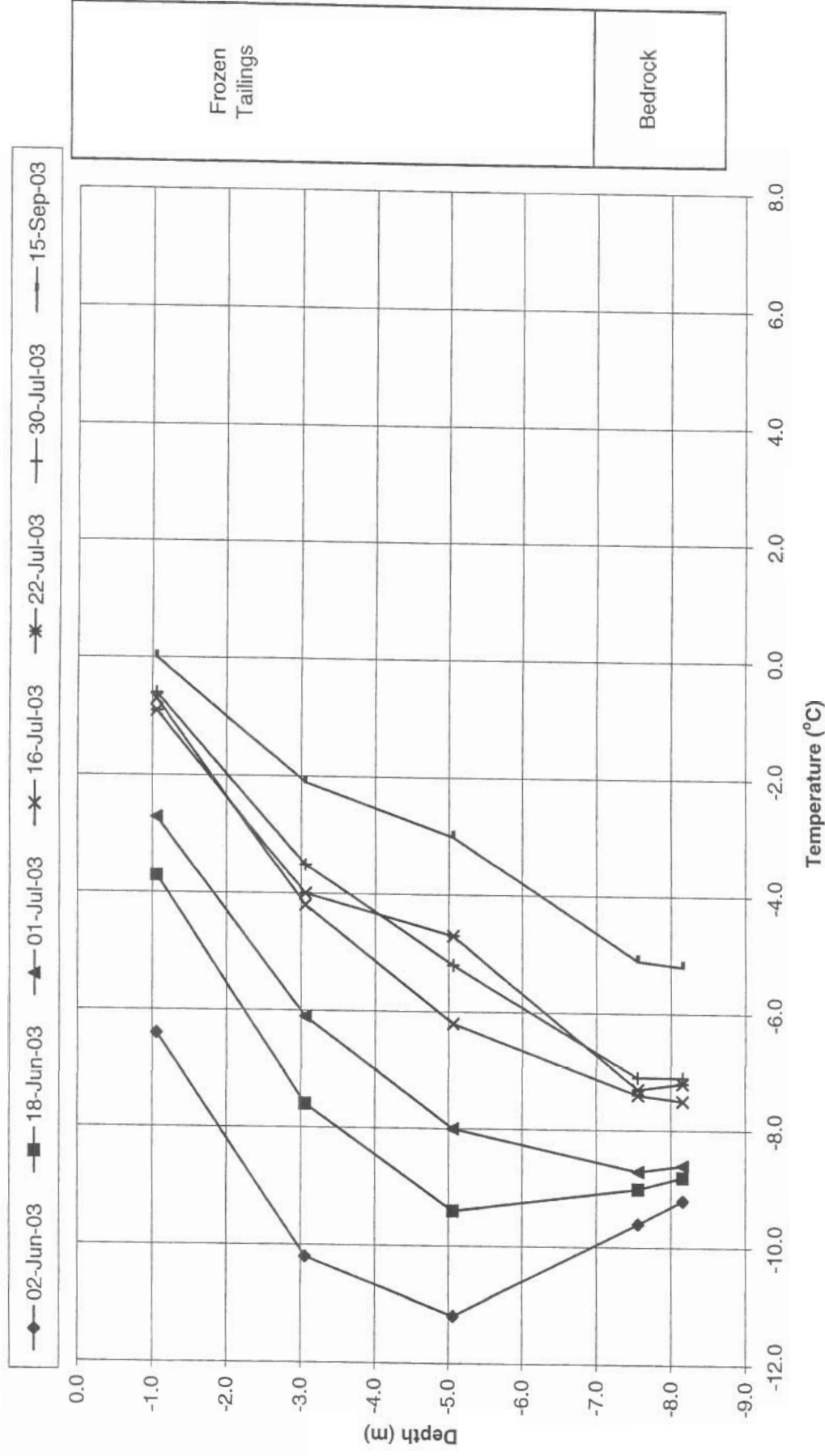
Geothermal Monitoring

Surface Cell

Thermistor BGC03-15



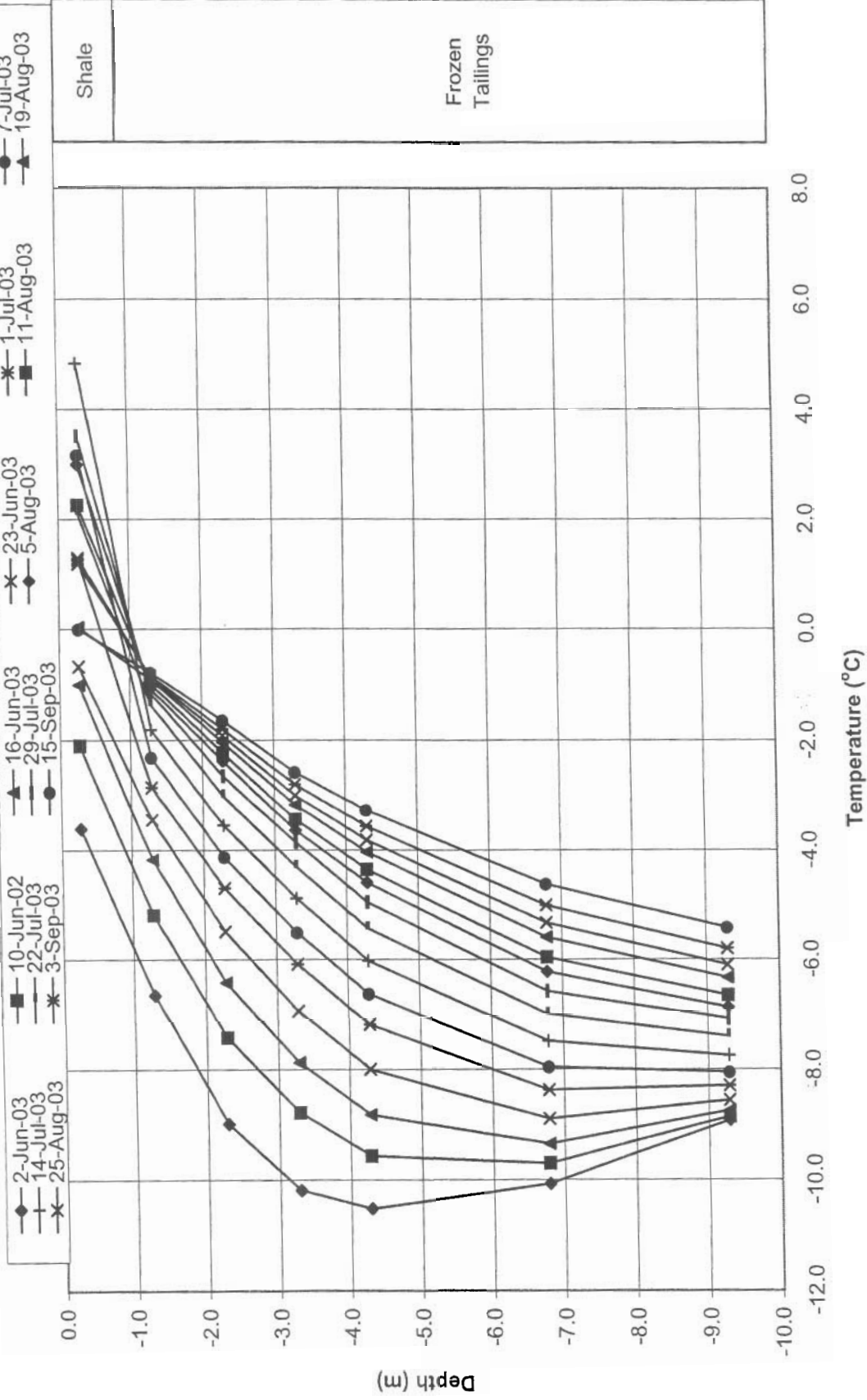
**Geothermal Monitoring
Toe of WTL Dike
Thermocouple BGC03-18**



Geothermal Monitoring

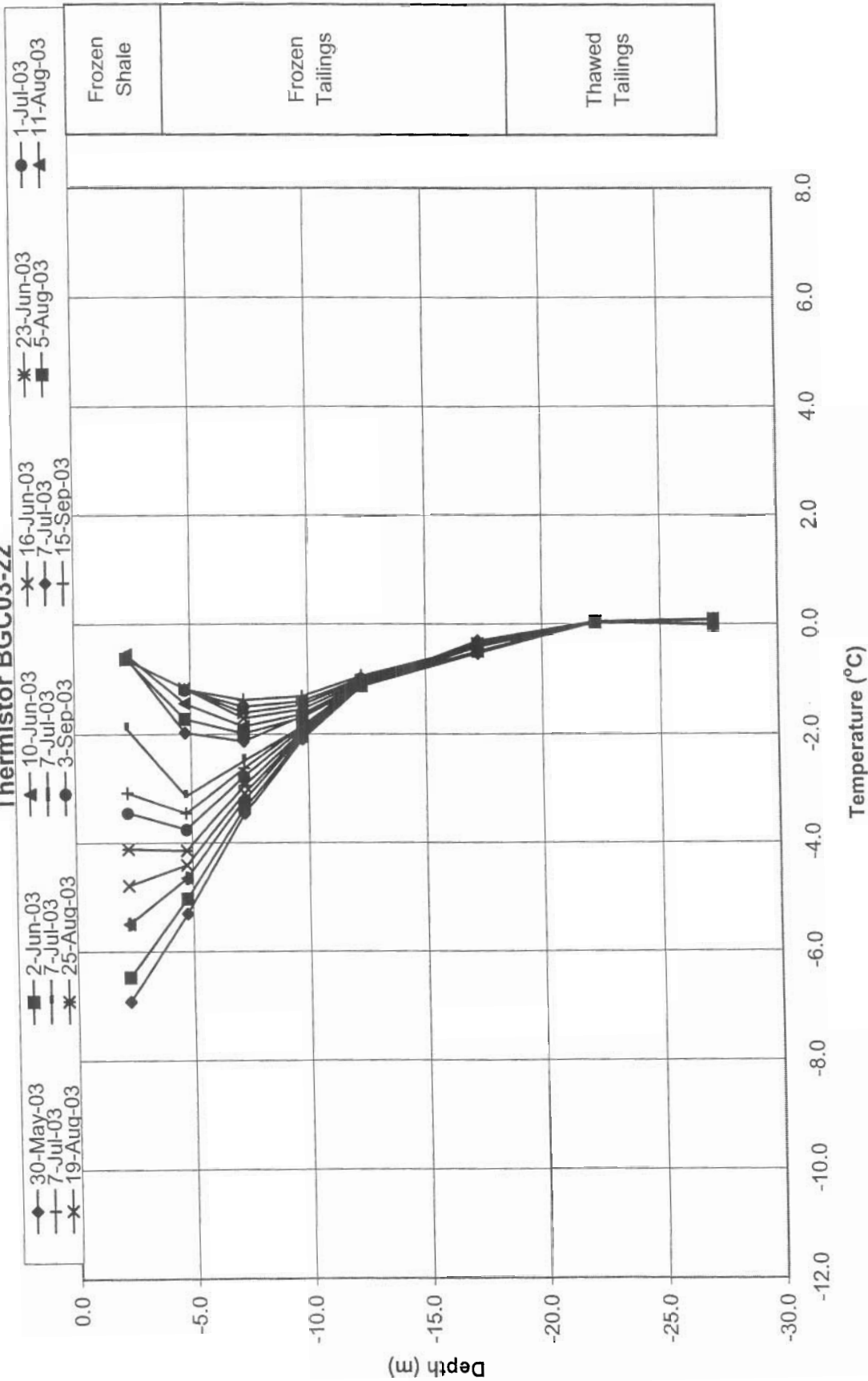
Toe of WTL Dike

Thermistor BGC03-19

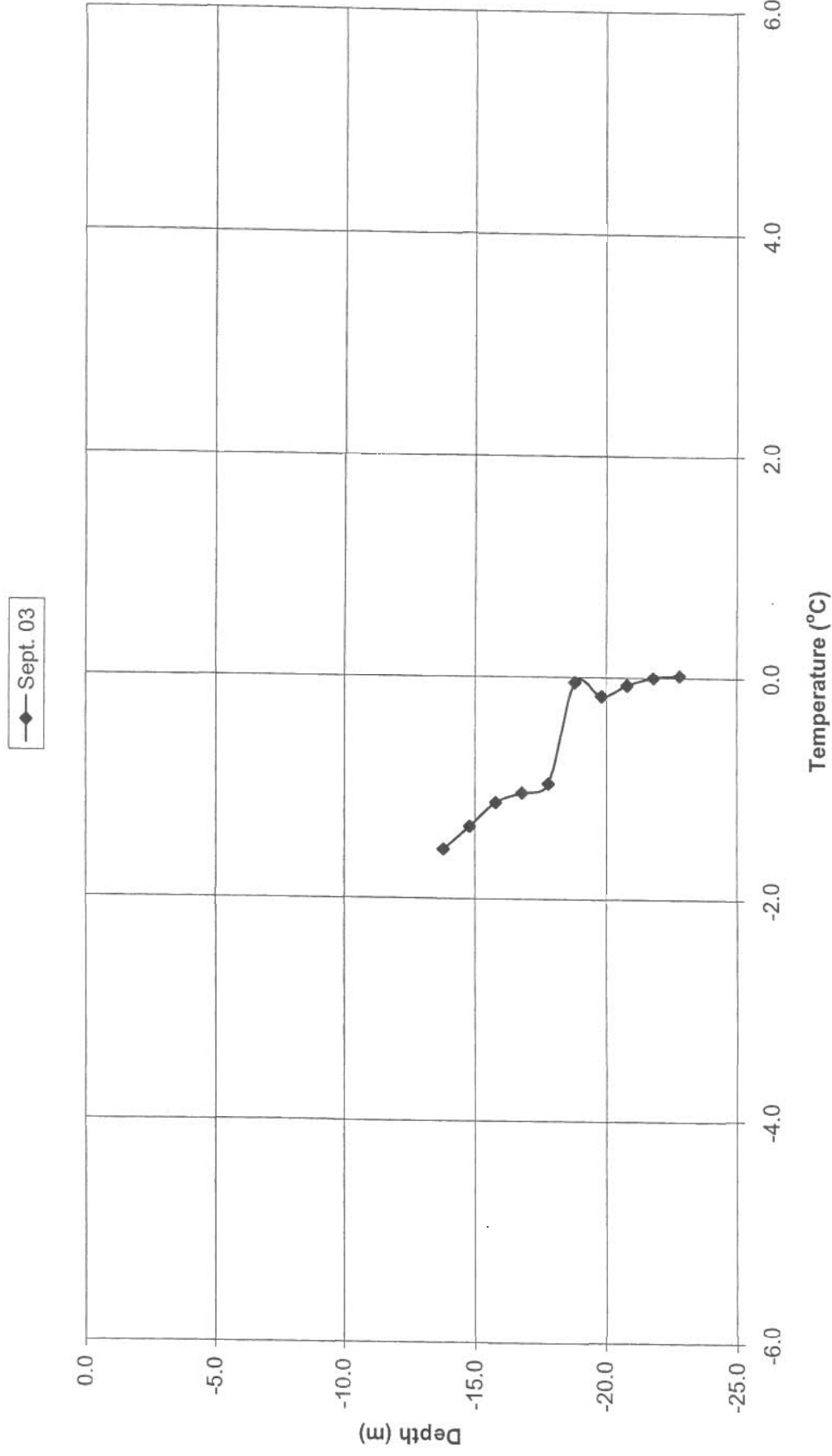


Geothermal Monitoring Test Cell Dyke

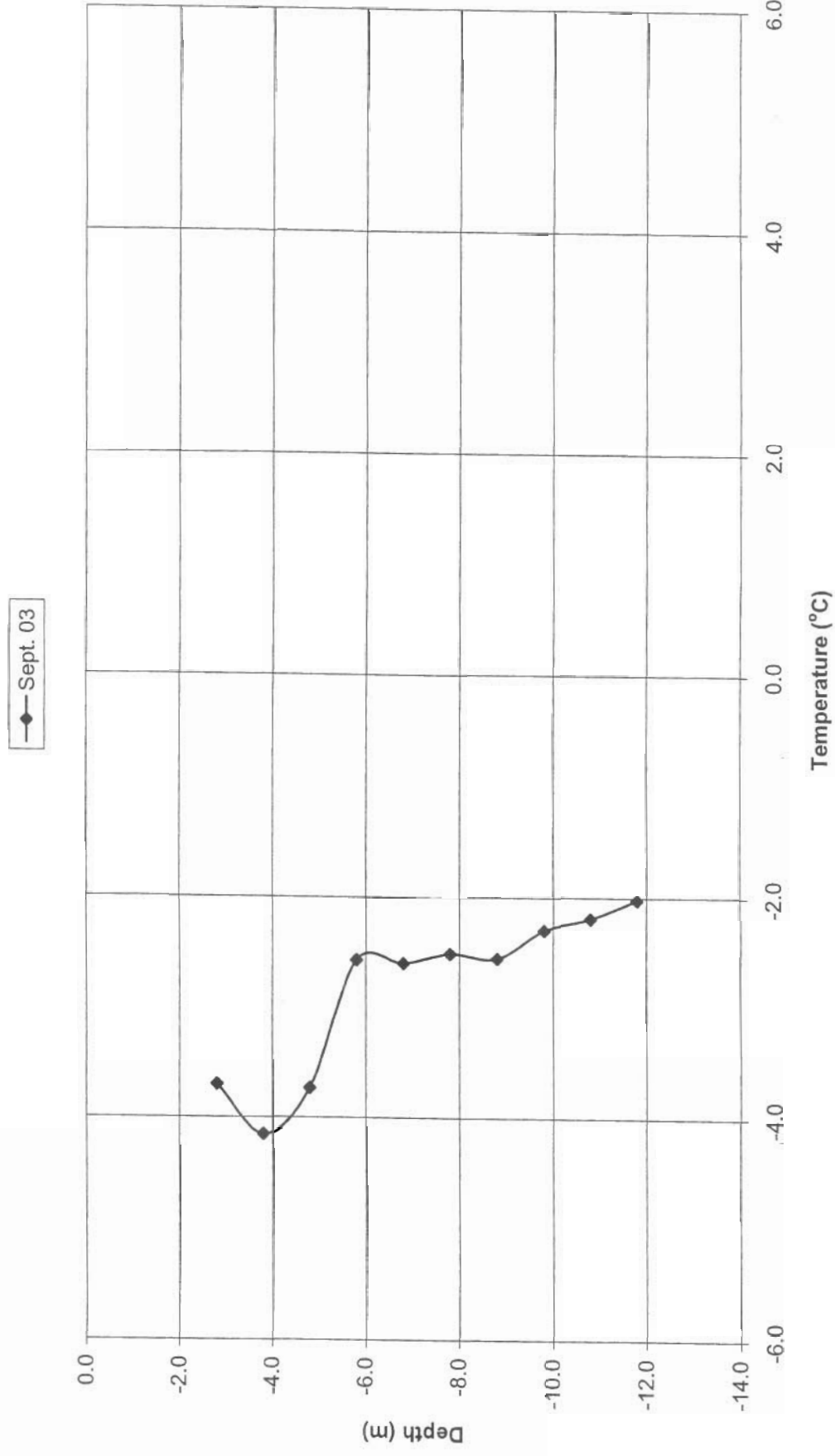
Thermistor BGC03-22



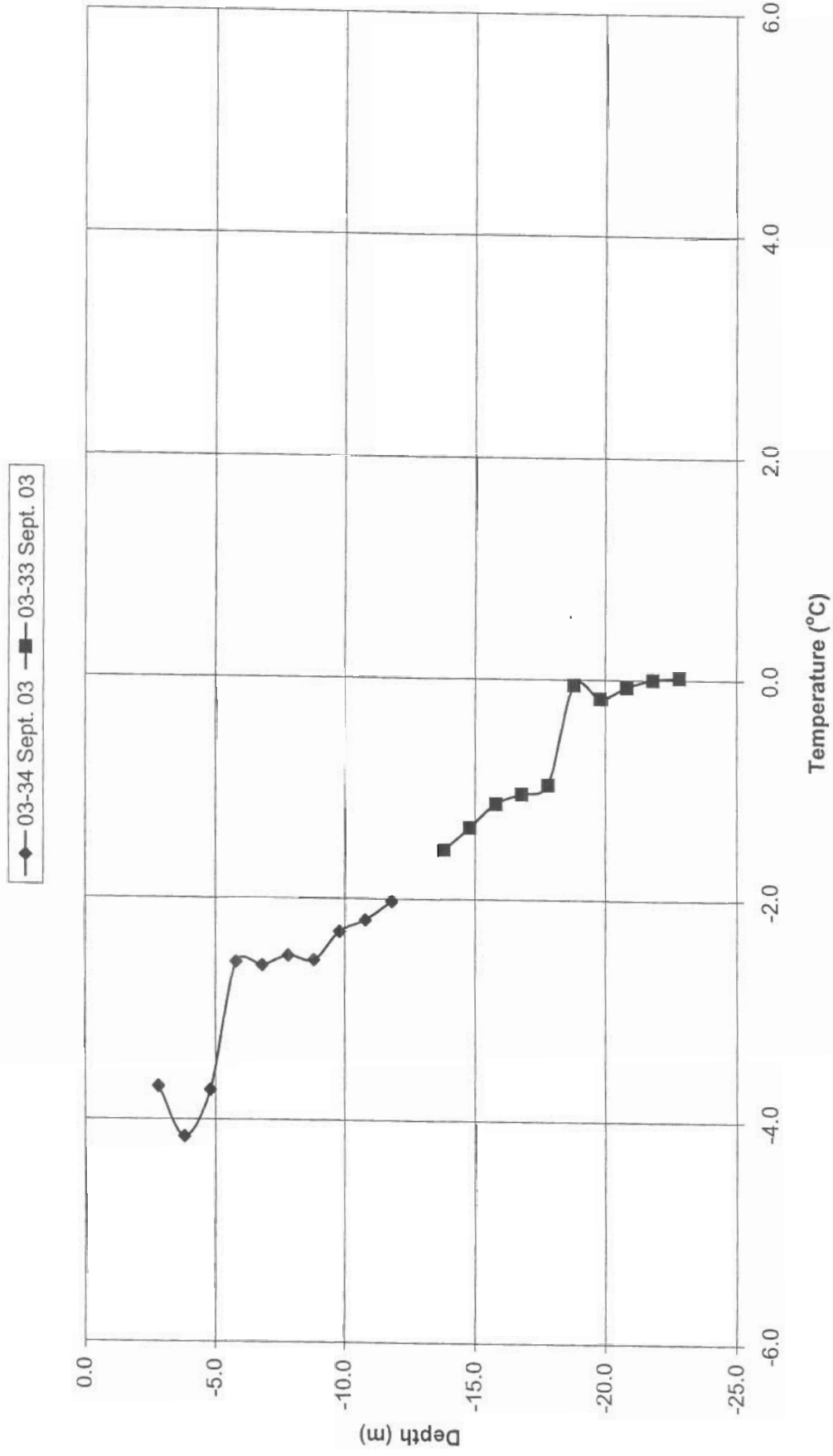
**Geothermal Monitoring
Surface Cell
Thermistor BGC03-33**



**Geothermal Monitoring
Surface Cell
Thermistor BGC03-34**

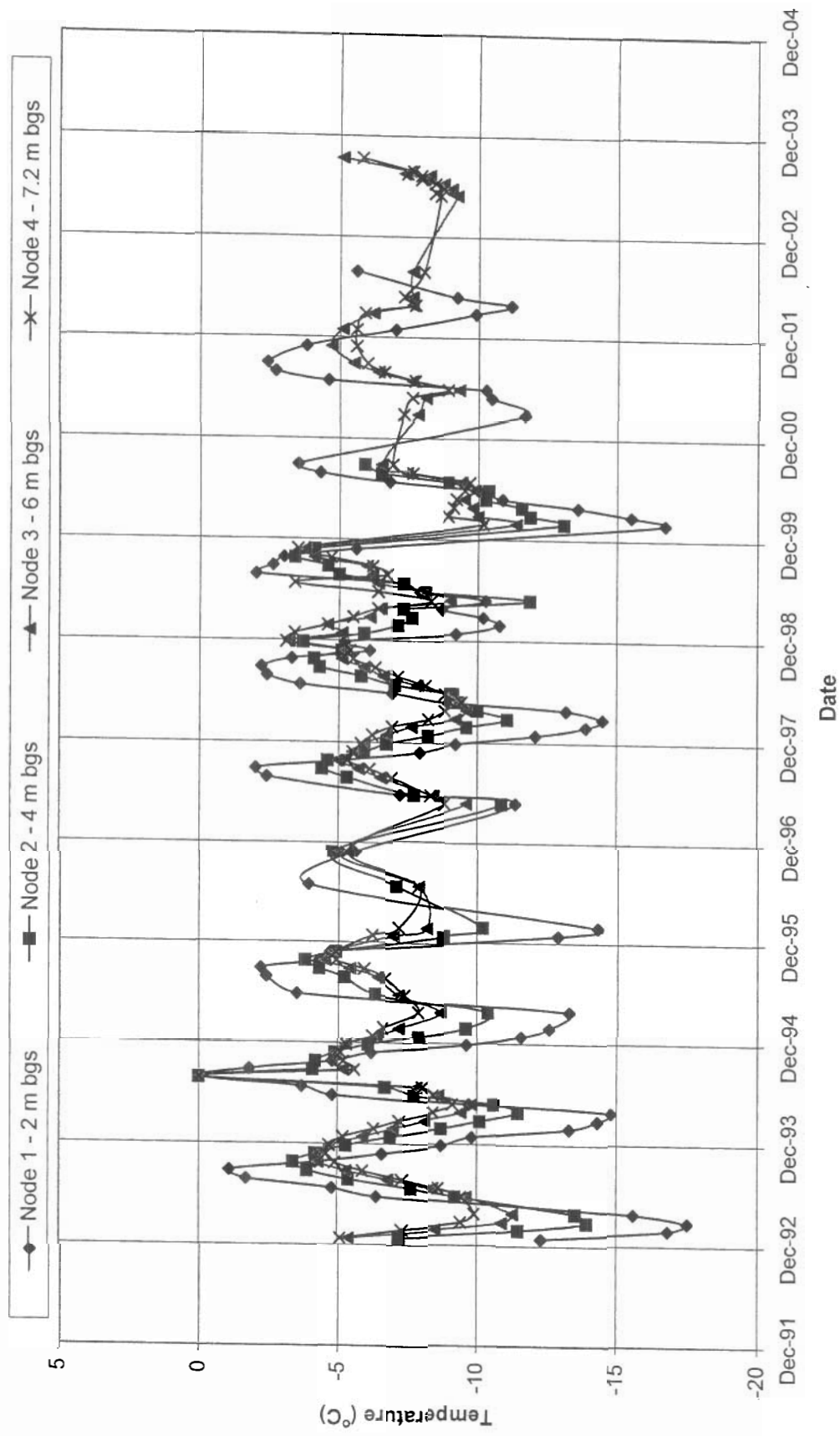


**Geothermal Monitoring
Surface Cell
Thermistor BGC03-33/34**

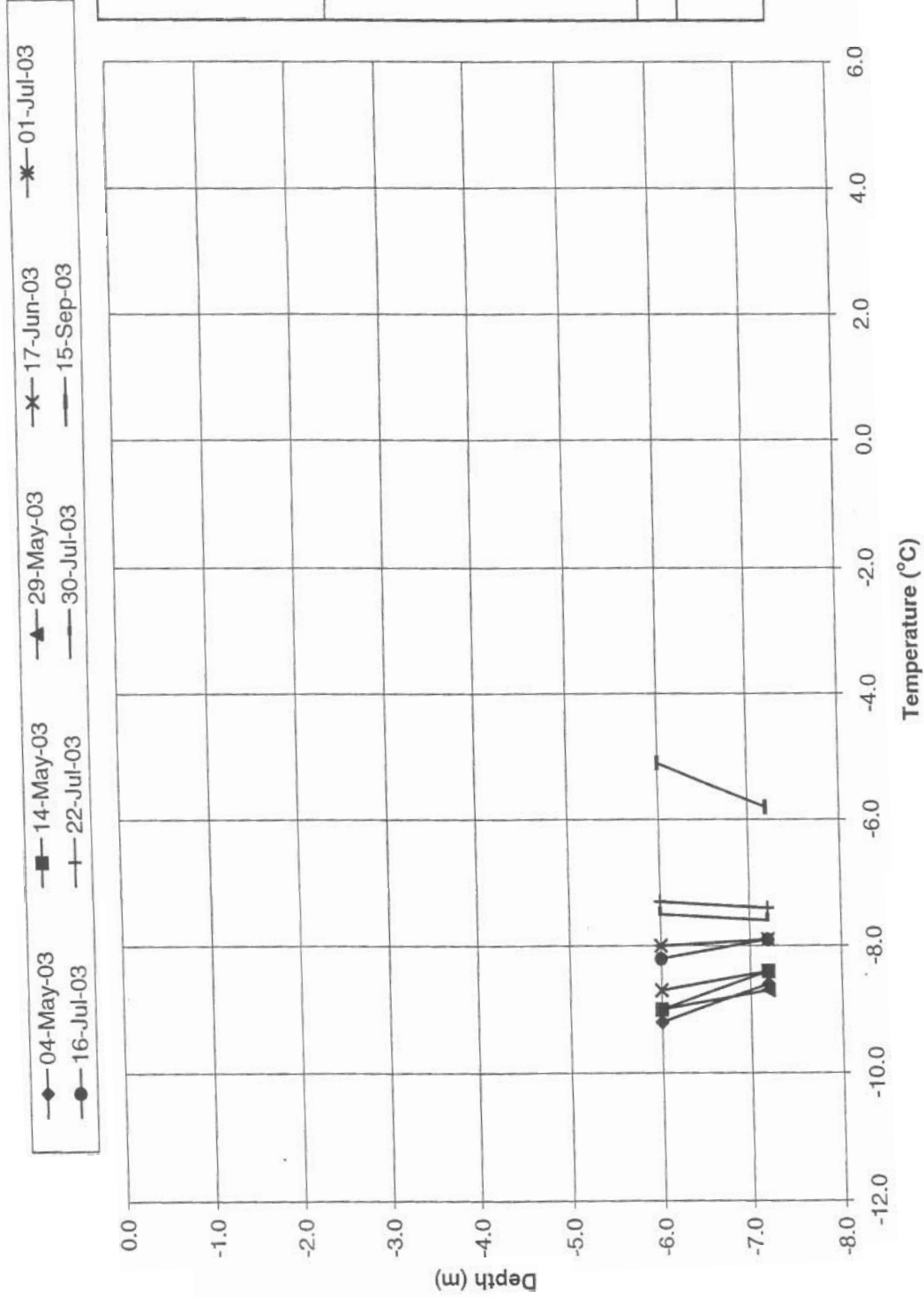


Thermocouple TC1

Stn 00+75
South Dike
Elev. 376 m

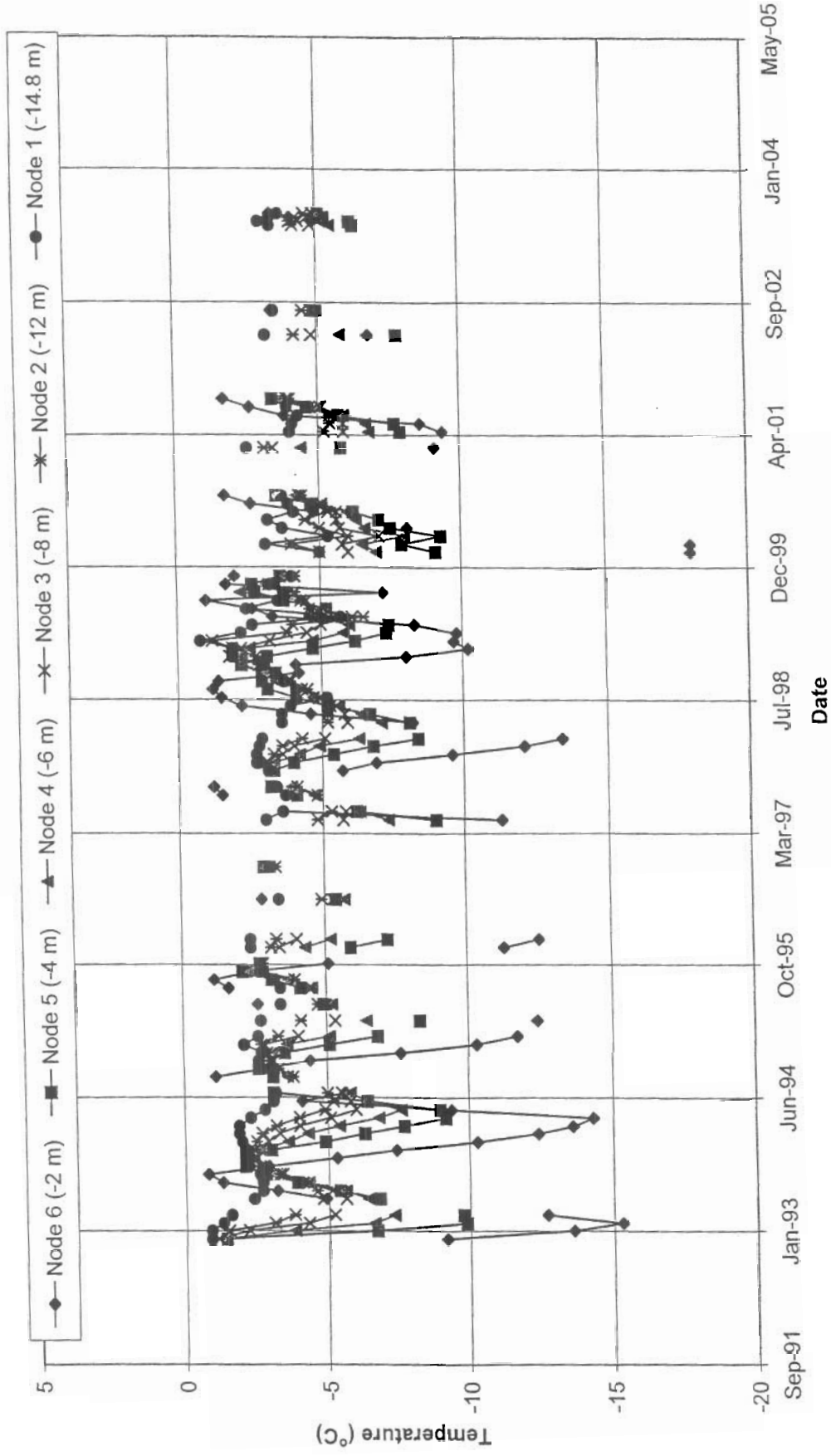


**Geothermal Monitoring
West Twin Dike
Thermocouple TC 1**

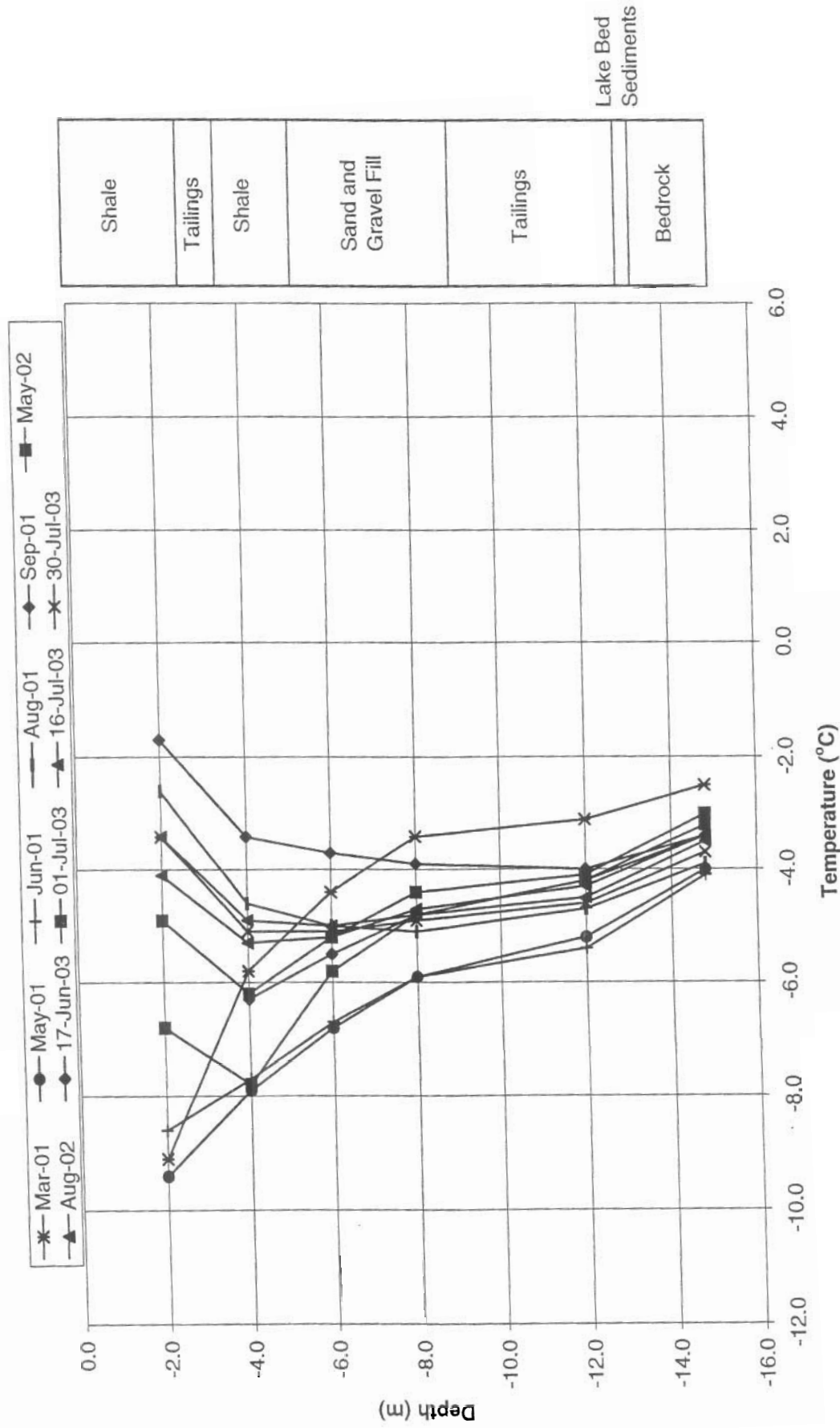


Thermocouple TC2

Stn 03+25
North Dike
Elev. 376 m

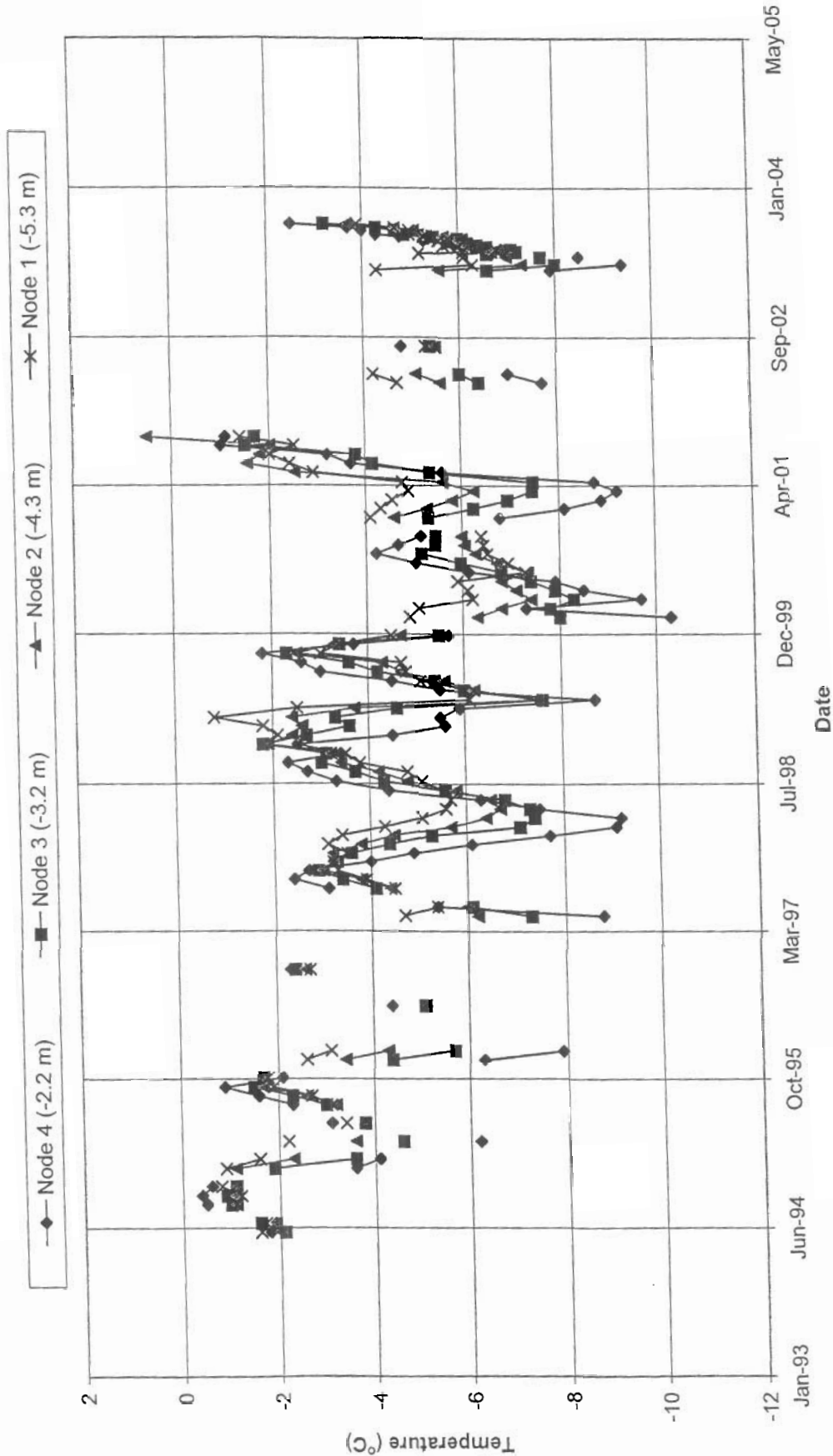


Geothermal Monitoring West Twin Dike Thermocouple TC 2

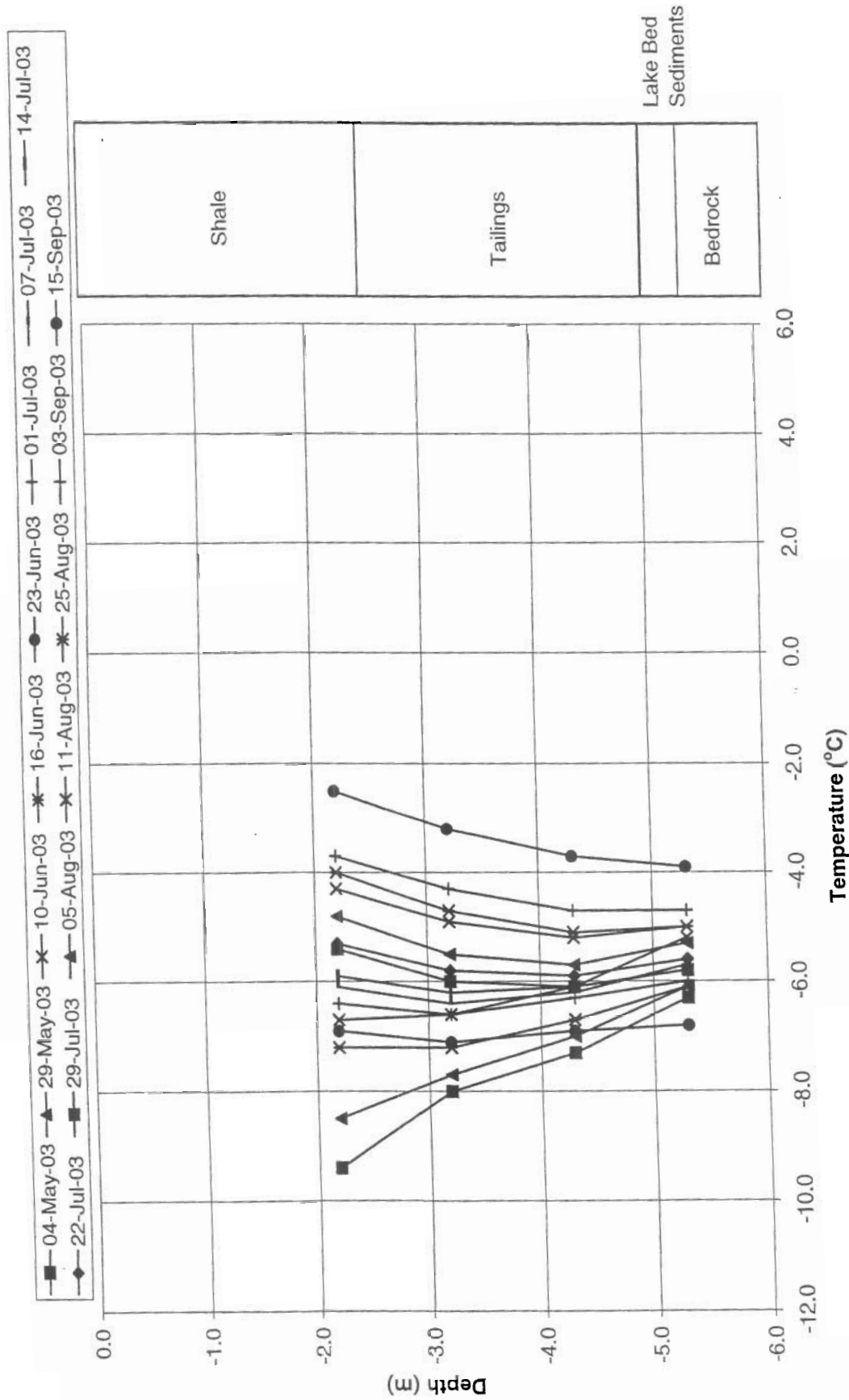


Thermocouple TC 12

Stn. 01+30
South Dike
Elev. 376 m

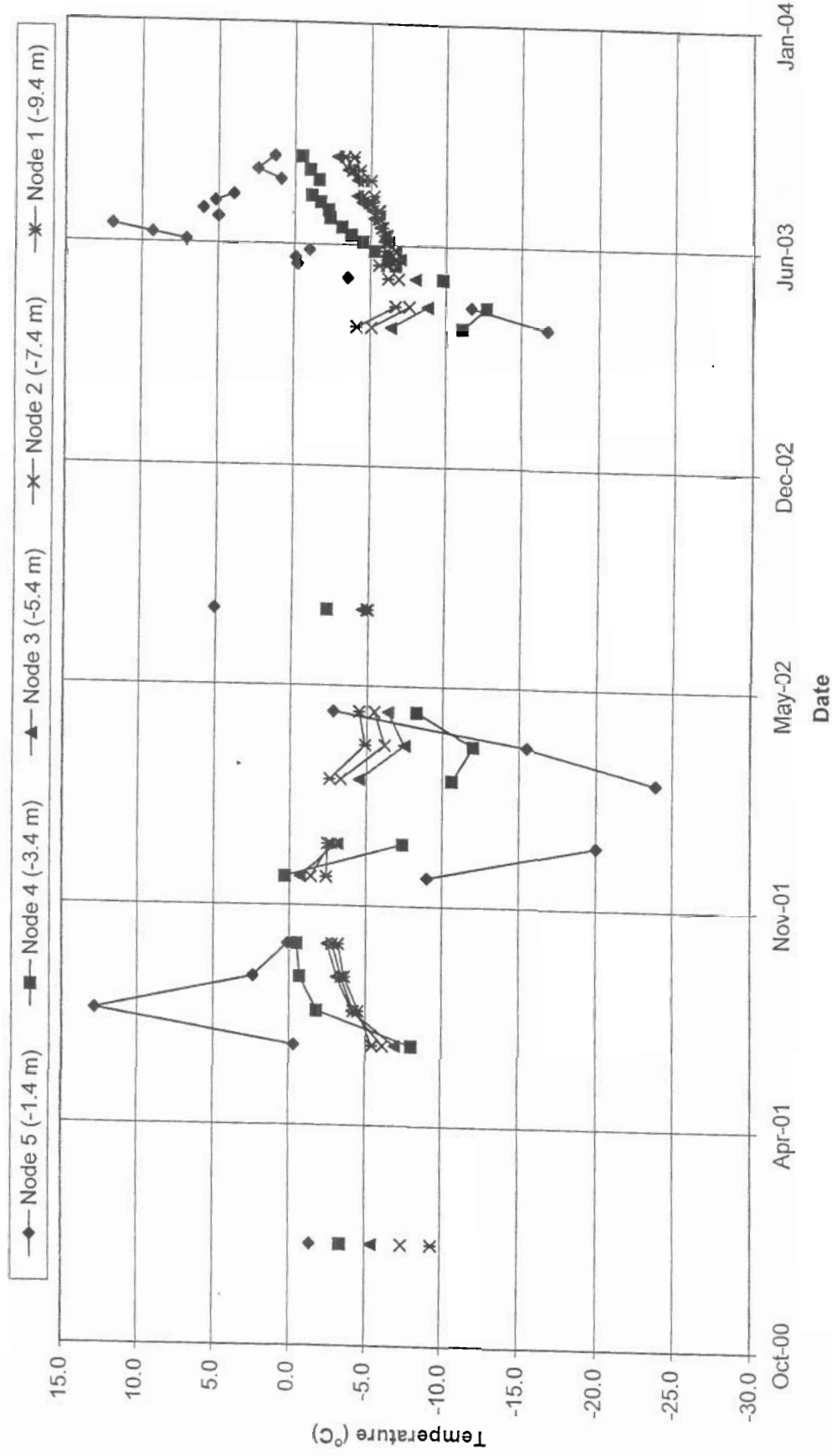


Geothermal Monitoring West twin Dike Thermocouple TC 12

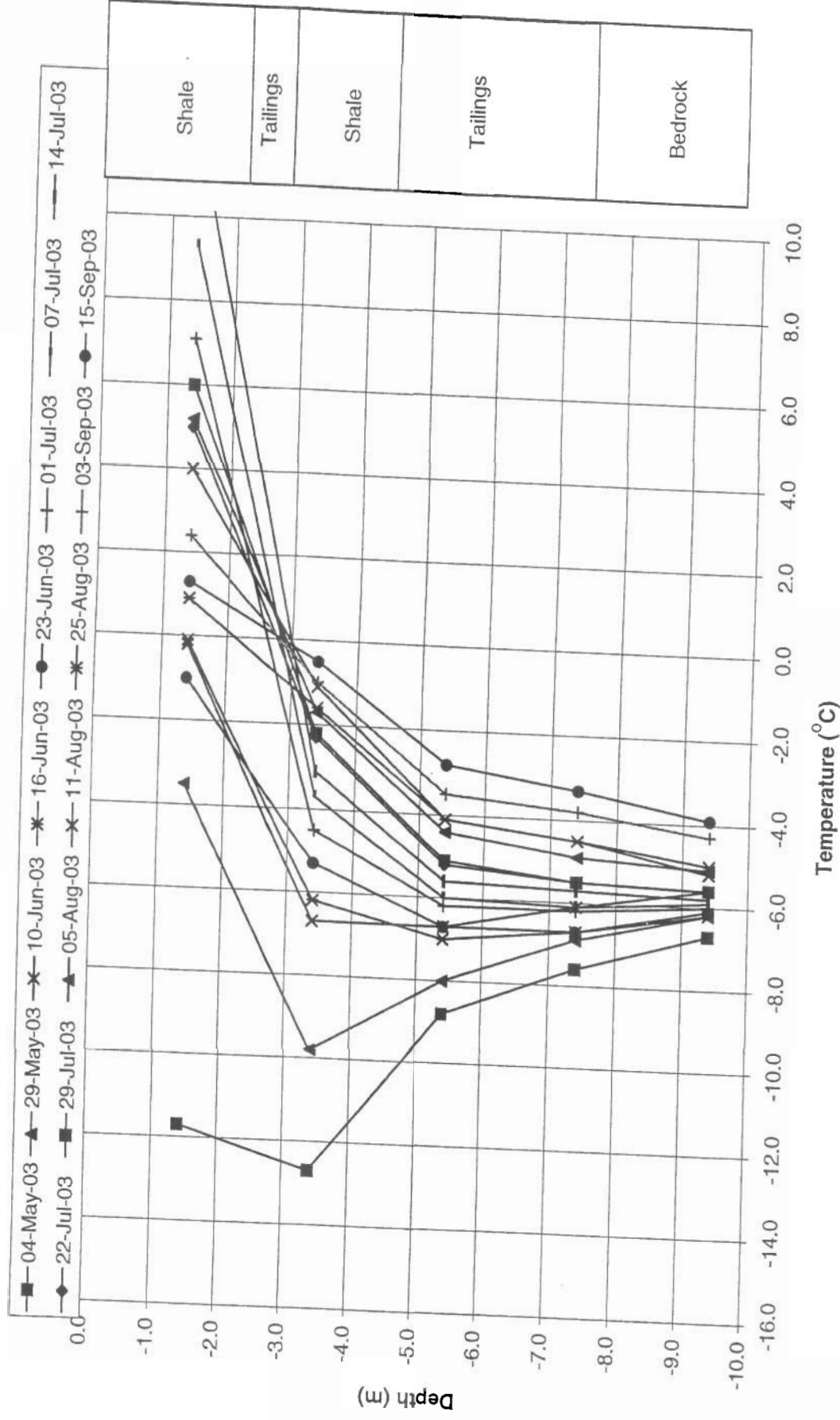


Thermocouple TC 13A

Stn. 01+78
South Dike
Elev. 376 m

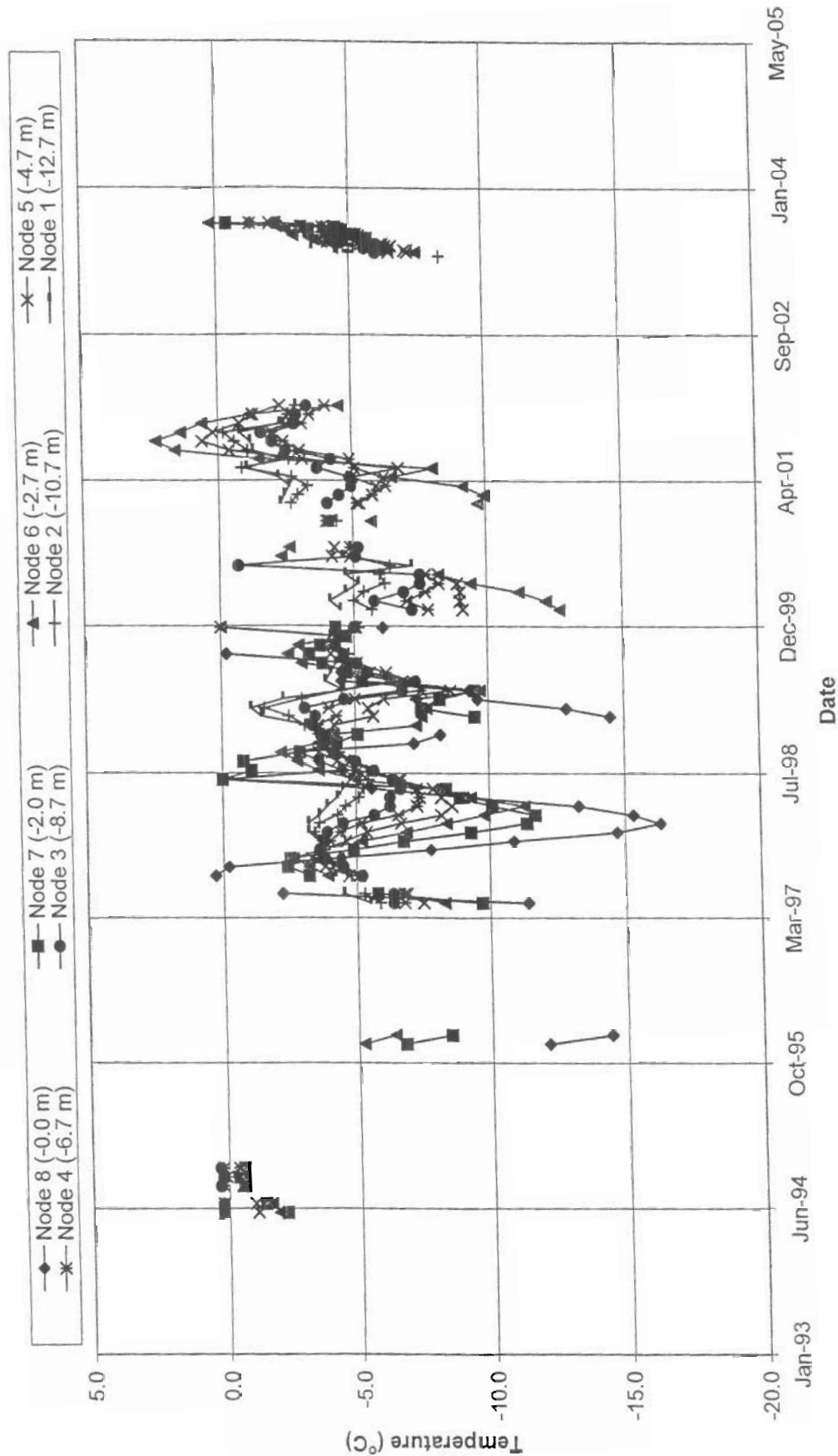


Geothermal Monitoring West Twin Dike Thermocouple TC 13A

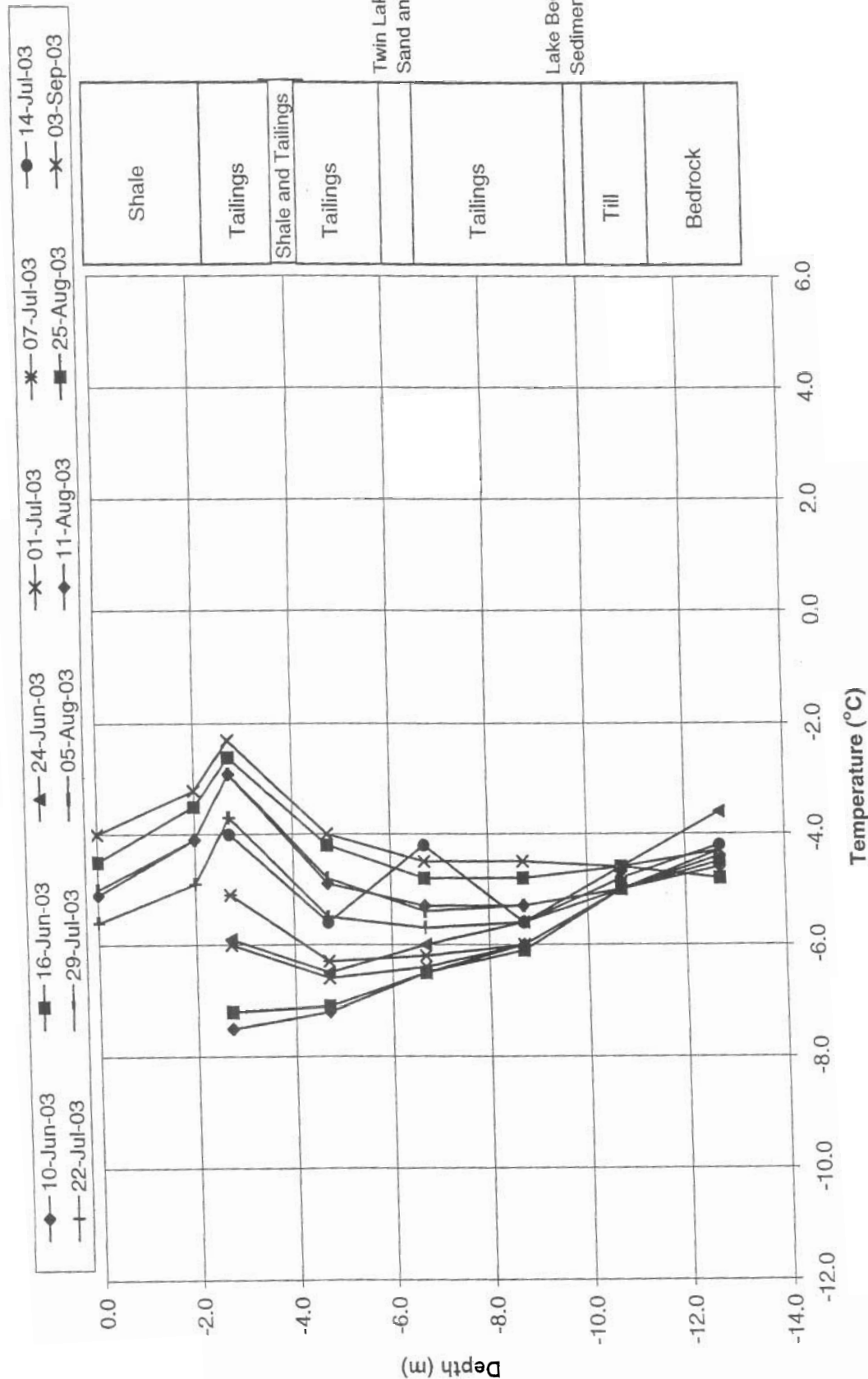


TC 14 - Thermocouple Data

Stn. 02+25
South Dike
Elev. 376 m

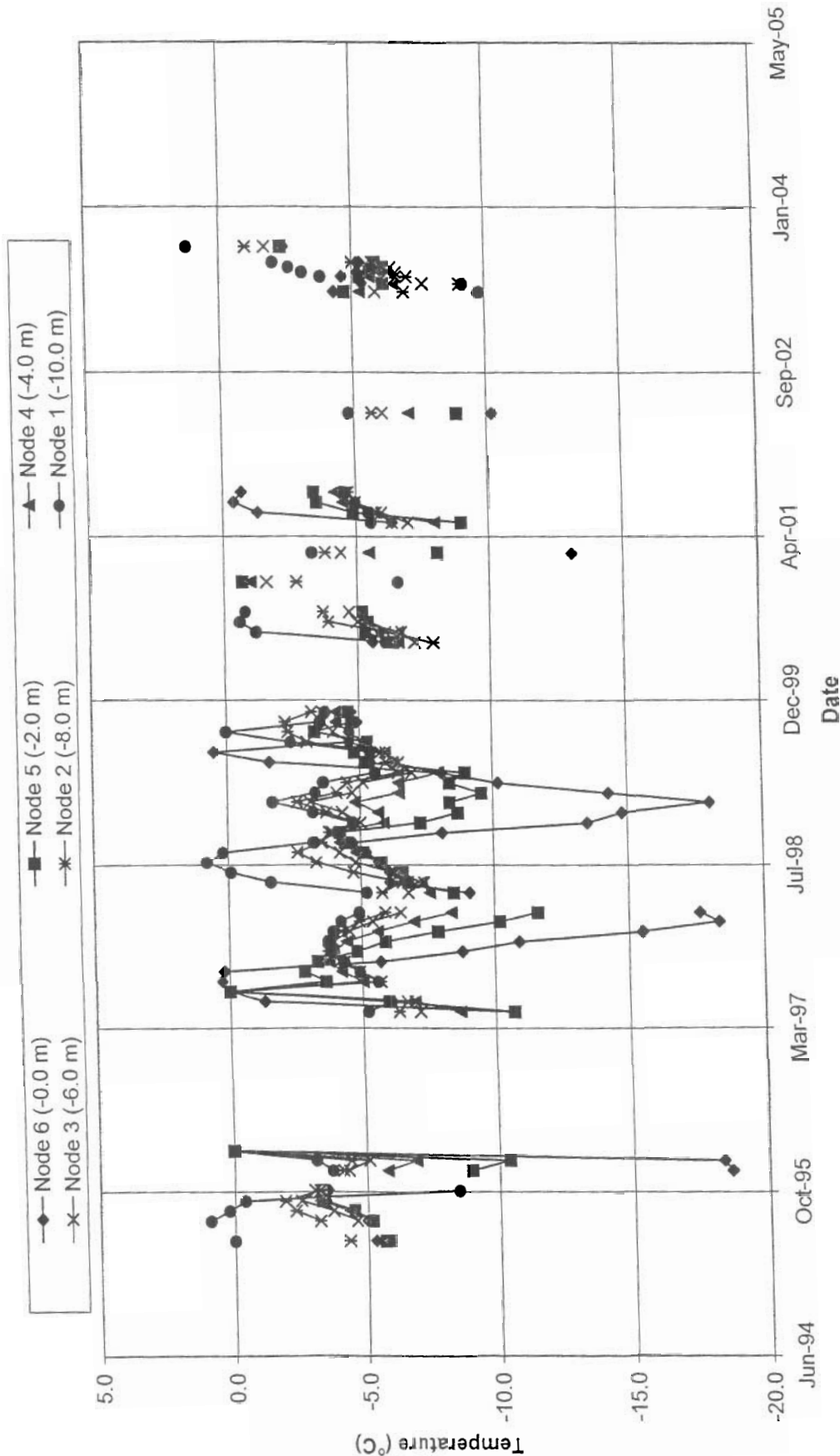


Geothermal Monitoring West Twin Dike Thermocouple TC 14

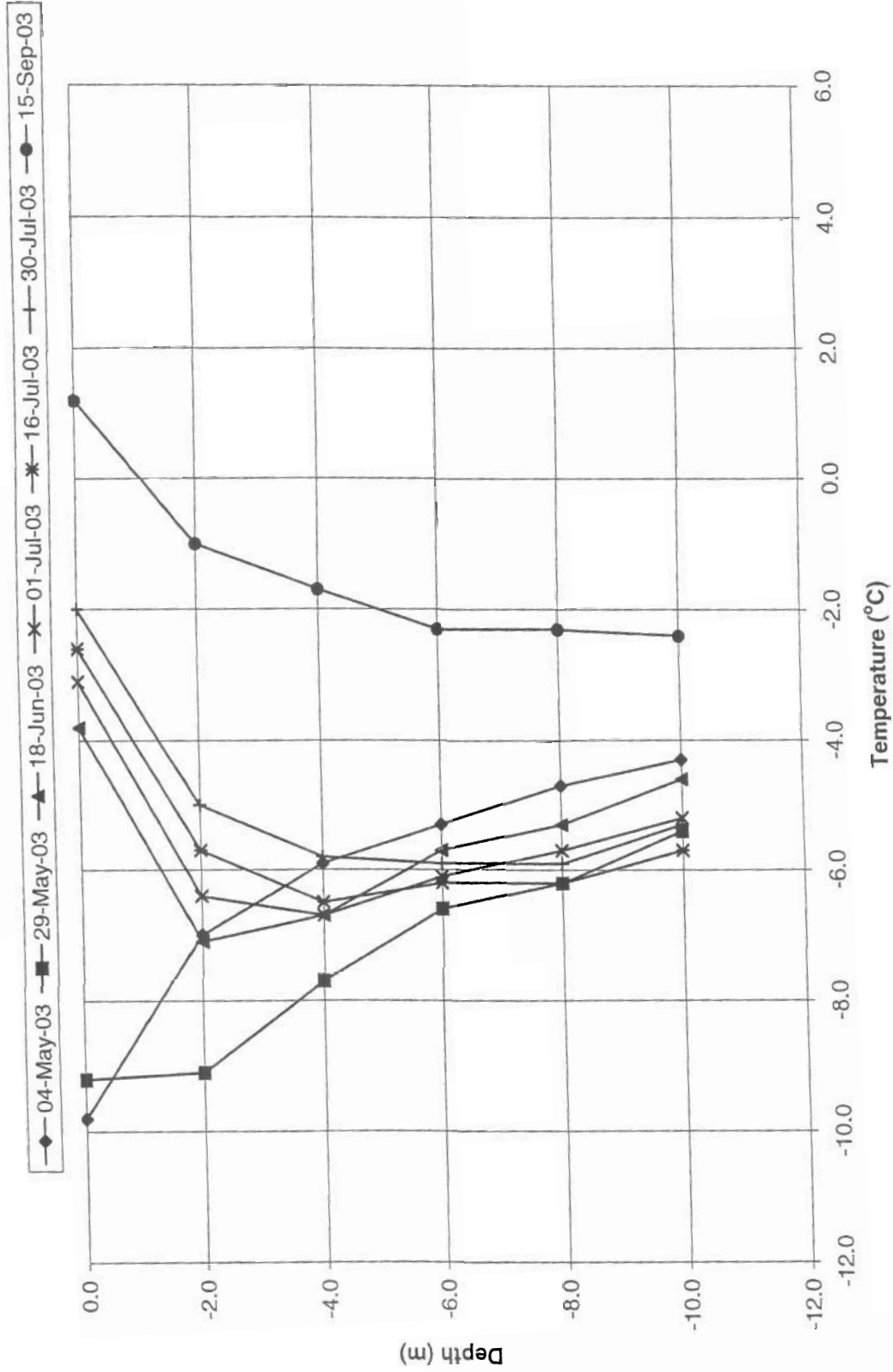


Thermocouple TC 15

Stn 02+28
North Dike
Elev. 376 m

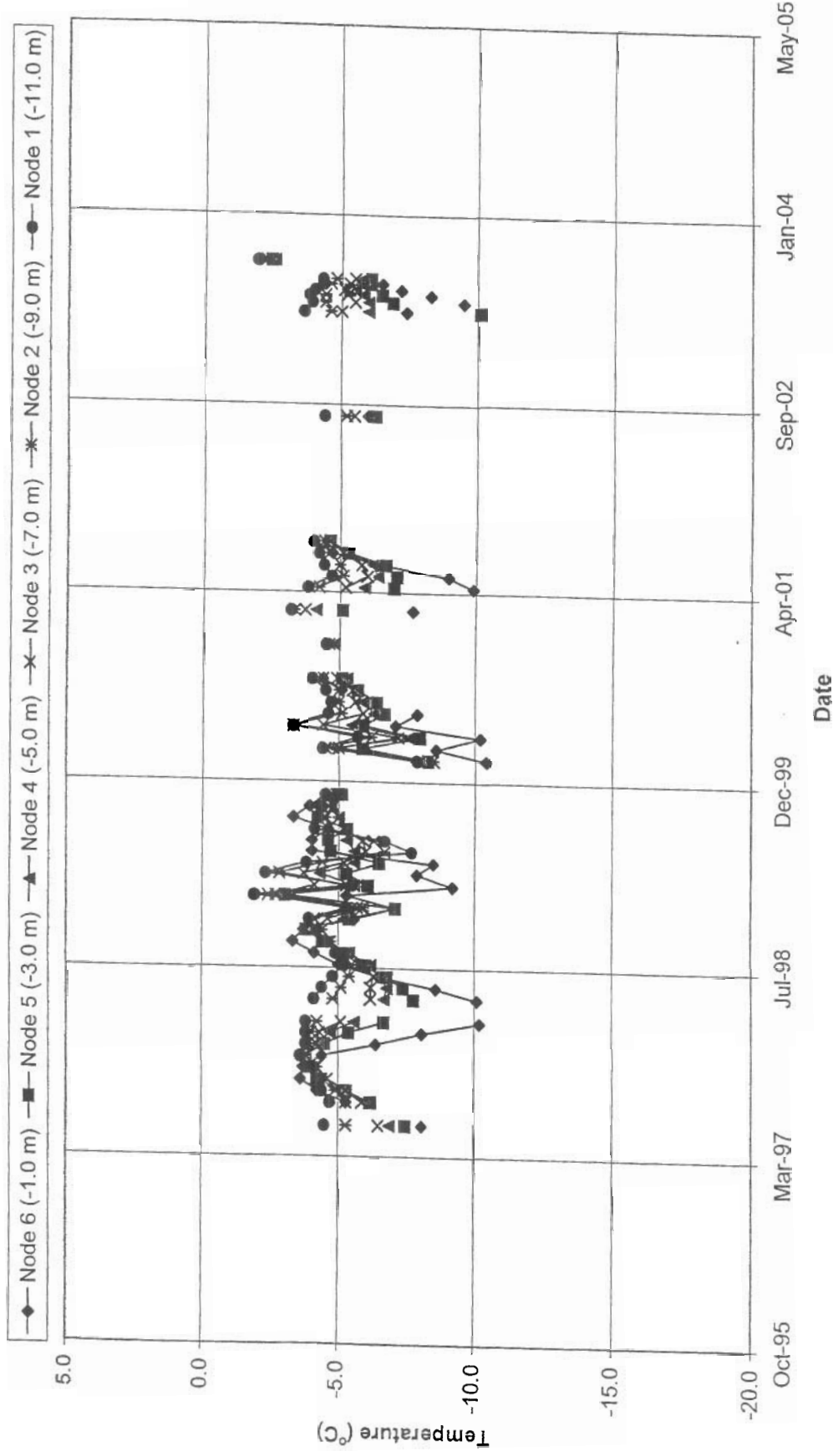


Geothermal Monitoring West Twin Dike Thermocouple 15



Thermocouple 15A

Stn. 03+00
North Dike
Elev. 377 m

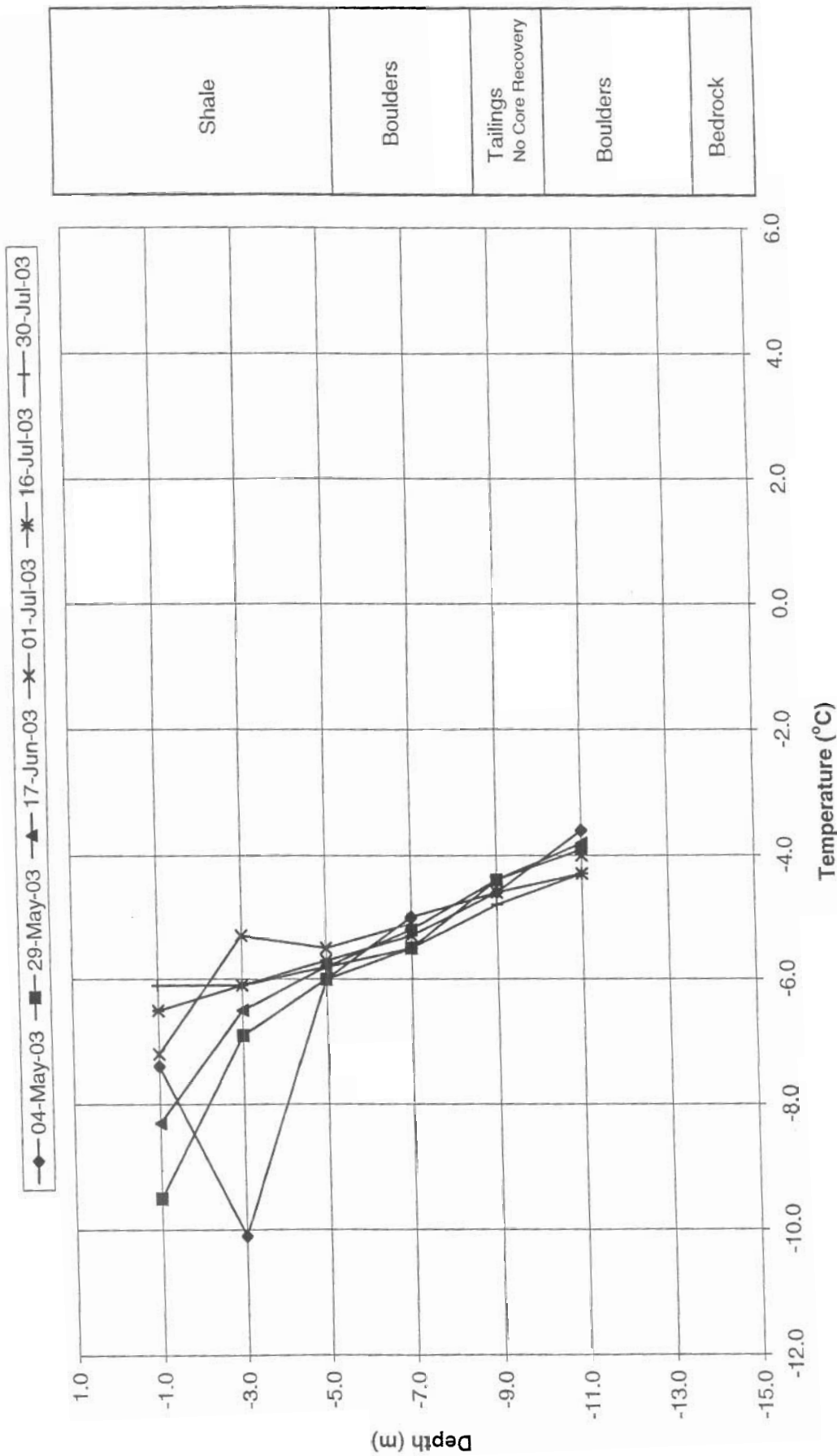


Nanisivik Thermocouple long term data
TC 15A chrt

BGC ENGINEERING INC.

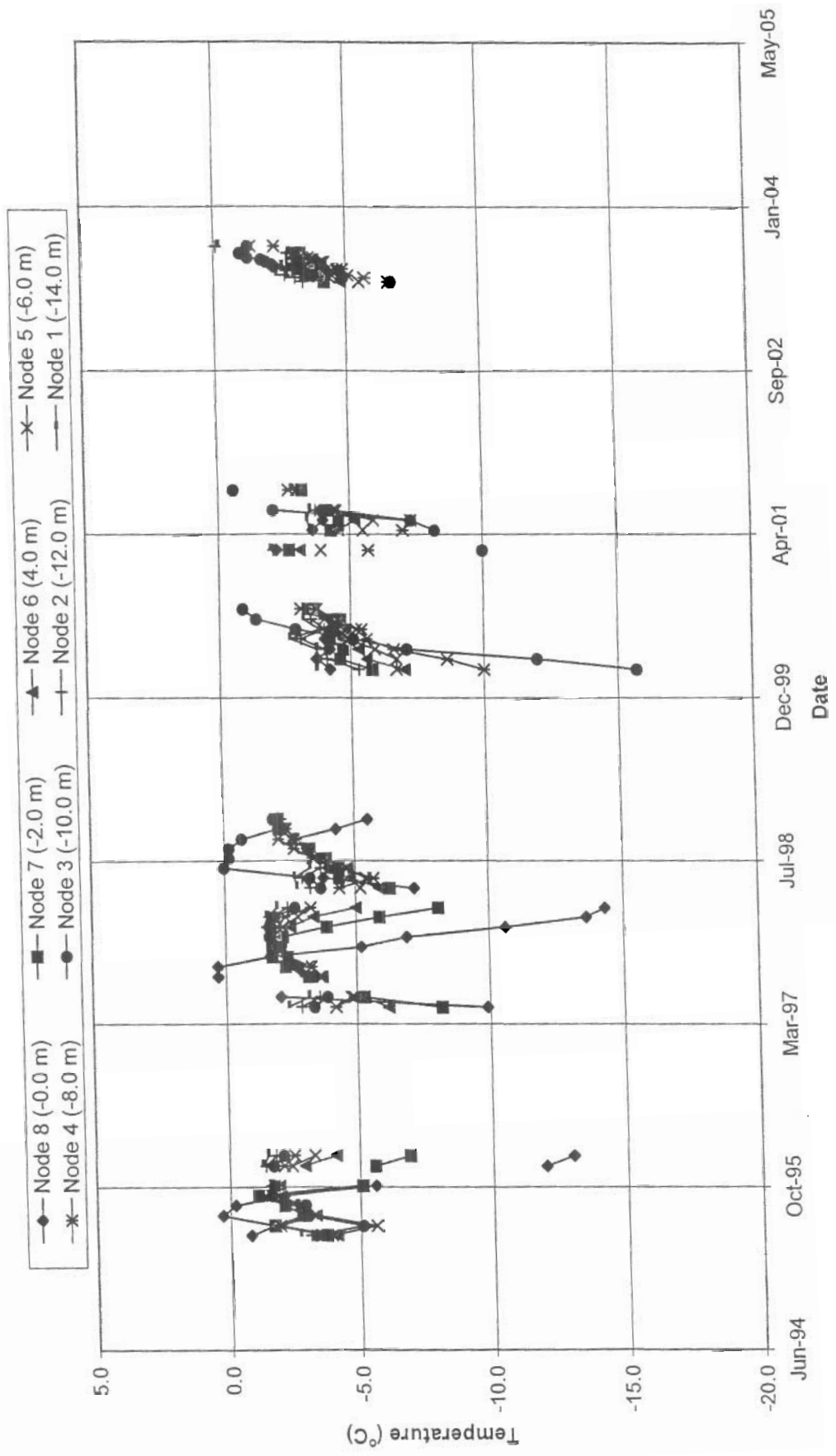
Note : Depth of thermocouple points is not the same
as what is indicated on borehole log (Tordon, 1997)

**Geothermal Monitoring
West Twin Dike
Thermocouple TC 15A**

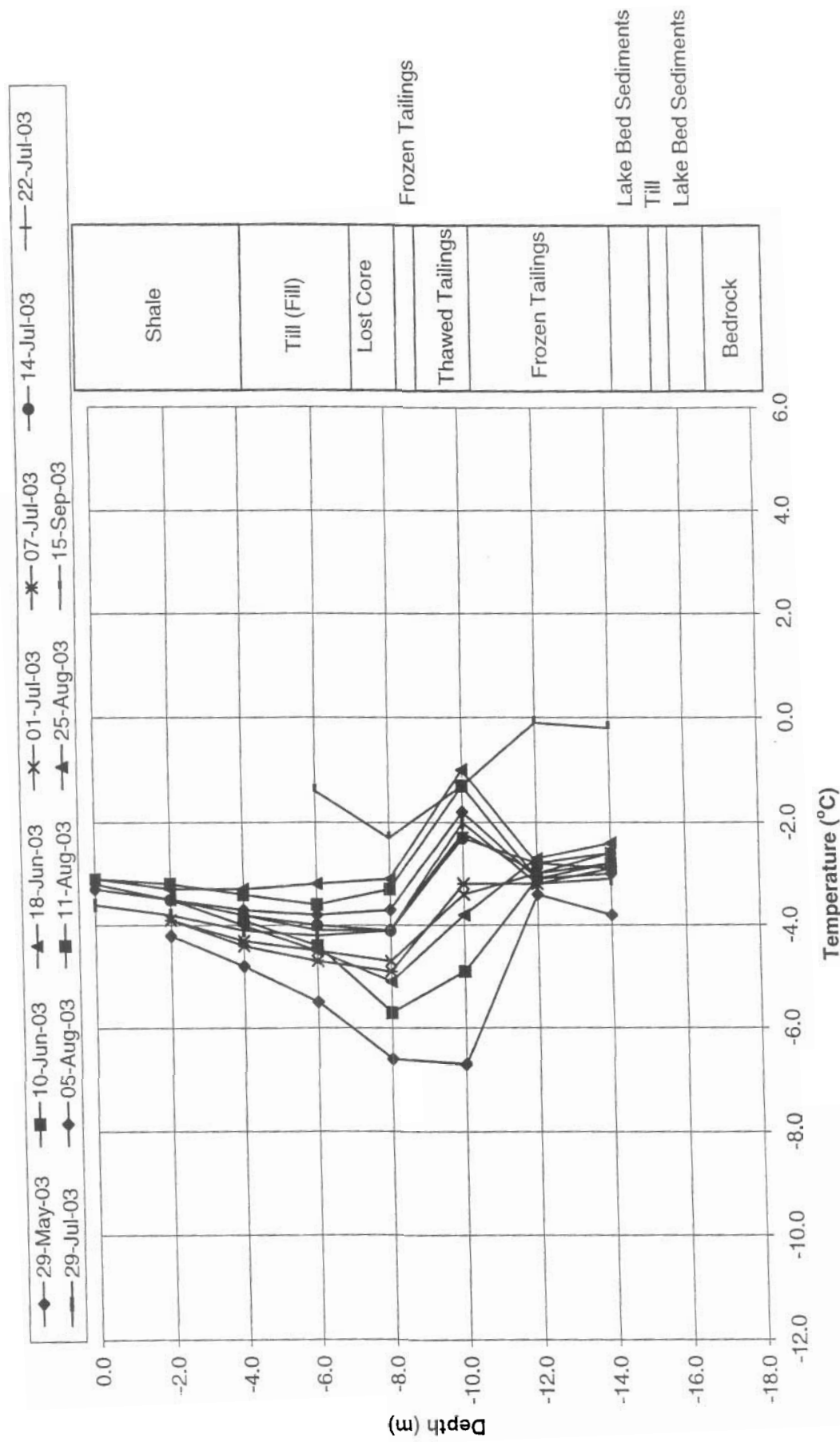


Thermocouple TC 16

Stn 03+75
North Dike
Elev. 376 m

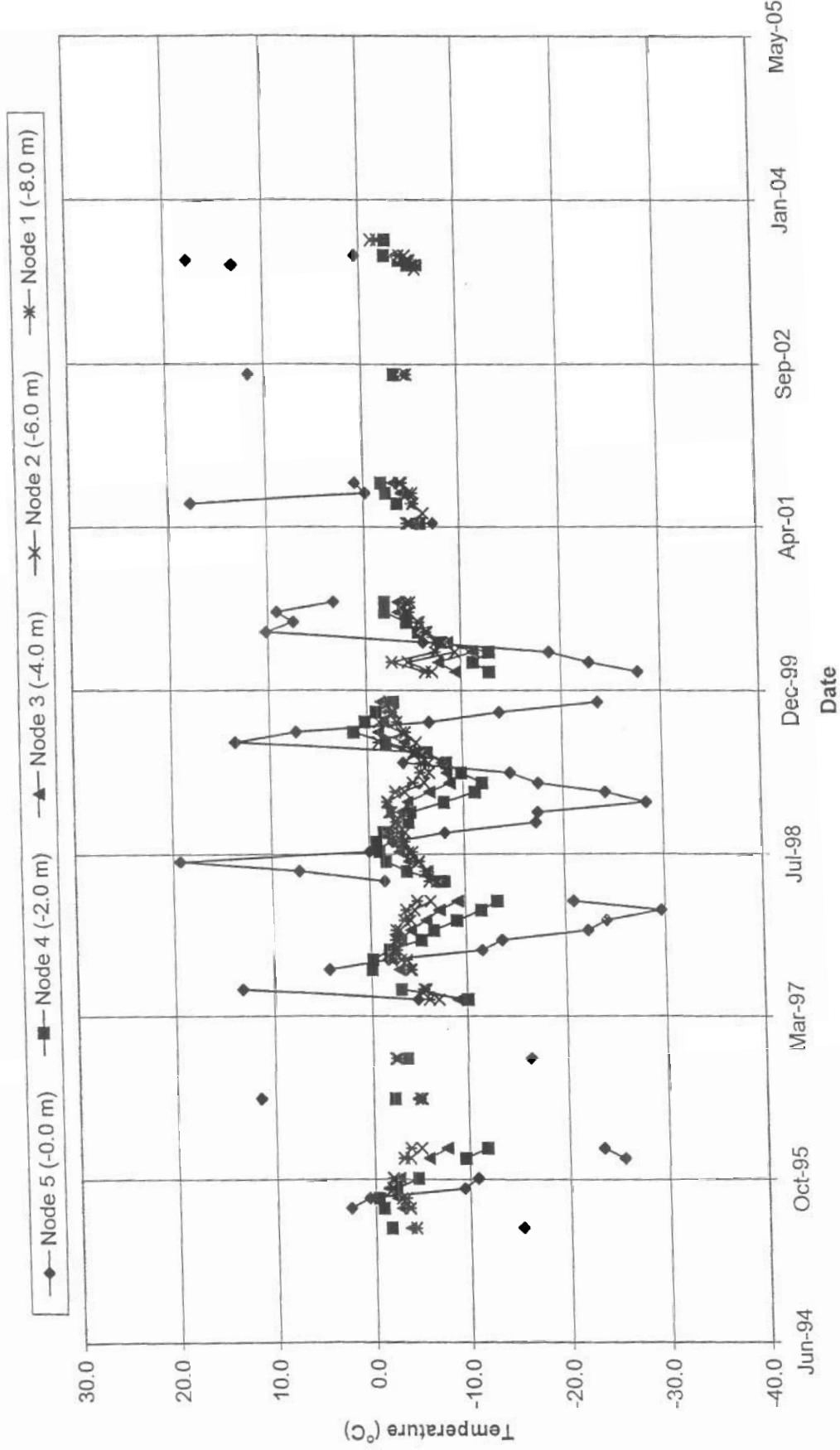


Geothermal Monitoring West Twin Dike Thermocouple TC 16



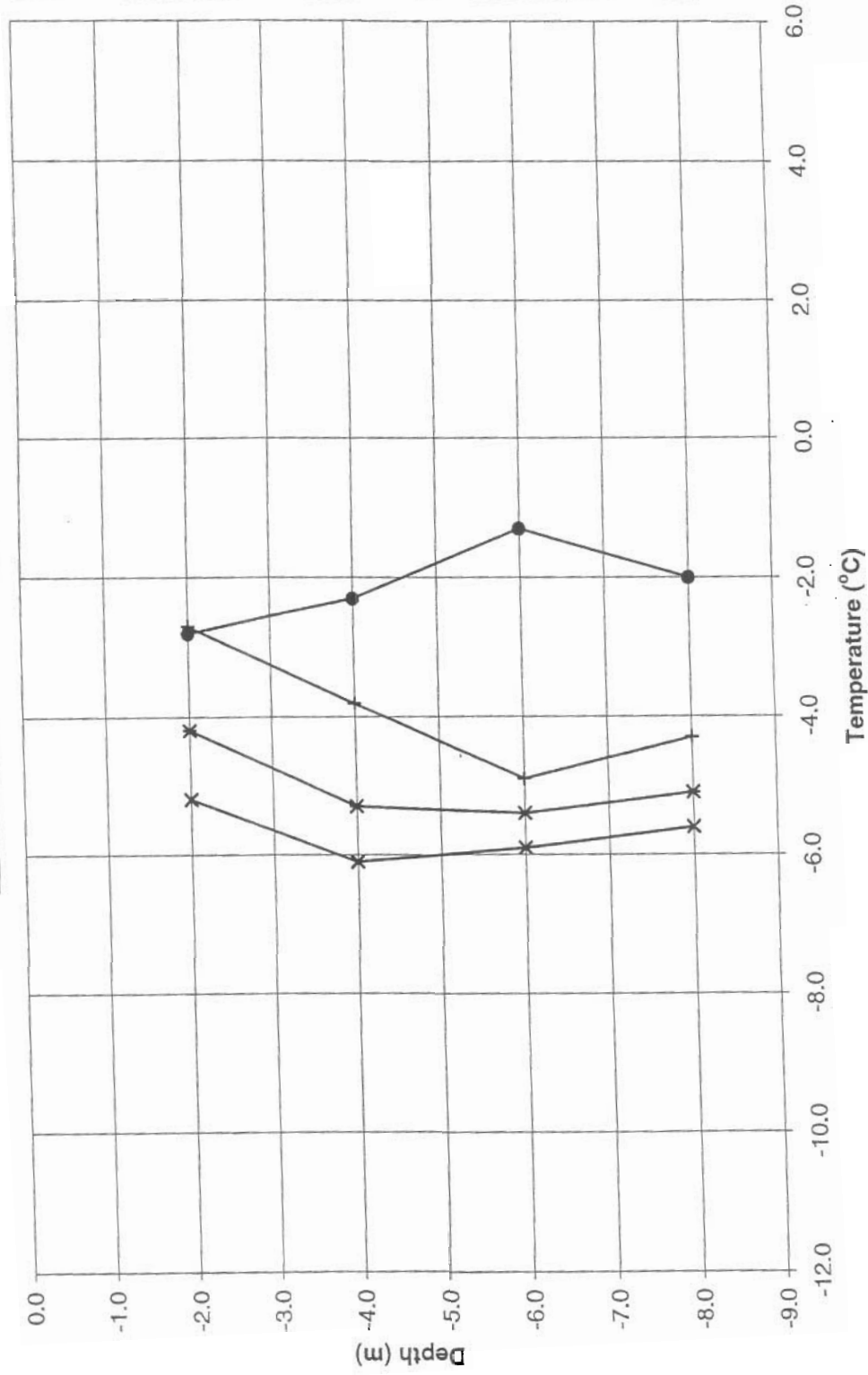
Thermocouple TC 17

Stn 04+25
North Dike
Elev. 376 m



**Geothermal Monitoring
 West Twin Dike
 Thermocouple TC 17**

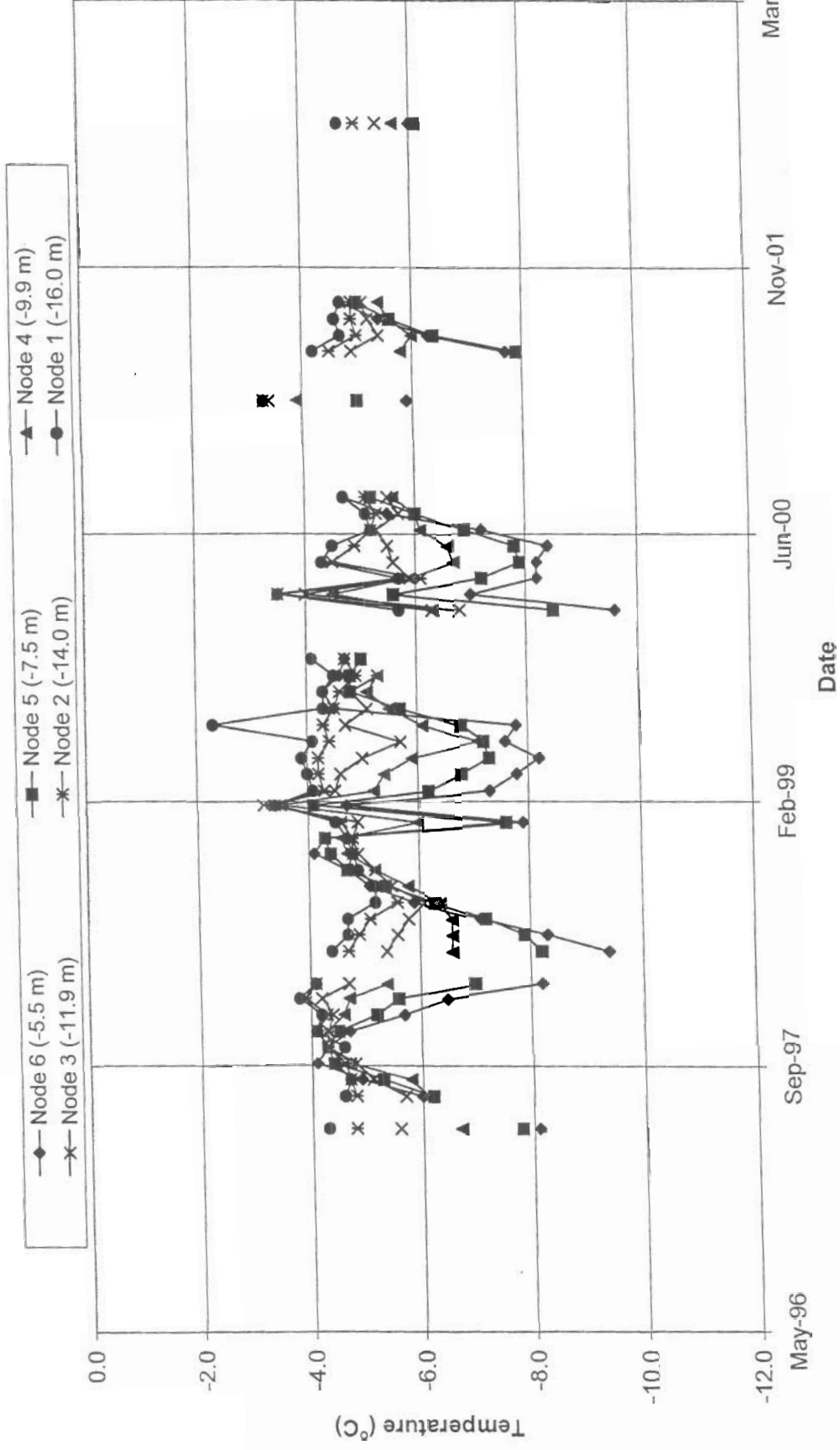
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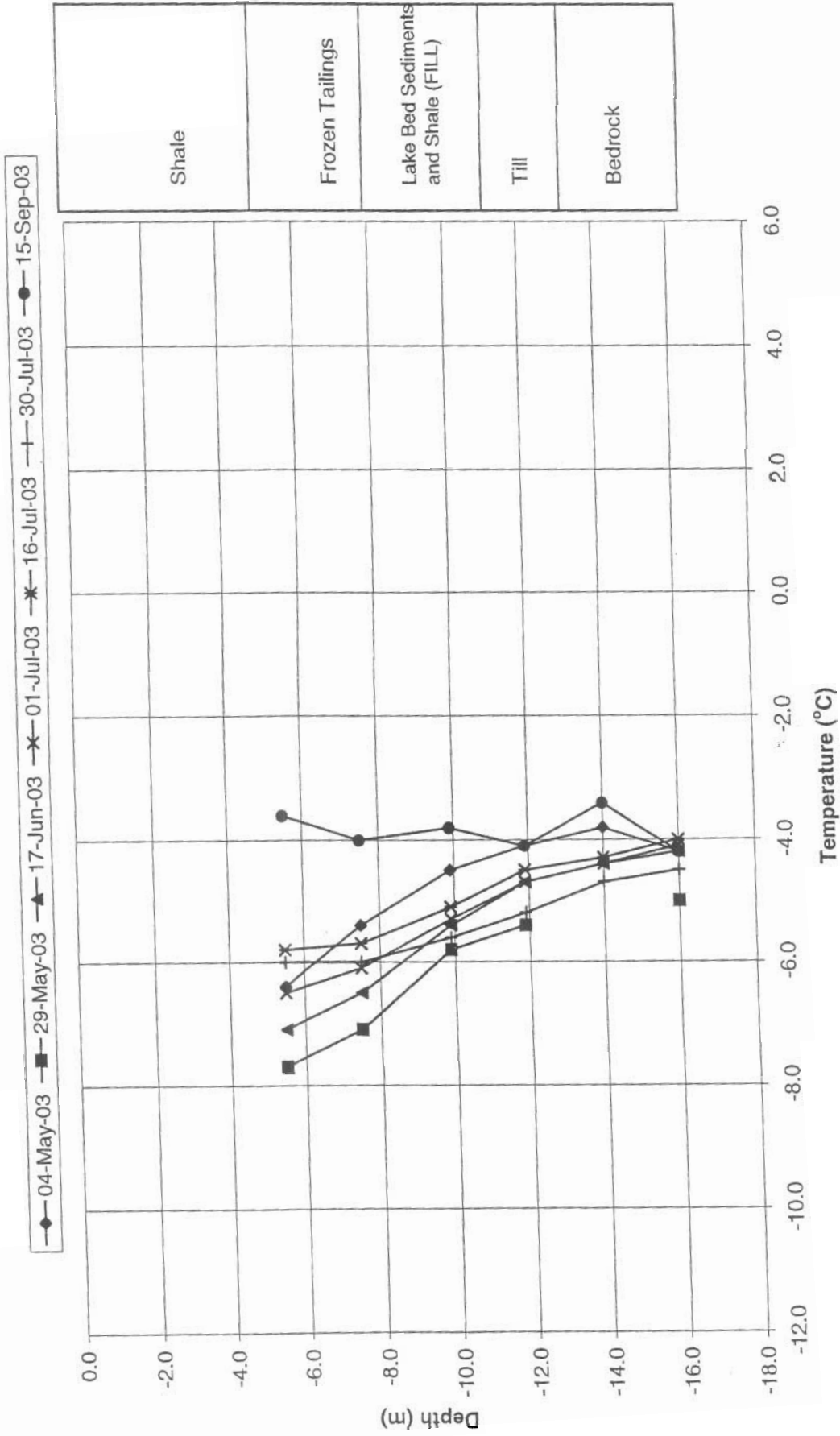
Shale
Frozen Tailings
Lake Bed Sediments and Shale (FILL)
Till
Bedrock

Thermocouple TC 17A

Stn. 04+50
North Dike
Elev. 376 m

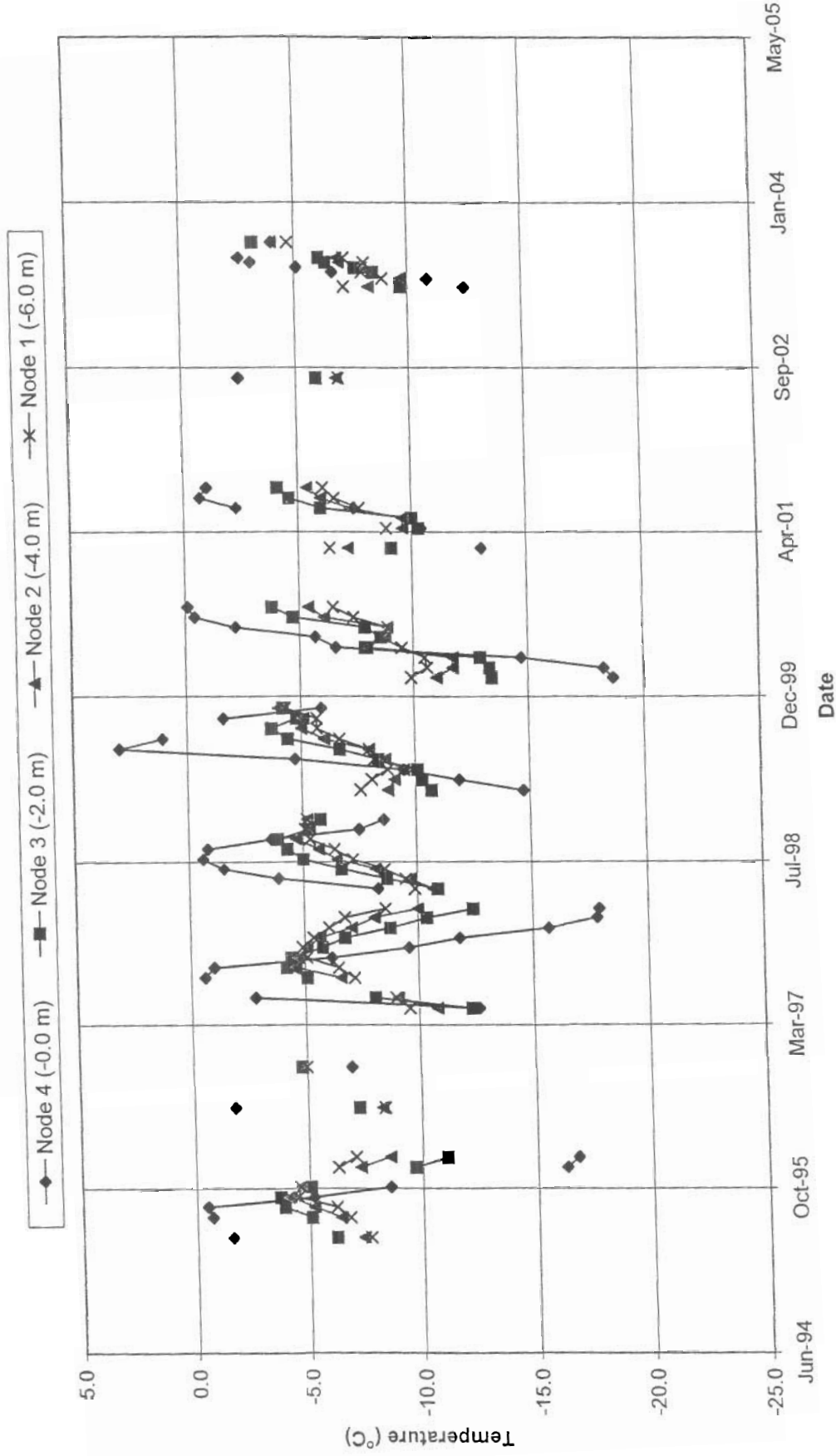


Geothermal Monitoring
West Twin Dike
Thermocouple TC 17A

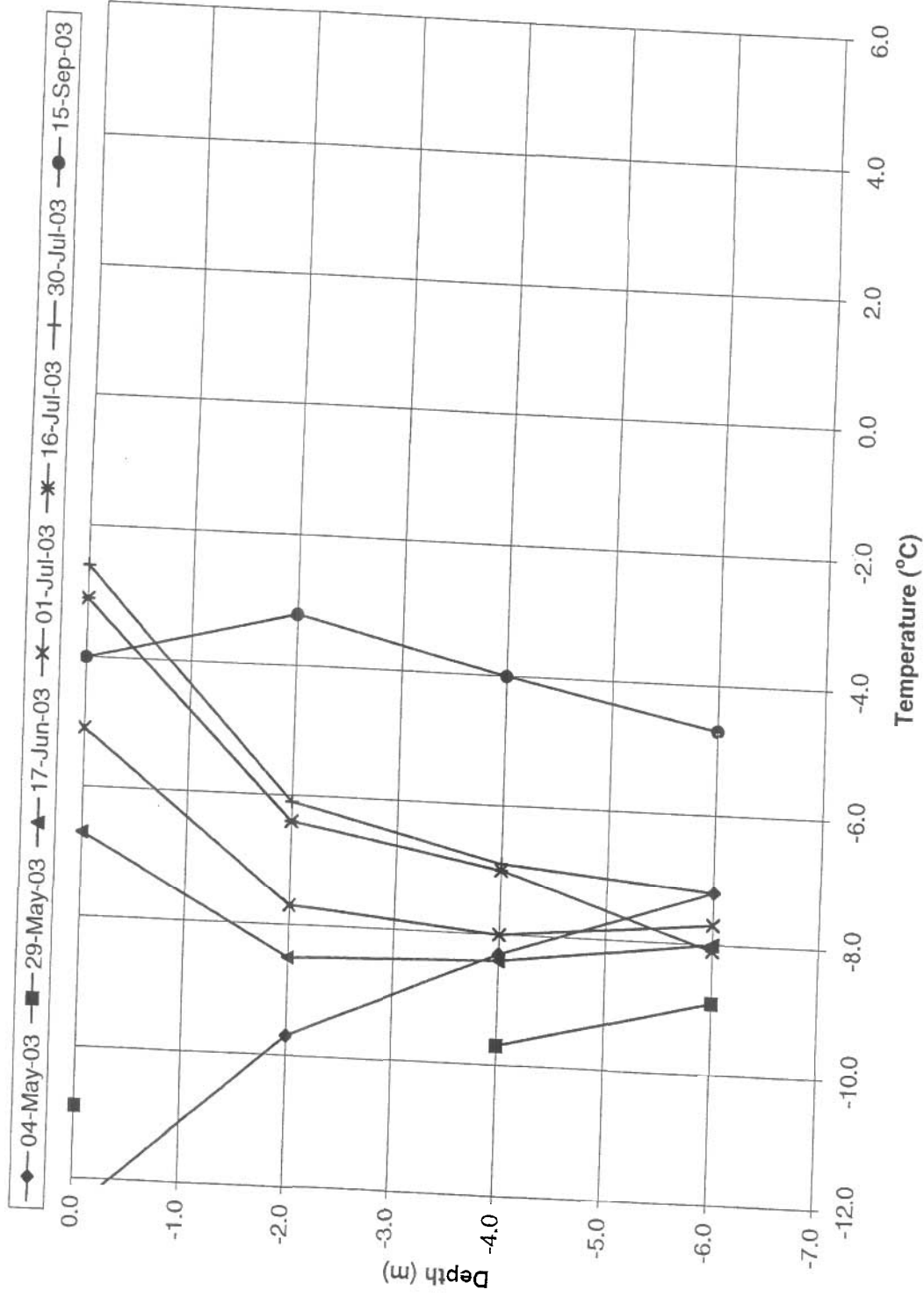


Thermocouple TC 18

Sfn. 04+75
North Dike
Elev. 376 m

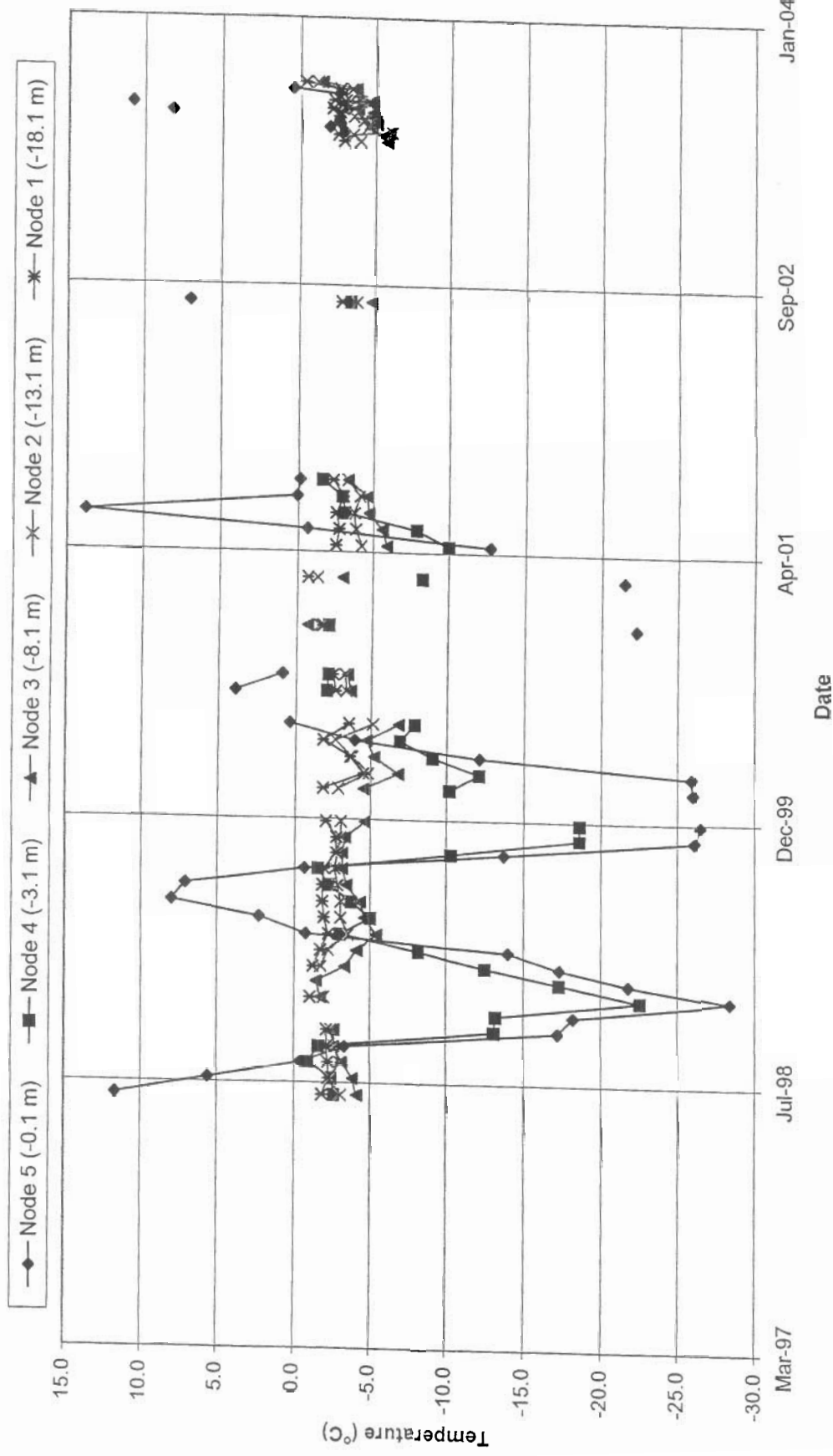


Geothermal Monitoring
West Twin Dike
Thermocouple TC 18

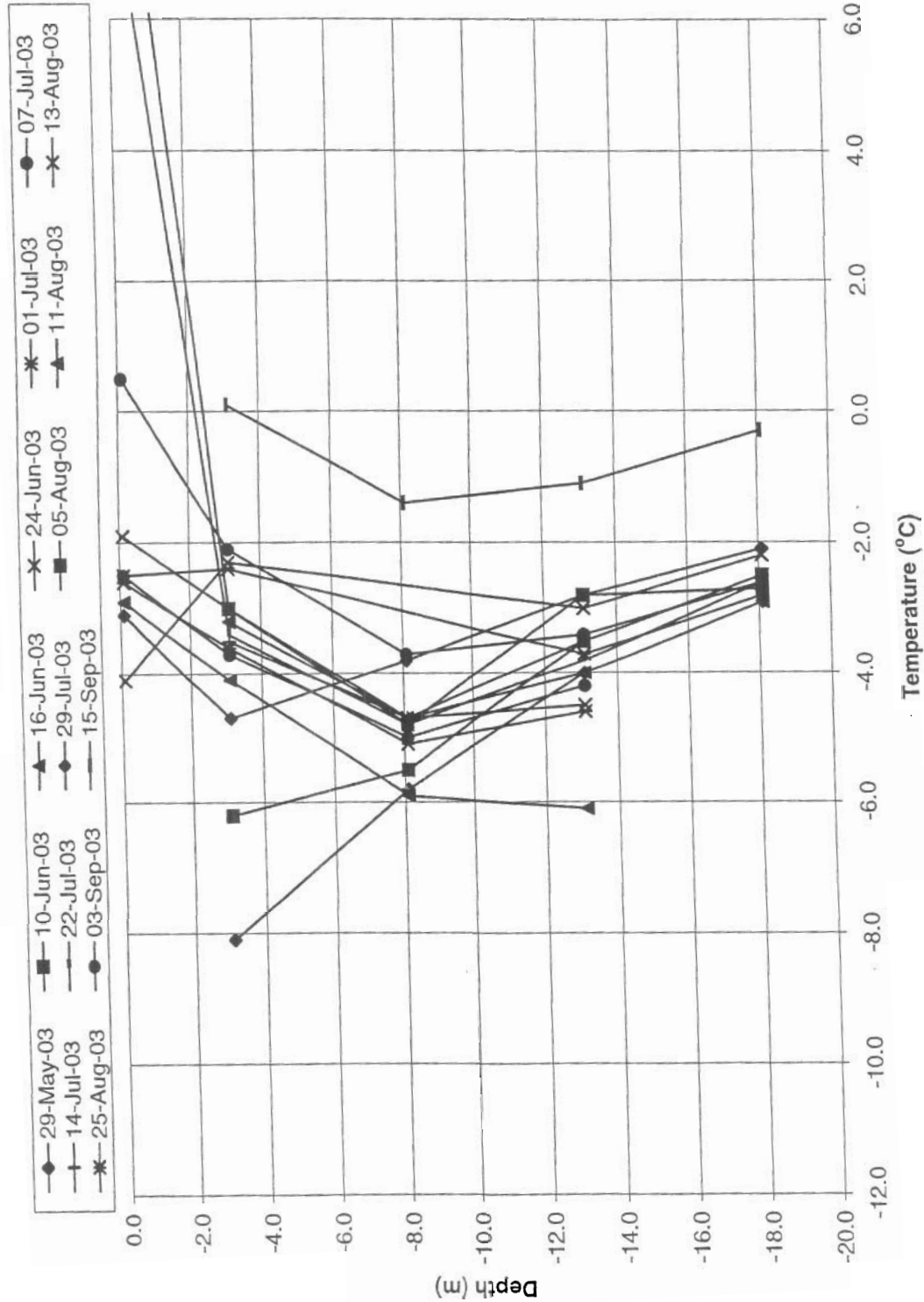


Thermocouple TC 28

Stn 02+25
South Dike
Elev. 384 m

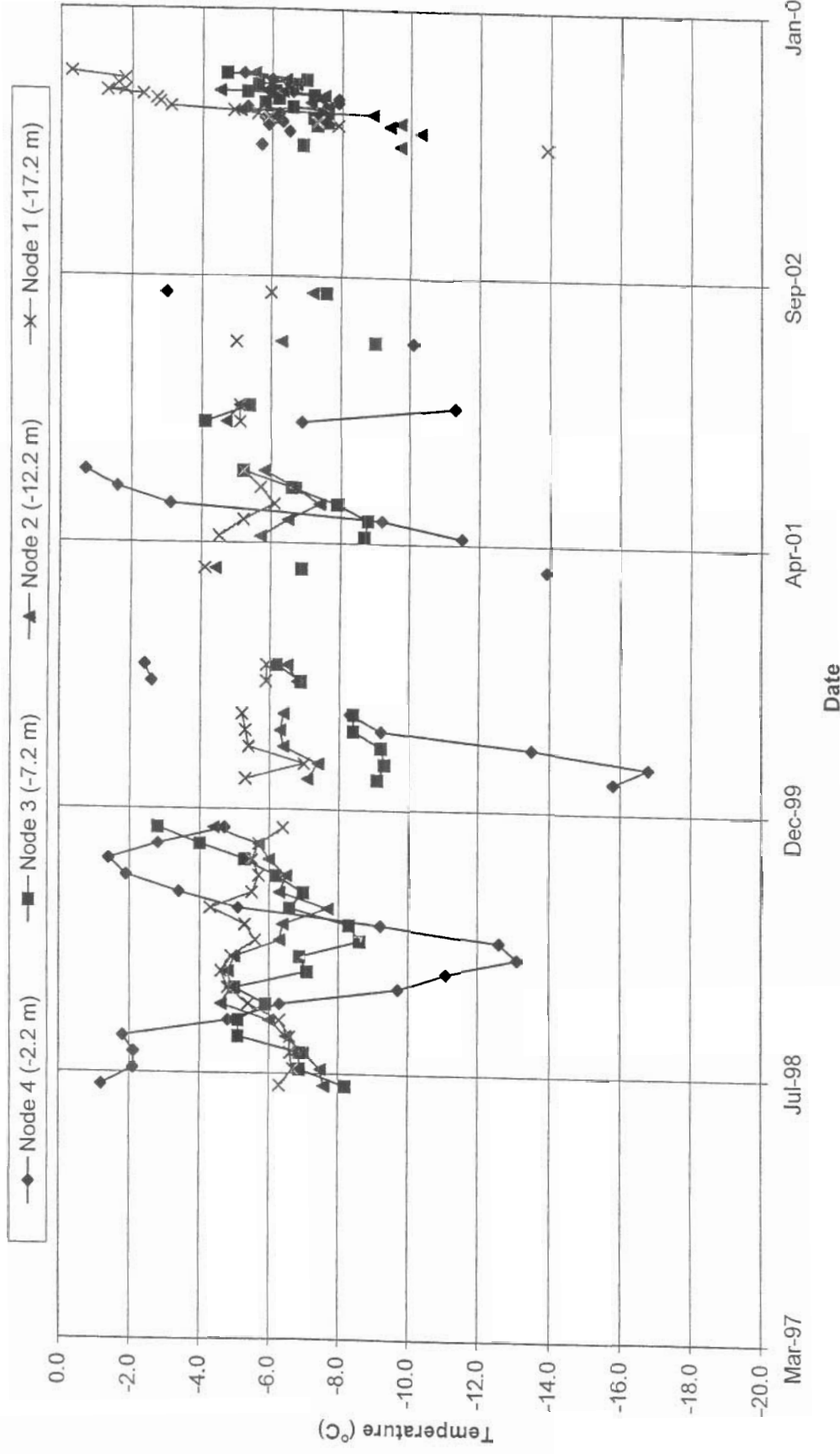


Geothermal Monitoring West Twin Dike Thermocouple TC 28

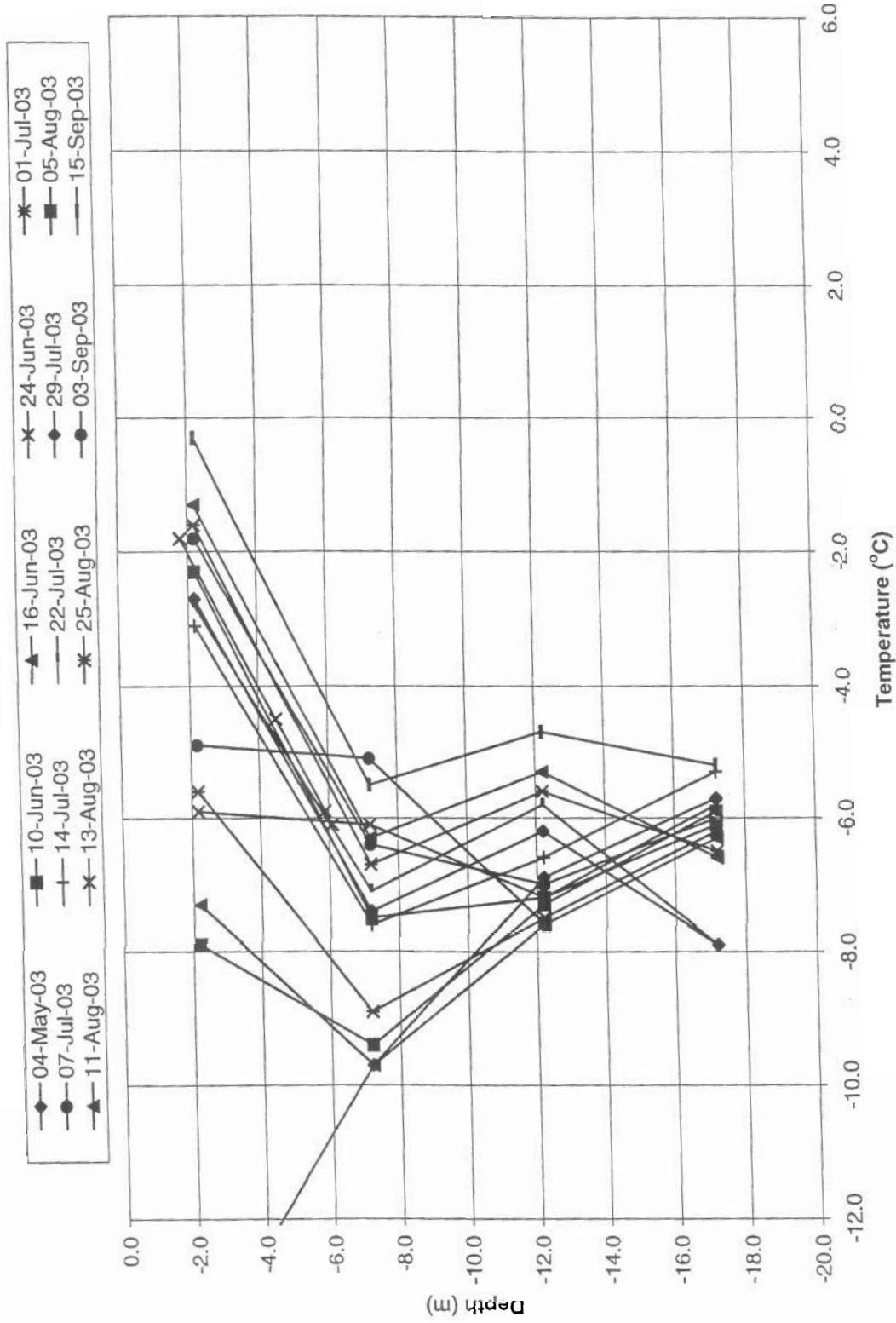


Thermocouple TC 29

Stn. 04+50
North Dike
Elev. 385 m

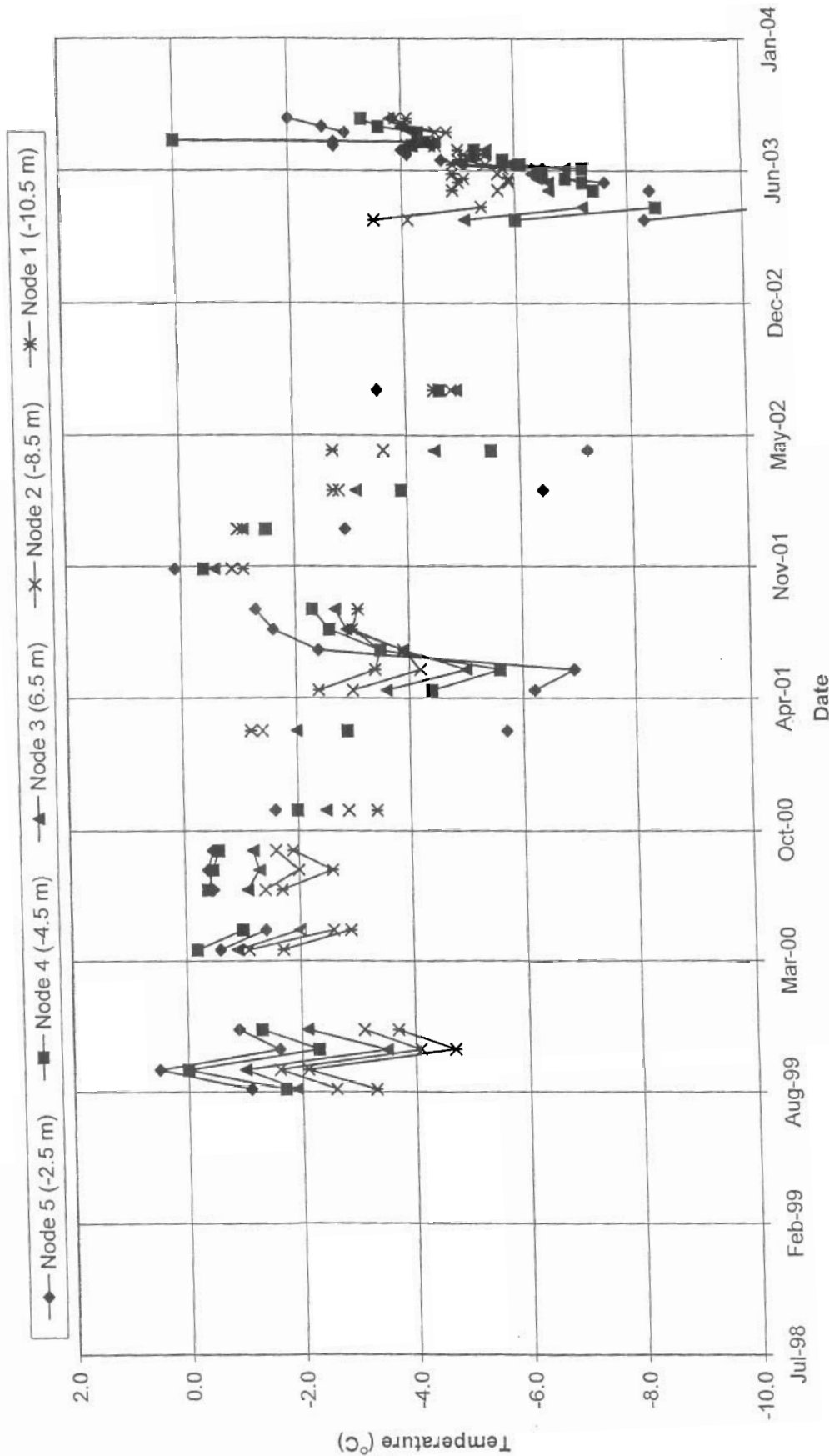


Geothermal Monitoring West Twin Dike Thermocouple TC 29

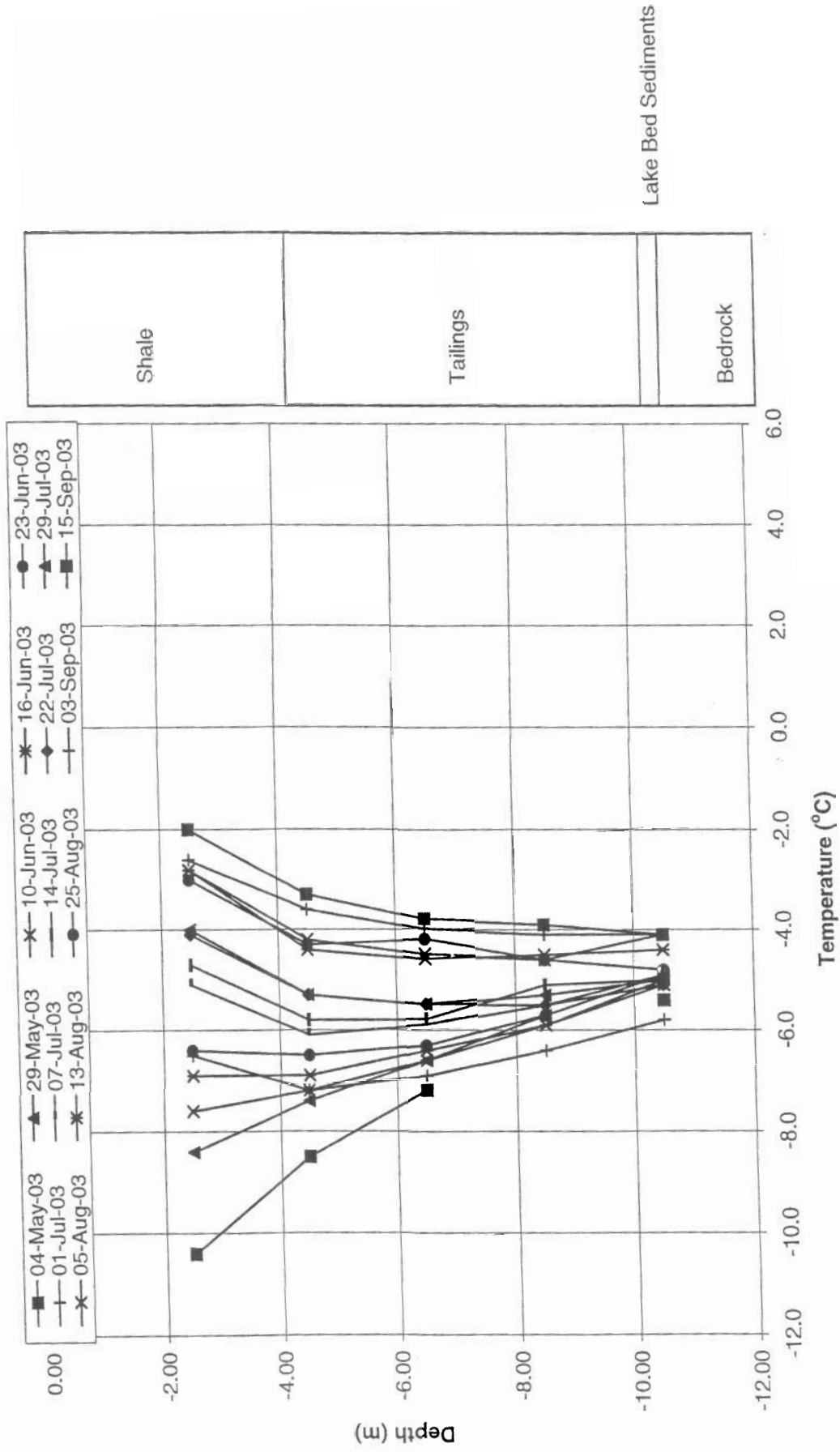


Thermocouple TC 31

Stn. 01+50
South Dike
Elev. 378 m



Geothermal Monitoring West Twin Dike Thermocouple TC 31

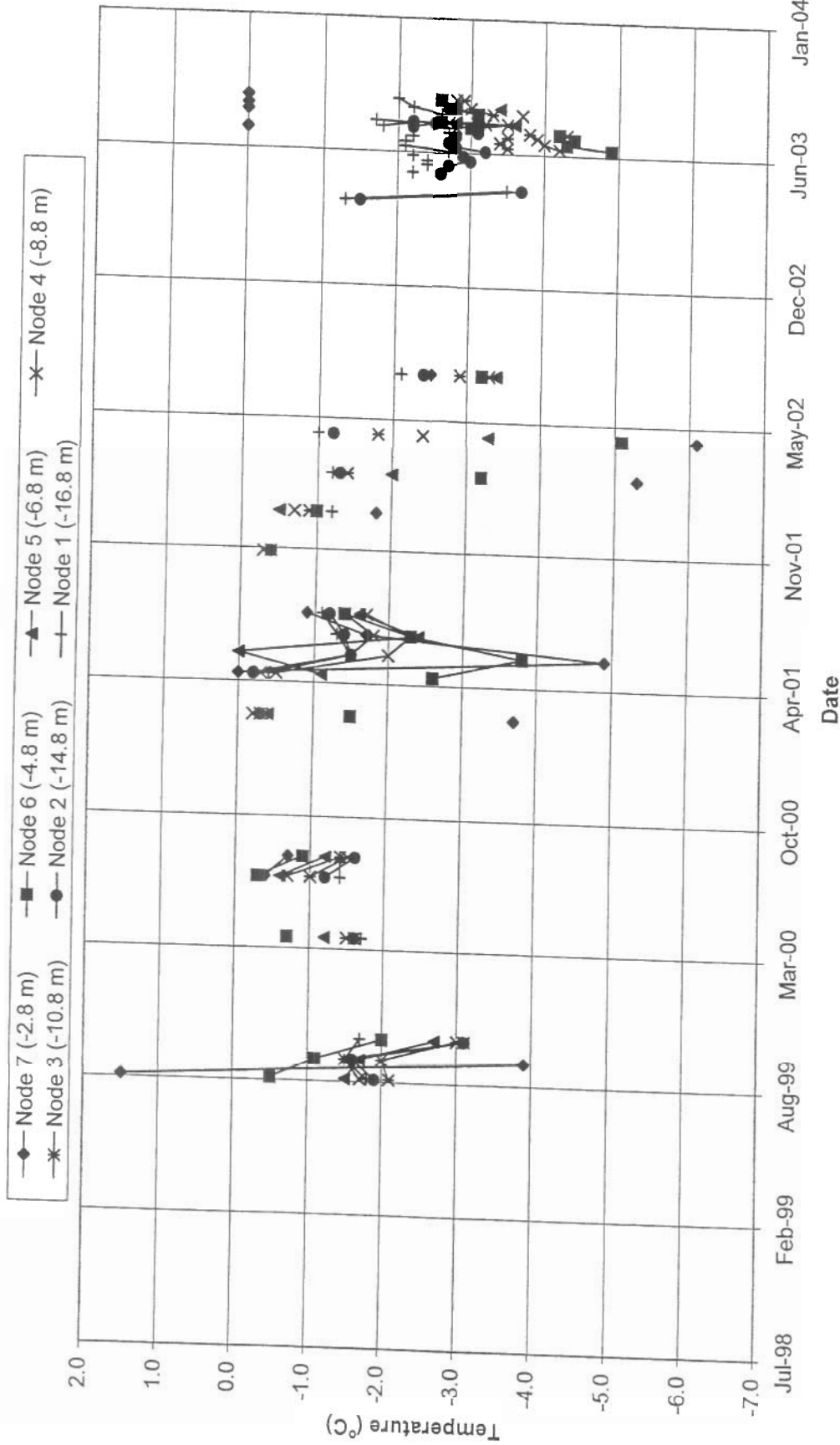


Thermocouple TC 32

Stn. 01+50

South Dike

Elev. 382 m

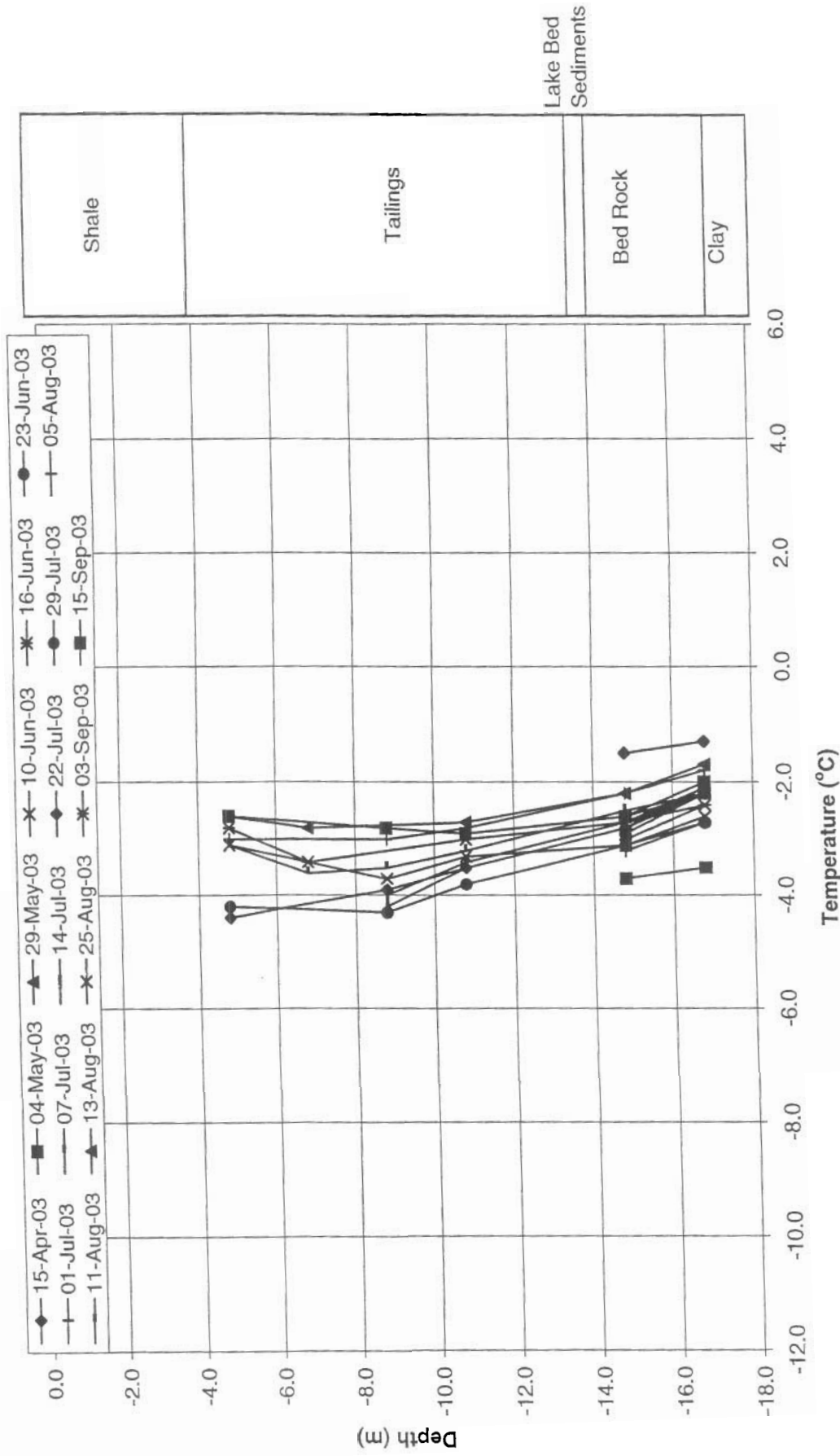


Nanisivik Thermocouple long term data
TC32 chart

BGC ENGINEERING INC.

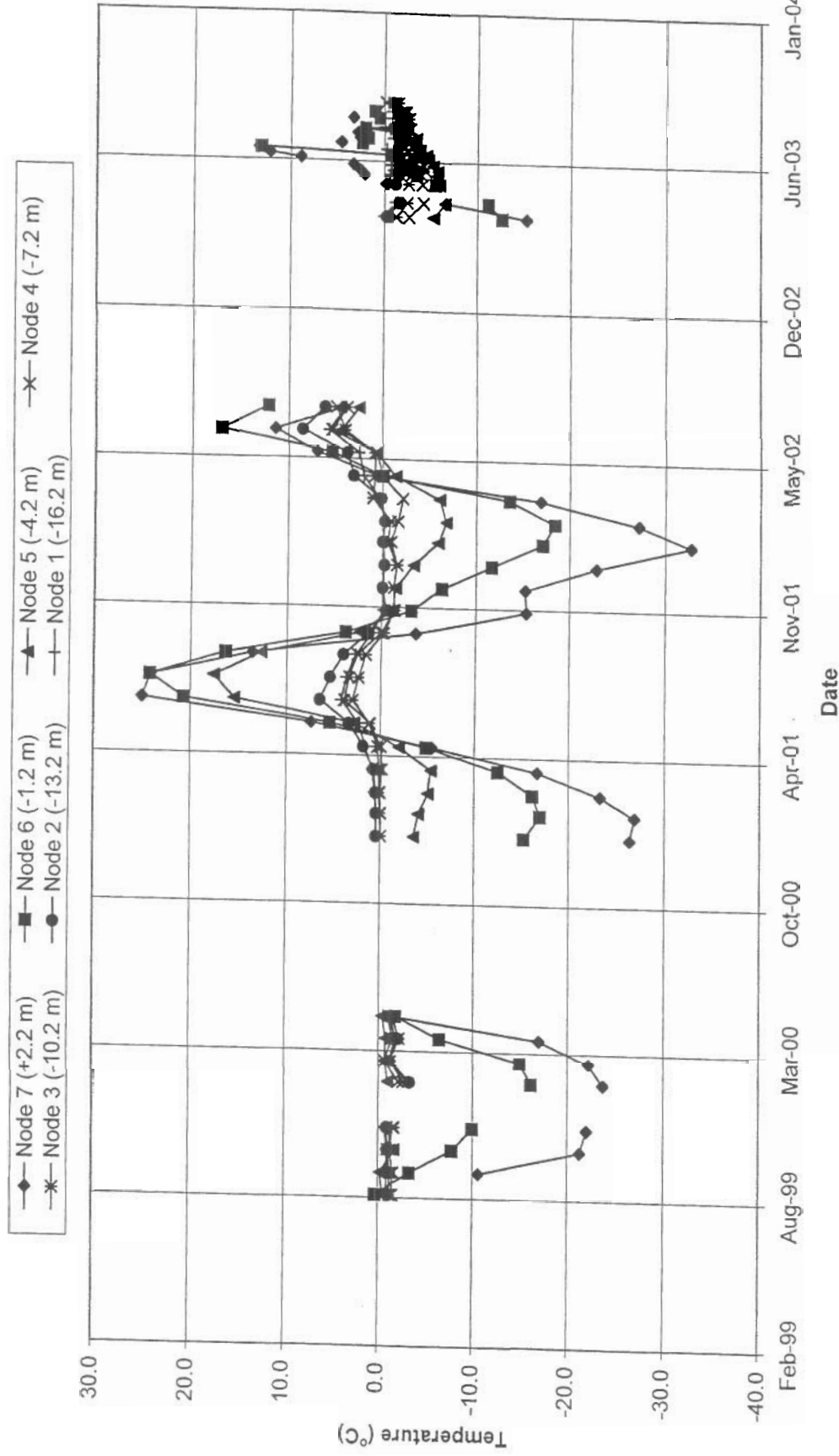
*Note - Data in 2000 and 2001 collected with data logger.
Unknown if data is corrected or uncorrected.

Geothermal Monitoring West Twin Dike Thermocouple TC 32



Thermocouple TC 33

Stn. 01+50
South Dike
Elev. 386 m

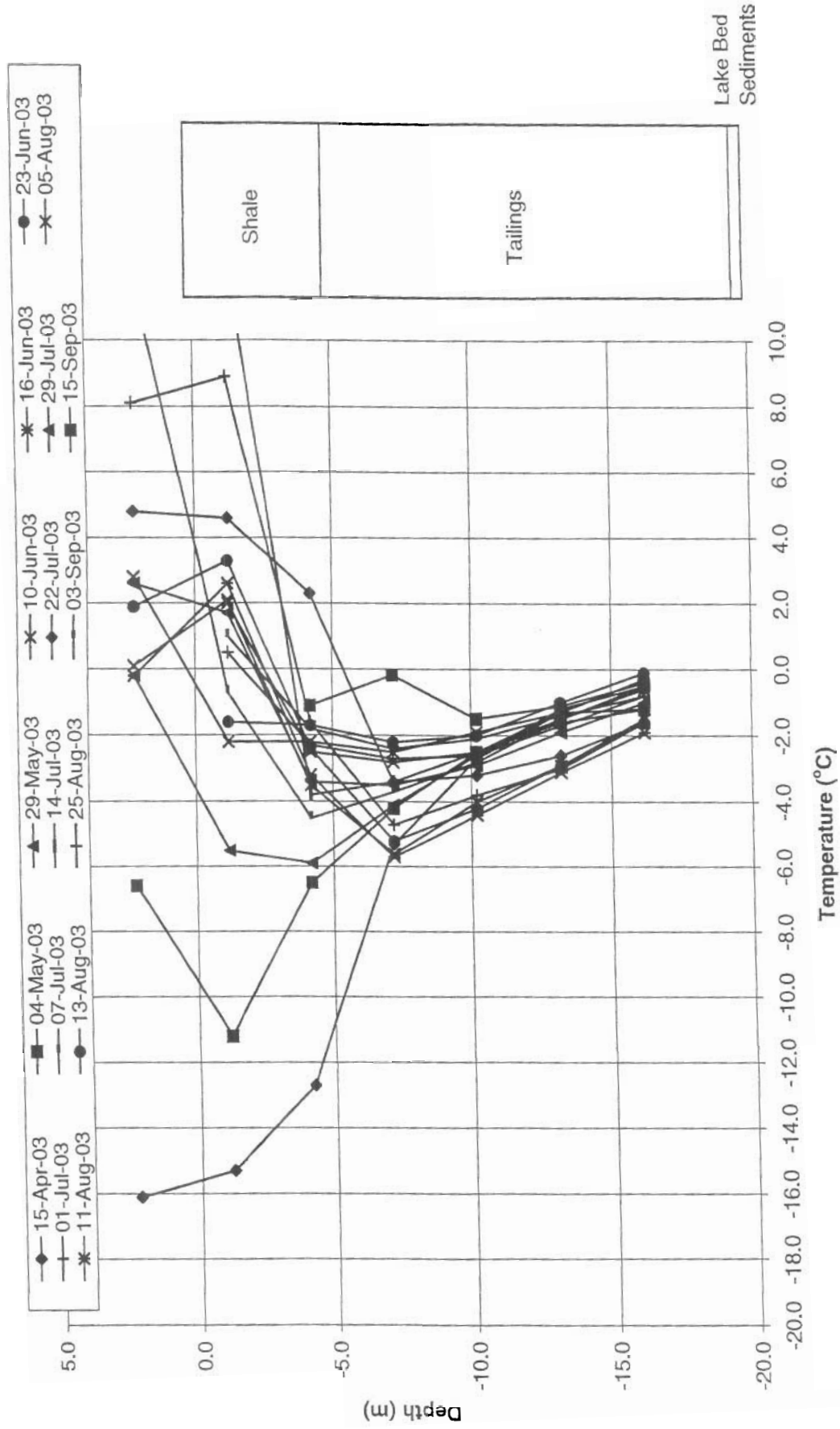


Nanisivik Thermocouple long term data
TC33 chrt

BGC ENGINEERING INC.

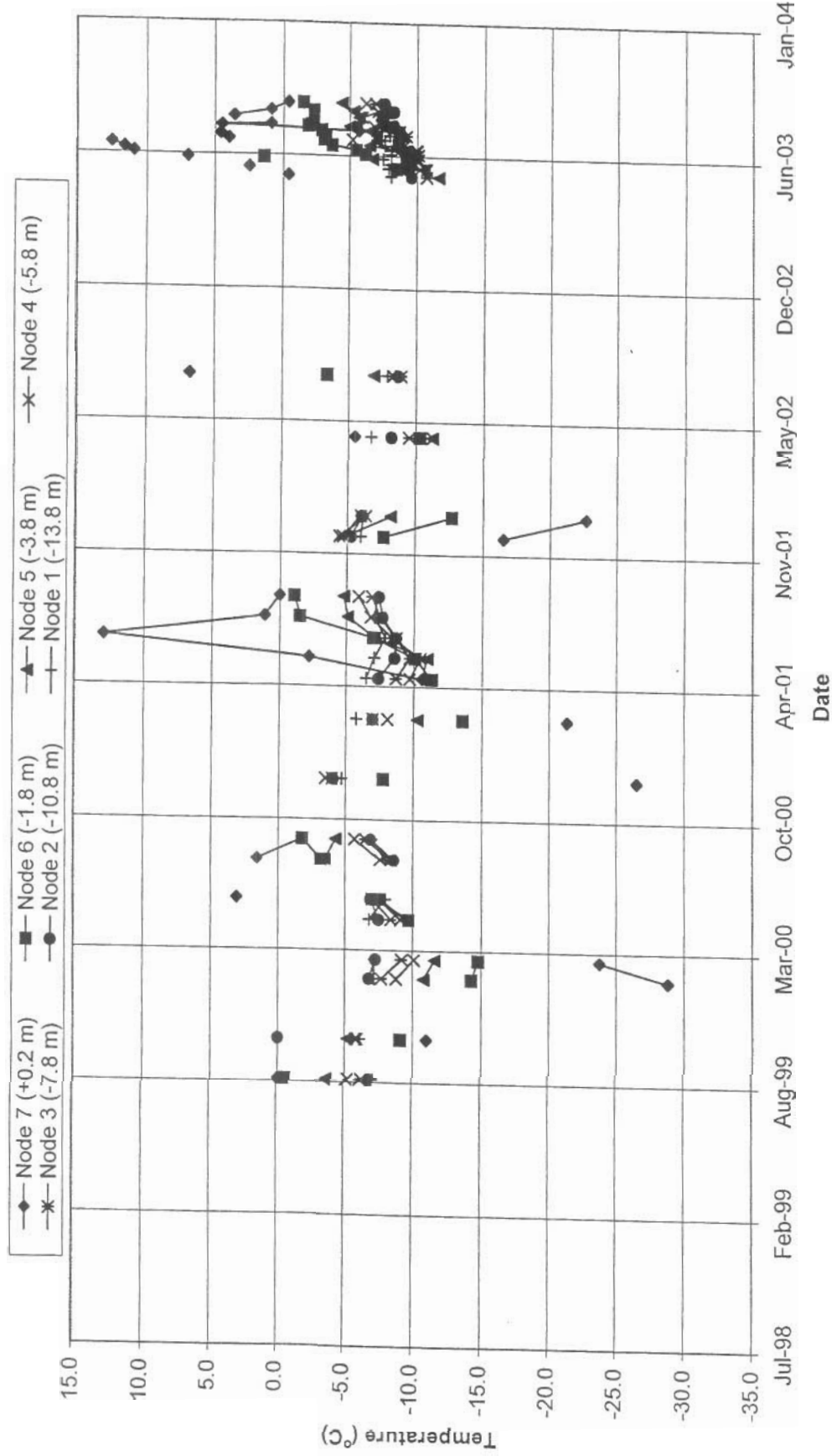
Note - Data in 2000 and 2001 collected with data logger.
Unknown if data is correct or uncorrected.

Geothermal Monitoring West Twin Dike Thermocouple TC 33

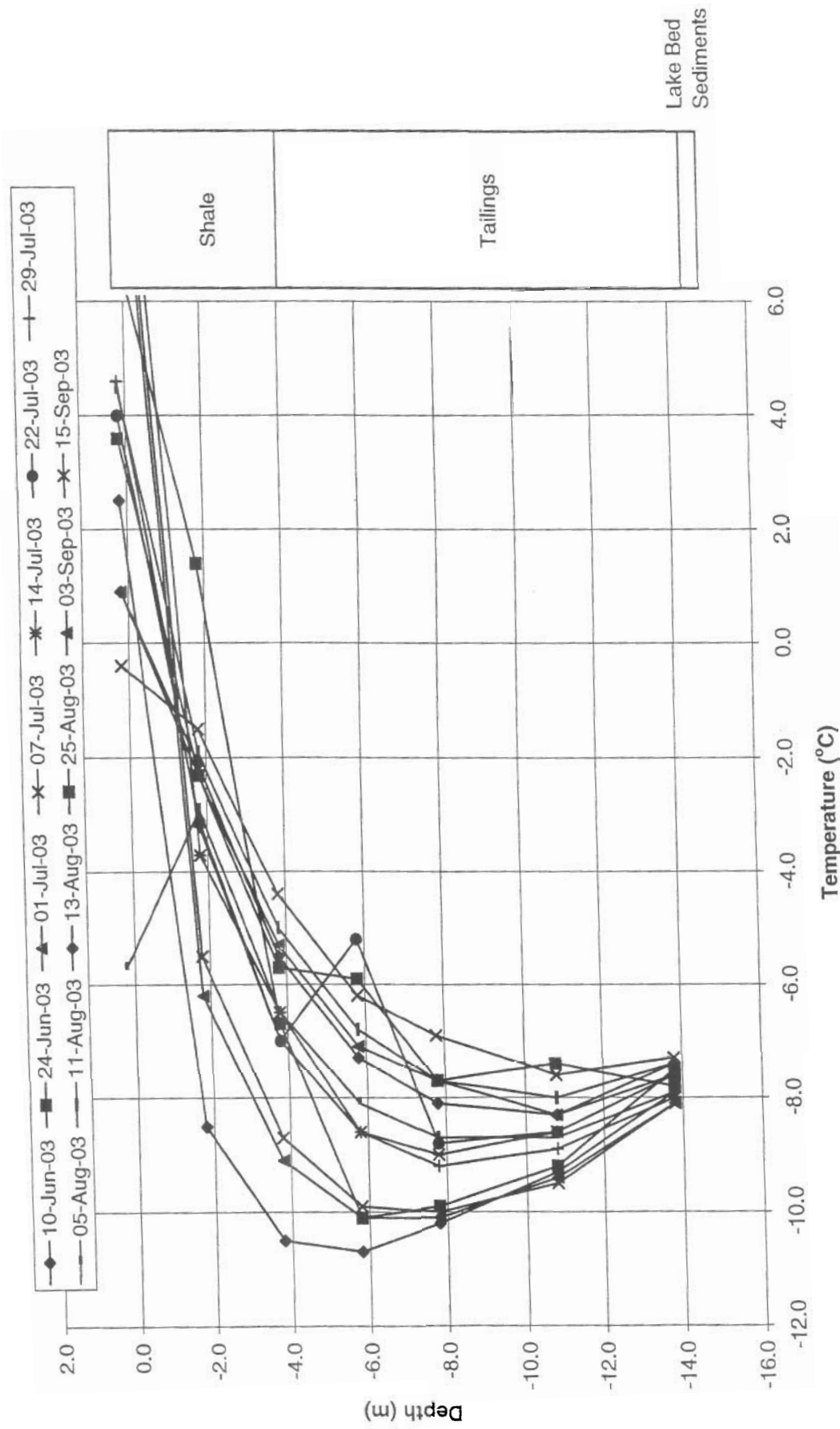


Thermocouple TC 34

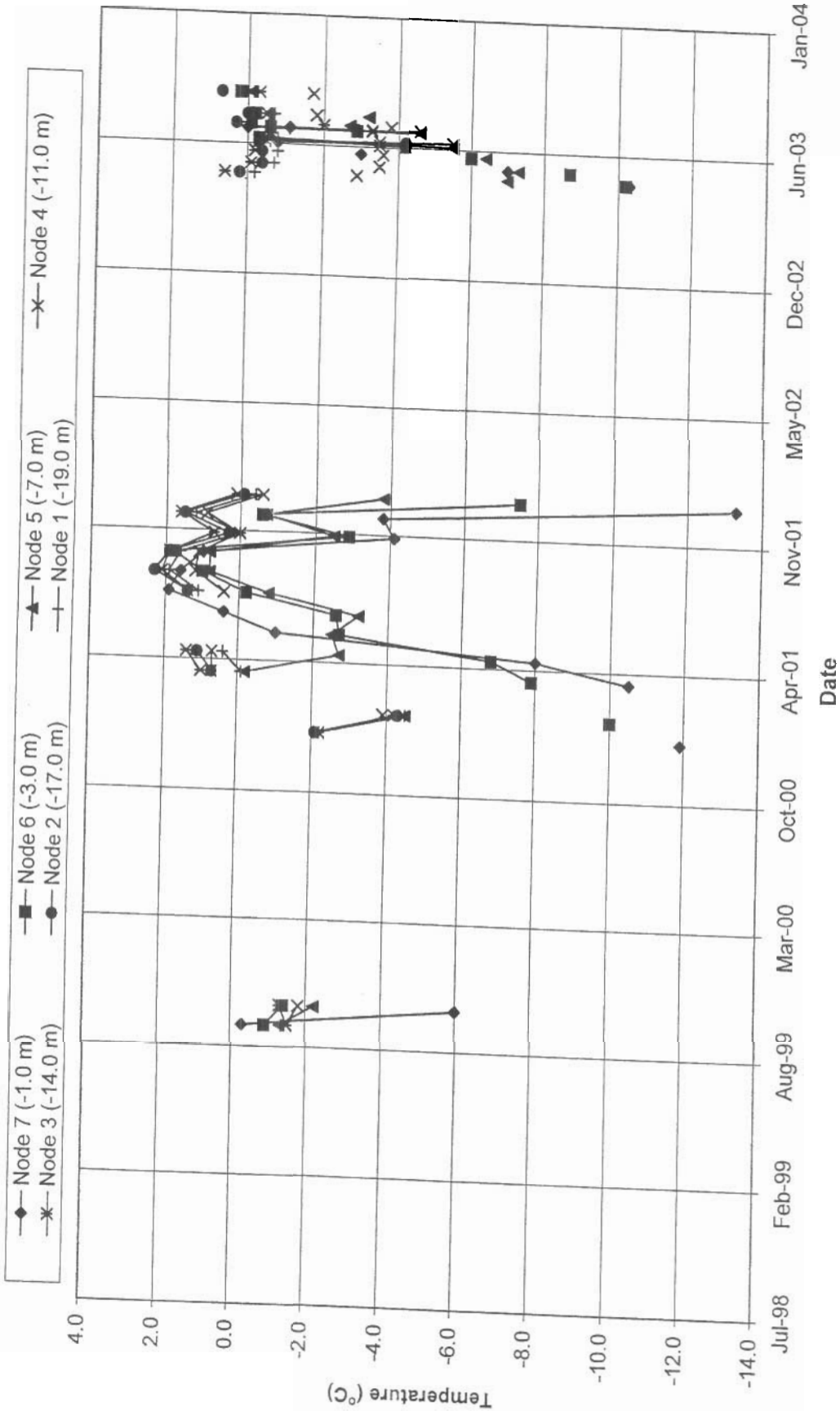
Stn. 04+75
North Dike
Elev. 385 m



Geothermal Monitoring West Twin Dike Thermocouple TC 34



Thermocouple TC 35
Surface Cell
Elev. 388 m

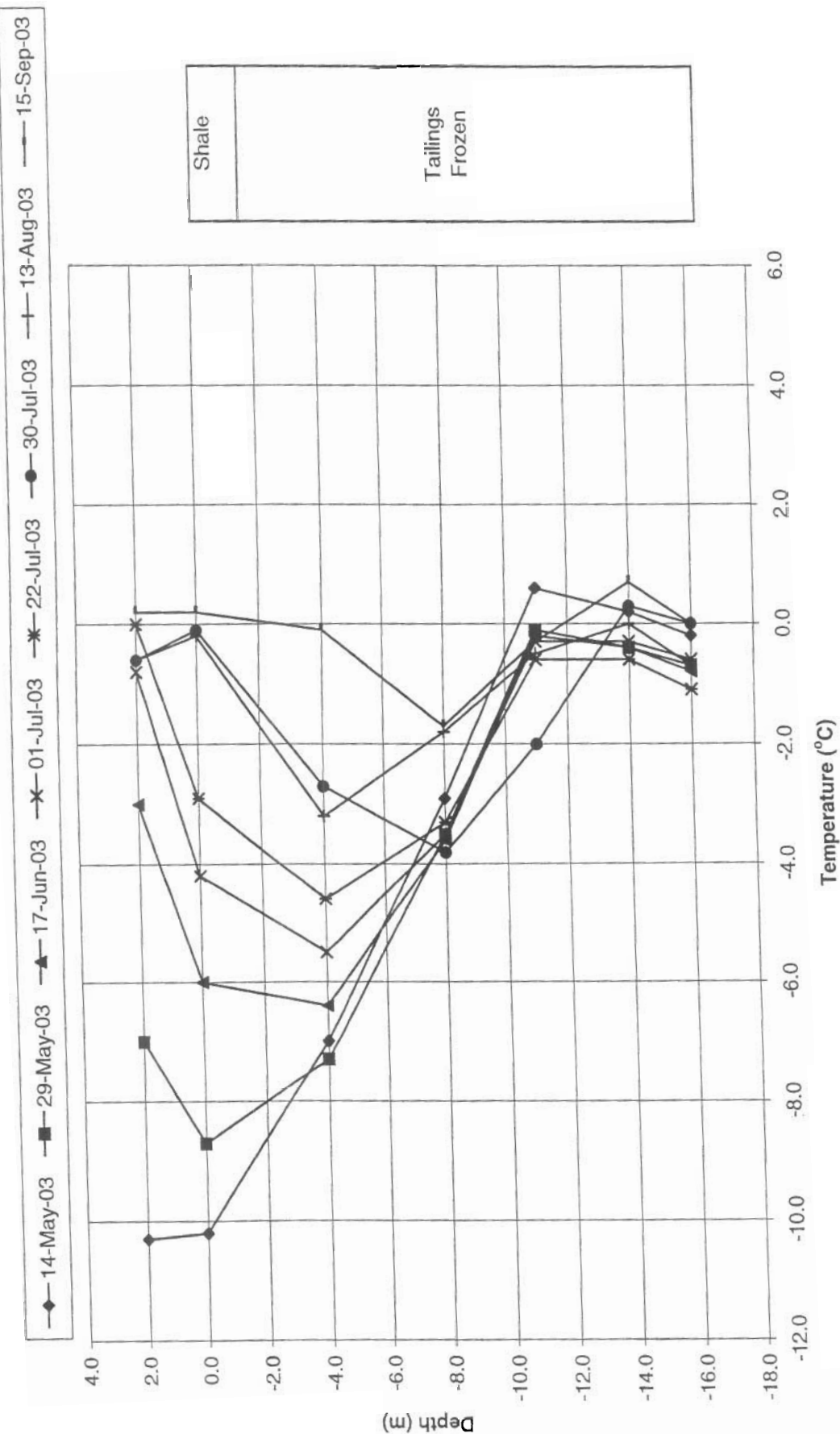


Nanisivik Thermocouple long term data
TC35 chrt

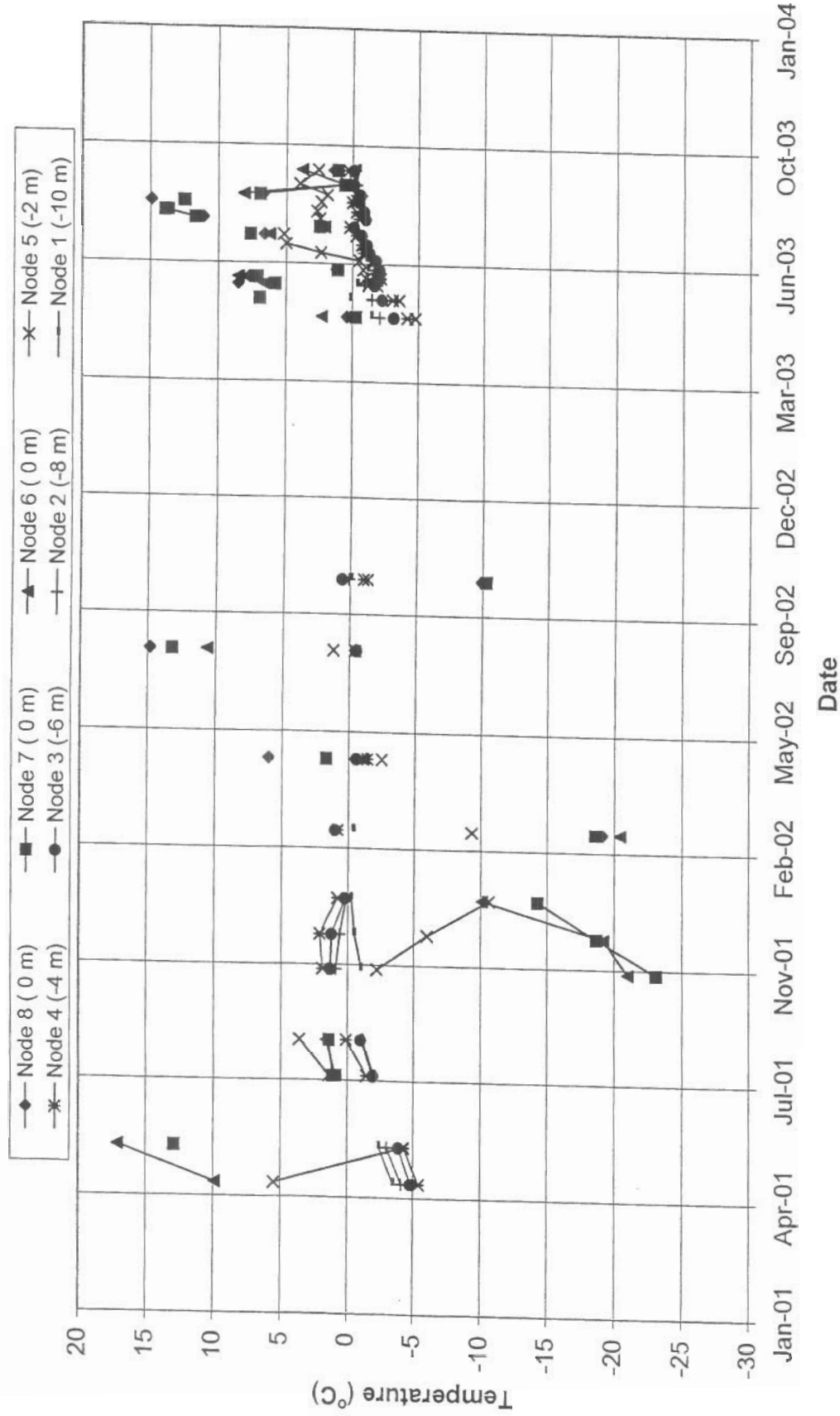
BGC ENGINEERING INC.

*Note: Data in 2000 and 2001 collected with data logger.
Unknown if data is corrected or uncorrected.

Geothermal Monitoring West Twin Dike Thermocouple TC 35



Thermocouple TC 36
Test Cell Dike
Elev. 376 m



Nanisivik Thermocouple long term data
TC36 chrt

BGC ENGINEERING INC.

Geothermal Monitoring Test Cell Dike Thermocouple TC 36

