

## **APPENDIX 14**

# **GEOTECHNICAL INSPECTION OF GARROW LAKE DAM**

# *EBA Engineering Consultants Ltd.*

Creating and Delivering Better Solutions

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November 5, 2003

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Teck Cominco Ltd.  
Little Cornwallis Island  
Polaris, NU  
X0A 0Y0

Attention: Mr. Bruce Donald

**Subject: Garrow Lake Dam  
2003 Annual Assessment  
Polaris, Nunavut**

## **1.0 GENERAL**

EBA Engineering Consultants Ltd. (EBA) observed the Garrow Lake Dam at the Polaris Mine, Little Cornwallis Island, Nunavut on August 20, 2002. The Polaris Mine and Garrow Lake Dam are owned and operated by Teck Cominco Ltd. (Teck Cominco). EBA's site representative for the 2003 dam assessment was Mr. Mark Watson, P.Eng.

The dam was constructed in the winters of 1990 and 1991. Details of the dam construction are discussed in EBA's 1991 report "As-Built Report for Garrow Lake Dam". The dam has previously been inspected by EBA in 1993, 1994, 1996, 1998, 2000 and 2002.

The 2003 dam assessment consisted of the following activities:

- Assessment of any existing seepage, instability or settlement;
- Observation of siphon discharge practices;
- Observation of limited portions of the reservoir shoreline immediately to the north of the dam abutments;
- Review of 2002 and 2003 ground temperature data; and
- Review of the 2002 and 2003 reservoir water level data.

John Knapp of Teck Cominco accompanied EBA during the 2003 dam inspection.

Information provided during Mr. Watson's site visit included:

- Reservoir level data and siphon discharge rate information
- Ground temperature data

Since EBA's 2002 visit, there have been no earthworks on the dam.

Mine operations at Polaris ceased at the end of August 2002. Water levels in the reservoir are presently being lowered in preparation for the 2004 decommissioning of the dam. Previous recommendations by EBA, for the decommissioning of the dam were provided in EBA's 2001 report "Garrow Lake Dam Decommissioning – Polaris Mine Operations, Nunavut".

## **2.0 GROUND TEMPERATURES**

Ground temperature measurements were recorded on a monthly basis in 2002/03 by Teck Cominco's mine site personnel. Ground temperature profiles are shown in Figures 1, 3 and 5, and temperature variation over time is shown in Figures 2, 4, and 6. The ground temperatures have been relatively stable over the years with the exception of 1999 when ground temperatures warmed in response to unusually warm weather experienced at the Polaris Mine.

The general trend in the collected data since dam construction has historically been one of slight warming; however, the 2001 and 2002 data collected indicated that this trend attenuated. In 2003, the trend observed was that of slight warming of 0.1 to 0.2 C°. The temperatures remain consistently lower than predicted by the thermal analysis used to support the dam design.

## **3.0 RESERVOIR LEVEL**

The mill ceased drawing water out of Garrow Lake and ceased to deposit tailings in Garrow Lake at the end of August 2002. The present objective is to draw the water level down to original water level in preparation for decommissioning of the dam in 2004.

The reservoir elevation was 1006.55 m on August 20, 2003. This is approximately 0.85 m higher than the lake elevation before impoundment, approximately 3.65 m below the maximum design water level and 1.3 m lower than when the dam was last inspected in 2002. The lake level history is shown in Figure 7.

## **4.0 SEEPAGE AND EROSION FEATURES**

On August 20, 2003, EBA found no signs of seepage from the dam and there were no reports of seepage by mine personnel.

A very small pool of water is ponded just past the downstream toe of the west abutment. Runoff from the approach road to the dam has a direct path to this location. Standing water was observed in this area by EBA in 1996, 1998, 2000 and 2002. The area has always been slightly depressed and likely has collected runoff from the surrounding area.

As reported in previous years, surface run-off has created an erosion gully on the west side of the west access road from the top of the dam to the toe of the dam. The erosion gully (up to 1.5 m deep in 2002) was filled with drifted snow on August 20, 2003. A detailed description of the erosion is provided in EBA's 2002 Dam Inspection Report.

The gully does not affect the dam performance; however it may require filling for aesthetic reclamation purposes. This could be done in 2004. It may be possible to use excavated dam rip rap material as gully backfill. Dam reclamation earthworks should not concentrate surface flows in areas where patterned ground or any other evidence of ice-rich permafrost is present.

## **5.0 DAM STABILITY**

The upstream and downstream dam slopes of Garrow Lake Dam have remained stable and there is negligible erosion on the slopes (Photos 1 and 2).

There has been a considerable amount of vehicle traffic on the west half of the dam since EBA's 2002 site visit. This traffic has occurred while adding and maintaining siphon lines. A modest curb of granular ridge has developed on the upstream crest shoulder from material displaced by rubber tired vehicle traffic. On the downstream side the ridge is absent, however, some areas of disturbance and subsequent redressing are apparent (Photos 3 and 4). A shallow dish shaped depression that was about 1.5m diameter remained on August 20, that was free of any water (Photo 4).

These areas do not present any influence on the short-term dam performance and can be addressed at the time of decommissioning of the dam.

## **6.0 RESERVOIR SLOPES**

There were three polar bears in the vicinity of the mine site during EBA's site visit; therefore, for safety reasons, EBA's inspection of the shorelines of the reservoir was limited to visual examination of the shorelines visible from the dam site and access road.

The lowering of the water level has exposed more beach (Photo 5). Upslope of the beach, the sides of the reservoir remain stable with no evidence of any new erosion or instability.

The reservoir is operating at water levels more than a metre below the levels of the last few years. At present rates of water removal via the siphons, the lake level is falling by about 2.0 to 2.5 cm per day. Shallow slope movements and erosion appear to be similar to that observed in previous years.

## 7.0 SIPHONS

Water has been discharged regularly from Garrow Lake since 1994. The number of siphons have varied during that time. At the time of closure in 2002, there were ten 300 mm diameter siphons. On August 20, 2003, EBA observed that another eight 250 mm diameter siphons were added since EBA's last visit. A nineteenth pipe was observed at the site on the east side of the 250 mm and 300 mm diameter lines. This pipe was found by TC to be inappropriate for use at this site and was inactive. Between August 18 and 22, 2003 fifteen to seventeen of the available eighteen siphons were operating simultaneously. Maintenance staff were working to keep lines functioning.

The siphons terminate at the same location as they have in the past, approximately 60 m downstream of the crest of the dam, and discharge into half culvert sections. The culverts discharge into a pool that has been partly armoured with rip rap.

Flow rates from each of the 15 operating siphons were observed to be approximately 19,500 gpm. Total annual discharge data provided by Teck Cominco:

<u>Year</u>	<u>Annual Discharge (m<sup>3</sup>)</u>
2000	4,262,425
2001	2,955,954
2002	5,048,667

Siphon discharge observed during the 2003 site visit is shown in Photo 6.

## 8.0 SUMMARY

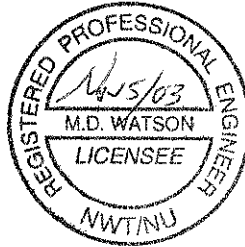
It is EBA's opinion that the dam is continuing to perform well. Ground temperatures are generally stable, and there are no signs of instability or significant erosion on the dam. The dam condition should continue to be monitored by TeckCominco on a monthly basis for any signs of seepage or distress and ground temperatures should continue to be measured. EBA should be informed of any soft areas, signs of instability/erosion or visible seepage through the dam. The erosion noted at the edge of the west access road to the reservoir does not adversely affect the dam in any way.

## 9.0 CLOSURE

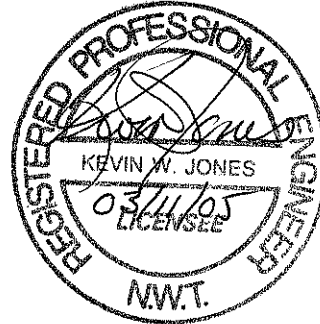
We trust that this information meets your requirements at this time. Please contact the undersigned if you have any questions.

Yours truly,  
EBA Engineering Consultants Ltd.

Reviewed by:

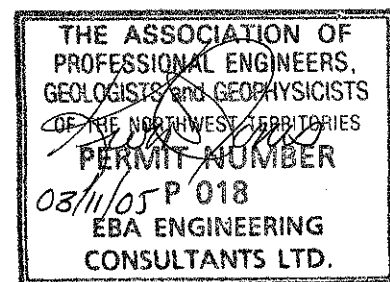


Mark Watson, P.Eng.  
Senior Geotechnical Engineer, Circumpolar Regions  
(Direct Line: (780) 451-2130, ext. 277)  
(e-mail: [mwatson@eba.ca](mailto:mwatson@eba.ca))



Kevin Jones, P.Eng.  
Project Director, Circumpolar Regions  
(Direct Line: (780) 451-2130, ext. 271)  
(e-mail: [kjones@eba.ca](mailto:kjones@eba.ca))

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**Photo 1**  
Upstream slope - looking west.



**Photo 2**  
Downstream slope - looking west.



**Photo 3**

Downstream slope - looking east.  
Very little ponded water at toe of dam.

**Photo 4**

Dam crest - looking east.



**Photo 5**

East abutment - beach condition after lowering reservoir.

**Photo 6**

Siphon discharge into Garrow Lake.  
Single line in foreground was inactive.

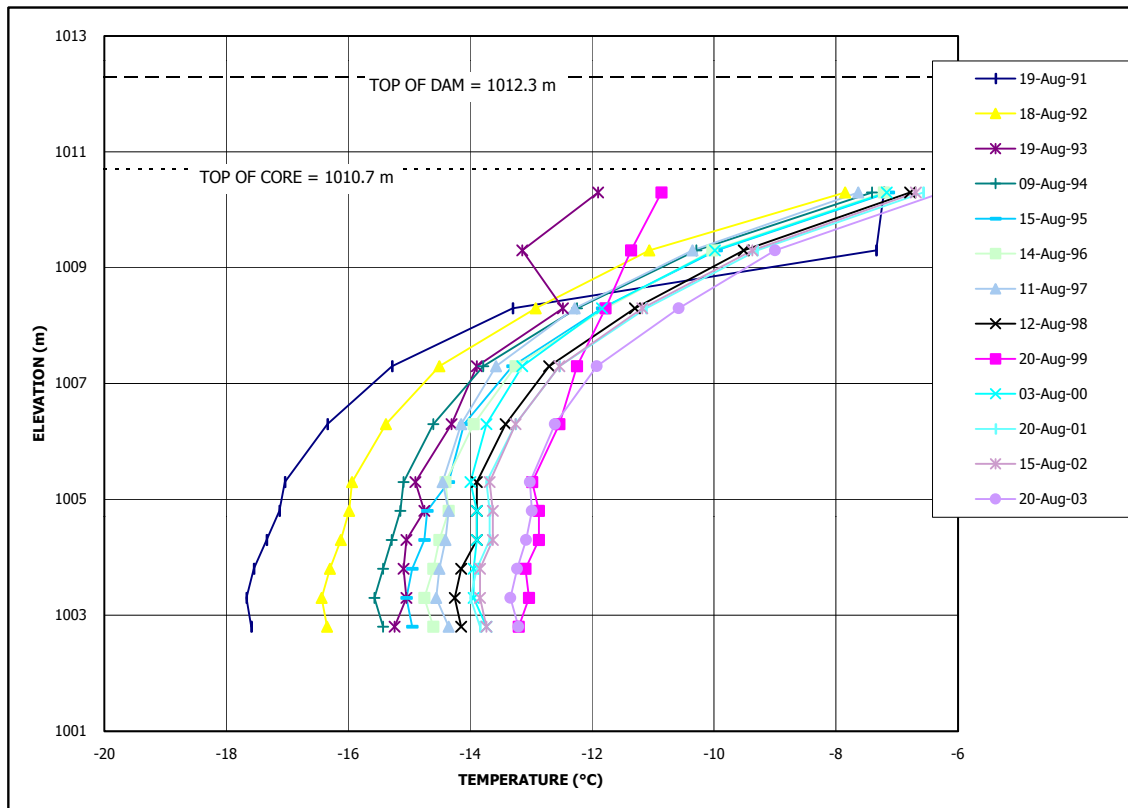


FIGURE 1: NORTH THERMISTOR - TEMPERATURE PROFILE

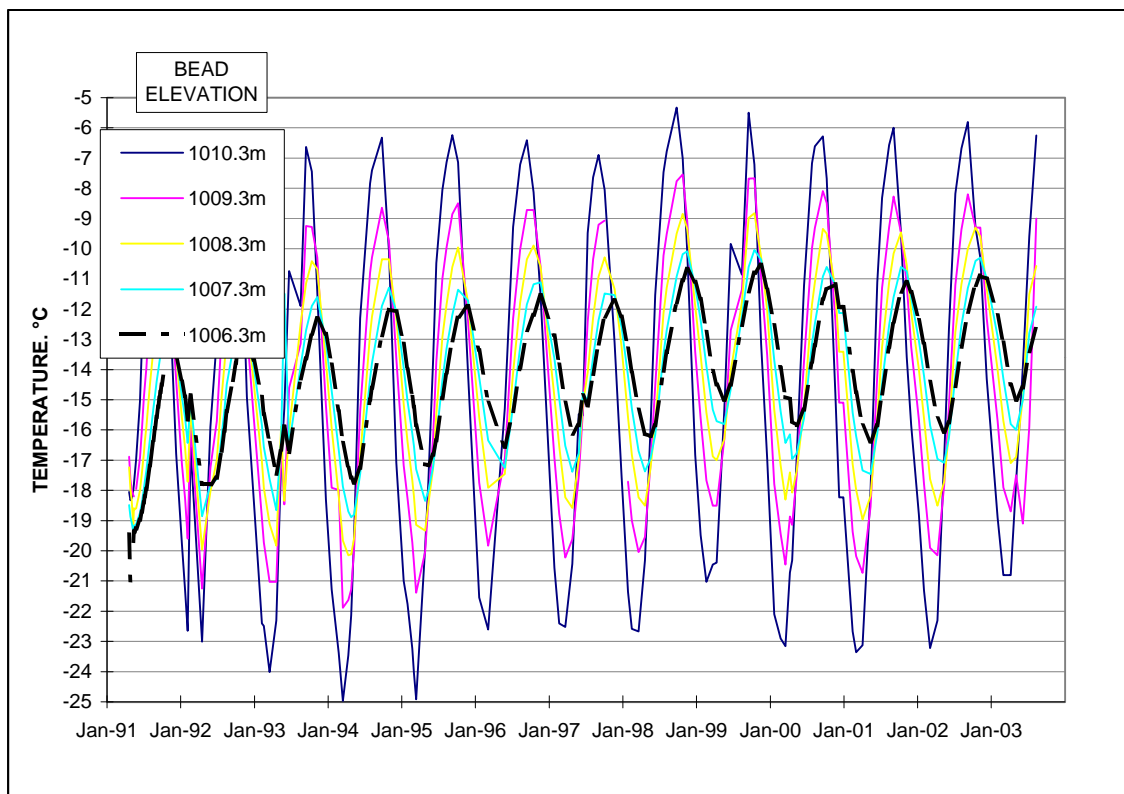


FIGURE 2: NORTH THERMISTOR - TEMPERATURE HISTORY

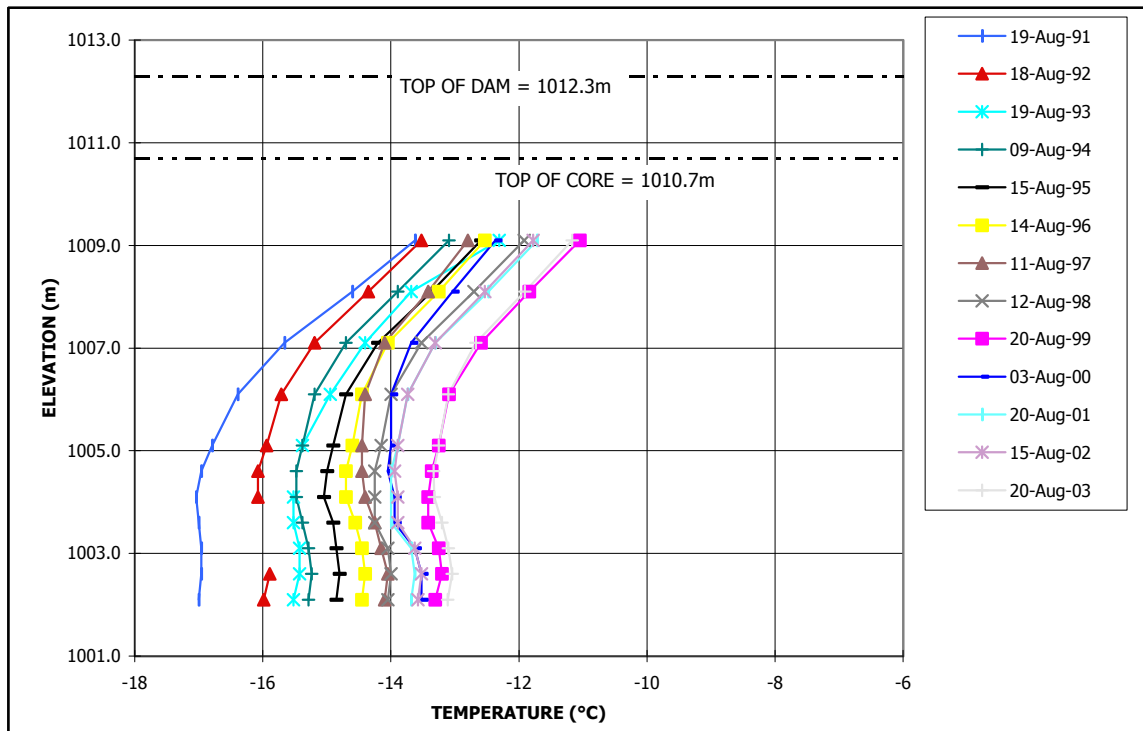


FIGURE 3: CENTRE THERMISTOR - TEMPERATURE PROFILE

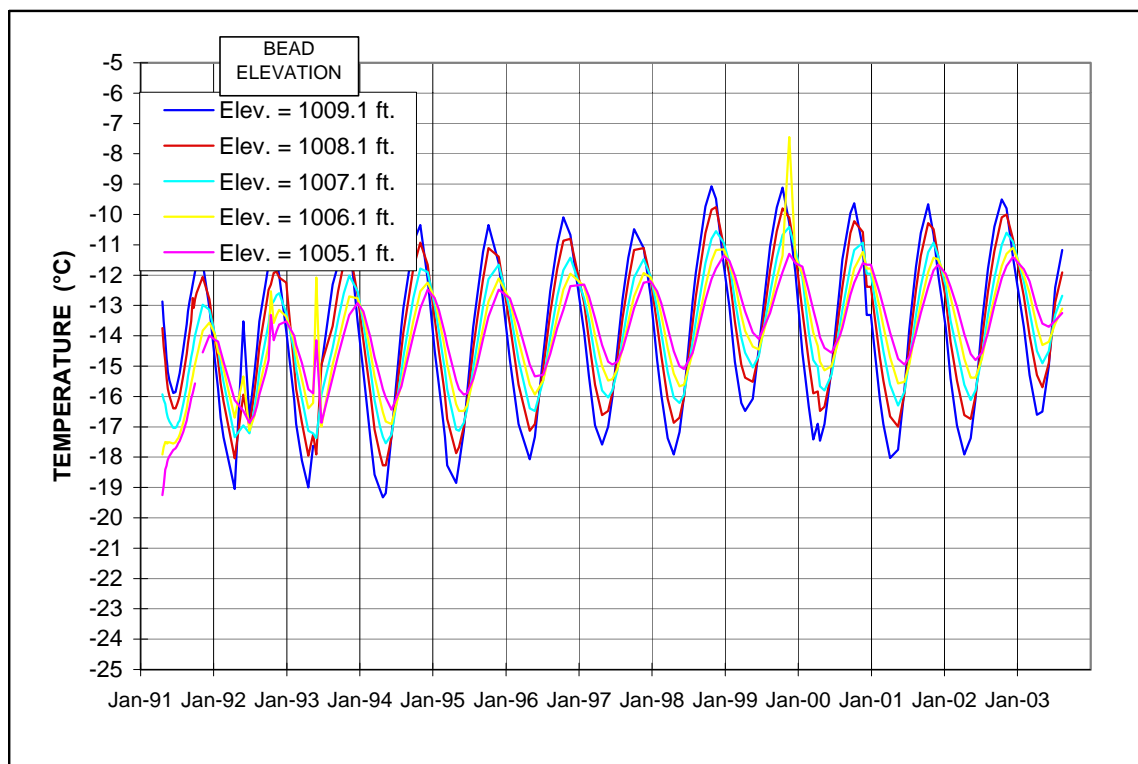


FIGURE 4: CENTRE THERMISTOR - TEMPERATURE HISTORY

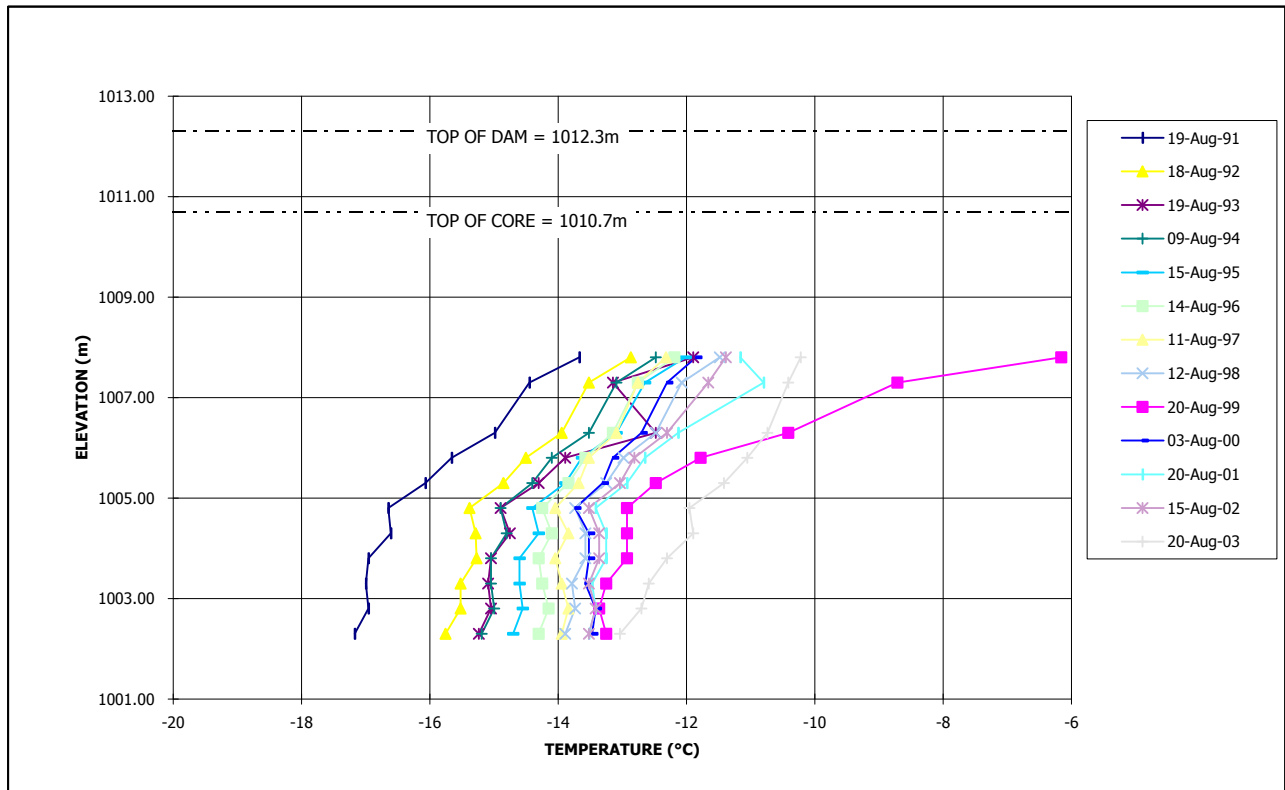


FIGURE 5: SOUTH THERMISTOR - TEMPERATURE PROFILE

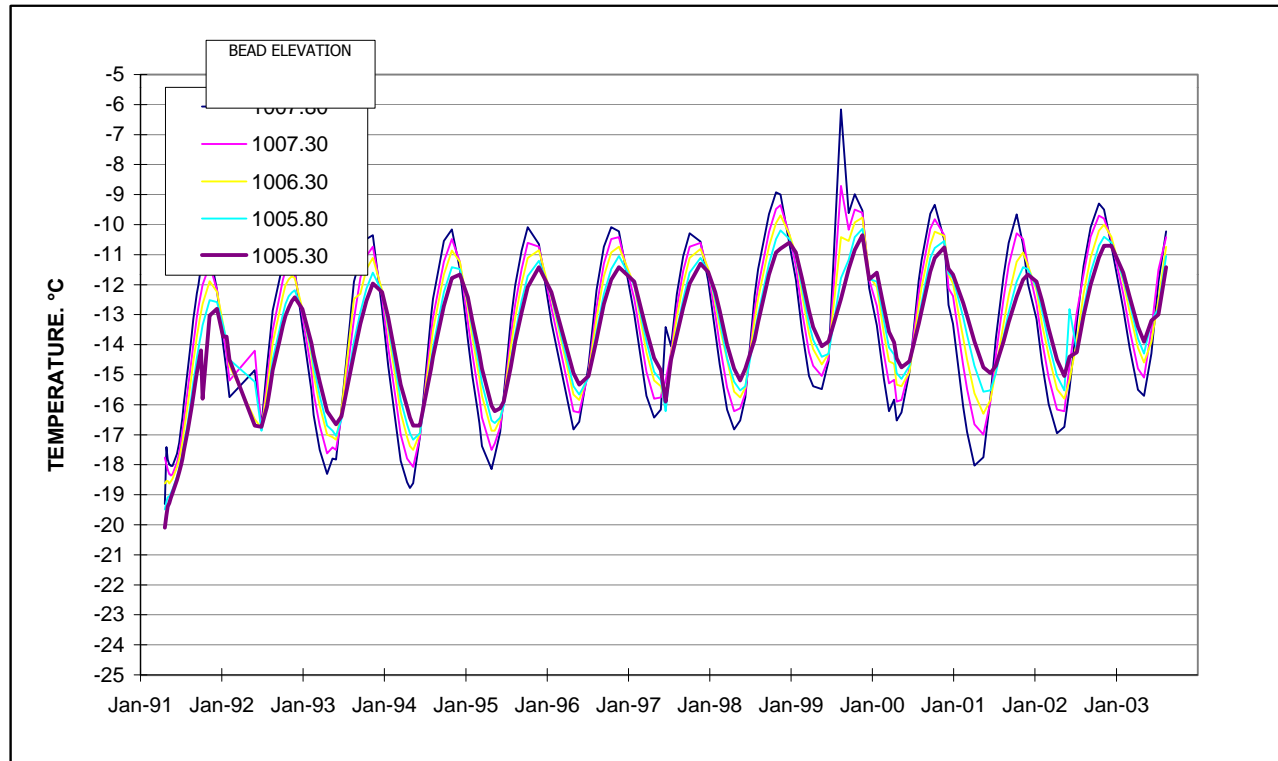


FIGURE 6: SOUTH THERMISTOR - TEMPERATURE HISTORY

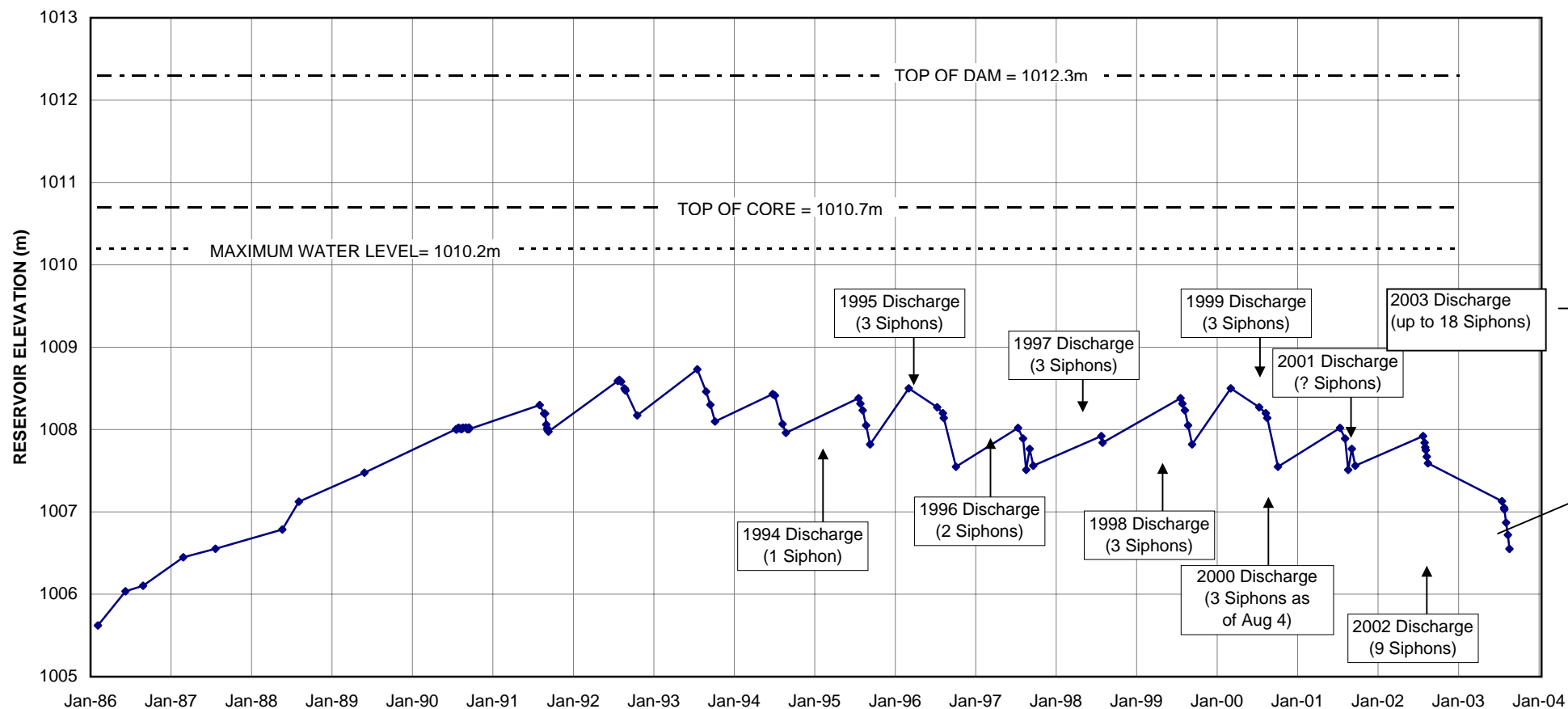


FIGURE 7: GARROW LAKE - RESERVOIR LEVEL